

The beetles (Insecta, Coleoptera) of the southwest of Primorsky Krai, Russian Far East

Kirill V Makarov[‡], Yuri N Sundukov[§]

[‡] Moscow State Pedagogical University, Moscow, Russia

[§] Federal Scientific Center of the East Asia Terrestrial Biodiversity Far Eastern Branch of the Russian Academy of Sciences, Vladivostok, Russia

Corresponding author: Kirill V Makarov (kvmac@inbox.ru)

Academic editor: Andrey Frolov

Abstract

Background

The article is based on the results of the authors' field studies on the fauna of Coleoptera in the southwest of Primorsky Krai, conducted in 1990, 1999, 2015 and 2017–2022. The collection of material was carried out in more than 150 geographical points in the territories of the Khasansky, Nadezhdensky and Ussuriysky raion of the Primorsky Krai of Russia. In addition, small collections materials stored at the Federal Scientific Center of East Asia Terrestrial Biodiversity FEB RAS (Vladivostok, Russia) and Moscow Pedagogical State University (Moscow, Russia) were studied. This is the first generalised list of beetles for south-western Primorye and protected natural areas. A total of 13274 beetles belonging to 629 species from 311 genera and 44 families were studied. In addition to our own collections, the sample includes literature data on 10008 specimens belonging to 355 species from 142 genera and 16 families.

New information

This is the first dataset that provides data on the taxonomic composition and geographic distribution with precise coordinates for 47 families of Coleoptera in the southwest of Primorsky Krai, Russia.

Keywords

Coleoptera, fauna, distribution, southwest of Primorsky Krai, Russian Far East

Introduction

The beetle fauna (Insecta, Coleoptera) of the southwest of Primorsky Krai is one of the best studied in the Russian Far East (Lehr 1989, Lehr 1992, Lehr 1996 etc.). However, information on the distribution of most species is very scarce or completely absent. The main goal of our work was to identify the taxonomic diversity of beetles (Coleoptera) and their distribution in the southwest of Primorsky Krai. The most intensive field research was conducted in 2017-2022 and the data were converted to Darwin Core format in 2022.

Sampling methods

Description: The data are based on material collected by the authors during nine field expeditions to the southwest of Primorsky Krai. During the period of the most intensive studies in 2017–2022, route and stationary studies covered the territory from the village of Khasanskoye in the south to Ussuriysk in the north (Fig. 1). During this period, the collection of beetles was carried out in more than 150 geographical points in the territories of the Khasansky, Nadezhdensky and Ussuriysky raion of Primorsky Krai. As a result, 13,274 Coleoptera specimens belonging to 629 species from 311 genera and 44 families were collected and identified. Processing of the publications cited here made it possible to include in the sample data on 10008 specimens belonging to 355 species from 142 genera and 16 families (Lafer and Zolotarev (1971), Lafer (1973), Hieke (1976), Lafer (1976), Lafer (1978), Lafer (1984), Kataev (1989), Kataev and Wrase (1995), Moraveč and Wrase (1997), Moraveč and Wrase (1995), Fedorenko (1996), Kurbatov (1993), Ito (1996), Obydov (1996), Zamotajlov (1996), Obydov (1999), Solodovnikov (1999), Lafer (2004), Zamotajlov (2005), Lafer (2005), Bezborodov et al. (2008), Dudko (2006), Lafer and Kataev (2008), Melnik (2009), Miroshnikov (2006), Ruzzier and Kovalev (2016), Gus'kova (2012), Jaeger (2013), Bezborodov (2014), Jendek and Grebennikov (2011), Bezborodov (2015), Bezborodov (2016a), Bezborodov (2016b), Veselova (2011), Polilov (2008), Valainis (2010), Obydov (2009), Ryvkin (2011a), Ryvkin (2011b), Sazhnev (2018), Bezborodov (2019), Schmidt and Liebherr (2009), Guéorguiev and Liang (2020), Lafer and Budilov (2015), Makarov et al. (2019), Sergeev (2019), Sergeev (2015), Shabalin (2013), Sundukov and Makarov (2021)). The complete sample includes 23282 Coleoptera specimens from 862 species, 360 genera and 47 families and the study area covers the Nadezhdensky, Oktyabrsky, Pogranichny, Ussuriysky, Khankaysky, Khasansky and Khorolsky administrative districts of Primorsky Krai (Fig. 1a, Fig. 1b).

