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Coleoptera, Cerambycidae

Francesco Vitali

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1. *Rhagium bifasciatum*, female on *Fagus*, Bambësch.
2. *Saperda scalaris*, female on *Fagus*, Bambësch.
3. *Rhagium mordax*, male, Bambësch.

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Acknowledgments

This book is based on a doctoral project financially supported by the Ministère de la Culture, de l'Enseignement supérieur et de la Recherche (Luxembourg), through a formation-research grant (n° 955375) awarded by the Aides à la Formation-Recherche of the Fonds National de la Recherche (Luxembourg). This task was realized in collaboration with the Fachbereich VI Geographie/ Geowissenschaften der Universität Trier (Germany), the Association Faune-Flore (Luxembourg) and the Muséum national d'histoire naturelle (Luxembourg). The field research was conducted due to personal derogation (N° 73438 FW) provided by the Ministère du Développement durable et des Infrastructures (Luxembourg), according to the Art.33 of the Law concerning the protection of nature. To all these institutions I wish to express my sincere thanks.

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Atlas of the Insects of the Grand-Duchy of Luxembourg Coleoptera Cerambycidae

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Key-words: Coleoptera, Cerambycidae, Luxembourg

Abstract

This book is the result of a multidisciplinary doctoral project focused on the Longhorn Beetles (Cerambycidae) of Luxembourg.

The larvae of this family act as primary decomposers of dead, senescent or living trees and building woods. They are considered as high bio-indicators for the state of forest health, biodiversity and wildlife ecosystems or having a great economical importance. Nonetheless, the knowledge of this group in Luxembourg was still at an early stage.

The study of the existing collections and a triennial field research throughout the country has allowed updating the species list of the Luxembourgish Cerambycids: 21 species were overall recorded as new and 4 species as erroneously recorded, so that 96 species can be considered as constituting the local cerambycofauna. For each species, a data sheet including identifying characteristics, updated distributions in Luxembourg, neighbouring regions and Eurasia, local conservation status and biological data (larval and imaginal biology, known host species, parasites, predators) is provided for scientific dissemination.

The analysis of the cerambycid biodiversity in time has evidenced that eight local species should be considered as extinct, five as "assumed extinct" and 17 as "threatened".

Moreover, the local cerambycofauna was compared to those of the neighbouring regions with the double objective of identifying biogeographical affinities between Luxembourg and the neighbouring regions and identifying common faunistic tendencies.

The comparative study of the changes observed over time in the Cerambycids of the neighbouring regions, in other Luxembourgish insects, in climate and vegetation has allowed tracing the causes of arrival, regression and extinction of some local species, as well their phenological changes.

In addition, some taxonomic changes were introduced*:* *Stenopterus rufus rufus* (Linnaeus, 1767) = *Stenopterus rufus* ab. *geniculatus* Kraatz, 1863 **rest. status**; *Chlorophorus glabromaculatus webbii* (Brullé, 1839) **n. comb.**; *Grammoptera ruficornis ruficornis* (Fabricius, 1781) = *Leptura pallipes* Stephens, 1831 = *Grammoptera ruficornis* var. *flavipes* Pic, 1892 **rest. status**; *Leptura maculata* Poda, 1761 = *Strangalia armata* var. *nigricornis* Stierlin, 1864 **rest. status**; *Stenurella melanura* (Linnaeus, 1758) = *Stenurella sennii* Sama, 2002 **n. syn.**

Zesummefaassung

Dëst Buch ass d'Resultat vun engem pluridisziplinäre Doktoratsprojet iwwer d'Bockkäferen (Cerambycidae) vu Lëtzebuerg.

D'Larve vun dëser Famill si Primärzersetzer vun doudegen, ofstierwenden oder liewege Beem a vu Bauholz. Si si gutt Bioindikatoren fir de Gesondheetszoustand vu Bëscher an hirer Biodiversitéit an hunn och ökonomesch Bedeitung an der Forstwirtschaft. Trotzdem war bis elo net allzevill iwwer dës Famill zu Lëtzebuerg bekannt.

De Studium vun de besteeënde Sammlungen an e landeswäiten Terrainsprojet iwwer dräi Joer hunn et erlaabt, d'Artelëscht vun de lëtzebuerger Cerambyciden ze ergänzen: 21 Arte waren nei fir d'Fauna vum Land a 4 sinn als Falschmeldungen erkannt ginn, sou dass elo am Ganzen 96 Arten fir d'Bockkäferfauna vu Lëtzebuerg zréckbehale kënne ginn. Fir all Art gëtt eng "Fiche" mat den Erkennungseegenarten an Informationen zur Verbreedung am Land an an de Nopeschregiounen, mee och an Eurasien präsentéiert. Doniewent gëtt d'Situatioun vun de lokale Populatiounen diskutéiert an et ginn Daten zur Biologie (souwuel fir d'Larven wéi och d'Imago'en, Bruttplanzen, Parasiten, Friessfeinden) geliwwert.

Eng Analys vun der Bestandssituatioun weist, datt 8 Arten schonn ausgestuerwe sinn, vu weidere 5 gëtt dat ugeholl a 17 sinn bedroht. D'Bockkäferfauna vom Land gëtt da mat däer von de Nopeschregioune verglach mam dueblen Ziel, biogeographësch Ähnlechkeeten a gemeinsam faunistesch Tendenzen ze fannen.

De Verglach mat Veränneerungen bei der Bockkäferfauna von de Nopeschlänner, bei anere lëtzebuergeschen Insekten, bei Klima a Vegetatioun huet et erlaabt, Grënn fir d'Awanderung, de Rëckgang oder d'Ausstierwe vun enger Rei eenheemeschen Arten ze fannen an/oder phänologesch Veränneerungen ze verstoen.

Zu gudder Lescht goufen och nach e puer taxonomesch Ännerungen zréckbehalen: *Stenopterus rufus rufus* (Linnaeus, 1767) = *Stenopterus rufus* ab. *geniculatus* Kraatz, 1863 **rest. status**; *Chlorophorus glabromaculatus webbii* (Brullé, 1839) **n. comb.**; *Grammoptera ruficoris ruficornis* (Fabricius, 1781) = *Leptura pallipes* Stephens, 1831 = *Grammoptera ruficornis* var. *flavipes* Pic, 1892 **rest. status**; *Leptura maculata* Poda, 1761 = *Strangalia armata* var. *nigricornis* Stierlin, 1864 **rest. status**; *Stenurella melanura* (Linnaeus, 1758) = *Stenurella sennii Sama*, 2002 **n. syn.**

1 Introduction

1.1 Context

The Cerambycidae is a family of Coleoptera widespread throughout Europe with more than 550 species (Bense, 1995). Both adults and larvae are phytophagous, mostly xylophagous. However, the majority of these species (500) are saproxylic, acting as primary decomposers of dead wood or senescent trees. Since some of them are of moderate size and pluriannual larval development, they are considered as important bioindicators of the state of health of forestry and wildlife ecosystems (Speight, 1989). Accordingly, Cerambycids have become a target group for many research programmes on biodiversity and forest health in European (LIFE97 NAT/A/004117, LIFE99 NAT/A/005915, LIFE99 NAT/IT/006245) and non-European countries (Maeto & Makihara, 1999; Maeto et al., 2002; Makino et al., 2007; Maleque et al., 2009). In addition, several cerambycid species are protected by the Council Directive 92/43/EEC (Natura 2000) and the law of several European countries (i.e. BArtSchV in Germany), among them also Luxembourg (AAVV, 2009).

A small number of species are also synanthropic (e.g. *Gracilia minuta*, *Nathrium brevipennis*) or attack dried building woods (e.g. *Chlorophorus pilosus*, *Trichoferus holosericeus*), sometimes with dramatic effects on the human habitations (i.e. *Hylotrupes bajulus*). Finally, larvae and adults of the remaining species (e.g. *Cerambyx* spp., Agapanthiini, Saperdini, Dorcadiini) are related to living plants. For a long time, some of them (i.e. *Cerambyx* spp., Saperdini) have also been considered as a pest in Luxembourg (Faber, 1901b; Schuster, 1907a; 1907b; Ferrant, 1907a; 1907b; 1911). Both groups show a great economical importance.

Definitively, Cerambycids have a vital importance from the ecological and economic point of view. In spite of this and the tradition of entomological studies in Luxembourg leading to the foundation of the Museum of Natural History more than 150 years ago, the knowledge of the local cerambycofauna is still in its infancy.

Mousset (1977) regretfully stated that Luxembourg was the only European country without a catalogue of the local Coleoptera. Even now some 30 years later, nothing has changed. This problem also concerns the Cerambycids: until the beginning of this project only some few papers or mostly short notes about the local fauna have been published (Hostie, 1951; Meyer, 1977; Mousset, 1969; 1973a; 1973b; 1981a; 1981b; Gerend, 2000; 2008; Gerend & Meyer 2007; Gerend et al., 2007; Thoma, 2009). In addition, the papers about the economic importance of the insects mentioned above are obscure concerning the fact that the mentioned cerambycids really belong to the local fauna since allochthonous species were also treated.

The numeric consistency, the importance and even the real presence of all Cerambycids that Mousset (1969, 1973) quoted for Luxembourg was actually unknown. This also concerned the species considered as threatened by Natura 2000 (*Cerambyx cerdo*, *Rosalia alpina*) or even protected by the local law (GDR, 2009). In particular, the Luxembourgish law formally protects *Cerambyx cerdo*, which has been considered as extinct in Luxembourg without certain proof (LUCE, 1996), and *Plagionotus detritus*, which had not been recorded in this country yet. The status of many saproxylic species, considered by the Council of Europe as of primary importance for biodiversity conservation (Speight, 1989), or of many other ones, protected by law in neighbouring countries (e.g *Aromia moschata*, *Purpuricenus kaehleri*, *Prionus coriarius*), deserved to be verified.

Actually, little was known about the cerambycofauna of Luxembourg. Mousset (1969) provided only 251 records concerning local cerambycids, while the papers published afterwards (Mousset, 1973b; 1981a; 1981b; Gerend, 2000; 2008; Gerend & Meyer 2007; Gerend et al., 2007; Thoma, 2009) elevated this number with only some units.

Besides the previously mentioned species, some other ones present in the neighbouring regions (e.g. *Cortodera humeralis*, *Stenopterus rufus*, *Exocentrus* spp.) seemed to be strangely absent, while even common species (*Grammoptera ruficornis*, *Pyrrhidium sanguineum*, *Phymatodes testaceus*) seemed to be very poorly distributed.

Moreover, the systematics and the taxonomy of several groups have fairly changed and some new species have been recently separated (Kratochvil, 1985; Wallin et al., 2009); thus, old data also deserved to be completely revised from this point of view.

Finally, Luxembourg is located at the crossroads of four different biogeographical regions (North-Atlantic France, Central France, Belgium + the Netherlands + North-western Germany and Western Germany), but the lack of significant data did not allow classifying the local cerambycofauna into a clear region (Illies, 1976).

1.2 Project aim

The doctoral project on the Cerambycofauna of Luxembourg aimed at three main aspects: (1) an updated check list with focus on the conservation status of all local species, (2) the biogeographical situation of Luxembourg (3) the faunistic changes over time.

To address these research fields, three hypotheses and a clear methodology to test them along the project were established. The outcomes of these hypotheses tests represented the scientific milestones of this project and will be the deliverables usable for future research activities, information given to the public and administrative planning programs and assessments in nature conservation.

Firstly, starting from the hypothesis that the Cerambycofauna of Luxembourg is similar in biodiversity and consistence to the ones of the neighbouring regions, the first outcome was the elaboration of a complete species list of the Luxembourgish cerambycofauna and their biogeographical evaluation in comparison with the adjoining regions.

In addition, a Red List for threatened Cerambycids of Luxembourg and suggestions for local forest management were elaborated.

Secondly, starting from the hypothesis that the biogeographical situation of Luxembourg is embedded in a western Central European biogeographical context with varying influences from the major Mediterranean expansion centres, the outcome was the biogeographical classification of Luxembourg for Cerambycids in the European context. This research was lately used for an original publication concerning the biogeography of all West-Palaearctic Cerambycoidea (Vitali & Schmitt, 2016).

Thirdly, starting from the hypothesis that the environmental conditions in Luxembourg have actually deteriorated for specialised forest cerambycid species though the coverage of forests has increased over the last century, the outcomes were the identification of species turn-over rates over the last century and the elaboration of the changes of environmental conditions for Cerambycids in Luxembourg.

1.3 Notes concerning the present book

In comparison with the doctoral dissertation, this volume of Ferrantia does not include the annex concerning the Cerambycofauna of West-Palaearctic Cerambycoidea, which was published separately (Vitali & Schmitt, 2016). Parts of introduction, materials and methods, results, discussion, tables and references were used for an original publication of climatology concerning the impact of the global change on the Longhorn beetle fauna of Luxembourg, which will be published separately.

In contrast, this volume includes the data collected in 2015-2016 and those of some collections that the MNHNL received during this period. Some taxonomic updates and a new species for Luxembourg (*Plagionotus arcuatus*) have been added, while the biogeographical analyses (5.1) and the bibliography have been updated accordingly.

2 Materials and methods

2.1 Biogeography of the Cerambycids of Luxembourg

2.1.1 Study of the literature

All available literature concerning the Cerambycofauna of Luxembourg, Belgium, Netherlands, France (Region of Alsace and Departments of Ardennes, Moselle and Meurthe-et-Moselle) and Germany (Rhineland-Palatinate and Saarland) was checked. In particular, the following catalogue and articles were used for the different countries: Luxembourg (Hostie, 1951; Meyer, 1977; Mousset,

1969; 1973a; 1973b; 1981a; 1981b; Gerend, 2000; 2008; Gerend & Meyer 2007; Gerend et al., 2007; Thoma, 2009; Weitzel, 2014); Rhineland-Palatinate and Saarland (Brahm, 1790; Horion, 1974; Niehuis, 2001; Gerend & Meyer 2007); northern Lorraine (Fournel & Gehin, 1846; Godron, 1866; Colson, 1980a; 1980b; 1981); Alsace (Fournel & Gehin, 1846; Godron, 1866; Matter, 1998; Callot, 2003); French Ardennes (Ligeron, 2005); Belgium (Lameere, 1885; 1894; Everts, 1903; Guilleaume, 1909; Picard, 1929; Collart, 1941; Desière, 1969; Horion, 1974; Villiers, 1978; Rouard, 2001; Drumont & Grifnee, 2005; Malderen, 2006; Troukens, 2007; Zeegers & Heijerman, 2008; Drumont & Wallin, 2009; Delwaide & Thieren, 2010; Drumont & Leduc, 2010; Drumont & Grootaert, 2011; Drumont et al., 2012a; 2012b), Netherlands (Lameere, 1894; Everts, 1903; 1922; Collart, 1941; Horion, 1974; Teunissen et al., 2005; Teunissen, 2007; Zeegers & Heijerman, 2008; Teunissen & Jansen, 2009; Belgers, 2012).

Moreover, since Luxembourg and Belgium lack recent catalogues of the local fauna, all volumes of the "Annales de la Société entomologique de Belgique" since 1860 and of the "Verein Luxemburger Naturfreunde / Bulletin de la Société des naturalistes luxembourgeois" since 1890 were examined in detail. Special attention was given to the periodical meetings of the members of these societies in order to find any news concerning collections of Cerambycids in Luxembourg.

In addition, many catalogues, monographs and articles about the Cerambycoidea were consulted (see 4.1 Used taxonomy and 9. References) in order to define the most consensual taxonomy, the known distributions in Europe and worldwide, the sub-fossil and fossil findings and all biological aspects.

In particular, the data concerning the biology were especially deduced from Butovitsch (1939), Hepp (1934), Quentin (1951), Demelt (1966), Paulus (1974), Villiers (1978), Contarini & Garagnani (1980), Sturani (1981), Bense (1995), Baur et al. (1997), Kovács et al. (1998), Sama (2002), Gouverneur & Guérard (2007), Laugsand et al. (2008), Han & Liu (2010) and Papi & Ceccolini (2013). Host plants effectively observed in Luxembourg were marked with "!" in the profile of each species. The data regarding parasites and predators were deduced from Picard (1929), Duffy (1953); Bonnemaison (1962); Demelt (1966), Tudor (169), Binazzi (1973), Fitton et al. (1988), Achterberg et al. (1990), Allegro (1991), Gutowski & Hilszczanski, (1997), Alexander (2002), Shaw (2006) and Sundkvist (2010) and updated to the current taxonomy.

2.1.2 Study of collections

All available collections (museums and private) conserving Cerambycids from Luxembourg were studied, their material identified, often sorted and sometimes even prepared and/or dissected for a reliable identification (i.e. *Leiopus* spp.).

In particular, the Palaearctic collection preserved in the National Museum of Natural History of Luxembourg (MNHNL) was reordered and studied through the following steps: sorting of unidentified specimens from various collections (~310 exx.); sorting from alcohol and preparation of old and new materials (~85 exx.), check of old identifications / identification; ordering species according to systematics and geographic provenance. In total, 1023 specimens were studied and 11 species resulted new for Luxembourg.

Moreover, the collection preserved in the Royal Institute of Natural Sciences of Belgium, Brussels (93 exx.), in the private collection J. Thoma, Crauthem (511 exx.), J. Cungs, Dudelange (206 exx., mostly sorted from alcohol and prepared), A. Mousset, Canach (44 exx.), N. Schneider, Luxembourg (28 exx.), M. & A. Galant, Nivelle (31 exx.) and the photographic material of S. Christian, Wasserbillig (13 exx.) and D. Giacomini, Walferdange (1 ex.) were studied. Four species resulted new for Luxembourg.

The specimens (408), which I collected in Luxembourg prior to this study (2008-2010), and some other ones (38), which local collectors donated to me, were included in the research. Finally, the present volume also includes the specimens collected until end 2015.

Since the oldest specimens (coll. Van Volxem, Ferrant, Schaack) are lacking basic data (date and/or locality) and the museums do not conserve documents referable to them, research on the life of the holders was done in the national library and in the register office in order to date this important material. Moreover, all reports concerning the meetings of the Society of Luxembourgish Naturalists and of the Belgian Entomologists were minutely examined.

2.1.3 Field research and rearing

Systematic surveys of all parts of Luxembourg with particular focus on important biotopes and systematic search were performed using different methods from the beginning of May (from March in 2012) to early August.

Flowers (especially, white Apiaceae and Asteraceae) at borders of woods and barks of fallen trunks were attentively examined. Blossom bushes and small trees were beaten with a bat and the fallen beetles collected with a beating sheet (Fig. 1). The use of a sweep net was very limited since local graminaceous fields are nearly deprived of cerambycids. The research of nocturnal species was much more reduced in time and limited to single nights of July-August with relatively warm temperatures. In these cases, the research was performed slowly crossing wooden paths by car, looking for insects with the help of the headlights. Two specimens of *Prionus coriarius*, besides several ones of *Carabus*, were individuated. Pitfall, Moericke and sweet traps were not used due to their scarce efficacy in humid forests of northern Europe (Gaspar & Verstraeten, 1972; Matter, 1998) and in order to limit the impact on the local fauna.

Due to the late start of the project, a rearing was only gathered in 2012. For this purpose, 20 plastic boxes measuring ~38 x 34 x 20 cm were bought and later modified (Fig. 2). A window was cut on a side of each box and later covered by gauze fixed with gaffer tapes. Special boxes were prepared for beetles living in stems, e.g. *Agapanthia* spp. (Fig. 3). The boxes were located with the side with the gauze in font of a window, in order to attract the reared beetles here. The collected branches were deposited inside and periodically nebulised with water, in order to maintain the original humidity. Despite the fact that some interesting cerambycids were reared (among which Leiopus femoratus, absent from the MNHNL), the system was overall rather disappointing since the selected branches produced numerous predators and parasitoids.

All collected specimens were killed in jars containing paper strips imbibed with ethyl acetate and subsequently prepared.

After agreement with the staff of the Museum, two specimens of each species for each locality and date were deposited in the MNHNL, while further duplicates were preserved in my collection to state the specific consistence. When found, larvae and

Fig. 1: Collecting cerambycids with beating sheet near Kayl (Esch-sur-Alzette).

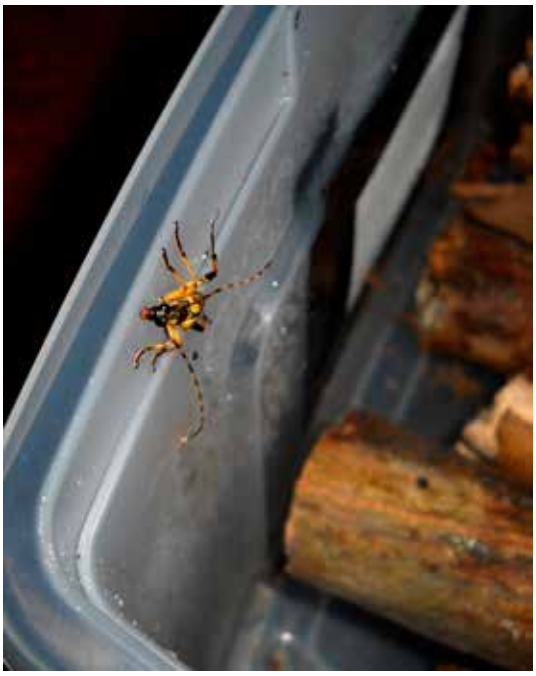


Fig. 2: *Leptura* emerging from oak rearing.

Fig. 3: Rearing for *Agapanthia* species.

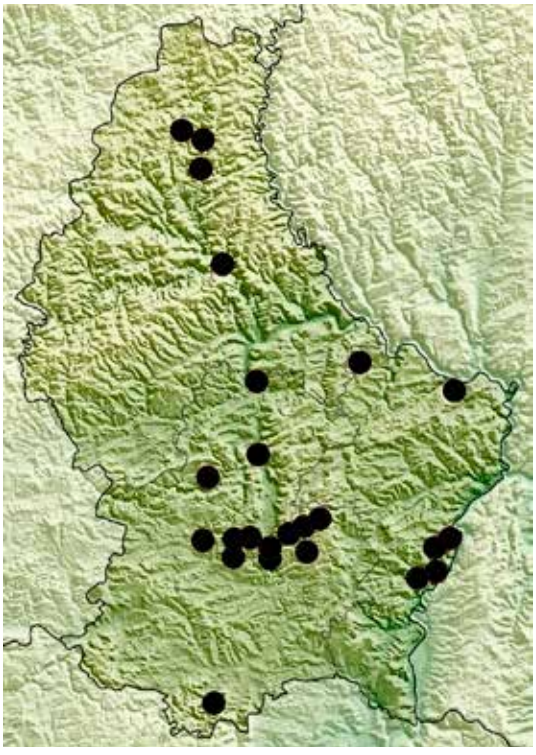


Fig. 4: Localities investigated by V. Ferrant.

pupae were also collected, conserved in alcohol, identified and deposited in the MNHNL or in my collection according to the previous rules.

During the first year (2011), the research was focused on the localities once examined by V. Ferrant (Fig. 4). 50 sites among the following localities were investigated: Ahn, Ansemburg, Beaufort, Bertrange, Clervaux, Dreiborn, Dudelange, Echternach, Eicherfeld, Eselborn, Goebelsmühle, Grünewald, Kayl, Kopstal, Mamer, Mersch, Mertert, Munshausen, Niederanven, Roodt, Sandweiler, Schieren, Strassen and Thillsmillen. The original project was to investigate each localities three times, but the favourable weather allowed visiting at most 14 localities twice, the last visited localities being by then nearly deprived of insects. Nonetheless, 415 specimens belonging to 37 different species were deposited in the MNHNL.

During the second year (2012), the research was focused to investigate some particular habitats (woods of juniper, larch, oak, riparian trees) looking for species known for neighbouring areas but still unknown for Luxembourg. Accordingly, 20 new localities (Baafelt, Beddelboesch, Bichewald, Biergerbësch, Bierschels, Briedemesser Bësch, Boschledchen, Bousserbësch, Geyerschaff,

Groussebësch, Hafferbësch, Huuscht, Jongebësch, Kleibierg, Knäppchen, Lasauvage, Riicht, Rommebësch and Siweschleff) were selected and visited in March and April for collecting branches for rearing.

Afterwards, these localities were visited twice from May to August. Additionally, five localities already investigated in the first year (Ansembourg, Fausermühle, Goebelsmühle, Münschecker, Thillsmillen) were investigated again, due to the importance of the previous findings. Conclusively, 320 specimens belonging to 37 different species were deposited in the MNHNL.

During the third year (2013), the research concerned 15 localities that were investigated only one time during the first year. Accordingly, 117 specimens belonging to 22 different species were deposited in the MNHNL.

Afterwards, some dead or interesting specimens were occasionally collected.

The collection of MNHNL was reordered and a list of the collected species was introduced in the database "Recorder" of the MNHNL at the end of every summer.

Moreover, articles concerning the faunistic news (Vitali, 2011; 2012b; 2013b) were published in the magazine "Lambillionea", Union des Entomologistes belges, Royal Museum for Central Africa, Tervuren and "L'Entomologiste", National Museum of Natural History, Paris (Vitali, 2014; 2016).

A report concerning the activity carried out, the list of collected species and a copy of all published articles were sent to the Department of Environment of Luxembourg at the beginning of every year.

At the end of the project, 852 specimens belonging to 49 different species were deposited in the MNHNL. In addition, the number of the boxes containing Cerambycids passed from 9 of partially identified and mixed materials to 19 completely identified and ranged materials.

2.2 Spatiotemporal changes

2.2.1 Faunistic changes

Intensive study of collected material and old publications, systematic surveys of all parts of Luxembourg with particular focus on old collecting localities, elaboration of past and recent cerambycid species inventories (see above) and their comparisons were performed.

The data concerning the Cerambycids of Luxembourg were compared with those of the neighbouring regions, through the previously mentioned literature and the online distribution maps of the saproxylic beetles from Belgium (Drumont & Grootaert, 2011).

Moreover, these data were compared with those concerning other groups of Luxembourgish insects (Coleoptera Carabidae, Hydroadephaga, Hydrophilidae, Meloidae, Curculionoidea; Odonata; Orthoptera; Lepidoptera Rhopalocera) on the basis of the published literature (Hoffmann, 1960; Meyer & Pelles, 1981; 1989; Braunert, 1996; 2009; Braunert & Gerend, 1997; Gerend, 2003; 2006; Proess, 2004; 2006; Trockur et al., 2010; Vitali, 2012a).

Except for aquatic beetles (Gerend, 2003; 2006) and Meloidae (Vitali, 2012a), the interpretation of the observed faunistic changes misses or completely lacks; therefore, some European faunas (Jeannel, 1941; 1942; Hoffmann, 1950; 1954; Higgins & Riley, 1970) have been consulted in order to identify the ecological characteristics of each concerned species.

2.2.2 Vegetation changes

Since local Cerambycids are mostly xylophagous species, the arboreal changes occurred in Luxembourg since 18th century were analysed through the following literature: local botanic manuals (Koltz, 1875; Signoret & Signoret, 2005; Schmit, 2008; Welter et al., 2008; Niemeyer et al., 2010), the "Verein Luxemburger Naturfreunde / Bulletin de la Société des naturalistes luxembourgeois" since 1890, reports of the Ministerial Conference on the Protection of Forests in Europe (MCPFE, 2007) and of the Administration des eaux et forêts du Grand-Duché de Luxembourg (2002; 2006).

2.2.3 Climatic changes

A comparison with climatic data was performed through different steps.

Compilation of all available data on longhorn beetles in Luxembourg from 1864 to 2014 only

including data sets with exact sampling dates. One data set was considered as one species collected at a specific date and locality independently from the number of individuals collected or observed. For obtaining these data, the sources mentioned in 2.1.1.1. and 2.2.1.3. were used, obtaining a total of 1984 data sets on 92 species. No exact sampling data were available for four of the 96 species recorded in Luxembourg.

Collection and insertion in an Excel-database of all monthly data until 2002 concerning temperature, rainfall (since 1854) and sunshine (since 1931) available in the literature (Ries, 2005).

Analysis of all monthly files (i.e. 116) concerning the climatic data collected by the Airport Luxembourg Findel from 2003 to 2013, available in the governmental Web-site MeteoLux or personally furnished by the Luxembourgish Administration of Air Navigation. Extraction of data concerning temperature, rainfall and sunshine, and their incorporation in the previously mentioned database.

Average annual temperature, rainfall (1854-2013) and sunshine (1931-2013), besides their standard deviations, were calculated and graphically represented for each year of the available periods of time. Average monthly temperature, rainfall and sunshine, besides their standard deviations, were calculated and graphically represented for each available period of time. 5-year moving average and linear trend lines were added in order to evidence their general tendency.

Indices of rainfall according to Lang (1915, i.e. average annual rainfall / average annual temperature), aridity according to De Martonne (1926, i.e. average annual rainfall / average annual temperature + 10), continentality according to Gams (1931, i.e. cotangent of: average annual rainfall / altitude) and to Rivas-Martinez (1987, i.e. average temperature of the hottest month / average temperature of the coldest month) were calculated in average and for every year (1854-2013). Their variations were graphically represented.

Average monthly temperature and rainfall (1854-2013) were used for the construction of a climograph Bagnouls & Gaussen (1953) improved by Walter & Lieth (1960). The linear trend lines of the mentioned data were used as base for the construction of two further diagrams representing the climatic tendency.

3 Introduction to the Cerambycidae of Luxembourg

3.1 Entomology in Luxembourg

3.1.1 Origins

The Entomology in Luxembourg dates back to 1850 with the idea of the foundation of a "cabinet of natural history" following the coming back to the country of three Luxembourgish explorers (Nicolas Funck, Jean-Jules Linden and Louis-Joseph Schlim) from their voyages to Central and South America. In the same year, the Society of Natural Sciences was founded under the patronage of the Prince Henry of the Netherlands for the promotion of the natural sciences (Philippo, 2004).

The collection of Coleoptera of the MNHNL does not conserve beetles dating from that epoch.

3.1.2 Collection Van Volxem

Though some tropical cerambycids were sold to the MNHNL in 1915 or donated by V. Ferrant in 1923, the authors overlooked the existence of this collection, mostly preserved in the Royal Institute of Natural Sciences of Belgium, Brussels (IRSNB). Nowadays, only two Luxembourgish cerambycids with simple labels have been found, but the meticulous analysis of the Belgian literature (Selys-Longchamps, 1867; Anonym, 1867; 1869; 1872) has allowed identifying further findings and the collection period.

Accordingly, the Belgian entomologist Camille Van Volxem (Fig. 5) investigated some localities of the Gutland (Rodenhof, Mertert) from 1864 to 1872, collecting the oldest specimens of Luxembourg.

3.1.3 Collection Ferrant

The oldest materials conserved in the MNHNL are the specimens collected by its first conservator, Victor Ferrant (Fig. 6). 278 cerambycid specimens belonging to 64 species coming from 25 different localities constitute the part of the collection examined in this project.

Fig. 5: Camille Van Volxem (1848-1875).

Fig. 6: Victor Ferrant (1856-1942).

Unfortunately, the totality of this material is incompletely labelled, the largest majority of them lacking the collection year and having only generic collection localities.

Since this collection also includes a certain number of species no longer found in the country (cf. 5.2.2 Extinct species), the dating of this material and the correct identification of the collection localities were crucial tasks.

Since the MNHNL does not conserve documents concerning this collection, the notices on the life and the properties of this entomologist (Erpelding, 1981; Massard, 1990; Guinet, 2002) were the only possibility to shine a light on this topic.

Accordingly, Ferrant's father bought a watermill near Mamer (consequently called Ferrantsmillen or Ferrants Millen) in 1859, where he moved with his family. Here, Victor spent his infancy; later, he attended commercial and industrial studies until 1874, when he went to Paris in order to learn the business. During this time, he met some Luxembourgish naturalists, but his career was compromised by a serious accident. He came back to Luxembourg and devoted his life to the natural sciences. Ferrant's father moved to Luxembourg City and leased the mill in 1880's. Victor got married in 1884 and he was engaged by the Agricultural Service in 1890; then, he moved to Luxembourg City, where he became conservator of the MNHNL in 1892. The mill, mentioned as belonging to Ferrant until 1893 (Kraus, 1893c), was finally sold to Johann Thill (from whom the current name Thillsmillen) at the end of the 19th century. We have no news concerning the period of WWI, but Ferrant was invalid and probably too old (58 years) to participate. According to the labels of the tropical collection, he donated his collection to the MNHNL in 1923. Finally, he retired in 1924.

We have no further biographical data concerning Ferrant's entomological activity, but the screening of the whole collection data reveals that some specimens (25) were differently labelled. These labels have no mention of month and day but only the collection year: 1879, 1883, 1891, 1897, 1901, 1902, 1903, 1904, 1906, 1908, 1911, 1912 and 1921.

Ferrant's collection covers 43 years of research but in a discontinuous manner. Observing his activity (Fig. 7), it is possible to notice that he did not write labels with collection data during the most important moments of his life (marriage, new

jobs, transfer, war) and some of the closest years. This does not mean that he did not collect beetles, but the time dedicated to the collection was most likely much more limited. Very improbably, he collected during WWI; moreover, there are no data concerning this epoch. He kept collecting insects also afterwards (two beetles are labelled 1921), but only occasionally. For reasons of simplicity, we accept 1879 as starting date and 1914 (beginning of WWI) as ending date of his activity.

A challenge for the curators of the MNHNL would be the finding of a manuscript, diary or catalogue with all data missing in the labels. Most likely, this document has never existed.

We can notice that all 25 beetles having labels with collection years belong to the family Carabidae. Most of them (14) belong to the genus *Amara*; while the remaining ones belong to the genus *Harpalus* (5), *Ophonus* (once subgenus of *Harpalus*, 3) and *Pterostichus* (3).

The hypothesis is that the boxes of Ferrant's collection were ranged according to collection years and only the first specimens of the box had labels with the year, while the remaining ones had labels with month and day.

The pre-printed Ferrant's labels have only one free line for writing data; thus, it is impossible to write a complete date after having written the locality. Moreover, this system to split labels on different specimens has been observed in the exotic collection of Cerambycids (of which Ferrant was curator), where the first specimen has the label with collection data and the second one the identification.

Inside each box, the beetles were ranged in systematic order; accordingly, Carabidae were at the beginning of each box, being the first family in every systematics. Moreover, the species could have been ranged in alphabetical order inside each family; that may explain why Amara is the genus having the largest number of labels with the year.

This system did not present practical difficulties, since Carabidae are often collected from the beginning of the year (cf. Fig. 111) However, the original order got lost when the collection was deposited in the MNHNL.

The only cerambycids surely datable on the basis of the bibliography are two Pyrrhidium sanguineum collected in the Grünewald in 1895 (Kraus, 1895). The other species can be dated only in a speculative manner.

"Mamer" is the richest collection locality, with 90 specimens (i.e. 32.4%). It is commonly recognized as Ferrantsmillen (Vitali, 2011b; 2012a; Vitali et al., 2012) but it could also be identified with some other places of the community of Mamer, due to the presence of beetles related to different habitats. The first label reporting Mamer dates back to 1879, the last one dates 1904. Though Ferrant moved to Luxembourg City before 1890, he evidently maintained some contacts with the mill, but most specimens should have been collected before 1890. For reason

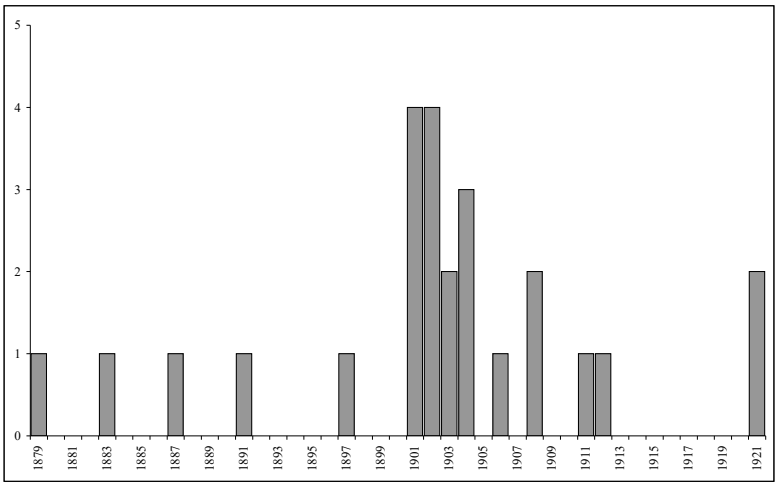


Fig. 7: Number of beetles of Ferrant's collection having a label mentioning a certain date.

of simplicity, all specimens collected at Mamer, are dated 1890 in the summary table (Fig. 11).

"Luxembourg" is the second locality for number of specimens (70, i.e. 25.2%). It should be identified with the surroundings of the capital and dated after 1890. For reason of simplicity, all specimens of the collection Ferrant, except those collected at Mamer, are dated 1900 in the summary table (Fig. 11).

3.1.4 The interwar period

With the beginning of WWI, the activity of the Luxembourgish entomologists reduced notably. Reading the Bulletin of the Society of the Luxembourgish Naturalists, it seems that the interest of the members focused on entertainment activities or lectures of theoretical Sciences such as Physics, without engaging personally. Consequently, simple notes of entomological subject, especially concerning beetles, became extremely rare. The Museum does not conserve cerambycids patently referable to that time, though a very recent paper (Weitzel, 2014) suggests that Entomology did not completely stop.

This paper refers 17 cerambycid species recorded by the commissioner for the Nature Protection of the district Trier-Saarburg Joseph Barthel between 1922 and 1934. Unfortunately, the destiny of this material, simply mentioned in a card file, is currently unknown.

However, the only existing material referable to that period might be represented by the collections by Lucien Marie Hyacinthe Schaack (1899-1971). This entomologist was born in Luxembourg from a family of Flemish origin. As student in Theology, he became member of the Society of the Luxembourgish Naturalists in October 1917 (Heuertz, 1917) and he was parish priest of the church St. Michel, Luxembourg City, in 1950. He collected insects of different groups since numerous butterflies were mentioned by Wagner-Rollinger (1950). Eight cerambycids (and, possibly, further materials) were given to Alfred Mousset and then deposited in the MNHNL in 2007 (Gerend, 2007).

The labels of this material, mainly beautiful large species, only mention the collector. However, the insects might have been collected around the capital and possibly, in the interwar period. Nonetheless, due to their uncertain location, these specimens were considered in the total number of collected species but in no other graphic.

Fig. 8: Alfred Mousset (1920-2005).

3.1.5 Collection Mousset

The collection of Alfred Mousset (Fig. 8) constitutes the second big historical collection of the MNHNL. The exact amount is hardly countable, since it includes specimens of the collection Schaack and some other received in exchange by the Luxemburgish entomologist Jos Thoma (not mentioned in the labels). Moreover, some specimens are still hold by his son, while some duplicates were done in exchange to J. Thoma. However, only counting the contribution of this entomologist in the different collections until today, he found 265 specimens belonging to 53 species of cerambycids coming from 70 localities of Luxembourg.

Mousset did 52 years of research from 1951 to 2003 in a more or less continuous manner (Fig. 9). The data collected before 1969 were published in the first partial catalogue of the Luxembourgish beetles (Mousset, 1969) and afterwards mapped (Mousset, 1973a). Some of the further data were also published (Mousset, 1973b; 1977; 1981a; 1981b). For a biography of this entomologist see Gerend (2007).

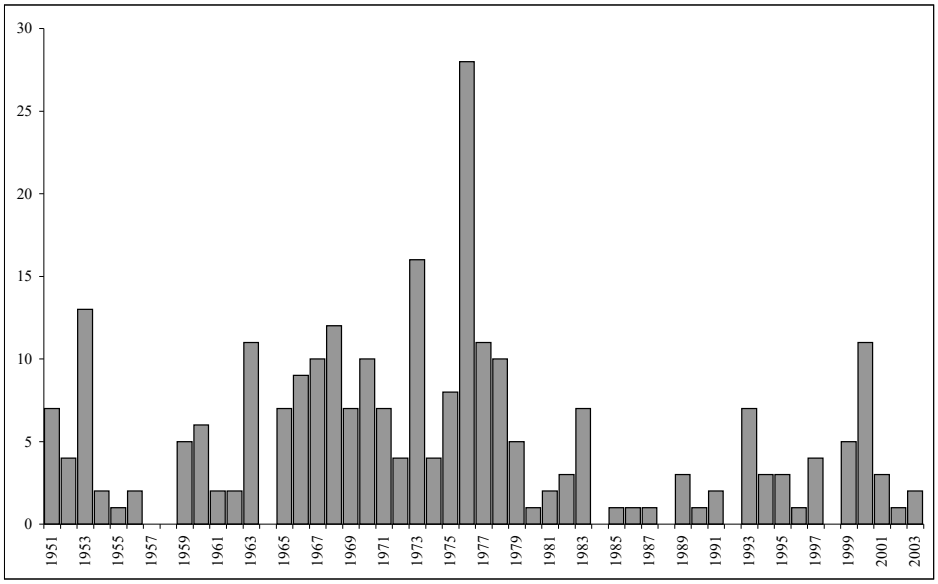


Fig. 9: Number of Cerambycids collected by Alfred Mousset during his activity.

3.1.6 Further collections

Beside the previously mentioned collections, a crucial contribution comes from the Luxembourgish entomologist Jos Thoma (Fig. 10). His private collection strongly contributed to the first partial catalogue of the Luxembourgish Coleoptera (Mousset, 1969), though it was not mentioned in the text. Afterwards, the author was overlooked by local entomologists despite the fact that he published some papers concerning the Cerambycids (Schneider & Thoma, 2004; Thoma, 2009).

Fig. 10: Jos Thoma.

This study has allowed recognizing 504 specimens (518, counting the specimens present in other collections) of local Cerambycids belonging to 60 different species, some new for Luxembourg (Vitali, 2012b), collected since 1963 in 46 different localities. Moreover, it has allowed tracing the real origin of some Mousset's specimens and of many data published in that catalogue.

Further contributions are constituted by the specimens recently deposited in the MNHNL, among which Carlo Braunert (206 exx.) and Camille Hahn (57 exx.), those collected by the staff of the MNHNL during different scientific projects (Meyer, 1977; Gerend et al., 2007) and by the private collections Josy Cungs (206 exx.) and Nico Schneider (27 exx.).

Beside the collection Van Volxem (3.1.2), the IRSNB preserves 90 specimens mainly collected in the 1950's by local entomologists

(J. Leclercq, J. M. Warlet, R. Brabant, D. Bischler), while further 31 specimens belong to the private collection M. & A. Galant.

3.1.7 Personal contribution

My contribution is constituted by the cerambycids collected before this project (coll. Vitali), those collected during this project (coll. MNHNL and coll. Vitali) and the identification or check of the species conserved in the available collections (both museum and private).

Since May 2008, I have collected over 2500 specimens belonging to 58 species of cerambycids coming from 80 different localities of Luxembourg.

10 species were recorded as new for Luxembourg (*Phymatodes rufipes*, *Stenopterus rufus*, *Gaurotes virginea*, *Cortodera humeralis*, *Anoplodera rufipes*, *Paracorymbia maculicornis*, *Anastrangalia dubia*, *Grammoptera ustulata*, *Oberea linearis* and *Exocentrus adspersus*).

In the study of the collections, 2027 specimens were overall examined.

As result, 16 species were new for the country (*Ropalopus femoratus*, *Callidium aeneum*, *Plagionotus detritus*, *Chlorophorus glabromaculatus*, *Stenopterus rufus*, *Cortodera humeralis*, *Paracorymbia maculicornis*, *Grammoptera ustulata*, *Grammoptera abdominalis*, *Arhopalus ferus*, *Agapanthia intermedia*, *Phytœcia nigricornis*, *Phytœcia icterica*, *Pogonocherus ovatus*, *Exocentrus adspersus* and *Exocentrus punctipennis*).

Considering that 5 species were contemporaneously collected by me and found in the collections, 21 species were overall recorded as new for Luxembourg.

Moreover, 4 species were recognised as erroneously recorded from Luxembourg (*Palaeocallidium coriaceum*, *Stenocorus quercus*, *Agapanthia violacea* and *Stenostola ferrea*) and one as questionable (*Ropalopus clavipes*).

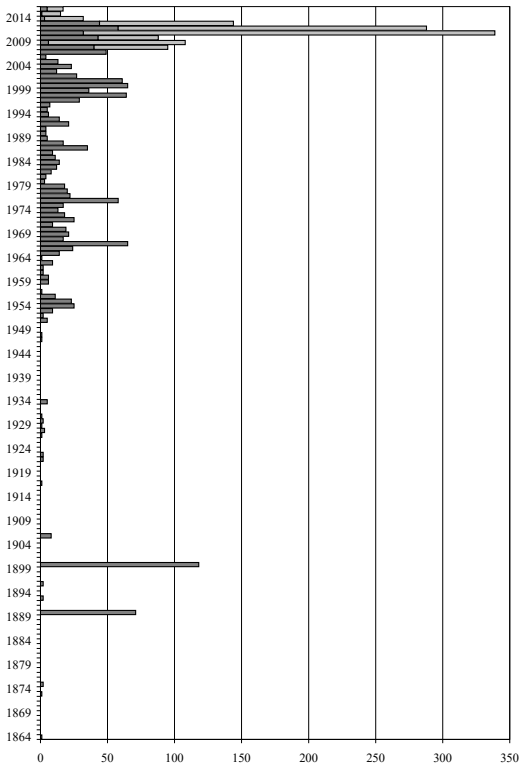


Fig. 11: Data collected every year (author's contribution light grey).

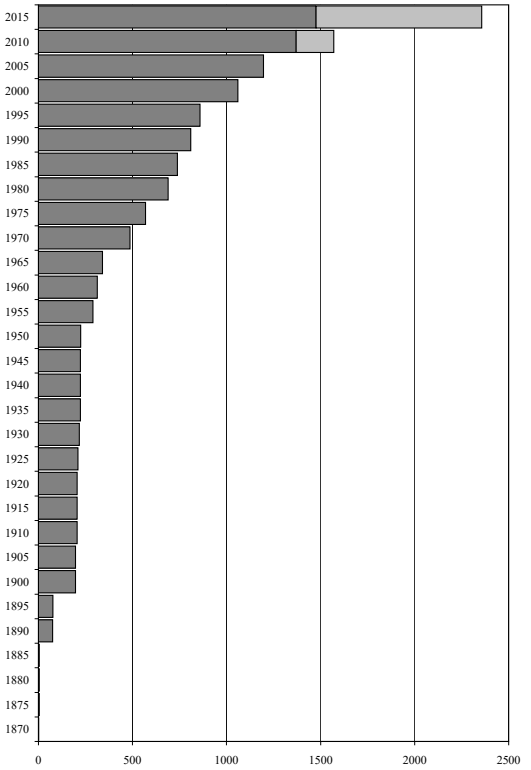


Fig. 12: Development of the collection data of Luxembourgish Cerambycids until 2015 (author's contribution light grey).

3.2 Development of the collection data

A "datum" is usually defined as any record characterised by species, locality and date. Each record differing in only one of these elements (i.e. different days) is considered as a different datum. The number of collected specimens for each datum is irrelevant.

Based on this definition and on the dating of the historic collections (3.1.1-3.1.3), the number of data (both published and real specimens) for every year concerning the Luxembourgish Cerambycids are summarised in Fig. 11.

The total amount of data is provided in Fig. 12, where they were merged in groups every five years for reason of simplicity.

Accordingly, the number of data reached ~200 unities mostly due to the collection Ferrant before WWI and they remained practically unvaried until 1950s, when they received the contribution of A. Mousset and of Belgian collectors. Starting from the 1970s, the increase was almost regular until ~2010 thanks to the activity of the MNHNL and of different collectors. Subsequently, it augmented abruptly, reaching 2375 data in 2016.

In this context, I collected 894 different data (666 during the doctoral project) from 2008 to 2016, i.e. 37.6% of all data concerning the Luxembourgish Cerambycids.

Considering the exact dates of adult emergence, the data show the distribution of Fig. 13. Only the period April-September was displayed in order to exclude collections of hibernating species (e.g. *Rhagium* spp.) or the earlier emergence of specimens sorting at home from firewood (e.g. *Phymatodes testaceus, Pyrrhidium sanguineum*). The diagram excludes 186 data without exact day of collection.

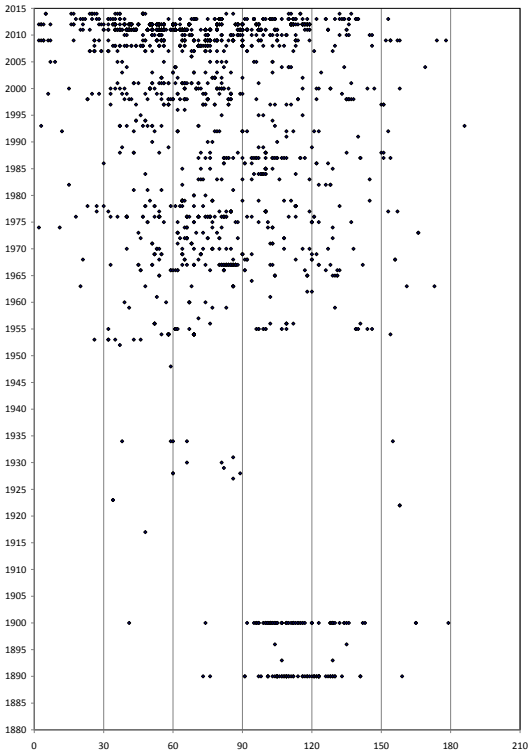


Fig. 13: Distribution of data concerning the Luxembourgish Cerambycids. The abscissa represents the months April-September (1-30: April; 31-61: May; 62-92: June; 93-123: July; 124-156: August; 157-186: September).

3.3 Used taxonomy

The following inventory counts the species effectively recorded from Luxembourg. Erroneously identified species (Vitali, 2011b) have been removed from the list, while doubtful species (missing real specimens, but possibly present in the studied area) or introduced ones have been included.

The systematic order used in this text differs somewhat from the one followed by most catalogues, often related to even older systematic traditions. Though, every systematic catalogue involves the unsolvable problem to express multidimensional phylogenetic relations in linear form. Thus, the published catalogues do not fully correspond to the evolution of the Cerambycoidea, which should be the natural basis of their order.

According to the wing morphology (Saalas, 1936), Prioninae and Lepturinae are seen as the most primitive subfamilies inside the European Cerambycidae. Nevertheless, larval morphology (Craighead, 1923) evidenced that they belong to two different phyletic lines, characterised by the presence or the absence of the tentorium (cephalic structure dividing the insertion of some cephalic muscles from other gular structures). This primitive character, present in all other families of Cerambycoidea (Vesperidae, Oxypeltidae, Disteniidae), is also shared by Cerambycinae (Švácha et al., 1997), which consequently, are immediately located after Prioninae in this catalogue. The usual

position of Cerambycinae after Spondylidinae is the memory of an old erroneous taxonomic setting that considered Spondylidinae (once Asemini) as a tribe of this subfamily.

Concerning Lepturinae, some authors identified the tribes Oxymirini and Rhamnusiini only on the basis of some larval characters (urogomphi), but they did not manage to evidence adult characters (Danilevsky, 1997; Sama & Sudre, 2009). Even if these divisions recognize natural groups inside Rhagiini, the separation of tribes without peculiar adult characters is sufficiently justified to be accepted; moreover, the paraphily with other genera has not been proved. Accordingly, the tribes are here considered in the traditional way (Picard, 1929; Villiers, 1978). Concerning the order of the genera inside Lepturini, the species having mutic basal angles of the pronotum and those, more specialised, having spined angles are regrouped separately. Grammoptera, which is a relatively primitive genus, is located at the beginning of the second group.

Concerning Lamiinae, already Müller (1906) criticized the usual systematic order starting with the wingless *Dorcadion* and ending up with *Oberea* or *Tetrops a*s not reflecting phylogeny. Unfortunately, this observation did not produce changes in further catalogues. Actually, Breuning (1950) evidenced four principal characters (mesotibial furrow, mesocoxal cavities closed, opposite claws, antennal ridge), more or less present in the different tribes, which are sufficient to organise a more respectful order of the natural systematics. Accordingly, *Dorcadion* is one of the most specialised Lamiinae. In this catalogue, the taxa lacking peculiar characters (Agapanthiini, Saperdini) are located at the beginning, while the most specialised ones (Acanthocinini, Lamiini) are located at the end.

In a non-peer-reviewed paper, Sama (2008) proposed strong taxonomic changes inside Lamiinae, reintroducing some tribes (Monochamini, Phytœcini, Obereini) synonymised for a long time by Breuning's worldwide revisions and introducing unnatural regroupings (Lamiini with Dorcadiini and Pachystolini, Pogonocherini with some Acanthocinini). These claims are only based on a very poor number of European genera and species (much less than 1% of the worldwide taxa); moreover, the differential characters defining tribes are not enunciated either, I prefer not considering this paper.

4 Catalogue of the Cerambycoidea of Luxembourg

Tables abbreviations: Cl-Clervaux, Wi-Wiltz, Di-Diekirch, Vi-Vianden, Rd-Redange, Me-Mersch, Ca-Capellen, Lu-Luxembourg, Es-Esch/Alzette, Ec-Echternach, Gr-Grevenmacher, Rm-Remich

4.1 Subfamily Prioninae Latreille, 1802

4.1.1 Tribe Prionini Latreille, 1802

4.1.1.1 *Prionus coriarius* (Linnaeus, 1758)

Prionus coriarius Kraus, 1893b: 51; Ferrant, 1907a: 295; Ferrant, 1911: 60; Mousset, 1969: 166; Mousset, 1973: Map. 418; Gerend et al., 2007: 290; Köhler, 2009: 62, 109; Vitali, 2013: 146; Vitali, 2014: 87; Weitzel, 2014: 215.

Body size 18-50 mm. Large, wide, chestnut to pitch brown; prothorax with three teeth at each side; antennae strongly dentate and 12-articulated in males, feebly dentate and 11-articulated in females. It is the largest cerambycid currently living in Luxembourg.

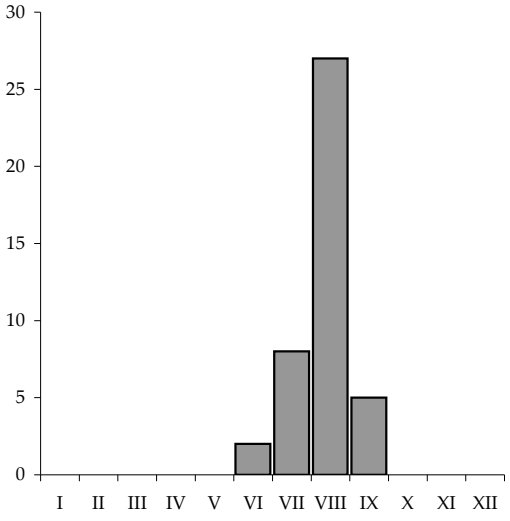


Fig. 14: Phenology of *Prionus coriarius* in Luxembourg.

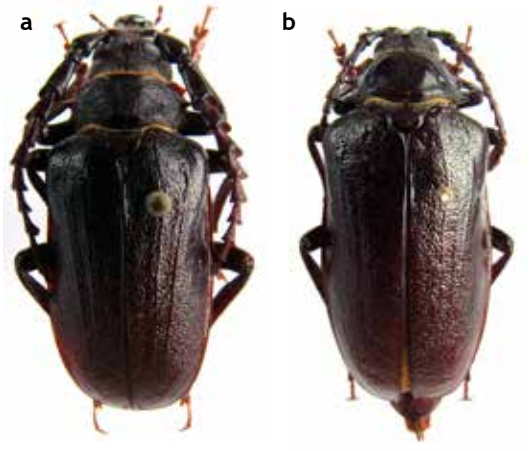


Fig. 15: *Prionus coriarius*, a. Male b. Female, Bambësch (author's coll.)

Life-cycle lasts three years. Female lays up to 180 eggs in bore old rotten wood and roots of both conifer and broadleaf trees, especially oaks, beech and birches. Larvae penetrate into the wood and then pupate in the soil inside a cocoon prepared with hearth and woody debris in early summer. Adults are crepuscular and especially nocturnal from mid to late summer (Fig. 14). It can be collected at light, rarely with pitfall, often single elytra are found on forest paths, being actively preyed by the tawny owl (Mariani, 1993).

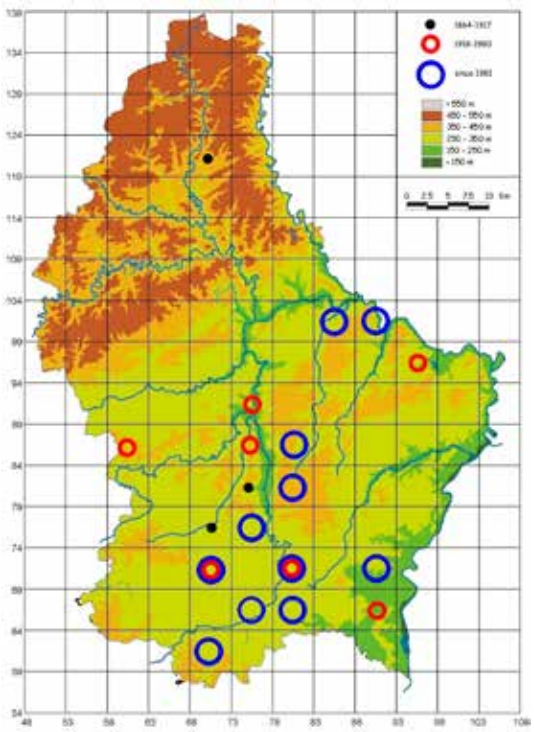
Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Betula*, *Corylus*, *Ulmus*, *Aesculus*, *Salix*, *Fraxinus*, *Abies*, *Picea*, *Pinus*.

Parasitoids: *Deuteroxorides elevator* (Panzer, 1799) (Ichneumonidae).

Predators: *Strix aluco* Linnaeus, 1758.

Western Palaearctic species, widespread from North Africa to northern Iran, reaching northwards the Great Britain and southern Scandinavia; especially related to old woods of broadleaf trees.

In the regions neighbouring Luxembourg, it is especially widespread in lowlands or hills. In Rhineland-Palatinate and the Saarland, it is widespread and known for a long time (Brahm, 1790) but always infrequently collected (Niehuis, 2001). Absent from the High Vosges (Matter, 1998), it is sporadic in northern Lorraine (Colson, 1980a), where it was once considered rare (Godron, 1866) or even very rare (Fournel & Gehin, 1846).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1						2						3
1918-1980						2	1	2	1	1		1	8
since 1981								3	4	2	3	1	13
total	1					2	3	5	4	3	3	2	24

Fig. 16: Distribution of *Prionus coriarius* and colonised localities in Luxembourg.

It is very rare in the French Ardennes (Ligeron, 2005), widespread in Belgium but absent from the Flanders (Lameere, 1894; Lempereur et al., 2000), present but rare in the Netherlands along the borders (Evers, 1903; Zeegers & Heijerman, 2008).

The species has been known for a relatively long time in Luxembourg (Kraus, 1893b) and the first specimen was collected by C. van Volxem near Rodenhof (now Roudenhaff, Kopstal) between 1864 and 1872. The majority of the specimens collected by V. Ferrant before 1890 also originate from the same forest (Thillsmillen, Mamer). This longicorn seems to have today a spotted distribution in the warmest localities of Luxembourg (Gutland and Moselle). The distributional data (Fig. 16) suggest a south-eastern regression, as also observed for other species. Actually, flying adults

can be found during warm summer evenings, an environmental condition increasingly rare in Luxembourg.

4.2 Subfamily Cerambycinae Latreille, 1802

4.2.1 Tribe Cerambycini Latreille, 1802

4.2.1.1 *Cerambyx cerdo* Linnaeus, 1758

Hammitticherus heros Kraus, 1893a: 34. *Cerambyx heros* Faber, 1901b: 495; Schuster, 1907b: 100. *Cerambyx cerdo* Ferrant, 1907a: 300-301, Fig. 27; Ferrant, 1911: 64-66, Fig. 29; Mousset, 1969: 169; Mousset, 1973: Map. 390; Drumont et al., 2012: 65; Vitali, 2013: 146. *Cerambyx (s. str.) cerdo* Vitali, 2012b: 236-237.

Body size 24-60 mm. Large, black with reddish elytral apex.

Smallest specimens might be confused with *Cerambyx scopolii* (4.2.1.2), which nevertheless shows uniformly dull black elytra.

