

The beetle fauna (Insecta: Coleoptera) of the Svetlogorsk Forest (Russia: Kaliningradskaya Oblast) at the beginning of the XXI century: high biodiversity and protection necessity

Фауна жесткокрылых (Insecta: Coleoptera) Светлогорского леса (Россия: Калининградская область) в начале XXI века: высокое биоразнообразие и необходимость охраны

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Ключевые слова: запад России, Самбийский полуостров, биоразнообразие, локальная фауна, охрана природы.

Abstract. 800 species (in 71 families) of the order Coleoptera are registered for a forested area of c. 8 km² in the northern Sambian Peninsula during a 20-year study (2001–2021). A preliminary list of beetles' species of the Svetlogorsk Forest is presented which includes the only known locality in Kaliningradskaya Oblast for 12 coleopteran species (*Hylis olexai*, *Denticollis rubens*, *Pyropterus nigroruber*, *Dryophilus pusillus*, *Pityophagus ferrugineus*, *Conopalpus testaceus*, *Phryganophilus auritus*, *Curtimorda maculosa*, *Oomorplus concolor*, *Phaedon laevigatus*, *Cotaster cuneipennis* and *Dendroctonus micans*). Six beetle species included in the Red Data Book of Kaliningradskaya Oblast (*Calosoma inquisitor*, *Carabus coriaceus*, *Dendroxena quadrimaculata*, *Protaetia marmorata*, *Gnorimus nobilis*, and *Prionus coriarius*) regularly occur in the Svetlogorsk Forest. Considering the high diversity of the associated fauna, as demonstrated by the Coleoptera, as well as presence of rare beetle populations, the Svetlogorsk Forest bears a great conservation value and can contribute to preserving the insect fauna in Kaliningradskaya Oblast. Taking in consideration of the high diversity and unique nature of the territory, the establishment of a large complex nature reserve or even national park «Warnicken Forest» in the northern coastal area of the Sambian peninsula is recommended.

Резюме. В период 20-летних исследований (2001–2021 гг.) на облеснённой территории севера Самбийского полуострова площадью приблизительно в 8 кв. км отмечено 800 видов из 71 семейства отряда Coleoptera. Предварительный список жуков Светлогорского леса приведён в работе. Изученный лесной массив — единственное известное место обитания в Калининградской области для 12 видов: *Hylis olexai*, *Denticollis rubens*, *Pyropterus nigroruber*, *Dryophilus pusillus*, *Pityophagus ferrugineus*,

Conopalpus testaceus, *Phryganophilus auritus*, *Curtimorda maculosa*, *Oomorplus concolor*, *Phaedon laevigatus*, *Cotaster cuneipennis* и *Dendroctonus micans*. Также здесь регулярно встречаются шесть видов, внесённых в Красную книгу Калининградской области: *Calosoma inquisitor*, *Carabus coriaceus*, *Dendroxena quadrimaculata*, *Protaetia marmorata*, *Gnorimus nobilis* и *Prionus coriarius*. Высокий уровень биоразнообразия на исследованной территории, продемонстрированный на примере отряда Coleoptera, а также наличие популяций редких жуков указывает на особую важность Светлогорского леса в поддержании биологического разнообразия и охране насекомых Калининградской области. Принимая во внимание большое количество различных уникальных природных объектов на изучаемой территории, рекомендуется организация единого крупного комплексного ООПТ или даже национального парка «Варникенский лес» на территории северного побережья Самбийского полуострова.

Introduction

The most part of faunal studies is focused on systematically or methodologically limited groups of animals. The increase of studied geographical area usually leads to constriction of studied group. The more or less complete faunal contribution for any area is possible for geographically limited territory only and thus it has important significance mostly for local conservation measurements of species and habitats, as well for local monitoring of biodiversity. Such research is conducted usually in the case, if the area is already under protection or clearly needs in proposition of protection [e.g.

Nikitsky et al., 1996; Ruchin et al., 2021]. Local inventories of the coleopterofauna for the local natural areas on the territory of Kaliningradskaya Oblast are scarce: the lists of the order Coleoptera are published for the raised bog Zehlau [Skwarra, 1929] and for the national park «Curonian Spit» [Alekseev, 2014] only.

In the time of the present-day anthropogenic loss of species diversity and the so-called «first mass extinction of insects» [Schachat, Labandeira 2021], the up-to-date inventory of animal species inhabiting of Kaliningradskaya Oblast is very actual. Insects have undergone a massive decrease in population abundance and biodiversity in recent decades [Sanchez-Bayo, Wyckhuys, 2019]. Long-term monitoring schemes are essential to understand the causes and current state of biodiversity loss [Thomaes et al., 2021]. Replicable faunal data sampled in limited time period and in limited area can provide starting data for environmental monitoring of faunal patterns and trends during the time in future.

The Svetlogorsk Forest (former «Forst Warnicken») is one of the largest woodlands of the Kaliningrad/Sambian peninsula (former «das Samland»). It is classified as mixed broadleaved-spruce forest with high admixture of nemoral elements. The forest begins from abrasive coast of the Baltic Sea and is strongly transformed by multi-year human activities, although never was completely logged out. The semi-natural narrow patch of humid broadleaved stands on the cliff of the Baltic Sea coast (*Tilio-Quercetum* or *Alnetum*) coexists with present-day overgrown park zone and also with the very diverse and long-time managed and partially human-planted forest. The acclimatized tree species (like *Larix decidua*, *Quercus rubra*, *Acer pseudo-platanus*) are presented between natural communities with *Betula pendula*, *Quercus robur*, *Picea abies*, *Carpinus betulus*, *Pinus sylvestris*, and *Fagus sylvatica*. The average age of trees is approximately 70 years [Litvin et al., 1999], but several oaks along the main road in the Lesnoe settlement are approximately 600-years old (natural monument «Oaken alley» at the present time).

The climate of the whole Svetlogorsk area is one of the most maritime in the Kaliningradskaya Oblast, with average annual precipitation about 850 mm, average annual temperature +7.0 °C, average isotherm of July +17.0 °C, and average isotherm of January –3.0 °C [Orlenok, 2002]. The territory is characterized by hilly terrain with height difference about 60 meters.

Fragmentary data concerning several beetles species of the Svetlogorsk area can be found in small faunal papers [Alekseev, Nikitsky, 2008; Bukejs, Alekseev, 2009; Alekseev, 2010; 2020; Alekseev, Bukejs, 2010; 2011; 2014; 2017; Balalaikins et al., 2011; Alekseev et al., 2012; 2015] or can be borrowed from regional faunal revisions [Lentz, 1879; Bercio, Folwaczny, 1979; Alekseev, 2007; 2008; 2018; Alekseev, Bukejs, 2019; Tamutis, Alekseev, 2020], while the generalized list for this area has been never compiled. The present inventory focuses on the reporting of twenty-year faunal

sampling results in the area of northern part of the Svetlogorsk Forest, includes all captured and identified beetles species and also includes several recommendations for possible urgent conservation measurements of regional or even federal level in the Svetlogorsk Forest.

Materials and methods

Adult beetles were collected in the northern and north-western part of the Svetlogorsk Forest only (Fig. 1A–B). The studied territory includes approximately eight square kilometers of the rather frequently visited by people and disturbed forest landscape and buffer afforested zones around the present-day settlement Otradnoe. The studied area is situated between following extreme points: western margin of Lesnoe [former Warnicken] (54.946° N, 20.057° E) [west], western suburb of Svetlogorsk [former Rauschen] (54.944° N, 20.132° E) [east], southern margin of the settlement Maiskii (54.923° N, 20.129° E) and Kolomenskoe [former Hirschau] (54.921° N, 20.095° E).

The presented material was collected by the author during the years 2001–2021 with the frequency of 3–15 sampling days per year. Most part of material was collected in warm season (March–October) by hand or using entomological net from vegetation. Pitfall traps without bait (plastic containers with 9 % acetic acid) were used in 2002–2003, 2009, 2015, and in 2019. Sampling localities included different forest habitats, forest margin, forest roadsides with partially ruderal vegetation, and the Baltic coastal area (including the surf zone as well as the beach and bottom of the cliff in distance less than 100 meters from forest). Productive samplings of flying-capable beetles were taken by hand in surf zone the Baltic Sea and in breeze accumulations on the sandy beach by appropriate weather in late spring — early summer. The examined material is partially deposited in the private collection of the author (Kaliningrad, Russia). The widely-distributed in Kaliningradskaya Oblast and determinable in field taxa, as well as protected in the region species were registered without specimen collecting.

By comparison of the coleopteran fauna, two simple similarities indexes were calculated:

Jaccard similarity coefficient was calculated according to the formula:

$$S_j = a / (a + b + c),$$

Sørensen similarity coefficient was calculated according to the formula:

$$S_s = 2a / (2a + b + c), \text{ where}$$

S_j = Jaccard similarity coefficient,

S_s = Sørensen similarity coefficient,

a = number of common species, b = number of species unique to the Svetlogorsk Forest, c = number of species unique to the Curonian Spit;

The specimens were identified by the author based on the standard European identification key [Freude et al., 1965–1989; 2004]. The order used in the checklist