Sampling description: When studying beetles in the southwest of Primorsky Krai, all available methods of collecting were used: manual collection, collection with an exhaustor, installation of soil traps, shaking off the crowns of trees and shrubs, catching by electric lamps, night collection with a flashlight, “trampling” of vegetation in wet and swampy biotopes, pouring water in near-water areas, sifting the litter with an entomological sieve, “mowing” the grass with an entomological net and catching with

window traps (Chapman and Kinghorn 1955, Hardwick 1968, Stewart and Lam 1968, Gillies 1969, Vanhercke et al. 1981, Kryzhanovskij 1983, Schauff 1986, Spence and Niemelä 1994, Dunaev 1997, Yahiro and Yano 1997, Skvarla et al. 2014).

Quality control: All collected specimens of the families Agyrtidae, Anobiidae, Carabidae, Cerambycidae, Coccinellidae, Cucujidae, Decliniidae, Disteniidae, Elmidae, Endomychidae, Erotylidae, Geotrupidae, Helotidae, Kateretidae, Lucanidae, Melandryidae, Meloidae, Monotomidae, Mordellidae, Mycetophagidae, Ochodaeidae, Pyrochroidae, Rhysodidae, Silphidae and Tenebrionidae have been identified by the authors of this resource. The species of other families are partially or completely determined by specialists: A.A. Gusakov (Bolboceratidae, Scarabaeidae, Trogidae), S.V. Kazantsev (Cantharidae, Lycidae), A.G. Kirejtshuk (Nitidulidae), B.M. Korotyayev, I.A. Zabaluev (Curculionidae), S.V. Kurbatov (Pselaphidae, Scydmaenidae), I.V. Melnik (Buprestidae, Cleridae, Trogossitidae), Yu.E. Mikhailov, M.E. Sergeev (Chrysomelidae, Megalopodidae), A.A. Petrov (Scolytidae), A.A. Polilov (Ptiliidae), A.A. Prokin (Elmidae), A.S. Sazhnev (Heteroceridae), S.V. Saluk (Latridiidae), O.I. Semionenkov, A.S. Tokareva (Staphylinidae) and V.K. Zinchenko (Leiodidae).

Systematics and names of taxa are given in accordance with the Catalogue of Palaearctic Coleoptera (Löbl and Smetana 2006, Löbl and Smetana 2007, Löbl and Smetana 2010, Löbl and Smetana 2011, Löbl and Smetana 2013, Löbl and Löbl 2015, Löbl and Löbl 2017, Löbl and Löbl 2020).

Geographic coverage

Description: The southwest of Primorsky Krai is located in the extreme southeast of mainland Russia. According to the physical-geographical zoning of the south of the Far East, it occupies the western part of the Khanka-Suifun physical-geographical region (Liverovskii and Kolesnikov 1949). Botanically and geographically, the flat part of the region belongs to the forest-steppe zone and the mountainous parts belong to the subzone of liana coniferous-deciduous forests (Liverovskii and Kolesnikov 1949, Petropavlovsky 2004). The presented territory is located at the coordinates 42.29° – 45.35° north latitude and 130.39° – 132.41° east longitude (Fig. 1a). Its western border runs along the state border of Russia with China and North Korea, the eastern - along the western shore of Lake Khanka, the valleys of the Ilistaya and Razdolnaya rivers and the coast of Peter the Great Bay. The length from north to south is about 350 km, the maximum length from west to east is about 100 km.

According to the nature of the relief in the south-west of Primorsky Krai, two parts are distinguished: the eastern plain and the western mid-mountain. The flat territory in the north is represented by the Khanka lowland, in the centre by the Ussuri lowland and the delta of the Razdolnaya River, in the extreme south - a small alluvial-marine plain on the site of the ancient delta of the Tumannaya River (Nikolskaya 1969). The orographic composition of the mountainous territory includes the Pogranichny Range (the highest point is Mount Kedrovaya, 984 m above sea level) in the north, the Borisov Plateau

(Mount Pologaya, 741 m above sea level) in the centre and the Black Mountains Range (Mount Luna, 919 m above sea level) in the south.

The most common vegetation of the plains is meadows, less often steppes (Kurentsova 1962). This vegetation is represented by wet reed grass meadows, moderately moistened and dry grass-grass meadows and grass swamps. Forest areas are fragmentary, occurring on small hills, along riverbeds and on the coastal ridges of Khanka Lake and Posyet Bay. Nemoral and mountain-nemoral oak and polydominant broad-leaved forests predominate in mountainous areas (Petropavlovsky 2004). Within the Borisov Plateau, mountain larch and spruce-fir forests with nemoral herbage are common.