Life-cycle lasts three years. Females lay 60-100 eggs in fissures of the bark of trunks of ill trees of oaks, exceptionally in other thermophile broadleaf trees. Larvae emerge after 12-14 days, feeding under the bark and then penetrating into the wood. They pupate in the wood in late summer, after having closed the pupal cell with a calcareous operculum. Adults hibernate in the cell and emerge in the warmest days of May. They can be observed from afternoon to evening, climbing on the host plants, where they can survive up to 45 days feeding on fruits or sap. Though some authors claimed a nocturnal activity, I never observed this species during the night, behaviour typical for the closely related *Cerambyx welensii* Küster, 1846. The adults are easily attracted by sweet traps in southern Europe, but this technique does not seem to work in Central Europe (Matter, 1998).

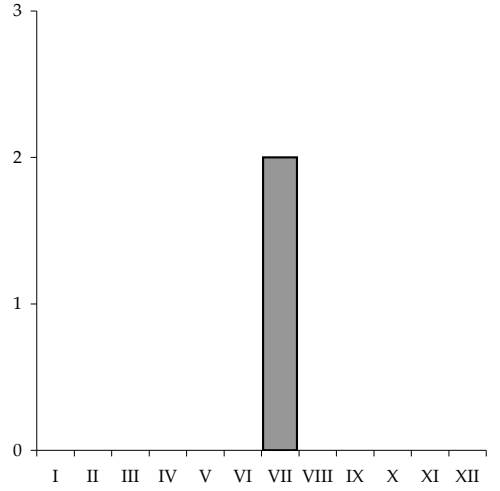


Fig. 17: Phenology of *Cerambyx cerdo* in Luxembourg.

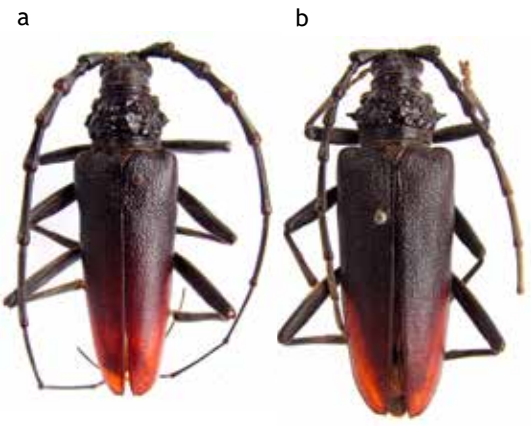
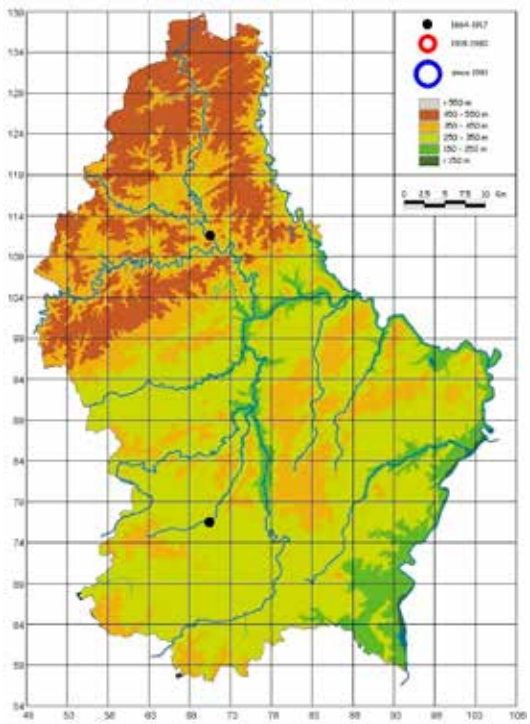


Fig. 18: *Cerambyx cerdo*, a. Male, Clervaux, b. Female, Goebelsmühle (coll. Mnhn).

Host plants: *Castanea*, *Quercus*, *Ulmus*, *Juglans*, *Salix*, *Fraxinus*.

Parasitoids: *Dolichomitus tuberculatus* (Geoffroy, 1785), *Ephialtes manifestator* (Linnaeus, 1758), *Megarhyssa superba* (Schrank, 1781), *Rhyssa amoena* Gravenhorst, 1829, *R. persuasoria* (Linnaeus, 1758) (Ichneumonidae); *Oobius rudnevi* (Nowicki, 1928) (Encyrtidae).

Western Palaearctic thermophile species, widespread from North Africa and Portugal to Iran. Fairly common and even sometimes considered as a pest in the Mediterranean area (Bonnemaison, 1962), it rarefies northwards. Extinct in the Great Britain between 3600-4000 BP (Twinn & Harding, 1999) and in most of northern Europe since the beginning of the 20th century, it has been inserted in the annexes II and IV of the Habitats Directive



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1		1								?		2
1918-1980													0
since 1981													0
Total	1		1										2

Fig. 19: Distribution of *Cerambyx cerdo* and colonised localities in Luxembourg.

92/43/EEC. Four subspecies have been recognised: the nominal form (Europe), *mirbecki* Lucas, 1842 (North Africa, southern Iberia and Baleares), *acuminatus* Motschulsky, 1852 (Caucasus and Crimea) and *iranicus* Heyrovský, 1951 (Iran), the latter one, however, having uncertain taxonomic validity. According to Gouverneur & Guérard (2011), the species cannot survive in localities having less than 1600 hours sunshine/yrs; nonetheless, the climatic exigencies seem to be even stricter.

In the areas neighbouring Luxembourg, the species exists at least for 9000 years as some sub-fossil specimens were found in oaks extracted from the gravel of the Rhine near Strasbourg (Schott, 1984). The species was still common in Rhineland-Palatinate, Alsace and northern Lorraine during the 19th century (Fournel & Gehin, 1846; Godron, 1866; Matter, 1998; Niehuis, 2001) but it has become increasingly rare already before WWI (Matter, 1998). It was intercepted several times in the Netherlands (Everts, 1903; Zeegers & Heijerman, 2008) and, according to Lameere (1894), only introduced specimens were collected in Brussels and Liège. This opinion is shared by Drumont et al. (2012), who also supposed a recent introduction in the extreme South of the country; nonetheless, the provided proofs (a picture of a larva and some rests found in a rodent burrow) do not seem convincing, also considering the climatic oceanisation of the region that is driving this species south-eastwards. Since no living specimens have been found after intensive research, the found remains might belong to a more or less recent sub-fossil. The species is very rare or extinct in the French Ardennes (Ligeron, 2005), the last specimen having been collected in 1959.

The first record of this species in Luxembourg is a piece of bored oak wood collected by E. Faber near Eisenborn (Junglinster, canton of Grevenmacher) and shown during the meeting 12th of April 1893 (Kraus, 1893a). It is unknown whether this sample belonged to this species, to *Cerambyx scopolii* or even to *Prionus coriarius*. However, at the beginning of the 20th century, the species was considered as a pest for oaks (Faber, 1901b; Schuster, 1907b; Ferrant, 1907a, 1911), but we do not have elements to suppose that it was so common or widespread in the country. The only samples present in the MNHNL are two specimens collected in Clervaux and Goebelsmühle (Fig. 18), most likely before WWI. Mousset (1969) did not mention the former specimen but another one collected in Troine (Wincrange). The origin of this datum, which also Drumont et al. (2012) mentioned, is unknown. Further research in the historical localities evidenced that the phytocenosis can still allow the presence of this species, but no further specimens or attacked trees have been detected. However, though already considered as extinct in Luxembourg by the Council of Europe (Luce, 1996), *Cerambyx cerdo* has been inserted in the local Red List (RGD, 2009).

4.2.1.2 *Cerambyx scopolii* Füssli, 1775

Cerambyx cerdo Schuster, 1907a: 84. *Cerambyx scopoli* Ferrant, 1907a: 301-302; Ferrant, 1911: 66. *Cerambyx scopolii* Mousset, 1969: 169; Mousset, 1973: Map. 391; Köhler, 2009: 61, 62, 110; Köhler, 2013: 63, 102; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 217.

Body size 17-31 mm. Cylindrical, everywhere dull black, covered with a fine silver pubescence, denser on the elytral apex.

Life-cycle lasts two years. Larvae bore dead and sometimes living branches of broadleaf trees especially oaks and fruit trees. They pupate in the wood in late summer, after having closed the cell with a calcareous operculum. Adults hibernate in the pupal cell and emerge since mid-spring (Fig. 20). They can be observed during the day climbing on host plants or on blossom bushes, especially Crataegus, until mid-summer.

Host plants: *Castanea*, *Fagus*, *Quercus*!, *Betula*, *Corylus*, *Carpinus*, *Ostrya*, *Ulmus*, *Juglans*, *Malus*, *Prunus*, *Salix*, *Populus*, *Tilia*.

Parasitoids: *Dolichomitus mesocentrus* (Gravenhorst, 1829), *D. tuberculatus* (Geoffroy, 1785), (Ichneumonidae); *Helconidea dentator* (Fabricius, 1804) (Braconidae).

Western Palaearctic species, widespread from North Africa and Portugal to Iran, extinct in England since 1902 (Twinn & Harding, 1999). Several authors considered some populations as varieties, subspecies or even true species (paludivagus Lucas, 1842 in North Africa, *helveticus* Stierlin, 1879 in the Alps, *nitidus* Pic, 1892 in Turkey, *siculus* Rapuzzi & Sama, 2010 in Sicily); however, the most recent systematic setting (Rapuzzi & Sama, 2010) does not correspond to coherent biogeographical criteria and needs to be carefully reconsidered.

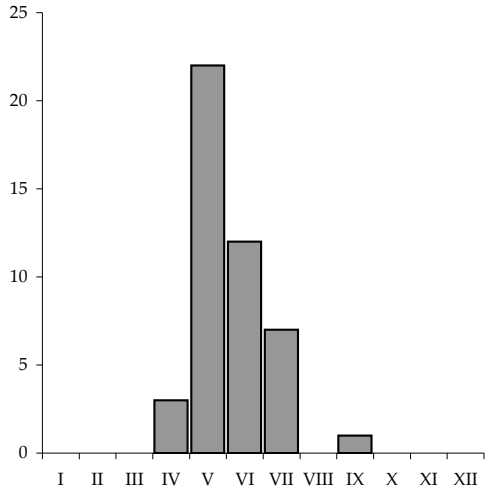
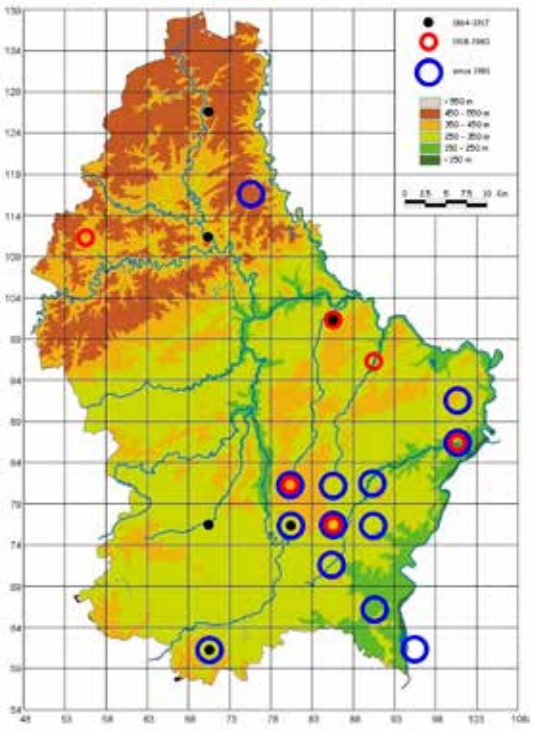


Fig. 20: Phenology of *Cerambyx scopolii* in Luxembourg.

Fig. 21: *Cerambyx scopolii*, a. Male, Niederanven b. Female, Mertert (author's coll.), c. Female, Walferdange (Photo: D. Giacomini), d. Male, Niederanven

In the areas neighbouring Luxembourg, the species is especially widespread in the warmest localities. In Rhineland-Palatinate and the Saarland, it is widespread in the plains, where it is in strong regression since the 1950s (Niehuis, 2001). Once common (Fournel & Gehin, 1846) or very common (Godron, 1866), it is nowadays still fairly common, but in regression, in northern Lorraine (Colson, 1980b), in sun-exposed localities of Alsace (Matter, 1998) and in the French Ardennes (Ligeron, 2005). The species is still common in the south-eastern half of Belgium (Lameere, 1894) but rare in the Netherlands (Zeegers & Heijerman, 2008), where the collected specimens were supposed to have been introduced through trade wood (Everts, 1903).

In Luxembourg, the species was considered as a pest for apple-trees at the beginning of the 20th century (Schuster, 1907a; Ferrant, 1907a, 1911). Nowadays, it is widespread along the German border and in the south-eastern half of the Gutland, though it had a larger distribution in the south-western part at the end of the 19th century (Fig. 22). It is localised in small oak woods of xerothermic localities, where it can be fairly common on bushes of Crateagus. The adults are sometimes attracted by yellow Moericke traps.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	1	1	1			4
1918-1980		1	1					2		1	1		6
since 1981	1							9	1	1	4	2	18
Total	1	1	1				1	12	2	3	5	2	28

Fig. 22: Distribution of *Cerambyx scopolii* and colonised localities in Luxembourg.

4.2.2 Tribe Callidiini Kirby, 1837

4.2.2.1 *Hylotrupes bajulus* (Linnaeus, 1758)

Xylotrupes bajulus (sic!) Schuster, 1907a: 87; *Hylotrupes bajulus* Ferrant, 1907a: 297, Fig. 23; Ferrant, 1911: 61, Fig. 25; Mousset, 1969: 169; Mousset, 1973: Map. 398; Vitali, 2013: 146.

Body size 7-21 mm. Flat, parallel-sided, brownish grey to black. Elytra sometimes testaceous (var. *scutifer*). Pronotum covered with greyish pubescence and three small longitudinal black raised prominences.

Life-cycle lasts two years. Female lays up to 400 eggs mainly in dry Pinaceae, but also in building woods of oak and chestnut (Palli & Gambetta, 1962). Larvae pupate in wood in spring, lasting two weeks. Females emerge since early summer (Fig. 23), while males remain in the larval or pupal galleries, resulting much rarer. Males on average live 17 days, females 26 days. They can be collected on host plants or flying during daytime

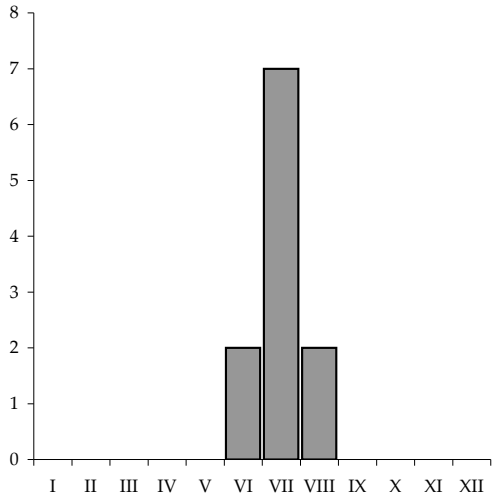


Fig. 23: Phenology of *Hylotrupes bajulus* in Luxembourg.

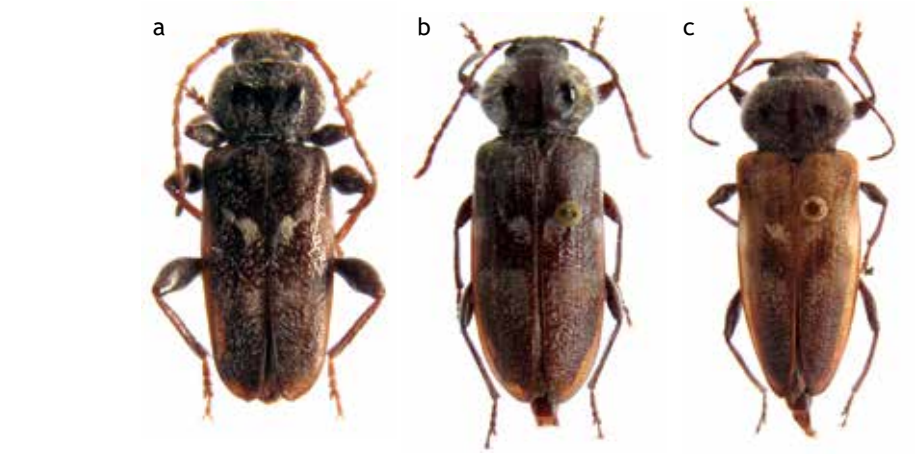


Fig. 24: *Hylotrupes bajulus*, a. Male, Italy (author's coll.), b. Female, Obweiler (coll. Mnhn), c. Female var. *scutifer*, Consdorf (coll. Mnhn).

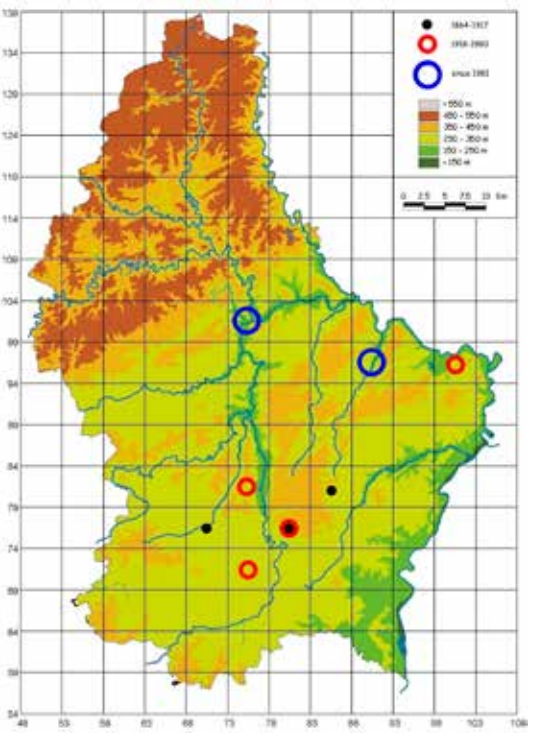
but they are much more common in urban habitats, attacking beams, parquets or telegraph poles. The biology of this species has made it a redoubtable pest for conifer building woods. The capacity of the larvae to survive in the wood up to 17 years and that of the adult to reproduce in galleries without emerging (Villiers, 1978) make its attack difficult to be detected and thus, particularly dangerous. Several generations of larvae can bore beams without leaving visible traces on the surface, while all inner part can be completely pulverised. The recent use of treated woods, glued laminated timbers (Glulam) and, especially, reinforced concrete has drastically returned to normality the consistency and the importance of this species.

Host plants: *Abies*, *Picea*, *Pinus*. *Castanea*. *Quercus* (only building woods).

Parasitoids: *Cryptus dianae* Gravenhorst, 1829, *C. minator* Gravenhorst, 1829, *Dolichomitus tuberculatus* (Geoffroy, 1785), *Ephialtes manifestator* (Linnaeus, 1758) (Ichneumonidae); *Doryctes leucogaster* (Nees, 1834) (Braconidae).

Predators: *Opilo domesticus* (Sturm, 1837), *O. mollis* (Linnaeus, 1758) (Cleridae).

The species is naturally present in the Mediterranean area but it has become widespread worldwide due to wood transport, reaching Africa, Australia and America, where it was already present at Linnaeus' times.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	2					3
1918-1980								3		1			4
since 1981			1							1			2
Total			1				1	4		2			8

Fig. 25: Distribution of *Hylotrupes bajulus* and colonised localities in Luxembourg.

In the regions neighbouring Luxembourg, it has been introduced for an unmemorable time, since damages of this species have been already known in Denmark in 1736 (Palli & Gambetta, 1962). It was common to very common in the buildings of the Netherlands, Rhineland-Palatinate and northern Lorraine during the 18th and 19th century (Fournel & Gehin, 1846; Godron, 1866; Everts, 1903; Niehuis, 2001). An investigation carried out in Hamburg in 1927 and 1928 showed that on average 41.46% of the houses were infested, some zones reaching 70-80% (Palli & Gambetta, 1962). Though widespread in Belgium, the species was nonetheless absent from the Ardennes and the Belgian Lorraine (Lameere, 1894). The current distribution is difficult to be defined: the beetle is still fairly common in the French Ardennes (Ligeron, 2005) and in regression in the Netherlands, northern Lorraine and Alsace (Colson, 1980b; Matter, 1998; Zeegers & Heijerman, 2008). According to Baumann (Niehuis, 2001), all recent specimens of Rhineland-Palatinate are related to findings in nature, an observation that seems incompatible with all other data.

In Luxembourg, the species has been known for a long time thanks to occasional samples or small series coming from urban localities throughout the country. Considered as a common pest at the beginning of the 20th century (Schuster, 1907a; Ferrant, 1907a, 1911), it is evidently in strong regression today, not having been collected for more than 30 years (Fig. 25).

4.2.2.2 *Ropalopus clavipes* (Fabricius, 1775)

Rhopalopus clavipes Mousset, 1969: 169; Mousset, 1973: Map. 426; *Ropalopus (s. str.) clavipes* Vitali, 2011b: 80.

Body size 10-23 mm. Flat, completely dull black. Femora club-shaped. Stable.

The species looks superficially similar *to Cerambyx scopolii* (4.2.1.2), with which it shares the same biology and behaviour. However, its body is much flatter, stouter and deprived of the silver pubescence characterising this last species.

Life-cycle lasts two years. Larvae bore dead branches of broadleaf trees, especially oaks and fruit trees including grape. Pupation occurs in wood in spring. Adults can be observed during the day climbing on host plants, rarely on blossom bushes. The best method to collect this species is, however, the rearing of attacked branches or the use of sweet traps; otherwise, the collection is purely occasional.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Corylus*, *Ulmus*, *Juglans*, *Malus*, *Prunus*, *Acer*, *Rhamnus*, *Paliurus*, *Vitis*, *Salix*, *Populus*, *Tilia*.

Parasitoids: *Helcon angustator* Nees, 1814 (Braconidae).

Euro-Anatolian thermophile species, widespread from the Iberian System to northern Iran, naturally absent from the British Isles and Scandinavia, extinct or in strong regression in northern Europe.

In the areas neighbouring Luxembourg, the species settled Rhineland-Palatinate in the warm period between 1850 and 1870 and became extinct at the end of the 19th century (Niehuis, 2001). The same events occurred in northern Lorraine, where the species, once very rare (Fournel & Gehin, 1846), became rare (Godron, 1866) and then extinct (Colson, 1980b), or in Belgium, where, erroneously recorded in 1884 (Lameere, 1885), it was considered rare in the central region (Lameere, 1894), where it is extinct today. Zeegers & Heijerman (2008) considered it as very rare in the Netherlands along the German border, but the species, already rare at the beginning of the 20th century (Everts, 1903), is probably extinct for a long time (Horion, 1974). The species is still present, though rare, only in the Alsatian plains (Matter, 1998), while it has never been recorded from the Saarland (Niehuis, 2001) and the French Ardennes (Ligeron, 2005).

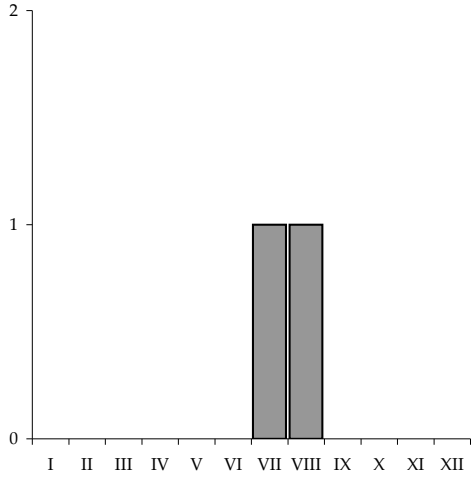


Fig. 26: Phenology of *Ropalopus clavipes* in Luxembourg (Mousset, 1969).

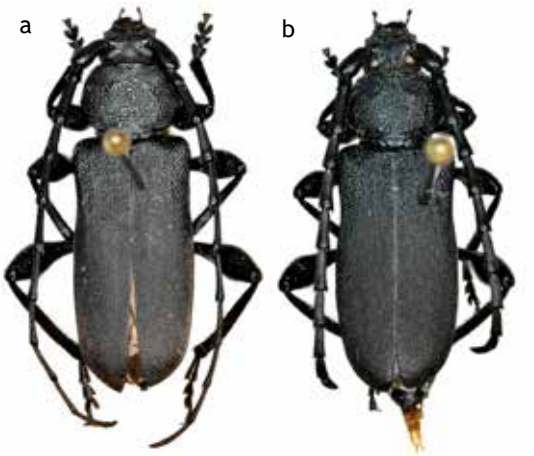


Fig. 27: *Ropalopus clavipes*, a. Male, b. Female, Greece (author's coll.).

	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	1					2
1918-1980													0
since 1981													0
Total							1	1					2

Fig. 28: Distribution of *Ropalopus clavipes* and colonised localities in Luxembourg.

This species was recorded in Luxembourg by two specimens collected by V. Ferrant at Thillsmillen and Luxembourg [city] before WWI (Mousset, 1969, 1973); nonetheless, neither of them has been found in the collections. A typewritten label, most likely dating to the 1940s, is still present in the general collection, indicating that Ferrant himself identified these specimens. The species does not present taxonomic problems; moreover, other *Ropalopus* species are present in the collection; thus, there is no reason to suppose a misidentification. Both specimens disappeared from MNHNL evidently after 1973. The species should be considered as currently extinct in Luxembourg (Fig. 28).

4.2.2.3 *Ropalopus femoratus* (Linnaeus, 1758)

Callidium coriaceum Mousset, 1969: 169; Mousset, 1973: Map. 388. *Ropalopus (s. str.) femoratus* Vitali, 2011b: 81, 84 Fig. 10. *Ropalopus femoratus* Vitali, 2013: 146; Weitzel, 2014: 217.

Body size 8-13 mm. Flat, completely dull black, except for the red club-shaped femora. Stable.

This species shows almost the same size and pattern of *Anoplodera rufipes* (4.4.2.3), from which it can be easily distinguished through its flat body, the rounded pronotum and the club-shaped femora.

Life-cycle lasts two years. Larvae bore dry branches of broadleaf trees especially oaks and fruit trees including grape. Pupation occurs in

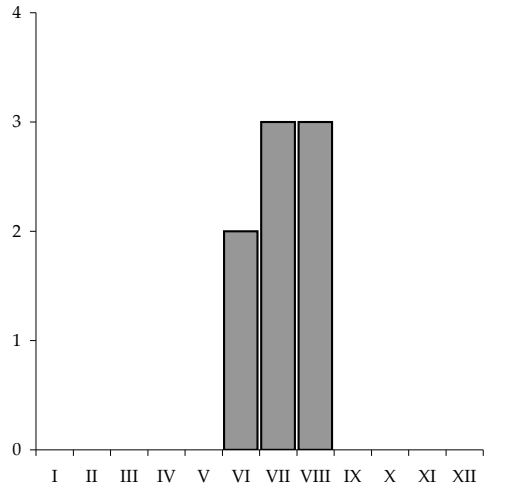


Fig. 29: Phenology of *Ropalopus femoratus* in Luxembourg.

Fig. 30: *Ropalopus clavipes*, Male, Lellingen (coll. Mnhn).

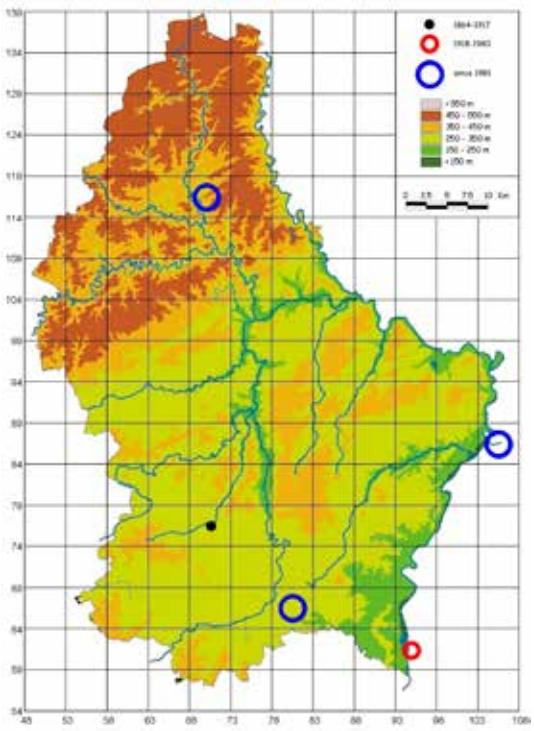
wood in spring. Adults can be observed in summer (Fig. 29) during the day climbing on the host plants, occasionally on flowers. Being nonetheless acrodendric, they are difficult to be observed. The best method to collect this species is the rearing of attacked branches or the use of sweet traps.

Host plants: *Castanea*, *Quercus*, *Alnus*, *Betula*, *Corylus*, *Ostrya*, *Juglans*, *Rosa*, *Pyrus*, *Malus*, *Prunus*, *Acer*, *Vitis*.

Euro-Anatolian thermophile species, marginally present at the Iberian Peninsula, in regression from north-western Europe, absent from the British Isles and most of Scandinavia. In comparison with *Ropalopus clavipes*, it is slightly less thermophilic, showing a bit larger climatic adaptability.

In the areas neighbouring Luxembourg, the species is extremely rare but possibly stable in the plains of Rhineland-Palatinate, but still not recorded in the Saarland (Niehuis, 2001), very rare in northern Lorraine (Fournel & Gehin, 1846; Godron, 1866), with recent records missing (Colson, 1980b) and little common in the Alsatian plains (Matter, 1998). Once very rare in Belgium (Lameere, 1885; 1894), it has not been collected for at least 60 years, whereas it is absent from the Netherlands (Everts, 1903; Zeegers & Heijerman, 2008).

Until a few years ago, this species was known in Luxembourg only by two specimens collected by Ferrant at Thillsmillen before 1890 but misidentified by Ferrant and Mousset (Vitali, 2011b). However, further specimens have been collected in different localities of the country. The species



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1						1
1918-1980												1	1
since 1981		1							1		1		3
Total		1					1		1		1	1	5

Fig. 31: Distribution of *Ropalopus femoratus* and colonised localities in Luxembourg.

might be still more widespread in the xerophilic oak woods of the South-east of the country and along the German border (Fig. 31).

4.2.2.4 *Callidium violaceum* (Linnaeus, 1758)

Callidium violaceum Ferrant, 1907a: 298; Ferrant, 1911: 62; Mousset, 1969: 170; Mousset, 1973: Map. 389; Vitali, 2014: 88; Vitali, 2013: 146.

Body size 8-16 mm. Flat, metallic blue with violet or green reflections. Elytra granulose, antennae shorter than body, femora club-shaped.

The species might be confounded with some melanistic varieties of *Phymatodes testaceus* (4.2.2.7), from which it differs in the stouter body, the shorter antennae and the granulose body surface.

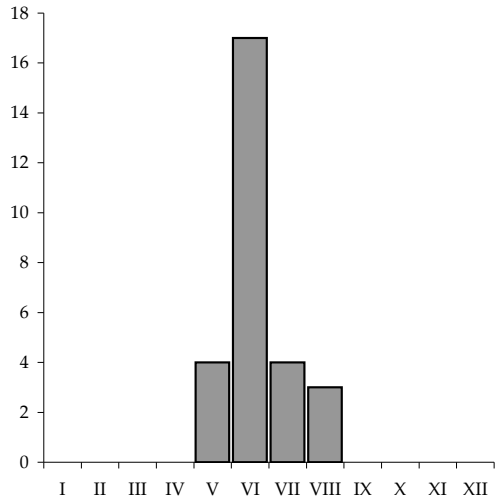


Fig. 32: Phenology of *Callidium violaceum* in Luxembourg.

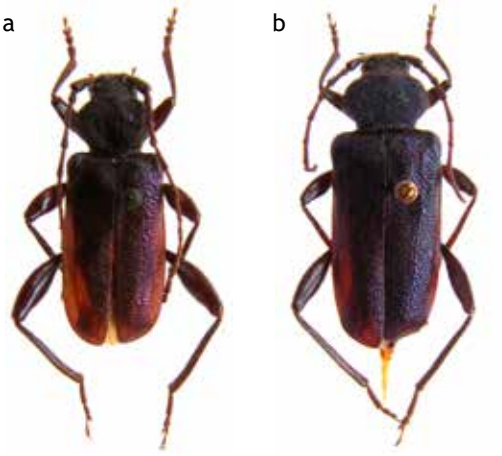
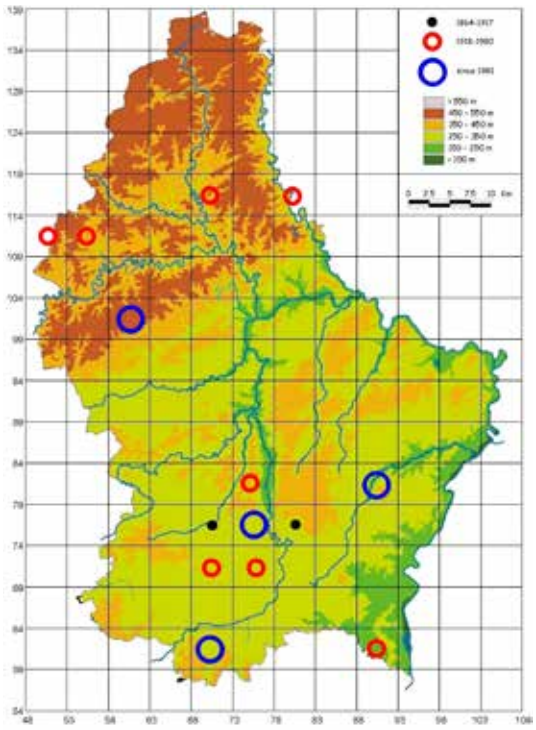


Fig. 33: *Callidium violaceum*, a. Male, Bertrange, b. Female, Wilwerwiltz (coll. Mnhn).

Life-cycle lasts two years. Larvae bore dry wood of mountain Pinaceae and Fagaceae, erroneously recorded from *Salix* and fruit trees (Demelt, 1966). Pupation occurs under the bark in spring. Adults can be observed during the day climbing on fallen trunks from mid-spring to end-summer (Fig. 32).

Host plants: *Fagus*, *Quercus*, *Alnus*, *Abies*, *Picea*, *Larix*, *Pinus*.

Parasitoids: *Coleocentrus caligatus* (Gravenhorst, 1829), *Ephialtes manifestator* (Linnaeus, 1758), *Xorides praecatorius* (Fabricius, 1793) (Ichneumonidae); *Aspicolpus carinator* (Nees, 1814), *Cyanopterus flavator* (Fabricius,



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	1					2
1918-1980	1	3					1	2				1	8
since 1981					1			1	1		1		4
Total	1	3			1		2	4	1		1	1	14

Fig. 34: Distribution of *Callidium violaceum* and colonised localities in Luxembourg.

1793), *Doryctes striatellus* (Nees, 1834), *Helcon angustator* Nees, 1814, *Helconidea dentator* (Fabricius, 1804), *H. ruspator* (Linnaeus, 1758) (Braconidae).

Eurasian species, widespread from Central Europe to Japan, restricted to mountains in the southern part of its distribution. Often intercepted with timber trade (Palli & Gambetta, 1962; Villiers, 1978), it has been introduced to the plains of northern Europe and Greenland (Bocher, 1988). The North American population, only settling the eastern coast, has been introduced as well, at least before the mid-19th century (Haldeman, 1847).

In the areas neighbouring Luxembourg, the species is autochthonous only in the Vosges and in southern Rhineland-Palatinate but spreads everywhere following conifer plantations. Once very rare in Rhineland-Palatinate and northern Lorraine (Brahm, 1790; Fournel & Gehin, 1846), it became fairly common

during the second half of the 19th century (Godron, 1866; Lameere, 1894) and then rarefied again in the entire area and even in the Vosges and the Black Forest (Colson, 1980b; Matter, 1998; Niehuis, 2001; Ligeron, 2005). In Belgium, the species is widespread everywhere, except in Flanders, in spruce woods and urban habitats along the borders (Lameere, 1894; Desière, 1969; Lempereur et al., 2000). Once widespread and locally not rare in the Netherlands (Evers, 1903), it is nowadays rarely collected in the surroundings of Amsterdam (Zeegers & Heijerman, 2008).

In Luxembourg, the species is fragmentally widespread everywhere, except for the eastern part of the Gutland (Fig. 34). Considered as little common already at Ferrant's times (Ferrant, 1907a, 1911), it seems to have become more common during the 1970s, while only few records have been known today. Adults were active until the beginning of August during the 19th century, while they were found only until early July during the 20th century.

4.2.2.5 *Callidium aeneum* (DeGeer, 1775)

Callidium dilatatum Ferrant, 1907a: 298; Ferrant, 1911: 62-63. *Callidium (Callidostola) aeneum* Vitali, 2012b: 236, 240 Fig. 1. *Callidium aeneum* Vitali, 2013: 146.

Body size 9-15 mm. Flat, metallic cupper to greenish. Elytra with net-shaped ridges, antennae shorter than body, femora club-shaped.

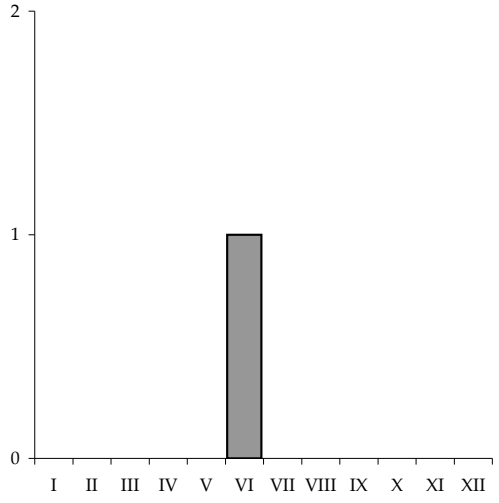


Fig. 35: Phenology of *Callidium aeneum* in Luxembourg.

Life-cycle lasts two years. Larvae bore dry branches of mountain conifers, though occasionally recorded from broadleaf trees as well. Pupation occurs under the bark in spring. Adults can be observed during the day climbing on fallen trunks from the end of spring to early summer.

Fig. 36: *Callidium aeneum*, Male, Harlange (coll. J. Thoma).

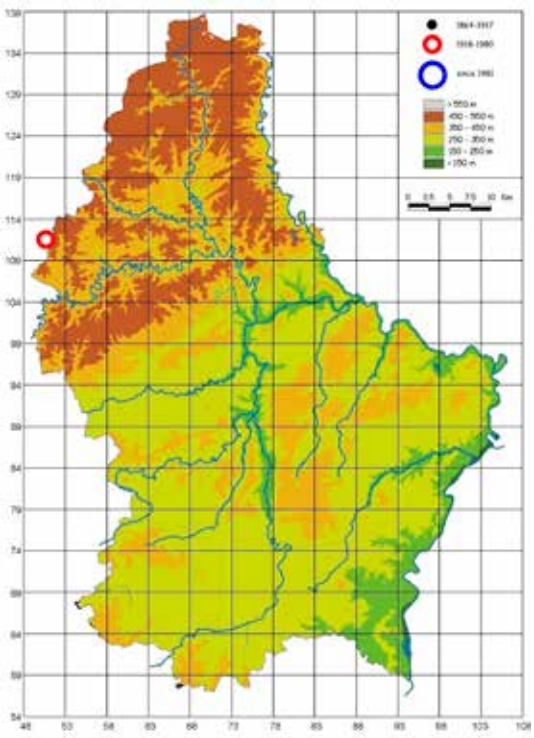


Fig. 37: Distribution of *Callidium aeneum* and colonised localities in Luxembourg.

Host plants: *Abies*, *Picea*, *Larix*, *Pinus*, *Juniperus*, *Fagus*, *Quercus*, *Acer*.

Parasitoids: *Heterischnus filiformis* (Gravenhorst, 1829) and *Xorides praecatorius* (Fabricius, 1793) (Ichneumonidae); *Eubazus ruficoxis* (Wesmael, 1835), *Helcon angustator* Nees, 1814, *Helconidea dentator* (Fabricius, 1804) and *Utetes caudatus* (Wesmael, 1835) (Braconidae).

Eurasian species, widespread from Central Europe to Japan, with one subspecies in the Caucasus (*longipenne* Plavilstshikov, 1940), restrict to mountains in the southern part of its distribution. With respect to *Callidium violaceum* (4.2.2.4), it shows a more thermophile character (Niehuis, 2001).

In the areas neighbouring Luxembourg, the species is autochthonous only in the Vosges and (maybe) in southern Rhineland-Palatinate. Once unknown elsewhere (Brahm, 1790; Fournel & Gehin, 1846; Godron, 1866; Lameere, 1894), it was collected since the end of the 19th century due to conifer plantations. It is however rare to very rare (Desière, 1969; Matter, 1998; Lempereur et al., 2000; Niehuis, 2001; Zeegers & Heijerman, 2008) or even unknown in some regions, such as northern Lorraine and the French Ardennes (Colson, 1980b; Ligeron, 2005). Possibly, this species was never acclimatised to the humid climate of the region and all samples are actually adventive specimens.

In Luxembourg, the species was considered as a pest for pines at the beginning of the 20th century (Ferrant, 1907a, 1911). Actually, no specimen has been known at that time since the first specimen was collected by J. Thoma at Harlange (Lac de la Haute Sûre, canton de Wiltz) only on 15 June 1979 (Fig. 37).

4.2.2.6 *Pyrrhidium sanguineum* (Linnaeus, 1758)

Callidium sanguineum Kraus, 1895: 100; Ferrant, 1907a: 298, Fig. 24; Ferrant, 1911: 62, Fig. 26. *Pyrrhidium sanguineum* Mousset, 1969: 170; Mousset, 1973: Map. 420; Köhler, 2013: 65, 102; Vitali, 2013: 146; Weitzel, 2014: 217.

Body size 6-15 mm. Flat, black; pronotum and elytra covered with a dense recumbent red pubescence. Antennae shorter than body, femora club-shaped. Stable.

Life-cycle lasts two years. Larvae bore dead stems of broadleaf trees, especially oaks and other

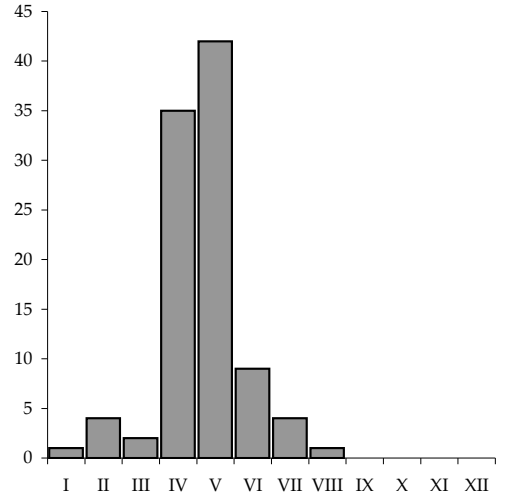
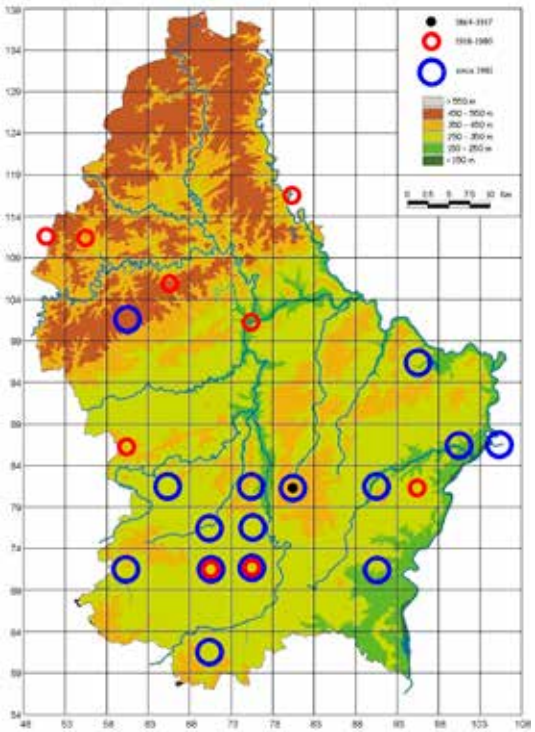


Fig. 38: Phenology of *Pyrrhidium sanguineum* in Luxembourg.

Fig. 39: *Pyrrhidium sanguineum*, a. Male, b. Female, Bambësch (author's coll.), c. Male, Bambësch on *Fagus*.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1					1
1918-1980	1	3	1				1	2			1		9
since 1981					1		3	5	1	1	4	1	16
Total	1	3	1		1		4	7	1	1	5	1	25

Fig. 40: Distribution of *Pyrrhidium sanguineum* and colonised localities in Luxembourg.

Fagales, exceptionally on conifers (Duffy, 1953; Villiers, 1978; Papi & Ceccolini, 2013). Pupation occurs under the bark in early spring. Adults can be observed running quickly or mating on fallen trunks during sunny days from early spring to early summer (Fig. 38). They regularly emerge from firewood and can be observed in larger numbers on the walls of woodsheds or houses since the end of winter.

Host plants: *Castanea*, *Fagus*!, *Quercus*!, *Betula*, *Carpinus*, *Ulmus*, *Malus*, *Aesculus*, *Abies*, *Pinus*, *Juniperus*.

Parasitoids: *Neoxorides nitens* (Gravenhorst, 1829), *Rhimphoctona teredo* (Hartig, 1847), *Xorides praecatorius* (Fabricius, 1793) (Ichneumonidae); *Helcon angustator* Nees, 1814 and *Ontsira antica* (Wollaston, 1858) (Braconidae).

Western Palaearctic species, widespread from North Africa to southern Scandinavia and Turkey.

In the regions neighbouring Luxembourg, it is widespread and common everywhere, especially in plains (Fournel & Gehin, 1846; Godron, 1866; Lameere, 1894; Everts, 1903; Desière, 1969; Gaspar & Verstraeten, 1972; Colson, 1980b; Lempereur et al., 2000; Niehuis, 2001; Zeegers & Heijerman, 2008), while it is rare or missing in the High Vosges (Matter, 1998), the French and the northern Belgian Ardennes (Collart, 1941; Ligeron, 2005).

In Luxembourg, this species has been known for the first time thanks to some pieces of bored beech bark collected by Ferrant in the Grünewald and shown during the meeting 24 November 1895 (Kraus, 1895). The collection still preserves some specimens referable to this record. At the beginning of the 20th century, the species was considered as a common pest for oaks and other broadleaf trees (Ferrant, 1907a, 1911). Nowadays, the species seems to be still widespread nearly everywhere, especially in oak and mixed woods of the Gutland (Fig. 40), but it is little common, even if locally fairly abundant. Analogously to other species, the distributional data seem to suggest a slow south-eastern regression. Adults were active until early August during the 19th century, while they were found only until early July during the 20th century.

4.2.2.7 *Phymatodes testaceus* (Linnaeus, 1758)

Callidium variabile Bricher, 1902: 172; Ferrant, 1907a: 297; Ferrant, 1911: 62. *Callidium variabilis* (sic!) Schuster, 1907b: 100. *Phymatodes testaceus* Mousset, 1969: 170; Mousset, 1973: Map. 412; Haagen, 1986: 49; Gerend et al., 2007: 290; Köhler, 2011: 90, 131; Köhler, 2013: 65, 102; Vitali, 2013: 146; Weitzel, 2014: 217.

Body size 6-18 mm. Flat, parallel-sided; elytra finely punctured; antennae fairly long, femora club-shaped. Extremely variable, from all testaceous to all blue-black, sometimes bicolour. In Luxembourg, the following varieties are widespread: completely testaceous (typical form), testaceous with a black head (*melanocephalus*), entirely blue with a more or less red pronotum (*similaris*, *variabilis*, *fennicus*).

Completely melanistic varieties (*violaceoniger*) might be confounded with *Callidium violaceum* (4.2.2.4.), from which they differ in the extremely fine dorsal punctuation.

Life-cycle lasts two years. Females lay up to 70 eggs in fissures of the bark of dead stems of broadleaf trees, especially oaks, but also other Fagales and fruit trees. Quoted, likely erroneously, from *Picea* and *Tsuga* in the United States (Craighead, 1923). Larvae bore under barks and pupate in early spring. Adults run and mate on fallen trunks in the evening and at night-time from late spring to mid-summer. They frequently emerge from firewood and can be observed in woodsheds or houses, sometimes coming at light, since end-winter (Fig. 41). The species has been recorded as a pest in the United States (Duffy, 1953).

Host plants: *Castanea*, *Fagus*, *Quercus*, *Corylus*, *Carpinus*, *Ulmus*, *Prunus*, *Malus*, *Salix*, *Fraxinus*. *Picea*? *Tsuga*?

Parasitoids: *Coleocentrus caligatus* (Gravenhorst, 1829), *Dolichomitus mesocentrus* (Gravenhorst, 1829), *D. tuberculatus* (Geoffroy, 1785), *Echthrus reluctator* (Linnaeus, 1758), *Ischnoceros rusticus* (Geoffroy, 1785), *Neoxorides nitens* (Gravenhorst, 1829), *Rhimphoctona megacephala* (Gravenhorst, 1829), *Townesia tenuiventris* (Holmgren, 1860), *Xorides praecatorius* (Fabricius, 1793) (Ichneumonidae); *Aspicolpus carinator* (Nees, 1814), *Cyanopterus flavator* (Fabricius, 1793), *Doryctes leucogaster* (Nees, 1834), *Helcon angustator* Nees, 1814, *Ontsira antica* (Wollaston, 1858), *Spathius exarator* (Linnaeus, 1758) (Braconidae); *Dinotiscus colon* (Linnaeus, 1758) (Pteromalidae).

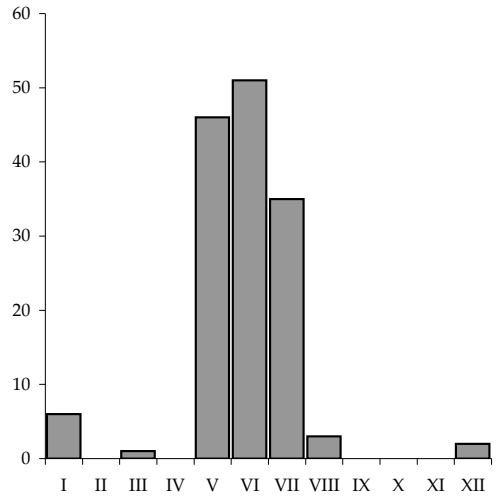


Fig. 41: Phenology of *Phymatodes testaceus* in Luxembourg.

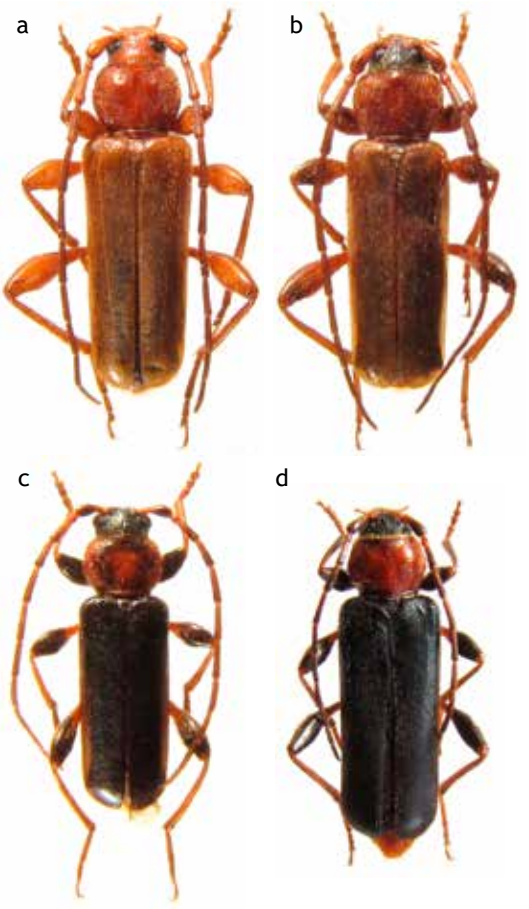
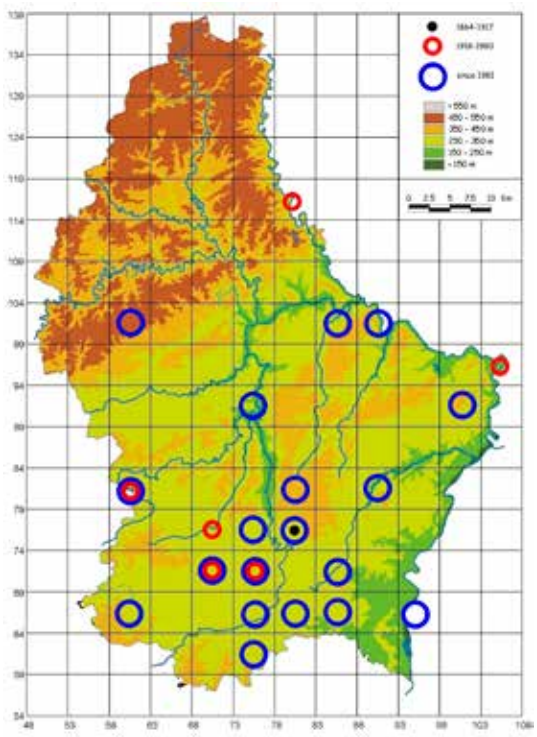


Fig. 42: *Phymatodes testaceus*, a.-c. Male, d. Female, Moesdorf (author's coll.).

Western Palaearctic species, widespread from North Africa to Scandinavia, Turkey and Iran. Introduced in the Nearctic (eastern Canada and USA) before mid-19th century (Haldeman, 1847) and in Greenland (Bocher, 1988).

In the regions neighbouring Luxembourg, it is widespread and common to very common nearly everywhere, especially in plains (Fournel & Gehin, 1846; Godron, 1866; Lameere, 1894; Everts, 1903; Colson, 1980b; Matter, 1998; Lempereur et al., 2000; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008). It seems to be rare in the Belgian Ardennes (Lameere, 1894).

In Luxemburg, this species was shown for the first time by F. Müllenberger, chartered surveyor from Wiltz, during a speech on metamorphose and varia-



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1					1
1918-1980	1						1	3		1			6
since 1981			1		1	1	1	7	5	1	4	1	22
Total	1		1		1	1	1	9	5	2	4	1	26

Fig. 43: Distribution of *Phymatodes testaceus* and colonised localities in Luxembourg.

bility of this species 21 September 1902 (Bricher, 1902). At the beginning of the 20th century, it was considered as a common pest for cherry trees, oaks and beech (Schuster, 1907b; Ferrant, 1907b, 1911). Nowadays, the species is little common, even if it is widespread in the oak and mixed woods of the south of the country (Fig. 43). Scarcely collected in nature maybe due to its relatively late adult phenology, it appears sometimes abundant in houses, emerging from firewood.

4.2.2.8 *Phymatodes pusillus* (Fabricius, 1787)

Phymatodes pusillus Gerend, 2008: 123-124 ; Vitali, 2013: 146.

Body size 5-10 mm. Small, flat, parallel-sided; all brown to blackish with metallic blue reflections, shoulder more (var. *humeralis*) or less reddish.

Life-cycle lasts one year. Larvae bore dead terminal branches of oaks. Pupation occurs in wood in autumn. Adults overwinter and emerge from middle to late spring (Fig. 44), remaining active on the terminal branches of the host plants.

Host plants: *Quercus cerris* L., *Q. ilex* L., *Q. petraea* (Matt.), *Q. pubescens* Willd., *Q. robur* L.

Parasitoids: *Neoxorides nitens* (Gravenhorst, 1829), *Xorides praecatorius* (Fabricius, 1793) (Ichneumonidae); *Atanycolus initiator* (Fabricius, 1793), *Doryctes mutillator* (Thunberg, 1822), *D. obliteratus* (Nees, 1834), *Helcon angustator* Nees, 1814, *Spathius curvicaudis* Ratzeburg, 1844 (Braconidae).

Euro-Anatolian thermophilic species, with a subspecies in the Caucasus (*rufipennes* Stark, 1889) and another, questionable, in Greece (*inopinatus* Sláma, 2010).

In the regions neighbouring Luxembourg, it is present in southern Rhineland-Palatinate (Niehuis, 2001), Alsace (Matter, 1998) and Belgium (Lempereur et al., 2000; Zeegers & Heijerman, 2008), where it is rarely collected. Absent elsewhere.

In Luxembourg, this species has been found in two localities of the South-east of the country (Fig. 46), but it might be more widespread. The rearing of terminal dead twigs of oaks seems to be the best collection method for this species.

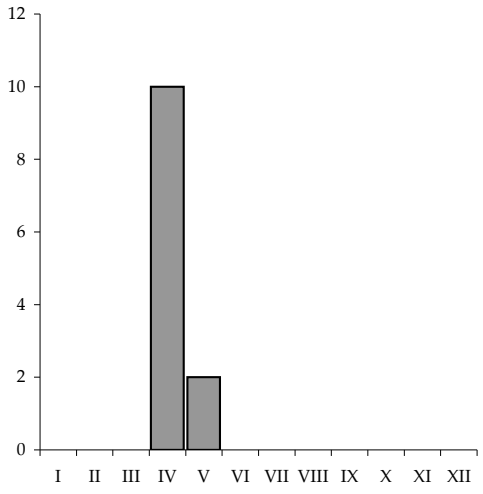


Fig. 44: Phenology of *Phymatodes pusillus* in Luxembourg.

Fig. 45: *Phymatodes pusillus*, Male, Czech Republic (author's coll.).

	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980											1		1
since 1981									1				1
Total									1		1		2

Fig. 46: Distribution of *Phymatodes pusillus* and colonised localities in Luxembourg.

4.2.2.9 *Phymatodes alni* (Linnaeus, 1767)

Phymatodes alni Mousset, 1969: 170; Mousset, 1973: Map. 411; Mousset, 1981a: 56; Köhler, 2011: 90, 91, 131 ; Vitali, 2013: 146.

Body size 4-7 mm. Small, flat; black; elytra with a brick-red, exceptionally black (var. *infuscatum*), base and two transversal white lines more or less interrupted along the suture.

Life-cycle lasts one year. Larvae bore dry thin branches of broadleaf trees, especially oaks; pupation occurs under the bark in early spring. Adults occur from mid to late spring (Fig. 47). Rarely observed because of their size, they can be collected, sometimes in larger number, by beating dry branches.

Host plants: *Castanea*, *Quercus*, *Alnus*, *Corylus*, *Carpinus*, *Ulmus*, *Rosa*, *Acer*, *Fraxinus*.

Euro-Turanian species, widespread from Andalusia to western Kazakhstan, with a subspecies in the Caucasus (*pici* Aurivillius, 1912) and another in Iran (*lateniger* Pic, 1945).

In the regions neighbouring Luxembourg, it is widespread nearly everywhere, especially in plains (Fournel & Gehin, 1846; Desière, 1969; Matter, 1998; Niehuis, 2001; Zeegers & Heijerman, 2008) but with an irregular distribution maybe due to its short and cryptic phenology. It was considered as rare in Belgium (Lameere, 1894; Lempereur et al., 2000) and in the French Ardennes (Ligeron, 2005),

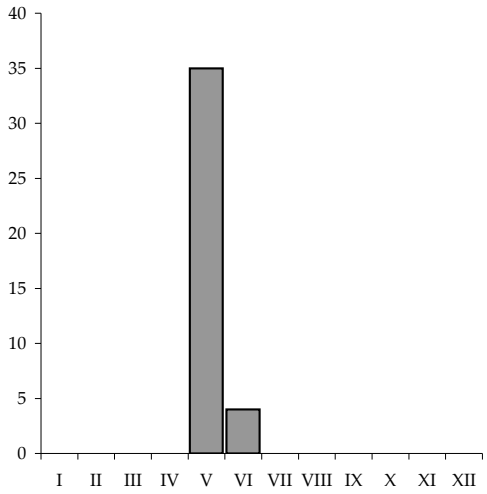


Fig. 47: Phenology of *Phymatodes alni* in Luxembourg.