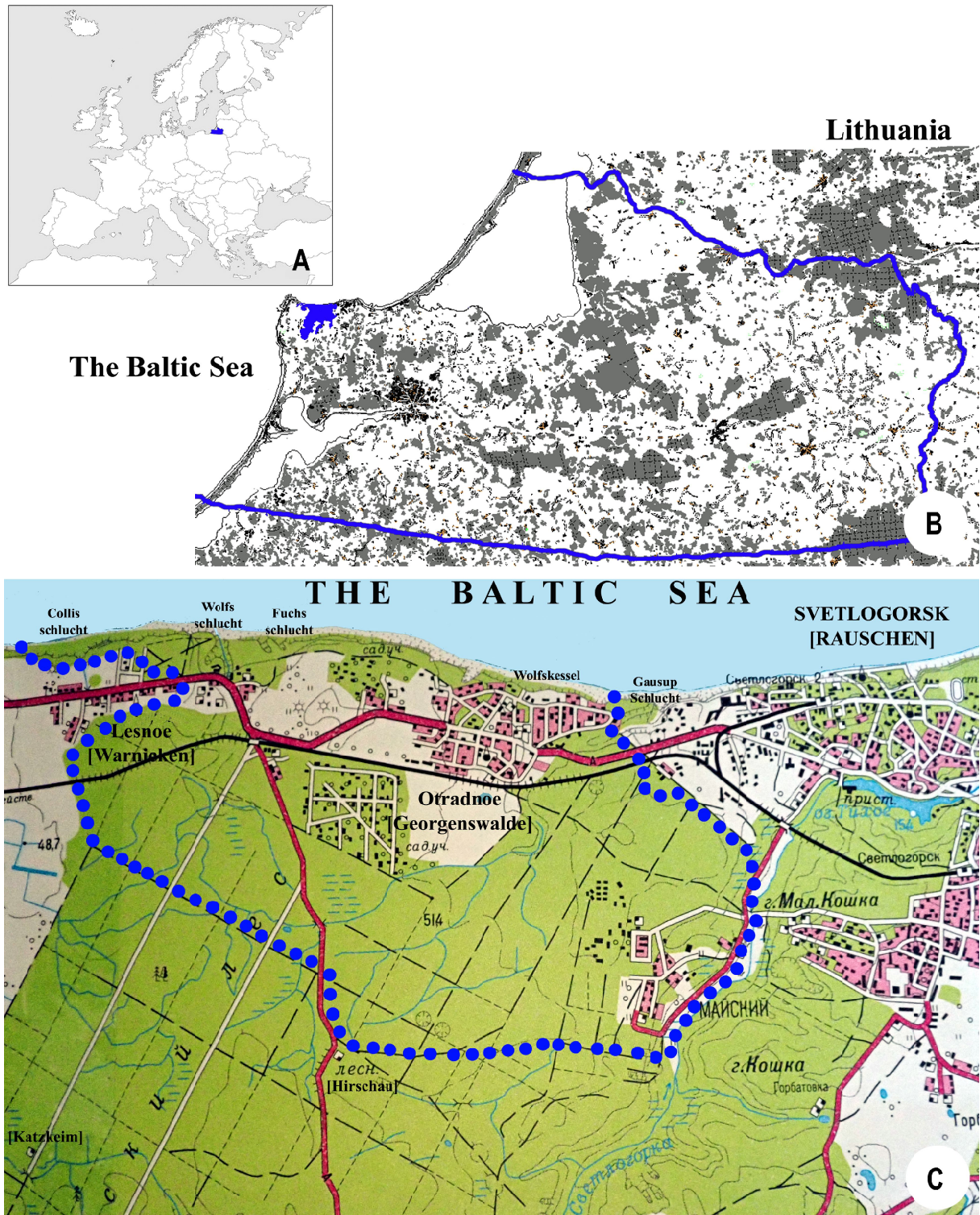


Fig. 1A — map of Europe (the territory of the Kaliningradskaya Oblast is blue coloured); B — the map of forest cover in Kaliningradskaya Oblast and location of the Svetlogorsk Forest (forests are grey, the Svetlogorsk Forest is blue); C — studied area in the northern part of the Svetlogorsk Forest (limited by blue dots).

Fig. 1A — карта Европы (территория Калининградской области отмечена синей заливкой); B — карта лесного покрова Калининградской области и местонахождение Светлогорского леса (лесопокрываемые площади — серый цвет, Светлогорский лес — синяя заливка); C — исследованная территория в северной части Светлогорского леса (ограничена синими точками).

is systematic for families and is given according to [Bouchard et al., 2011]. Genera and species collected or observed during the field activities are arranged alphabetically (according to the scientific name).

Results

During examination and identification of the materials from the studied territory, a list of 800 species (71 families) was compiled. Of these, 12 species of Coleoptera are known in Kaliningradskaya Oblast in this territory only. These locally distributed (or badly known species) are marked in the list with two asterisks (**). Other 23 sporadically distributed in the region beetles as well as 6 regionally protected in Kaliningradskaya Oblast species are marked with one asterisk (*).

PRELIMINARY LIST OF BEETLES (COLEOPTERA) OF THE SVETLOGORSK FOREST

1. Gyrinidae Latreille, 1810

(2 species)

Gyrinus natator (Linnaeus, 1758); *G. substriatus* Stephens, 1835.

2. Carabidae Latreille, 1802

(105 species)

Acupalpus exiguus Dejean, 1829; *A. flavicollis* (Sturm, 1825); *A. meridians* (Linnaeus, 1761); *Agonum afrum* (Duftschmid, 1812); *A. dolens* (Sahlberg, 1827); *A. fuliginosum* (Panzer, 1809); *A. gracile* Sturm, 1824; *A. gracilipes* (Duftschmid, 1812); *A. micans* Nicolai, 1822; *A. sexpunctatum* (Linnaeus, 1758); *Amara aenea* (De Geer, 1774); *A. brunnea* (Gyllenhal, 1810); *A. eurynota* (Panzer, 1796); *A. familiaris* (Duftschmid, 1812); *A. fulva* (Muller, 1776); *A. similata* (Gyllenhal, 1810); *A. spreta* Dejean, 1831; *Anchomenus dorsalis* (Pontoppidan, 1763); *Anisodactylus binotatus* (Fabricius, 1787); *Asaphidion flavipes* (Linnaeus, 1761); *Badister bullatus* (Schrank, 1798); *B. dilatatus* Chaudoir, 1837; *B. peltatus* (Panzer, 1796); *Bembidion assimile* Gyllenhal, 1810; *B. biguttatum* (Fabricius, 1779); *B. cruciatum* Dejean, 1831; *B. dentellum* (Thunberg, 1787); *B. doris* (Panzer, 1797); *B. femoratum* Sturm, 1825; *B. guttula* (Fabricius, 1792); *B. illigeri* Netolitzky, 1914; *B. lampros* (Herbst, 1784); *B. obliquum* Sturm, 1825; *B. octomaculatum* (Goeze, 1777); *B. semipunctatum* (Donovan, 1806); *B. tetracolum* Say, 1823; *B. varium* (Olivier, 1795); *B. quadrimaculatum* (Linnaeus, 1761); *Blemus discus* (Fabricius, 1792); *Blethisa multipunctata* (Linnaeus, 1758); *Brosicus cephalotes* (Linnaeus, 1758)*; *Calathus ambiguus* (Paykull, 1790); *C. erratus* (Sahlberg, 1827); *C. fuscipes* (Goeze, 1777); *C. melanocephalus* (Linnaeus, 1758); *Calodromius spilotus* (Illiger, 1798); *Calosoma inquisitor* (Linnaeus, 1758)*; *Carabus cancellatus* Illiger, 1798; *C. convexus* Fabricius, 1775; *C. coriaceus* Linnaeus, 1758*; *C. glabratus* Paykull, 1790; *C. granulatus* Linnaeus, 1758; *C. hortensis* Linnaeus, 1758; *C. nemoralis* Muller, 1764; *C. violaceus* Linnaeus, 1758; *Cicindela campestris* Linnaeus, 1758; *C. hybrida* Linnaeus, 1758; *Chlaenius nigricornis* (Fabricius, 1787); *Clivina fossor* (Linnaeus, 1758); *Curtonotus aulicus* (Panzer, 1796); *Cychrus caraboides* (Linnaeus, 1758); *Demetrias monostigma* Samouelle, 1819; *Dromius agilis* (Fabricius, 1787); *D. quadrimaculatus* (Linnaeus, 1758); *Dyschirius thoracicus* (Rossi, 1790); *Elaphrus cu-*

preus Duftschmid, 1812; *E. riparius* (Linnaeus, 1758); *Epaphius rivularis* (Gyllenhal, 1810); *Harpalus affinis* (Schrank, 1781); *H. griseus* (Panzer, 1796); *H. luteicornis* (Duftschmid, 1812); *H. rubripes* (Duftschmid, 1812); *H. rufipes* (De Geer, 1774); *H. signaticornis* (Duftschmid, 1812); *Lebia chlorocephala* (Hoffmannsegg, 1803); *Leistus rufomarginatus* (Duftschmid, 1812); *L. terminatus* (Panzer, 1793); *Limodromus assimilis* (Paykull, 1790); *L. livens* (Gyllenhal, 1810); *Lionychus quadrillum* (Duftschmid, 1812)*; *Loricera pilicornis* (Fabricius, 1775); *Nebria brevicollis* (Fabricius, 1792); *Nebria livida* (Linnaeus, 1758)*; *Notiophilus biguttatus* (Fabricius, 1779); *N. palustris* (Duftschmid, 1812); *Odacantha melanura* (Linnaeus, 1767); *Ophonus rufibarbis* (Fabricius, 1792); *Oxypselaphus obscurus* (Herbst, 1784); *Panagaeus cruxmajor* (Linnaeus, 1758); *Paradromius longiceps* (Dejean, 1826); *Paranchus albipes* (Fabricius, 1796); *Poecilus cupreus* (Linnaeus, 1758); *P. lepidus* (Leske, 1785); *P. versicolor* (Sturm, 1824); *Pterostichus anthracinus* (Illiger, 1798); *P. aterrimus* (Herbst, 1784); *P. niger* (Schaller, 1783); *P. melanarius* (Illiger, 1798); *P. oblongopunctatus* (Fabricius, 1787); *P. strenuus* (Panzer, 1796); *Stenolophus mixtus* (Herbst, 1784); *Stomis pumicatus* (Panzer, 1796); *Synuchus vivalis* (Illiger, 1798); *Tachyta nana* (Gyllenhal, 1810); *Trechus quadristriatus* (Schrank, 1781).

3. Haliplidae Brullé, 1835

(1 species)

Haliplus ruficollis (De Geer, 1774).

4. Noteridae Thomson, 1860

(2 species)

Noterus clavicornis (De Geer, 1774); *N. crassicornis* (Müller, 1776).

5. Dytiscidae Leach, 1815

(24 species)

Acilius canaliculatus (Nicolai, 1822); *A. sulcatus* (Linnaeus, 1758); *Agabus bipustulatus* (Linnaeus, 1767); *A. chalconotus* (Panzer, 1796); *A. nigroaeneus* (Erichson, 1837); *A. sturmi* (Gyllenhal, 1808); *A. undulatus* (Schrank, 1776); *Colymbetes fuscus* (Linnaeus, 1758); *Dytiscus dimidiatus* Bergstrasser, 1778; *D. marginalis* Linnaeus, 1758; *Graphoderus cinereus* (Linnaeus, 1758); *Hydaticus seminiger* (De Geer, 1774); *Hydroporus palustris* (Linnaeus, 1761); *H. planus* (Fabricius, 1781); *Hygrotus inaequalis* (Fabricius, 1777); *Hyphydrus ovatus* (Linnaeus, 1761); *Ilybius ater* (De Geer, 1774); *I. fuliginosus* (Fabricius, 1792); *Laccophilus hyalinus* (De Geer, 1774); *Platambus maculatus* (Linnaeus, 1758); *Porhydrus lineatus* (Fabricius, 1775); *Rhantus exoletus* (Forster, 1771); *R. frontalis* (Marsham, 1802); *R. grapii* (Gyllenhal, 1808).