The south-western part of Primorsky Krai is a unique for Russia refugium of warm-temperate East Asian flora and fauna, distinguished by a high level of biodiversity amongst the regions of the Russian Far East. Therefore, a significant part of this territory is part of specially protected natural areas of the federal ("Land of the Leopard" National Park, "Kedrovaya Pad" Nature Reserve, Far Eastern Marine Reserve (Fig. 1b) and western clusters of Khankaysky Nature Reserve) and regional (Nature Reserves Khasansky, Komissarovsky and Poltavsky) values.

The most important feature of the flora of the territory is the high saturation with subtropical and tropical species, which hardly penetrate here into the territory of Russia from adjacent regions of East Asia (Kozhevnikov et al. 2005). For example, south-western Primorye includes 46% of all Far Eastern and 87% of all Primorsky Krai angiosperm species included in the Red Book of the Russian Federation (Anonymous 2008). Moreover, 30% of the rare species of Primorsky Krai are found only in its southwest. The same can be said about gymnosperms (50% of the entire Far East and 80% of Primorsky Krai), lichens (49% and 74%, respectively) or fungi (50% and 50%, respectively) (Anonymous 2008). No less noticeable is the contribution of the southwest of Primorsky Krai to the conservation of animal diversity. For example, this territory is inhabited by 55% of Far Eastern and 100% of protected species of terrestrial mammals of Primorsky Krai (50% is found only here), 67% of Far Eastern and 100% of reptiles of Primorsky Krai (50% is found only here), 60% of Far Eastern and 78% of protected insects of Primorsky Krai and 100% annelids of Far East and Primorsky Krai (Anonymous 2021).

The share of beetles included in the Red Data Book of Russia is also high. In the southwest of Primorsky Krai, 64% of Far Eastern and 90% of rare beetle species of Primorsky Krai are found, 30% of which are found only in this territory (Anonymous 2021). In addition to the species included in the Red Book, a number of taxa have been noted in the southwest of Primorsky Krai that are also distributed in the modern fauna of foreign East Asia, but do not go beyond southwest of Primorsky Krai in their distribution. For example, amongst ground beetles (Carabidae), these include *Amara silvestrii* Baliani, 1937, *Anisodactylus punctatipennis* A. Morawitz, 1862, *Bembidion coreanum* Jedlička, 1946, *Brachinus aeneicostis* Bates, 1883, *Carabus fraterculus* Reitter, 1895, *C. hummeli pusongensis* Imura, 1993, *C. jankowskii* (Oberthür, 1883), *C. smaragdinus losevi* Rapuzzi, 2016, *C. wulffiusi* A. Morawitz, 1862, *Cymindis kuznetzowi* Sundukov, 2001,

Dromius jureceki (Jedlička, 1935), *Harpalus chasanensis* Lafer, 1989, *H. farkaci* Kataev et Wrase, 1995, *Mastax thermarum egorovi* Lafer, 1973, *Nebria komarovi* Semenov et Znojko, 1928, *Nipponoharpalus discrepans* (A. Morawitz, 1862), *Stenaptinus agnatus* (Chaudoir, 1876), *Pogonus itoshimaensis* Habu, 1954, *Pristosia vigil* (Tschitschérine, 1895), *Pterostichus coruscus* (Tschitschérine, 1895), *P. jungens* (Tschitschérine, 1893), *P. kerzhneri* Lafer, 1983, *P. mukdenensis* Breit, 1933, *P. orientalis nigromontanus* Lafer et Budilov, 2015, *Scarites terricola pacificus* Bates, 1873, *Tachyura gradata* Bates, 1873 and some others.

It should be noted that the southwest of Primorsky Krai is one of the most populated parts of the Russian Far East (population density is about 10 people/km²). A characteristic feature of this part of the region is a rather high degree of environmental transformation. Primary ecosystems here co-exist with secondary ones and a significant part of the forests has been subjected to fires or economic felling. Therefore, the publication of the results of our research seems relevant, as it can serve for the purposes of further monitoring.

Coordinates: 42.29 and 45.35 Latitude; 130.39 and 132.41 Longitude.

Taxonomic coverage

Description: Data on 862 species of the order Coleoptera belonging to 360 genera and 47 families are given (Sundukov and Makarov 2022).

Taxa included:

Rank	Scientific Name	Common Name
order	Coleoptera	Beetles

Temporal coverage

Data range: 1870-6-05 - 2022-6-09.