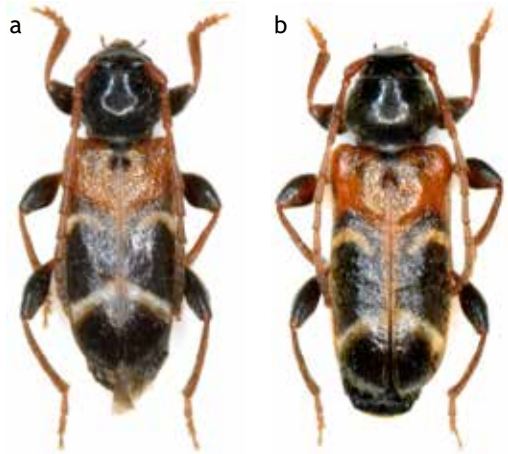
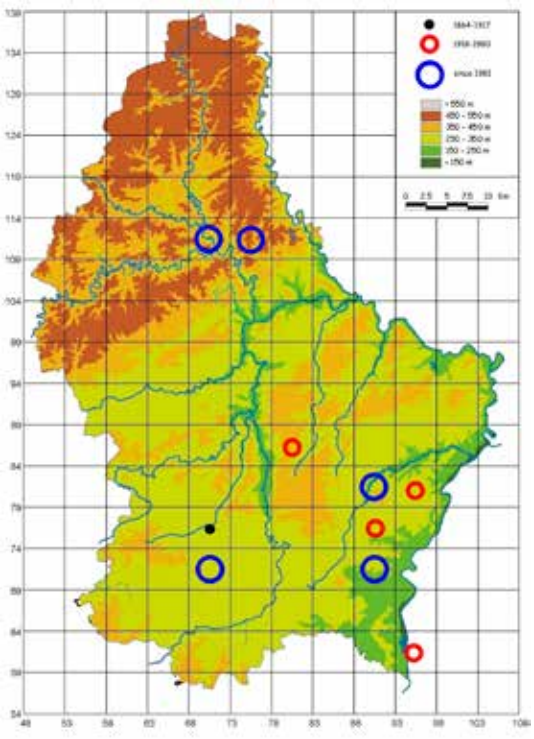


Fig. 48: *Phymatodes alni*, a. Male, b. Female, Bridemesser Bësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1						1
1918-1980								1			2	1	4
since 1981	1		1					1			1	1	5
Total	1		1				1	2			3	2	10

Fig. 49: Distribution of *Phymatodes alni* and colonised localities in Luxembourg.

while it seems to be missing in northern Lorraine (Colson, 1980b), though once recorded as common near Nancy (Godron, 1866).

In Luxembourg, the species is widespread along the German border and in the south-eastern half of the Gutland (Fig. 49), though it probably had a wider distribution in the south-western part at the end of the 19th century. It seems fairly rare and localised in oak woods of xerothermic localities, where, nonetheless, it can be very abundant locally.

4.2.2.10 *Phymatodes rufipes* (Fabricius, 1776)

Phymatodes (Phymatodellus) rufipes Vitali, 2012b: 236, 240 Fig. 2. *Phymatodes rufipes* Vitali, 2013: 146.

Body size 5-8 mm. Small, flat, metallic blue to violet; legs red except for the blue femoral club. Stable.

Life-cycle lasts one year. Larvae bore dead thin branches of thermophilic broadleaf trees and bushes, especially oaks and Rosaceae; pupation occurs under the bark in early spring. Adults occur from mid to late spring on blossom bushes.

Host plants: *Quercus*, *Corylus*, *Juglans*, *Rubus*, *Crataegus*, *Prunus*, *Cornus*.

Euro-Anatolian thermophilic species, widespread from Andalusia to southern Turkey, strongly rarefying north- and southwards. A subspecies (*syriacus* Pic, 1891) has been recognised in Syria and adjacent regions.

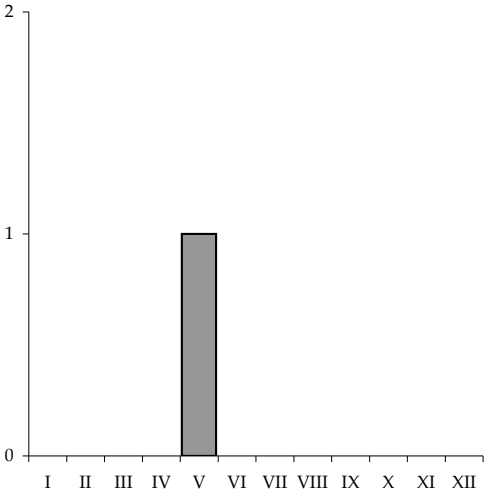
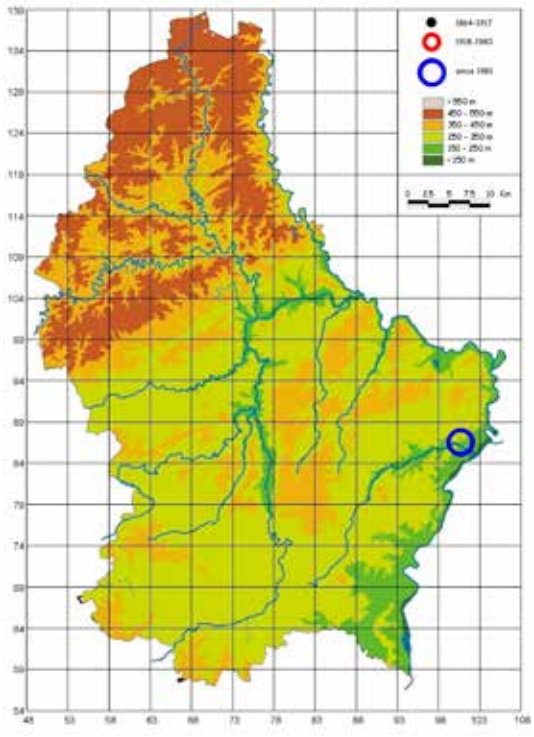


Fig. 50: Phenology of *Phymatodes rufipes* in Luxembourg.

Fig. 51: *Phymatodes rufipes*, Male, Munschecker (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981											1		1
Total											1		1

Fig. 52: Distribution of *Phymatodes rufipes* and colonised localities in Luxembourg.

In the regions neighbouring Luxembourg, it is widespread in eastern Rhineland-Palatinate (Niehuis, 2001) and Alsace (Matter, 1998). Once recorded from eastern Belgium (Lameere, 1885; Everts, 1903) and northern Lorraine (Fournel & Gehin, 1846; Godron, 1886) as well, it seems extinct for a long time, while it has never been recorded elsewhere.

In Luxembourg, the species has been known for a single specimen collected beating a sun-exposed blossom bush of *Crataegus monogyna* Jacq near to oak woods in the South-east of the country (Fig. 52).

4.2.3 Tribe Compsocerini Thomson, 1864

4.2.3.1 *Rosalia alpina* (Linnaeus, 1758)

Rosalia alpina Mousset, 1969: 139; Vitali, 2011b: 81.

Body size 15-38 mm. Flat, parallel-sided; ashy grey, more or less cerulean on antennae and shoulders; pronotum with a black spot at the apical margin; elytra with a variable black pattern disposed as follows: an sub-humeral spot, a post-median transversal band and a small pre-apical spot. The pattern of European population is rather stable, while it is strongly variable in the oriental ones, the pronotum and the elytra being completely grey to black.

Life-cycle lasts two years. Larvae bore dead branches or trunks of standing exposed trees, nearly exclusively on beech in Central European mountains. Pupation occurs in the wood in spring to early summer. Adults are diurnal on the host plants in mid-summer. If disturbed, it lets itself fall to the ground.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Carpinus*, *Ulmus*, *Juglans*, *Crataegus*, *Acer*, *Salix*, *Tilia*, *Fraxinus*.

Euro-Turanian species, mountains in the southern part of its distribution, with a relict subspecies in the Nur Mts., south-eastern Anatolia (*syriaca* Pic, 1895). A fossil rest is known from Late Pliocene shale of Willershausen am Harz, Germany (Schweigert, 2003). *Rosalia alpina* was erroneously considered as a Boreo-montane species, but the natural absence in Central Europe suggests that, actually, it has relatively thermophilic or even xerophilic exigencies. Strongly in regression in western Europe since the

beginning of the 20th century, the species has been inserted in the annexes II and IV of the Habitats Directive 92/43/EEC.

In the regions neighbouring Luxembourg, the species was autochthonous only in the Vosges, where it was already very rare until the beginning of the 20th century (Fournel & Gehin, 1846; Godron, 1866; Matter, 1998). It has rarely been intercepted in Rhineland-Palatinate (Niehuis, 2001).

In Luxembourg, the species was mentioned by Mousset (1969) in the introduction of his partial catalogue of the local beetles, as collected by the Prof. L. Reichling in the Park of Merl, Luxembourg City. Traces of this specimen are no longer present today.

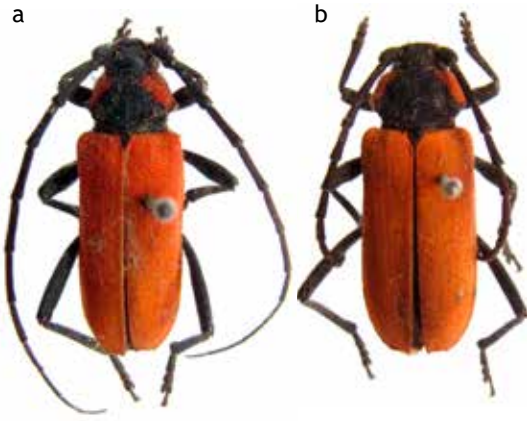


Fig. 54: *Purpuricenus kaehleri*, a. Male, b. Female, Wasserbillig (coll. Mnhn).

4.2.4 Tribe Trachyderini Dupont, 1836

4.2.4.1 *Purpuricenus kaehleri* (Linnaeus, 1758)

Purpuricenus kaehleri Mousset, 1969: 171; Mousset, 1973: Map. 419; Vitali, 2013: 146.

Body size 9-21 mm. Parallel-sided, chromatically variable. Head and limbs black; pronotum black with a red spot at each apical angle (typical form), sometimes wanting (var. *nigricollis*); elytra red with a black variable discal spot, sometimes missing (var. *ruber*) or invading the whole surface (var. *carbonarius*). More combinations are possible. As it occurs for other species (e.g. *Leptura maculata*), some chromatic forms are locally prevailing without forming true subspecies due to their discontinuous distribution. The melanistic forms are dominant in Sicily and the Balkans, while the var. *ruber* is the only one collected in Luxembourg, Belgian Lorraine and Brittany (Gouverneur & Guérard, 2011). Nonetheless, it is also prevailing in the surroundings of Paris (Picard, 1929) and in central Italy (Sama, 1988).

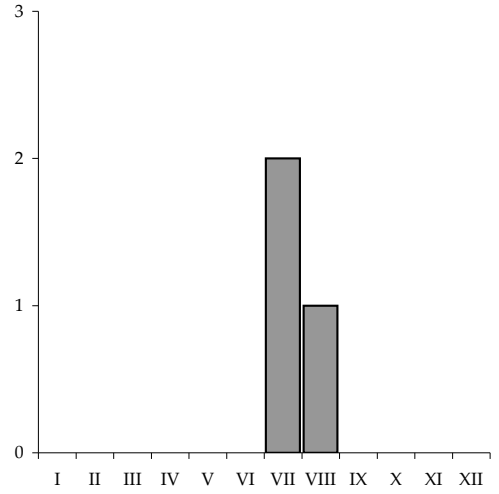


Fig. 53: Phenology of *Purpuricenus kaehleri* in Luxembourg.

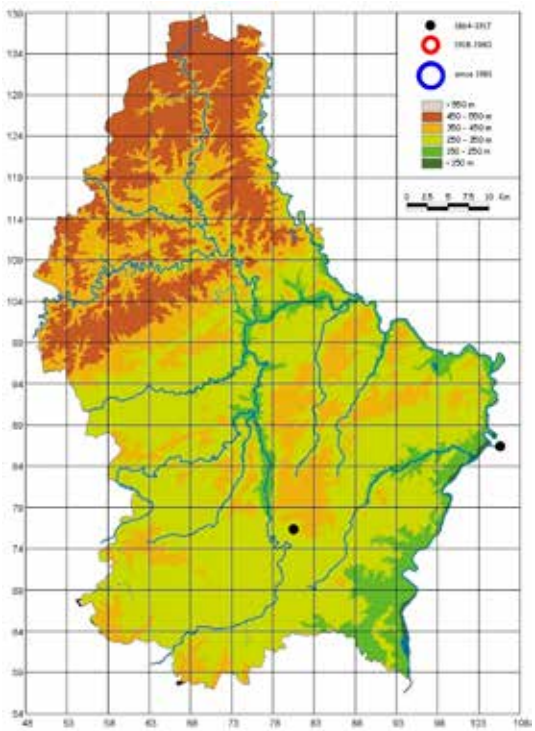
Life-cycle lasts two years. Larvae bore dead branches of thermophile broadleaf trees, especially oaks and fruit trees. Pupation occurs in wood in spring. Adults are active from early to mid-summer (Fig. 53) and can be found on host plants or blossom bushes, often being attracted by wine or sweet traps.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Corylus*, *Ulmus*, *Ficus*, *Juglans*, *Crataegus*, *Prunus*, *Robinia*, *Paliurus*, *Salix*, *Populus*.

Parasitoids: *Dolichomitus mesocentrus* (Gravenhorst, 1829) (Ichneumonidae); *Pristaulacus galitae* (Gribodo, 1879) (Aulacidae).

Euro-Anatolian thermophilic species, widespread from the Iberian System to northern Iran, with a subspecies in the Caucasus (*menetriesi* Motschulsky, 1845). Naturally absent from the British Isles and Scandinavia, it is extinct or in strong regression all over northern Europe.

In the regions neighbouring Luxembourg, it is still present in Alsace (Matter, 1998), while it became extinct elsewhere after the expansion occurred



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1			1		2
1918-1980													0
since 1981													0
Total								1			1		2

Fig. 55: Distribution of *Purpuricenus kaehleri* and colonised localities in Luxembourg.

during the warm period from 1850 to 1870 (Fig. 119). During the same epoch, it also regressed in Brittany (Gouverneur & Guérard, 2011) and the Paris Basin, where it was once common (Villiers, 1978). According to Matter (1998), the species was widespread in the vineyard areas and has become extinct because of treatments, but this does not correspond to reality since it became extinct long time before the use of chemical treatments and also from localities where vineyards never existed. In fact, *Purpuricenus kaehleri* became extinct from north-eastern Rhineland-Palatinate in the 1920s, while it never settled the Saarland (Niehuis, 2001). Once considered as rare (Fournel & Gehin, 1846), later very rare (Godron, 1886), it is no longer present in northern Lorraine today (Colson, 1980b). In Belgium, the species was considered as introduced in the Liège Botanical Garden (Lameere, 1885, 1894) but it was also recorded along the French border: Arlon (Everts, 1903) and Landelies (Picard, 1929). Picard (1929) noticed that the species was absent from the regions without warm summers; thus, the oceanisation of the climate most probably was the principal reason for its extinction.

In Luxembourg, this species has been known thanks to three specimens collected by V. Ferrant near Wasserbillig and in Luxembourg (city?) most likely before WWI (Fig. 55). The species must be considered as extinct from Luxembourg for a long time.

4.2.5 Tribe Callichromatini Blanchard, 1845

4.2.5.1 *Aromia moschata* (Linnaeus, 1758)

Aromia moschata Kraus, 1896: 168; Ferrant, 1907a: 302, Fig. 28; Ferrant, 1911: 66, Fig. 30; Mousset, 1969: 169; Mousset, 1973: Map. 386; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 217.

Body size 13-38 mm. Parallel-sided, entirely metallic cupper, green, blue, violet or nearly black, sometimes bicolour. Specimens green with golden reflections are generally found in the regions neighbouring Luxembourg. The pronotum is more or less bright red in some subspecies.

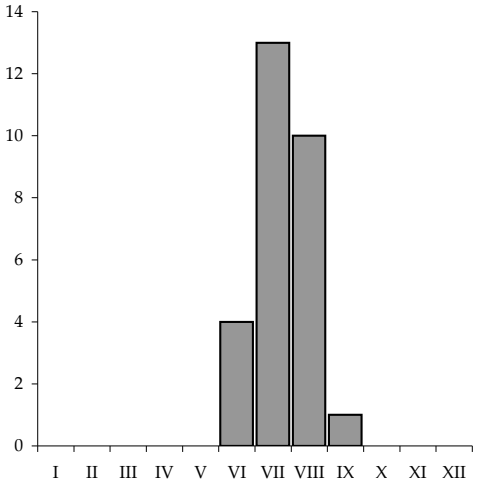


Fig. 56: Phenology of *Aromia moschata* in Luxembourg.

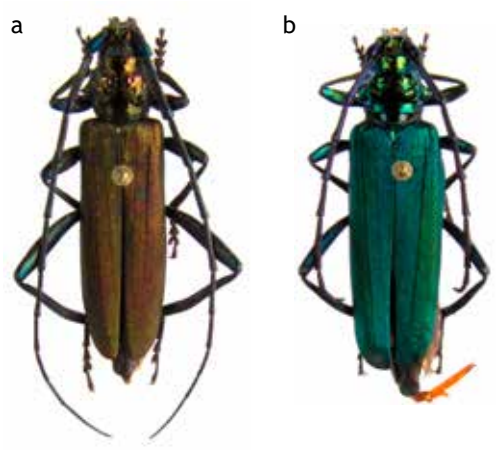
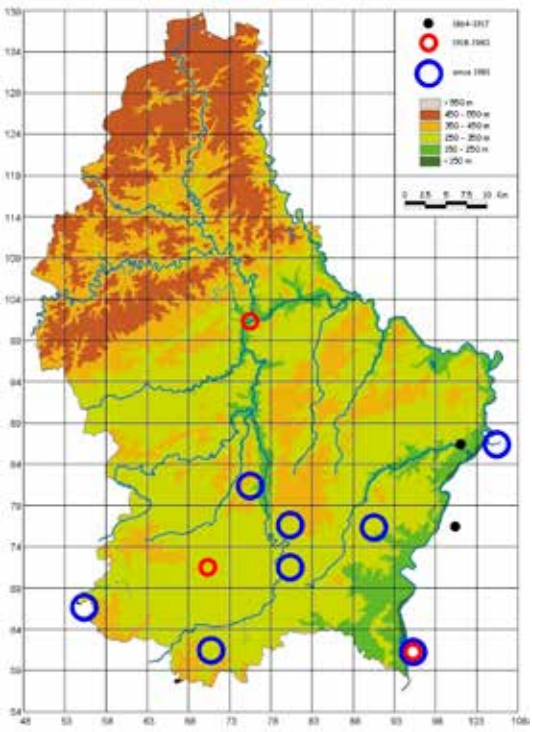


Fig. 57: *Aromia moschata*, a. Male, Uebersyren (author's coll), b. Female, Luxembourg (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917											2		2
1918-1980			1					1				1	3
since 1981								4	2		1	1	7
Total			1					5	2		3	1	12

Fig. 58: Distribution of *Aromia moschata* and colonised localities in Luxembourg.

Life-cycle lasts three years. Larvae bore sick living woods of different species of willow. Pupation occurs in wood in spring. Adults are active in July, sometimes also in late summer (Fig. 56), climbing on trunks of the host plants or on blossom bushes. They are often attracted by wine or sweet traps.

Host plants: *Salix alba* L., *S. atrocinerea* Brot., *S. caprea* L., *S. euxina* Belyaeva, *S. viminalis* L.

Parasitoids: *Dolichomitus tuberculatus* (Geoffroy, 1785), *Ischnoceros rusticus* (Geoffroy, 1785), *Perithous scurra* (Panzer, 1804), *Xorides praecatorius* (Fabricius, 1793) (Ichneumonidae).

Palaearctic species widespread from North Africa to Japan with several subspecies of uncertain systematic value (true species, local forms?). The nominal form is focused in the Central Europe, reaching westward the Cantabrian Mts., eastwards to the European part of Russia, southwards to central Italy and the Balkans, and northwards over most of Scandinavia and Great Britain. Subfossils have been known from Warwickshire, England since the Early Holocene (Osborne, 1974).

In the regions neighbouring Luxembourg, the species is widespread everywhere in riparian habitats (Niehuis, 2001; Zeegers & Heijerman, 2008) but it is little common (Lameere, 1894; Colson, 1980b; Ligeron, 2005) or in regression (Matter, 1998) due to anthropic impact on the banks.

In Luxembourg, the species has been known for a long time (Kraus, 1896) and has even been considered as a pest for willows (Ferrant, 1907a, 1911). Actually, it seems very rare and fragmentally widespread only in the Gutland (Fig. 58); nonetheless, it is regularly collected at the colonised localities. Adults are usually collected on blossom bushes of Sambucus ebulus L. or with interception traps.

4.2.6 Tribe Clytini Mulsant, 1839

4.2.6.1 *Plagionotus detritus* (Linnaeus, 1758)

Plagionotus detritus Köhler, 2013: 64, 102, Fig. 17. *Plagionotus (s. str.) detritus detritus* Vitali, 2016: 315-318, Fig. 1.

Body size 10-21 mm. Elongated; limbs and base of the elytra reddish; body dull black, sometimes brown to reddish (var. rufescens), covered with a pattern of yellow pubescence disposed as follows:

Fig. 59: *Plagionotus detritus*, Male, Grouf N.R. (coll. Mnhn).

a transverse band on the occiput, two transverse bands on the pronotum, five transverse bands on the elytra, the two basal ones interrupted at the suture and the three apical ones more or less connected among them along the suture. Scutellum covered with a black pubescence. The pattern is fairly stable, though numerous weakly varieties have been described. The body colour is reddish and the pattern is much more extended, especially on the pronotum, in the ssp. *caucasicola* Plavilstshikov, 1940.

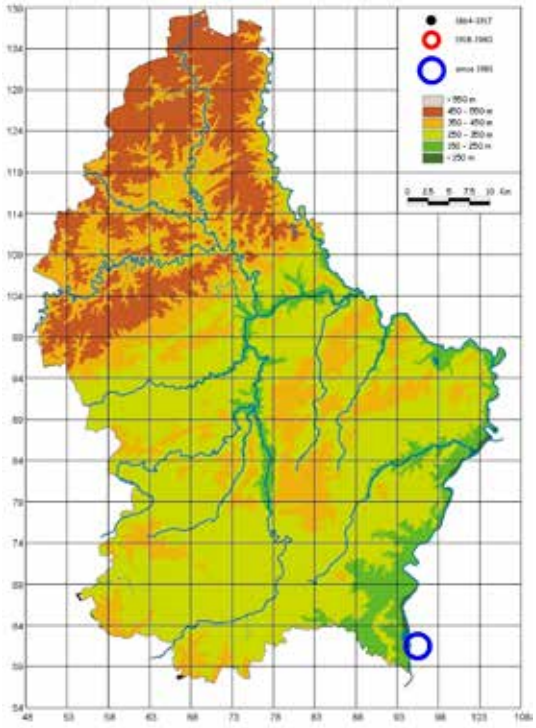
Life-cycle lasts two years. Females lay eggs in cracks of bark of sun exposed standing dead trunks and thick branches of broadleaf trees, especially oaks. Larvae emerge around two weeks after and bore the inner bark next to the cambium. Pupation lasts two weeks under bark in spring. Adults can be observed running restless or mating on fallen trunks during sunny days from mid-spring to mid-summer.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Betula*, *Carpinus*, *Salix*.

Parasitoids: *Xorides filiformis* (Gravenhorst, 1829) (Ichneumonidae); *Spathius curvicaudis* Ratzeburg, 1844 (Braconidae).

Predators: *Dendrocopos major* (Linnaeus, 1758) (Picidae).

Euro-Turanian thermophilic species, widespread from northern Portugal to the southern Urals and Kazakhstan, with a subspecies (*caucasicola* Plavilstshikov, 1940) in the Caucasus. The nominal form



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													
1918-1980													
since 1981												1	1
Total												1	1

Fig. 60: Distribution of *Plagionotus detritus* and colonised localities in Luxembourg.

is focused in primaeval oak forests of the Central Europe, reaching northwards the southern Scandinavia, absent from the British Islands and extinct from Denmark in the 19th century.

In the regions neighbouring Luxembourg, it presence is regular in the warm oak forests of Haut-Rhine (Matter, 1998), while it is rare or known for isolated specimens elsewhere. Very rare in the Netherlands (Everts, 1903; 1922; Zeegers & Heijerman, 2008), it is scattered in Belgium (Drumont & Grootaert, 2011), in all departments of Lorraine (Fournel & Gehin, 1846; Godron, 1886; Colson, 1980; Schoenstein et al., 2015) and northern Alsace (Matter, 1998). Threatened in south-eastern Rhineland (Niehuis, 2000], it seems to lack in western Rhineland, Saarland (Niehuis, 2001) and the French Ardennes (Ligeron, 2005).

Though inserted in the Red List (RGD, 2009), this species was recorded only very recently in a Forest natural reserve of the extreme South-east of Luxembourg. Its presence in the country is still unknown, but its biology makes suppose a threatened species with a scattered distribution in some few thermophilic oak forests of Gutland along the Mosel.

4.2.6.2 *Plagionotus arcuatus* (Linnaeus, 1758)

Clytus arcuatus Schuster, 1907b: 100. *Plagionotus arcuatus* Mousset, 1969: 170; Mousset, 1973: Map. 415; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 217.

Body size 6-20 mm. Elongated; limbs testeceous; body dull black, covered with a pattern of yellow pubescence disposed as follows: a transverse band on the occiput, three transverse bands on the pronotum (the discal one usually divided in the middle in males), three basal spots and four bowed transverse bands on the elytra. Scutellum covered with a yellow pubescence. The pattern is fairly stable, the first elytral band being rarely divided forming four spots (var. *reichei*). The pattern is usually reduced, yellowish to white, while the limbs are more or less blackish in the oriental subspecies.

The species might be superficially confused only with *Clytus arietis* (4.2.6.5) or *Xylotrechus arvicola* (4.2.6.4), which nevertheless show a different pattern.

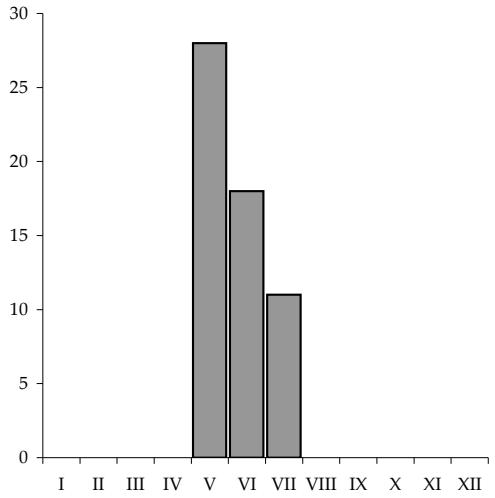


Fig. 61: Phenology of *Plagionotus arcuatus* in Luxembourg.

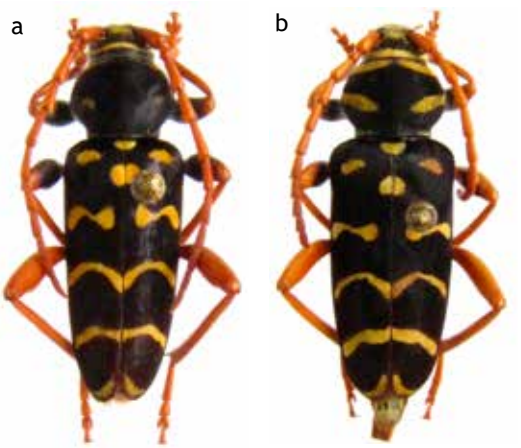


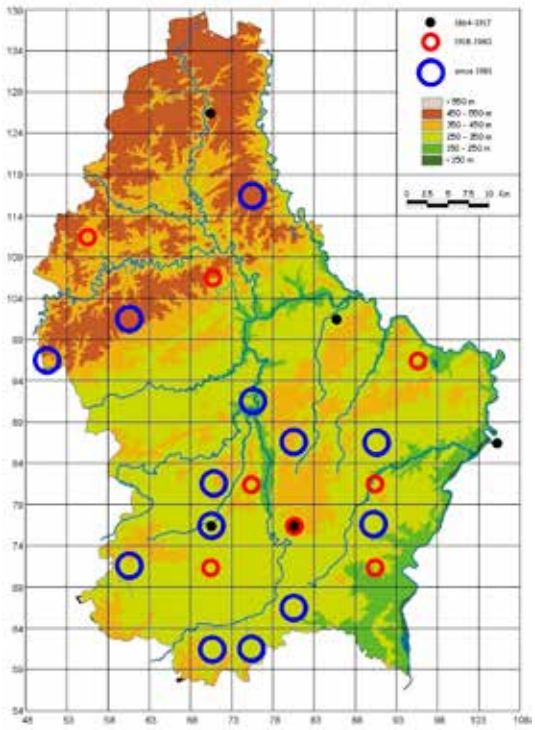
Fig. 62: *Plagionotus arcuatus*, a. Male, b. Female, Jongebësch (author's coll.).

Life-cycle lasts two years. Larvae bore the cortex of dead trunks and thick branches of broadleaf trees, especially oaks, secondarily beech. Pupation occurs under bark in spring. Adults can be observed running restless or mating on fallen trunks during sunny days from mid-spring to mid-summer (Fig. 61). Their behaviour reminds of some wasps, with which they may be initially mistaken.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Carpinus*, *Juglans*!, *Prunus*, *Robinia*, *Vitis*, *Salix*.

Parasitoids: *Dolichomitus mesocentrus* (Gravenhorst, 1829), *Echthrus reluctator* (Linnaeus, 1758), *Heterischnus filiformis* (Gravenhorst, 1829), *Xorides irrigator* (Fabricius, 1793) (Ichneumonidae); *Aspicolpus carinator* (Nees, 1814), *Cyanopterus nigrator* (Zetterstedt, 1838), *Doryctes leucogaster* (Nees, 1834), *Glyptomorpha pectoralis* (Brullé, 1832), *Helconidea dentator* (Fabricius, 1804), *Ontsira antica* (Wollaston, 1858) (Braconidae).

Western Palaearctic species, widespread from North Africa and Portugal to the southern Urals. The nominal form is widespread in North Africa, Turkey and Europe to the southern Urals, reaching northwards to southern Scandinavia and being extinct in England during the 19th century (Twinn & Harding, 1999). Four other subspecies have been recognised: one in Crete (*ghidottii* Pesarini & Sabbadini, 2011), two in the Caucasus (*lugubris* Ménétriés, 1832 and *multiinterruptus* Pic, 1933) and another in Kirgizstan (*kirgizicus* Lazarev, 2010).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1						1	1		1	1		5
1918-1980		2	1				1	2	1	1	1	1	10
since 1981	1				2	1	2	2	3		2		13
Total	2	2	1		2	1	4	4	4	2	4	1	27

Fig. 63: Distribution of *Plagionotus arcuatus* and colonised localities in Luxembourg.

In the regions neighbouring Luxembourg, it is widespread but in slow regression everywhere (Fournel & Gehin, 1846; Godron, 1886; Colson, 1980b; Matter, 1998; Niehuis, 2001), being rare in Belgium (Lameere, 1894; Lempereur et al., 2000) and the French Ardennes (Ligeron, 2005), while it absent from the western Netherlands (Zeegers & Heijerman, 2008).

In Luxembourg, the species was sometimes considered as a pest for oaks at the beginning of the 20th century (Schuster, 1907b). Today, it is widespread in oak and mixed woods (Fig. 63) but little common. It seems to be the direct concurrent of *Clytus arietis*, prevailing in oak woods but succumbing in woods where beech is dominant. For this reason, it seems in regression in a great part of the country.

4.2.6.3 *Xylotrechus rusticus* (Linnaeus, 1758)

Xylotrechus rusticus Thoma, 2009: 153-154, Fig. 1; Köhler, 2013: 61, 63, 102; Vitali, 2013: 146; Vitali, 2014: 88.

Body size 9-20 mm. Elongated, slate-grey, covered with a marbled yellowish pubescence forming four longitudinal bands on the pronotum and three transverse zigzag bands on the elytra. The entire body is sometimes uniformly covered with such pubescence (var. *uniformis*) and the femurs are more or less red (var. *heroicus*).

Life-cycle lasts two years. Larvae bore dead trunks of broadleaf trees, especially poplars; pupation occurs in wood in spring. Adults can be observed running or mating on fallen trunks during sunny days from late spring to mid-summer (Fig. 64).

Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Betula*, *Ulmus*, *Juglans*, *Sorbus*, *Acer*, *Salix*, *Populus*, *Tilia*, *Fraxinus*.

Parasitoids: *Ephialtes manifestator* (Linnaeus, 1758), *Heterischnus filiformis* (Gravenhorst, 1829) (Ichneumonidae); *Helcon tardator* Nees, 1814 (Braconidae).

Eurasian species, widespread from Spain to Japan.

In the regions neighbouring Luxembourg, it shows a scattered distribution. According to Colson (1980b), this might be due to its cryptic pattern and behaviour, but probably the scattered availability of adequate hosts is another important reason. The species is unknown from the Saarland

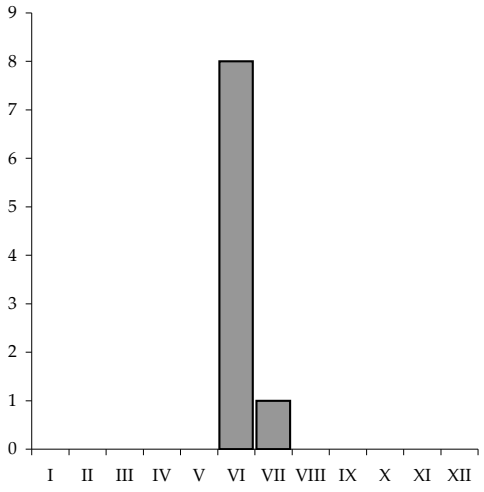


Fig. 64: Phenology of *Xylotrechus rusticus* in Luxembourg.

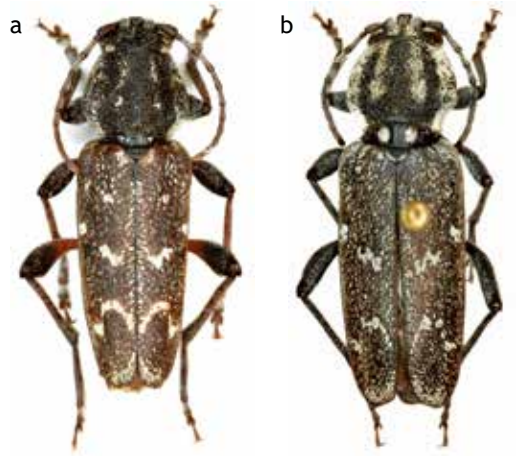
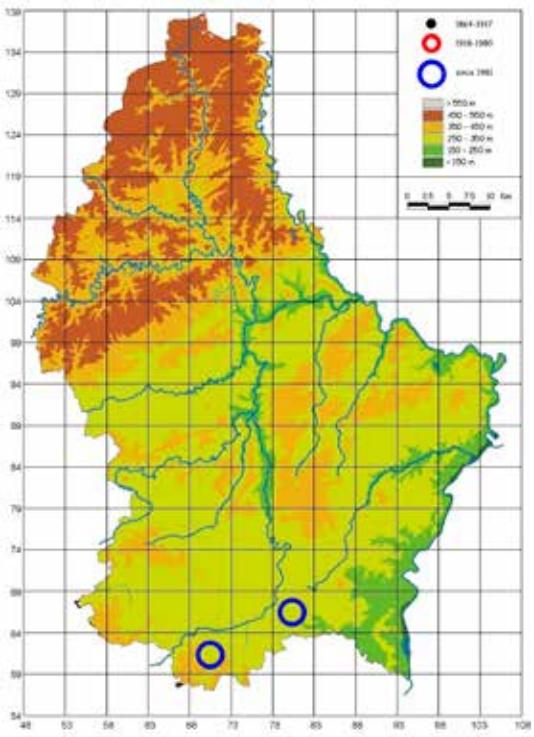


Fig. 65: *Xylotrechus rusticus*, a. Male, b. Female, Russia (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981									2				2
Total									2				2

Fig. 66: Distribution of *Xylotrechus rusticus* and colonised localities in Luxembourg.

and only known in south-eastern Rhineland-Palatinate (Niehuis, 2001), little common in Alsace (Matter, 1998), rare and only known for poor data in northern Lorraine (Fournel & Gehin, 1846; Godron, 1886; Colson, 1980b), apparently absent for the French Ardennes (Ligeron, 2005) and the Netherlands (Zeegers & Heijerman, 2008). In Belgium, it was once considered as very rare and localised (Lameere, 1894), but the distribution map of the local saproxylic beetles (Drumont & Grootaert, 2011) provides a fairly large distribution with recent data as well (Lempereur et al., 2000).

In Luxembourg, the species has been very recently discovered in the extreme south of the country (Fig. 66), where it seems to be locally abundant. Another locality has lately confirmed and widened the known distribution; however, the origin of these specimens (recently introduced or finally evidenced species) remains still uncertain.

4.2.6.4 *Xylotrechus arvicola* (Olivier, 1795)

Xylotrechus arvicola Mousset, 1969: 170; Mousset, 1973: Map. 444; Vitali, 2013: 146.

Body size 8-21 mm. Elongated; limbs and elytral base testeceous; body dull black, covered with a pattern of yellow pubescence disposed as follows: a spot at each angle of the pronotum; a basal band, two C- or J-shaped pre-median bands united along the suture, two post-basal spots and

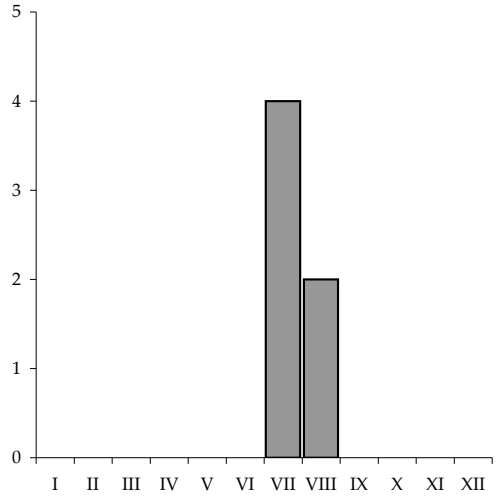


Fig. 67: Phenology of *Xylotrechus arvicola* in Luxembourg.

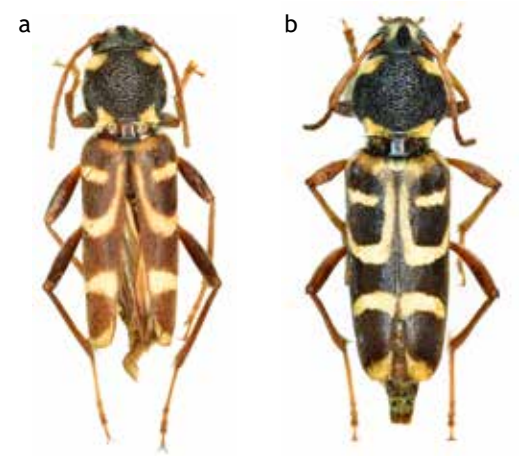


Fig. 68: *Xylotrechus arvicola*, a. Male, Lellingen (coll.Mnhn), b. Female, Italy (author's coll).

two post-median transverse bands on the elytra. Scutellum covered with a yellow pubescence. The post-basal spots are oblique in males and transverse in females. Fairly stable.

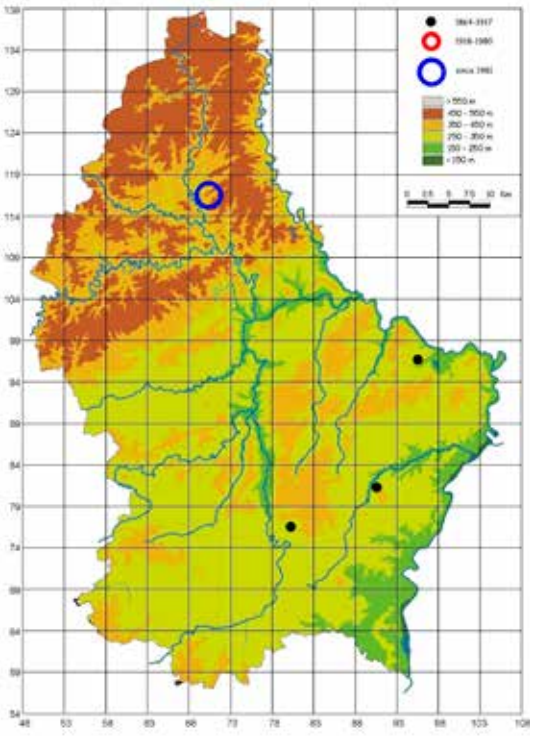
The species is very similar to the common *Clytus arietis* (4.2.6.4), showing an analogue pattern. Nonetheless, this latter species always has a black elytral base and a Λ-shaped pre-median yellow band.

Life-cycle lasts two years. Larvae bore dead branches of broadleaf trees, especially oaks and fruit trees; sometimes recorded as a pest for the vineyards in Spain (Moreno et al., 2004). Pupation occurs in the wood in spring. Adults can be observed running quickly on trunks during sunny days from late spring to mid summer (Fig. 67). Usually, they are rarely observed, while they may be more easily collected through sweet traps or rearing.

Host plants: *Platanus*, *Castanea*, *Fagus*, *Quercus*, *Betula*, *Corylus*, *Carpinus*, *Ostrya*, *Ulmus*, *Morus*, *Ficus*, *Rosa*, *Crataegus*, *Pyrus*, *Malus*, *Sorbus*, *Prunus*, *Vitis*, *Populus*, *Tilia*.

Parasitoids: *Heterischnus filiformis* (Gravenhorst, 1829) (Ichneumonidae); *Doryctes leucogaster* (Nees, 1834) (Braconidae); *Stephanus serrator* (Fabricius, 1798) (Stephanidae).

Western Palaearctic thermophilic species, widespread from North Africa to Kazakhstan, northwards rarefying, absent from Great Britain and Scandinavia.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1		1	1		3
1918-1980													0
since 1981		1											1
Total		1						1		1	1		4

Fig. 69: Distribution of *Xylotrechus arvicola* and colonised localities in Luxembourg.

In the regions neighbouring Luxembourg, it was unknown until the end of the 19th century, being recorded for the first time in Rhineland-Palatinate only in 1894 (Niehuis, 2001). In Belgium, the species was recorded as fairly common nearby Liège (Lameere, 1885), but later, as rare and localised (Lameere, 1894). Nowadays, it is rare or possibly extinct from the Netherlands (Horion, 1974; Zeegers & Heijerman, 2008), very rare in Alsace (Matter, 1998) and absent from northern Lorraine (Fournel & Gehin, 1846; Godron, 1886; Colson, 1980b) and the French Ardennes (Ligeron, 2005). This species is evidently rare because of the humid climatic conditions; nonetheless, the unusual behaviour and the possibility that some specimens have been overlooked due to their similarity to the common *Clytus arietis* might have made it less common than it actually is.

Collected by V. Ferrant in several localities of the Gutland before WWI, this species seemed to be extinct from Luxembourg. Nonetheless, a pair was collected through a Malaise trap in the canton of Wiltz in the August of 2000 (Fig. 69), proving that this species is not extinct but more widespread than currently supposed.

4.2.6.5 *Clytus arietis* (Linnaeus, 1758)

Clithus (sic!) Ferrant, 1897: 132; *Clythus* (sic!) *arietis* Bricher, 1903: 162. *Clytus arietis* Ferrant, 1907a: 303, Fig. 29; Schuster, 1907b: 100; Ferrant, 1911: 67, Fig. 31; Mousset, 1969: 170; Mousset, 1973: Map. 394; Haagen, 1986: 49; Gerend et al., 2007: 290; Köhler, 2009: 62, 110; Köhler, 2013: 63, 102; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 217.

Body size 6-15 mm. Elongated; limbs testeceous except for the dark profemurs and antennal apices; body dull black, covered with a pattern of yellow pubescence disposed as follows: a narrow band at the apical and basal margin of the pronotum; two post-basal transverse spot, a pre-median Λ-shaped band and two post-median transverse bands on the elytra. Scutellum covered with a yellow pubescence. Stable; some males can show dark to black femurs (var. *gazella*). Small specimens often show oblique, rather than straight, post-basal spots, which make them similar to other European species not present in the regions neighbouring Luxembourg.

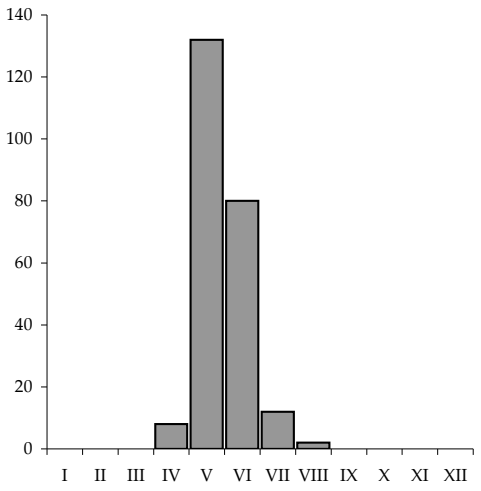


Fig. 70: Phenology of *Clytus arietis* in Luxembourg.

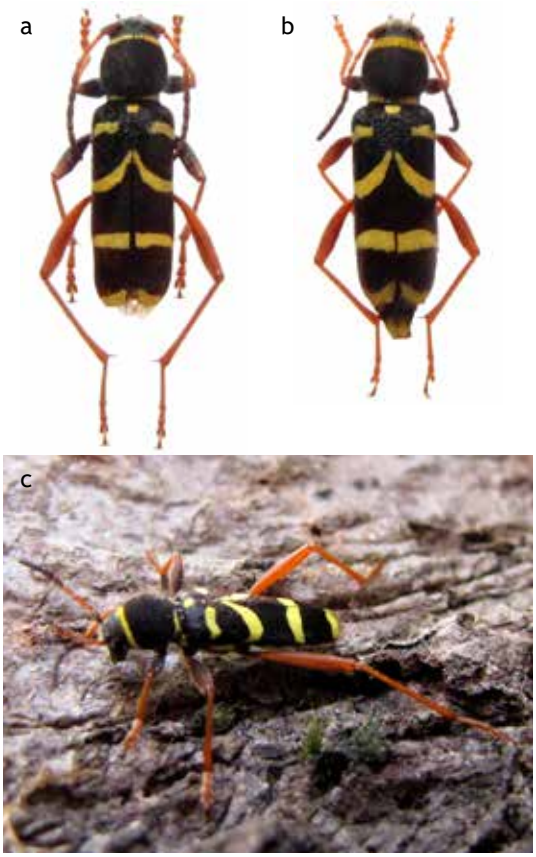
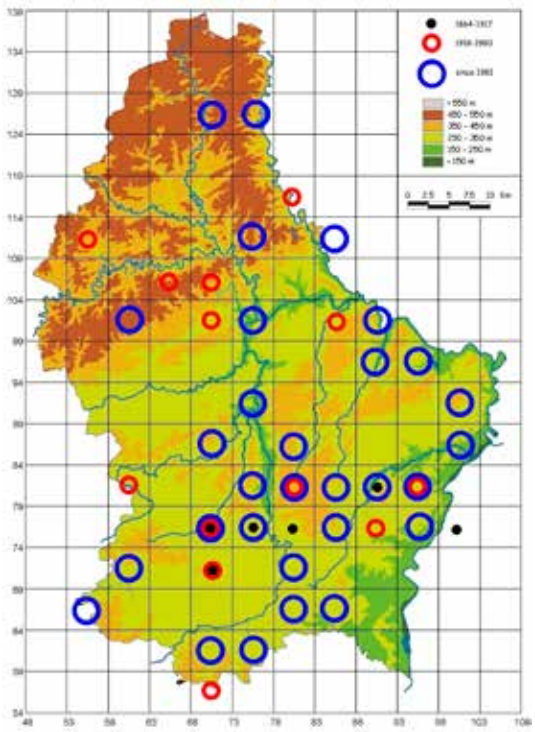


Fig. 71: *Clytus arietis*, a. Male, b-c. Female, Bambësch (author's coll.).

The species can be confused with the rare *Xylotrechus arvicola* (4.2.6.4), showing an analogue pattern. Nonetheless, this last species always shows elytra with a reddish base and with two C- or J-shaped pre-median bands united along the suture.

Life-cycle lasts two years. Larvae live in dead branches and trunks of numerous broadleaf trees and bushes, exceptionally of junipers. Pupation occurs in the wood in autumn or in spring. Adults can be observed running on white flowers or fallen stems from April to mid-summer (Fig. 70). They regularly emerge from firewood and can be found on the walls of woodsheds or houses even in winter.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Corylus*, *Carpinus*, *Ostrya*, *Ulmus*, *Morus*, *Ficus*, *Juglans*!, *Rosa*, *Crataegus*, *Amelanchier*, *Prunus*!, *Robinia*, *Acer*, *Ilex*, *Frangula*, *Vitis*, *Salix*, *Populus*!, *Fraxinus*, *Juniperus*.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	3			2		6
1918-1980	1	3	3				3	3	1		2		16
since 1981	3		2	1	2	4	6	13	8	6	7		52
Total	4	3	5	1	2	4	9	18	9	6	8		69

Fig. 72: Distribution of *Clytus arietis* and colonised localities in Luxembourg.

Parasitoids: *Neoxorides nitens* (Gravenhorst, 1829), *Rhimphoctona teredo* (Hartig, 1847) (Ichneumonidae); *Wroughtonia spinator* (Lepeletier & Audinet-Serville, 1825) (Braconidae).

Euro-Turanian species, widespread from Spain to Turkmenistan with a Caspian subspecies (*lederi* Ganglbauer, 1881). The Caucasian subspecies *oblitus* Roubal, 1936, based on small specimens characterised by oblique post-basal spots, seems doubtful.

In the regions neighbouring Luxembourg, the species is widespread and common nearly everywhere (Fournel & Gehin, 1846; Godron, 1886; Gaspar & Verstraeten, 1972; Colson, 1980b; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008), except for the High Vosges (Matter, 1998) and the Belgian Ardennes (Lameere, 1894).

In Luxembourg, *Clytus arietis* has been well-known for a long time, being mentioned several times as a common pest of dead wood (Ferrant, 1897, 1907a, 1911; Bricher, 1903; Schuster, 1907b). The species is very common and widespread throughout the country, especially in mixed and beech woods around the capital (Fig. 72). Its presence and distribution are the country is statistically stable.

4.2.6.6 *Chlorophorus figuratus* (Scopoli, 1763)

Chlorophorus figuratus Mousset, 1969: 170; Mousset, 1973: Map. 392; Vitali, 2013: 146.

Body size 6-14 mm. Elongated; entirely black, elytra covered with a pattern of grey pubescence disposed as follows: two humeral elongated spots, two C- or J-shaped pre-median bands united along the suture and including the scutellum and two post-median transverse bands. Scutellum covered with a grey pubescence. Stable.

The species reminds of some other local Clytini, from which it differs in the grey, rather than yellow, pattern. The only species with which it might be confused is *Chlorophorus sartor* (4.2.6.7), which differs in the smaller size, the white pattern and the lacing of the humeral spots.

Life-cycle lasts two years. Larvae bore dead but not-fallen branches of several broadleaf trees and bushes, except for beech; pupation occurs in wood in early spring. Adults occur on white flowers from late spring to mid-summer; usually, single

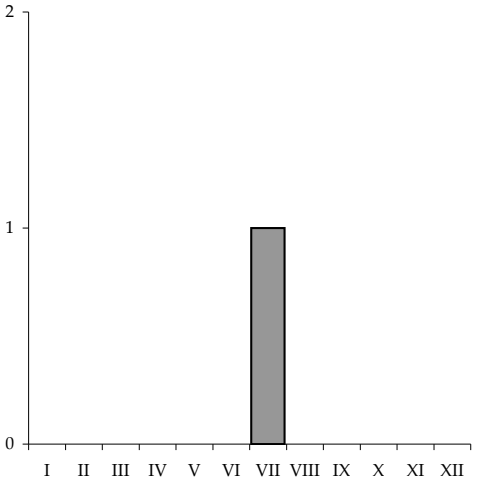


Fig. 73: Phenology of *Chlorophorus figuratus* in Luxembourg.

Fig. 74: *Chlorophorus figuratus*, Male, Ansembourg (coll. Mnhn).

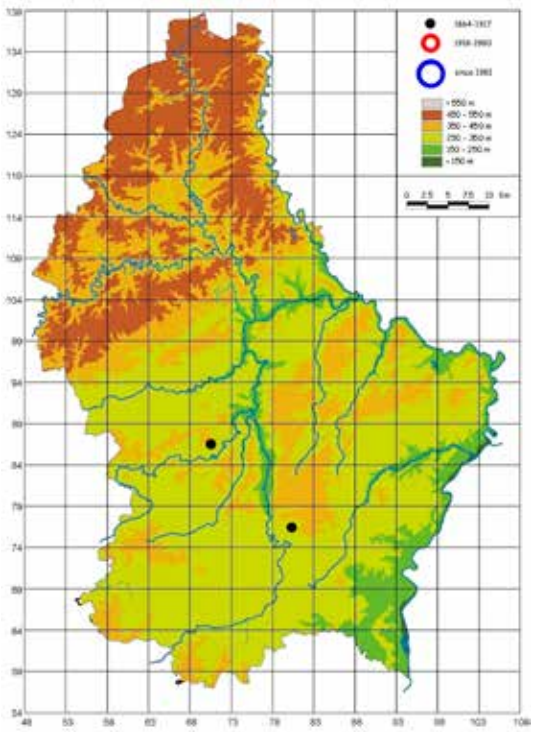
specimens are found. As other *Chlorophorus*-species, they are active on open fields, needing high summer temperatures.

Host plants: *Castanea*, *Quercus*, *Betula*, *Corylus*, *Carpinus*, *Ulmus*, *Rosa*, *Crataegus*, *Pyrus*, *Prunus*, *Robinia*, *Pistacia*, *Euonymus*, *Salix*, *Populus*, *Viburnum*.

Euro-Turanian species, widespread from Portugal to southern Urals and Kazakhstan, generally with hilly or mountain distribution. Naturally absent from the British Isles and Scandinavia, it is extinct or in strong regression all over northern Europe.

In the regions neighbouring Luxembourg, it reached the Walloon Brabant and the Eifel, where it was however rare during the 19th century. The species disappeared from Westphalia since 1882 and from North-Rhine since 1927, while it has been never recorded in the Saarland (Niehuis, 2001). In southern Belgium, it was very rare in the South-east (Fairmaire, 1885, 1894), where it is extinct today. Once common in northern French Lorraine (Godron, 1866), it was little common, but extremely localised and apparently related to orchards until 30 years ago (Colson, 1980b). It is still widespread in xerothermic localities of the Alsatian plains and mountains (Matter, 1998).

In Luxembourg, this species has been known by two specimens collected in the middle of the country during the 19th century (Fig. 75). The oldest one was collected by Camille van Volxem between 1864 and 1872. This sample, currently preserved in the IRSN Brussels, is simply labelled



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917						1		?					1
1918-1980													0
since 1981													0
Total						1		?					1

Fig. 75: Distribution of *Chlorophorus figuratus* and colonised localities in Luxembourg.

"G.D. Luxembourg" but, considering the localities investigated by this Belgian entomologist, it was most likely collected in the middle to southern parts of the country. A second specimen (Fig. 74) was collected by V. Ferrant near Ansembourg (Tuntange), most likely before WWI. Probably, this locality should be referred to the fields around the New Castle, which were and still are planted with orchards. The species should be considered as currently extinct from Luxembourg.

4.2.6.7 *Chlorophorus sartor* (O. F. Müller, 1766)

Chlorophorus sartor Mousset, 1969: 170; Mousset, 1973: Map. 393; Vitali, 2013: 146.

Body size 5-9 mm. Small, elongated; entirely black, elytra with apex and two transversal ΛΛ-shaped bands of white pubescence. Stable.

The species reminds of some other local Clytini, from which it differs in the white, rather than yellow, pattern. The only species with which it might be confused is *Chlorophorus figuratus* (4.2.6.6), which differs in the larger size, the grey pattern and the presence of a humeral spot.

Life-cycle lasts two years. Larvae bore dead branches of many broadleaf trees and bushes; pupation occurs in wood in early spring. Adults occur often numerous on white flowers, especially Apiaceae from late spring to mid-summer.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Ostrya*, *Ulmus*, *Celtis*, *Ficus*, *Juglans*, *Crataegus*, *Prunus*, *Ceratonia*, *Cercis*, *Cytisus*, *Gleditsia*, *Robinia*, *Elaeagnus*, *Pistacia*, *Cornus*, *Paliurus*, *Salix*.

Euro-Turanian thermophilic species, widespread in Mediterranean islands as well, generally with plain or hilly distribution. At the northern limit of its distribution, the species seems localised and apparently related to orchards.

In the regions neighbouring Luxembourg, it is mostly in regression or extinct. Once considered as common in north-eastern Rhineland-Palatinate (Brahm, 1790), it has been progressively reduced to the warmest localities of the South-east, while the only record from Saarland is prior to 1896 (Niehuis, 2001). Once common in northern Lorraine (Godron, 1866), it was considered as little common to very rare until 30 years ago (Colson, 1980b). After having been collected in two local-

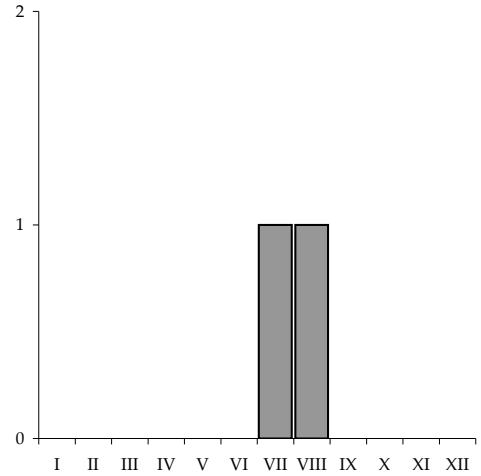


Fig. 76: Phenology of *Chlorophorus sartor* in Luxembourg.

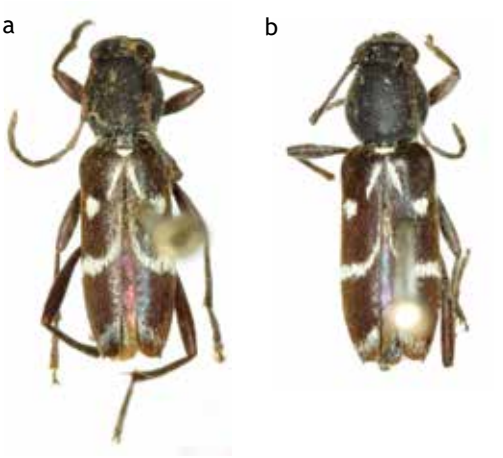
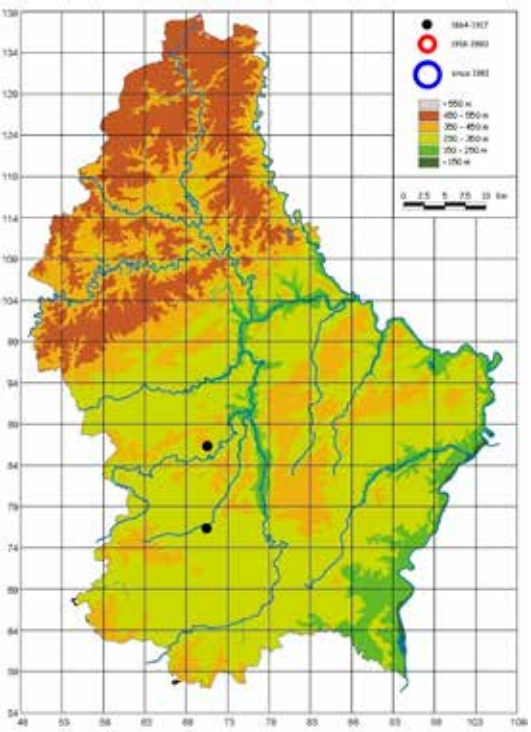


Fig. 77: *Chlorophorus sartor*, a. Male, Mamer, b. Female, Ansembourg (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917						1	1						2
1918-1980													0
since 1981													0
Total						1	1						2

Fig. 78: Distribution of *Chlorophorus sartor* and colonised localities in Luxembourg.

ities of Wallonia, the species was considered as extinct from Belgium already at the end of the 19th century (Fairmaire, 1894), but it was collected again in 1938 on the High Fens (Collart, 1941). It is still widespread in xerothermic localities of Alsatian plains and mountains (Matter, 1998).

In Luxembourg, the species is known thanks to the two specimens collected by Ferrant near Ansembourg and Mamer (Fig. 77-78). While the former sample is probably to be referred to the orchards around the New Castle, the latter specimen is difficultly referable to Thillsmillen, as it occurs to other ones analogously labelled, since the locality is rather woody. However, it should have been collected before 1890. *Chlorophorus sartor* became extinct from Luxembourg, possibly already at the end of the 19th century, analogously to the neighbouring regions.

4.2.6.8 *Chlorophorus glabromaculatus* (Goeze, 1777)

Chlorophorus glabromaculatus Vitali, 2011b: 81, 84 Fig. 11; Vitali, 2013: 146.

Body size 9-18 mm. Elongated; entirely covered with a pubescence sulphur yellow on the dorsal side and grey on the ventral side and limbs; each elytron with 4 brown to black spots, one humeral and three discal, longitudinally aligned. Stable, though varieties with supplemental or missing points have been described.

Life-cycle lasts two years. Larvae bore dried branches and small trunks of several broadleaf trees, exceptionally of conifers. Pupation occurs in wood in early spring. Adults are found on host plants or white flowers from mid-spring to mid-summer; nonetheless, they are much more common in urban habitats, emerged from firewood, building wood or furniture. In fact, larvae manage to survive in dry wood up to 20 years (Villiers, 1978).