6. Hydrophilidae Latreille, 1802

(24 species)

Anacaena lutescens (Stephens, 1829); *Berosus luridus* (Linnaeus, 1760); *Cercyon convexusculus* Stephens, 1829; *C. haemorrhoidalis* (Fabricius, 1787); *C. lateralis* (Marsham, 1802); *C. marinus* Thomson, 1853; *C. melanocephalus* (Linnaeus, 1761); *C. unipunctatus* (Linnaeus, 1758); *Coelostoma orbiculare* (Fabricius, 1775); *Cryptopleurum minutum* (Fabricius, 1775); *Cymbiodyta marginella* (Fabricius, 1792); *Helochares obscurus* (Mueller, 1776); *Helophorus aquaticus* (Linnaeus, 1758); *H. brevipalpis* Bedel, 1881; *H. granularis* (Linnaeus, 1761); *H. griseus* Herbst, 1793;

H. tuberculatus Gyllenhal, 1808; *Hydrobius fuscipes* (Linnaeus, 1758); *Hydrochara caraboides* (Linnaeus, 1758); *Hydrochus elongatus* (Schall.); *Laccobius minutus* (Linnaeus, 1758); *Sphaeridium bipustulatum* Fabricius, 1781; *S. marginatum* Fabricius, 1787; *S. scarabaeoides* (Linnaeus, 1758).

7. Histeridae Gyllenhal, 1808

(11 species)

Atholus duodecimstriatus (Schrank, 1781); *Dendrophilus punctatus* (Herbst, 1791); *Hister funestus* Erichson, 1834; *H. unicolor* Linnaeus, 1758; *Margarinotus brunneus* (Fabricius, 1775); *M. purpurascens* (Herbst, 1792); *Paromalus flavicornis* (Herbst, 1792); *P. parallelepipedus* (Herbst, 1792); *Plegaderus caesus* (Herbst, 1791); *P. vulneratus* (Panzer, 1797); *Saprinus aeneus* (Fabricius, 1775).

8. Hydraenidae Mulsant, 1844

(3 species)

Hydraena riparia Kugelann, 1794; *Limnebius truncatellus* (Thunberg, 1794); *Ochthebius minimus* (Fabricius, 1792).

9. Ptiliidae Erichson, 1845

(2 species)

Acrotichis intermedia (Gillmeister, 1845); *A. thoracica* (Waltl, 1838).

10. Leiodidae Fleming, 1821

(9 species)

Agathidium nigripenne (Fabricius, 1792); *A. seminulum* (Linnaeus, 1758); *Anisotoma castanea* (Herbst, 1792); *A. humeralis* (Fabricius, 1792); *Catops fuliginosus* Erichson, 1837; *C. nigrita* Erichson, 1837; *C. picipes* (Fabricius, 1787); *Choleva glauca* Britten, 1918; *Sciodrepoides watsoni* (Spence, 1815).

11. Silphidae Latreille, 1807

(8 species)

Dendroxena quadrimaculata (Scopoli, 1772)*; *Nicrophorus humator* (Olivier, 1791); *N. vespillo* (Linnaeus, 1758); *N. vespilloides* Herbst, 1784; *Oiceptoma thoracica* (Linnaeus, 1758); *Phosphuga atrata* (Linnaeus, 1758); *Silpha carinata* Herbst, 1783; *Thanatophilus sinuatus* (Fabricius, 1775).

12. Staphylinidae Latreille, 1802

(45 species)

Acidota crenata (Fabricius, 1793); *Aleochara curtula* (Goeze, 1777); *Anotylus rugosus* (Fabricius, 1775); *A. tetracaratus* (Block, 1799); *Anthobium atrocephalum* (Gyllenhal, 1827); *Bisnius fimetarius* (Gravenhorst, 1802); *Bledius gallicus* (Gravenhorst, 1806); *Bolitobius castaneus* (Stephens, 1832); *Coprophilus striatulus* (Fabricius, 1793); *Drusilla canaliculata* (Fabricius, 1787); *Eutheia plicata* (Gyllenhal, 1813); *Gyrophaena affinis* Mannerheim, 1830; *Lathrobium fulvipenne* Gravenhorst, 1806; *Lordithon lunulatus* (Linnaeus, 1761); *Megarthus depressus* (Paykull, 1789); *Ocyopus brunnipes* (Fabricius, 1781); *Omalium rivulare* (Paykull, 1789); *Ontholestes murinus* (Linnaeus, 1758); *Othius punctulatus* (Goeze 1777); *Oxyporus maxillosus* Fabricius, 1793; *Paederus littoralis* Gravenhorst, 1802; *Philonthus splendens* (Fabricius, 1792); *Platydracus stercorarius* (Olivier, 1795); *Proteinus brachypterus* (Fabricius, 1792); *Quedius xanthopus* Erichson, 1839; *Rugilus rufipes* Germar, 1836; *Scaphidium quadrimaculatum* Olivier, 1790; *Scaphisoma agaricinum* (Linnaeus, 1758); *Scydmorephes minutus*

(Chaudoir, 1845); *Sepedophilus marshami* (Stephens, 1832); *S. testaceus* (Fabricius, 1793); *Stenichnus collaris* (Müller et Kunze, 1822); *Stenichnus scutellaris* (Müller & Kunze, 1822); *Stenus bimaculatus* Gyllenhal, 1810; *S. clavicornis* (Scopoli, 1763); *S. similis* (Herbst, 1784); *Tachinus basalis* Erichson, 1840; *T. subterraneus* (Linnaeus, 1758); *Tachyporus chrysosomelinus* (Linnaeus, 1758); *T. obtusus* (Linnaeus, 1767); *T. solutus* Erichson, 1839; *Velleius dilatatus* (Fabricius, 1787)*; *Xantholinus longiventris* Heer, 1839; *Zyras humeralis* (Gravenhorst, 1802); *Zyras limbatus* (Paykull, 1789);

13. Geotrupidae Latreille, 1806

(2 species)

Anoplotrupes stercorosus (Scriba, 1751); *Geotrupes stercorarius* (Linnaeus, 1758).

14. Lucanidae Latreille, 1806

(4 species)

Dorcus parallelepipedus (Linnaeus, 1758); *Platycerus caprea* (De Geer, 1774); *P. caraboides* (Linnaeus, 1758); *Sinodendron cylindricum* (Linnaeus, 1758).

15. Scarabaeidae Latreille, 1802

(20 species)

Amphimallon solstitiale (Linnaeus, 1758); *Anomala dubia* (Scopoli, 1763); *Aphodius ater* (De Geer, 1774); *A. fimetarius* (Linnaeus, 1758); *A. fossor* (Linnaeus, 1758); *A. granarius* (Linnaeus, 1767); *A. rufipes* (Linnaeus, 1758); *Cetonia aurata* (Linnaeus, 1758); *Protaetia marmorata* (Fabricius, 1792)*; *Gnorimus nobilis* (Linnaeus, 1758)*; *Hoplia graminicola* (Fabricius, 1792); *Melolontha melolontha* (Linnaeus, 1758); *Onthophagus nuchicornis* (Linnaeus, 1758); *Oxyomus sylvestris* (Scopoli, 1763); *Oxythyrea funesta* (Poda, 1761); *Phyllopertha horticola* (Linnaeus, 1758); *Potosia metallica* (Herbst, 1782); *Serica brunnea* (Linnaeus, 1758); *Trichius fasciatus* (Linnaeus, 1758); *Valgus hemipterus* (Linnaeus, 1758).

16. Eucinetidae Lacordaire, 1857

(1 species)

Eucinetus haemorrhoidalis (Germar, 1818)

17. Clambidae Fischer von Waldheim, 1821

(1 species)

Clambus punctulum (Beck, 1817).

18. Scirtidae Fleming, 1821

(5 species)

Cyphon padi (Linnaeus, 1758); *C. pubescens* (Fabricius, 1792); *C. variabilis* (Thunberg, 1787); *Microcara testacea* (Linnaeus, 1767); *Scirtes hemisphaericus* (Linnaeus, 1758).

19. Buprestidae Leach, 1815

(5 species)

Agrilus laticornis (Illiger, 1803); *A. viridis* (Linnaeus, 1758); *Anthaxia quadripunctata* (Linnaeus, 1758); *Chrysobothris affinis* (Fabricius, 1794); *Trachys minutus* (Linnaeus, 1758).

20. Byrrhidae Latreille, 1804

(5 species)

Byrrhus fasciatus (Forster, 1771); *B. pilula* (Linnaeus, 1758); *B. pustulatus* (Forster, 1771); *Cytilus sericeus* (Forster, 1771); *Lamprobyrrhulus nitidus* (Schaller, 1783).