Usage licence

Usage licence: Creative Commons Public Domain Waiver (CC-Zero)

Data resources

Data package title: The Coleoptera of the southwest of Primorsky Krai, Russian Far East

Resource link: <https://www.gbif.org/ru/dataset/d90681d8-285b-4682-b2f6-f8929dfe6899>

Alternative identifiers: <http://gbif.ru:8080/ipt/resource?r=colswprim&v=1.2>

Number of data sets: 1

Data set name: The Coleoptera of the southwest of Primorsky Territory, Russian Far East

Character set: UTF-8

Download URL: https://www.gbif.org/ru/occurrence/download?dataset_key=d90681d8-285b-4682-b2f6-f8929dfe6899

Data format: Darwin Core

Description: The dataset includes the results of the authors' field studies on the fauna of Coleoptera in the southwest of Primorsky Krai, conducted in 1990, 1999, 2015 and 2017–2022. The collection of material was carried out in more than 150 geographical points in the territories of the Khasansky, Nadezhdensky and Ussuriysky raion of the Primorsky Territory of Russia. In addition, small collection materials stored in the Federal Scientific Center of East Asia Terrestrial Biodiversity FEB RAS (Vladivostok, Russia) and Moscow Pedagogical State University (Moscow, Russia) were studied. A total of 13274 beetles belonging to 629 species from 311 genera and 44 families were studied. In addition to our own collections, the sample includes literature data, including information on 10008 specimens belonging to 355 species from 142 genera and 16 families.

Column label	Column description
basisOfRecord	Preserved Specimen (in all table).
class	Insecta (in all records).
continent	Asia (in all records).
coordinateUncertaintyInMetres	The horizontal distance (in metres) from the given decimalLatitude and decimalLongitude describing the smallest circle containing the whole of the Location.
country	Russia (in all records).
countryCode	Country code, RU in all records.
county	Full, unabbreviated name of the next smaller administrative region than state Province in which the Location occurs.
day	The integer day.
decimalLatitude	The geographic latitude.
decimalLongitude	The geographic longitude.
eventDate	The date or interval during which an Event occurred.
family	Full scientific name of the family in which the taxon is classified.
genus	Generic name.

geodeticDatum	Geodetic datum, WGS84 in all records.
habitat	Category or characteristic of the habitat in which the beetles are collected.
infraspecificEpithet	The name of the lowest or terminal infraspecific epithet of the scientificName, excluding any rank designation.
kingdom	Animalia (in all records).
locality	The specific description of the place.
LocationRemarks	Comments or notes about the Location. Specially protected natural areas of Primorsky Krai under the leadership of the Federal State Budgetary Institution "Land of the Leopard": Far Eastern Marine Reserve, Gamovsky cluster, Kedrovaya Pad Nature Reserve, Land of the Leopard National Park.
month	The integer month.
occurrenceID	An composite identifier for Occurrence: the first 4 letters of the generic epithet, 10 letters from the specific epithet and the ordinal number of the entry for this species.
order	Coleoptera (in all records).
organismQuantity	A number value for the quantity of specimens.
organismQuantityType	The type of quantification system used for the quantity of organism.
phylum	Arthropoda (in all records).
recordedBy	A person, responsible for recording the original Occurrence.
scientificName	The full scientific name, including author and year.
specificEpithet	The name of the first or species epithet of the scientificName.
stateProvince	Primorsky (Maritime) Krai, in all records.
taxonRank	The taxonomic rank of the most specific name in the scientificName (species or subspecies).
verbatimCoordinates	The verbatim original spatial coordinates.
verbatimCoordinateSystem	In all table: degrees, minutes, seconds.
verbatimEventDate	The verbatim original representation of the date information.
verbatimLocality	The original textual description of the place.
year	The four-digit year.

Acknowledgements

We extend our thanks to all colleagues who assisted in our work and especially to entomologists, who provided a reliable identification of a part of the material: A.A. Gusakov, S.V. Kazantsev, A.G. Kirejtshuk, B.M. Korotyaev, I.A. Zabaluev, S.V. Kurbatov,

I.V. Melnik, Yu.E. Mikhailov, M.E. Sergeev, A.A. Petrov, A.A. Polilov, A.A. Prokin, A.S. Sazhnev, S.V. Saluk, O.I. Semionenkov, A.S. Tokareva and V.K. Zinchenko.