Host plants: *Castanea*, *Quercus*, *Alnus*, *Ulmus*, *Zelkova*, *Morus*, *Ficus*, *Juglans*, *Cydonia*, *Pyrus*, *Prunus*, *Mimosa*, *Robinia*, *Acer*, *Vitis*, *Salix*, *Populus*, *Pinus*, *Juniperus*.

Parasitoids: *Pristaulacus chlapowskii* Kieffer, 1900 (Aulacidae); *Doryctes leucogaster* (Nees, 1834) (Braconidae).

Predators: *Opilo domesticus* (Sturm, 1837) (Cleridae).

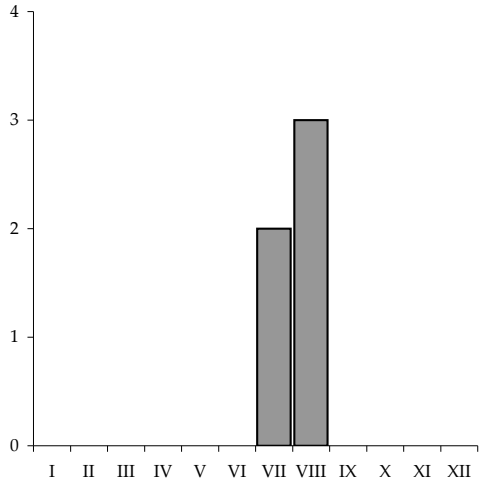
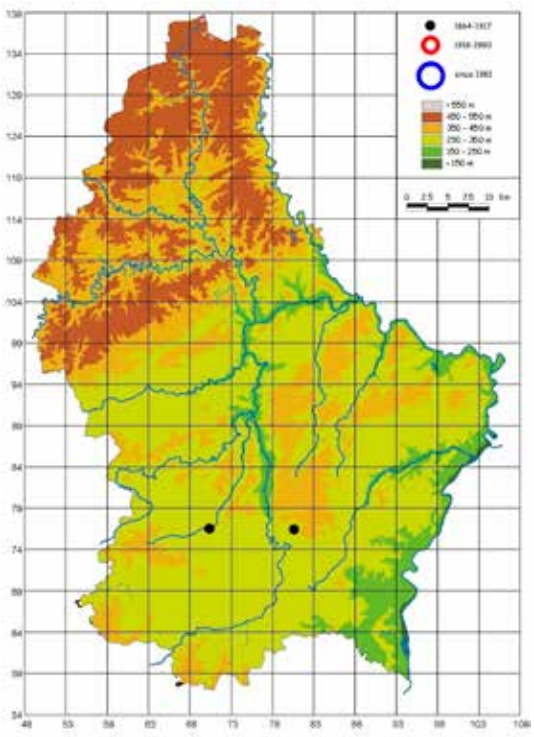


Fig. 79: Phenology of *Chlorophorus glabromaculatus* in Luxembourg.

The species is naturally widespread in the Western Circum-Mediterranean area but it has been intercepted or introduced in regions far from its original distribution, such as England (Nash, 1983) or even New Zealand (Blair, 1937). Its natural distribution is also complicated by the presence of a female form with grey elytra prevailing in the western part of its range, once called *pilosus* and today *glaucus*. This form is naturally present in North Africa, the southern part of the Iberian Peninsula and the Baleares. The isolated population of Provence (Var) is introduced, since it is focused in the surroundings of the international harbour of Marseille (Paulian, 1994). This form has evidently been introduced in Madeira, Canarias and Sardinia, where it was found close to the harbour of Cagliari only in 1995. Ignoring this dispersal capacity, Sama (1999) claimed that the contemporaneous presence of both forms in southern Sardinia implies to consider them as true species; nonetheless, he managed neither to evidence differential characters for males nor biological differences. The yellow form is present in the North Mediterranean from Dalmatia to Spain (González Peña et al., 2007), where it is even predominant (Vives, 1984) and not absent as Sama (2002) claimed. Populations having grey females could be accepted as *Chlorophorus glabromaculatus* ssp. *glaucus* (Fabricius, 1781) **n. comb.**

In the regions neighbouring Luxembourg, the species is not autochthonous but was signalised

Fig. 80: *Chlorophorus glabromaculatus*, a. Male, b. Female, Mamer (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	1					2
1918-1980													0
since 1981													0
Total							1	1					2

Fig. 81: Distribution of *Chlorophorus glabromaculatus* and colonised localities in Luxembourg.

several times since the 19th century. In Rhineland-Palatinate, it was always intercepted as synathrope until 1950, in the Saarland also in the 1980s (Niehuis, 2001). Never signalled from northern Lorraine, it was only once recorded from the Vosges (Fournel & Gehin, 1846), where the species is considered as absent today, as it occurs in Baden (Matter, 1998). It is considered as very rare in the French Ardennes (Ligeron, 2005), while it was intercepted in Wallonia until 1940 (Horion, 1974) and only once in the Netherlands, emerged from furniture (Zeegers & Heijerman, 2008).

In Luxembourg, the species has been known thanks to five specimens collected by V. Ferrant in Mamer and Luxembourg [city], most likely before WWI (Fig. 81). By considering the close emerging data and the collection localities, it is most probable that all specimens were collected in Ferrant's habitations.

4.2.7 Tribe Anaglyptini Lacordaire, 1869

4.2.7.1 *Anaglyptus mysticus* (Linnaeus, 1758)

Anaglyptus mysticus Mousset, 1969: 171 Mousset, 1973: Map. 385; Gerend et al., 2007: 290; Köhler, 2009: 62, 110; Köhler, 2011: 88, 131; Köhler, 2013: 63, 102; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 217.

Body size 6-14 mm. Elongated; black; elytra brick-red on the basal half, crossed by 3 fine whitish oblique lines in the middle and covered with a whitish pubescence on the apical fourth. The elytral base might be black in a variety (*albofasciatus*) still not collected in Luxembourg.

Life-cycle lasts two years. Larvae bore dried branches of many broadleaf trees; pupation occurs in wood in late summer or in autumn. Adults overwinter and emerge in mid-spring, being active in early or mid-summer (Fig. 82) on blossom bushes and flowers located in the proximity of woods.

Host plants: *Fagus*, *Quercus*, *Alnus*, *Corylus*, *Carpinus*, *Ulmus*, *Juglans*, *Rosa*, *Crataegus*, *Malus*, *Prunus*, *Robinia*, *Acer*, *Euonymus*, *Salix*, *Tilia*, *Sambucus*.

Parasitoids: *Aspigonus flavicornis* (Nees, 1834) (Braconidae).

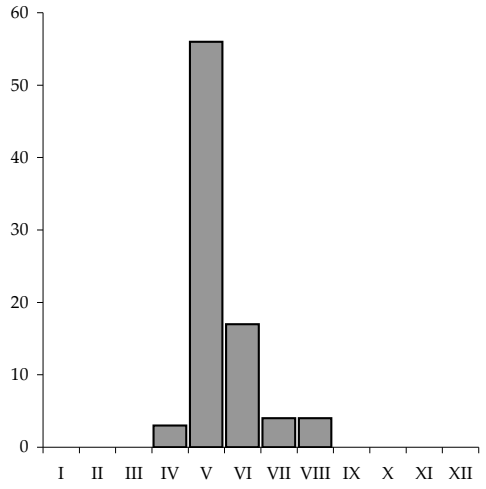


Fig. 82: Phenology of *Anaglyptus mysticus* in Luxembourg.

European species, widespread from Andalusia to the Caucasus, related to relatively fresh-humid hilly habitats, showing a preference to plains in the northern part of its distribution and to mountains in the southern part, where it is also getting rarer.

In the regions neighbouring Luxembourg, it is widespread everywhere but with different distribution and frequency. Known for a long time (Brahm, 1790) in Rhineland-Palatinate, it is widespread especially in plains, while it has been found in the Saarland only since 1950 (Niehuis, 2001). In northern Lorraine, the species was and

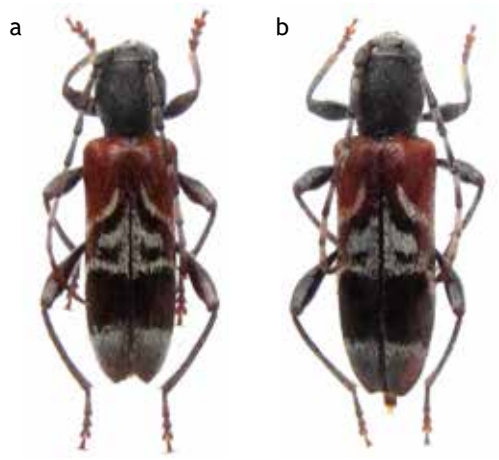
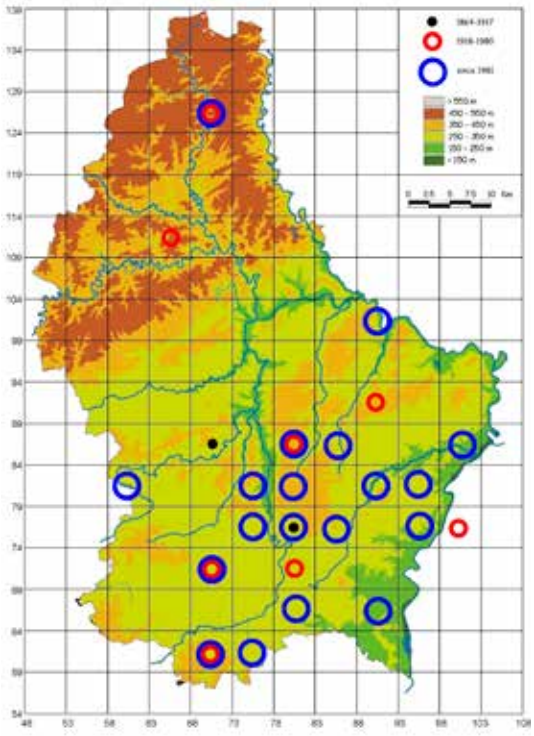


Fig. 83: *Anaglyptus mysticus*, a. Male, Sandweiler, b. Female, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917						1		1					2
1918-1980	1	1				1		4	1	1	1		10
since 1981	1					1	1	8	4	1	7	1	24
Total	1	1				2	1	12	5	2	8	1	32

Fig. 84: Distribution of *Anaglyptus mysticus* and colonised localities in Luxembourg.

remains rare (Godron, 1866; Colson, 1980b), such as in the French Ardennes (Ligeron, 2005) and in the Alsatian plains, while it becomes more common southwards, in hills and mountains (Matter, 1998). In Belgium, it is infrequent along the Ardennes but fairly common and widespread in the middle of the country (Fairmaire, 1894; Desière, 1969), and also in the Netherlands, along the German border, while it is rare elsewhere (Zeegers & Heijerman, 2008).

In Luxembourg, this species is widespread throughout the Gutland, where it is common and abundant, while it is very rare in the Oesling (Fig. 84). The adults, active during sunny days, are usually collected on Apiaceae or beating blossom bushes of *Crataegus*. Females have sometimes been collected on fallen trunks of beech. During the

19th century, adults were active until mid-August, while nowadays they can be found only until mid-June.

4.2.8 Tribe Molorchini Mulsant, 1863

4.2.8.1 *Molorchus minor* (Linnaeus, 1758)

Molorchus minor Mousset, 1969: 169; Mousset, 1973: Map. 408; Vitali, 2013: 146; Weitzel, 2014: 217.

Body size 6-16 mm. Elongated; black; elytra shortened, leaving visible the hind wings, brick-red on the disc and crossed by an oblique raised yellow vitta. Stable.

The species might be confused with *Molorchus umbellatarum* (4.2.8.2), which differs in the smaller size and the uniformly brownish elytra.

Life-cycle lasts two years. Larvae bore dead branches or roots of mountain Pinaceae; erroneously recorded from *Cupressus* and *Betula* (Bense, 1995). Pupation occurs in wood from mid to late summer. Adults overwinter and emerge in mid-spring, being active until early summer (Fig. 85) on blossom bushes and flowers. They can also be found on fallen trunks, where they result, however, fairly mimetic.

Host plants: *Abies*, *Picea*, *Larix*, *Pinus*.

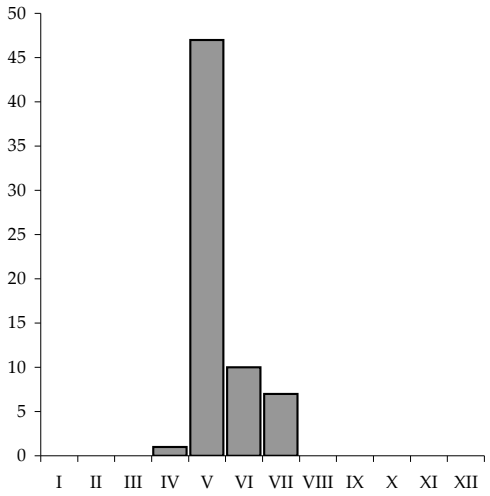


Fig. 85: Phenology of *Molorchus minor* in Luxembourg.

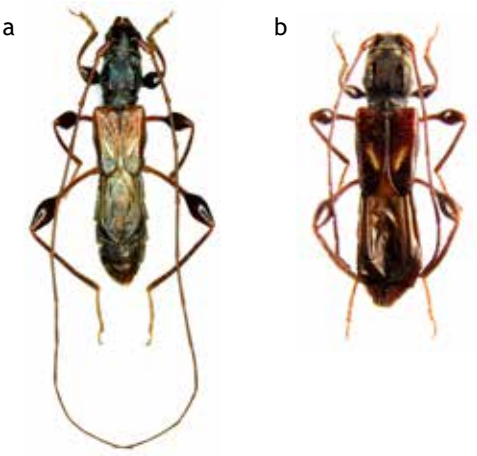
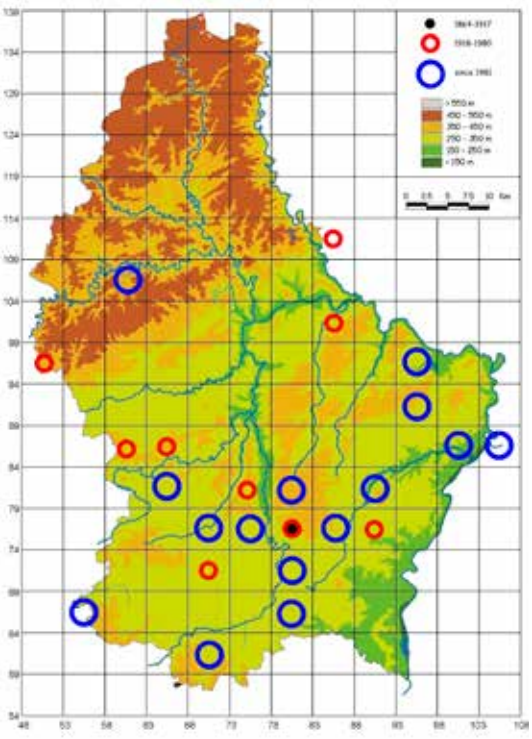


Fig. 86: *Molorchus minor*, a. Male, Poland, b. Female, Differdange (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1					1
1918-1980			1	1	1		2	4		1			10
since 1981		1					1	7	3	2	4		18
Total		1	1	1	1		3	12	3	3	4		29

Fig. 87: Distribution of *Molorchus minor* and colonised localities in Luxembourg.

Parasitoids: *Xorides gracilicornis* (Gravenhorst, 1829), *X. niger* (Pfeffer, 1913) (Ichneumonidae); *Vipio nominator* (Fabricius, 1793) (Braconidae).

Eurasian species, widespread from the Pyrenees to Japan, there with an isolated subspecies in the Kamikochi Mts. (*fuscus* Hayashi, 1955), mountain species in the southern part of its distribution, introduced with plantations of spruce in the plains of northern Europe, Great Britain (Twinn & Harding, 1999) and Greenland (Bocher, 1988).

In the regions neighbouring Luxembourg, it is autochthonous only in the Vosges and the southern of Rhineland-Palatinate but it is widespread everywhere. In Rhineland-Palatinate, it has been known for a long time (Brahm, 1790), while it has been introduced in the Saarland only since 1953 (Niehuis, 2001). In northern Lorraine, the species is little common today (Colson, 1980b) but it was even rarer during the 19th century (Fournel & Gehin, 1846). Apparently unknown from the French Ardennes (Ligeron, 2005) and once very rare in Belgium (Fairmaire, 1894), it was still uncommon in more recent times as well (Collart, 1941; Desière, 1969; Lempereur et al., 2000). In contrast, it is fairly common in the eastern half of the Netherlands (Zeegers & Heijerman, 2008) and in the Alsatian coniferous forests (Matter, 1998).

In Luxembourg, this species was collected for the first time around the capital, probably at the end of the 19th century or, however, before WWI. After a first diffusion throughout the country, it seems today mainly present in the Gutland (Fig. 85), where it is generally little common but sometimes locally abundant on blossom Crataegus.

4.2.8.2 *Molorchus umbellatarum* (Schreiber, 1759)

Molorchus umbellatarum Gerend & Meyer, 2007: 12; Vitali, 2013: 146; Vitali, 2014: 88.

Body size 5-9 mm. Small, elongated; brownish black; elytra brownish on the disk, shortened, leaving visible the hind wings. The femoral base might be brownish black (typical form) or yellow (var. diversipes).

The species might be confused with *Molorchus minor* (4.2.8.1), which differs in the larger size and the elytra brick-red, crossed by an oblique yellow vitta.

Life-cycle lasts two years. Larvae bore recently dead, dried branches of broadleaf trees and bushes, especially Rosaceae; pupation occurs in wood in mid-spring. Adults are diurnal on white blossom flowers and bushes of woody localities in June (Fig. 88). Aruncus and low plants of Anthriscus seem to be the preferential flowers.

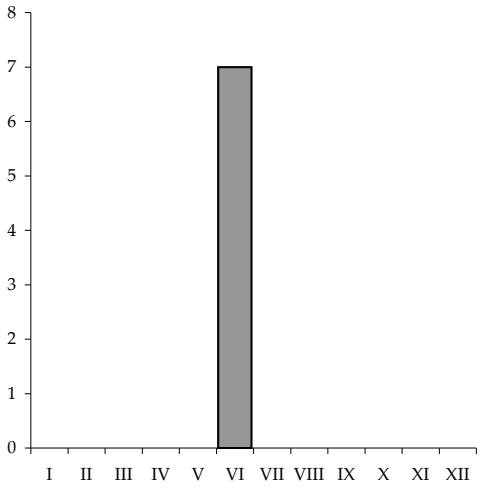


Fig. 88: Phenology of *Molorchus umbellatarum* in Luxembourg.

Host plants: *Castanea*, *Rosa*, *Rubus*, *Crataegus*, *Malus*, *Prunus*, *Amelanchier*, *Cotinus*, *Cornus*, *Euonymus*, *Frangula*, *Viburnum*.

Euro-Anatolian species, widespread from the Pyrenees to Anatolia and the Caucasus.

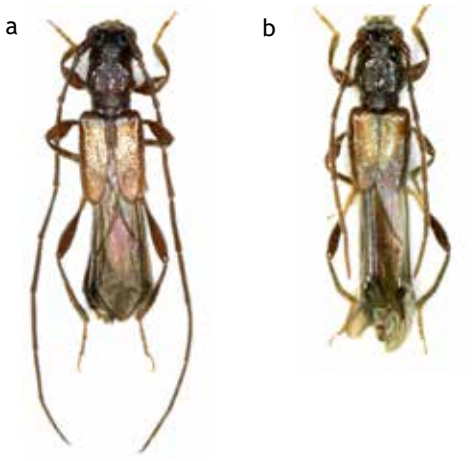
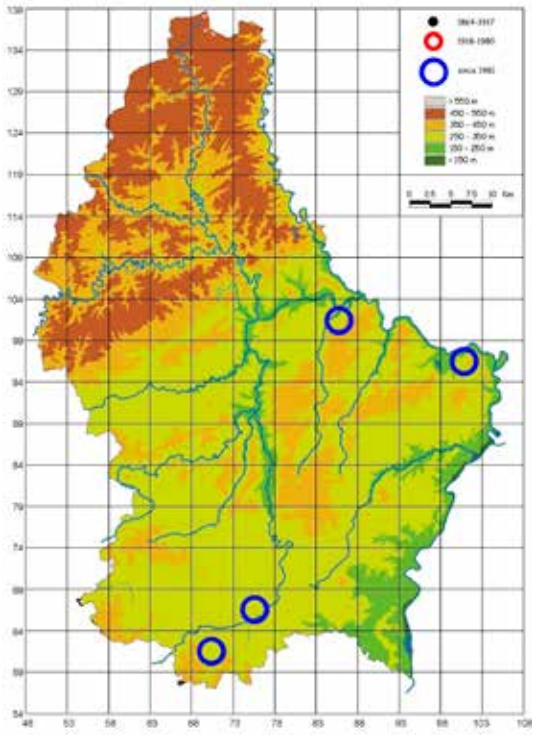


Fig. 89: *Molorchus umbellatarum*, a. Male, Gehansbësch (author's coll.), b. Female, Gehausebësch (coll. Mnhn).

In the regions neighbouring Luxembourg, it is sporadically widespread and generally uncommon. In Rhineland-Palatinate, it is present especially in plains, where it seems to be in expansion, while it was firstly collected in the Saarland only in 1996 (Niehuis, 2001). In northern Lorraine, the species was recorded only recently (Colson, 1980b), whereas it is apparently in expansion in the Alsatian plains and hills (Matter, 1998), where it was considered as rare for a long time (Fournel & Gehin, 1846). It is still unknown from the French Ardennes (Ligeron, 2005), while it is rare in Belgium (Fairmaire, 1894) and in the South-east of the Netherlands (Zeegers & Heijerman, 2008).

In Luxembourg, *Molorchus umbellatarum* was recorded for the first time by Gerend & Meyer (2007), without particular remarks. The species seems to be locally very rare and limited to the warmest localities of Gutland and at the German border (Fig. 90). However, it is an ombrophilic species with a short phenology, which most likely is more widespread as it currently looks like.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981									2	2			4
Total									2	2			4

Fig. 90: Disribution of *Molorchus umbellatarum* and colonised localities in Luxembourg.

4.2.9 Tribe Graciliini Mulsant, 1839

4.2.9.1. *Gracilia minuta* (Fabricius, 1781)

Gracilia minuta Ferrant, 1907a: 299-300, Fig. 26; Ferrant, 1911: 64, Fig. 28; Mousset, 1969: 169; Mousset, 1973: Map. 396; Vitali, 2013: 146.

Body size 2.5-7 mm. Minute, cylindrical, flat, throughout brownish.

The species might be superficially confused with *Obrium brunneum* (4.2.11.1), from which it differs in the smaller eyes and the pronotum laterally unarmed.

Life-cycle lasts one year. Larvae bore dry thin twigs of numerous broadleaf trees and bushes, rarely of conifers; pupation occurs in wood in spring. Adults are found from mid-spring to mid-summer on the host plants. Curiously, Ferrant (1907a, 1911) stated "mid-June" as adult phenology, while all specimens of his collection were found in July (Fig. 91). The species was, however, much more frequently collected in houses, emerging from wickerwork (*Salix viminalis* L.) manufactures.

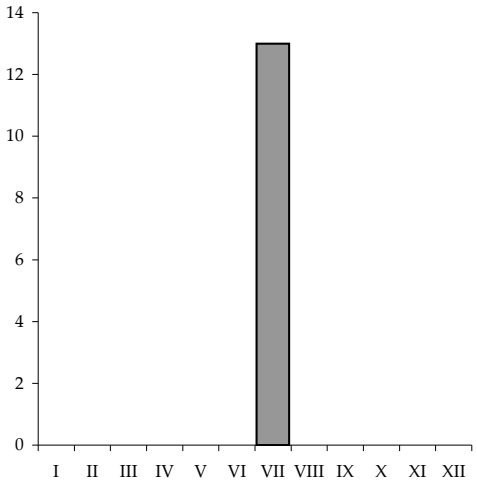
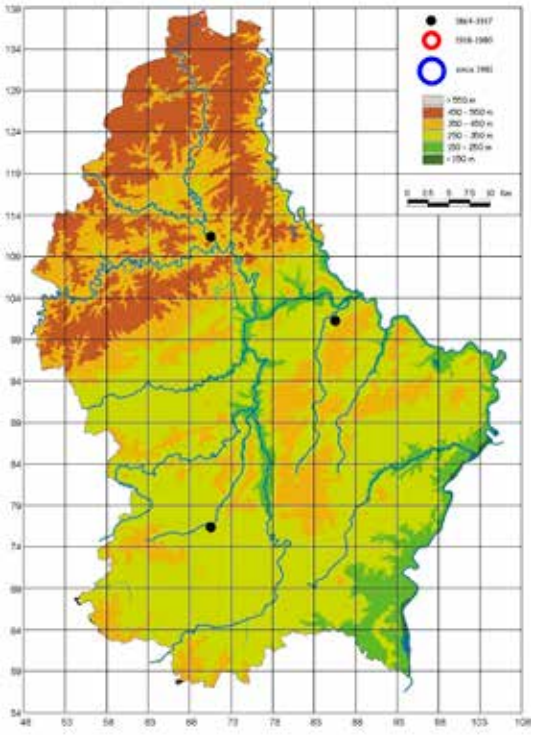


Fig. 91: Phenology of *Gracilia minuta* in Luxembourg.

Fig. 92: *Gracilia minuta*, Beaufort (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	1		1			3
1918-1980													0
since 1981													0
Total							1	1		1			3

Fig. 93: Distribution of *Gracilia minuta* and colonised localities in Luxembourg.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Betula*, *Corylus*, *Carpinus*, *Ficus*, *Juglans*, *Rosa*, *Rubus*, *Crataegus*, *Malus*, *Sorbus*, *Prunus*, *Ceratonia*, *Citrus*, *Pistacia*, *Aesculus*, *Acer*, *Euonymus*, *Frangula*, *Rhamnus*, *Salix*, *Cedrus*, *Pinus*.

Parasititoids: *Dolichomitus agnoscendus* (Roman, 1939) (Ichneumonidae); *Eubazus macrocephalus* Nees, 1814 (Braconidae); *Aprostocetus emesa* (Walker, 1839) (Eulophidae).

Probably a Circum-Mediterranean species, intercepted or more or less stably introduced all over Europe, Greenland, America and Australia.

In the regions neighbouring Luxembourg, it is generally synanthropic, though rare catches in nature are also known. In Rhineland-Palatinate, the species was recorded since the second half of the 19th century, mostly synanthropic, but it seems to be acclimatised in some southern xerothermic localities. In the Saarland, only one sample dating 1983 is known (Niehuis, 2001). In northern Lorraine, the species was recorded, though rare or very rare, from several localities during the 19th century (Fournel & Gehin, 1846; Godron, 1866) but not in more recent times (Colson, 1980b), while it remains rare and sporadic in Alsace (Matter, 1998). Recorded as rare from the French Ardennes (Ligeron, 2005), it was once considered as very common (Fairmaire, 1894), or as more or less widespread everywhere in Belgium (Collart, 1941); nonetheless, Drumont & Grootaert (2011) provided only two data later than 1950 and two others later than 1980. It is widespread everywhere but rare and synanthropic in the Netherlands (Zeegers & Heijerman, 2008).

In Luxembourg, the species has been known due to two small series collected by V. Ferrant in Mamer and Luxembourg [city], probably in his own habitations, before WWI (Fig. 93). A last specimen coming from Beaufort completes this group of ancient findings. The beetle was considered as a pest for osiers at the beginning of the 20th century (Ferrant, 1907a, 1911), but no further specimens have been found in more recent times. Most likely, it has never been acclimatised in the country.

4.2.10 Tribe Stenopterini Fairmaire, 1868

4.2.10.1 *Stenopterus rufus* (Linnaeus, 1767)

Stenopterus rufus Vitali, 2011b: 81, 84 Fig. 12; Vitali, 2013: 146; Weitzel, 2014: 217.

Body size 7-16 mm. Elongated, elytra posteriorly restricted and dehiscent. Black, pronotum with golden pubescence at both basal and apical margins; elytra nearly entirely testaceous; legs reddish except for the black femurs; antennae mostly reddish; abdomen ringed of yellow pubescence. Locally fairly stable: the metafemurs are entirely red (typical form) or more or less black (var. *geniculatus* **rest. status**), while the antennae are occasionally entirely black (var. *nigricornis*). Varieties with entirely red femora are only widespread in the warmest localities of southern Europe.

Life-cycle lasts two years. Larvae bore dry branches of broadleaf trees and bushes; pupation occurs in wood in spring. Adults are found on low flowers (typically *Achillea* or *Daucus carota* L.) in xerothermic localities, usually locally abundant, from late spring to mid-summer (Fig. 94).

Host plants: *Quercus*, *Castanea*, *Corylus*, *Ostrya*, *Juglans*, *Pistacea*, *Paliurus*.

Euro-Turanian species, widespread from Portugal to Turkmenistan, with a subspecies focused on Syria (*syriacus* Pic, 1892) and another one on the south of

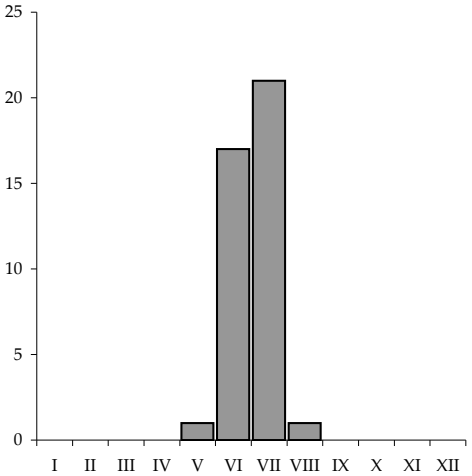


Fig. 94: Phenology of *Stenopterus rufus* in Luxembourg.

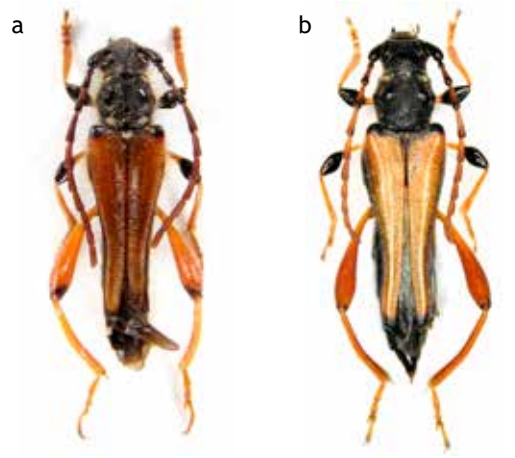
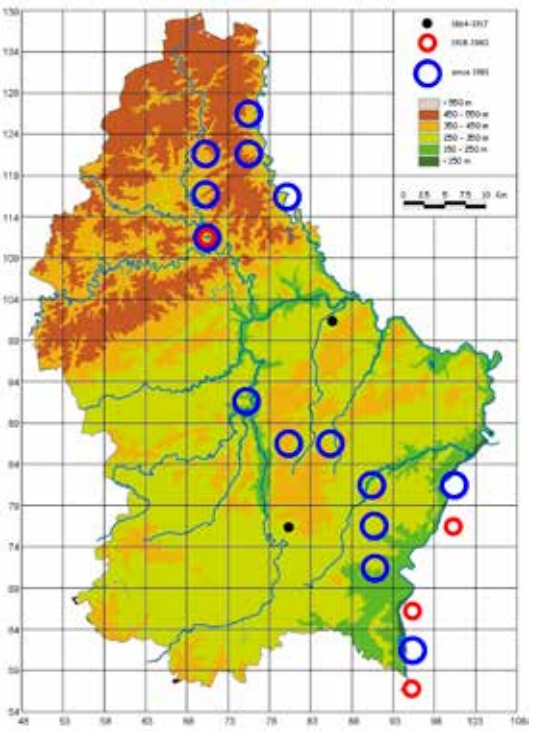


Fig. 95: *Stenopterus rufus*, a. Male, Göbelsmühle (coll. Mnhn), b. Female, Munshausen (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1		1			2
1918-1980			1								1	2	4
since 1981	4	1	2			1					6	3	17
Total	4	1	2			1		1		1	7	5	22

Fig. 96: Distribution of *Stenopterus rufus* and colonised localities in Luxembourg.

the Caspian Sea (*transcaspicus* Lazarev, 2008). The subspecies "*geniculatus* Kraatz, 1863" claimed for the Balkans and Anatolia (Sama, 2002) is illusory since specimens with analogue characters are also frequently collected from Spain to Germany or the Netherlands, where they are even predominant (Everts, 1922). Moreover, perfectly typical ones are found in the Balkans, Anatolia and even in the typical series of *geniculatus* (absurdly mentioned as "decoloured specimens").

In the regions neighbouring Luxembourg, the species is sporadically widespread but fairly common nearly everywhere. In eastern Rhineland-Palatinate, it was common for a very long period (Brahm, 1790) but it started spreading westwards only in the 1920s (Horion, 1974). Nowadays, it is largely widespread and common, except for the mountains (Niehuis, 2001). Possibly originating from French populations, the species was recorded for the first time in the Saarland only in 1896, where it is today limited to the southern part of the country (Niehuis, 2001). In northern Lorraine, it has been known for a long time (Fournel & Gehin, 1846), even as very common during the 19th century (Godron, 1866), while it is fairly common today (Colson, 1980b), as well as in Alsace (Matter, 1998). Common in the French Ardennes (Ligeron, 2005), the species is fairly little common in Belgium, where it is however largely widespread (Fairmaire, 1894; Guilleaume, 1909; Desière, 1969; Troukens, 2007) as well as in the Netherlands (Zeegers & Heijerman, 2008).

Though this species was recorded for the first time only recently (Vitali, 2011b), it has been known in Luxembourg at least for one century. The analysis of the data suggests a westwards expansion from the German border, where it was collected by J. Leclerc and J. Thoma in several localities after WWII. Nonetheless, it had disappeared from central Luxembourg until the second half of the 1980s and it was unknown to Mousset, who did not include it in the list of the local species. Presently, Stenopterus rufus is a little common species with a scattered distribution throughout the country (Fig. 96), though sometimes locally abundant in dry fields.

4.2.11 Tribe Obriini Mulsant, 1839

4.2.11.1 *Obrium brunneum* (Fabricius, 1792)

Obrium brunneum Mousset, 1969: 169; Mousset, 1973: Map. 410; Köhler, 2011: 88, 131; Köhler, 2013: 66, 102; Vitali, 2013: 146.

Body size 4-7 mm. Minute, cylindrical, flat, throughout reddish brown.

The species might be superficially confused with *Gracilia minuta* (4.2.9.1), from which it differs in the big globular eyes and the pronotum laterally toothed.

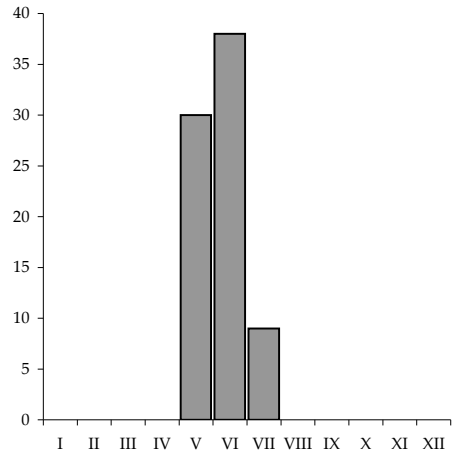


Fig. 97: Phenology of *Obrium brunneum* in Luxembourg.

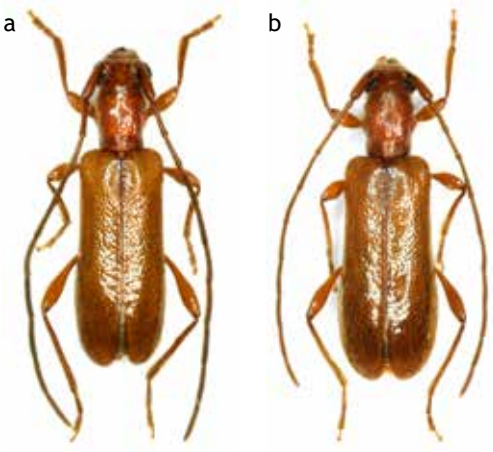


Fig. 98: *Obrium brunneum*, a. Male, b. Female, Bourscheid (author's coll.).

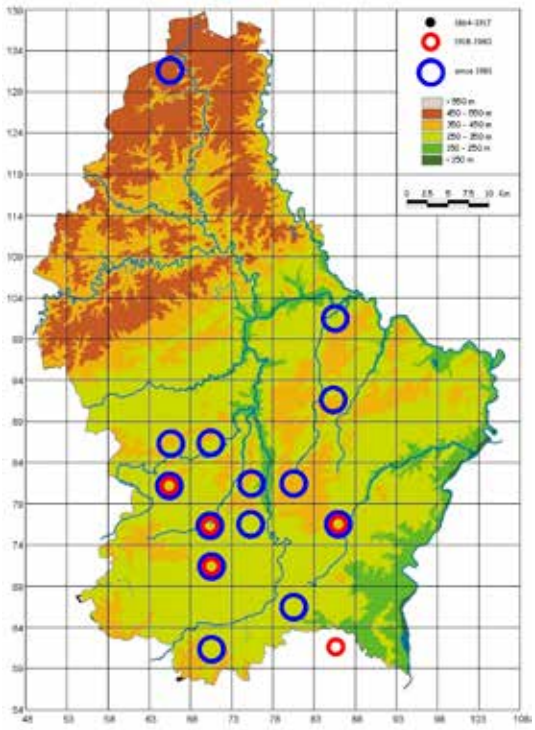
Life-cycle lasts one year. Larvae bore dead branches of Pinaceae; pupation occurs in wood in early spring. Adults are diurnal on white blossom flowers and bushes of woody localities from mid-spring to early summer (Fig. 97). Aruncus and Anthriscus seem to be the preferential flowers.

Host plants: *Abies*, *Picea*, *Larix*, *Pinus*.

Euro-Anatolian species, widespread from the Pyrenees to northern Iran, mountain or relict species in the southern part of its distribution.

In the regions neighbouring Luxembourg, it is autochthonous only in the Vosges and southern Rhineland-Palatinate, but it has become widespread elsewhere through artificial plantations of Pinaceae. In Rhineland-Palatinate, the species is largely widespread and known for a long period (Brahm, 1790), while it was recorded for the first time in the Saarland only in 1965 (Niehuis, 2001). It is still unknown in northern Lorraine (Fournel & Gehin, 1846; Colson, 1980b), while it is widespread in Alsace (Matter, 1998), where it has been known for a long time (Godron, 1866). The species is very rare in the French Ardennes (Ligeron, 2005) and Belgium (Fairmaire, 1894; Desière, 1969; Lempereur et al., 2000) but widespread on sandy soils of the Netherlands (Zeegers & Heijerman, 2008).

In Luxembourg, this species seems to have been introduced in the surroundings of the capital in the late 1960s (first record: 1967); thus, nearly contemporaneously to the introduction in the Saarland. After an apparently twenty-year period of stasis (there are no records in the 1980-1990s'), it has begun to rapidly expand since 1997. Nowadays, it is little common, but locally fairly abundant, in several spruce woods of the Gutland (Fig. 99).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980							2	1	1			1	5
since 1981	1					1	4	6	3	1	1		17
Total	1					1	6	7	4	1	1	1	22

Fig. 99: Distribution of *Obrium brunneum* and colonised localities in Luxembourg.

4.3 Subfamily Lepturinae Latreille, 1802

4.3.1 Tribe Rhagiini Kirby, 1837

4.3.1.1 *Stenocorus meridianus* (Linnaeus, 1758)

Stenocorus meridianus Mousset, 1969: 167; Köhler, 2013: 63, 102; Vitali, 2013: 146; Vitali, 2014: 87; *Stenochorus meridianus* Mousset, 1973: Map. 431; Weitzel, 2014: 216.

Body size 15-27 mm. Scarcely dimorphic, both sexes having elytra posteriorly narrowed. Chromatically variable: head and prothorax black, elytra testaceous (var. *cantharinus*), more or less obscured apically, sometimes entirely black (var. *chrysogaster*); legs testaceous, black or bicolour. Everywhere covered with a fine silver pubescence.

Specimens with nearly entirely black elytra (typical form) may be confused with Stenocorus quercus (4.4.1.2), which nevertheless have shorter elytra, without a silver pubescence. Totally melanistic specimens may be confused with males of *Oxymirus cursor* (4.4.1.3) but their pronotum is always smooth, without two longitudinal ridges present in this species.

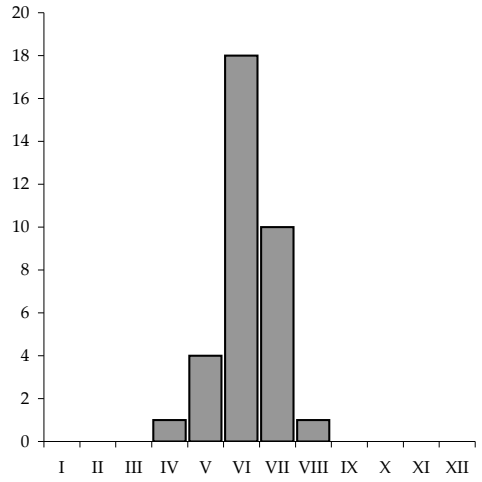


Fig. 100: Phenology of *Stenocorus meridianus* in Luxembourg.

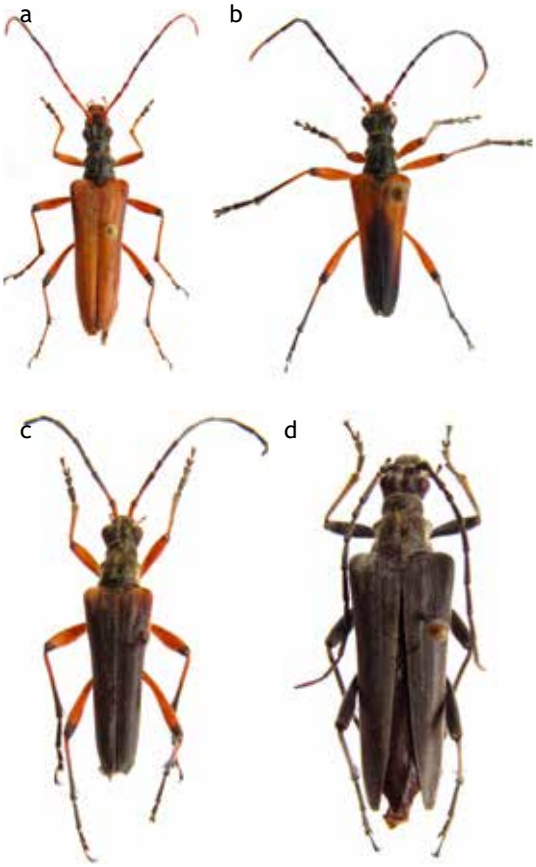
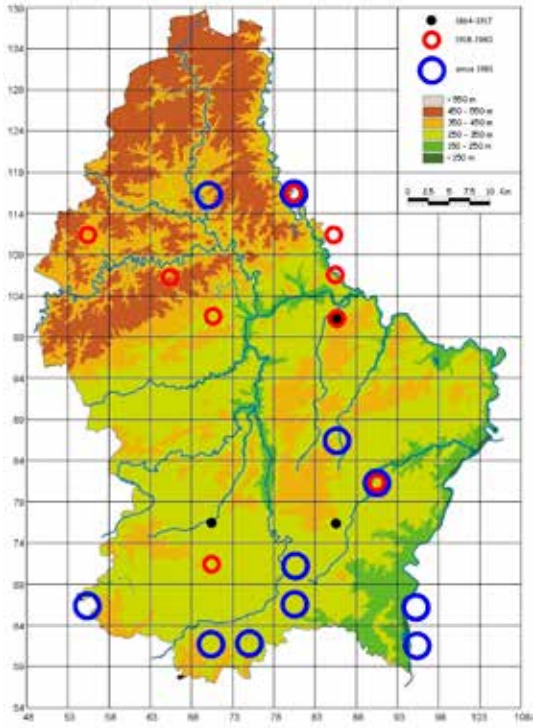


Fig. 101: *Stenocorus meridianus*, a. Female, Lellingen, b. Male, Obereisenbach, c. Male, Vianden, d. Female, Howald (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	1		1			3
1918-1980	1	2	3	1					1		1		9
since 1981		1		2				1	4		3	2	13
Total	1	3	3	2			1	2	5	1	4	2	24

Fig. 102: Distribution of *Stenocorus meridianus* and colonised localities in Luxembourg.

Life-cycle lasts two years. Females lay up to 84 eggs in the soil. Larvae emerge after two weeks and bore rotten roots of broadleaf trees, especially oaks. Pupation occurs in the soil alongside roots in spring. Adults are diurnal on fallen trunks or blossom bushes from late spring to mid-summer (Fig. 100).

Host plants: *Fagus*, *Quercus*, *Alnus*, *Ulmus*, *Malus*, *Prunus*, *Acer*, *Salix*, *Populus*, *Fraxinus*.

Euro-Siberian species, widespread from Andalusia to the Lake Baikal, mainly related to the primary oak forests of Central Europe, mountain and relict species elsewhere.

In the regions neighbouring Luxembourg, it is present throughout, more common in the warmer regions of Rhineland-Palatinate (Niehuis, 2001), northern Lorraine (Colson, 1980a) and Belgium,

except for the South-east (Lameere, 1894; Lempereur et al., 2000); rare but known for a long time in the Netherlands (Everts, 1922; Zeegers & Heijerman, 2008) and in the French Ardennes (Ligeron, 2005).

In Luxembourg, the species is little common and localized in the South of the country and along the German border (Fig. 102). Seemingly, it is in south-eastern regression.

4.3.1.2 *Stenocorus quercus* (Götz, 1783)

Toxotus quercus Olm, 1892: 37; *Stenocorus quercus* Mousset, 1969: 167 (missid.); *Stenochorus quercus* Mousset, 1973: Map. 432 (missid.); *Stenocorus (Anisorus) quercus* Vitali, 2011b: 79.

Body size 12-22 mm. Dimorphic: males narrower, usually black with red shoulders; females parallel-sided, black with reddish elytra; sometimes both sexes completely black (var. unicolor). Legs always black.

The species differs from *Stenocorus meridianus* (4.4.1.1.) in the antennomere III, always shorter (rather than longer) than V. Since this character is difficultly observable in living specimens, females are easily distinguished for their parallel-sided elytra, while males for their shorter elytra deprived of silver pubescence.

Life-cycle lasts two years. Females lay up in the soil. Larvae bore rotten roots of broadleaf trees, especially oaks. Pupation occurs in the soil alongside roots in spring. Adults are diurnal on fallen trunks or blossom bushes from early-spring to early-summer.

Host plants: *Quercus*, *Acer*, *Fraxinus*?

Euro-Anatolian species, widespread from Andalusia to northern Iran, mainly related to primary oak-forests of Central Europe, montane and relict elsewhere. Adults have habits similar to the previous species, but generally are rarer because of their reduced trophic spectrum.

In the regions neighbouring Luxembourg, it is fragmentally present in eastern Rhineland-Palatinate (Niehuis, 2001), while it is most likely extinct from Belgium (Lameere, 1894) and northern Lorraine (Colson, 1980a), where it was once very rare (Godron, 1866). According to Matter (1998), the species is restricted to thermophilic oak woods at south of Colmar. It is absent elsewhere.

Olm (1892) recorded a specimen from Manternach, 6 June 1892, on *Rosa canina* and Mousset (1969) another from Sandweiler. The latter one was in reality a male of *Oxymirus cursor* (Vitali, 2011b); no further specimens have ever been collected in Luxembourg. The species, maybe once present in Luxembourg, is not supported by samples; moreover, misidentifications with other species are always possible.

4.3.1.3 *Oxymirus cursor* (Linnaeus, 1758)

Toxotus cursor Mousset, 1969: 167; Mousset, 1973: Map. 443; *Stenocorus quercus* Mousset, 1969: 167 (missid.); *Stenochorus quercus* Mousset, 1973: Map. 432 (missid.); *Oxymirus cursor* Vitali, 2011b: 79, 84 Fig. 1; Vitali, 2013: 146.

Body size 16-30 mm. Dimorphic. Males narrow, with elytra posteriorly restricted, completely black. Females wider, parallel-sided, usually black with two brick-red longitudinal bands on each elytron; rarely entirely black (var. *niger*) or red (var. *verneuili*).

Males might be confused with melanistic *Stenocorus meridianus* (4.4.1.1) but they always show two longitudinal ridges on the pronotum, missing in that species.

Life-cycle lasts three years. Larvae bore rotten fallen woods of Pinaceae, especially spruce, rarely of some Fagales. Pupation occurs in the soil. The adults, prevailingly nocturnal, can be collected on fallen wood, at soil, rarely on blossom flowers.

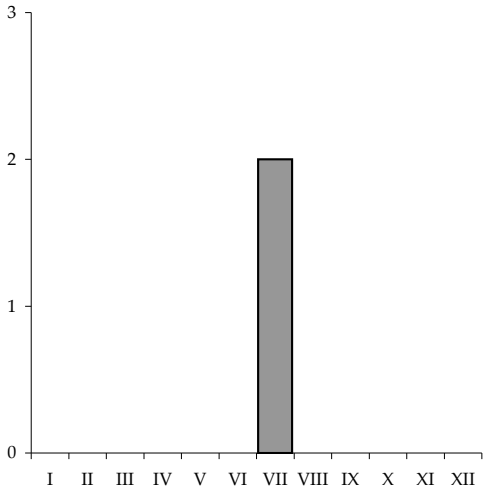


Fig. 103: Phenology of *Oxymirus cursor* in Luxembourg.

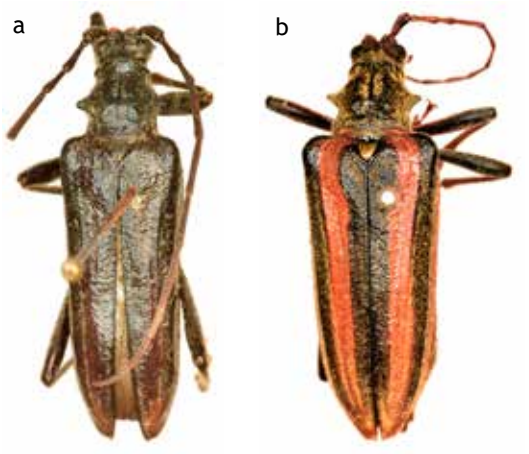
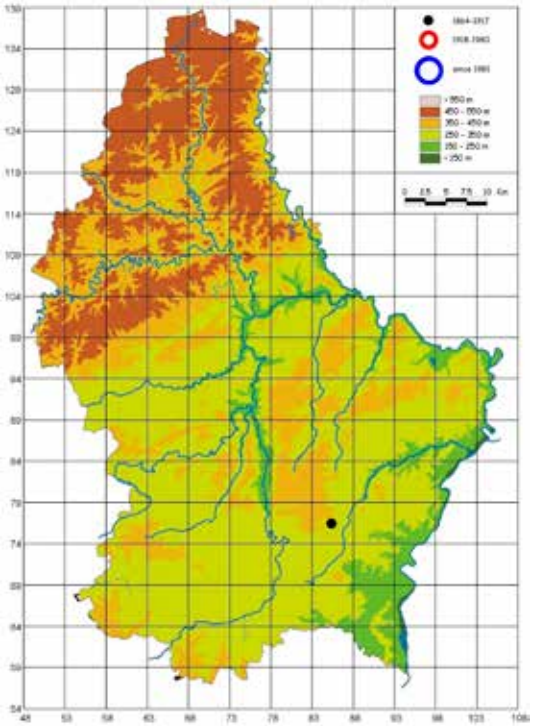


Fig. 104: *Oxymirus cursor*, a. Male, b. Female, Sandweiler (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1					1
1918-1980													0
since 1981													0
Total								1					1

Fig. 105: Distribution of *Oxymirus cursor* and colonised localities in Luxembourg.

Host plants: *Abies*, *Picea*, *Larix*, *Pinus*, *Fagus*, *Alnus*, *Betula*, *Corylus*.

Parasitoids: *Acaenitus dubitator* (Panzer, 1800) (Ichneumonidae)

Euro-Siberian species, widespread from the Pyrenees to Altai Mts., it is restricted to mountains in the southern part of its distribution. The species was intercepted or introduced with artificial plantations of spruce in northern Europe and even in Baluchistan and Pakistan (Gahan, 1906).

In the regions neighbouring Luxembourg, it colonises the Vosges, where it was very common for a long time (Fournel & Gehin, 1846; Godron, 1866; Matter, 1998) and the more mountainous parts of Rhineland-Palatinate (Niehuis, 2001). In the northern Ardennes, it is considered as imported (Lameere, 1885, 1894; Collart, 1941), while very rare adventive specimens are known in northern Lorraine (Godron, 1866) and in the Netherlands (Everts; 1922; Zeegers & Heijerman, 2008).

The species has been known in Luxembourg only through a pair collected by V. Ferrant nearby Sandweiler, most likely before WWI (Fig. 105). By considering the distribution in the neighbouring regions, the species might be present in the northern parts of Oesling, while Ferrant's specimens should be considered as a temporary introduction.

4.3.1.4 *Rhamnusium bicolor* (Schrank, 1781)

Rhamnusium bicolor Mousset, 1969: 167; Mousset, 1973: Map. 425; Vitali, 2013: 146.

Body size 14-24 mm. Bright red; elytra usually metallic blue, rarely black (var. *salicis*) or entirely red (var. *glaucopterum*); antennae red (var. *gracilicorne*) or black starting from the 5th joint (typical form). Several chromatic combinations are possible.

Saproxylic species related to rotten cavities of old living broadleaf trees, privileging isolated exposed trees of city parks or boulevards. According to Matter (1998), such trees are always previously attacked by weevils Cossonini, especially of the genus *Rhyncolus* Germar, 1817. Life-cycle lasts two years. Larvae bore the bordering parts between dead and living wood; pupation occurs in the wood in spring. The adults are crepuscular or nocturnal, emerging for only few days on the host plant or remaining hidden in wood cavities.

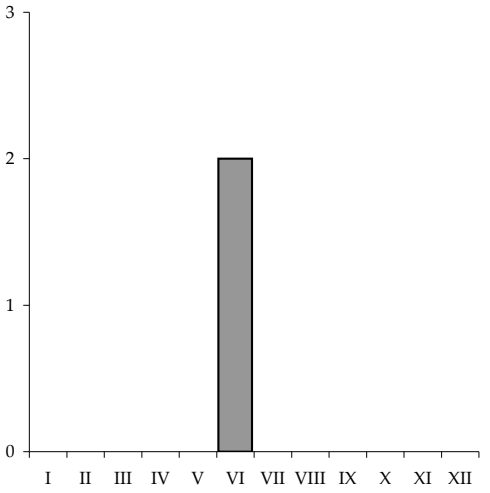


Fig. 106: Phenology of *Rhamnusium bicolor* in Luxembourg.

Fig. 107: *Rhamnusium bicolor*, Female, Mamer (coll. Mnhn).

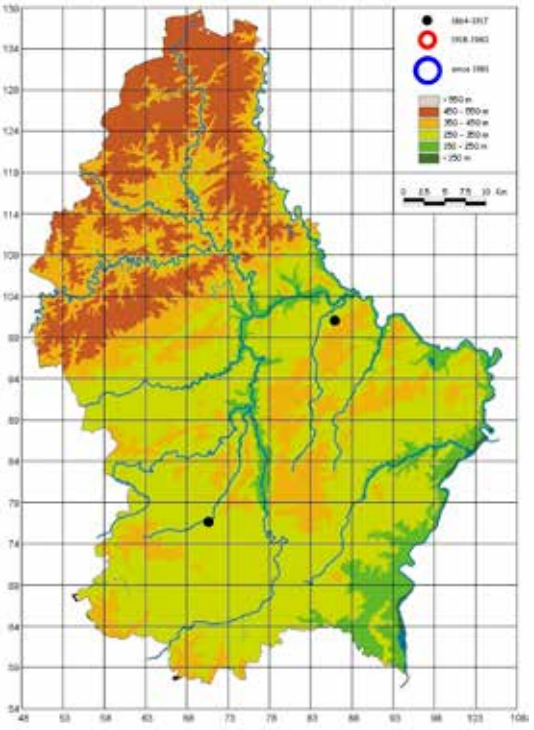
Host plants: *Platanus*, *Castanea*, *Fagus*, *Quercus*, *Ulmus*, *Juglans*, *Prunus*, *Robinia*, *Aesculus*, *Acer*, *Salix*, *Populus*, *Tilia*; *Liquidambar* (Turkey).

Parasitoids: *Bracomorpha rector* (Thunberg, 1822) (Braconidae).

Predators: *Megapenthes lugens* (Redtenbacher, 1842) (Elateridae).

Euro-Anatolian species widespread from the Pyrenees to the southern Urals and fragmented in several subspecies, the Apennine ones (*demaggii* Tippmann, 1956 and *italicum* Müller, 1966) still having an uncertain taxonomic status. Seven of them are today accepted: the typical one (Europe), *graecum* Schaufuss, 1862 (Greece), *constans* Danilevsky, 2012 (European Russia), *lenkoranum* Danilevsky, 2012 (eastern Caucasus), *testaceipenne* Pic, 1897 (western Caucasus), *juglandis* Fairmaire, 1866 (Turkey) and *praeustum* Reitter, 1895 (Cilicia). The typical form is fragmentally widespread throughout Europe, but in regression everywhere, resulting in being extremely localised and seldomly collected.

In the regions neighbouring Luxembourg, it is scatteredly widespread. It has been known in Rhineland-Palatinate since the second half of the 19th century, but in the Saarland only since 1989, resulting in regression due to tree sanitations (Niehuis, 2001). In northern Lorraine, it was rare during the 19th century (Fournel & Gehin, 1846, Godron, 1866) and it seems extinct today (Colson,



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	total
1864-1917							1			1			2
1918-1980													0
since 1981													0
Total							1			1			2

Fig. 108: Distribution of *Rhamnusium bicolor* and colonised localities in Luxembourg.

1980a), while it is still fairly common in northern Alsace (Matter, 1998). The species is unknown in the French Ardennes (Ligeron, 2005), rare in Belgium (Lameere, 1894, Everts, 1903, Guilleaume, 1909) but still present today (Drumont, in litt.), whereas it was very rare in the Netherlands, near The Hague, where it is possibly extinct today (Zeegers & Heijerman, 2008).

The species is recorded in Luxembourg only by two specimens collected by V. Ferrant at the end of the 19th century (Fig. 108). The kind of habits suggests that it should be very rare or even extinct today.

4.3.1.5 *Rhagium bifasciatum* Fabricius, 1775

Rhagium bifasciatum Ferrant, 1907a: 303; Ferrant, 1911: 67; Mousset, 1969: 166; Mousset, 1973: Map. 421; Gerend et al., 2007: 290; Köhler, 2009: 62, 109; Vitali, 2013: 146; Weitzel, 2014: 215.

Body size 12-22 mm. Black, elytra with margins more or less brick-red and four yellow oblique spots on the disk, the apical ones more or less reduced, exceptionally united with the basal ones forming two longitudinal bands. Males show posteriorly narrowed elytra.

Life-cycle lasts two years. Larvae are polyphagous, mainly related to Pinaceae, especially spruce, but also Fagales. The genus *Sarothamnus* (=*Cytisus scoparius* L.), which some authors quoted as host, is certainly wrong. Pupation occurs inside the wood. The adults overwinter and emerge at the beginning of spring (Fig. 109), remaining active on fallen trunks.

Host plants: *Abies*, *Picea*!, *Pinus*, *Castanea*, *Fagus*!, *Quercus*!, *Alnus*, *Betula*, *Corylus*.

Parasitoids: *Coleocentrus excitator* (Poda, 1761), *Ischnoceros caligatus* (Gravenhorst, 1829), *I. rusticus* (Geoffroy, 1785) (Ichneumonidae); *Atanycolus initiator* (Fabricius, 1793), *Doryctes leucogaster* (Nees, 1834), *Iphiaulax impostor* (Scopoli, 1763) (Braconidae).

Euro-Anatolian species, widespread from Portugal to the Caucasus and eastern Turkey, generally restricted to mountain areas in the southern part of its distribution.