21. **Dryopidae** Billberg, 1820
(1 species)
Dryops auriculatus (Geoffroy, 1785).
22. **Heteroceridae** MacLeay, 1825
(1 species)
Heterocerus fenestratus (Thunberg, 1784).
23. **Eucnemidae** Eschscholtz, 1829
(4 species)
Eucnemis capucina Ahrens, 1812; *Hylis olexai* (Palm, 1955)**; *Microrhagus lepidus* Rosenhauer, 1847; *M. pygmaeus* (Fabricius, 1793).
24. **Throscidae** Laporte de Castelnau, 1840
(2 species)
Aulonothroscus brevicollis (Bonvouloir, 1859); *Trixagus dermestoides* (Linnaeus, 1767).
25. **Elateridae** Leach, 1815
(25 species)
Adrastus pallens (Fabricius, 1792); *Agriotes lineatus* (Linnaeus, 1767); *A. obscurus* (Linnaeus, 1758); *A. sputator* (Linnaeus, 1758); *Agrypnus murinus* (Linnaeus, 1758); *Ampedus balteatus* (Linnaeus, 1758); *A. pomorum* (Herbst, 1784); *A. sanguineus* (Linnaeus, 1758); *Anostirus castaneus* (Linnaeus, 1758); *Athous haemorrhoidalis* (Fabricius, 1801); *A. subfuscus* (Muller, 1764); *A. vittatus* (Fabricius, 1792); *Cardiophorus ruficollis* (Linnaeus, 1758); *Cidnopus aeruginosus* (Olivier, 1790); *Ctenicera pectinicornis* (Linnaeus, 1758); *Dalopius marginatus* (Linnaeus, 1758); *Denticollis linearis* (Linnaeus, 1758); *D. rubens* Piller & Mitterpacher, 1783**; *Hemicrepidius niger* (Linnaeus, 1758); *Melanotus villosus* (Geoffroy, 1785); *Prosternon tessellatum* (Linnaeus, 1758); *Selastosomus aeneus* (Linnaeus, 1758); *S. cruciatus* (Linnaeus, 1758); *S. impressus* (Fabricius, 1792)*; *Ectinus aterrimus* (Linnaeus, 1761).
26. **Lycidae** Laporte de Castelnau, 1836
(4 species)
Dictyoptera aurora (Herbst, 1784); *Lygisterus sanguineus* (Linnaeus, 1758); *Platycis cosnardi* (Chevrolat, 1829)*; *Pyropterus nigroruber* (De Geer, 1774)**.
27. **Lampyridae** Latreille, 1817
(2 species)
Lampyris noctiluca (Linnaeus, 1758); *Phosphaenus hemipterus* (Goeze, 1777).
28. **Cantharidae** Imhoff, 1856
(17 species)
Cantharis flavilabris Fallen, 1807; *C. fusca* Linnaeus, 1758; *C. livida* Linnaeus, 1758; *C. nigricans* (Muller, 1776); *C. obscura* Linnaeus, 1758; *C. pallida* Goeze, 1777; *C. paludosa* Fallen, 1807; *C. pellucida* Fabricius, 1792; *C. rufa* Linnaeus, 1758; *Malthinus biguttatus* (Linnaeus, 1758); *Malthodes guttifer* Kiesenwetter, 1852; *M. marginatus* (Latreille, 1806); *Podabrus alpinus* (Paykull, 1798); *Rhagonicha fulva* (Scopoli, 1763); *R. limbata* Thomson, 1864; *R. lutea* (Muller, 1764); *R. testacea* (Linnaeus, 1758).
29. **Dermestidae** Latreille, 1804
(3 species)
Anthrenus museorum (Linnaeus, 1761), *Attagenus pellio* (Linnaeus, 1758); *Dermestes lanarius* Illiger, 1801.
30. **Ptinidae** Latreille, 1802
(11 species)
Dorcatoma dresdensis Herbst, 1792; *Dryophilus pusillus* (Gyllenhal, 1808)**; *Ernobius mollis* (Linnaeus, 1758); *Hadrobregmus confusus* (Kraatz, 1881); *H. pertinax* (Linnaeus, 1758); *Ptilinus fuscus* Geoffroy, 1785; *P. pectinicornis* (Linnaeus, 1758); *Ptinomorphus imperialis* (Linnaeus, 1767); *Ptinus fur* (Linnaeus, 1758); *P. subpillosus* Sturm, 1837; *Xestobium rufovillosum* (De Geer, 1774).
31. **Lymexylidae** Fleming, 1821
(2 species)
Hylecoetus dermestoides (Linnaeus, 1761); *Lymexylon navale* (Linnaeus, 1758).
32. **Trogossitidae** Latreille, 1802
(3 species)
Grynocharis oblonga (Linnaeus, 1758); *Ostoma ferruginea* (Linnaeus, 1758); *Peltis grossa* (Linnaeus, 1758).
33. **Cleridae** Latreille, 1802
(2 species)
Thanasimus formicarius (Linnaeus, 1758); *Tillus elongatus* (Linnaeus, 1758).
34. **Melyridae** Leach, 1815
(10 species)
Anthocomus equestris (Fabricius, 1781); *A. rufus* (Herbst, 1784); *Axinotarsus pulicarius* (Fabricius, 1775); *Charopus graminicola* (Dejean, 1833); *Cordylepherus viridis* (Fabricius, 1787); *Dasytes caeruleus* (De Geer, 1774); *D. fuscus* (Illiger, 1801); *D. niger* (Linnaeus, 1761); *Dolichosoma lineare* (Rossi, 1792); *Malachius bipustulatus* (Linnaeus, 1758).
35. **Byturidae** Gistel, 1848
(2 species)
Byturus ochraceus (Scriba, 1791); *B. tomentosus* (De Geer, 1774).
36. **Sphindidae** Jacquelin du Val, 1861
(1 species)
Aspidiphorus orbiculatus (Gyllenhal, 1808).
37. **Erotylidae** Latreille, 1802
(3 species)
Dacne bipustulata (Thunberg, 1781); *Triplax russica* (Linnaeus, 1758); *Tritoma bipustulata* Fabricius, 1775.
38. **Monotomidae** Laporte, 1840
(6 species)
Monotoma conicollis Aubé, 1837; *Rhizophagus bipustulatus* (Fabricius, 1793); *Rh. depressus* (Fabricius, 1793); *Rh. dispar* (Paykull, 1800); *Rh. parallelocolis* Gyllenhal, 1827; *Rh. parvulus* (Paykull, 1800).

39. Cryptophagidae Kirby, 1826

(8 species)

Antherophagus pallens (Linnaeus, 1758); *Atomaria atricapilla* Stephens, 1830; *A. basalis* Erichson, 1846; *A. fuscata* (Schönherr, 1808); *Cryptophagus badius* Sturm, 1845; *C. lycoperdi* (Scopoli, 1763); *C. pilosus* Gyllenhal, 1827; *Telmatophilus typhae* (Fallén, 1802).

40. Silvanidae Kirby, 1837

(4 species)

Dendrophagus crenatus (Paykull, 1799); *Silvanus bidentatus* (Fabricius, 1792); *S. unidentatus* (Olivier, 1790); *Uleiota planata* (Linnaeus, 1761).

41. Phalacridae Leach, 1815

(4 species)

Phalacrus nigrinus (Marsham, 1802); *Olibrus bicolor* (Fabricius, 1792); *O. millefolii* (Paykull, 1800); *Stilbus testaceus* (Panzer, 1797).

42. Kateretidae Kirby, 1837

(4 species)

Brachypterolus pulicarius (Linnaeus, 1758); *Brachypterus urticae* (Fabricius, 1792); *Heterhelus scutellaris* (Heer, 1841); *Kateretes pedicularius* (Linnaeus, 1758).

43. Nitidulidae Latreille, 1802

(21 species)

Amphotis marginata (Fabricius, 1781); *Cryptarcha strigata* (Fabricius, 1787); *Cychramus luteus* (Fabricius, 1787); *Cylloides ater* (Herbst, 1792); *Epuraea florea* Erichson, 1845; *E. guttata* (Olivier, 1811); *E. longula* Erichson, 1845; *E. melanocephala* (Marsham, 1802); *E. terminalis* (Mannerheim, 1843); *E. unicolor* (Olivier, 1790); *Glischrochilus grandis* (Tournier, 1872); *G. hortensis* (Geoffroy, 1785); *G. quadriguttatus* (Fabricius, 1777); *G. quadripunctatus* (Linnaeus, 1758); *Ipidia binotata* Reitter, 1875; *Meligethes aeneus* (Fabricius, 1775); *M. viridescens* (Fabricius, 1787); *Pityophagus ferrugineus* (Linnaeus, 1761)**; *Pocadius adustus* Reitter, 1888; *Soronia grisea* (Linnaeus, 1758); *S. punctatissima* (Illiger, 1794)*.

44. Cerylonidae Billberg, 1820

(2 species)

Cerylon ferrugineum Stephens, 1830; *C. histeroides* (Fabricius, 1793).

45. Endomychidae Leach, 1815

(2 species)

Endomychus coccineus (Linnaeus, 1758); *Mycetina cruciata* (Schaller, 1783).

46. Coccinellidae Latreille, 1807

(25 species)

Adalia bipunctata (Linnaeus, 1758); *A. decempunctata* (Linnaeus, 1758); *Anatis ocellata* (Linnaeus, 1758); *Anisosticta novemdecimpunctata* (Linnaeus, 1758); *Aphidecta oblitterata* (Linnaeus, 1758); *Calvia decemguttata* (Linnaeus, 1767); *C. quatuordecimguttata* (Linnaeus, 1758); *Chilocorus renipustulatus* (Scriba, 1790); *Coccidula rufa* (Herbst, 1783); *C. scutellata* (Herbst, 1783); *Coccinella hieroglyphica* Linnaeus, 1758; *C. semtempunctata* Linnaeus, 1758; *C. quinquepunctata* Linnaeus, 1758; *Halyzia sedecimguttata* (Lin-

naeus, 1758); *Harmonia axyridis* (Pallas, 1773); *H. quadripunctata* (Pontoppidan, 1763); *Hippodamia notata* (Laicharting, 1781); *H. tredecimpunctata* (Linnaeus, 1758); *Hyperaspis campestris* (Herbst, 1783); *Myrrha octodecimguttata* (Linnaeus, 1758); *Myzia oblongoguttata* (Linnaeus, 1758); *Propylea quatuordecimpunctata* (Linnaeus, 1758); *Psyllobora vigintiduopunctata* (Linnaeus, 1758); *Scymnus suturalis* Thunberg, 1795; *Subcoccinella vigintiquatuorpunctata* (Linnaeus, 1758).

47. Corylophidae LeConte, 1852

(3 species)

Corylophus cassidoides (Marsham, 1802); *Orthoperus atomus* (Gyllenhal, 1808); *Sericoderus lateralis* (Gyllenhal, 1827).

48. Latridiidae Erichson, 1842

(11 species)

Aridius nodifer (Westwood, 1839); *Corticaria elongata* (Gyllenhal, 1827); *C. longicollis* (Zetterstedt, 1838); *Corticaria fuscata* (Gyllenhal, 1827); *Corticaria gibbosa* (Herbst, 1793); *Dienerella elongata* (Curtis, 1830); *Enicmus rugosus* (Herbst, 1793); *E. transversus* (Olivier, 1790); *Latridius minutus* (Linnaeus, 1767); *Melanophthalma curticolis* (Mannerheim, 1844); *Stephostethus angusticollis* (Gyllenhal, 1827).