References

- Anonymous (2008) Red Data Book of the Russian Federation (plants and mushrooms). Association of Scientific Publications KMK, Moscow, 855 pp. [In Russian].
- Anonymous (2021) Red Data Book of the Russian Federation. Animals. VNIi Ekologiya, Moscow, 1128 pp. [In Russian].
- Bezborodov VG, Lafer GS, Ivanov SN (2008) A new record of the tiger beetle *Cicindela obliquefasciata* Adams, 1817 (Coleoptera, Cicindelidae) from the Russian Far East. Euroasian Entomological Journal 7 (1): 19-22. [In Russian].
- Bezborodov VG (2014) Annotated list of the lamellicorn beetles (Coleoptera, Scarabaeoidea) of the fauna of the Primorsky Krai (Russia). Amurian Zoological Journal 6 (1): 22-50. [In Russian]. <https://doi.org/10.33910/1999-4079-2014-6-1-22-50>
- Bezborodov VG (2015) The genus *Osmoderma* (Coleoptera, Scarabaeidae, Trichiinae) in Siberia and the Russian Far East. Zoologicheskii Zhurnal 94 (11): 1282-1292. [In Russian].
- Bezborodov VG (2016a) Chorology and population structure of *Callipogon relictus* Semenov, 1899 (Coleoptera, Cerambycidae) in East Asia. Euroasian Entomological Journal 15 (4): 393-398. [In Russian].
- Bezborodov VG (2016b) The genus *Copris* (Coleoptera, Scarabaeidae) in the Far East of Russia. Zoologicheskii Zhurnal 95 (6): 692-698. [In Russian].
- Bezborodov VG (2019) Lamellicorn beetles (Coleoptera, Scarabaeoidea) from Ecological Park "Leopardy na Gamova" and its neighbouring areas, Primorskii Krai, Russia. Euroasian Entomological Journal 18 (2): 131-148. [In Russian]. <https://doi.org/10.15298/euroasentj.18.2.09>
- Chapman JA, Kinghorn JM (1955) Window flight traps for insects. The Canadian Entomologist 87: 46-47. <https://doi.org/10.4039/Ent8746-1>
- Dudko RY (2006) A revision of the Palaearctic species of the subgenus *Catonebria* Shilenkov, 1975 (Coleoptera, Carabidae, *Nebria*). 2. *Nebria catenulata*-species group. Eurasian Entomological Journal 5: 17-46. [In Russian].
- Dunaev EA (1997) Methods of ecological and entomological research. Moskovskaya Gorodskaya Stanziya Yunykh Naturalistov, Moscow, 44 pp. [In Russian].
- Fedorenko DN (1996) Reclassification of world Dyschiriini, with a revision of the Palaearctic fauna (Coleoptera, Carabidae). Pensoft Publishers, Sofia, Moscow, St. Petersburg, 224 pp.
- Gillies MT (1969) The ramp-trap, an unbaited device for flight studies of mosquitoes. Mosquito News 29: 189-193.
- Guéorguiev B, Liang H (2020) Revision of the Palaearctic and Oriental representatives of *Lachnocrepis* LeConte and *Oodes* Bonelli (Coleoptera: Carabidae), with special account on Chinese species. Zootaxa 4850: 1-89. <https://doi.org/10.11646/zootaxa.4850.1.1>
- Gus'kova EV (2012) *Donacia bicoloricornis* Chen, 1941 (Coleoptera: Chrysomelidae) - little known leaf-beetle in the Russian fauna. Amurian Zoological Journal 4 (3): 245-246. [In Russian]. <https://doi.org/10.33910/1999-4079-2012-4-3-245-246>