In the regions neighbouring Luxembourg, it is widespread in the plains of Rhineland-Palatinate and the Saarland, where it seems however in regression (Niehuis, 2001). Once rare in northern Lorraine (Fournel & Gehin, 1846), the species is no longer present today (Colson, 1980a), while

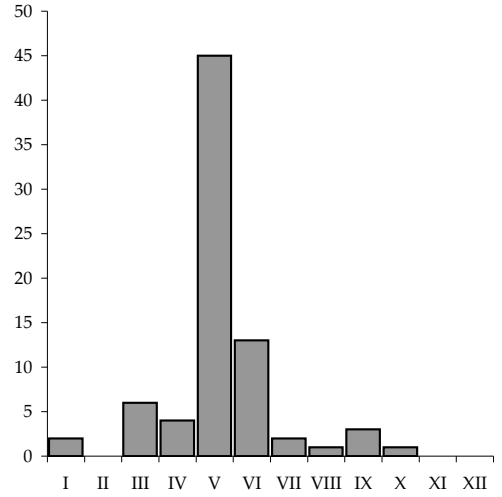
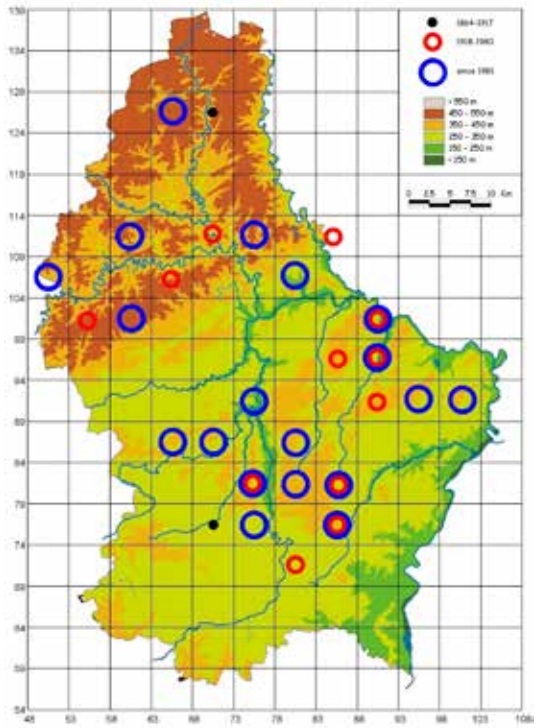


Fig. 109: Phenology of *Rhagium bifasciatum* in Luxembourg.

Fig. 110: *Rhagium bifasciatum*, a. Male, b. Female, Bambësch (author's coll.), c. Female Bambësch, on *Fagus*.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1						1						2
1918-1980		2		1	1	1	1	4		3			13
since 1981	1	2	1	1	1	3	1	7		4	1		22
Total	2	4	1	2	2	4	3	11		6	1		36

Fig. 111: Distribution of *Rhagium bifasciatum* and colonised localities in Luxembourg.

it is rare in the French Ardennes (Ligeron, 2005) and widespread but apparently uncommon in Alsace (Godron, 1866; Matter, 1998). In Belgium, the species is fairly common all over the south-eastern parts of the country (Collart, 1941; Lempereur et al., 2000), where it is probably introduced according to Lameere (1894). However, this assumption is unfounded considering the polyphagy of the species. In the Netherlands, it is common and widespread in Veluwe but dispersed elsewhere (Zeegers & Heijerman, 2008).

In Luxembourg, the species is fairly widespread, except for the warmest locality of the Gutland (Fig. 111). It is common especially in humid woodlands, but the adults are fairly discrete so that only single individuals are usually collected. Its presence and distribution in the country seem to be stable.

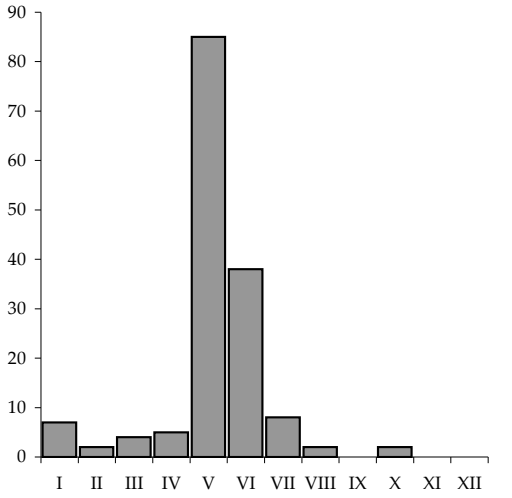


Fig. 112: Phenology of *Rhagium mordax* in Luxembourg.

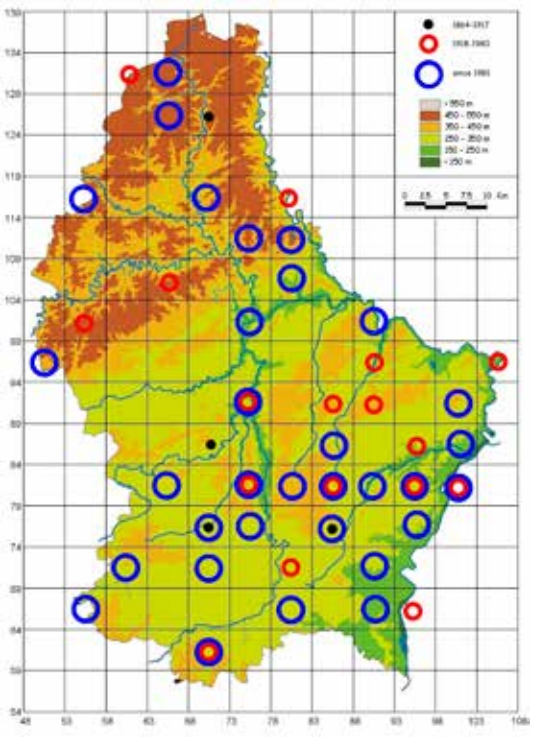
Fig. 113: *Rhagium mordax*, a. Male, b. Female, Bambësch, (author's coll.), c. Male, Bambësch.

4.3.1.6 *Rhagium mordax* (DeGeer, 1775)

Rhagium mordax Ferrant, 1907a: 303; Schuster, 1907b: 100; Ferrant, 1911: 68; Mousset, 1969: 167; Mousset, 1973: Map. 423; Gerend et al., 2007: 290; Köhler, 2011: 90, 130; Vitali, 2013: 146; Vitali, 2014: 87; Weitzel, 2014: 216.

Body size 11-23 mm. Grey; elytra crossed with a black band (sometimes reduced to two lateral spots) and two yellow ones located before and after it. Males show wide temples. Stable. Some southern populations show mustard-yellow ground colouring.

Life-cycle lasts two years. Larvae bore rotten wood of broadleaf trees, especially beech, rarely of Pinaceae. Pupation occurs inside the wood. The adults overwinter and emerge at the beginning of spring (Fig. 112). They can be collected on fallen trunks, or on blossom flowers and bushes (*Crataegus*, *Rubus*, *Sambucus*, *Heracleum*, *Ranunculus*).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1					1	1	1					4
1918-1980	2	1			1	2	1	3	1	3	3	1	18
since 1981	4	3	1	2	1	1	5	12	5	2	10	2	48
Total	7	4	1	2	2	4	7	16	5	5	11	3	69

Fig. 114: Distribution of *Rhagium mordax* and colonised localities in Luxembourg.

Host plants: *Castanea*, *Fagus*!, *Quercus*!, *Alnus*, *Betula*!, *Corylus*, *Acer*, *Populus*, *Tilia*, *Abies*, *Picea*.

Parasitoids: *Dolichomitus tuberculatus* (Geoffroy, 1785), *Ischnoceros caligatus* (Gravenhorst, 1829), *I. rusticus* (Geoffroy, 1785) (Ichneumonidae); *Atanycolus denigrator* (Linnaeus, 1758), *Doryctes leucogaster* (Nees, 1834) (Braconidae).

Euro-Siberian species, widespread from the Iberian System to the Altai Mts., generally restricted to mountain areas in the southern part of its distribution.

In the regions neighbouring Luxembourg, the species is widespread and for a long time common to very common everywhere (Godron, 1866; Lameere, 1894; Collart, 1941; Desière, 1969; Colson, 1980a; Lempereur et al., 2000; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008).

In Luxembourg, the species has been known for a long time as related to oaks (Schuster, 1907b; Ferrant, 1907a, 1911). Nowadays, it seems especially related to beech or other Fagales such as birch, resulting very common and widespread everywhere (Fig. 114). The analysis of the data suggests a gradual expansion throughout the country, most likely favoured by the forest management.

4.3.1.7 *Rhagium sycophanta* (Schrank, 1781)

Rhagium inquisitor Kraus, 1892b: 49; Ferrant, 1907a: 303; Schuster, 1907b: 99; Ferrant, 1911: 68. *Rhagium sycophanta* Ferrant, 1917: 242; Mousset, 1969: 167; Mousset, 1973: Map. 424; Gerend et al., 2007: 290; Köhler, 2011: 88, 130; Köhler, 2013: 62, 102; Vitali, 2013: 146.

Body size 15-30 mm. Mustard-yellow, more or less scattered with irregular brown spots forming two scarcely definite yellow transversal bands, sometimes reduced to four large yellow spots. Males show wide temples. Stable.

Life-cycle lasts two years. Larvae bore rotten woods of broadleaf trees, especially oaks; pupation occurs inside the wood. The adults overwinter and emerge at the beginning of spring (Fig. 115). They can be collected on fallen trunks, where they look strongly mimetic with the substratum.

Host plants: *Castanea*, *Fagus*, *Quercus*!, *Alnus*, *Betula*, *Tilia*, *Abies*, *Picea*.

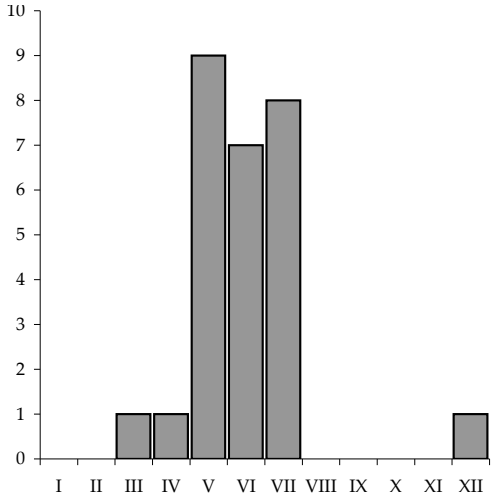


Fig. 115: Phenology of *Rhagium sycophanta* in Luxembourg.

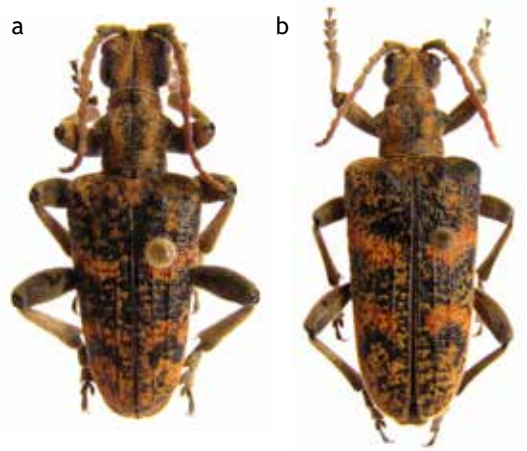


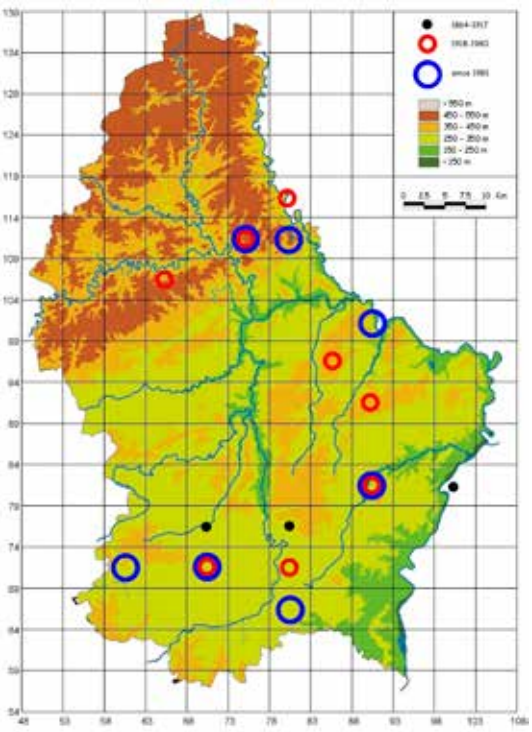
Fig. 116: *Rhagium sycophanta*, a. Male, Jongebësch b. Female, Bertrange (coll. Mnhn).

Parasitoids: *Dolichomitus tuberculatus* (Geoffroy, 1785), *Iphiaulax impostor* (Scopoli, 1763), *Ischnoceros caligatus* (Gravenhorst, 1829) (Ichneumonidae).

European species, widespread from Portugal to European Russia, focused on the primary oak woods of Central Europe.

In the regions neighbouring Luxembourg, it is fairly common in Belgium (Lameere, 1894; Collart, 1941; Gaspar & Verstraeten, 1972; Lempereur et al., 2000), the French Ardennes (Ligeron, 2005), northern Lorraine (Godron, 1866; Colson, 1980a) and the plain regions of Rhineland-Palatinate (Niehuis, 2001). Nonetheless, it is usually rarely collected and in strong regression everywhere since the 1950s (Niehuis, 2001).

In Luxembourg, the species was shown for the first time by J. N. Theis during the meeting on 8 August 1892 (Kraus, 1892b). Formally, it was identified as "*Rhagium inquisitor*", since the species currently having this name was once called "*R. indagator*". It was maybe collected near Steinfort (Capellen), the place of residence of the collector, but the locality was not indicated formally. Another specimen was collected by P. Steffes near Machtum (Wormeldange, Grevenmacher) on 17 May 1917 (Ferrant, 1917). Such specimen, marked with "L" in the table, is no longer present in the collection today. However, the species has been known at least since 1890 by a specimen collected at Thillsmillen by Ferrant. Nowadays, it is fragmentally widespread



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	1			L		3
1918-1980	1	1	1			1		2		1	1		8
since 1981			1	1			1	1	2	1	2	1	10
Total	1	1	2	1		1	2	4	2	2	4	1	21

Fig. 117: Distribution of *Rhagium sycophanta* and colonised localities in Luxembourg.

in old oak woods (Fig. 117), rare and in regression everywhere, usually collected as single individuals, seemingly smaller and smaller in size.

4.3.1.8 *Rhagium inquisitor* (Linnaeus, 1758)

Rhagium indigator (sic!) Ferrant, 1907a: 303. *Rhagium indagator* Ferrant, 1911: 67. *Rhagium inquisitor* Mousset, 1969: 167; Mousset, 1973: Map. 422; Gerend et al., 2007: 290; Vitali, 2013: 146.

Body size 9-21 mm. Grey, more or less covered with minute black spots forming two scarcely definite transverse bands. Males show posteriorly narrowed elytra. Stable inside the local population.

Life-cycle lasts two years. Larvae of the European subspecies bore under barks of rotten fallen Pinaceae, especially Scots and black pine; other subspecies show different trophic preferences. Pupation occurs under barks inside a typical circular cell surrounded by agglutinated sawdust in late summer. Adults overwinter and emerge at the beginning of spring. All stadia can be easily collected under barks starting from September (Fig. 118), while adults are hardy collected on fallen trunks, resulting strongly mimetic with the substrate.

Host plants: *Abies*, *Picea*!, *Larix*, *Pinus*!; *Cedrus* (Algeria); *Fagus*, *Quercus*, *Betula*, *Populus* (Far East).

Parasitoids: *Echthrus reluctator* (Linnaeus, 1758), *Ischnoceros rusticus* (Geoffroy, 1785), *Xorides irrigator* (Fabricius, 1793), *X. rufipes* (Gravenhorst, 1829) (Ichneumonidae); *Atanycolus initiator* (Fabricius, 1793),

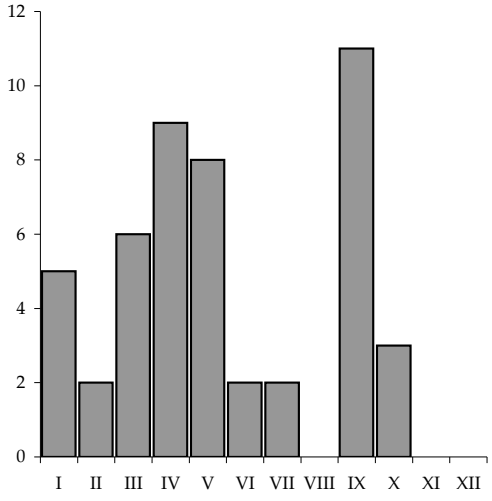


Fig. 118: Phenology of *Rhagium inquisitor* in Luxembourg.

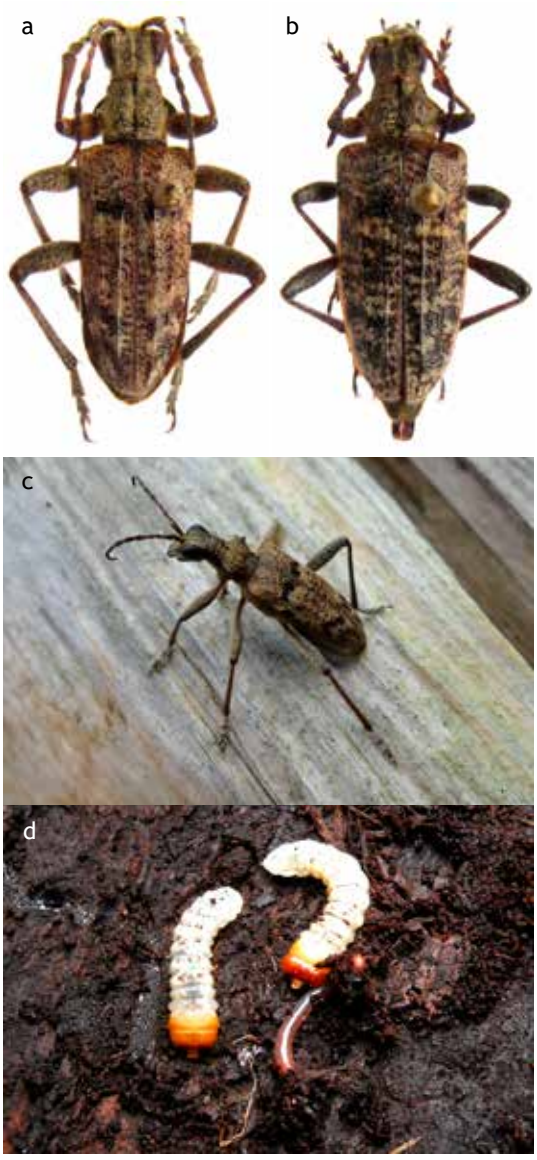
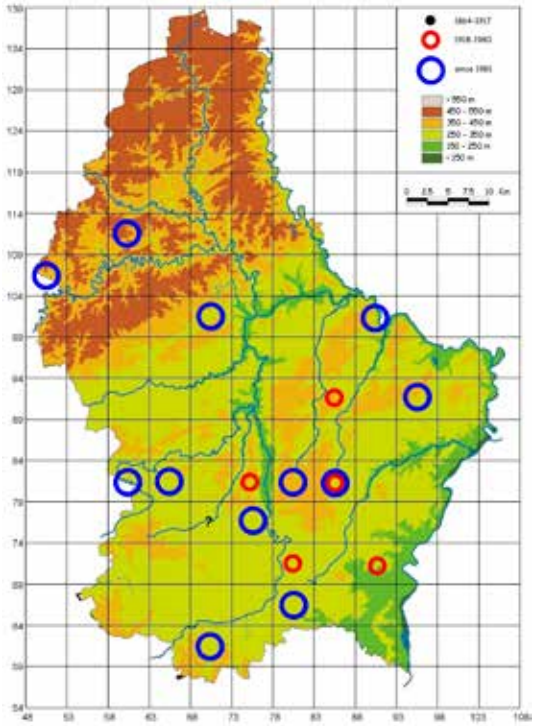


Fig. 119: *Rhagium inquisitor*, a. Male, Bambësch, b. Female, Geyershaff (author's coll.), c. Male on *Picea*, Bambësch, d. Larve under bark of *Picea*, Bambësch.

A. denigrator (Linnaeus, 1758), *Cyanopterus nigrator* (Zetterstedt, 1838), *Doryctes leucogaster* (Nees, 1834), *Ontsira imperator* (Haliday, 1836) (Braconidae).

Predators: *Nudobius lentus* (Gravenhorst, 1806) (Staphylinidae).

Palaearctic species, widespread from North Africa to Korea, erroneously recorded elsewhere. Five



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							?L						2
1918-1980						1	1	2				1	5
since 1981		2	1				2	5	2	4			16
Total		2	1			1	3	7	2	4		1	21

Fig. 120: Distribution of *Rhagium inquisitor* and colonised localities in Luxembourg.

subspecies have been recognised: the typical one (Europe to central Siberia), *cedri* Raymond & Reid, 1953 (Algeria), *schtschukini* Semenov, 1898 (Caucasus), *fortipes* Reitter, 1898 (Syria) and *rugipenne* Reitter, 1898 (from central Siberia to Korea). The synonymy of all American Rhagium with *R. inquisitor inquisitor* (Linsley & Chemsak, 1972), uncritically accepted by some authors (Villiers, 1978; Niehuis, 2001; Sama, 2002), cannot be accepted. In fact, the typical form is replaced by the ssp. *rugipenne* in central Siberia and is also widespread in North America. Moreover, while only one species is widespread from North Africa to Mexico, five close endemic species inhabit Japan. Actually, seven Nearctic taxa have been already recognised as different species (Podaný, 1964). The species is related to mountain coniferous woodlands but it has been largely introduced in plains through artificial plantations or timber trade. Adventive specimens were also intercepted in Ireland (Johnson & Halbert, 1902).

In the regions neighbouring Luxembourg, it is acclimatised and fairly common everywhere for a long time (Fournel & Gehin, 1846; Godron, 1866; Lameere, 1885, 1894; Collart, 1941; Colson, 1980a; Lempereur et al., 2000; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008), though it is autochthonous probably only in the Vosges (Matter, 1998).

In Luxembourg, the species has been introduced and known for a long time (Ferrant, 1907a), though ancient samples are no longer present in the collection today. The first specimen was possibly collected at Thillsmillen (Capellen) by Ferrant before 1890, being mentioned as "Mamer" in Mousset (1969; 1973). The localisation in central Luxembourg is commonly observed for species newly introduced through conifers. A specimen identified as "*Rhagium inquisitor*" was shown by J. N. Theis during the meeting 8 August 1892 (Kraus, 1892b), but this name once corresponded to *R. sycophanta* (4.4.1.7). Nowadays, the species is a little common inhabitant of conifer plantations, which does not seem very widespread in the country, being concentrated around the capital (Fig. 120).

4.3.1.9 *Gaurotes virginea* (Linnaeus, 1758)

Gaurotes (Carilia) virginea thalassina Vitali, 2011b: 79, 84 Fig. 2; Vitali, 2012b: 235-236; Vitali, 2014: 88. *Gaurotes virginea* Vitali, 2013: 146.

Body size 7-12.5 mm. Stout; head and limbs black; prothorax black (nominal form) or red (ssp. *thalassina*); elytra metallic green to blue-violet, rarely copper or black; abdomen red (black in the Far Eastern subspecies). Intermediate forms are present in the contact areas.

Life-cycle lasts two years. Larvae bore rotten woods of Pinaceae (in Europe only of spruce) and overwinter in the soil. The pupation occurs in spring in the soil. Adults are diurnal on blossom flowers from mid-spring to mid-summer (Fig. 121).

Host plants: *Picea*. *Pinus* (Far Eastern subspecies).

Euro-Manchurian species, widespread from the Alps to Korea. Five subspecies have been recognised: the nominal one and *thalassina* Schrank, 1781 (Europe), *aemula* Mannerheim, 1852 (Siberia, from

Kazakhstan to Mongolia), *kozhevnikovi* Plavilstshikov, 1915 (Far East of Russia and north-eastern China) and *komensis* Tamanuki, 1938 (Korea). The nominal form occupies Savoy, Jura, Vosges, Germany, Carpathians and Scandinavia while *thalassina* is naturally widespread in the Alps and the mountains of the German-Czech border region (Ore Mts., Bavarian and Bohemian Forest). Contact areas are present in the western and the eastern Alps as well as in Thuringia (Vitali, 2012b).

In the regions neighbouring Luxembourg, the species is autochthonous only in the Vosges

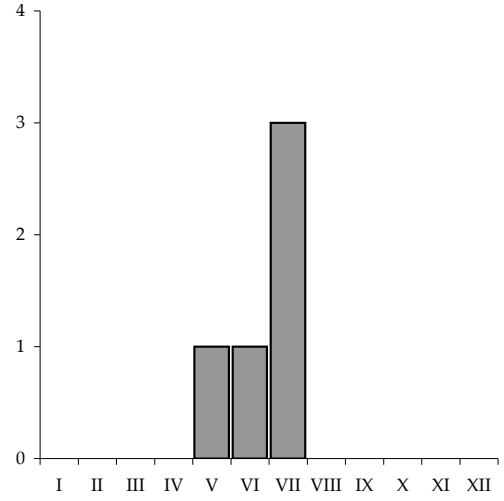


Fig. 121: Phenology of *Gaurotes virginea* in Luxembourg.

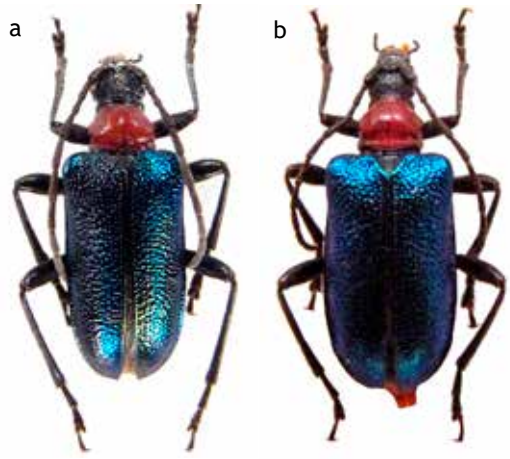
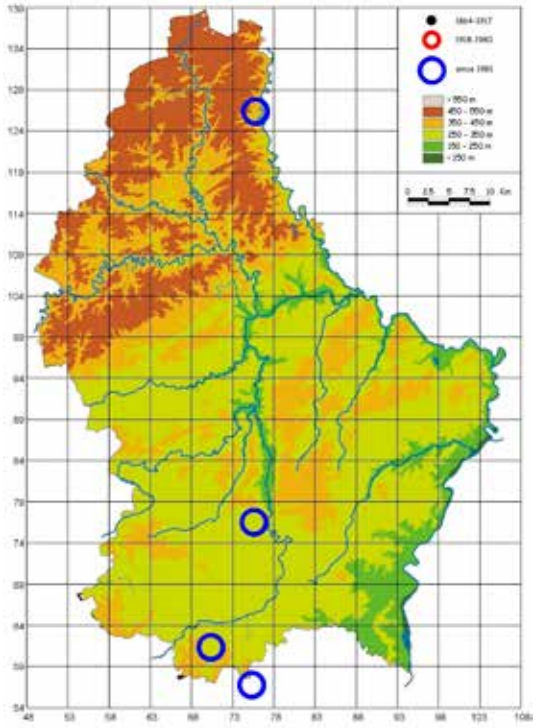


Fig. 122: *Gaurotes virginea*, a. Male, Eicherfeld, b. Female, Fischbach (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981	1							1	2				4
Total	1							1	2				4

Fig. 123: Distribution of *Gaurotes virginea* and colonised localities in Luxembourg.

(Matter, 1998). The subspecies *thalassina* has been recently introduced and acclimatised in the Belgian Ardennes (Drumont & Grifnee, 2005; Drumont et al., 2012; Lays et al., 2013), where it has already been recorded in the past (Fauvel, 1884). Such record, which Lameere (1885) considered as "very suspect", most likely was true, though it concerned a temporary introduction. In Rhineland-Palatinate, the species shows a spotted distribution completely disconnected from mountain populations (Niehuis, 2001); hence, it should be considered as introduced.

In Luxembourg, the species has been introduced very recently (2011) and it seems in expansion following the artificial plantations of spruce (Fig. 123).

4.3.1.10 *Dinoptera collaris* (Linnaeus, 1758)

Acmaeops collaris Mousset, 1969: 167; Mousset, 1973: Map. 379. *Dinoptera collaris* Vitali, 2013: 146; Weitzel, 2014: 216.

Body size 6.5-10 mm. Small, stout; body black; prothorax and abdomen red. Rarely, the pronotum is entirely black (var. *nigricollis*).

The species is easily distinguishable from melanistic *Gaurotes virginea* (4.4.1.9) for its prothorax, deprived of lateral tubercles, and its elytra, covered with an extremely fine pubescence and puncturing (hairless and covered with a coarse puncturing in *G. virginea*).

Life-cycle lasts two years. Larvae bore dried branches and roots of several broadleaf trees and bushes, except for Fagus, they overwinter in the soil and the pupation occurs in spring. Adults are diurnal on blossom flowers from mid-spring to early summer (Fig. 124).

Host plants: *Castanea*, *Quercus*, *Pyrus*, *Malus*, *Acer*, *Cornus*, *Euonymus*, *Populus*, *Fraxinus*.

Euro-Turanian species, widespread from the Iberian System to Kazakhstan, mainly related to fresh hill broadleaf woods. A closely related species - *Dinoptera concolor* (Heyden & Faust, 1888) - is widespread in the Caucasus.

In the regions neighbouring Luxembourg, it is in regression everywhere: extinct in the Netherlands

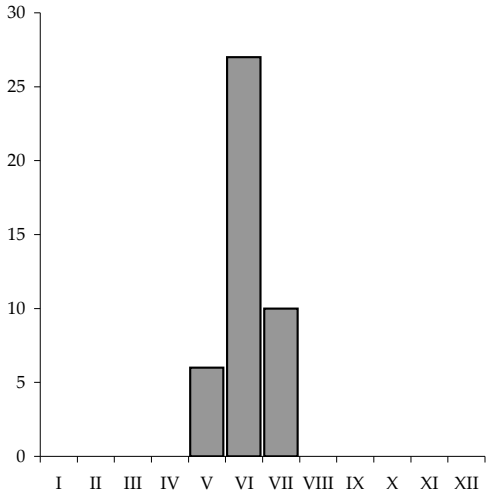


Fig. 124: Phenology of *Dinoptera collaris* in Luxembourg.

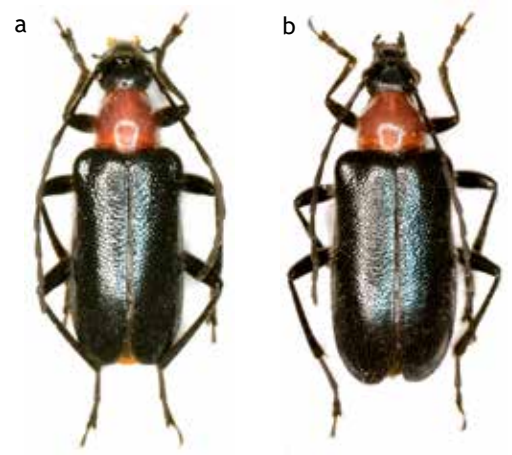
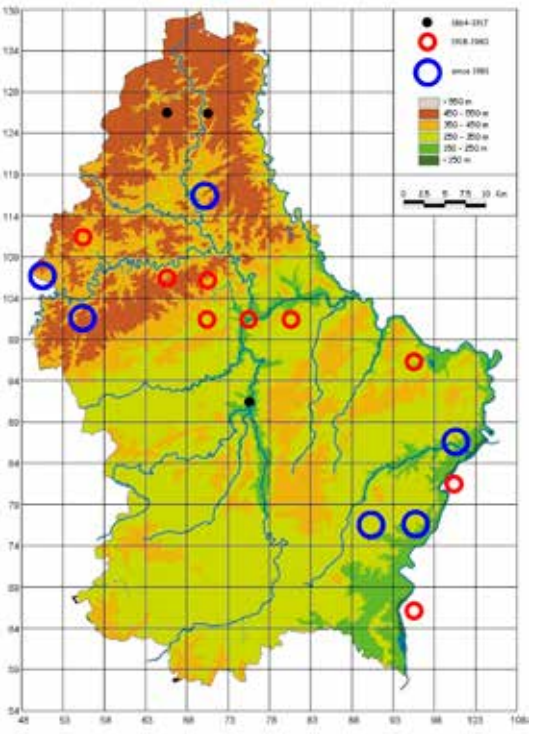


Fig. 125: *Dinoptera collaris*, a. Male, Ahn b. Female, Boulaide (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	2					1							3
1918-1980		4	4							1	1	1	11
since 1981		2			1						2	1	6
Total	2	6	4		1	1				1	3	2	20

Fig. 126: Distribution of *Dinoptera collaris* and colonised localities in Luxembourg.

(Zeegers & Heijerman, 2008), in strong regression in Rhineland-Palatinate (Niehuis, 2001), rare in the French Ardennes (Ligeron, 2005), fairly common in northern Lorraine (Colson, 1980a), though once common (Godron, 1866) or very common (Fournel & Gehin, 1846). In Belgium, it was fairly common in the Condroz but very rare elsewhere (Lameere, 1894; Lempereur et al., 2000).

Once widespread and abundant in the central and northern of Luxembourg, the species has become rarer and rarer, few single specimens being sporadically collected in these last years (Fig. 126).

4.3.2 Tribe Lepturini Latreille, 1802

4.3.2.1 *Cortodera humeralis* (Schaller, 1783)

Cortodera humeralis Vitali, 2011b: 79, 84 Fig. 3; Vitali, 2013: 146.

Body size 7-12 mm. Black, elytra parallel-sided with four yellow spots at the base (typical form), or entirely black (var. *inhumeralis*), sometimes entirely yellow (var. *spinulosa*), or with a black suture (var. *suturalis*). Limbs at least red at the base. The dark forms are prevalent in Germany (Reitter, 1912), while they are very rare in France (Fauvel, 1884; Villiers, 1978; Matter, 1998) and even absent from Belgium (Lameere, 1894: Picard, 1929). In Luxembourg, they are ~40% of all collected specimens, a fact suggesting a mixed origin of this population.

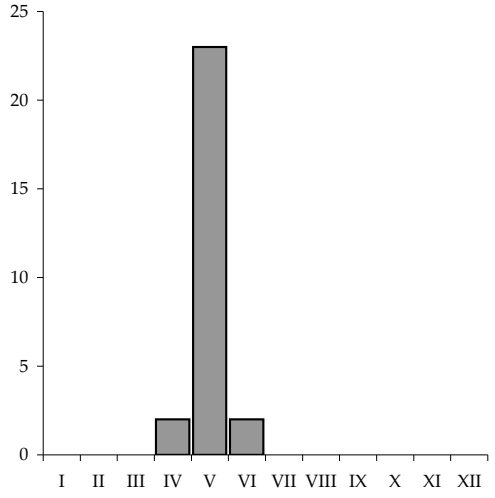


Fig. 127: Phenology of *Cortodera humeralis* in Luxembourg.

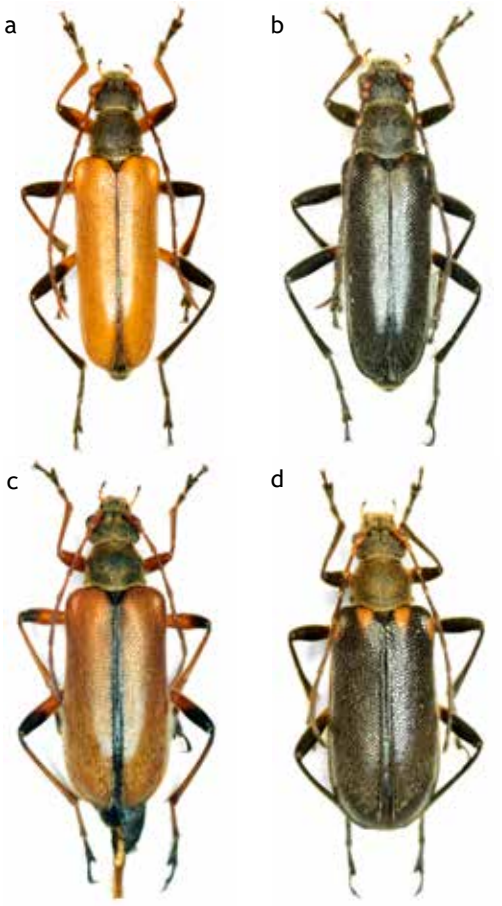
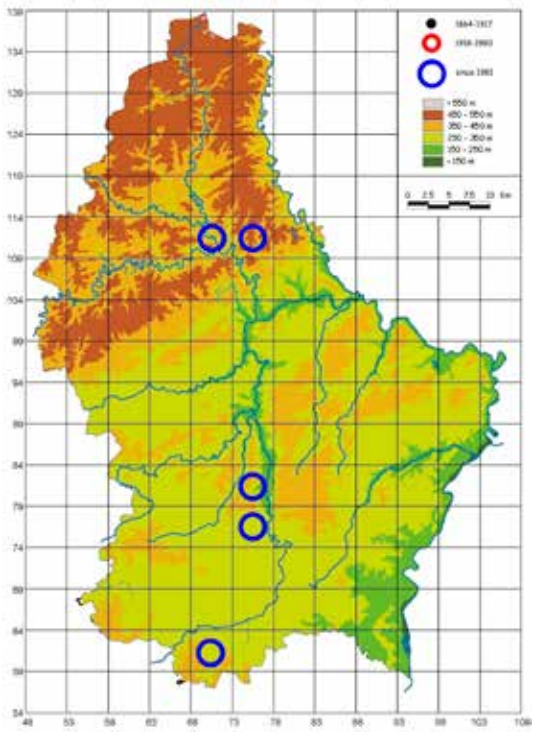


Fig. 128: *Cortodera humeralis*, a-b. Male, Bambësch, c-d. Female, Bambësch (author's coll.).

The melanistic form may be confused with several species: *Stenurella nigra* (4.3.2.20) and *Leptura aethiops* (4.3.2.16), both with the pronotum spined at the base, *Grammoptera* spp. (4.3.2.10 and 4.3.2.12), having smaller size, or melanistic *Anoplodera sexguttata* (4.3.2.2) with always black limbs. The forms with yellow elytra differ from all local species in the parallel-sided elytra.

Life-cycle lasts one year. Larvae bore rotten branches and roots of thermophilic broadleaf trees and bushes, overwinter in the soil and the pupation occurs in early spring. Adults are diurnal on blossom trees in spring (Fig. 127). They can be collected, sometimes in larger number, especially by beating branches of host trees.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981	1		1				1	1	1				5
Total	1		1				1	1	1				5

Fig. 129: Distribution of *Cortodera humeralis* and colonised localities in Luxembourg.

Host plants: *Quercus* and *Prunus*. *Pinus*, quoted by some authors, must be referred to other species.

Euro-Anatolian thermophilic species, widespread from the Pyrenees to southern Anatolia. Three subspecies have been recognised: the nominal one (most of Europe), *aspromontana* J. Müller, 1948 (trans-Adriatic: southern Italy and Greece) and *orientalis* Adlbauer, 1988 (Anatolia). In Central Europe, it is widespread in xeric localities and infrequently collected.

The regions neighbouring Luxembourg show scattered data, revealing the episodic character of the findings. In Rhineland-Palatinate, the species is widespread but in strong regression to the warmer plains of Palatinate, while it was found in the Saarland only in 1995 (Niehuis, 2001). It is little common in northern Lorraine (Colson, 1980a), though once very rare (Fournel & Gehin, 1846), but widespread and sometimes abundant everywhere in Alsace (Matter, 1998). It is rare in the French Ardennes (Ligeron, 2005) and in the Netherlands (Zeegers & Heijerman, 2008), uncommon in Belgium and restricted to the south-eastern of the country (Lameere, 1885, 1894; Lempereur et al., 2000; Delwaide & Thieren, 2010).

The species is fragmentally widespread in the oak woods of xerothermic localities of Luxembourg (Fig. 129). Due to its unusual habits, it has been collected only recently but it seems in probable regression everywhere.

4.3.2.2 *Anoplodera sexguttata* (Fabricius, 1775)

Leptura sexguttata Mousset, 1969: 167; Mousset, 1973: Map. 406. *Anoplodera sexguttata* Köhler, 2011: 88, 130; Köhler, 2013: 63, 102; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 216.

Body size 7-12 mm. Entirely black; elytra with six yellow spots (typical form), the discal and the apical ones often united forming a discal yellow line (var. *exclamationis*), or reduced so that only the basal one (var. *biguttata*) or no spot (var. *atrata*) is present. The typical form is mainly present in females, while males show united or reduced spots.

The only melanistic form may be confused with other species: *Stenurella nigra* (4.3.2.20) and *Leptura aethiops* (4.3.2.16), both having the pronotum with spined basal angles, *Grammoptera* spp. (4.3.2.10 and

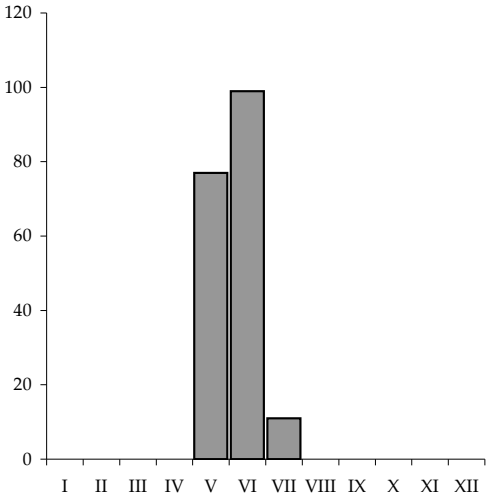


Fig. 130: Phenology of *Anoplodera sexguttata* in Luxembourg.

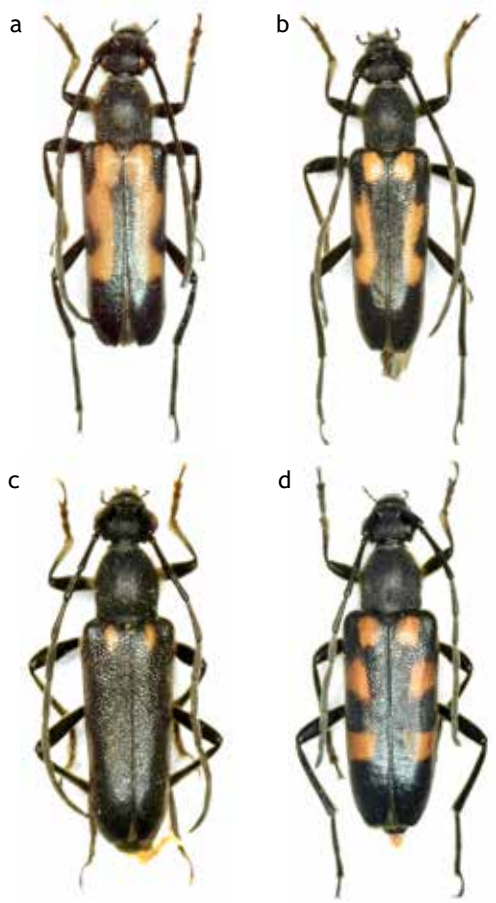
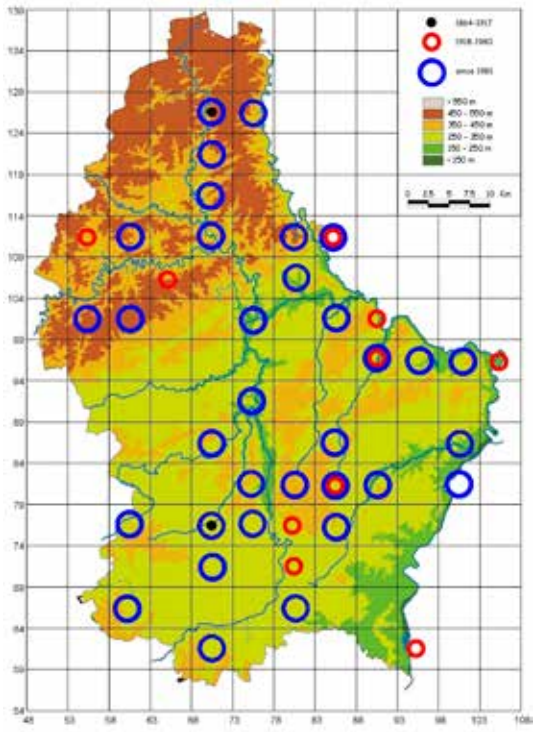


Fig. 131: *Anoplodera sexguttata*, a-b. Male, Biergerbësch, c. Male, Grossebësch/Tandel, d. Female, Ierelschen (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	total
1864-1917	1						1						2
1918-1980		2		1				3		3		1	10
since 1981	3	2	2	3	2	4	4	13	4	4	6		47
Total	4	4	2	3	2	4	4	16	4	7	6	1	57

Fig. 132: Distribution of *Anoplodera sexguttata* and colonised localities in Luxembourg.

4.3.2.12), having smaller size, or melanistic *Cortodera humeralis* (4.3.2.1), with partially red limbs.

Life-cycle lasts two years. Larvae bore rotten woods of Fagales, especially beech; pupation occurs inside the wood. Adults are diurnal on blossom flowers and bushes, especially in fresh humid shaded localities, from mid-spring to early summer (Fig. 130).

Host plants: *Fagus*, *Quercus*, *Alnus*, *Carpinus*.

Western Palaearctic species, widespread from the Iberian System to European Russia tracing the distribution of beech, with a relict population in Algeria. It is usually uncommon or rare, but sometimes numerous in old beech woods.

In the regions neighbouring Luxembourg, it is largely widespread in Rhineland-Palatinate and the Saarland (Niehuis, 2001). Once considered as very rare (Godron, 1866; Picard, 1929), it has become fairly common in northern Lorraine (Colson, 1980a) and in Alsace (Matter, 1998), continuing to be rare in the French Ardennes (Ligeron, 2005). In Belgium, the species is infrequent and nowadays prevalent in the South (Desière, 1969; Lempereur et al., 2000), while once it was present and fairly common only in the Condroz (Lameere, 1894).

The species is very common and widespread throughout Luxembourg (Fig. 130). It is in evident expansions, especially in the southern beech woods, evidently favoured by the forest management privileging this tree.

4.3.2.3 *Anoplodera rufipes* (Schaller, 1783)

Anoplodera (s. str.) rufipes Vitali, 2011b: 79, 84 Fig. 4. *Anoplodera rufipes* Vitali, 2013: 146.

Body size 7-12 mm. Black; legs red. Stable. In the southern and eastern part of its distribution it shows forms, more or less considered as subspecies, with a red abdomen.

Life-cycle lasts two years. Larvae bore the bordering parts between dead and living wood of Fagales, especially oaks; pupation occurs inside the wood. Adults are diurnal on blossom bushes and trees (*Crataegus, Quercus*) in warm localities in late spring (Fig. 133).

Host plants: *Fagus, Quercus, Betula.*

Euro-Anatolian thermophilic species, sporadic everywhere, sometimes locally abundant.

In the regions neighbouring Luxembourg, it is mainly present in eastern Rhineland-Palatinate (Niehuis, 2001), while it is rare in northern Lorraine (Godron, 1866; Colson, 1980a) and Alsace (Matter, 1998). Relatively recently found in southern Belgium (Desière, 1969), where it seemed extinct. Absent or extinct elsewhere (Ligeron, 2005; Zeegers & Heijerman, 2008).

The species is fragmentally widespread in the oak woods of some xerothermic localities of Gutland (Fig. 135). Only recently very recorded, but probable in regression south-eastwards.

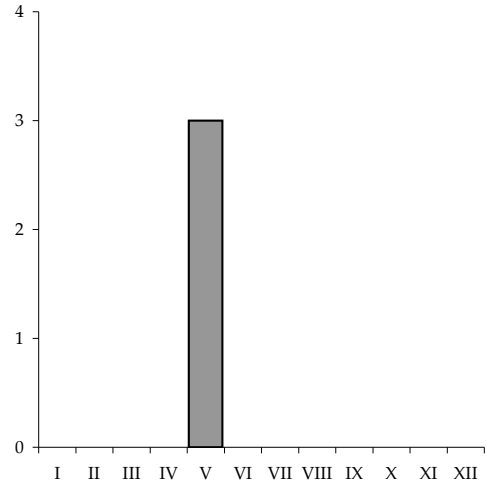
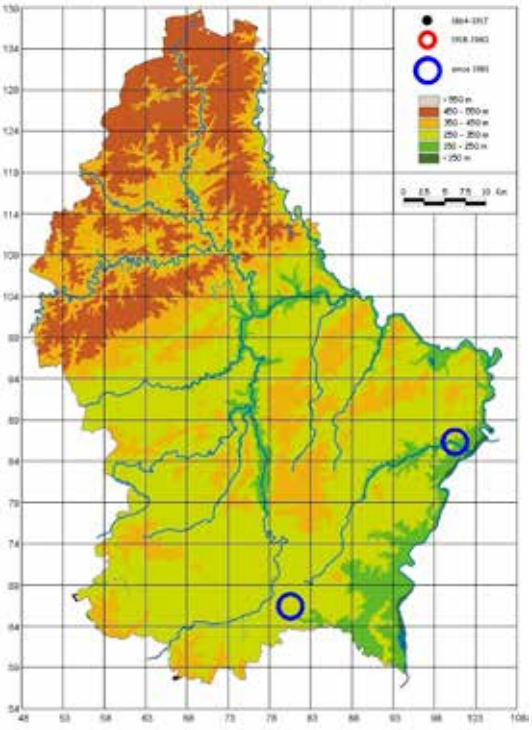


Fig. 133: Phenology of *Anoplodera rufipes* in Luxembourg.

Fig. 134: *Anoplodera rufipes*, Male, Fausermühle (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	total
1864-1917													0
1918-1980													0
since 1981									1		1		2
Total									1		1		2

Fig. 135: Distribution of *Anoplodera rufipes* and colonised localities in Luxembourg.

4.3.2.4 *Pseudovadonia livida* (Fabricius, 1776)

Leptura livida Hostie, 1951: 373; Mousset, 1969: 168; Mousset, 1973: Map. 403. *Pseudovadonia livida* Vitali, 2013: 146; Weitzel, 2014: 216.

Body size 5-9 mm. Small, throughout black with testaceous elytra. Pronotum with rounded basal angles; scutellum bi-toothed at the apex. Stable. Other subspecies show different pubescence, or reddish elytra, legs or abdomen.

The species may be confused with some Lepturini with analogue colouring and size: *Paracorymbia maculicornis* (4.3.2.8), but antennae ringed of white and elytral apex at least obscured; *Alosterna tabacicolor* (4.3.2.13), but more elongate, with pronotum with spined basal angles and yellow legs; males of *Stenurella* spp. (4.3.2.18-4.3.2.19), more elongate and with pronotum with spined basal angles.

Life-cycle lasts two years. Larvae feed on wood rests in soils colonised by the mycelium of *Marasmius oreades* (Bolt.) and pupates in the soil in an earthen cocoon. Adults are diurnal on blossom flowers of small sunny grasslands in early summer (Fig. 136).

Parasitoids: *Pœmenia hectica* (Gravenhorst, 1829) (Ichneumonidae).

Eurasian thermophilic species, widespread from Portugal to western China. Six subspecies have been recognised: the nominal form (Central Europe), pecta J. Daniel & K. Daniel, 1891 (Iberia, Mediterranean France and Italy), *setosa* Danilevsky, 2013 (southern and eastern Balkans), *bicarinata* Arnold, 1869 (from eastern Europe to China), *desbrochersi* Pic, 1891 (Caucasus) and *hatayensis* Özdikmen, 2015 (Turkey). In most of Europe, the species is common and abundant, mainly in lowlands.

In the regions neighbouring Luxembourg, it is widespread and very common in the southern Netherlands (Zeegers & Heijerman, 2008), central Belgium (Lameere, 1894; Collart, 1941) and lowlands of Rhineland-Palatinate and Alsace (Matter, 1998). It is little widespread in the Saarland (Niehuis, 2001), locally fairly rare in northern Lorraine (Colson, 1980a) and fairly common in the French Ardennes (Ligeron, 2005).

In Luxembourg, this species is common and mainly abundant in June, especially on *Achillea millefolium* L. in open fields at the borders of woods or even in gardens (Fig. 138).

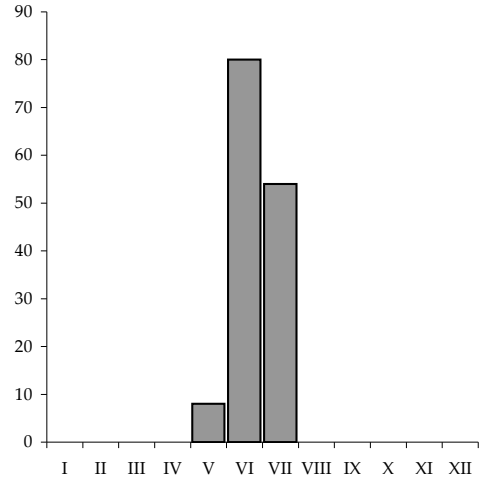
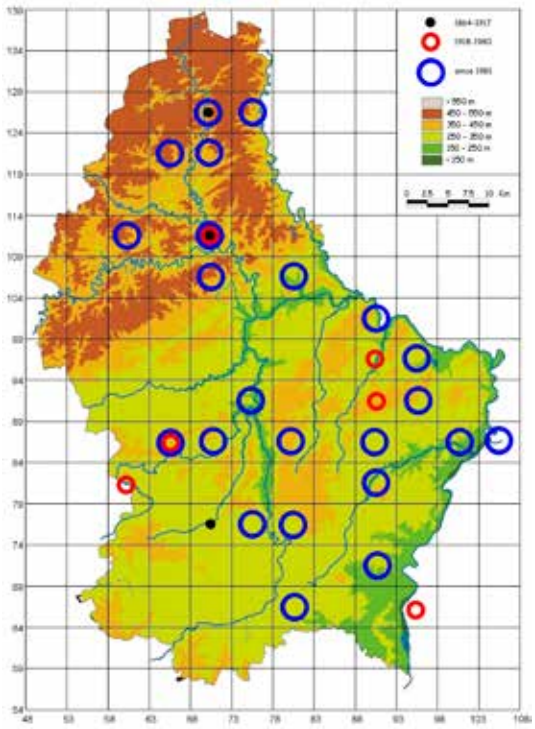


Fig. 136: Phenology of *Pseudovadonia livida* in Luxembourg.

Fig. 137: *Pseudovadonia livida*, a. Male, Eicherfeld, b. Female, Munshausen (author's coll.), c. Female, Bambësch on *Achillea*.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1		1				1						3
1918-1980			1				2			2		1	6
since 1981	3	2	3	1		2	1	4	1	4	5	1	27
Total	4	2	4	1		2	4	4	1	6	5	1	34

Fig. 138: Distribution of *Pseudovadonia livida* and colonised localities in Luxembourg.

4.3.2.5 *Stictoleptura rubra* (Linnaeus, 1758)

Leptura rubro-testacea Schuster, 1907a: 87. *Leptura testacea* Ferrant, 1907a: 303; Ferrant, 1911: 68. *Leptura rubra* Mousset, 1969: 168; Mousset, 1973: Map. 405; Haagen, 1986: 49. *Corymbia rubra* Gerend et al., 2007: 290; Weitzel, 2014: 216. *Stictoleptura rubra* Vitali, 2013: 146; Vitali, 2014: 88.

Body size 10-20.5 mm. Dimorphic: males smaller, with posteriorly restricted testaceous elytra; females larger, with parallel-sided elytra, red with a blackish head. Antennae black and legs bicolour in both sexes. Stable.

Life-cycle lasts two years. Larvae bore rotten woods of conifers, especially spruce and pines, exceptionally observed on Fagales (*Quercus*, *Fagus* and *Betula*). Pupation occurs inside the wood in early summer. Adults are diurnal on leaves and flowers of bushes, especially on *Rubus* in areas subject to clear-cutting; females are often on fallen trunks in mid-summer (Fig. 139).

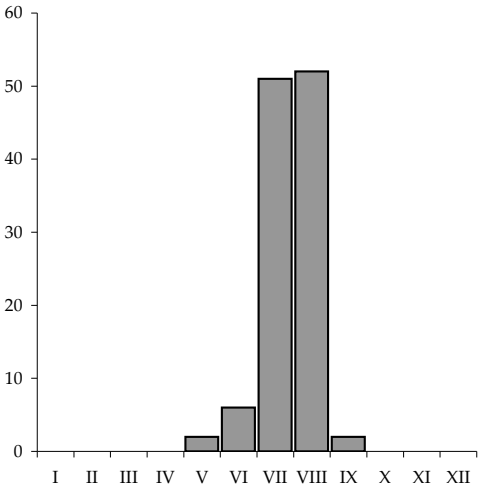


Fig. 139: Phenology of *Stictoleptura rubra* in Luxembourg.

Host plants: *Abies*, *Picea*!, *Larix*, *Pinus*.

Parasitoids: *Rhimphoctona xoridiformis* (Holmgren, 1860) (Ichneumonidae).

Predators: *Lacon punctatus* (Herbst, 1779) (Elateridae).

Palaearctic species, widespread from North Africa to Japan. Four subspecies have been recognised, though sometimes considered as synonyms or true species: *numidica* Peyerhimoff, 1917 (Algeria), the nominal form (from Portugal to Lake Baikal), *dichroa* Blanchard, 1871 (eastern Siberia to Manchuria) and *succedanea* Lewis, 1873 (Japan). The distribution of species with analogue geonemy and biology (i.e. *Rhagium inquisitor*) supports the subspecific status of these taxa. In Europe, the species is of mountain origin, but it has been introduced and acclimatised in plains in relatively recent times due to conifer plantations.

In the regions neighbouring Luxembourg, it is autochthonous only in the Vosges, once being unknown elsewhere or very rare in Rhineland-Palatinate and northern Lorraine (Brahm, 1790; Fournel & Gehin, 1846). In Belgium, it was collected for the first time by C. van Volxem near Namur (Anonym, 1866), later from Rouge-Cloître (Lameere, 1885), but it was considered as

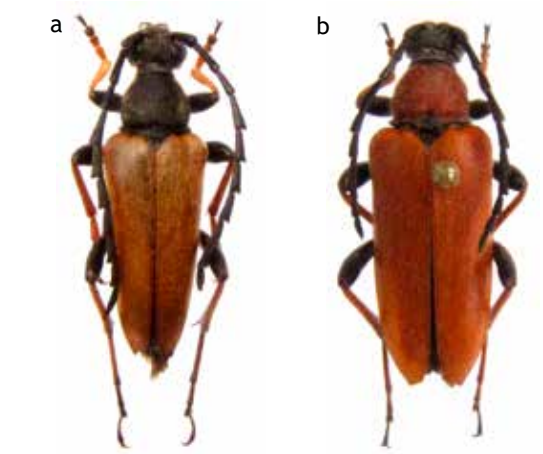
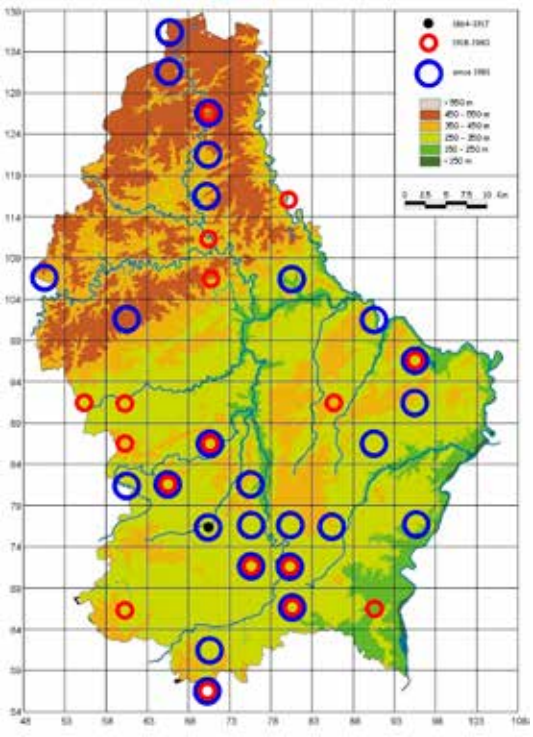


Fig. 140: *Stictoleptura rubra*, a. Male, b. Female, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1						1
1918-1980	2	1	1		2	2	2	3	3	1		1	18
since 1981	6	2		2	1	1	3	11	3	3	2		34
Total	8	3	1	2	3	3	6	13	6	4	2	1	52

Fig. 141: Distribution of *Stictoleptura rubra* and colonised localities in Luxembourg.

accidental (Lameere, 1894). It has already been present in Holland at the end of the 19th century (Lameere, 1894) but it was unknown in the Belgian Ardennes until 1910 (Collart, 1941). Afterwards, it has become more and more common in the Netherlands, Belgium, Rhineland-Palatinate and Alsace (Collart, 1941; Matter, 1998; Lempereur et al., 2000; Niehuis, 2001; Thirion, 2005a; Zeegers & Heijerman, 2008) remaining rare in northern Lorraine and in the French Ardennes (Colson, 1980a; Ligeron, 2005).