49. Mycetophagidae Leach, 1815

(4 species)

Litargus connexus (Geoffroy, 1785); *Mycetophagus quadriguttatus* Müller, 1821; *M. quadripustulatus* (Linnaeus, 1761); *Triphyllus bicolor* (Fabricius, 1777)*.

50. Ciidae Leach, 1819

(7 species)

Cis boleti (Scopoli, 1763); *C. castaneus* Mellié, 1848; *C. hispidus* (Paykull, 1798); *C. Jacquemartii* Mellié, 1848; *C. micans* (Fabricius, 1792); *Ennearthron cornutum* (Gyllenhal, 1827); *Sulcaxis affinis* (Gyllenhal, 1827).

51. Tetratomidae Billberg, 1820

(2 species)

Hallomenus axillaris (Illiger, 1807); *Tetratoma fungorum* Fabricius, 1790.

52. Melandryidae Leach, 1815

(6 species)

Abdera flexuosa (Paykull, 1799)*; *Conopalpus testaceus* (Olivier, 1790)**; *Hypulus bifasciatus* (Fabricius, 1792)*; *Orchesia micans* (Panzer, 1794); *O. undulata* Kraatz, 1853; *Phryganophilus auritus* Motschulsky, 1860**.

53. Mordellidae Latreille, 1802

(6 species)

Curtimorda maculosa (Naezen, 1794)**; *Mordellochroa abdominalis* (Fabricius, 1775); *Mordellistena humeralis* (Linnaeus, 1758); *M. neuwaldeggiana* (Panzer, 1796); *Tomoxia bucephala* Costa, 1854; *Varimorda villosa* (Schrank, 1781).

54. Zopheridae Solier, 1834

(3 species)

Bitoma crenata (Fabricius, 1775); *Colydium filiforme* Fabricius, 1792*; *Synchita humeralis* (Fabricius, 1793).

55. Tenebrionidae Latreille, 1802

(11 species)

Bolitophagus reticulatus (Linnaeus, 1767); *Corticeus unicolor* Piller & Mitterpacher, 1783; *Crypticus quisquilius* (Linnaeus, 1761); *Diaperis boleti* (Linnaeus, 1758); *Eledona agricola* (Herbst, 1783); *Lagriia hirta* (Linnaeus, 1758); *Melanimon tibialis* (Fabricius, 1781); *Mycetochara linearis* (Illiger, 1794); *Opatrum sabulosum* (Linnaeus, 1761); *Prionychus ater* (Fabricius, 1775); *Uloma culinaris* (Linnaeus, 1758).

56. Oedemeridae Latreille, 1810

(5 species)

Chrysanthia geniculata (W. Schmidt, 1846); *Nacerdes melanura* (Linnaeus, 1758); *Oedemera femorata* (Scopoli, 1763); *O. lurida* (Marsham, 1802); *O. virescens* (Linnaeus, 1767).

57. Pyrochroidae Latreille, 1807

(2 species)

Pyrochroa coccinea (Linnaeus, 1761); *Schizotus pectinicornis* (Linnaeus, 1758).

58. Salpingidae Leach, 1815

(1 species)

Rhinosimus planirostris (Fabricius, 1787).

59. Anthicidae Latreille, 1819

(4 species)

Anthicus antherinus (Linnaeus, 1761); *A. flavipes* (Panzer, 1797); *A. sellatus* (Panzer, 1797); *Notoxus monoceros* (Linnaeus, 1761).

60. Aderidae Csiki, 1909

(2 species)

Anidorus nigrinus (Germar, 1831)*, *Euglenes pygmaeus* (De Geer, 1775)*.

61. Scraptiidae Gistel, 1848

(3 species)

Anaspis frontalis (Linnaeus, 1758); *A. rufilabris* (Gyllenhal, 1827); *A. thoracica* (Linnaeus, 1758).

62. Cerambycidae Latreille, 1802

(36 species)

Agapanthia villosoviridescens (De Geer, 1775); *Alosterina tabacicolor* (De Geer, 1775); *Anaglyptus mysticus* (Linnaeus, 1758)*; *Anoplodera dubia reyi* (Heyden, 1889); *A. sexguttata* (Fabricius, 1775); *Aromia moschata* (Linnaeus, 1758); *Callidium aeneum* (De Geer, 1775)*; *Carilla virginea* (Linnaeus, 1758); *Dinoptera collaris* (Linnaeus, 1758); *Grammoptera ruficornis* (Fabricius, 1781); *Judolia sexmaculata* (Linnaeus, 1758); *Leiopus linnei* Wallin, Nylander et Kvamme, 2009; *Leptura annularis* Fabricius, 1801; *L. quadrifasciata* Linnaeus, 1758; *Molorchus minor* (Linnaeus, 1758); *Mono-chamus sutor* (Linnaeus, 1758); *Oberea oculata* (Linnaeus, 1758); *Obrium brunneum* (Fabricius, 1792); *Oxymirus cursor* (Linnaeus, 1758); *Pachyta quadrimaculata* (Linnaeus, 1758); *Pachytodes cerambyciformis* (Schrank, 1781); *Paracorymbia maculicornis* (De Geer, 1775); *Prionus coriarius* (Linnaeus, 1767)*; *Pseudovadonia livida* (Fabricius, 1776); *Rhagium inquisitor* (Linnaeus, 1758); *R. mordax* (De Geer, 1775); *Rutpela maculata* (Poda, 1761)*; *Saperda scalaris*

(Linnaeus, 1758); *Spondylis buprestoides* (Linnaeus, 1758); *Stenostola dubia* (Laicharting, 1784); *Stenurella melanura* (Linnaeus, 1758); *S. nigra* (Linnaeus, 1758); *Stictoleptura rubra* (Linnaeus, 1758); *Strangalia attenuata* (Linnaeus, 1758); *Tetrops praeusta* (Linnaeus, 1758); *Xylotrechus rusticus* (Linnaeus, 1758).

63. Megalopodidae Latreille, 1802

(2 species)

Zeugophora subspinosa (Fabricius, 1781); *Z. turneri* Power, 1863*.

64. Orsodacnidae Thomson, 1859

(1 species)

Orsodacne cerasi (Linnaeus, 1758).

65. Chrysomelidae Latreille, 1802

(92 species)

Agelastica alni (Linnaeus, 1758); *Altica carinthiaca* Weise, 1888; *A. chamaenerii* (Lindberg, 1926); *Aphthona lutescens* (Gyllenhal, 1813); *A. nonstriata* (Goeze, 1777); *Batophila rubi* (Paykull, 1799); *Bromius obscurus* (Linnaeus, 1758); *Bruchus affinis* Frölich, 1799; *B. atomarius* (Linnaeus, 1761); *B. loti* Paykull, 1800; *Cassida flaveola* Thunberg, 1794; *C. nebulosa* Linnaeus, 1758; *C. nobilis* Linnaeus, 1758; *C. prasina* Illiger, 1798; *C. vibex* Linnaeus, 1767; *C. viridis* Linnaeus, 1758; *Chaetocnema aridula* (Gyllenhal, 1827); *Ch. concinna* (Marsham, 1802); *Chrysolina fastuosa* (Scopoli, 1763); *Ch. graminis* (Linnaeus, 1758); *Ch. marginata* (Linnaeus, 1758); *Ch. oricalcia* (Müller, 1776); *Ch. polita* (Linnaeus, 1758); *Ch. sanguinolenta* (Linnaeus, 1758); *Ch. staphylaea* (Linnaeus, 1758); *Ch. sturmi* (Westhoff, 1882); *Chrysomela populi* Linnaeus, 1758; *Ch. tremula* Fabricius, 1787; *Clytra quadripunctata* (Linnaeus, 1758); *Cryptocephalus fulvus* (Goeze, 1777); *C. labiatus* (Linnaeus, 1761); *C. janthinus* Germar, 1824; *C. nitidulus* Fabricius, 1787; *C. sericeus* (Linnaeus, 1758); *Colaphus sophiae* (Schaller, 1783)*; *Crepidodera aurata* (Marsham, 1802); *C. aurea* (Geoffroy, 1785); *C. fulvicornis* (Fabricius, 1792); *Donacia aquatica* (Linnaeus, 1758); *D. cinerea* Herbst, 1784; *D. crassipes* Fabricius, 1775; *D. impressa* Paykull, 1799; *D. semicuprea* Panzer, 1796; *Epitrix pubescens* (Koch, 1803); *Galeruca tanacetii* (Linnaeus, 1758); *Galerucella calmariensis* (Linnaeus, 1767); *G. nymphaeae* (Linnaeus, 1758); *G. pusilla* (Duftschmid, 1825); *G. tenella* (Linnaeus, 1761); *Gastrophysa viridula* (De Geer, 1775); *G. polygoni* (Linnaeus, 1758); *Goniocetena decemnotata* (Marsham, 1802); *G. intermedia* (Helliesen, 1913); *G. viminalis* (Linnaeus, 1758); *Hermaeophaga mercurialis* (Fabricius, 1792); *Hippuriphila modeeri* (Linnaeus, 1761); *Labidostomis longimana* (Linnaeus, 1761); *Lema cyanella* (Linnaeus, 1758); *Leptinotarsa decemlineata* (Say, 1824); *Lilioceris merdigera* (Linnaeus, 1758); *Lochmaea caprea* (Linnaeus, 1758); *L. crataegi* (Forster, 1771)*; *Longitarsus luridus* (Scopoli, 1763); *L. succineus* (Foudras, 1860); *Lythraia salicariae* (Paykull, 1800); *Neocrepidodera transversa* (Marsham, 1802); *Oomorpha concolor* (Sturm, 1807)**; *Oulema Duftschmidi* (Redtenbacher, 1874); *O. gal-laeciana* (Heyden, 1870); *O. melanopus* (Linnaeus, 1758); *Pachybrachys hieroglyphicus* (Laicharting, 1781); *Phaedon cochleariae* (Fabricius, 1792); *Ph. armoraciae* (Linnaeus, 1758); *Ph. laevigatus* (Duftschmid, 1825)**; *Phyllotreta quadrimaculata* (Linnaeus, 1758); *Phyllotreta atra* (Fabricius, 1775); *Ph. flexuosa* (Illiger, 1794); *Ph. nemorum* (Lin-

naeus, 1758); *Ph. striolata* (Fabricius, 1803); *Ph. tetrastigma* (Comolli, 1837); *Ph. undulata* Kutschera, 1860; *Ph. vittula* (Redtenbacher, 1849); *Phratora laticollis* (Suffrian, 1851); *Plagioderma versicolora* (Laicharting, 1781); *Plagiosterna aenea* (Linnaeus, 1758); *Prasocuris junci* (Brahm, 1790); *P. phellandrii* (Linnaeus, 1758); *Psylliodes chalcomera* (Illiger, 1807); *P. napi* (Fabricius, 1792); *Sermylassa halensis* (Linnaeus, 1767); *Sphaeroderma testaceum* (Fabricius, 1775).