- Hardwick DF (1968) A brief review of the principles of light trap design with a description of an efficient trap for collecting noctuid moths. *Journal of the Lepidopterists' Society* 22: 65-75.
- Hieke F (1976) Revision einiger Gruppen der Gattung *Amara* Bon. (Col., Carabidae). *Deutsche Entomologische Zeitschrift (N.F.)* 23: 297-366. <https://doi.org/10.1002/mmnd.19760230406>
- Ito N (1996) Descriptions of three new species and a redescription of the Selenophori group from Asia (Harpalini, Carabidae, Coleoptera). *The Entomological Review of Japan* 51: 53-61.
- Jaeger B (2013) Revision of the East Palaearctic and Oriental species of the *Acupalpus* subgenus *Stenolophidius* Jeannel, 1948 (Coleoptera: Carabidae: Harpalini: Stenolophina). *Vernate* 32: 291-346.
- Jendek E, Grebennikov V (2011) *Agrilus* (Coleoptera: Buprestidae) of East Asia. Jan Farkač, Prague, 362 pp.
- Kataev BM (1989) Novye dannye o zhuzhelitsakh rodov *Pangus* i *Harpalus* (Coleoptera, Carabidae) Mongolii s reviziey ryada palearkticheskikh grupp. *Nasekomye Mongolii* 10: 188-278. [In Russian].
- Kataev BM, Wrase DW (1995) Three new and two little-known Palaearctic species of the genus *Harpalus* Latr. (Coleoptera, Carabidae). *Linzer Biologische Beiträge* 27 (1): 319-330.
- Kozhevnikov AE, Korkishko RI, Kozhevnikova ZV (2005) State and problems of flora protection in the southwestern part of Primorsky Territory. V.L. Komarov Memorial Lectures 51: 101-123. [In Russian].
- Kryzhanovskij OL (1983) Beetles of the suborder Adephaga: families Rhysodidae, Trachypachidae; family Carabidae (introduction and overview of the fauna of the USSR). *Fauna SSSR: Zhestkokrylye*. 1 (2). Nauka, Leningrad, 341 pp. [In Russian].
- Kurbatov SA (1993) Scydmaenid beetles of the genera *Stenichnus* Thoms. and *Euconnus* Thoms. (Coleoptera, Scydmaenidae) of Russian Far East. *Entomologicheskoe Obozrenie* 72 (3): 591-596. [In Russian].
- Kurentsova GE (1962) Vegetation of the Khanka plain and surrounding foothills. *USSR Academy of Sciences Publ, Moscow-Leningrad*, 140 pp. [In Russian].
- Lafer GS, Zolotareno GS (1971) Yavanskiy bombardir *Pheropsophus javanus* (Dejean) – novy vid zhuzhelitsy (Coleoptera, Carabidae) v faune SSSR. In: Cherepanov AI (Ed.) *Novye i maloizvestnyye vidy Sibiri*. Novosibirsk, 64–70 pp. [In Russian].
- Lafer GS (1973) O maloizvestnykh zhuzhelitsakh (Coleoptera, Carabidae) iz Primorya i ikh zoogeograficheskaya kharakteristika. *Entomologicheskoe Obozrenie* 52 (4): 845-855. [In Russian].
- Lafer GS (1976) Review of the species of ground beetles of the tribe Agonini (Coleoptera, Carabidae) of the Far East of the USSR I. *Trudy Biologo-pochvennogo Instituta DVNC AN SSSR* 43 (146): 18-40. [In Russian].
- Lafer GS (1978) Review of the species of the subgenus *Celia* Zimm. of the genus *Amara* Bon. (Coleoptera, Carabidae) from the south of the Far East of the USSR. *Trudy Biologo-pochvennogo Instituta DVNC AN SSSR* 50 (153): 58-79. [In Russian].
- Lafer GS (1984) O sostave podroda *Lagarus* Chaud. i ego svyazyakh s drugimi blizkimi podrodami roda *Pterostichus* Bon. (Coleoptera, Carabidae). 2. Sistematischeskiy obzor vostochnoasiatskikh vidov podroda *Lagarus* Chaud. *Sistematika Nasekomykh Dal'nego Vostoka*: 18-30. [In Russian].

- Lafer GS (2004) Ground-beetles (Coleoptera: Carabidae) of the inlands. In: Tyurin AN (Ed.) Far Eastern Marine Biosphere Reserve. Biota. 2. Dalnauka, Vladivostok, 711–719 pp. [In Russian].
- Lafer GS (2005) *Pterostichus (Pseudomaseus) mukdenensis* Breit, 1933 (Coleoptera, Carabidae) - a new species of ground beetles for the fauna of Russia. Euroasian Entomological Journal 4: 317-320. [In Russian].
- Lafer GS, Kataev BM (2008) On species of the genus *Diplocheila* Brulle (Coleoptera, Carabidae) from the Russian Far East, with a brief review of the East Asian species. Entomologicheskoe Obozrenie 87: 604-623. [In Russian].
- Lafer GS, Budilov PV (2015) New subspecies of *Pterostichus orientalis* (Motschulsky, 1844) (Coleoptera: Carabidae) from Primorskii Krai. A.I. Kurentsov's Annual Memorial Meetings 26: 101-108. [In Russian].
- Lehr PA (Ed.) (1989) Opredelitel nasekomykh Dalnego Vostoka SSSR. Vol. 3. Zhestkokrylye, ili zhuki. Part 1. Nauka, Leningrad, 572 pp. [In Russian].
- Lehr PA (Ed.) (1992) Opredelitel nasekomykh Dalnego Vostoka SSSR. Vol. 3. Zhestkokrylye, ili zhuki. Part 2. Nauka, St. Petersburg, 704 pp. [In Russian].
- Lehr PA (Ed.) (1996) Opredelitel nasekomykh Dalnego Vostoka Rossii. Vol. 3. Zhestkokrylye, ili zhuki. Part 3. Dalnauka, Vladivostok, 556 pp. [In Russian].
- Liverovskii YA, Kolesnikov BP (1949) The nature of the southern half of the Soviet Far East. Physical and geographical characteristic. Geograficheskaya Literatura, Moscow, 381 pp. [In Russian].
- Löbl I, Smetana A (Eds) (2006) Catalogue of Palaearctic Coleoptera. Volume 3. Scarabaeoidea, Scirtoidea, Dascilloidea, Buprestoidea, Byrrhoidea. 3. Apollo Books, Stenstrup, 690 pp.
- Löbl I, Smetana A (Eds) (2007) Catalogue of Palaearctic Coleoptera. Volume 4. Elateroidea, Derodontoidea, Bostrichoidea, Lymexyloidea, Cleroidea, Cucujoidea. 4. Apollo Books, Stenstrup, 935 pp. <https://doi.org/10.1163/9789004260894>
- Löbl I, Smetana A (Eds) (2010) Catalogue of Palaearctic Coleoptera. Volume 6. Chrysomeloidea. 6. Apollo Books, Stenstrup, 924 pp.
- Löbl I, Smetana A (Eds) (2011) Catalogue of Palaearctic Coleoptera. Volume 7. Curculionoidea I. 7. Apollo Books, Stenstrup, 373 pp.
- Löbl I, Smetana A (Eds) (2013) Catalogue of Palaearctic Coleoptera. Volume 8. Curculionoidea II. 8. Apollo Books, Stenstrup, 700 pp.
- Löbl I, Löbl D (Eds) (2015) Catalogue of Palaearctic Coleoptera. Volume 2. Hydrophiloidea – Staphylinoidea. Revised and Updated Edition. 2. Brill, Leiden–Boston, XXXVI+1702 pp. <https://doi.org/10.1163/9789004296855>
- Löbl I, Löbl D (Eds) (2017) Catalogue of Palaearctic Coleoptera. Volume 1. Archostemata – Myxophaga – Aephaga. Revised and Updated Edition. 1. Brill, Leiden–Boston, XXXIV+1443 pp.
- Löbl I, Löbl D (Eds) (2020) Catalogue of Palaearctic Coleoptera. Volume 5. Tenebrionoidea. Revised and Updated Edition. 5. Brill, Leiden–Boston, 969 pp. <https://doi.org/10.1163/9789004434998>
- Makarov KV, Sundukov YN, Korepanov MK (2019) A review of the genus *Odacantha* (Coleoptera, Carabidae) of the Russian Far East. Far Eastern Entomologist 380: 8-19. <https://doi.org/10.25221/fee.380.2>