In Luxembourg, the species was considered as a pest for pines at the beginning of the 20th century (Schuster, 1907a), but without importance, according to Ferrant (1907b, 1911). The first specimen was collected by V. Ferrant at Thillsmillen most probably before 1890. Nowadays, the species is present in nearly all spruce plantations (Fig. 141), being the last species of Lepturinae that can be observed in summer. The analysis of its distribution over time suggests that it was introduced at the end of the 19th century and colonised the country eastwards taking advantage of the forest management, which privileged spruce (Faber, 1913b).

4.3.2.6 *Stictoleptura scutellata* (Fabricius, 1781)

Corymbia scutellata Gerend et al., 2007: Fig. 10, 290; Köhler, 2009: 61, 62, 71, 110; Köhler, 2013: 60, 62, 102. *Stictoleptura scutellata* Vitali, 2013: 146.

Body size 12-20 mm. Entirely dull black; scutellum covered with light pubescence. Males smaller, with posteriorly restricted elytra, scutellum covered with silver pubescence; females larger, with parallel-sided elytra scutellum covered golden pubescence. Stable. In the southern and eastern part of its distribution, it shows forms with the elytra being testaceous or covered with a dense yellow pubescence.

Smaller males with missing scutellar pubescence may be confused with other black Lepturinae having analogue size; nonetheless, they always show a coarse puncturing covering the basal half of the elytra, lacking in other species.

Life-cycle lasts at least two years. Larvae bore rotten wood of Fagales, especially beech, exceptionally found on *Larix* (Bense, 1995). Pupation occurs inside the wood in spring. Adults are diurnal on the host plants, rarely on flowers, since the end of spring (Fig. 142). Because of its

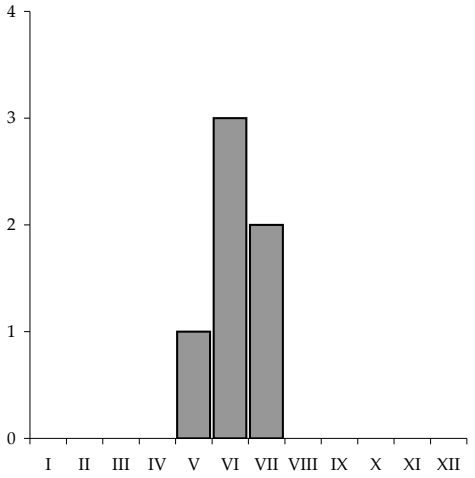
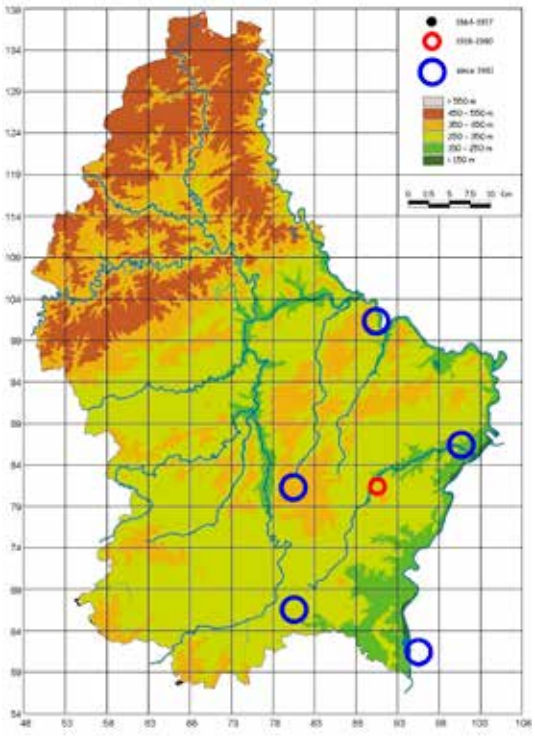


Fig. 142: Phenology of *Stictoleptura scutellata* in Luxembourg.

Fig. 143: *Stictoleptura scutellata*, a. Male, b. Female, Grünewald (coll. Mnhn), c. Female, Grünewald.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980											1		1
since 1981								2	1	1	1	1	6
Total								2	1	1	2	1	7

Fig. 144: Distribution of *Stictoleptura scutellata* and colonised localities in Luxembourg.

colouring, the species is difficultly visible and rarely observed. More commonly collected with sweet traps.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Betula*, *Corylus*, *Carpinus*.

Parasitoids: *Histeromerus mystacinus* Wesmael, 1838 (Braconidae).

Western Palaearctic thermophilic species, in Central Europe, especially related to beech but usually uncommon everywhere.

In the regions neighbouring Luxembourg, it has a scattered distribution in plain regions of Rhineland-Palatinate (Niehuis, 2001); it is rare to very rare in northern Lorraine (Fournel & Gehin, 1846; Godron, 1866; Colson, 1980a) and Belgium

(Lameere, 1894); absent from the Netherlands (Ligeron, 2005) and the French Ardennes (Zeegers & Heijerman, 2008).

Though this species was recorded for the first time in 2007, J. Thoma collected the first Luxembourgish specimen in 1978. Nowadays, *S. scutellata* is mainly present in the old beech forests of the eastern Gutland (Fig. 144), but its distribution is still inadequately known.

4.3.2.7 *Paracorymbia fulva* (DeGeer, 1775)

Leptura fulva Mousset, 1969: 168; Mousset, 1973: Map. 402. *Paracorymbia fulva* Vitali, 2013: 146; Vitali, 2014: 88. *Corymbia fulva* Weitzel, 2014: 216.

Body size 9.5-15 mm. Throughout black, elytra testaceous with a black apex. Pronotum with rounded basal angles. Stable.

The species may be confused with some Lepturini with analogue coloration and size: *Paracorymbia maculicornis* (4.3.2.8), which shows antennae ringed of white, and males of *Anastrangalia dubia* (4.3.2.9), which are more elongated and show laterally black elytra.

The biology of this species is inadequately known. Adults were occasionally reared from broadleaf stumps. Adults are diurnal on blossom flowers of sunny grasslands in summer (Fig. 145).

Host plants: *Castanea*, *Acer*, *Salix*, *Populus*, *Pinus*.

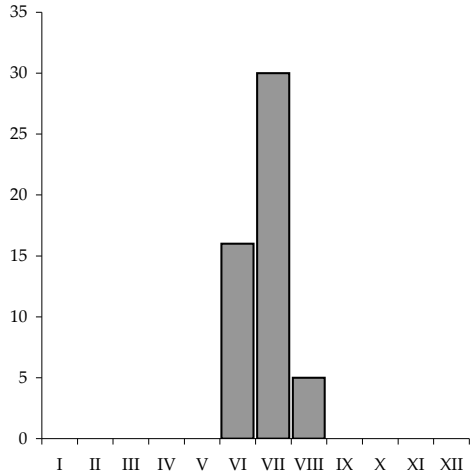


Fig. 145: Phenology of *Paracorymbia fulva* in Luxembourg.

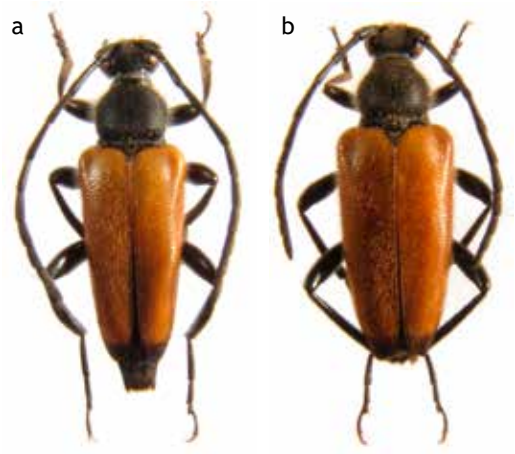
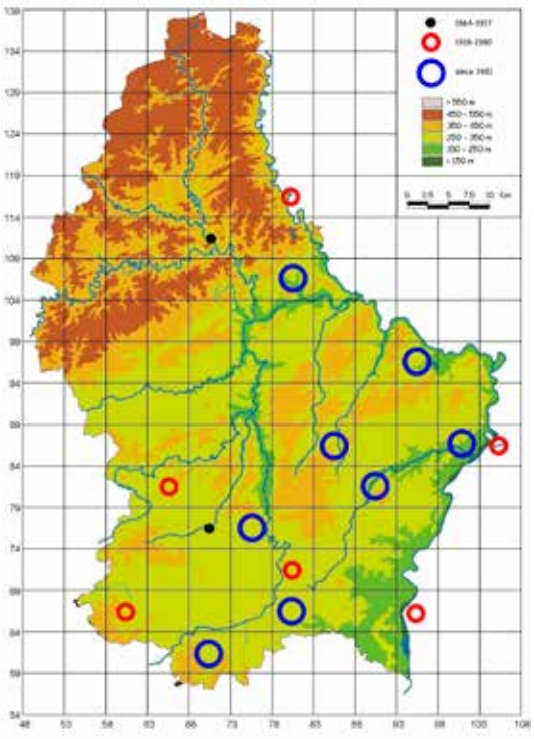


Fig. 146 *Paracorymbia fulva*, a. Male, Dudelange, b. Female, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917			1				1						2
1918-1980	1						1	2	1		1	1	7
since 1981				1				3	3	2	4		13
Total	1		1	1			2	5	4	2	5	1	22

Fig. 147: Distribution of *Paracorymbia fulva* and colonised localities in Luxembourg.

Euro-Anatolian thermophilic species, generally fairly common.

It is widespread in all regions neighbouring Luxembourg (Fournel & Gehin, 1846; Godron, 1866; Lameere, 1894; Colson, 1980a; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008), being very common in most southern plains, especially in south-eastern Rhineland-Palatinate, northern Lorraine and the French Ardennes, while it is rare in the Vosges (Matter, 1998).

In Luxembourg, it is mainly widespread in the sunny grasslands of the southern and the eastern parts of the country (Fig. 147), where it seems particularly related to the white inflorescences of *Daucus carota* L. and *Achillea millefolium* L. Seemingly, it is little common and in some south-eastwards regression.

4.3.2.8 *Paracorymbia maculicornis* (DeGeer, 1775)

Leptura maculicornis Mousset, 1973: Map. 404. *Corymbia maculicornis* Köhler, 2009: 59, 62, 109; Köhler, 2013: 63, 102. *Paracorymbia maculicornis* Vitali, 2011b: 79, 84 Fig. 8; Vitali, 2013: 146.

Body size 7-10 mm. Small, throughout black; elytra testaceous, except for the apex and a small spot under the shoulder. Antennae ringed of white; pronotum with rounded basal angles. Stable.

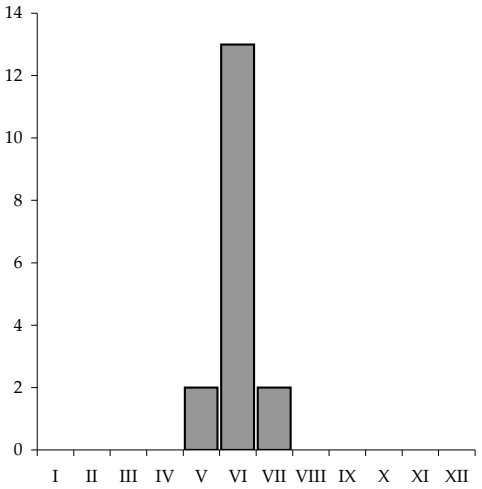


Fig. 148: Phenology of *Paracorymbia maculicornis* in Luxembourg.

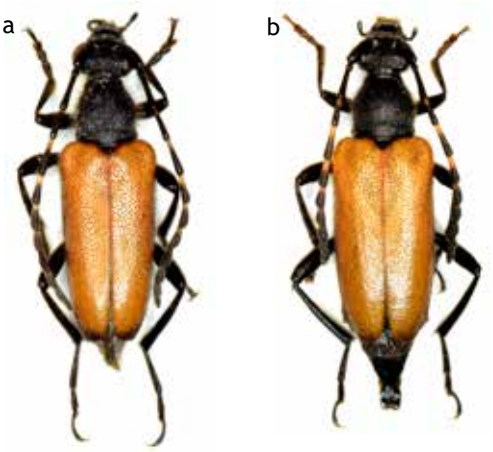
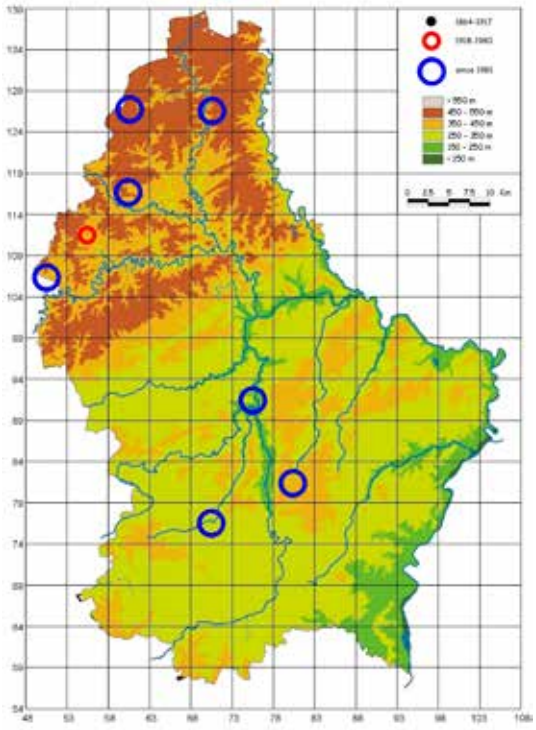


Fig. 149: *Paracorymbia maculicornis*, a. Male, b. Female, Surré (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980		1											1
since 1981	3	2				1	1	1					8
Total	3	3				1	1	1					9

Fig. 150: Distribution of *Paracorymbia maculicornis* and colonised localities in Luxembourg.

The species may be confused with several Lepturini with analogue colouring but it is the only one showing ringed antennae.

Life-cycle lasts two years. Larvae bore the rotten branches of Pinaceae and Fagales; pupation occurs inside the wood in spring. Adults are diurnal on blossom flowers from mid-spring to early summer (Fig. 148).

Host plants: *Fagus*, *Quercus*, *Betula*, *Corylus*, *Abies*, *Picea*, *Pinus*.

European boreal species related to the postglacial Scots pine-birch forests (Vitali, 2004). Southwards, it is limited by the Pyrenees and the Alps and widespread up to most of Scandinavia and Belarus.

In the regions neighbouring Luxembourg, it is a relatively recent colonisation: unknown to Fournel & Gehin (1846), it was recorded as very common in the high Vosges by Godron (1866), while it appeared in northern Rhineland-Palatinate - apparently imported - only in 1900 (Niehuis, 2001). It is fairly common in northern and southern Rhineland-Palatinate but strangely absent from the central reliefs of the Hunsrück, little common in northern Lorraine (Colson, 1980a) but common in Alsace (Matter, 1998). It is widespread, but rare, in the southern reliefs of the Belgian Ardennes (Lameere, 1885, 1894; Collart, 1941; Lempereur et al., 2000) and in the French Ardennes (?Ligeron, 2005, as *Leptura hybrida*). This spotted distribution suggests a natural range along the Vosges and local acclimatisations following introductions elsewhere.

Though Mousset (1973) figured three localities prior to 1950 and one between 1950 and 1973, no specimen was collected in Luxembourg until 1977, correspondently to the fact that Mousset (1969) had not mentioned this species. Presently, *Paracorymbia maculicornis* is rare and mainly widespread in the Oesling (Fig. 150), where it has possibly been introduced and always in correlation to artificial plantations of Picea abies.

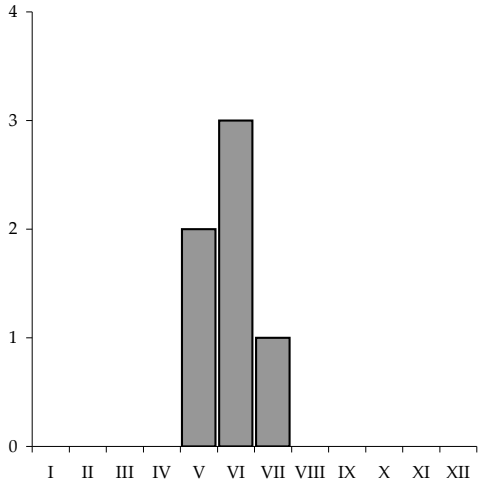


Fig. 151: Phenology of *Anastrangalia dubia* in Luxembourg.

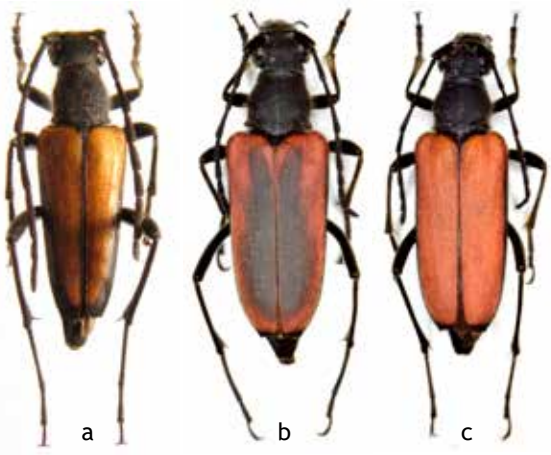


Fig. 152: *Anastrangalia dubia*, a. Male, Bambësch (author's coll.), b. Female, Grünewald, c. Female, Thillsmillen (coll. Mnhn).

4.3.2.9 *Anastrangalia dubia* (Scopoli, 1763)

Anastrangalia dubia Vitali, 2011b: 80, 84 Fig. 7; Vitali, 2013: 146.

Body size 9-16 mm. Very variable but usually dimorphic: throughout black, elytral disk testaceous in male, red in female. Males with elytra more or less obscured at the apex (var. *triangulifera*, *moreana*) to entirely black (var. *chamomillae*); female often with entirely red elytra (var. *graeca*) or with the disk more or less covered by a black band (typical form), sometimes entirely black.

The only melanistic forms (not found in Luxembourg yet) may be confused with several other species having analogue colouring: *Stictoleptura scutellata* (4.3.2.6), with coarse puncturing covering the basal elytral half, *Stenurella nigra* (4.3.2.20), with spined pronotal base, *Leptura aethiops* (4.3.2.16) and *Anoplodera sexguttata* (4.3.2.2), both with rounded elytral apex.

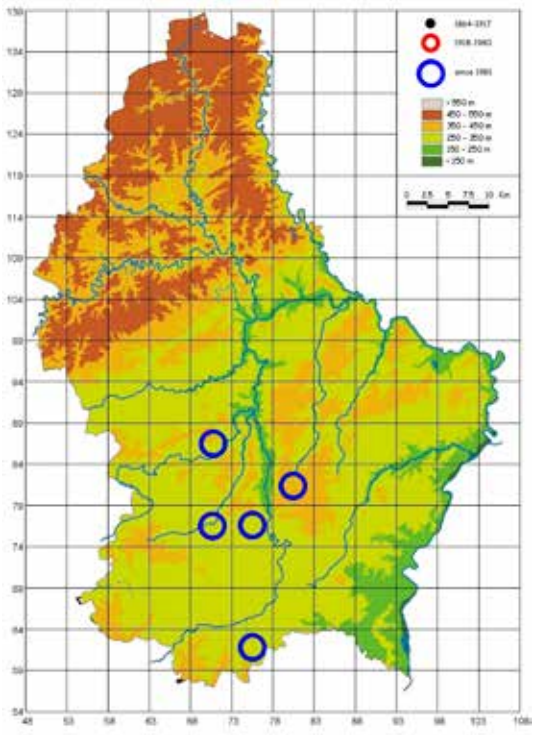
Life-cycle lasts two years. Larvae bore the rotten branches of Pinaceae; pupation occurs inside the wood in spring. Adults are diurnal on blossom flowers from late spring to mid-summer (Fig. 151).

Host plants: *Abies*, *Picea*, *Pinus*.

Western Palaearctic species, widespread from the Iberian System to Belarus and Ukraine, with an isolated population in Algeria and a subspecies (*melanota* Faldermann, 1837) in the Caucasus. Mainly occurring in mountains, it has been sometimes introduced or intercepted in plains through artificial plantations of conifers.

In the regions neighbouring Luxembourg, it is autochthonous only in the Vosges, where it has been known for a long time (Fournel & Gehin, 1846; Matter, 1998). It should be autochthonous in southern Rhineland-Palatinate as well, but the first records date to 1967 (Niehuis, 2001). It is still unknown from the Saarland and northern Lorraine, though a single old specimen from Meurthe-et-Moselle has been known (Colson, 1980a) and the species was once recorded from Metz and Nancy as well (Godron, 1866). Still absent from the Netherlands (Zeegers & Heijerman, 2008) and the French Ardennes (Ligeron, 2005), it has been recently found - evidently imported - in two localities of southern Wallonia (Drumont & Grootaert, 2011).

The species has been very recently introduced to southern Luxembourg (Fig. 153), where it seems in expansion following the artificial plantations of Picea abies.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981						1	1	2	1				5
Total						1	1	2	1				5

Fig. 153: Distribution of *Anastrangalia dubia* and colonised localities in Luxembourg.

4.3.2.10 *Grammoptera ruficornis* (Fabricius, 1781)

Grammoptera ruficornis Mousset, 1969: 174; Mousset, 1973: Map. 397; Mousset, 1981a: 56; Köhler, 2011: 90, 130; Köhler, 2013: 65, 102; Vitali, 2013: 146; Weitzel, 2014: 216. *Grammoptera (s. str.) ruficornis* Vitali, 2014: 88.

Body size 3-7 mm. Minute, thin; lead-black with greenish reflection; antennae ringed of reddish, anterior legs and femoral bases reddish testaceous. Stable, exceptionally with black (var. *holomelina*) or testaceous limbs (var. *pallipes*).

The species may be confused with other small Lepturini but it is the only one showing ringed antennae. The melanistic *holomelina* can be confused with *Grammoptera abdominalis* (4.3.2.12), which has a squared pedicle (elongated in *G. ruficornis*) and the abdomen partially red.

Life-cycle lasts one year. Larvae bore dry branches of many broadleaf trees; pupation occurs inside the wood in spring. Adults are diurnal on blossom flowers and bushes, unfrequently on blossom trees, from early spring to early summer (Fig. 154). Though they may be collected on isolated blossom bushes, the adults are preferentially ombrophilic and hygrophilic, being mainly common along wood trails. They are also attracted by Moericke traps with light colours (yellow, green or pink).

Host plants: *Fagus*, *Quercus*, *Alnus*, *Corylus*, *Carpinus*, *Ulmus*, *Ficus*, *Juglans*!, *Rosa*, *Crataegus*, *Malus*, *Sorbus*, *Prunus*, *Spartium*, *Robinia*, *Cotinus*, *Acer*, *Cornus*, *Hedera*!, *Euonymus*, *Frangula*, *Rhamnus*, *Salix*, *Populus*, *Tilia*, *Fraxinus*.

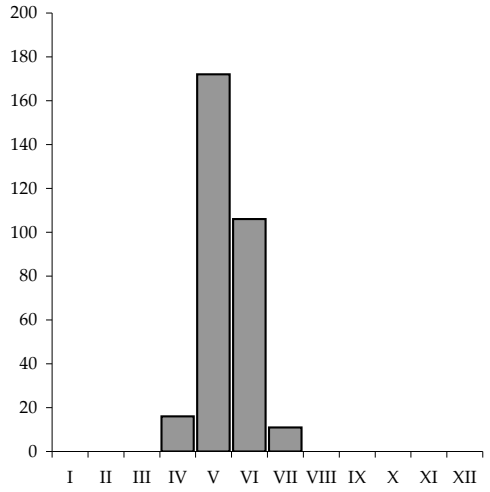


Fig. 154: Phenology of *Grammoptera ruficornis* in Luxembourg.

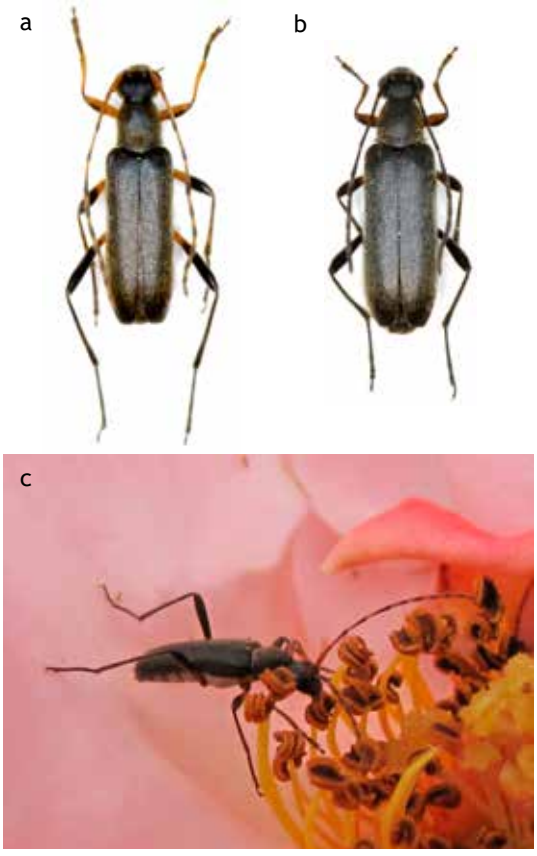
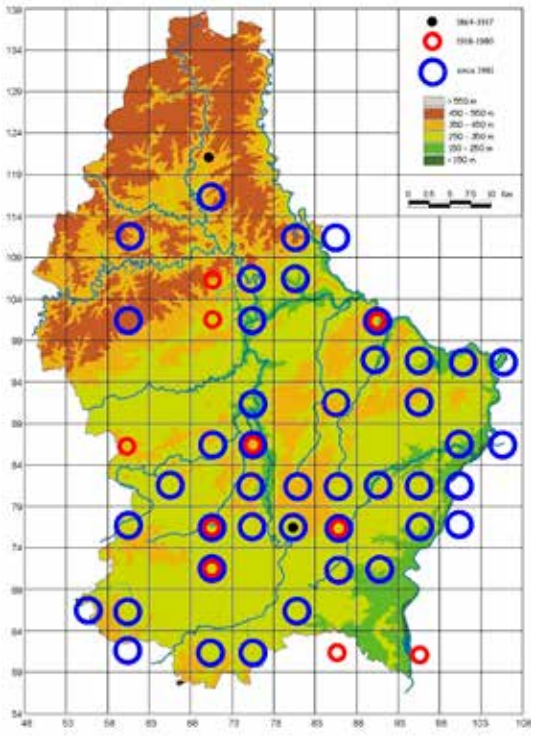


Fig. 155: *Grammoptera ruficornis*, a. Male, b. Female, Bambësch (author's coll.), c. Male on *Rosa*, Bambësch.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917			1					1					2
1918-1980		1	2			1	2	2		1		2	11
since 1981		2	3	3	1	5	6	13	9	10	11	6	69
Total		3	6	3	1	5	8	14	9	11	11	8	79

Fig. 156: Distribution of *Grammoptera ruficornis* and colonised localities in Luxembourg.

Parasitoids: *Dolichomitus agnoscendus* (Roman, 1939) (Ichneumonidae); *Cenocoelius aartseni* (van Achterberg, 1994) (Braconidae).

Euro-Anatolian species, widespread and common from Portugal to northern Iran. Two subspecies have been recognised: *obscuricornis* Kraatz, 1886 (eastern Caucasus) and the nominal form (remaining distribution). The var. *flavipes* Pic, 1892 **rest. status**, characterised by yellow limbs, is not a peculiar subspecies of Sicily (Rapuzzi & Sama, 2006) but a variety mixed with typical specimens in central Italy as well (Biscaccianti, 2007). Though revalidated again on the basis of inconsistent reasons (Rapuzzi & Sama, 2010), it must be definitively considered as a simple chromatic form; moreover, specimens showing analogue characters have already been described from England *as*

Leptura pallipes Stephens, 1831. This form is not uncommon in Ireland as well (Johnson & Halbert, 1902).

In the regions neighbouring Luxembourg, it is known for a long time, widespread and common to very common nearly everywhere (Fournel & Gehin, 1846; Godron, 1866; Lameere, 1894; Desière, 1969; Colson, 1980a; Lempereur et al., 2000; Niehuis, 2001; Zeegers & Heijerman, 2008), except for the reliefs covered with conifers of the Ardennes and the Vosges (Collart, 1941; Matter, 1998; Ligeron, 2005).

In contrast to the neighbouring regions, the species seems to have been very rare during the 19th century and in expansion only after WWII. Though Ferrant had already collected it in the Oesling before WWI, Mousset (1969) recorded the first specimens from Ernzen (Mersch) and Betrange (Luxembourg) in 1968. Currently, none of them is present in the collection, being only *Alosterna tabacicolor* collected in Ernzen and the first *Grammoptera* collected at Betrange only in 1971. Actually, several specimens were collected in the Oesling and along the Belgian border still during the 1950s. Thus, it seems that *G. ruficornis* was once fairly rare in central Luxembourg and possibly, widespread later, following the augmentation of the vegetal coverture and the climatic oceanisation. Nowadays, it is very common throughout the country (Fig. 156) and often very abundant on all white flowers, especially of *Anthriscus* and *Crataegus*. It is the first longicorn to appear in the first sunny days of April.

4.3.2.11 *Grammoptera ustulata* (Schaller, 1783)

Grammoptera ustulata Köhler, 2011: 88, 130; Köhler, 2013: 63, 102; Vitali, 2013: 146. *Grammoptera (s. str.) ustulata* Vitali, 2011b: 80, 84 Fig. 6.

Body size 5-9 mm. Small, thin; testaceous with darker head, elytral apex, tarsi and flagellum. Stable.

The species might be superficially confused with *Alosterna tabacicolor* (4.2.2.13), which has an entirely black prothorax.

Life-cycle probably lasts one year. Larvae bore the dead branches of thermophilic broadleaf trees (especially oaks and walnut) and bushes (hawthorns), attacked by the fungus *Vuilleminia comedens* (Nees) Maire. Pupation occurs inside the wood in spring. Adults are diurnal on blossom trees and bushes in late spring.

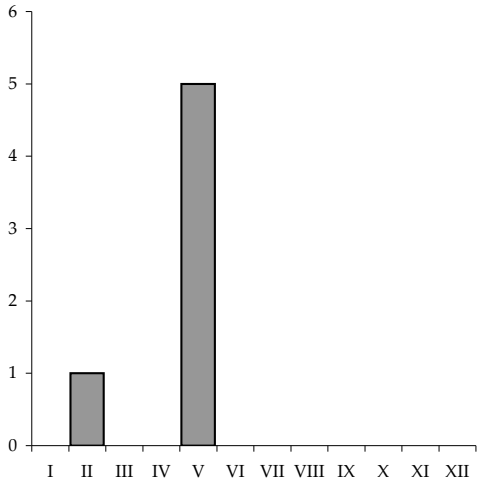


Fig. 157: Phenology of *Grammoptera ustulata* in Luxembourg.

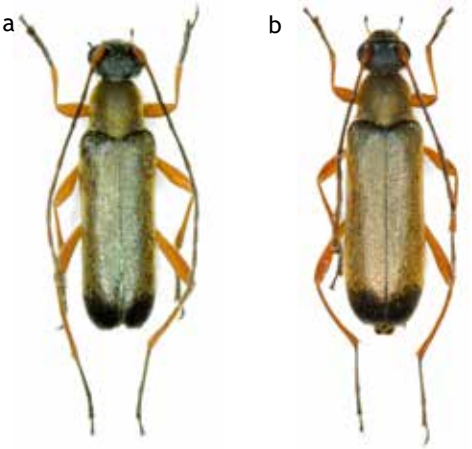
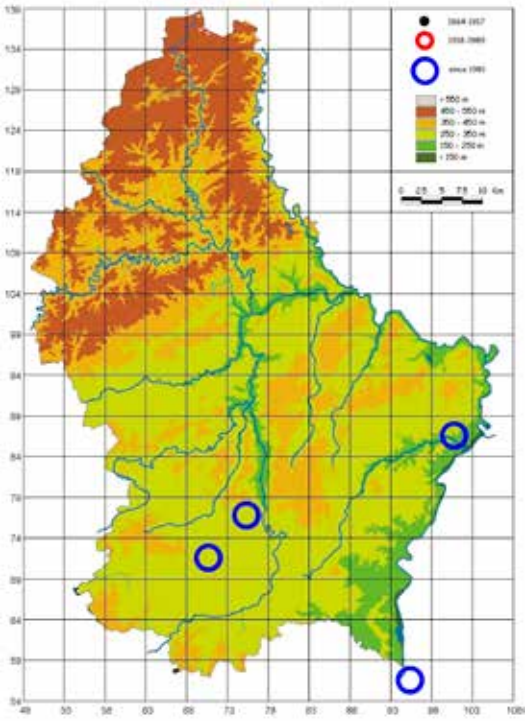


Fig. 158: *Grammoptera ustulata*, a. Male Leudelange, (coll. Mnhn), b. Female, Mertert (author's coll.).

Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Juglans*, *Crataegus*.

Euro-Anatolian species, widespread from Andalusia to the Caucasus, prevalent in Central European oak forests.

In all regions neighbouring Luxembourg, it is widespread but apparently uncommon to rare (Godron, 1866; Lameere, 1894; Colson, 1980a; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008). Possibly, it was more common in the past (Fournel & Gehin, 1846), even if still unknown in Belgium at the end of the 19th century (Lameere, 1885).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981								2	1		1	1	5
Total								2	1		1	1	5

Fig. 159: Distribution of *Grammoptera ustulata* and colonised localities in Luxembourg.

This species has rarely been collected in xerothermic localities of south-eastern Gutland (Fig. 159) in May, beating blossom *Crateagus* and *Quercus*.

4.3.2.12 *Grammoptera abdominalis* (Stephen, 1831)

Grammoptera abdominalis Köhler, 2011: 88, 130; Vitali, 2013: 146. *Grammoptera (s. str.) abdominalis* Vitali, 2011b: 80, 84 Fig. 5.

Body size 5-10 mm. Small, thin; black, femoral bases and sometimes part of the abdomen red. Stable.

The species may be confused with melanistic *Grammoptera ruficornis* (4.2.2.10), which has an evidently elongated pedicle (squared in *G. abdominalis*).

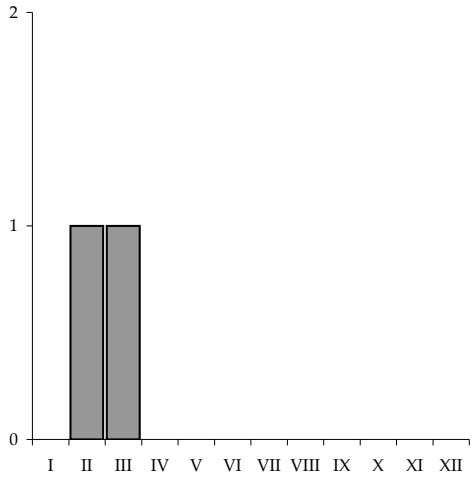


Fig. 160: Phenology of *Grammoptera abdominalis* in Luxembourg.

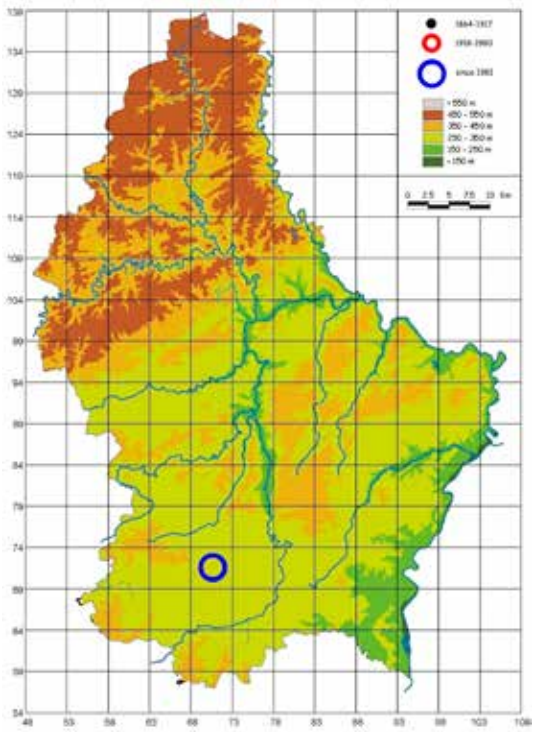
Fig. 161: *Grammoptera abdominalis*, Male, Leudelange (coll. Mnhn).

Life-cycle lasts probably two years. Larvae bore dry branches of thermophilic Fagaceae, especially oaks, attacked by the fungus *Vuilleminia comedens* (Nees) Maire. Pupation occurs inside the wood in spring. Adults are diurnal on blossom trees in late spring. Acrodendric species.

Host plants: *Castanea*, *Quercus*.

Euro-Anatolian species, widespread from Andalusia to the Caucasus, prevalent in Central European oak forests.

In the regions neighbouring Luxembourg, it is widespread in plains but always rare to very rare



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981								1	1				2
Total								1	1				2

Fig. 162: Distribution of *Grammoptera abdominalis* and colonised localities in Luxembourg.

everywhere (Fournel & Gehin, 1846; Godron, 1866; Lameere, 1894; Colson, 1980a, 1980b; Matter, 1998; Lempereur et al., 2000; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008).

This species has rarely been collected in xerothermic oak woods of south-eastern Gutland (Fig. 162), most probably reared from firwood.

4.3.2.13 *Alosterna tabacicolor* (DeGeer, 1775)

Alosterna tabacicolor Mousset, 1969: 167; Mousset, 1973: Map. 384; Gerend et al., 2007: 290; Köhler, 2009: 62, 109; Köhler, 2011: 88, 130; Köhler, 2013: 62, 102; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 216.

Body size 5-9.5 mm. Small, thin; black with testaceous elytra and legs. Elytral suture and apex more or less obscured (typical form), rarely completely testaceous (var. *unicolor*).

The species might be superficially confused with *Grammoptera ustulata* (4.3.2.11), which has an entirely black prothorax. Other species with analogue colouring always show black legs.

Life-cycle lasts two years. Females lay eggs in rotten humid branches of broadleaf trees, especially Fagales, exceptionally of Pinaceae. Larvae emerge after 15 days and bore the sapwood. Pupation occurs inside the wood in spring (Fig. 163). Adults are diurnal on blossom flowers and bushes in woody localities from mid-spring to mid-summer.

Host plants: *Quercus*, *Betula*, *Corylus*, *Carpinus*, *Ulmus*, *Acer*, *Salix*, *Picea*, *Pinus*.

Eurasian species, widespread from the Cantabrian Mts. to Japan, northwards to the North Cape, restricted to mountains in the southern part of its distribution. Six subspecies have been recognised: the nominal form (Europe to Kazakhstan), *subvittata* Reitter, 1885 (Caucasus), *tokatensis* Pic, 1901 (Turkey), *erythropus* Gebler, 1841 (Altai Mts. to Japan), *sachalinensis* Danilevsky, 2012 (Sakhalin) and *tenebris* Danilevsky, 2012 (Ussuri to Korea).

In the regions neighbouring Luxembourg, it is widespread and common to very common everywhere (Fournel & Gehin, 1846; Godron, 1866; Everts, 1903; Desière, 1969; Gaspar & Verstraeten, 1972; Colson, 1980a; Matter, 1998; Lempereur et al., 2000; Niehuis, 2001; Zeegers & Heijerman,

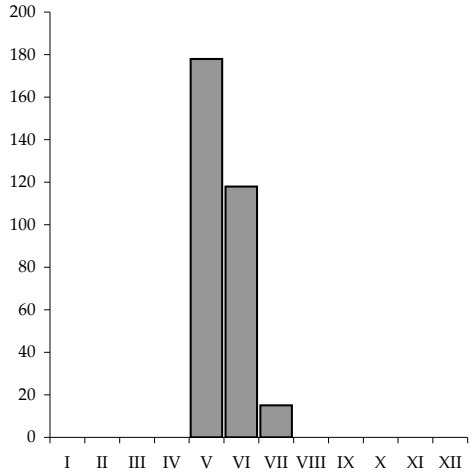


Fig. 163: Phenology of *Alosterna tabacicolor* in Luxembourg.

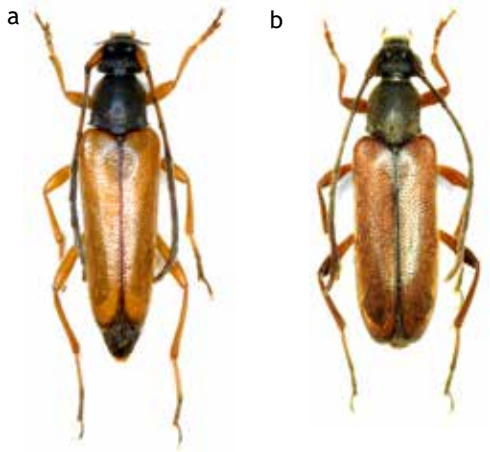
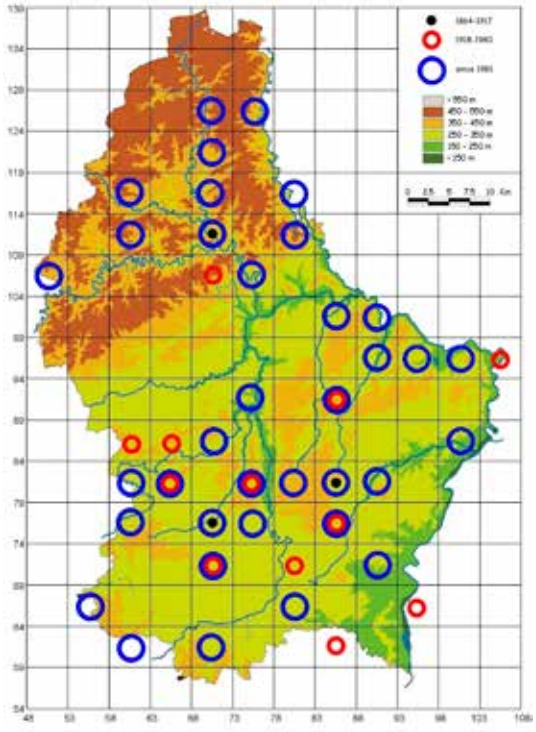


Fig. 164: *Alosterna tabacicolor*, a. Male, Oberanven, b. Female, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917			1				1	1					3
1918-1980		1				1	4	4	1	1		2	14
since 1981	5	3	1	2		2	7	13	7	8	4	1	53
Total	5	4	2	2		3	11	18	8	9	4	3	69

Fig. 165: Distribution of *Alosterna tabacicolor* and colonised localities in Luxembourg.

2008), except for the French and the northern Belgian Ardennes (Lameere, 1894; Collart, 1941; Ligeron, 2005).

In Luxembourg, this species is one of the first longicorns to appear in the first mild days of May, nearly always together with *Grammoptera ruficornis*. It is very common everywhere (Fig. 165) and often very abundant on white flowers, especially of *Anthriscus* and *Rubus*, in woods, where its emergence is contemporary to that of *G. ruficornis*.

4.3.2.14 *Judolia cerambyciformis* (Schrank, 1781)

Leptura cerambyciformis Hostie, 1951: 373. *Judolia cerambyciformis* Mousset, 1969: 168; Mousset, 1973: Map. 399; Vitali, 2013: 146; Vitali, 2014: 88. *Pachytodes cerambyciformis* Gerend et al., 2007: 290; Köhler, 2011: 88, 130; 2013: 63, 102; Weitzel, 2014: 216.

Body size 7-13 mm. Stout, with long posterior legs; black, elytra yellowish white (yellow in dead specimens) with variable black spots disposed as follows: 3 postbasal ones, 1 median marginal one and 1 apical one. The three postbasal spots (typical form) may be commonly reduced to two (var. *octomaculata*), sometimes miss completely (var. *anticereducta*) or are united together. In this case, the median spots can also be united together so that the beetle looks having three transversal bands.

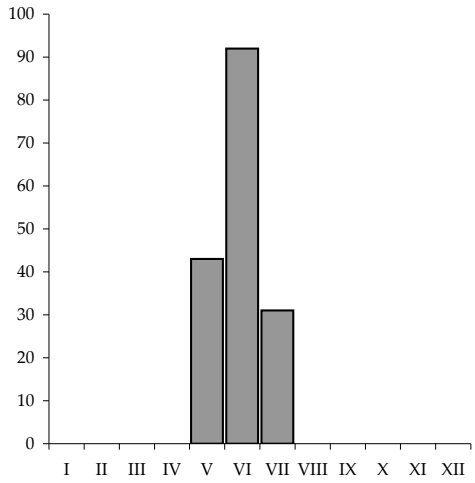


Fig. 166: Phenology of *Judolia cerambyciformis* in Luxembourg.

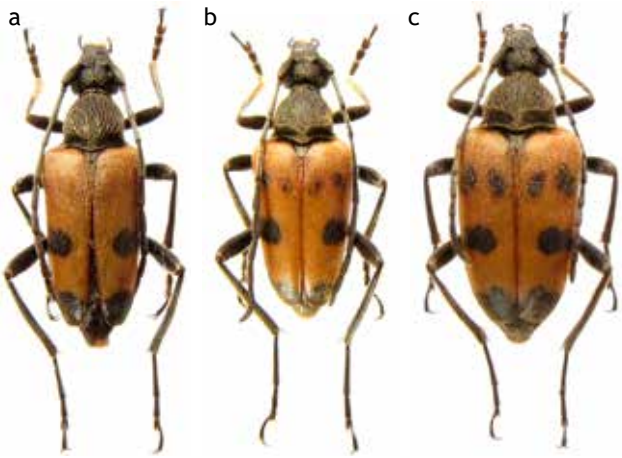
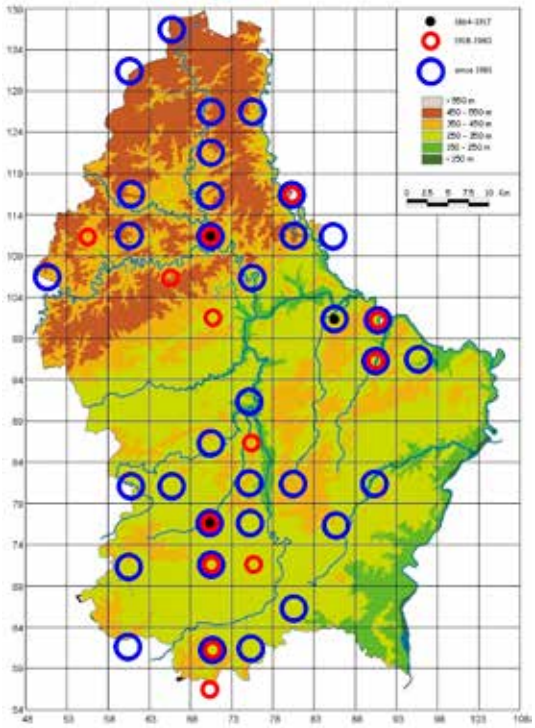


Fig. 167: *Judolia cerambyciformis*, a. Male, Clemency, b. Male, Bambësch, c. Female, Tandel (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917			1				1			1			3
1918-1980	1	2	2				1	1	4	2			13
since 1981	6	4	1	3		3	7	11	4	5	1		45
Total	7	6	2	3		3	8	12	8	8	1		58

Fig. 168: Distribution of *Judolia cerambyciformis* and colonised localities in Luxembourg.

In the study region, the species cannot be confused with other ones because of the stout habitus and the long posterior legs.

Life-cycle lasts two years. Larvae are polyphagous in exposed rotten roots of Fagaceae, Salicaceae and Pinaceae. Pupation occurs in a thin earth cocoon in the soil or in barks (Matter, 1998). Adults are diurnal on blossom flowers and bushes of woody localities from mid-spring to mid-summer (Fig. 166).

Host plants: *Castanea*, *Quercus*, *Betula*, *Carpinus*, *Salix*, *Populus*, *Abies*, *Picea*, *Pinus*.

European species, widespread from the Iberian System to Belarus and Ukraine, southwards limited by the Alps, restricted to mountains in the southern part of its distribution.

In the regions neighbouring Luxembourg, it is widespread and fairly common to very common everywhere (Fournel & Gehin, 1846; Godron, 1866; Collart, 1941; Desière, 1969; Colson, 1980a; Matter, 1998; Niehuis, 2001; Zeegers & Heijerman, 2008), though fairly rare in the Belgian and French Ardennes (Lameere, 1894; Lempereur et al., 2000; Ligeron, 2005).

In Luxembourg, the species is very common and widespread throughout the country, except for the south-western part of Gutland, where it seems absent (Fig. 168). Adults are generally collected on blossom *Rubus*.

4.3.2.15 *Leptura aurulenta* Fabricius, 1792

Strangalia aurulenta Kraus, 1892a: 35; Mousset, 1969: 168; Mousset, 1973: Map. 436; *Leptura aurulenta* Gerend et al., 2007: 290; Köhler, 2009: 61, 62, 71, 109; Köhler, 2013: 60, 63, 102; Vitali, 2013: 146; Vitali, 2014: 88-90.

Body size 12-23 mm. Slightly dimorphic. Male narrower, black; elytra reddish crossed by four transversal black bands; legs reddish, femurs obscured at the base. Female larger and wider, black; elytra yellow with four transversal black bands, sometimes the basal ones missing; limbs entirely reddish. Pronotal base covered with a dense golden pubescence in both sexes.

The golden pronotal pubescence and the yellow legs distinguish this species from all European congeners.

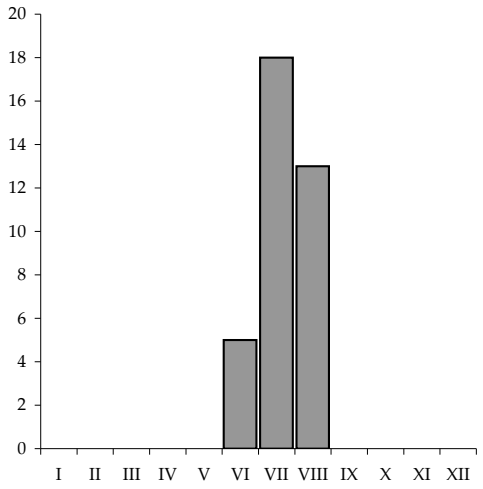


Fig. 169: Phenology of *Leptura aurulenta* in Luxembourg.

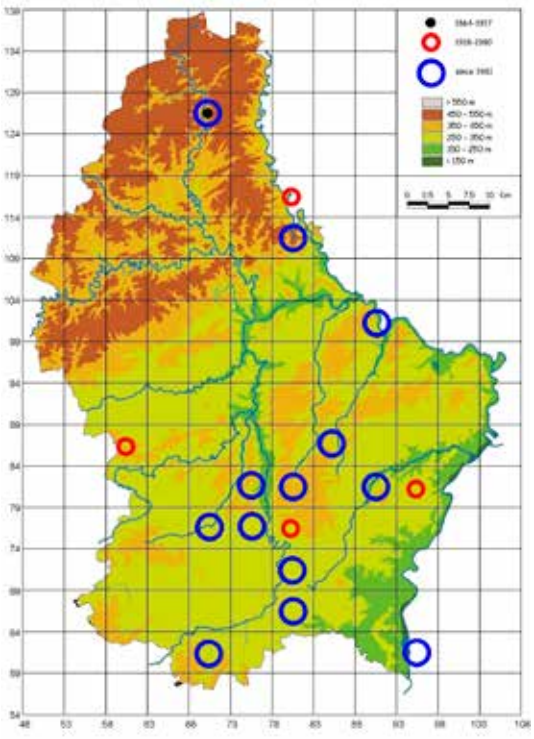
Life-cycle lasts at least two years. Larvae bore old rotten woods of beech, though occasionally observed in other broadleaf trees. Pupation occurs inside the wood in late spring. Adults are diurnal on fallen trunks of beech, exceptionally on flowers, in summer (Fig. 169).

Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Betula*, *Ulmus*, *Juglans*, *Prunus*, *Aesculus*, *Salix*, *Populus*.

Parasitoids: *Histeromerus mystacinus* Wesmael, 1838 (Braconidae).

Western Palaearctic species, widespread from Portugal to Poland, with a relict population in Algeria. It is closely related to beech forests, prevailing in lowland in the northern part of its distribution and in mountains in the South.

Fig. 170: *Leptura aurulenta*, a. Male, Kayl, b. Female, Mamer (author's coll.), c. Female on *Fagus*, Bambësch.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1	?											1
1918-1980	1						1	1			1		4
since 1981	1			1			2	7	3	1	2	1	18
Total	3			1			3	8	3	1	3	1	23

Fig. 171: Distribution of *Leptura aurulenta* and colonised localities in Luxembourg.

In the regions neighbouring Luxembourg, it is widespread in Rhineland-Palatinate and the Saarland plains (Niehuis, 2001), southern Belgium (Lempereur et al., 2000), northern Lorraine (Colson, 1980a) and Alsace (Matter, 1998); absent from the Netherlands (Zeegers & Heijerman, 2008) and the French Ardennes (Ligeron, 2005). Though once rare (Fournel & Gehin, 1846; Godron, 1866; Picard, 1929) or even unknown (Lameere, 1894), it is little common today, most likely due to forest management tending to privilege beech against oak. The species is difficult to be observed because of its cryptic and late phenology (Colson, 1980a).

The first specimen for Luxembourg was collected during a trip to Kautenbach-Wiltz on 26 June 1892 (Kraus, 1892a) but it is not present in the collections today. The relatively early emerging date and the fact that this species, rare in the Oesling, has never been collected in the Wiltz canton suggested that the mentioned specimen might have been *Leptura maculata* (4.3.2.17), a very common species in the region.

Nowadays, the species is little common but widespread throughout the country (Fig. 171). It is seldomly collected because it is one of the last species to emerge, when the favourable season for other ones is finishing; however, it is easily visible on fallen trunks or on the soil because of its colouring. Though currently inserted in the Red List (RGD, 2009), it does not seem to be threatened but rather even in expansion, since it is favoured by the forest management privileging beech.

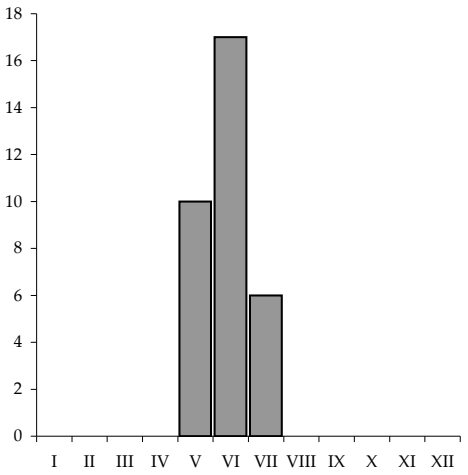


Fig. 172: Phenology of *Leptura aethiops* in Luxembourg.

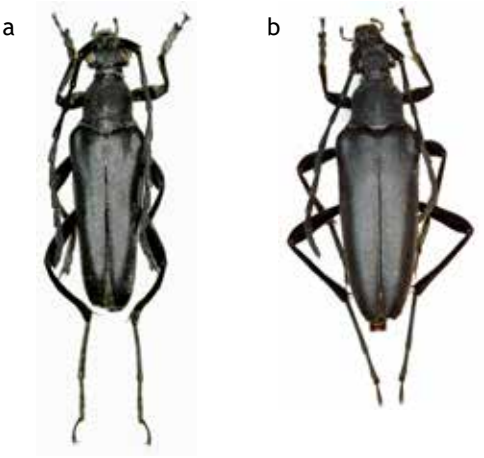
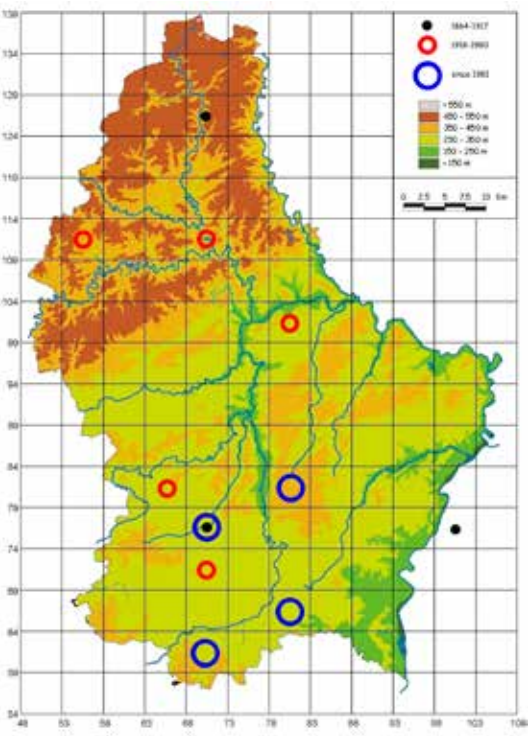


Fig. 173: *Leptura aethiops*, a. Male, Poland b. Female, Russia (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1						1				1		3
1918-1980		2	1				1	1					5
since 1981							2	1	1				4
Total	1	2	1				3	2	1		1		11

Fig. 174: Distribution of *Leptura aethiops* and colonised localities in Luxembourg.

4.3.2.16 *Leptura aethiops* Poda, 1761

Strangalia aethiops Mousset, 1969: 168; Mousset, 1973: Map. 434. *Leptura aethiops* Vitali, 2013: 146.

Body size 10-15 mm. Entirely black; males with elytra apically restricted and sinuate mesotibiae. Stable in the studied area; some eastern Asian populations could have red pronotum (var. *dimorpha*) or brown elytra (var. *adustipennis*).

This species differs from analogously coloured Lepturinae in the rounded elytral apex. The only other species showing this character is the melanistic form of Anoplodera sexguttata (4.3.2.2), which differs in the pronotum with rounded basal angles (spined in L. aethiops).

Life-cycle lasts probably two years. Larvae bore rotten branches of broadleaf trees, especially Fagales, occasionally on pine. Pupation occurs inside the wood in spring. Adults are diurnal in humid woods on blossom flowers from late spring to mid-summer (Fig. 172).

Host plants: *Quercus*, *Alnus*, *Betula*, *Corylus*, *Salix*, *Tilia*, *Pinus*.

Eurasian species, mainly widespread in eastern Asia including Japan, southwards limited by the Pyrenees and the Alps in Europe.

In the regions neighbouring Luxembourg, it is widespread but generally localised or rare (Picard, 1929; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008), except for central Belgium, northern Lorraine and the Alsatian plains, where it is common (Lameere, 1894; Desière, 1969; Gaspar & Verstraeten, 1972; Colson, 1980a; Matter, 1998; Lempereur et al., 2000).

In Luxembourg, the species shows a spotted distribution throughout the country (Fig. 174), apparently being in southwards regression. It is occasionally collected on low flowers at the borders of woods as single specimens, rarely numerous.

4.3.2.17 *Leptura maculata* Poda, 1761

Leptura maculata Hostie, 1951: 373; Gerend et al., 2007: 290; Köhler, 2009: 62, 109; Köhler, 2011: 88, 130; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 216. *Strangalia maculata* Mousset, 1969: 168; Mousset, 1973: Map. 438; Haagen, 1986: 49.

Body size 13-20 mm. Elongate, black; elytra yellow with extremely variable black pattern; antennae ringed with yellow; legs mainly yellow. Male metatibia with medial preapical tooth. In Luxembourg, the elytral pattern is fairly stable, each elytron showing: 3 postbasal spots more or less united together, rarely missing; 1 median lateral spots, often forming a transverse band; 1 preapical transverse band; apex black.

The ringed antennae easily distinguish this species from all local congeners.

Life-cycle lasts two years. Larvae bore rotten branches and roots of Fagaceae, Salicaceae and Pinaceae; other plants sometimes recorded as hosts (*Crataegus*, *Sarothamnus*, *Euonymus*, *Sambucus*) are possibly only pollinated by adults. Pupation occurs inside the wood in spring. Adults are diurnal on blossom flowers and bushes from mid-spring to late summer (Fig. 175).

Host plants: *Castanea*, *Fagus*, *Quercus*!, *Alnus*, *Betula*, *Corylus*, *Carpinus*, *Prunus*!, *Salix*, *Populus*, *Fraxinus*, *Abies*, *Picea*, *Pinus*.