66. Anthribidae Billberg, 1820

(4 species)

Anthribus nebulosus Forster, 1770; *Choragus sheppardi* Kirby, 1819*; *Platyrhinus resinus* (Scopoli, 1763); *Platys-tomos albinus* (Linnaeus, 1758).

67. Attelabidae Billberg, 1820

(12 species)

Apoderus coryli (Linnaeus, 1758); *Attelabus nitens* (Scopoli, 1763)*; *Byctiscus betulae* (Linnaeus, 1758); *B. populi* (Linnaeus, 1758); *Caenorhinus mannerheimii* (Hummel, 1823)*; *Deporaus betulae* (Linnaeus, 1758); *Involvulus cupreus* (Linnaeus, 1758); *Lasiorrhynchites cavifrons* (Gyllenhal, 1833)*; *Neocoenorhinus germanicus* (Herbst, 1797); *Tatianaerhynchites aequatus* (Linnaeus, 1767); *Temnocerus coeruleus* (Fabricius, 1798); *T. longiceps* (Thomson, 1888).

68. Brentidae Billberg, 1820

(17 species)

Apion frumentarium Linnaeus, 1758; *Catapion seniculus* (Kirby, 1808); *Eutrichapion viciae* (Paykull, 1800); *E. ervi* (Kirby, 1808); *Holotrichapion ebenium* (Kirby, 1808); *Ischnopterapion loti* Kirby, 1808; *Nanophyes marmoratus* (Goeze, 1777); *Omphalapion hookerorum* (Kirby, 1808); *O. laevigatum* (Paykull, 1792); *Oxystoma pomonae* (Fabricius, 1798); *Perapion curtirostre* (Germar, 1817); *P. violaceum* (Kirby, 1808); *Protapion apricans* (Herbst, 1797); *P. assimile* (Kirby, 1808); *P. fulvipes* (Geoffroy, 1785); *Stenopterapion tenue* (Kirby, 1808); *Taenitapion urticarium* (Herbst, 1784).

69. Dryophthoridae Schonherr, 1825

(1 species)

Dryophthorus corticalis (Paykull, 1792).

70. Brachyceridae Billberg, 1820 (6 species)

Grypus equiseti (Fabricius, 1775); *Notaris acridulus* (Linnaeus, 1758); *N. aethiops* (Fabricius, 1792); *N. scirpi* (Fabricius, 1792); *Tanyssphyrus lemnae* (Paykull, 1792); *Thryogenes nereis* (Paykull, 1800).

71. Curculionidae Latreille, 1802

(111 species)

Acalles camelus (Fabricius, 1792); *Anoplus setulosus* Kir-sch, 1870; *Anthonomus pomorum* (Linnaeus, 1758); *Archarius salicivorus* (Paykull, 1792); *Bagous tubulus* Caldara et O'Brien, 1994; *Baris artemisiae* (Herbst, 1795); *Barynotus moerens* (Fabricius, 1792); *B. obscurus* (Fabricius, 1775); *Ceuthorhynchus barbareae* Suffrian, 1847; *C. cochleariae* (Gyllenhal, 1813); *C. erysimi* (Fabricius, 1787); *C. obstructus* (Marsham, 1802); *C. typhae* (Herbst, 1795); *Cionus hortulanus* (Geoffroy, 1785); *C. tuberculatus* (Scopoli, 1763); *Charagmus gressorius* (Fabricius, 1792); *Chlorophanus viridis* (Linnaeus, 1758); *Cleonis pigra* (Scopoli, 1763); *Cossonus parallelepipedus* (Herbst, 1795); *Cotaster cuneipennis*

(Aubé, 1850)**; *Cryphalus asperatus* Gyllenhal, 1813; *Crypturgus pusillus* (Gyllenhal, 1813); *Curculio glandium* Marsham, 1802; *C. venosus* (Gravenhorst, 1807); *C. villosus* Fabricius, 1781; *Dendroctonus micans* (Kugelann, 1794)**; *Dorytomus taeniatus* (Fabricius, 1781); *D. tortrix* (Linnaeus, 1761); *Dryocoetes autographus* (Ratzeburg, 1837); *D. villosus* (Fabricius, 1792); *Eremotes ater* (Linnaeus, 1758); *Furcipes rectirostris* (Linnaeus, 1758); *Gronops inaequalis* Boheman, 1842; *Hylastes ater* (Fabricius, 1792); *Hylesinus crenatus* (Fabricius, 1787); *H. varius* (Fabricius, 1775); *Hylobius abietis* (Linnaeus, 1758); *H. pinastri* (Gyllenhal, 1813); *Hylurgops palliatus* (Gyllenhal, 1813); *Hylurgus ligniperda* (Fabricius, 1787); *Hypera arator* (Linnaeus, 1758); *H. meles* (Fabricius, 1792); *H. nigrirostris* (Fabricius, 1775); *H. viciae* (Gyllenhal, 1813); *H. rumicis* (Linnaeus, 1758); *Ips typographus* (Linnaeus, 1758); *Isochnus flagellum* (Erichson, 1902); *Larinus turbinatus* Gyllenhal, 1835; *Lepyrus palustris* (Scopoli, 1763); *Limnobaris dolorosa* (Goeze, 1777); *Liophloeus tessulatus* (Müller, 1776); *Lixus iridis* Olivier, 1807; *Magdalis armigera* (Geoffroy, 1785); *M. ruficornis* (Linnaeus, 1758); *M. violacea* (Linnaeus, 1758); *Mecinus pyrastrer* (Herbst, 1795); *Micropiontium triangulum* (Boheman, 1845); *Mononychus punctumalbum* (Herbst, 1784); *Nedys quadrimaculatus* (Linnaeus, 1758); *Orthotomicus laricis* (Fabricius, 1792); *O. suturalis* (Gyllenhal, 1827); *Otiorrhynchus ovatus* (Linnaeus, 1758); *O. raucus* (Fabricius, 1777); *O. singularis* (Linnaeus, 1767); *O. tristis* (Scopoli, 1763); *Pelenomus velaris* (Gyllenhal, 1827); *Phyllobius argentatus* (Linnaeus, 1758); *Ph. glaucus* (Scopoli, 1763); *Ph. maculicornis* Germar, 1824; *Ph. oblongus* (Linnaeus, 1758); *Ph. pomaceus* Gyllenhal, 1834; *Ph. pyri* (Linnaeus, 1758); *Pityogenes chalcographus* (Linnaeus, 1761); *Polydrusus mollis* (Ström, 1768); *P. picus* (Fabricius, 1792); *P. tereticollis* (De Geer, 1775); *P. undatus* (Fabricius, 1781); *Polygraphus poligraphus* (Linnaeus, 1758); *Rhamphus oxyacanthae* (Marsham, 1802); *Rh. pulicarius* (Herbst, 1795); *Rh. subaeneus* (Illiger, 1807); *Rh. noncus bruchoides* (Herbst, 1784); *Rh. pericarpus* (Linnaeus, 1758); *Rhinusa antirrhini* (Paykull, 1800); *Rhynchaenus iota* (Fabricius, 1787); *Rutidosoma globulus* (Herbst, 1795); *Sciaphilus asperatus* (Bonsdorff, 1785); *Scolytus intricatus* (Ratzeburg, 1837); *S. scolytus* (Fabricius, 1775); *S. ratzeburgi* Janson, 1856; *Sibinia pellucens* (Scopoli, 1772); *Sitona lineatus* (Linnaeus, 1758); *S. macularius* (Marsham, 1802); *S. puncticollis* Stephens, 1831; *S. suturalis* Stephens, 1831; *Stereonychus fraxini* (De Geer, 1775); *Strophosoma capitatum* (De Geer, 1775); *S. melanogrammum* (Forster, 1771); *Tachyerges rufitarsis* (Germar, 1821); *T. stigma* (Germar, 1821); *T. salicis* (Linnaeus, 1758); *Tapinotus sellatus* (Fabricius, 1794); *Tomicus piniperda* (Linnaeus, 1758); *Trachodes hispidus* (Linnaeus, 1758); *Trachyphloeus bifoveolatus* (Beck, 1817); *Trichosirocalus troglodytes* (Fabricius, 1787); *Trypodendron domesticum* (Linnaeus, 1758); *T. lineatum* (Olivier, 1795); *T. signatum* (Fabricius, 1792); *Tychius stephensi* Gyllenhal, 1836; *Zacladus geranii* (Paykull, 1800).

Discussion

1. Beetles of the Svetlogorsk Forest. The Svetlogorsk Forest supports an astonishing diversity of coleopteran fauna. Representatives of 71 families (800 species listed, i.e. 0.25–0.3 of full beetles' fauna of Kaliningradskaya Oblast) were captured or observed in the forested area of approximately 8 km² in the northern Sambian peninsula during twenty-year period at the

beginning of the XXI century. Current faunal knowledge about different groups of beetles varies and depends on the taxonomic group, so research could be continued in this area and the methodology of Coleoptera inventoring could be additionally extended. All beetles' fauna of the Svetlogorsk Forest could consist of double species number (i.e. approximately 1500 species), which could be collected by careful and more targeted research. The presented species list is provisional and represents the general picture of the fauna, including mostly numerous, common and widely distributed taxa. Several beetles groups not sampled in research time (e.g. Pselaphinae, Trogidae) would be added by continuing of researches. The most species-rich family (Staphylinidae) should be represented by no less than 120–150 species in studied territory (in contrast to revealed 45) and might be an aim of additional collecting efforts. The water beetles (primarily Dytiscidae and Hydrophilidae) are underrepresented in the list, what should be corrected by additional and focused sampling.