- Melnik IV (2009) New and little-known species of checkered-beetles (Coleoptera: Cleridae, Thanerocleridae) from Russian Far East. *Russian Entomological Journal* 18 (1): 63-72. [In Russian].
- Miroshnikov AI (2006) Little known species of longicorn beetles (Coleoptera: Cerambycidae) from the Russian Far East. *Proceedings of the Russian Entomological Society* 77: 226-234. [In Russian].
- Moraveč P, Wrase DW (1995) Beitrag zur Systematik und Fauna der Trechodini und Trechini des Russischen Fernen Ostens mit der Beschreibung von zwei neuen Arten (Col., Carabidae). *Linzer Biologische Beiträge* 27: 367-395.
- Moraveč P, Wrase DW (1997) Zweiter Beitrag zur Systematik und Fauna der Trechodini und Trechini des Russischen Fernen Ostens mit der Beschreibung von zwei neuen *Trechus*-Arten (Coleoptera, Carabidae). *Linzer Biologische Beiträge* 29: 1057-1067.
- Nikolskaya VV (1969) Geological structure and relief. In: Gerasimov IP (Ed.) Southern part of the Far East. Nauka, Moscow, 21–69 pp. [In Russian].
- Obydov D (1996) Zur Frage der interartlichen Systematik von *Carabus (Megodontus) vietinghoffi* Adams, 1812 (Coleoptera, Carabidae). *Lambillionea* 96: 80-87.
- Obydov D (1999) Review of the *Megodontus* group of the genus *Carabus* of Sibiria. *Coleoptera, Schwanfelder Coleopterologische Mitteilungen* 1999: 83-130.
- Obydov D (2009) Faune des *Carabus* de Sibérie et d'Extrême-Orient russe – 1 Lipastrimorphi. *Collection Systématique*, 20. Magélianes, 148 pp.
- Petropavlovsky BS (2004) Forests of Primorsky Territory (Ecological and geographical analysis). Dalnauka, Vladivostok, 317 pp. [In Russian].
- Polilov AA (2008) An introduction to the Ptiliidae (Coleoptera) of Primorskiy region with descriptions of three new genera, new and little known species. *Russian Entomological Journal* 17 (2): 149-176. [In Russian].
- Ruzzier E, Kovalev AV (2016) First record of *Calycina* Blair, 1922 (Coleoptera, Mordellidae) in the Russian Far East with description of a new species. *Zootaxa* 4103 (1): 75-78. <https://doi.org/10.11646/zootaxa.4103.1.9>
- Ryvkin AB (2011a) Contributions to the knowledge of *Stenus (Nestus)* species of the *crassus* group (Insecta: Coleoptera: Staphylinidae: Steninae). 1. Four new species from the Russian Far East with taxonomic notes. *Baltic Journal of Coleopterology* 11 (1): 57-72.
- Ryvkin AB (2011b) On new and poorly known *Lathrobium* (s.str.) species from Siberia and the Russian Far East (Insecta: Coleoptera: Staphylinidae: Paederinae). *Baltic Journal of Coleopterology* 11 (2): 135-170.
- Sazhnev AS (2018) Materials to the variegated mud-loving beetles fauna (Coleoptera: Heteroceridae) of the Russian Far East. *Caucasian Entomological Bulletin* 14 (2): 153-155. [In Russian]. <https://doi.org/10.23885/181433262018142-153155>
- Schauff ME (1986) Collecting and preserving insects and mites - techniques and tools. *USDA Miscellaneous Publ* 1443: 1-68.
- Schmidt J, Liebherr JK (2009) Beiträge zur Systematik und Verbreitung paläarktischer Arten der Platynini (Coleoptera, Carabidae). *Vernate* 28: 225-257.
- Sergeev ME (2015) To study of leaf beetles (Coleoptera: Chrysomelidae) of protected areas of Primorskiy Region (Russia). *Caucasian Entomological Bulletin* 11 (1): 49-55. [In Russian]. <https://doi.org/10.23885/1814-3326-2015-11-1-49-55>