Euro-Turanian species, widespread from Portugal to Kazakhstan, with a doubtful subspecies (known by only two specimens) in southern Turkey. It is mainly restricted to mountains in the southern part of its distribution. Some specimens from different localities (Great Britain, Spain, Corsica, Italy, Sicily, Caucasus, Turkey, Syria) show darker limbs, a fact that lead some recent authors (Rapuzzi & Sama, 2010; Özdikmen et al., 2012) to claim the existence of a

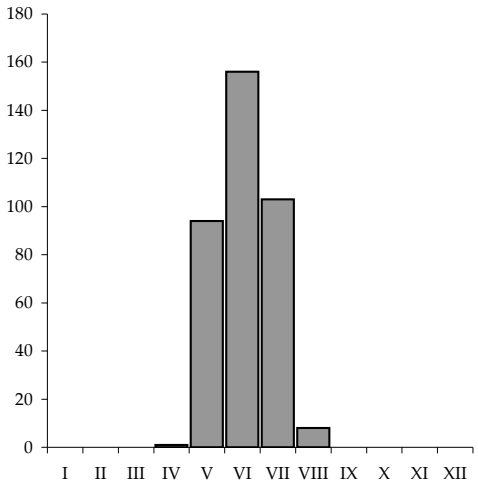


Fig. 175: Phenology of *Leptura maculata* in Luxembourg.

subspecies. Nonetheless, such specimens (var. *nigricornis* Stierlin, 1864 **rest. status**) are always mixed with typical ones and these regions were evidently never connected together, necessary condition for evolving a subspecies (Biscaccianti, 2007).

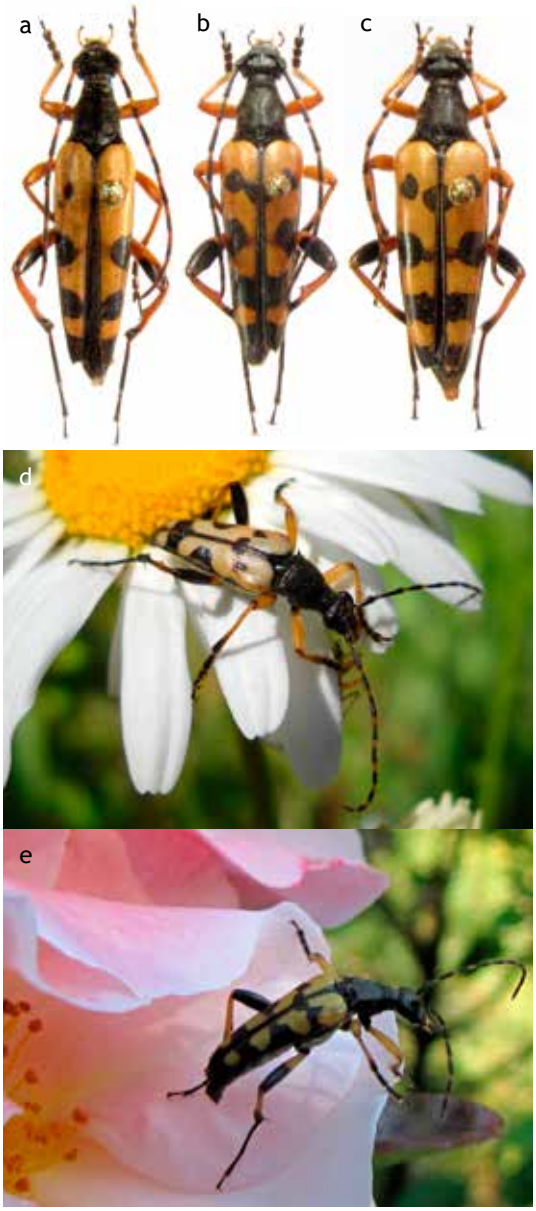
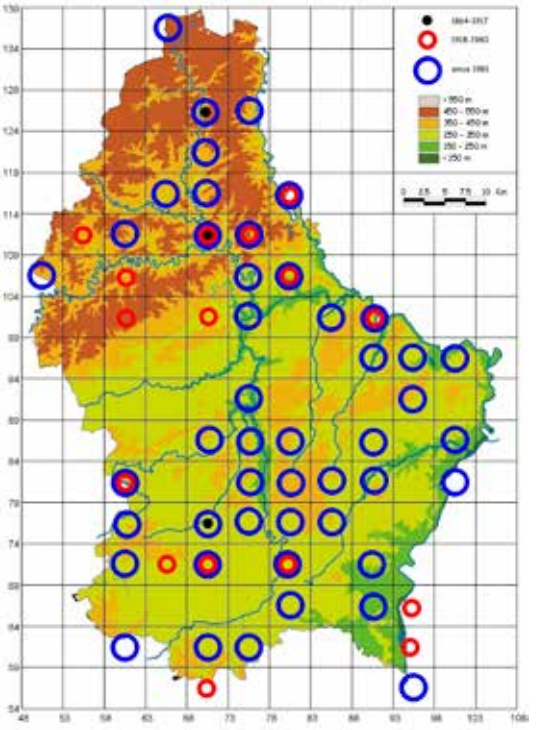


Fig. 176: *Leptura maculata*, a. Male, Mersch, b. Male, Kopstal, c. Female, Mecher (author's coll.), d. Male on daisy, Kopstal, e. Male on *Rosa*, Bambësch.

In the regions neighbouring Luxembourg, this species is widespread and common to very common everywhere (Collart, 1941; Desière, 1969; Gaspar & Verstraeten, 1972; Colson, 1980a; Matter, 1998; Lempereur et al., 2000; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008). In the Belgian Ardennes and northern Lorraine, it was once less common than today (Fournel & Gehin, 1846; Godron, 1866; Lameere, 1894).

In Luxembourg, the species is very common and widespread throughout the country (Fig. 177), especially in the proximity to broadleaf woods on blossom plants, particularly *Rubus*.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1		1				1						3
1918-1980	1	3	3		1		2	3	2	1		2	18
since 1981	10	5	5	2		5	7	20	4	8	8	4	78
Total	11	8	7	2	1	5	9	21	6	9	8	6	93

Fig. 177: Distribution of *Leptura maculata* and colonised localities in Luxembourg.

4.3.2.18 *Stenurella melanura* (Linnaeus, 1758)

Leptura melanura Hostie, 1951: 373; *Strangalia melanura* Mousset, 1969: 168; Mousset, 1973: Map. 439; Haagen, 1986: 49; *Stenurella melanura* Gerend et al., 2007: 290; Köhler, 2009: 62, 110; Köhler, 2011: 88, 130; Köhler, 2013: 62, 102; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 216.

Body size 6-11.5 mm. Small, dimorphic: entirely black; elytra testaceous in male, red in female. Apex and suture more or less obscured in male, always in female. Pubescence variable: golden, silver, black or sometimes bicolour, specimens with golden pubescence being largely predominant in Luxembourg.

According to Sama (2002), male specimens having elytra uniformly testaceous and golden pubescence (Fig. 179 d) belong to *S. sennii*. This species, whose females are completely indistinguishable from those of *melanura*, was described from Alsace but has been commonly observed nearly everywhere in Europe, always together with *S. melanura* (Gouverneur & Guérard, 2011; Berger, 2012). Actually, golden pubescence is usually associated with black elytral apex or/and suture (Fig. 179 c); hence, the colour of male pubescence is the only character supporting this species. According to Özdikmen (2013), *S. sennii* is a subspecies of *S. samai* Rapuzzi, 1995 from Bulgaria, but according to Danilevsky (2012a), *S. samai* is a subspecies of *S. melanura*, though he observed that there is no evidence that such local variations are true species. However, *S. sennii* cannot be considered as a subspecies of *S. melanura*, due to their largely superposed distribution areas. Thus, missing any other character proving that this species is not only a chromatic form of *S. melanura*, *S. sennii* is considered here as a new synonym of this last species.

In the studied area, this species may be confused only with *Stenurella bifasciata* (4.3.2.19). Beside the different pattern, *S. melanura* shows a completely black abdomen (red in *S. bifasciata*).

Life-cycle lasts two years. Larvae bore rotten thin branches and roots of broadleaf trees and conifers; pupation occurs inside the wood in spring (Fig. 178). Adults are diurnal on blossom flowers, rarely on bushes, from late spring to late summer.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Corylus*, *Crataegus*, *Cytisus*, *Acer*, *Salix*, *Sambucus*, *Abies*, *Picea*, *Pinus*, *Juniperus*.

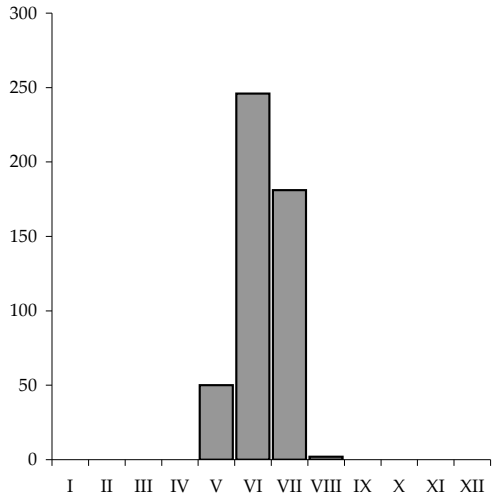


Fig. 178: Phenology of *Stenurella melanura* in Luxembourg.

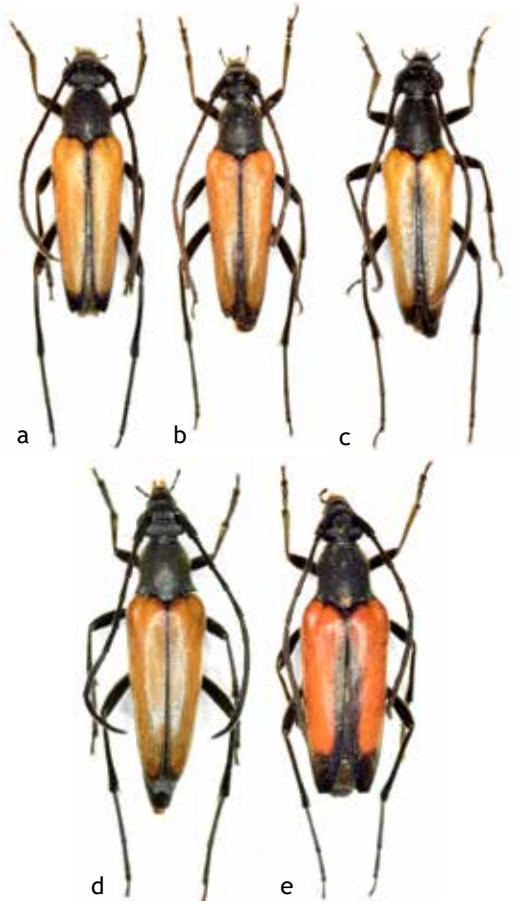
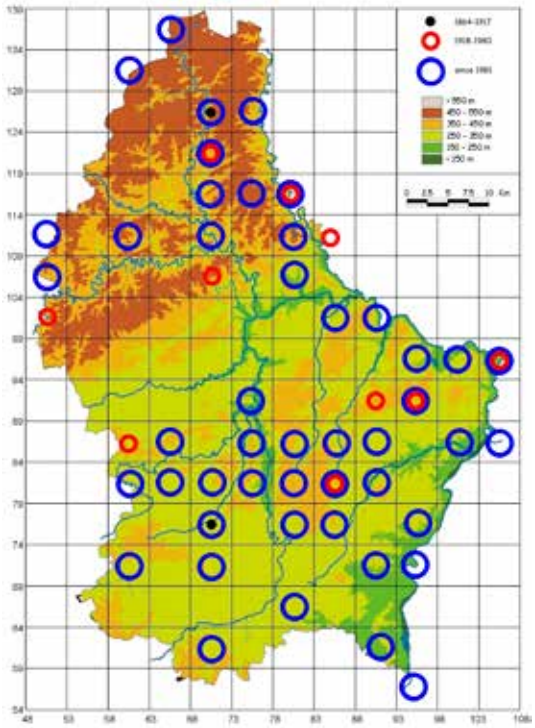


Fig. 179: *Stenurella melanura*, a-d. Male, e. Female, Mersch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1						1						2
1918-1980	2	1		1	1		1	1		3			10
since 1981	13	7	6	2		4	8	15	5	7	11	5	83
Total	15	8	6	3	1	4	9	16	5	10	11	5	93

Fig. 180: Distributionof *Stenurella melanura* and colonised localities in Luxembourg.

Euro-Turanian species, widespread from Andalusia to Kazakhstan, more cryophilic than other congeners, being the only one colonising Scandinavia and England. Some taxa (*samai* Rapuzzi, 1995, *pamphiliae* Rapuzzi & Sama, 2009) have been described from Bulgaria and Turkey, but there is no agreement on whether they are species, subspecies or simply local forms.

In the regions neighbouring Luxembourg, this species is widespread and common to very common everywhere for a long period of time (Fournel & Gehin, 1846; Godron, 1866; Lameere, 1894; Collart, 1941; Desière, 1969; Colson, 1980a; Matter, 1998; Lempereur et al., 2000; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008).

In Luxembourg, the species shares the habitat with *Leptura maculata* (4.3.2.17). It is very common and widespread throughout the country (Fig. 180), mainly in the proximity to broadleaf woods on blossom plants, especially *Rubus*.

4.3.2.19 *Stenurella bifasciata* (O. F. Müller, 1776)

Strangalia bifasciata Mousset, 1969: 168; Meyer, 1973: 61; Mousset, 1973: Map. 437. *Stenurella bifasciata* Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 217.

Body size 6-12 mm. Small, entirely black with red elytra and abdomen. Dimorphic: elytra with obscured apex in male, with apex and a postmedian transverse black band in female. The species is fairly stable in the studied area, but other subspecies have reddish legs, black abdomen, closer pronotal punctuation or a different shape of the transverse band (Danilevsky, 2011).

In the study area, this species may be only confused with *Stenurella melanura* (4.3.2.18), from which it can be easily separated through its red abdomen.

Life-cycle lasts two years. Larvae bore dried thin branches and roots of broadleaf trees and conifers; pupation occurs inside the wood in spring. Adults are diurnal on blossom flowers, rarely on bushes, from late spring to late summer (Fig. 181).

Host plants: *Quercus*, *Ulmus*, *Ficus*, *Rosa*, *Spartium*, *Salix*, *Pinus*.

Euro-Anatolian species, more thermophilic than other congeners, being the only one colonising the largest western Mediterranean islands.

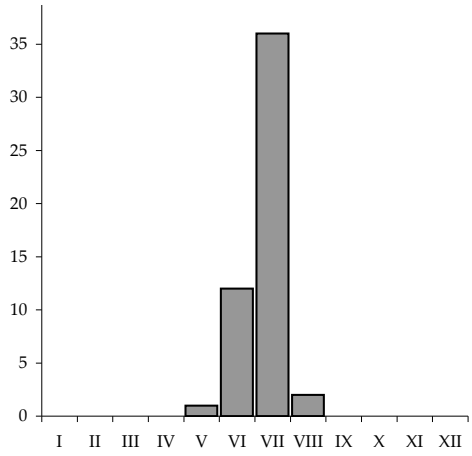


Fig. 181: Phenology of *Stenurella bifasciata* in Luxembourg.

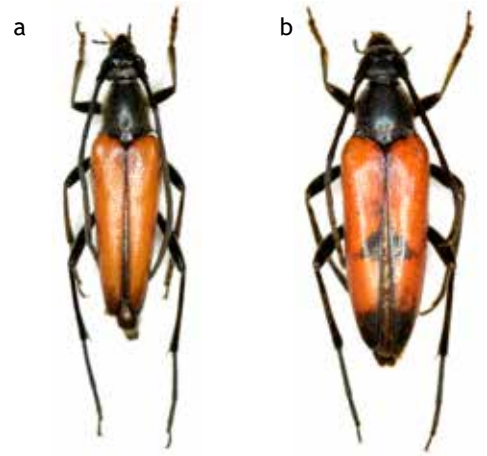
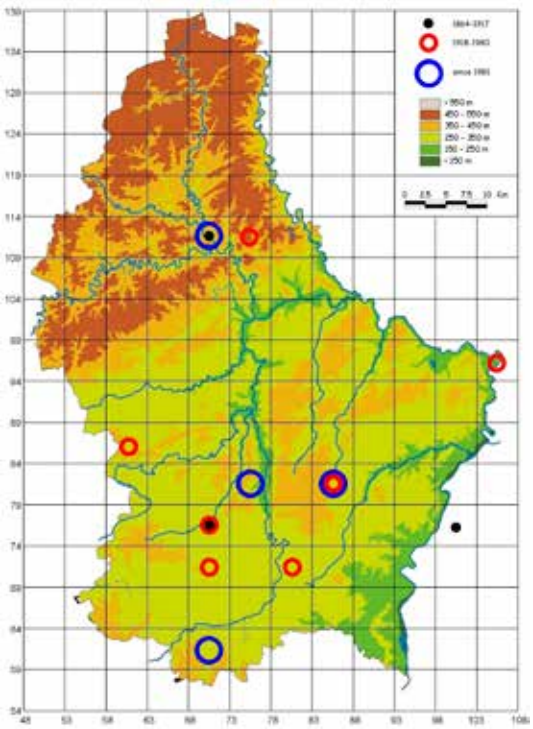


Fig. 182: *Stenurella bifasciata*, a. Male, b. Female, Kayl (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917			1				1				1		3
1918-1980	1						2	3		1			7
since 1981			1					2	4				7
Total	1		1				3	4	4	1	1		15

Fig. 183: Distribution of *Stenurella bifasciata* and colonised localities in Luxembourg.

In the regions neighbouring Luxembourg, it shows a prevalent south-eastern diffusion. It is widespread and stable in lowlands of Rhineland-Palatinate but little present in the Saarland (Niehuis, 2001), fairly rare in northern Lorraine (Colson, 1980a), absent from the French Ardennes (Ligeron, 2005) and more frequent in Alsace (Matter, 1998). Fairly common in the Condroz, it is absent or very rare in the resting Belgium (Lameere, 1894; Guilleaume, 1909) and in the south-eastern Netherlands (Zeegers & Heijerman, 2008).

The species is widespread but rare in the highlands of the extreme South of Luxembourg, where it is sometimes abundant, only occasionally elsewhere (Fig. 183). The analysis of its distribution over time seems to evidence a slow south-eastwards regression.

4.3.2.20 *Stenurella nigra* (Linnaeus, 1758)

Leptura nigra Hostie, 1951: 373; *Strangalia nigra* Mousset, 1969: 168; Mousset, 1973: Map. 440; *Stenurella nigra* Gerend, 2000: 111; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 217.

Body size 6-10 mm. Small, elongate; body entirely black, except for the red abdomen. Stable, exceptionally pronotum (var. *varicollis*) or body (var. *vitai*) is entirely red.

The species might be confused with some other Lepturinae having analogue colouring, but it is the only one showing a red abdomen.

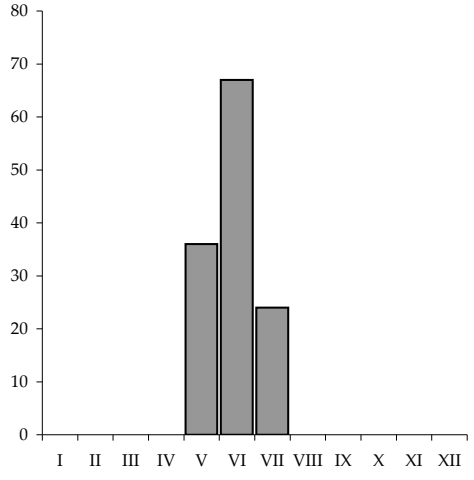


Fig. 184: Phenology of *Stenurella nigra* in Luxembourg.

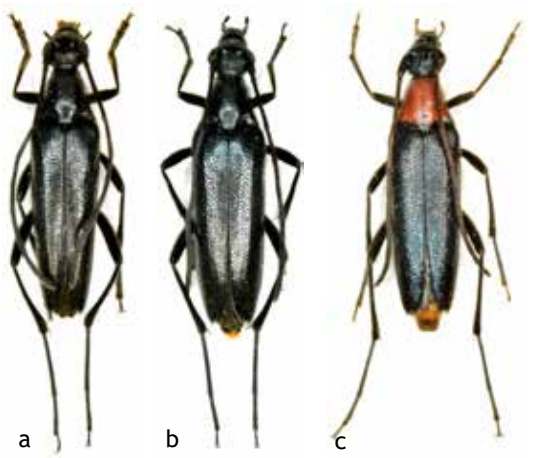
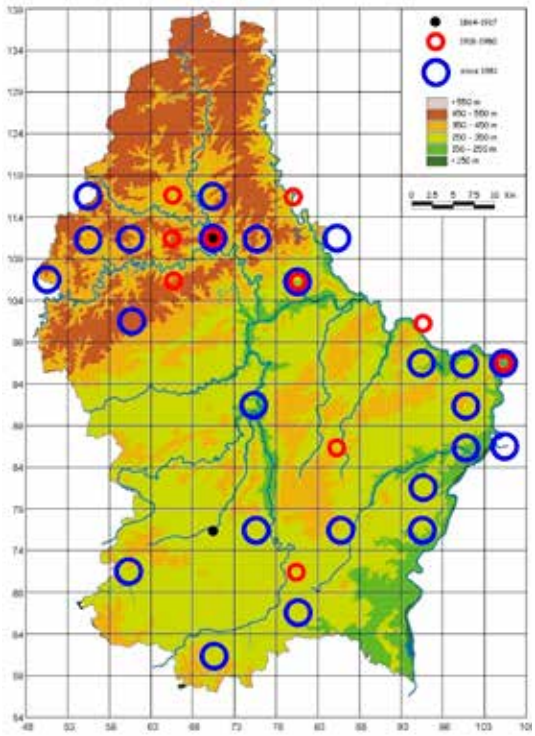


Fig. 185: *Stenurella nigra*, a. Male, b. Female, Mertert (author's coll.) c. Female var. *varicollis*, Pintsch (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOTl
1864-1917			1				1						2
1918-1980	2	4	1					1		2			10
since 1981	1	7	3	3	1	1	1	2	4	5	6		34
Total	3	11	4	3	1	1	2	3	4	6	6		44

Fig. 186: Distribution of *Stenurella nigra* and colonised localities in Luxembourg.

Life-cycle lasts two years. Larvae bore rotten dried branches of broadleaf trees and bushes; pupation occurs inside the wood in spring. Adults are diurnal on low flowers, especially in fresh humid shaded localities, from mid-spring to early summer (Fig. 184).

Host plants: *Quercus*, *Betula*, *Corylus*, *Carpinus*, *Ulmus*, *Rosa*, *Robinia*, *Frangula*.

Euro-Anatolian species, widespread from Andalusia to northern Iran, strongly rarefying in the southern part of its distribution where it is mostly restricted to mountain ranges. An isolated subspecies (*mœsta* Danilevsky, 2013) has been recognised in the Caucasus.

In the regions neighbouring Luxembourg, it is widespread and fairly common everywhere (Fournel & Gehin, 1846; Godron, 1866; Lameere, 1894; Guilleaume, 1909; Gaspar & Verstraeten, 1972; Colson, 1980a; Matter, 1998; Lempereur et al., 2000; Niehuis, 2001; Ligeron, 2005; Zeegers & Heijerman, 2008).

In Luxembourg, this species is common and mainly present in shaded localities of the Oesling (Fig. 186). Due to their behaviour and colouring, the adults seem to be more elusive than their congeners, resulting in lower recorded abundances.

4.3.2.21 *Strangalia attenuata* (Linnaeus, 1758)

Strangalia attenuata Mousset, 1969: 168; Mousset, 1973: Map. 435; Vitali, 2013: 146.

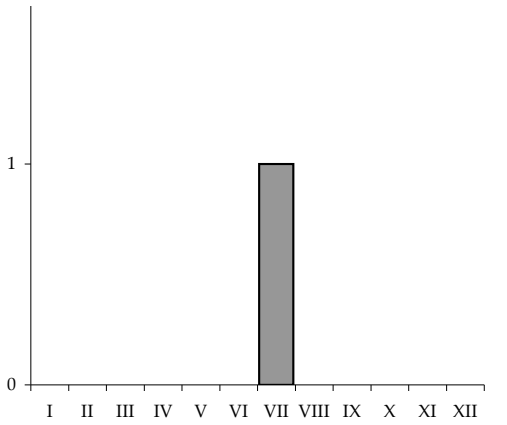


Fig. 187 : Phenology of *Strangalia attenuata* in Luxembourg.

Body size 9-17 mm. Black, elytra yellow with four black transversal bands, sometimes incomplete; legs yellow with black apex of metafemurs.

The species might be confused with other Lepturini with similar colouring, especially dark females of *Leptura maculata* (4.3.2.17), which have antennae ringed of yellow, or *Leptura aurulenta* (4.3.2.15), which show a wider body and a pronotal base covered with dense golden pubescence.

Life-cycle lasts two years. Larvae bore rotten wood of broadleaf trees, especially oaks, occasionally on pine. Pupation occurs inside the wood. Adults are diurnal on blossom flowers (*Crataegus*, *Quercus*) since early summer.

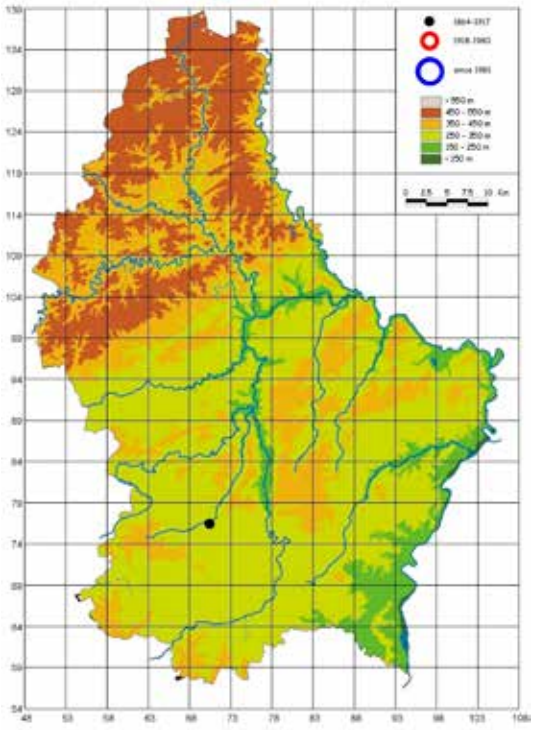
Host plants: *Castanea*, *Quercus*, *Alnus*, *Betula*, *Corylus*, *Ulmus*, *Tilia*, *Pinus*.

Eurasian thermophilic species, widespread from the Iberian System to Japan, prevalent in eastern Asia and showing a boreo-montane, often relict, distribution in Europe. Though known for a very long time, its infrequency in western Europe has rarely been remarked and never explained. At the beginning of entomological research, this species was evidently more widespread and common than today, being recorded many times in Central Europe. Analogously to other species with wide Eurasian distributions (*Leptura annularis*, *L. aethiops*, *Necydalis major*, *Nothorhina punctata*), the reasons should be searched in the environmental conditions induced by the Little Ice Age, which favoured this pool of Siberian species, which only have survived in some mountain or relict localities today.

In the regions neighbouring Luxembourg, this species is present in southern Rhineland-Palatinate, though once more widespread (Niehuis, 2001) and in the Vosges (Matter, 1998). It is absent from the Saarland, northern Lorraine and the French Ardennes (Fournel & Gehin, 1846; Godron, 1866; Colson, 1980a; Niehuis, 2001; Ligeron, 2005). A relict population, regularly collected until today, survives, though in decline, along the Belgian-Netherlands border (Lameere, 1894; Zeegers & Heijerman, 2008).

In Luxembourg, the species has been known by only one male collected by V. Ferrant at Thillsmillen, most likely before 1890 (Fig. 189). Since this species has not been collected for more than 120 years, it is in southwards regression in the neighbouring regions and does not show a particular phenology, it must be deemed as extinct from Luxembourg.

Fig. 188: *Strangalia attenuata*, Male, Thillsmillen (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1						1
1918-1980													0
since 1981													0
Total							1						1

Fig. 189: Distribution of *Strangalia attenuata* and colonised localities in Luxembourg.

4.3.3 Tribe Necydalini Latreille, 1825

4.3.3.1 *Necydalis major* (Linnaeus, 1758)

Necydalis major Weitzel, 2014: 217.

Body size 19-33 mm. Cylindrical, elongated; elytra shortened, leaving visible the hind wings, testaceous; legs reddish with black metafemoral club; antennae uniformly reddish (female) or apically black (male).

The species can be only confused with *Necydalis ulmi* Chevrolat, 1838 (present in the neighbouring French regions), which differs in the longer pronotal pubescence and the black mesofemurs and metatibial apex.

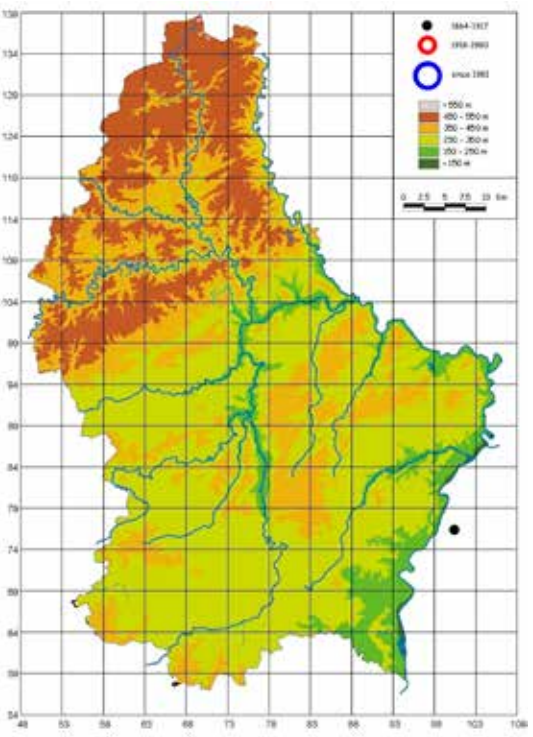
Life-cycle lasts three years. Larvae bore decayed trunks and branches of broadleaf trees often colonised by the shelf fungus *Inonotus radiatus* (Sowerby) Karst. Pupation occurs at the end of a deep curved gallery inside the wood (at least 2 cm of depth) in June. Adults are active on host plants, rarely on flowers of Apiaceae, in warm sunny days of June and July. They are rarely observed because of their short phenology (two weeks, according to Horion, 1974) but they can be more commonly collected with sweet traps.

Host plants: *Fagus*, *Quercus*, *Alnus*, *Betula*, *Carpinus*, *Ulmus*, *Celtis*, *Malus*, *Prunus*, *Aesculus*, *Salix*, *Populus*, *Tilia*. *Picea*?

Eurasian thermophilic species, widespread from the Asturias to Japan, with a subspecies in Hokkaido (*aino* Kuisama, 1975). Analogously to other species with wide Eurasian distributions, such as *Strangalia attenuata* (4.3.2.21), the species was widespread and sometimes even common in most Europe only at the beginning of the 20th century (Horion, 1974).

In the areas neighbouring Luxembourg, the species was recorded nearly everywhere but it is nearly extinct today. In Rhineland-Palatinate, it has been known as rare for a long time (Brahms, 1790) but it was collected only twice in the last 70 years (Niehuis, 2001). Unknown from the Saarland (Niehuis, 2001) and the French Ardennes (Ligeron, 2005), it is no longer present in northern Lorraine and in the Vosges (Colson, 1980a; Matter, 1998), where it was already once very rare (Fournel & Gehin, 1846; Godron, 1866). In Belgium, the species, rare and known only for the centre (Lameere, 1894), was collected only two times before 1980 (Drumont & Grootaert, 2011). In the Netherlands, it is most likely extinct (Zeegers & Heijerman, 2008) but it was very rare already at the beginning of the 20th entury (Everts, 1903).

In Luxembourg, the species is known only for a single record mentioned in the cardfile of the commissioner for the Nature Protection of the district Trier-Saarburg, J. Berthel: Ahn, 1906, Dr. Hein (Fig. 190). The locality, which once hosted mytic species with analogue biology as Osmoderma eremita (Linnaeus, 1758), is today completely anthropized (Vitali et al., 2012). However, the destiny, as well the correct identification of this specimen(s), is currently unknown.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917											1		1
1918-1980													0
since 1981													0
Total											1		1

Fig. 190: Distribution of *Necydalis major* and colonised localities in Luxembourg.

4.4 Subfamily Spondylidinae Audinet-Serville, 1832

4.4.1 Tribe Asemini Thomson, 1860

4.4.1.1 *Arhopalus rusticus* (Linnaeus, 1758)

Criocephalus rusticus Mousset, 1969: 166; Mousset, 1973: Map. 395. *Arhopalus rusticus* Vitali, 2011b: 80; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 215.

Body size 10-30 mm. Flat, parallel-sided, chestnut to dark brown; pronotum with a longitudinal furrow at each side of the disk. Females generally more oblong and darker.

The species might be easily confused with *Arhopalus ferus* (4.4.1.2), which principally differs from this species in the darker and more oblong body, the pronotum with a single median furrow and the scarcely bilobed metatarsomere III.

Life-cycle lasts two years. Larvae bore dead wood of mountain Pinaceae, especially pines. Pupation occurs under the bark in late spring or early summer. Adults are active in summer during the night, being sometimes attracted by lights, while they remain hidden under barks during the day. They can survive up to 45 days without feeding.

Host plants: *Abies*, *Picea*, *Larix*, *Pinus*.

Parasitoids: *Dolichomitus imperator* (Kriechbaumer, 1854), *Odontocolon appendiculatum* (Gravenhorst, 1829), *Pœmenia notata* Holmgren, 1859, *Rhimphoctona xoridiformis* (Holmgren, 1860), *Xorides ater* (Gravenhorst, 1829), *X. fuligator* (Thunberg, 1822) (Ichneumonidae); *Atanycolus neesii* (Marshall, 1897) (Braconidae).

Holarctic species, widespread from North Africa to Honduras, with one subspecies in Eurasia and four ones in Central and North America. The nominal form is widespread in North Africa, Europe, Turkey and all over the Palaearctic region including Japan. In Manchuria, it coexists with several taxa with uncertain taxonomic status. In the southern or the warmest part of its distribution, it is restricted to mountain habitats, while it has often been intercepted or introduced with timber trade to localities far away from its original distribution, such as Jamaica and Australia (Wang & Leschen, 2003). Subfossils of this species (or of its ancestor) have been known from Cheshire, England since the Late Pleistocene (Coope, 1959).

In the areas neighbouring Luxembourg, the species is autochthonous only in the Vosges and in southern Rhineland-Palatinate but has spread everywhere following conifer plantations since the second half of the 19th century. Even if it was unknown in Rhineland-Palatinate until 1856 and in the Saarland until 1951, it is nowadays largely widespread throughout the region, particularly in Palatinate (Niehuis, 2001). Once unknown in Alsace and northern Lorraine as well (Fournel & Gehin, 1846), it later became very rare in the Vosges (Godron, 1866), where it is still present today (Matter, 1998), while it has been occasionally intercepted to northern Lorraine (Colson, 1980b). In contrast, the species is more widespread in the western part, being fairly common in the French Ardennes (Ligeron, 2005). In Belgium, it was fairly common only in the Campine (Lameere, 1894) but it is widespread throughout the country nowadays, especially along the northern and eastern borders (Collart, 1941; Troukens, 2007; Drumont & Grootaert, 2011). It is widespread and known for a long time also in the Netherlands, particularly on sandy soils (Everts, 1903; Zeegers & Heijerman, 2008).

Until the 2000s, the species has been known in Luxembourg only by a single specimen collected by V. Ferrant in the Oesling (Clervaux) before WWI. Currently, it seems very rare and apparently fragmentally widespread in the Gutland (Fig. 193). The scarcity of records most likely is

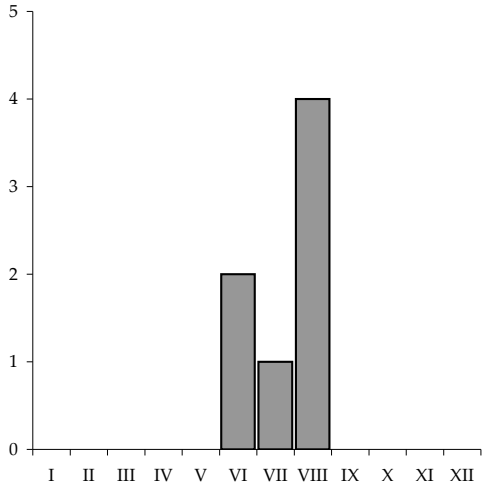


Fig. 191: Phenology of *Arhopalus rusticus* in Luxembourg.

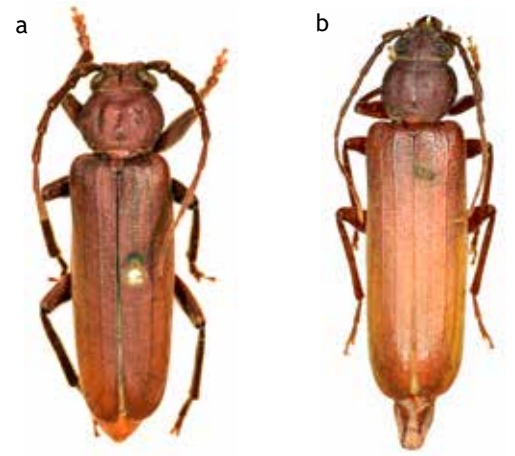
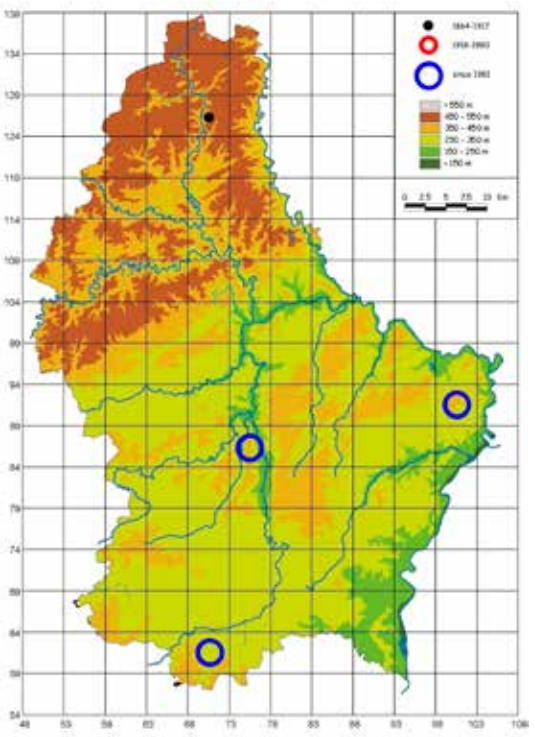


Fig. 192: *Arhopalus rusticus*, a. Male, b. Female, Clervaux (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1												1
1918-1980													0
since 1981						1			1	1			3
Total	1					1			1	1			4

Fig. 193: Distribution of *Arhopalus rusticus* and colonised localities in Luxembourg.

due to the management of artificial conifer forests, which privileges spruce against pine. Nonetheless, specialised research with UV-light in pinewoods might evidence a wider diffusion of this species.

4.4.1.2 *Arhopalus ferus* (Mulsant, 1839)

Arhopalus (s. str.) ferus Vitali, 2011b: 80, 84 Fig. 9. *Arhopalus ferus* Vitali, 2013: 146.

Body size 9-27 mm. Convex, oblong, generally pitch-brown; pronotum with a longitudinal median furrow and small dimples at each side of the disk.

The species might be confused with *Arhopalus rusticus* (4.4.1.1), which principally differs from this species in the more reddish and parallel-sided body, the pronotum with a furrow at each side of the disk and the deeply bilobed metatarsomere III.

Life-cycle lasts three years. Females lay up to 60 eggs in dead wood of Pinaceae, especially thermophilic pines. Larvae pupate under the bark in late spring or early summer. Adults are active throughout summer during the night, being sometimes attracted by lights, while they remain hidden under barks during the day.

Host plants: *Picea*, *Pinus*.

Parasitoids: *Megaselia rufipes* (Meigen, 1804) (Phoridae).

Predators: *Thoramus wakefieldi* (Sharp, 1877) Elateridae (Murray, 1973: New Zealand).

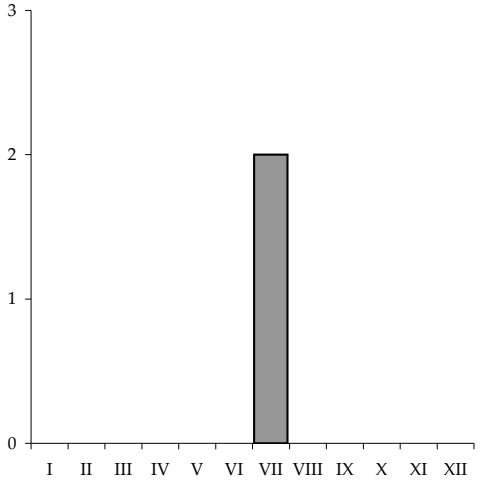


Fig. 194: Phenology of *Arhopalus ferus* in Luxembourg.

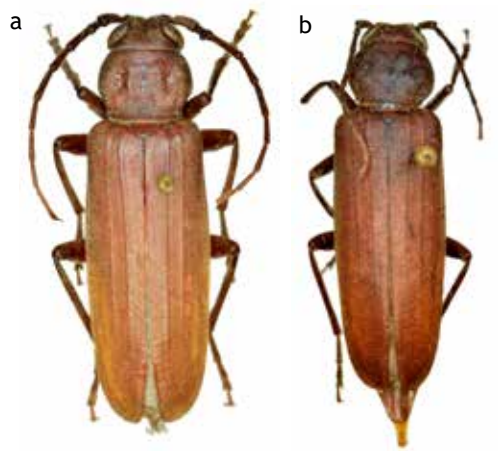
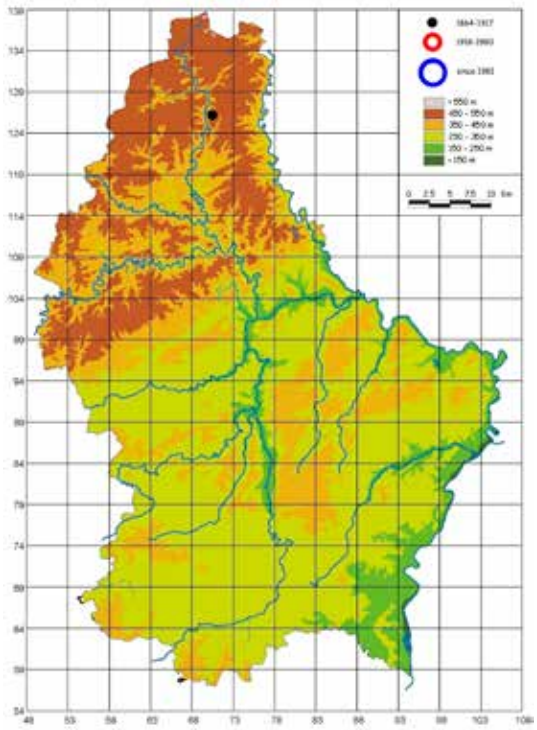


Fig. 195: *Arhopalus ferus*, a. Male, b. Female, Clervaux (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1												1
1918-1980													0
since 1981													0
Total	1												1

Fig. 196: Distribution of *Arhopalus ferus* and colonised localities in Luxembourg.

Palaearctic thermophilic species, widespread from the Circum-Mediterranean to China, often intercepted or introduced with timber trade to far disjointed localities, such as Namibia (Adlbauer, 2001) and New Zealand (Wang & Leschen, 2003).

In the areas neighbouring Luxembourg, the species was seldomly intercepted, without establishing stable populations. Rare samples are known in Rhineland-Palatinate, where it was recorded for the first time in 1911 and no one in the Saarland (Niehuis, 2001). Completely unknown in the French Ardennes and northern Lorraine (Fournel & Gehin, 1846; Godron, 1866; Colson, 1980b; Ligeron, 2005), the species has been known in northern Alsace only thanks to two recent captures (Matter, 1998). In the Netherlands, the species was found for the first time in Maastricht at the end of the 19th century (Lameere, 1894) and in Belgium near Pery/Beaufays (Everts, 1903).

In Luxembourg, the species has been recorded only very recently, but on the basis of two specimens coming from the North of the country and dating before WWI (Fig. 196). Considering their localisation, it is possible that this introduction was somehow related to the Dutch populations through the northern Ardennes.

4.4.1.3 *Asemum striatum* (Linnaeus, 1758)

Asenun striatum (sic!) Schuster, 1907a: 87. *Asemum striatum* Mousset, 1969: 166; Mousset, 1973: Map. 387; Vitali, 2013: 146.

Body size 8-23 mm. Pitch-brown, flat, parallel-sided, with short antennae; elytra irregularly wrinkled, sometimes testaceous (var. *agreste*).

The species might be confused with the melanistic variety of *Tetropium castaneum* (4.4.1.4), which differs from this species in the divided eyes, the smooth elytral surface, the more inflated femurs and the more robust antennae.

Life-cycle lasts two years. Larvae bore dead wood of mountain Pinaceae, especially pines of the subsections Pinus (Scots pine and, secondarily, Black pine) in areas subject to clear-cutting. Pupation occurs in the wood in spring. Adults emerge from late spring to mid-summer (Fig. 197), being active from the evening and during the night and remaining hidden in fissures of barks during the day. They can survive two weeks without feeding.

Host plants: *Abies*, *Picea*, *Larix*, *Pinus*. In Nearctic also *Pseudotsuga*.

Parasitoids: *Pœmenia notata* Holmgren, 1859 (Ichneumonidae); *Atanycolus initiator* (Fabricius, 1793) (Braconidae).

Analogously to *Rhagium inquisitor* (4.3.1.8), which shares the same habitat, the species is currently considered as Holarctic, though past authors described numerous species. This excessive taxonomic simplification is due to Heyden (1890), who also established a lot of erroneous synonymies between Palaearctic and Nearctic species. In fact, American and west Siberian populations look sufficiently different, e.g. showing a pronotum less angulated than European populations do. In my opinion the "species" deserves a full revision under the micro-systematic profile, with the revalidation of some taxa.

In western Palaearctic, *Asemum striatum* has its strongholds in Central and northern Europe, where it follows the distribution of its principal hosts, while it shows a mountain relict distribution in the southern peninsulas. Its capacity to colonise rather cold regions enabled it to settle the first Scots pinewoods since the Early Holocene. In contrast, the difficulty of larvae to survive in dried wood makes it a rarely exported species. Accordingly, the population that has recently colonised England is considered as an originally Scottish population related to Caledonian pines and not as an introduced species (Richards, 1964).

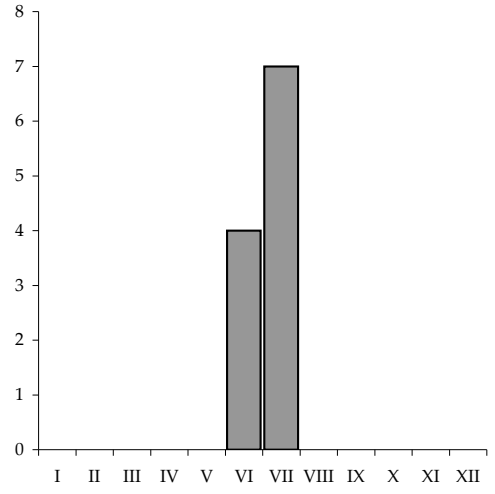


Fig. 197: Phenology of *Asemum striatum* in Luxembourg.

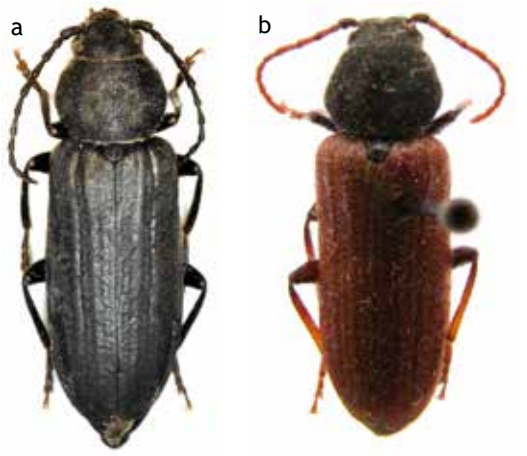
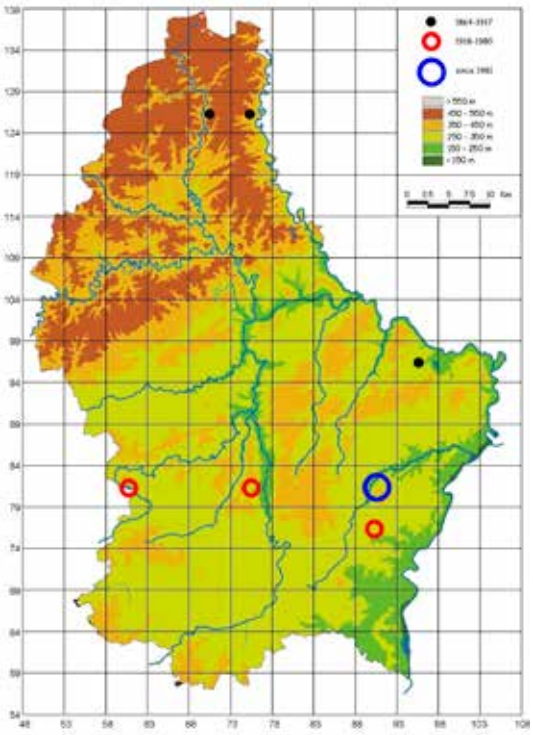


Fig. 198: *Asemum striatum*, a.Male, Poland (author's coll.), b. Female var *agreste*, Roodt (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	2									1			3
1918-1980							2	1					3
since 1981										1			1
Total	2						2	1		2			7

Fig. 199: Distribution of *Asemum striatum* and colonised localities in Luxembourg.

In the regions neighbouring Luxembourg, it is an autochthonous species widespread everywhere, though limited to the pinewoods and infrequently collected because of its phenology. In Rhineland-Palatinate, it is rare and especially widespread in Palatinate, while it is still unknown in the Saarland (Niehuis, 2001). In northern Lorraine and Alsace, it has been known for a long time (Godron, 1866) and today, it shows a discontinuous distribution in the pinewoods of Lorraine (Colson, 1980b), while it is still widespread in Alsace (Matter, 1998). Rare in the French Ardennes (Ligeron, 2005), it is widespread in the Gaume, Campine and the mountain regions of Belgium (Lameere, 1894; Collart, 1941; Lempereur et al., 2000; Thirion, 2005b; Troukens, 2007). Widespread and once locally not rare in the Netherlands (Everts, 1903), it is today fairly rare on sandy soils (Zeegers & Heijerman, 2008).

In Luxembourg, this species is widespread but very rare and scattered (Fig. 199), though already known as a pest for pines at the beginning of the 20th century (Schuster, 1907a). Its rarity might be related to the forest management privileging spruce against pine.

4.4.1.4 *Tetropium castaneum* (Linnaeus, 1758)

Tetropium luridum Ferrant, 1907a: 298-299, Fig. 25; Ferrant, 1911: 63, Fig. 27. *Tetropium castaneum* Mousset, 1969: 166; Mousset, 1973: Map. 441; Vitali, 2013: 146.

Body size 8-19 mm. Flat, parallel-sided, with short antennae and eyes having the dorsal and the ventral part evidently separated. Head and pronotum shining black, elytra and legs chromatically variable, forming the following possible combinations: elytra and legs brown (typical form); elytra brown, legs black (var. *luridum*); elytra black, legs red to brown (var. *ruficrus*), entirely black (var. *aulicum*).

The only melanistic variety might be confused with *Asemum striatum* (4.4.1.3), which differs from this species in entire eyes, the irregularly wrinkled surface, the less inflated femurs and the finer antennae. The var. *ruficrus* might be superficially confused with the female of *Ropalopus femoratus* (4.2.2.3), which differs in the longer antennae, the entire eyes and the finely granulated elytral surface.

Life-cycle lasts one year. Larvae live under bark of sick or freshly fallen mountain Pinaceae, especially spruce. Pupation occurs in the wood in early spring. Adults are diurnal on fallen trunks, especially in areas subject to clear-cutting, from mid-spring to mid-summer (Fig. 200).

Host plants: *Abies*, *Picea*, *Pinus*.

Parasitoids: *Coleocentrus caligatus* (Gravenhorst, 1829), *Neoxorides collaris* (Gravenhorst, 1829), *N. nitens* (Gravenhorst, 1829), *Rhimphoctona megacephala* (Gravenhorst, 1829), *Xorides ater* (Gravenhorst, 1829), *X. brachylabis* (Kriechbaumer, 1889), *X. niger* (Pfeffer, 1913), *X. praecatorius* (Fabricius, 1793) (Ichneumonidae); *Aspicolpus dissimilis* (Nees, 1834), *Atanycolus denigrator* (Linnaeus, 1758), *A. initiator* (Fabricius, 1793), *Doryctes leucogaster* (Nees, 1834), *D. mutillator* (Thunberg, 1822), *D. obliteratus* (Nees, 1834), *Helcon tardator* Nees, 1814, *Helconidea dentator* (Fabricius, 1804) (Braconidae).

Eurasian species, widespread from the Pyrenees to Japan, mountain or relict populations in the southern part of its distribution, introduced with plantations of spruce in the plains of northern Europe, Great Britain (Twinn & Harding, 1999) and Greenland (Bocher, 1988).

In the regions neighbouring Luxembourg, it is autochthonous only in the Vosges, but widespread elsewhere following the artificial plantations of spruce since the second half of the 19th century.

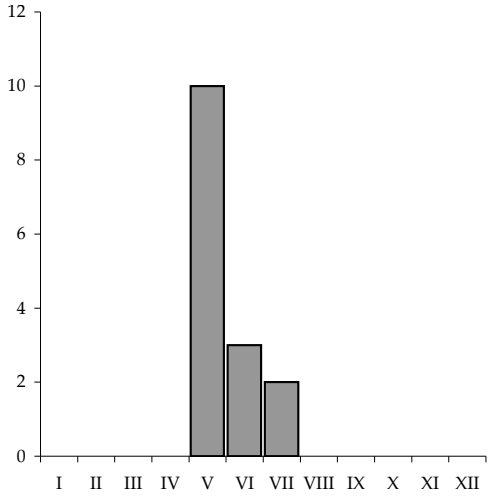


Fig. 200: Phenology of *Tetropium castaneum* in Luxembourg.

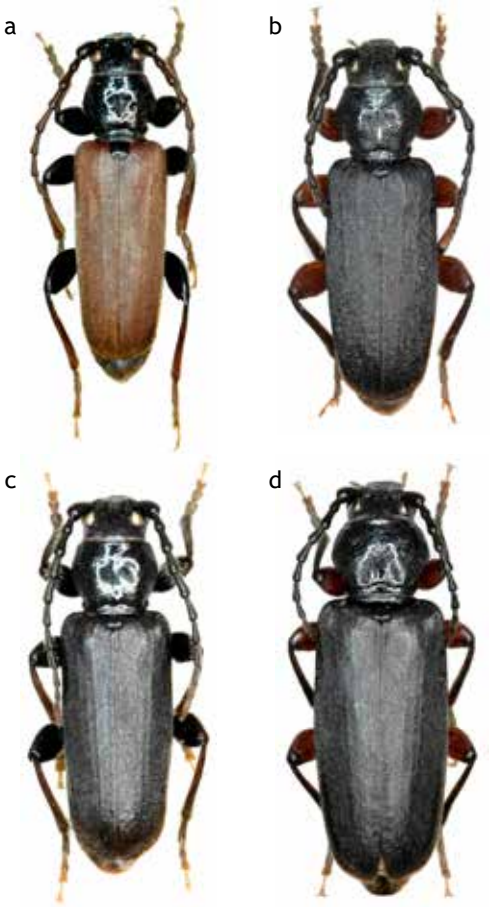
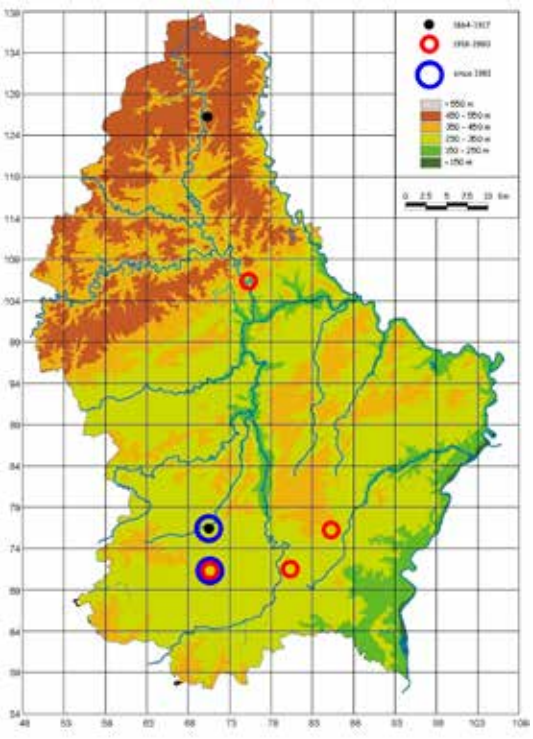


Fig. 201: *Tetropium castaneum*, a-c. Male, d. Female, Thillsmillen (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1						1						2
1918-1980			1					3					4
since 1981							1	1					2
Total	1		1				1	3					6

Fig. 202: Distribution of *Tetropium castaneum* and colonised localities in Luxembourg.

In Rhineland-Palatinate, it has been known since 1849, while it was firstly collected in the Saarland only in 1977. Nowadays, it shows a scattered distribution but seems in expansion (Niehuis, 2001). In northern Lorraine and Alsace, it has been known only from the Vosges, where once it was rare (Godron, 1866) and where it was no longer collected in the plain after 1950 (Matter, 1998). It is rare in the French Ardennes (Ligeron, 2005), in Belgium, though it shows a stable presence in the Ardennes (Lameere, 1894; Collart, 1941; Lempereur et al., 2000; Thirion, 2005b; Troukens, 2007; Drumont & Grootaert, 2011) and in the Netherlands (Everts, 1903; Zeegers & Heijerman, 2008).

In Luxembourg, this species is very rare, showing at all a similar consistency and abundance like *Asemum striatum* (4.4.1.3). Nonetheless, differently from this species, it seems to still resist in the surroundings of the capital taking advantage of the artificial plantations of spruce (Fig. 202). Adults were active until late July during the 19th century, while they were found only until mid-June during the 20th century.

4.4.2 Tribe Spondylidini Audinet-Serville, 1832

4.4.2.1 *Spondylis buprestoides* (Linnaeus, 1758)

Spondylis buprestoides Ferrant, 1907a: 295-296; Ferrant, 1911: 60; Mousset, 1969: 166; Mousset, 1973: Map. 430; Vitali, 2013: 146; Weitzel, 2014: 215.

Body size 10-26 mm. Dull black, cylindrical; antennae short, mandible prominent, reminding of a stag beetle. Dimorphic: males with arched, internally smooth mandibles and two longitudinal ridges on each elytron; female with straighter internally toothed mandibles and elytra without ridges.

Life-cycle lasts two years. Larvae bore dead wood of mountain Pinaceae, especially *Pinus sylvestris* L. Pupation occurs in wood. Adults are active in summer (Fig. 203) during the night, being sometimes attracted by lights, while they remain hidden under fallen logs during the day. They can survive 20-25 days without feeding.

Host plants: *Abies*, *Picea*, *Larix*, *Pinus*.

Parasitoids: *Ephialtes manifestator* (Linnaeus, 1758), *Odontocolon dentipes* (Gmelin, 1790), *Rhyssa persuasoria* (Linnaeus, 1758) (Ichneumonidae); *Cyanopterus nigrator* (Zetterstedt, 1838) (Braconidae).

Eurasian species, widespread from Andalusia to Japan, mountain or relict poulations in the southern part of its distribution.

Analogously to *Asemum striatum* (4.4.1.3), the species is autochthonous in the area neighbouring Luxembourg, having colonised northern Europe since the Early Holocene following Scots pine, afterwards reducing its presence due to the spread of temperate forests. Currently, it survives in some pinewoods, showing a scarce adaptation to the artificial plantations of *Picea*. In Rhineland-Palatinate, the beetle, once fairly rare (Brahm, 1790), has spread everywhere during the 19th century, recolonizing the Saarland at the end of the century (Niehuis, 2001). In northern Lorraine and Alsace, the species has been known only from the Vosges (Godron, 1866), where it is still common today (Matter, 1998). It is very rare in the French Ardennes (Ligeron, 2005), while it shows a scattered distribution in Belgium along the northern and southern borders and around the capital (Lameere, 1894; Collart, 1941; Lempereur et al., 2000; Troukens, 2007; Drumont & Grootaert, 2011). In the Netherlands, it is widespread for a long time and fairly common on sandy soils along the borders (Everts, 1903; Zeegers & Heijerman, 2008).