The obtained preliminary results should and could be interpreted by comparison. E.g. the faunistic study in the national park «Curonian Spit» [Alekseev, 2014] revealed 909 species from 72 families during 15 years of sampling. That research is methodically similar, made in territory situated 22 km away from the Svetlogorsk Forest and more or less comparable in different respects, however the territory of the national park «Curonian Spit» is 8 times larger than the studied area in the Svetlogorsk Forest. The sampled faunas differ in details, but are comparable in general species richness. The Jaccard similarity coefficient (S_j) between the faunal species lists for the Curonian Spit and the Svetlogorsk Forest is 0.473, the Sørensen similarity coefficient (S_s) is 0.642. The major differences in species composition (the Jaccard index is less than 0.3; the Sørensen index is less than or equal to 0.4) are observed in families Ptiliidae, Staphylinidae, Eucnemidae, Lycidae, Ptinidae, Monotomidae, Nitidulidae, Mycetophagidae, Melandryidae, and Mordellidae.

Differences in species composition of the lists are significant and are primarily resulted from subjective incompleteness of both studies, active use of a light trap by faunal survey on the Curonian Spit (not used in the Svetlogorsk Forest) and objective differences of two studied territories in set of ecosystems: the Curonian Spit almost lacks broad-leaved stands (oak, lime, hornbeam), while the open biotopes of the Svetlogorsk Forest area were not included in faunal study.

During examination and identification of the materials from the studied territory of the Svetlogorsk Forest, a list of 800 species was compiled. Among these registered beetles, 12 species are actually known in Kaliningradskaya Oblast in this territory only. These locally distributed (or very badly known) species are following: *Hylis olexai*, *Denticollis rubens* (Fig. 2E), *Pyropterus nigroruber*, *Dryophilus pusillus*, *Pityophagus ferrugineus*, *Conopalpus testaceus*, *Phryganophilus*

auritus, *Curtimorda maculosa*, *Oomorpha concolor*, *Phaedon laevigatus*, *Cotaster cuneipennis*, and *Dendroctonus micans*. Majority of these species are xylomycetophagous.

Twenty three species of the Svetlogorsk Forest are regionally rare, known from 2-4 restricted geographical points in Kaliningradskaya Oblast only. There are: *Brosicus cephalotes* (Fig. 2B), *Lionychus quadrillum*, *Nebria livida*, *Velleius dilatatus*, *Selastosomus impressus*, *Platycis cosnardi*, *Soronia punctatissima*, *Triphyllus bicolor*, *Abdera flexuosa*, *Hypulus bifasciatus*, *Colydium filiforme*, *Anidorus nigrinus*, *Euglenes pygmaeus*, *Anaglyptus mysticus*, *Callidium aeneum*, *Rutpela maculata* (Fig. 2F), *Zeugophora turneri*, *Colaphus sophiae*, *Lochmaea crataegi*, *Choragus sheppardi*, *Atelabus nitens*, *Caenorhinus mannerheimii*, and *Lasiorhynchites cavifrons*. Three of them are inhabitants of sandy and open cliff habitat (*B. cephalotes*, *L. quadrillum*, *N. livida*), and other beetles are connected with forest habitats. Xylomycetophagous species dominate among this group of beetles too.

Geographically small studied forest site maintains populations of diverse officially protected species. Six beetles of the Svetlogorsk Forest (*Calosoma inquisitor* (Fig. 2C), *Carabus coriaceus* (Fig. 2A), *Dendroxena quadrimaculata*, *Protaetia marmorata*, *Gnorimus nobilis* (Fig. 2D), and *Prionus coriarius*) are listed in the current issue of Red Data Book of Kaliningradskaya Oblast [Dedkov, Grishanov, 2010] and one species (*Dorcus parallelepipedus*) is mentioned in appendix I («need of special attention and control»). Seven species inhabiting the Svetlogorsk Forest are included in the actual Red Data Book of Lithuania [Rašomavičius, 2021]. These protected in the neighboring territory beetles and its corresponding IUCN categories are following: *Calosoma inquisitor* (NT i.e. «near threatened»), *Carabus coriaceus* (NT), *Dendroxena quadrimaculata* (NT), *Peltis grossa* (EN i.e. «endangered»), *Protaetia marmorata* (NT), *Prionus coriarius* (EN), and *Xestobium rufovillosum* (NT).

The Svetlogorsk Forest hosts four saproxylic species indicating primeval forests in Central Europe [Eckelt et al., 2018], e.g. *Grynocharis oblonga*, *Peltis grossa*, *Colydium filiforme*, and *Phryganophilus auritus*. These species are considered «primeval forest relict beetles» and are included in a set of 168 umbrella species for the protection of European primeval forest remnants.

Additionally, 37 species of the revealed Svetlogorsk Forest fauna are listed in European Red List of saproxylic beetles [Nieto, Alexander, 2010]. There are: *Anaglyptus mysticus*, *Aromia moschata*, *Callidium aeneum*, *Clytus arietis*, *Molorchus minor*, *Obrium brunneum*, *Plagionotus arcuatus*, *Plagionotus detritus*, *Prionus coriarius*, *Saperda scalaris*, *Xylotrechus rusticus*, *Protaetia marmorata*, *Gnorimus nobilis*, *Valgus hemipterus*, *Ampedus balteatus*, *A. pomorum*, *A. sanguineus*, *Cardiophorus ruficollis*, *Denticollis linearis*, *D. rubens*, *Melanotus villosus*, *Dacne bipustulata*, *Triplax russi-*

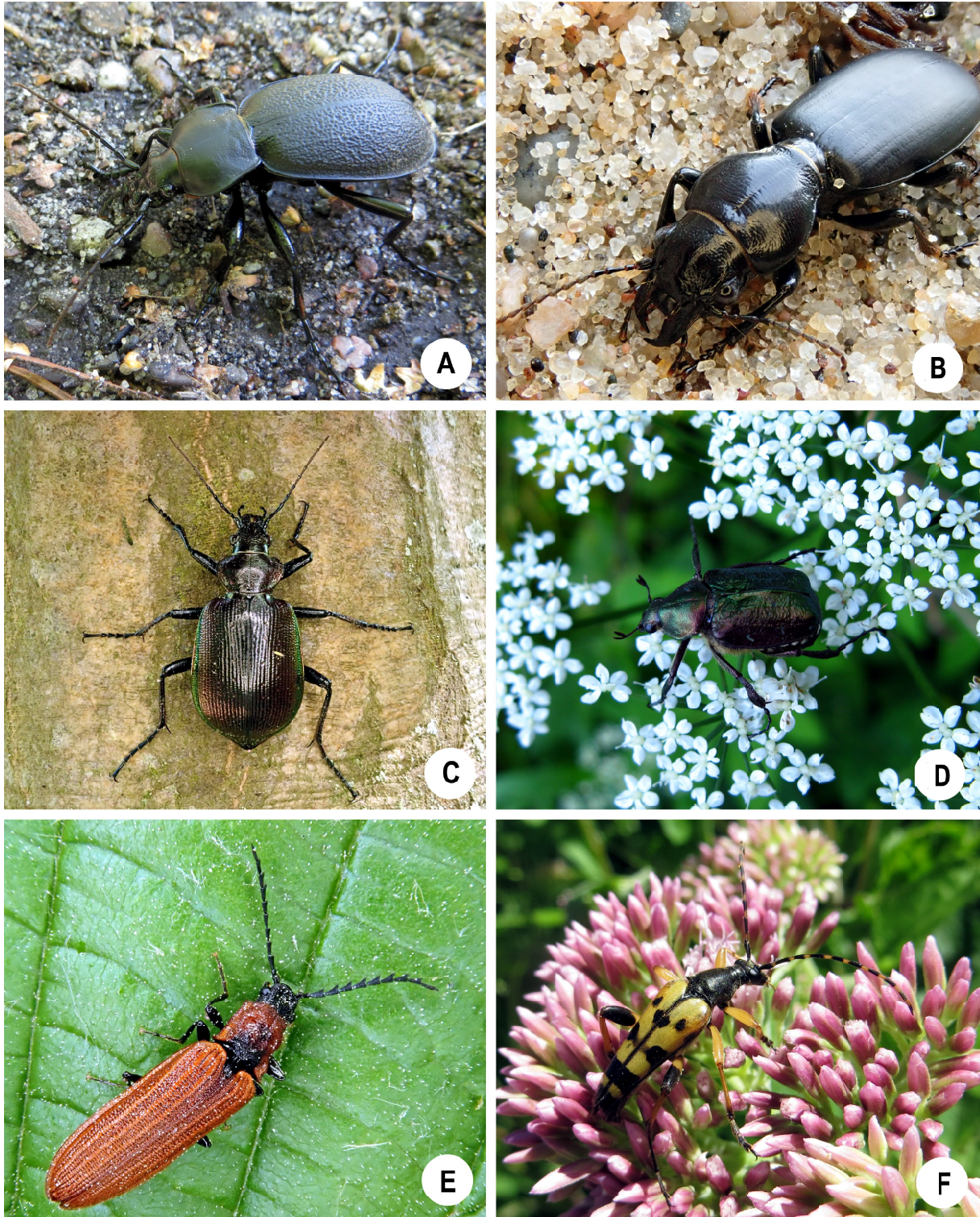


Fig. 2. Nature photos of several regionally rare beetles in the studied area: A — *Carabus coriaceus* (Otradnoe, «Wolfskessel», 1.09.2020); B — *Broscus cephalotes* (Otradnoe, sandy beach of the Baltic Sea, 6.09.2021); C — *Calosoma inquisitor* (forest edge in west suburb of Svetlogorsk, 3.06.2021); D — *Gnorimus nobilis* (Lesnoe, «Wolfsschlucht», 29.06.2011); E — *Denticollis rubens* (Lesnoe, «Fuchsschlucht», 3.06.2021); F — *Rutpela maculata* (forest edge in west suburb of Svetlogorsk, 18.07.2020).

Fig. 2. Фотографии некоторых регионально редких жуков в природе на территории исследования: А — *Carabus coriaceus* (Отрадное, «Wolfskessel», 01.09.2020); В — *Broscus cephalotes* (Отрадное, песчаный пляж Балтийского моря, 6.09.2021); С — *Calosoma inquisitor* (опушка леса на западной окраине Светлогорска, 3.06.2021); D — *Gnorimus nobilis* (Лесное, «Wolfsschlucht», 29.06.2011); E — *Denticollis rubens* (Лесное, «Fuchsschlucht», 3.06.2021); F — *Rutpela maculata* (опушка леса на западной окраине Светлогорска, 18.07.2020).