- Sergeev ME (2019) The leaf beetles (Coleoptera: Chrysomelidae) of the Far Eastern State Marine Reserve, Primorskiy Krai. *Far Eastern Entomologist* 37(5): 11-19. <https://doi.org/10.25221/fee.375.3>
- Shabalin SA (2013) Review of the road beetles genus *Ontholestes* (Coleoptera, Staphylinidae) from the Russian Far East. *A.I. Kurentsov's Annual Memorial Meetings* 24: 149-157. [In Russian].
- Skvarla MJ, Larson JL, Dowling AP (2014) Pitfalls and preservatives: A review. *JESO* 14(5): 15-43.
- Solodovnikov IA (1999) New and little-known species of ground beetles of the tribe Lebiini (Coleoptera, Carabidae) of the fauna of Russia and neighboring countries. *Vestnik BGU* 1 (11): 108-109. [In Russian].
- Spence JR, Niemelä JK (1994) Sampling carabid assemblages with pitfall traps: the madness and the method. *The Canadian Entomologist* 126: 881-894. <https://doi.org/10.4039/Ent126881-3>
- Stewart PA, Lam JJ (1968) Catch of insects at different heights in traps equipped with blacklight lamps. *Journal of Economic Entomology* 61: 1227-1230. <https://doi.org/10.1093/jee/61.5.1227>
- Sundukov Y, Makarov K (2022) The Coleoptera of the southwest of Primorsky Territory, Russian Far East. Version 1.2. Moscow Pedagogical State University (MPSU). Occurrence dataset. <https://doi.org/10.15468/pvzym3>. Accessed on: 2022-11-18.
- Sundukov YN, Makarov KV (2021) The ground beetles of the tribe Trechini (Carabidae) on the Southern Kuril Islands. *Nature Conservation Research* 6 (4): 15-51. [In Russian].
- Valainis U (2010) A review of genus *Omophron* Latreille, 1802 (Coleoptera: Carabidae) Palearctic fauna and distribution. *Baltic Journal of Coleopterology* 10 (2): 105-128.
- Vanhercke L, Maelfait JP, Desender K (1981) Beetles captured by means of a light trap. *Biologisch Jaarboek Dodonaea, Antwerpen* 48: 153-162.
- Veselova E (2011) On the fauna of Tachyporinae (Coleoptera, Staphylinidae) of the Russian Far East. I. The genus *Tachinus* Gravenhorst, 1802. *Baltic Journal of Coleopterology* 11 (1): 73-92.
- Yahiro K, Yano K (1997) Ground beetles (Coleoptera, Caraboidea) caught by a light trap during ten years. *Esakia* 37: 57-69. <https://doi.org/10.5109/2608>
- Zamotajlov AS (1996) Contribution to the knowledge of the Palearctic species of the genus *Diplous* Motschulsky, 1850 (Coleoptera: Carabidae). *Zoosystematica Rossica* 5: 107-129.
- Zamotajlov AS (2005) A new species of the genus *Diplous*, subgenus *Platidius* (Coleoptera, Carabidae) from East Siberia. *Vestnik Zoologii* 39 (1): 47-54.