Fig. 3. A — Ruins of the historical ladder of the German spa park of former Georgenswalde (Otradnoe, 30.10.2018); B — the same place three years later (6.09.2021); C — map of the northern seacoast of the Sambion peninsula with location of recommended area for the national park «Warnicken Forest» (blue colouring).

Fig. 3. A — Руины исторической лестницы немецкого курортного парка бывшего Георгенсвальде (Отрадное, 30.10.2018); B — то же место три года спустя (6.09.2021); C — карта северного побережья Самбийского полуострова с месторасположением рекомендуемой территории для организации национального парка «Варникенский лес» (синяя заливка).

ca, *Tritoma bipustulata*, *Eucnemis capucina*, *Microrhagus pygmaeus*, *Dorcus parallelepipedus*, *Platycerus caprea*, *P. caraboides*, *Sinodendron cylindricum*, *Litar-gus connexus*, *Mycetophagus quadriguttatus*, *M. quad-*

ripustulatus, *Triphyllus bicolor*, *Grynocharis oblonga*, *Ostoma ferruginea*, and *Peltis grossa*.

Abovementioned 70 coleopteran species (approximately 9 % of identified fauna) are regionally rare or, in

varying degrees, at risk, showing the important role of the studied territory for conservation of regional biodiversity. The Svetlogorsk Forest provides important habitat for the populations of diverse protected beetles, as well as relatively large number of other regionally rare beetles. The part of this forest in possible international nature conservation projects or programs would be a mistake to underestimate. The future of these species depends on targeted conservation measures. Many of the above listed species depend on deadwood or suitable forest or intact cliff habitat; their conservation should be the central task of nature protection in the Svetlogorsk Forest.

A reference should be made to the fact, that the insect fauna of any area is not stable and is changing over a time. Usually, such processes are poorly documented. Especially dramatic, accelerating and sometimes structural faunal changes are currently experiencing due to modern human economical activities. The determination of precise time of appearance or of definitive disappearance regarding an insect in an area is especially problematic and should be mentioned with caution. Numerous recently unconfirmed reports of beetles from Rauschen [now Svetlogorsk], Warnicken [Lesnoe], Hirschau [Kolomenskoe], Kraam [Grachevka] and Georgenswalde [Otradnoe], i.e. in approximate territory of interest, are mentioned in the comprehensive old catalogues of the regional fauna [Lentz, 1879; Bercio, Folwaczny, 1979]. The actual presence of such peculiar beetles as *Miscodera arctica* Paykull, 1798, *Licinus depressus* (Paykull, 1790), *Cymindis* spp., *Phausis splendidula* (Linnaeus, 1767), *Drilus concolor* Ahrens, 1812, *Onthophagus fracticornis* (Preyssler, 1790), *Lycoperdina* spp., *Lyctus linearis* (Goeze, 1777), *Pachyta lamed* (Linnaeus, 1758), and *Chlorophorus figuratus* (Scopoli, 1763) seem still probable here, but not verified during the study in the XXI century. The five following species, registered in the XIX or in the XX centuries before 1945, are probable extinct in the Svetlogorsk Forest at present: *Calosoma sycophanta* (Linnaeus, 1758), *Nicrophorus germanicus* (Linnaeus, 1758), *Lucanus cervus* (Linnaeus, 1758), *Caccobius schreberi* (Linnaeus, 1767), and *Cerocoma schaefferi* (Linnaeus, 1758). In the contrary, two species, *Oxythyrea funesta* and *Harmonia axyridis*, are recent (the beginning of the XXI century) invaders in the studied territory. The first registered in the Svetlogorsk Forest specimens of these species with recently expanding distribution are known in 2018–2019 years only. Four following species are also migrants for the studied territory, appeared here in the second half of the XX century after 1945: *Tachyta nana*, *Lionychus quadrillum*, *Leptinotarsa decemlineata*, and *Charagmus gressorius*.

2. Nature conservation recommendations. A narrow coastal area of the Svetlogorsk/Warnicken Forest together with the Baltic Sea cliff was under protection as the part of nature reserve (Naturschutzgebiet «Samländischer Küstenhain») in Eastern Prussia during 1934–1945. The resort area under federal jurisdiction «Svetlogorsk–Otradnoe» was the status of protection for the

territory during the Soviet time in the XX century. Formally, the territory also possessed this status at least until 2013. Modern economic activities increasingly transform the area without any nature protection status in the last ten years. Commercial logging in the studied territory is absent, but the forested area is under strong anthropogenic pressure, gradually reduced and fragmented as a result of the new building of houses (Svetlogorsk suburb, Maiskii parish, Otradnoe), extending of the network of the electric power transmission lines through the forest, widening of old roads and creation of new roads, opening of the amusement park near Otradnoe and not regulated tourism. Present-day status cannot ensure any nature protection and also any conservation of historical heritage for posterity (Fig. 3A, B), necessitating immediate and coordinated preservation efforts on the territory of the Svetlogorsk Forest.

Unfortunately, present-day nature preservation in Kaliningradskaya Oblast is completely formal and virtual, having a very complicate bureaucratic and administrative character. There are no places untouched from human influence and non-transformed in the region. Several little transformed natural territories without an economic importance and usually distant from current economic interest are declared «protected». Such declaration usually remains only a concept on paper: no efforts of real protection, no economic limitation or even investigation are carried out, probably because the area is outside of current economic importance and distant. If the territory enters the area of interest (building, land use, exploitation of resources, improvements of infrastructure), the status of protection for the territory disappears. The ten present-day protected natural reserves on the Sambian Peninsula are geological, that seem to be meaningless for protection of living nature existing in the form of integrated ecosystems of living organisms. All conflicts between nature protection and economic activity resolve in in favour of immediate proceeds under cover of motto «benefits and wellbeing for people». Preservation of biodiversity is not practised in the region, even in the national park «Curonian Spit». The substitution of broad-leaved or conifer native veteran trees by any seedlings (including introducents) with the relationship one-to-one is legitimate and official practice of «compensatory greening» in whole area of Kaliningradskaya Oblast.

The strategy of nature habitat protection in Kaliningradskaya Oblast should completely differ: the seminatural territories (with high biodiversity and natural value, like the Svetlogorsk Forest) near economically interesting areas (and thereby at risk of disappearing) must be primarily protected. The protected areas in the region should primarily include old parks, old alleys and different forests as well other seminatural ecosystems; the protection of these territories should exclude change of their borders and status for economical purposes. The spatial planning of land use should include expertise connected with nature protection and conservation. The forest management should consider the importance of



Fig. 3. Several landscape photos from the studied area as examples of nature with aesthetic value for the recommended national park «Warnicken Forest»: A — mixed forest (eastward of Maiskii settlement, 20.10.2018); B — cliff and seaside of the Baltic Sea (between Lesnoe and Otradnoe, 10.08.2021); C — seaside of the Baltic Sea with the ferruginized sandstones of the Eocene Krant facies in Zipfelberg (NE Primorye, 26.05.2020); D — natural monument «Oaken alley» with 600-years old trees (Lesnoe, 1.09.2020); E — forested ravine «Wolfsschlucht» (Lesnoe, 2.10.2020); F — the northern seacoast of the Sambian Peninsula, view from «Jägerspitze» (Lesnoe, 06.09.2021).

Fig. 3. Фотографии природы в некоторых точках изученной территории как примеры эстетичной природы в рекомендуемом национальном парке «Варникенский лес»: А — смешанный лес (к востоку от пос. Майский, 20.10.2018); В — клиф и побережье Балтийского моря (между пос. Лесное и Отрадное, 10.08.2021); С — берег Балтийского моря с эоценовым ожелезненным песчаником фации Крант дюны Ципфельберг (СВ пос. Приморье, 26.05.2020); D — памятник природы «Дубовая аллея» с деревьями возрастом 600 лет (пос. Лесное, 1.09.2020); E — облесенный овраг «Волчьё ущелье» [Wolfsschlucht] (пос. Лесное, 2.10.2020); F — северное побережье Самбийского полуострова, вид с «Егерской вершины» «Jägerspitze» (пос. Лесное, 6.09.2021).

local deadwood availability and prevent forest degradation occurring through the loss of key ecological structures, such as dying trees and deadwood.

Considering the high species richness of the beetles, the Svetlogorsk Forest bears a great conservation value and can contribute to preserving the insect fauna in the region. The listed in Red Data Book and different red lists beetle species are flagships for territory conservation. Measure taken to protect these beetles and its habitats can also benefit other threatened wildlife, including other insects and plants. It is worth noting; only two transformed by human activity forests are currently present in the coastal area of the Baltic Sea in Kaliningradskaya Oblast: (1) a larger, mixed Svetlogorsk Forest in the northern coast of the Sambian Peninsula and (2) a smaller, broad-leaved forested area near Baltiisk in the south-western coast of the Sambian Peninsula. Both forest fragments include partially surviving insect community of European broad-leaved temperate forest zone and merit nature protection and aimed diversity preservation. Three circumstances (habitat for set of protected species, locality of high general biodiversity, and unique last refugium for broad-leaved ecosystems on the Sambian Peninsula) especially underline the importance of the Svetlogorsk Forest in regional nature preservation. Taking in consideration the high number of diverse (geomorphological, botanical) and unique nature objects on the territory as well as sites of particular ecological, historical and aesthetic value (see e.g. Fig. 4), the establishment of a large-area (approximately 60 square kilometers) complex state nature reserve «Warnicken Forest» or even federal national park in the northern coastal area of the Sambian peninsula, extended from Primorye towards western suburb of Svetlogorsk (including the Zipfelberg dune, forested area and cliff of the Baltic Sea coast, coastal parks of Lesnoe and Otradnoe, «Oaken alley» along road in Lesnoe, forested area with burial mounds in Otradnoe vicinity, and the Svetlogorsk Forest) is proposed (Fig. 3C). Aesthetic, cultural, historical, and natural arguments for such project as second national park on the territory of Kaliningradskaya Oblast seem to be no feebler than for the existing Curonian Spit national park. The Svetlogorsk Forest needs in strict protection and urgent conservation measurements in order to preserve biodiversity. The form of this protection and the status of the territory should be discussed by diverse experts, but at a decision should be arrived within the next few years.

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