Analogously to *Asemum striatum*, the species was once more widespread in Luxembourg and appar-

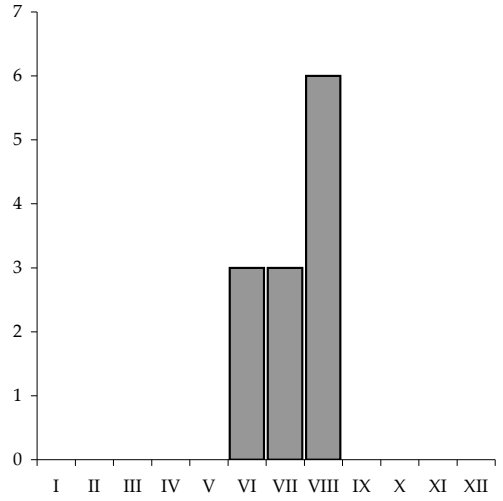


Fig. 203: Phenology of *Spondylis buprestoides* in Luxembourg.

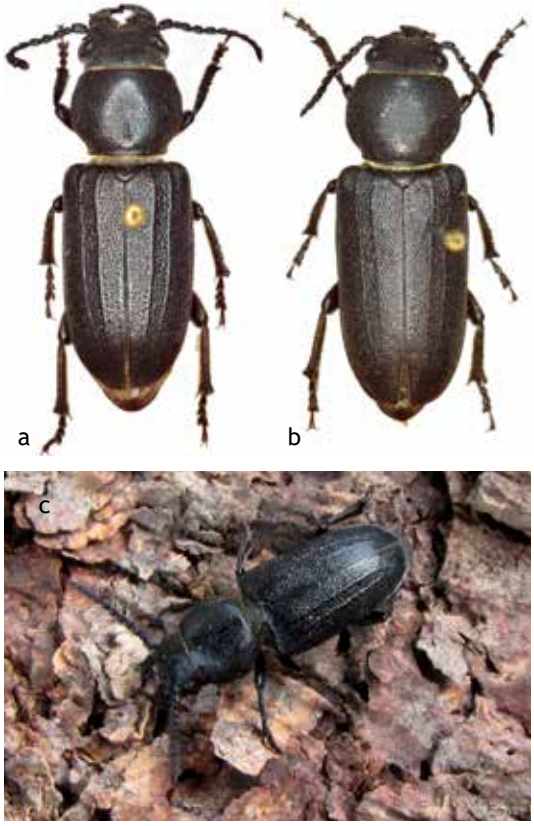
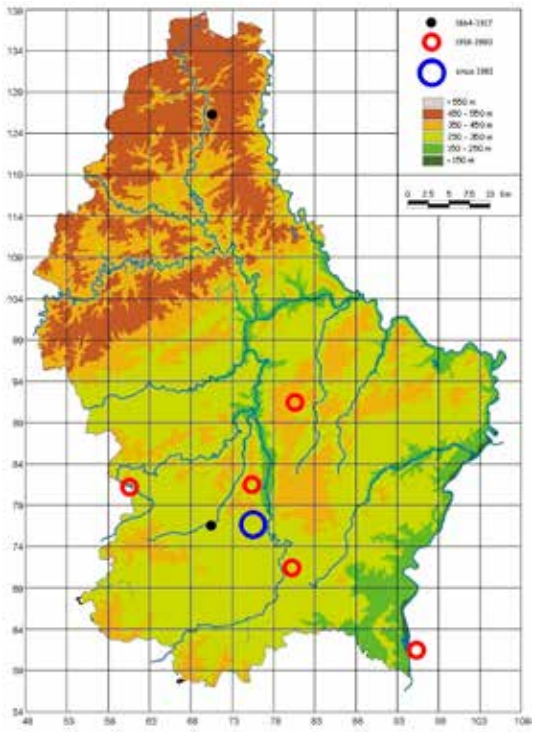


Fig. 204: *Spondylis buprestoides*, a. Male, Bridel, b. Female, Fischbach, c. Male on *Picea*, Bambësch (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1						1						2
1918-1980						1	2	1				1	5
since 1981								1					1
Total	1					1	3	2				1	8

Fig. 205: Distribution of *Spondylis buprestoides* and colonised localities in Luxembourg.

ently restricted its distribution to the pinewoods around the capital during the 20th century (Fig. 205). No longer collected after 1975, it was found again in 2015.

4.5 Subfamily Lamiinae Latreille, 1802

4.5.1 Tribe Agapanthiini Mulsant, 1839

4.5.1.1 *Agapanthia violacea* (Fabricius, 1775)

Agapanthia violacea Mousset, 1969: 172; Mousset, 1973: Map. 383; *Agapanthia (Smaragdula) violacea* Vitali, 2011b: 81; Vitali, 2012b: 237.

Agapanthia violacea is extremely similar to *A. intermedia* (4.5.1.2), with which was generally (mis) identified in the past. Most data are still mixed; consequently, the species will be treated together.

The existence of two species of blue *Agapanthia* in Central Europe has been known for a long time, though under different names. Dejean (1835) separated these species as *A. violacea* and *A. smaragdina* (n. n.), Mulsant (1863) mentioned *A. micans* (Panzer, actually Füssli) and *A. coerulea* (Schönherr) for France, while Godron (1886) recorded *A. violacea* and *A. coerulea* for northern Lorraine. However, ancient authors identified the current *A. intermedia* as *A. violacea*, thinking that Fabricius had described it from specimens from northern Europe (actually from Piedmont, Italy). Ganglbauer (1883) described *A. intermedia* as a variety of *A. cyanea* (= *violacea*) characterised by three longitudinal white bands on the pronotum. On the basis of different characters (elytral structure and pubescence), Frieser (1976) considered this form as a true species, raising many questions.

According to Dajoz (1978), *A. intermedia* and *A. violacea* occupy partially superposed distributions showing a scarcely limited geographic gradient, resulting to be the same species. In contrast, Carrière (2000) evidenced significant biological differences, which imply to consider them as different species. Correspondently, Švácha (2001) found that larvae living on *Knautia* (identified as *A. intermedia*) differ from those living in other herbaceous plants (identified as *A. violacea*), supporting their specific difference.

Actually, the situation still presents numerous obscure aspects. First, the type and the typical locality of *A. intemedia* were not even fixed. Dajoz (1978) examined four specimens of the collection Ganglbauer identified as *A. intermedia* and *A. violacea*: all perfectly corresponded to the type of *A. violacea*. Consequently, the true identity of *A. intermedia* and its relation with *Knautia* are merely speculative. Second, the adult characters are weak, mixed and often only illusory (Dajoz, 1978); thus, the identification is sometimes based on the host. Nonetheless, this is often unknown and old data can mention "*Scabiosa*" (Everts, 1922), currently considered as a different genus from *Knautia* but also an accepted host for *A. violacea*. Third, the evidenced larval characters (abdominal stigma, metanotal pubescence) separate *A. intermedia*

from *A. violacea* but not from *A. osmanlis* Reiche & Saulcy, 1858, another species of the group (Švácha, 2001). They are distinguishable only for the fact that they live on *Dipsacus*. In contrast, the adults are easily distinguishable from both species for their ringed antennae. Actually, this character can also be observed in some specimens of *A. intermedia*. Fourth, monophagy is a rather strange fact inside *Agapanthia*, where polyphagy is normal among well-known species. Still more obscure is the fact that *A. violacea* shows a wide polyphagy, feeding at least on 12 different herbaceous plants belonging to seven different families (among which Dipsacaceae as well), but it was never found on *Knautia* or *Dipsacus*.

In my opinion, these oddities can be explained by considering that *A. violacea*, *A. intermedia*, *A. osmanlis* and maybe other taxa, are not true species but ecological subspecies, related to different Dipsacaceae.

4.5.1.2 *Agapanthia intermedia* Ganglbauer, 1883

Agapanthia violacea Mousset, 1969: 172; Vitali, 2013: 146. *Agapanthia (Smaragdula) intermedia* Vitali, 2012b: 237, 240 Fig. 3.

Body size 7-13 mm. Cylindrical, everywhere metallic green to blue, covered with a whitish pubescence more evident on the elytral apex. Male foreheads covered with white pubescence.

The species might be confused with little specimens of *Agapanthia villosoviridescens* (4.5.1.3) or *A. cardui* (4.5.1.4) with reduced or damaged pubescence, from which it differs in the brilliant metallic colour (bluish black in other species) and the uniformly dark antennae (more or less ringed with white pubescence in other species).

Life-cycle lasts one year. Female lays up to 29 eggs in the stalk of different species of scabiosa. Larvae bore descending towards the ground. In late summer, they cut off the stalk and plug up the hole with fibres; afterwards, they descend in the basal part close to the ground, where they hibernate. Pupation occurs in late April. Adults emerge from a lateral hole and are active on the host plants during daytime from mid-spring to mid-summer.

Host plants: *Knautia arvensis* (L.) Coult., *K. arvernensis* (Briq.) Szabo and *K. dipsacifolia* (Schrank) Kreutzer.

The distribution is difficult to be defined because of the confusion with the sibling *A. violacea* (4.5.1.1) and several closely related species, whose systematic position need to be verified. However, *A. intermedia* seems to be the only species living in northern Europe, reaching eastward to the European part of Russia, while *A. violacea* is predominant or exclusive in southern Europe and Asia Minor; both species coexist in the European mountains.

In the areas neighbouring Luxembourg, this species is widespread but rare, though Knautia arvernsis is common everywhere. In Rhineland-Palatinate, it was recorded since the second half of the 19th century and nowadays it shows a scattered distribution in xeric habitats, while it was found in the Saarland only in 1960 (Niehuis, 2001). In northern Lorraine, Godron (1866) mentioned both species as rare, while Colson (1981) recorded *A. violacea* as occasional. The data are still mixed in the Vosges (Matter, 1998), where the species probably coexist. *A. violacea* was mentioned as very rare in the French Ardennes (Ligeron, 2005). Considered as absent from Belgium (Lameere, 1885) and later doubtfully mentioned near the Belgian borders (Lameere, 1894), it was finally recorded from the Belgian Lorraine on *Scabiosa* (Everts, 1922) and the Gaume (Lempereur et al., 2000). Currently, the data of both species are widespread in the distri-

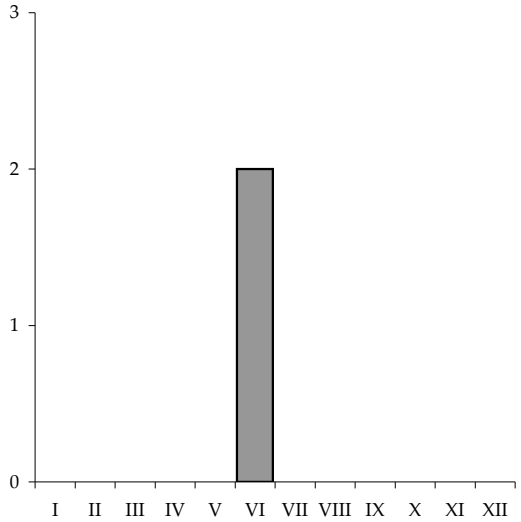
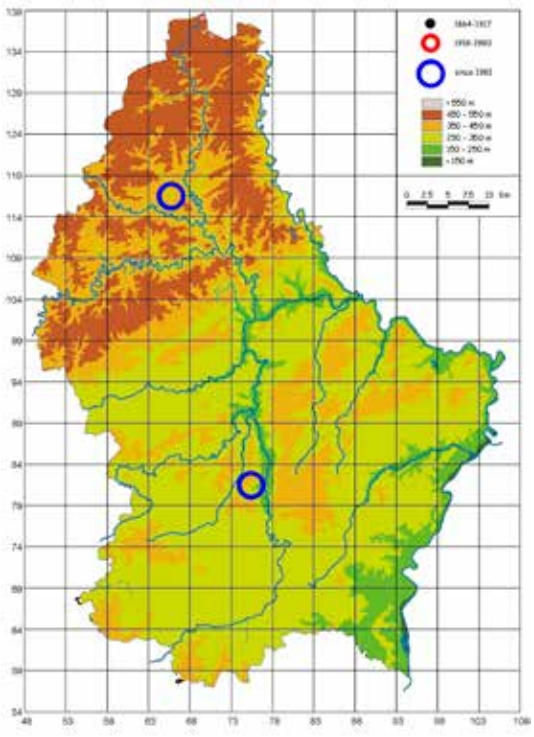


Fig. 206: Phenology of *Agapanthia intermedia* in Luxembourg.

Fig. 207: *Agapanthia intermedia*, Male, Eschweiler (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980									?				?
since 1981		1					1						2
Total		1					1		?				2

Fig. 208: Distribution of *Agapanthia intermedia* and colonised localities in Luxembourg.

bution map of the saproxylic beetles (Drumont & Grootaert, 2011). In the Netherlands, the species was only recently recorded (Teunissen, 2007; Zeegers & Heijerman, 2008).

In Luxembourg, the species was already recorded as *A. violacea* by Moussett (1969; 1973), but the only specimen indentified as such has resulted misidentified (Vitali, 2012b). Currently, *A. intermedia* is a very rare species, which occasionally has been found in xeric grasslands (Fig. 208). Its distribution, however, should be wider than it presently looks, although focused research on *Knautia* fields have not produced results until today.

4.5.1.3 *Agapanthia villosoviridescens* (DeGeer, 1775)

Agapanthia villosoviridescens Mousset, 1969: 171 Mousset, 1973: Map. 382; Haagen, 1986: 49; Gerend et al., 2007: 291; Vitali, 2011b: 82; Vitali, 2013: 146; Vitali, 2014: 88; Weitzel, 2014: 218.

Body size 9-22 mm. Cylindrical, everywhere lead-black; body covered with a scattered yellow pubescence; antennae black largely ringed with white pubescence.

The species might be confused with *Agapanthia dahli* (Richter, 1821), still not recorded from Luxembourg but present in Belgium and once in Rhineland-Palatinate. It differs from *A. villosoviridescens* in the antennae evidently reddish, with a

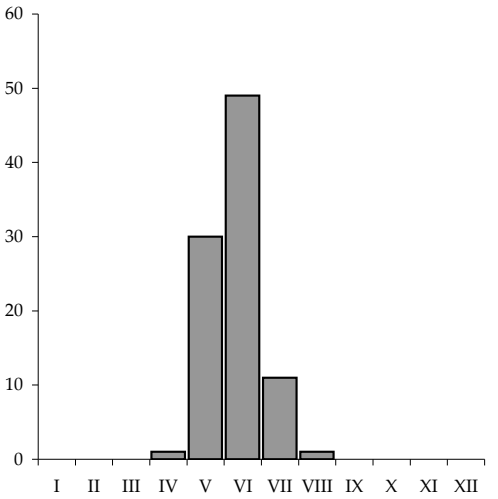


Fig. 209: Phenology of *Agapanthia villosoviridescens* in Luxembourg.

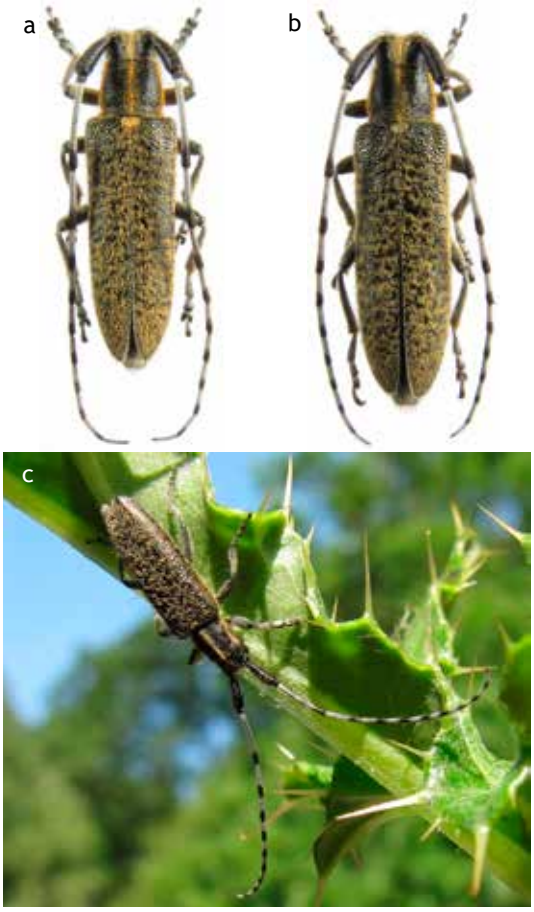
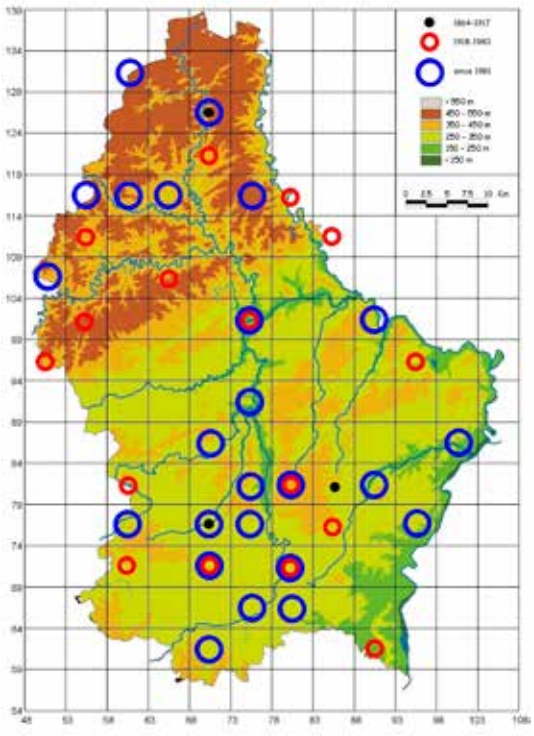


Fig. 210: *Agapanthia villosoviridescens*, a. Male, b. Female, Thillsmillen (author's coll.) c. Male on *Cirsium*, Bambësch.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1						1	1					3
1918-1980	2	2	1	1	2	1	2	3	1	1	1	1	18
since 1981	3	4	2	1		2	4	6	3	1	3		29
Total	6	6	3	2	2	3	6	10	4	2	4	1	49

Fig. 211: Distribution of *Agapanthia villosoviridescens* and colonised localities in Luxembourg.

tuft of hairs at the apex of the antennomeres III and IV. Old specimens with scratched pubescence can be confused with other species of *Agapanthia*, from which they differ in the dense and fairly coarse elytral pubescence.

Life-cycle lasts one year. Females lay up to 42 eggs in the stalk of numerous herbaceous plants, especially Apiaceae and Asteraceae. Larvae bore into the stem, descending towards the ground. In late summer, they cut off the stalk and plug up the hole with fibres; afterwards, they descend in the basal part close to the ground, where they hibernate. Pupation occurs in late April. Adults emerge from a lateral hole and are active, sometimes in larger numbers, on the host plants during daytime from mid-spring to mid-summer (Fig. 209).

Host plants: *Helleborus*, *Urtica*, *Angelica*, *Anthriscus*, *Filipendula*, *Heracleum*, *Torilis*, *Cirsium*, *Carduus*, *Erigeron*, *Eupatorium*, *Senecio*, *Parasenecio*, *Veratrum*.

Paraitoids: *Bracon intercessor* Nees, 1834 (Braconidae).

Euro-Turanian species, widespread from Andalusia to Kazakhstan. In the Caucasus and eastern Asia, it is replaced by *A. lederi* Ganglbauer, 1883 and *A. daurica* Ganglbauer, 1883, respectively, which several authors considered as synonyms or varieties of *A. villosoviridescens*. Actually, the differential characters can be also found in some European specimens, which, on the other side, usually show the tendency to form local populations. In my opinion, these forms should be more correctly considered as subspecies.

In the areas neighbouring Luxembourg, *A. villosoviridescens* is common everywhere and in expansion since the second half of the 19th century, most likely due to reforestation and consequent increase of humid zones. In Rhineland-Palatinate, it is common and widespread throughout the region, whereas it was once very rare, being recorded since 1856. In the Saarland, it was recorded only in 1960 (Niehuis, 2001). Analogously, it seems to be the most common species of the tribe in northern Lorraine and Alsace today (Colson, 1981; Matter, 1998), while it was once rare (Godron, 1866) or even unknown (Fournel & Gehin, 1846). It is common in the French Ardennes (Ligeron, 2005), southern Belgium, the Belgian Ardennes and in all humid zones, rarefying northwards (Lameere, 1894; Collart, 1941; Desière, 1969; Lempereur et al., 2000; Thirion, 2005a). In the Netherlands, the species is common throughout the country for a long period of time (Everts, 1903; Zeegers & Heijerman, 2008).

In Luxembourg, the species is common and widespread throughout the country (Fig. 211), resulting sometimes abundant at the margin of woods, especially on thistles.

4.5.1.4 *Agapanthia cardui* (Linnaeus, 1767)

Agapanthia cardui Mousset, 1969: 172; Mousset, 1973: Map. 381; Mousset, 1981a: 56; Vitali, 2013: 146; Vitali, 2014: 89. *Agapanthia pannonica* Gerend, 2000: 111; Gerend et al., 2007: 290; Köhler, 2013: 102; Weitzel, 2014: 218.

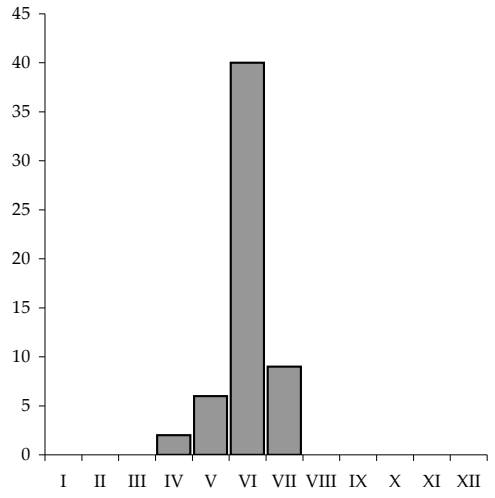


Fig. 212: Phenology of *Agapanthia cardui* in Luxembourg.

Body size 6.5-13.5 mm. Polymorphic species, which led to the description of different taxa, considered as simple varieties to true species. Cylindrical, everywhere lead black, sometimes greenish or bluish, with a longitudinal light line dividing the entire dorsal side; antennae largely ringed with white pubescence. Pubescence variable, usually white in northern Europe and yellow (var. consobrina) in the Mediterranean, but with many exceptions. Small specimens tend to reduce the light pattern on antennae (var. *peragalli*), elytra (var. *marginalis*) or the entire body (var. *nigroaenea*). A form, sometimes considered as a true species - *A. suturalis* (Fabricius 1787) - characterised by an acute elytral apex, is widespread in Mediterranean, where it widely coexists and apparently interbreeds with the typical form in the more northern part. The specimens of the area neighbouring Luxembourg are generally smaller and darker than the typical ones from southern Europe.

Small specimens with reduced white pattern might be confused with *A. violacea* (4.5.1.1), which nevertheless always shows brilliant metallic colour, or with specimens of *A. villosoviridescens* (4.5.1.3) with damaged pubescence, which nevertheless show a denser and coarse elytral puncturing.

Life-cycle lasts one year. Larvae bore the stalk of many herbaceous plants, descending towards the ground. In late summer, they cut off the stalk and plug up the hole with fibres; afterwards, they descend in the basal part close to the ground, where they hibernate. Pupation occurs in spring. Adults emerge from a lateral hole and are active on the host plants during daytime from late spring to mid-summer (Fig. 212). Sometimes numerous in southern Europe, single specimens are usually collected in Luxembourg.

Host plants: *Urtica*, *Artemisia*, *Cirsium*, *Carduncellus*, *Carduus*, *Heracleum*, *Knautia*.

A. cardui (s. l.) is widespread in the western Palaearctic from Spain to the Middle East. Sama (2002) pointed out the presence of two "phenotypes", dominating in Europe (*cardui* = *pannonica*) or in the south Mediterranean (*suturalis*), widely coexisting and intergrading in the northern Mediterranean. According to Švácha (2001), larvae are clearly different, but no character was added supporting this claim. Recently, Sama (2008) evidenced that some male genital characters (aedeagus and endophallic sclerites) are the best differential characters; never-

theless, leaving a still inconclusive situation. In fact, the evidenced characters still show a patent variability that might lead to split interpretations (further species? intraspecific variability?), while the author avoided to investigate coexisting populations in order to exclude the merging of genital characters. Actually, the presence of virtually unidentifiable specimens in mixed populations suggests that the taxa are probably able to interbreed, since sibling species tend to accentuate their differences in overlapping areas (Brown & Wilson, 1956).

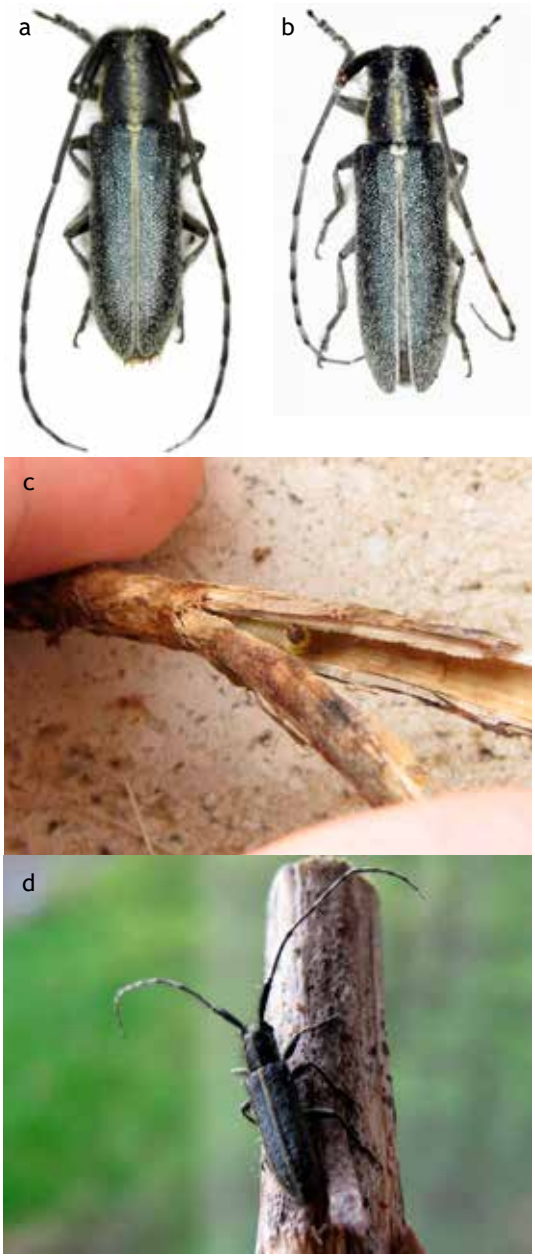
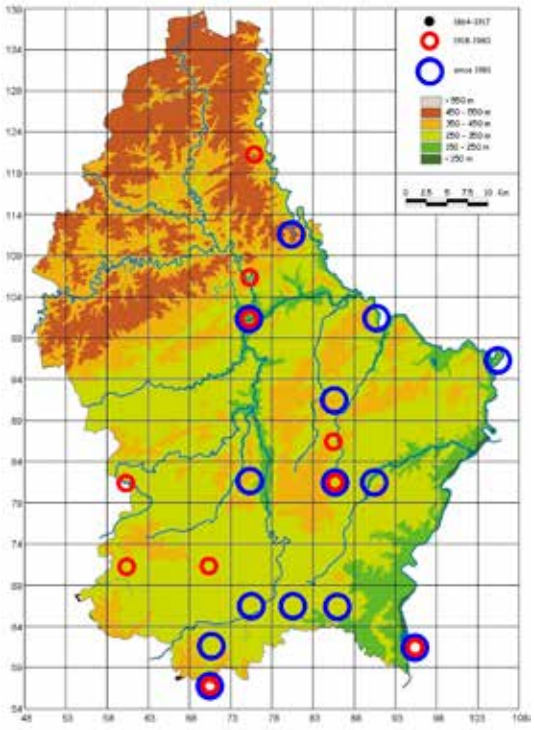


Fig. 213: *Agapanthia cardui*, a. Male, Kayl (author's coll.), b. Female, Petange (coll. Mnhn), c. Larve, Kayl, d. Male, Kayl.

In the areas neighbouring Luxembourg, the species is widespread but little common, being limited to xeric habitats of the plains, where it is in expansion. Analogously to A. villosoviridescens, it was recorded from Rhineland-Palatinate only in 1856 and from the Saarland in 1951. Nowadays, the species is fairly common and widespread in the warmest habitats (Niehuis, 2001). In Alsace and northern Lorraine, the species is fairly common (Colson, 1981; Matter, 1998) but it was once very rare (Fournel & Gehin, 1846). Fairly rare in the French Ardennes (Ligeron, 2005),



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980	1		2				1	2	3			1	10
since 1981			1	1		1		2	6	2	3	2	18
Total	1		3	1		1	1	4	9	2	3	2	27

Fig. 214: Distribution of *Agapanthia cardui* and colonised localities in Luxembourg.

it was unknown in Belgium during the 19th century (Lameere, 1885; 1894; Everts, 1903), being recorded only in the 1920s (Everts, 1922), while it is absent from the Netherlands (Zeegers & Heijerman, 2008).

In Luxembourg, this species was unknown prior to WWII, the first specimen having been collected by A. Mousset near Esch-sur-Alzette only in 1951. The species already showed a wide distribution in the country (Fig. 214), which suggest an earlier introduction; nonetheless, it should have been very rare or absent at Ferrant's times. Currently, it is a little common species, mainly widespread and regularly present in some xeric field of the Gutland.

4.5.1.5 *Calamobius filum* (Rossi, 1790)

Calamobius filum Gerend, 2008: 124; Vitali, 2013: 146; Vitali, 2014: 89.

Body size 5-12 mm. Cylindrical, extremely thin, slate-grey, everywhere covered with a yellowish to whitish pubescence, sometimes also showing one to three whitish longitudinal bands on the pronotum and another one along the elytral suture.

Life-cycle lasts one year. Larvae develop in the stems of many Poaceae, sometimes also in Fabaceae (*Hedysarum coronarium* L.), while the rearing from fruit trees (Gerend, 2008) is undoubtedly erroneous. Females lay up to 200 eggs, each in an incisure made below the ear. The larvae emerge after 8-10 days and feed on the pith descending towards the ground. In late summer, it cuts off

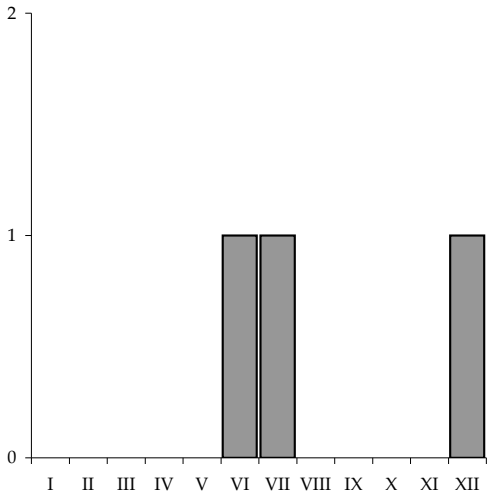


Fig. 215: Phenology of *Calamobius filum* in Luxembourg.

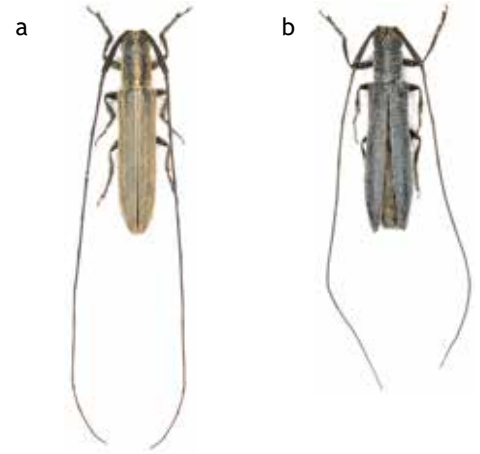
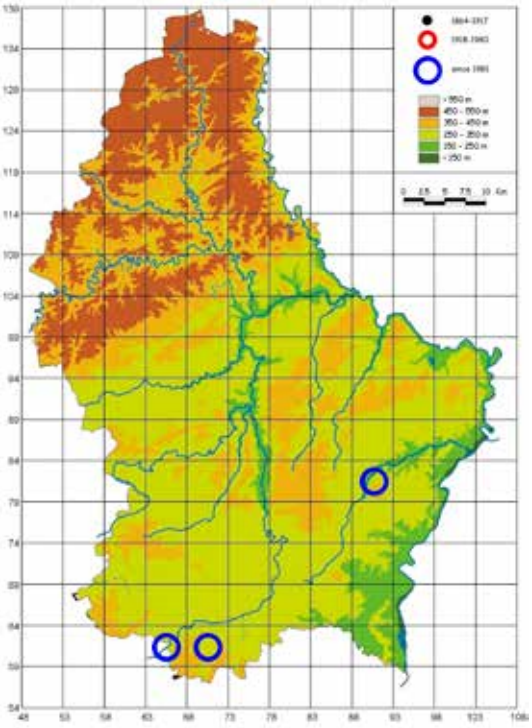


Fig. 216: *Calamobius filum*, a. Male, Italy, b. Female, Greece (Author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981									2		1		3
Total									2		1		3

Fig. 217: Distribution of *Calamobius filum* and colonised localities in Luxembourg.

the stem at 15-25 cm above soil remaining in the upper part. After having plugged both extremities with fibres, it hibernates and pupates in spring. Adults emerge from a lateral hole and are active on the host plants, resulting strongly mimetic, during daytime from mid-spring to mid-summer. The species sometimes is a pest for corn, but only occasionally in south-eastern France (Bonnemaison; 1962; Balachowsky, 1962; Villiers, 1978).

Host plants: *Arrhenatherum*, *Avena*, *Calamagrostis*, *Dactylis*, *Triticum*, *Hordeum*, *Hedysarum*.

Western Palaearctic species, widespread from the Mediterranean to Iran and rarefying towards Central Europe.

In the areas neighbouring Luxembourg, it is in expansion for a few years. In Rhineland-Palatinate, it has spread westwards since 1961, while it reached the Saarland only in 1995 (Niehuis, 2001). Still unknown in northern Lorraine (Colson, 1981), the species has begun spreading in eastern Alsace since 1960s (Matter, 1998). It was very recently recorded from Belgium (Rouard, 2001) and the Netherlands (Belgers, 2012).

Though the species was firstly recorded for Luxembourg only in 2008, J. Thoma already collected a specimen near Esch-sur-Alzette in 2005. Nowadays, it shows a spotted distribution in the warmest localities of the Gutland (Fig. 217) but possibly, it is more widespread than it currently seems. However, the specimen reared from "a fruit tree" (Gerend, 2008) is not taken into consideration in the table since the authentic locality is actually unknown because of a possible contamination in the rearing.

4.5.2 Tribe Saperdini Mulsant, 1839

4.5.2.1 *Saperda populnea* (Linnaeus, 1758)

Saperda populnea Ferrant, 1907b: 315-316, Fig. 33; Ferrant, 1911: 72, Fig. 35; Mousset, 1969: 172; Mousset, 1973: Map. 428; Lambinon et al., 2012: 176; Köhler, 2013: 63, 102; Vitali, 2013: 146; Weitzel, 2014: 218.

Body size 7.5-15 mm. Cylindrical, flattened, clay-grey; body covered with a sulphur-yellow pattern condensed forming three longitudinal bands on the pronotum and a row of five spots on each elytron; antennae ringed with white pubescence. The median band of the pronotum, considerably narrower than the lateral ones, is often reduced or missing; the elytral spots are rarely reduced or completely absent, typically in the ssp. *balsamifera* (Motschulsky, 1860). Elytra of Nearctic subspecies are uniformly yellow (ssp. tulari Felt & Joutel 1904) or grey (ssp. mœsta LeConte 1850).

Life-cycle lasts two years. The female produces a U-shaped woodcut in the bark of living twigs of young Salicaceae, especially poplars but, occasionally, also Betulaceae. It lays a single egg in a hole excavated in the middle of this fissure, laying 50-80 eggs in all. The plant reacts to the cut producing a typical gall, which furnishes nutrition to the larva. Larvae emerge after 10-14 days, feeding on the gall and then penetrating the twig. In late summer, pupation occurs in the twig, where the beetle hibernates as pupa. Adults are found on host plants from late spring to early summer (Fig. 218). The species has sometimes been considered a pest for poplars (Bonnemaison, 1962).

Host plants: *Populus*, *Salix*, *Betula*, *Corylus*.

Parasitoids: *Cryptus viduatorius* Fabricius, 1804, *Dolichomitus messor* (Gravenhorst, 1829), *D. populneus* (Ratzeburg, 1848), *D. tuberculatus* (Geoffroy, 1785), *Echthrus reluctator* (Linnaeus, 1758), *Ephialtes manifestator* (Linnaeus, 1758), *Helcostizus restaurator* (Fabricius, 1775), *Idiolispa analis* (Gravenhorst, 1807), *Lycorina triangulifera* Holmgren, 1859, *Schreineria populnea* (Giraud, 1872) *Xylophrurus lancifer* (Gravenhorst, 1829)

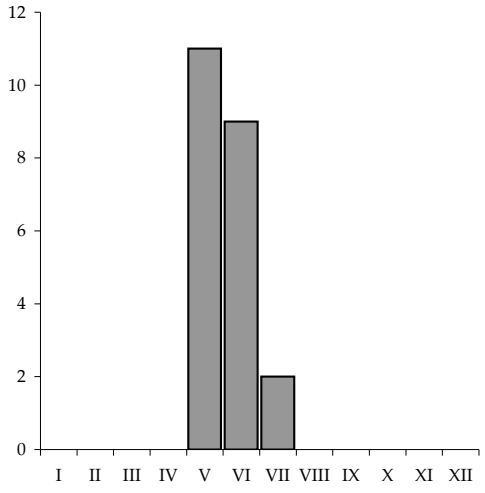


Fig. 218: Phenology of *Saperda populnea* in Luxembourg.

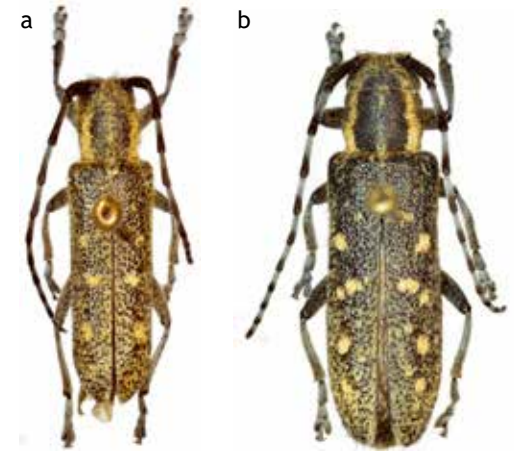
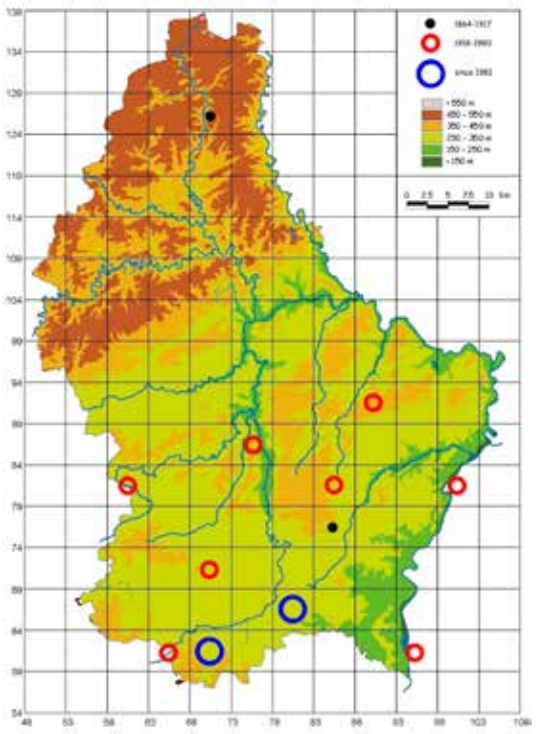


Fig. 219: *Saperda populnea*, a. Male, Bridel b. Female, Esch-sur-Alzette (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1							1					2
1918-1980							1	2	1	1	1	1	7
since 1981							1		4				5
Total	1						2	3	5	1	1	1	14

Fig. 220: Distribution of *Saperda populnea* and colonised localities in Luxembourg.

(Ichneumonidae); *Apanteles laevigatus* (Ratzeburg, 1848), *Ascogaster rufidens* Wesmael, 1835, *Atanycolus denigrator* (Linnaeus, 1758), *Iphiaulax multiarticulatus* (Ratzeburg, 1852) (Braconidae); *Entedon chalybaeus* Ratzeburg, 1852 (Eulophidae); *Pteromalus varians* (Spinola, 1808) (Pteromalidae).

Holarctic species, widespread from North Africa to the Unites States of America. Four subspecies have been recognised: the typical one in the western Palaearctic, *balsamifera* (Motschulsky, 1860) from Siberia to Manchuria and Japan, *mœsta* LeConte 1850 in the eastern Nearctic and *tulari* Felt & Joutel, 1904 in California. Though present in North Africa as well, the species is largely widespread in boreal Europe and in all regions neighbouring Luxembourg.

In Rhineland-Palatinate and the Saarland, it is common and known from a long time period (Brahms, 1790; Niehuis, 2001), whereas it seems in regression in northern Lorraine, though once very common (Fournel & Gehin, 1846) or common (Godron, 1866), but where it has no longer been collected after the 1970s (Colson, 1981). In Alsace, it is common and widespread especially in the plain (Matter, 1998), as well as in the French Ardennes (Ligeron, 2005). Fairly common in Belgium (Lameere, 1894; Picard, 1929; Lempereur et al., 2000; Delwaide & Thieren, 2010), it is largely widespread in the Netherlands, except along the coast (Everts, 1903; Zeegers & Heijerman, 2008).

In Luxembourg, the species was considered as a very common pest of poplars at the beginning of the 20th century, (Ferrant, 1907b, 1911). Currently, it is widespread in the Grunland but rarely collected (Fig. 220). The analysis of the data shows a seeming regression, but a recent survey of the zoocecidia of Luxembourg (Lambinon et al., 2012) might show that it is still more widespread in the country than it seems today. Unfortunately, no concrete samples have been collected in order to support this claim.

4.5.2.2 *Saperda scalaris* (Linnaeus, 1758)

Saperda scalaris Ferrant, 1907b: 314-315; Ferrant, 1911: 71; Mousset, 1969: 172; Mousset, 1973: Map. 429; Vitali, 2013: 146; Weitzel, 2014: 218.

Body size 11-19 mm. Cylindrical, flattened, black; body covered with a variable yellow pattern condensed along the eyes, the pronotal sides and the elytral suture, where it shows six lateral

teeth reminding of a zipper and some isolated spots; antennae ringed with whitish pubescence. Specimens with bluish gray to whitish, rather than sulphur-yellow, pattern belong to the var. *hieroglyphica*.

Life-cycle lasts one year. Larvae bore dead branches of conifer and broadleaf trees, including fruit trees; pupation occurs in wood in spring. Adults are diurnal and nocturnal on host plants from early spring to early summer (Fig. 221); it can sometimes be collected at light or with yellow Moericke traps.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Betula*, *Corylus*, *Carpinus*, *Ulmus*, *Juglans*, *Malus*, *Pyrus*, *Sorbus*, *Prunus*, *Acer*, *Ilex*, *Salix*, *Populus*, *Sambucus*, *Abies*, *Picea*, *Larix*.

Parasitoids: *Orthocentrus fulvipes* Gravenhorst, 1829 (Ichneumonidae); *Meteorus tabidus* (Wesmael, 1835) (Braconidae).

Palaearctic species, widespread from the Cantabrian Mts. to Manchuria, with a relict subspecies in Algeria (*algeriensis* Breuning, 1952). It is a cryohygrophilic element, restricted to mountains in the southern part of its distribution but largely widespread on the British Islands and all over Scandinavia to the North Cape. It was also present in Ireland at least until the 13th century (Whitehouse, 2006). In the eastern part of its distribution, the forms with grey pattern (var. *hieroglyphica*) predominate largely so that some authors (Breuning, 1952) recognised it as a subspecies. Nonetheless, they are known from western Europe as well, where they are mixed with specimens with more or less yellowish pattern (Villiers, 1978); thus, hieroglyphica only seems to be a local adaptation to trees with light bark, such as *Betula* and *Alnus*, as Bußler (2013) rightly noticed. In contrast, the population of Algeria is really isolated, the species being largely absent from Iberia; thus, the status of subspecies should be accepted.

In the areas neighbouring Luxembourg, the species is widespread but little common to rare. In Rhineland-Palatinate and the Saarland, it is known for a long time and widespread especially in the plain (Brahms, 1790; Niehuis, 2001). In northern Lorraine, it is fairly rare and localised (Fournel & Gehin, 1846; Godron, 1866; Colson, 1981), while it is recorded everywhere in Alsace (Matter, 1998). Rare in the French Ardennes (Ligeron, 2005), it is little common but widespread in Belgium (Lameere, 1894; Picard, 1929; Collart,

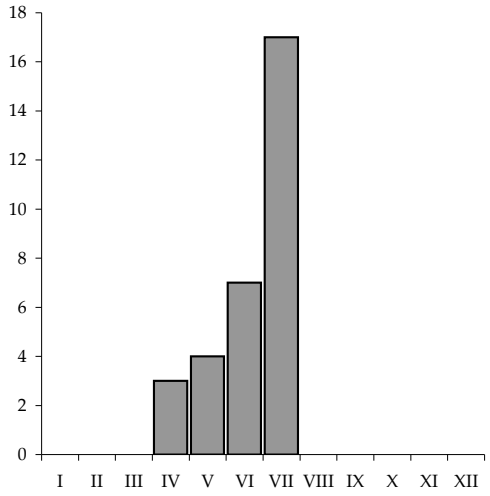
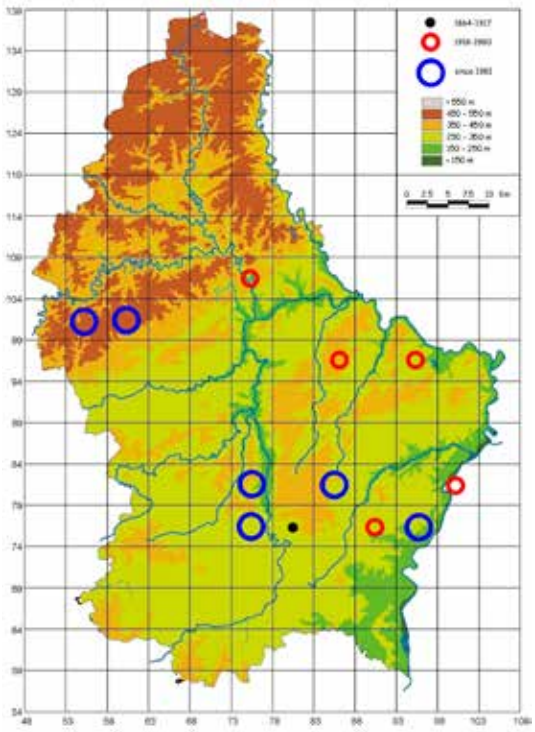


Fig. 221: Phenology of *Saperda scalaris* in Luxembourg.

Fig. 222: *Saperda scalaris*, a. Male, Lorraine (coll. Mnhn), b. Female, Bambësch (author's coll.), c. Female on *Fagus*, Bambësch.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1					1
1918-1980			1			1		1		1	1		5
since 1981					2			3			1		6
Total			1		2	1		5		1	2		12

Fig. 223: Distribution of *Saperda scalaris* and colonised localities in Luxembourg.

1941; Desière, 1969; Lempereur et al., 2000; Troukens, 2007; Delwaide & Thieren, 2010) and in the Netherlands, where it becomes rare along the coasts (Zeegers & Heijerman, 2008).

In Luxembourg, the species was considered as an occasional pest for apple, cherry and walnut-trees at the beginning of the 20th century (Ferrant, 1907b, 1911). Actually, it has very rarely been collected, though resulting occasionally abundant. Its presence in the country seems to be stable (Fig. 223).

4.5.2.3 *Saperda carcharias* (Linnaeus, 1758)

Saperda carcharias Ferrant, 1907b: 315, Fig. 32; Schuster, 1907b: 101; Ferrant, 1911: 71-72, Fig. 34; Mousset, 1969: 172; Mousset, 1973: Map. 427; Vitali, 2013: 146; Vitali, 2014: 89; Weitzel, 2014: 218.

Body size 20-32 mm. Cylindrical, black, everywhere covered with a yellow pubescence, except for numerous small points on the elytra; antennae widely ringed with a similar pubescence. The pubescence usually varies from light to mustard-yellow but rarely, it can be light grey (var. *grisescens*).

The species may be only confused with *Saperda similis* Laicharting, 1784 (not recorded from Luxembourg yet but present in the neighbouring regions), from which it differs in the larger size and the elytra pointed at the apex (rounded in *S. similis*).

Life-cycle lasts three years. The female produces an oval woodcut in the bark of branches of living Salicaceae, especially poplars, laying inside a single egg. Each female lays 30-50 eggs. The egg undergoes diapause for 10 months until May of the subsequent year, when the larva begins its development. It bores an ascending gallery in the branch during ca. 13 months; then, it pupates in the wood in June of the third year. Adults are found on host plants from mid to late summer (Fig. 224), crepuscular or nocturnal, sometimes coming to the light. Males can survive 15-20 days and females 2-3 months, feeding on leaves of the hosts-plants. The species has sometimes been considered a pest for poplars (Bonnemaison, 1962).

Host plants: *Populus nigra* L., *P. tremula* L., *P.* × *canadensis* Moench, *Salix caprea* L., *S. viminalis* L.

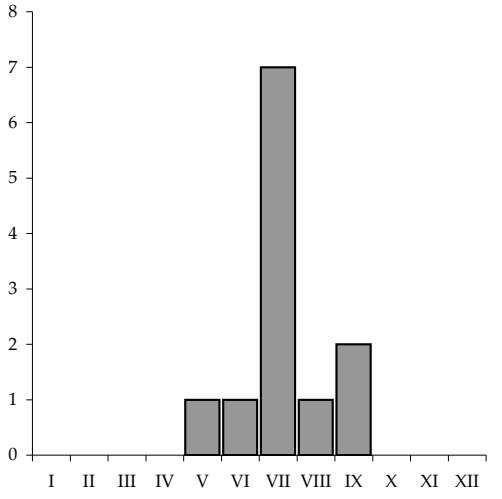


Fig. 224: Phenology of *Saperda carcharias* in Luxembourg.

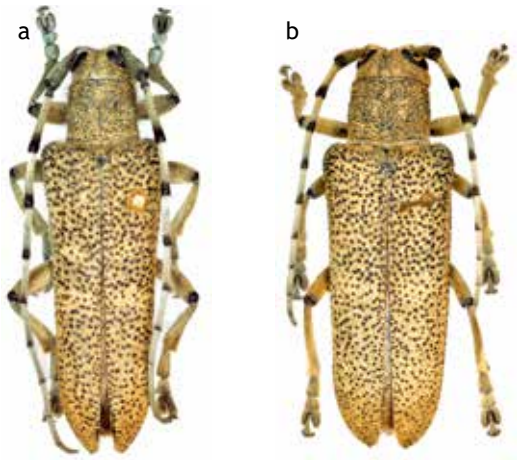


Fig. 225: *Saperda carcharias*, a. Male, Germany, b. Female, Bertrange (coll. Mnhn).

	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	2			2	1	6
1918-1980							1	1				1	3
since 1981									1				1
Total							2	3	1		2	2	10

Fig. 226: Distribution of *Saperda carcharias* and colonised localities in Luxembourg.

Parasitoids: *Ischnoceros rusticus* (Geoffroy, 1785) (Ichneumonidae).

Predators: *Dendrocopos major* (Linnaeus, 1758) (Picidae).

Euro-Manchurian species, widespread from the Cantabrian Mts. to Manchuria. A closely related species is widespread in China (*S. simulans* Gahan, 1888) and another one in the Nearctic (*S. calcarata* Say, 1824), while a fossil comparable to the Eurasian species - *S. robusta* (Schmidt, 1967) - has been found in Late Pliocene shale near Willershausen, Germany (Schmidt, 1967; Vitali, 2011a).

In the areas neighbouring Luxembourg, the species is widespread nearly everywhere but usually rare and in regression. In Rhineland-Palatinate and the Saarland, it has been known for a long time (Brahms, 1790) but it evidently is in strong regression, maybe due to its late phenology but also to the anthropic impact on the favourable habitats (Niehuis, 2001). In northern Lorraine, no recent findings have been known (Colson, 1981), though the species was once considered as fairly common (Fournel & Gehin, 1846; Godron, 1866). It is also in regression in Alsace, Belgium and the Netherlands, where it was once fairly common (Picard, 1929; Matter, 1998; Zeegers & Heijerman, 2008). It has always been rare in the French and Belgian Ardennes (Lameere, 1894; Ligeron, 2005) and along the Luxembourgish frontier (Delwaide & Thieren, 2010).

In Luxembourg, the species was considered as a pest for poplars at the beginning of the 20th century, (Schuster, 1907b; Ferrant, 1907b, 1911). Nowadays, it is very rare and in evident regression (Fig. 226). The only recent findings come from the Natural Reserve of the Haardt (Esch-sur-Alzette), where the beetle has been regularly collected through Malaise traps but always seldom and as single specimens (Vitali, 2014).

4.5.2.4 *Stenostola ferrea* (Schrank, 1776)

Stenostola ferrea Anonyme, 1867: xxv; Mousset, 1969: 172; Mousset, 1973: Map. 433; Vitali, 2011b: 82.

Due to a controversial interpretation of the original descriptions, several past authors identified this species and the close *Stenostola dubia* in opposite manner. Panzer (1806), Ganglbauer (1883), Everts (1903), Picard (1929), Horion (1974) and Villiers (1978) identified specimens with evident metallic

reflections as *S. ferrea*, while Mulsant (1839; 1863) and then Müller (1915), Everts (1922), Breuning (1952), Harde (1966) and Bense (1995) identified dull specimens as *S. ferrea*. The synonym *S. nigripes* (Fabricius, 1792) was sometimes attributed to either species as a valid name, while some authors (i.e. Demelt 1966) even renounced to differentiate them. Nowadays, all specialists agree with Mulsant's interpretations; consequently, all past records need to be verified.

The true *S. ferrea* has resulted to be a very rare species, possibly monophagous on *Tilia*, actually absent from Great Britain (Twinn & Harding, 1999), Rhineland-Palatinate, the Saarland (Niehuis, 2001), Finland (Clayhills, 2002), Sweden (Wallin et al., 2005) and with a very restrict distribution elsewhere (Kwamme & Wallin, 2011). Though both species are still marked in the distribution map of the saproxylic beetles of Belgium (Drumont & Grootaert, 2011), all verified specimens of the regions neighbouring Luxembourg belong to *S. dubia* (4.5.2.5), a species characterised by evident metallic reflections. In fact, the north-eastern limit of *S. ferrea* seems to reach the southern Alsace (Matter, 1998).

4.5.2.5 *Stenostola dubia* (Laicharting, 1784)

Stenostola ferrea Anonyme, 1867: xxv; Mousset, 1969: 172; Mousset, 1973: Map. 433; *Stenostola dubia* Gerend et al., 2007: 290; Vitali, 2011b: 82, 84 Fig. 14; Vitali, 2013: 146.

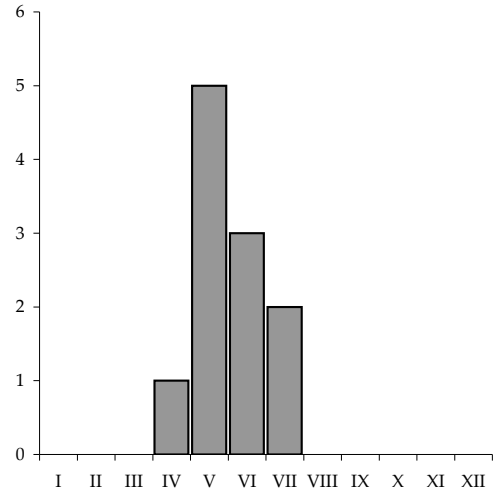


Fig. 227 : Phenology of *Stenostola dubia* in Luxembourg.

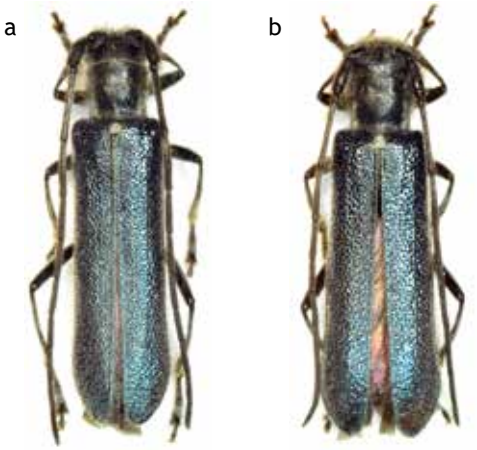
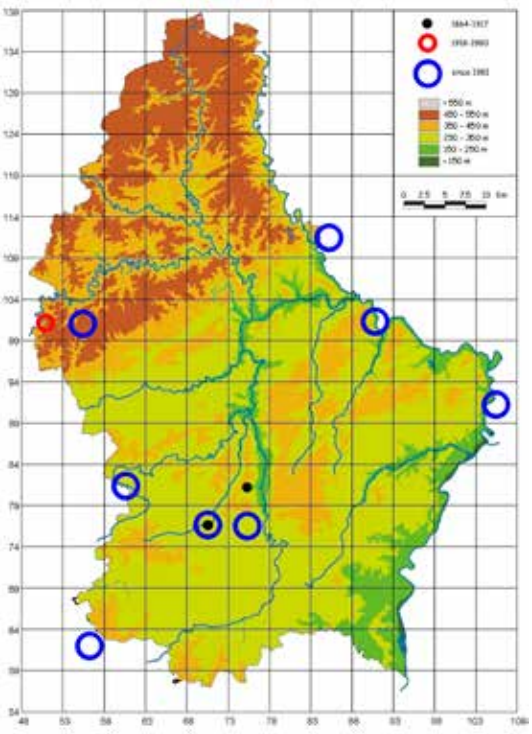


Fig. 228: *Stenostola dubia*, a. Male, b. Female, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1L						2
1918-1980					1								1
since 1981				1	1		1	2	1	2			8
Total				1	2		3	2	1	2			11

Fig. 229: Distribution of *Stenostola dubia* and colonised localities in Luxembourg.

Body size 9-14 mm. Cylindrical, depressed, everywhere black with evident bluish or rarely greenish metallic reflections; pronotum covered with three more or less visible longitudinal lines of white pubescence.

Life-cycle lasts two years. Larvae develop in dead fallen thin branches of broadleaf trees, especially mesophilic species. Pupation occurs in wood in a hook-shaped cell in spring. Adults are diurnal on leaves of the host plants from mid-spring to mid-summer (Fig. 227).

Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Betula*, *Corylus*, *Carpinus*, *Ulmus*, *Juglans*, *Pyrus*, *Sorbus*, *Prunus*, *Acer*, *Euonymus*, *Frangula*, *Rhamnus*, *Salix*, *Populus*!, *Tilia*, *Fraxinus*.

Parasitoids (as referred to *S. ferrea*): *Atanycolus initiator* (Fabricius, 1793), *Neurocrassus tesari* Šnoflák, 1945 (Braconidae).

Distribution still uncertain because of the past taxonomic misidentification with *S. ferrea* (4.5.2.4); however, the species is focused on the Central Europe, rarefying both north- and southwards.

In the areas neighbouring Luxembourg, it is widespread but generally uncommon. In Rhineland-Palatinate and the Saarland, it is widespread in humid plain woods, where its presence seems to be stable (Niehuis, 2001). In northern Lorraine, the species, known for a long time as *nigripes* or *ferrea*, is rare (Fournel & Gehin, 1846; Godron, 1866) and no records have been known after the 1970s (Colson, 1981). In Alsace, the species is largely widespread (Matter, 1998). Fairly rare in the French Ardennes (Ligeron, 2005, as ferrea), it was recorded from Belgium only by Everts (1903, as ferrea), datum emended by the same author in 1922 (as *nigripes*), but overlooked by Collart (1941) and following authors. Currently, both species are marked in the distribution map of the saproxylic beetles of Belgium (Drumont & Grootaert, 2011), but the presence of *S. ferrea* is very suspect: only *S. dubia* is present and widespread in the Belgian Ardennes (Horion, 1974; Lempereur et al., 2000, *as ferrea*). In the Netherlands, the species is rare in the southern Limburg and extremely rare elsewhere (Zeegers & Heijerman, 2008).

In Luxembourg, the species has been known for a long time, the first specimen having been collected by Camille van Voixem at "Rodenhof near Kopstal" (today Roudenhaff, Capellen) at the beginning of May 1864 (Anonymous, 1867). This specimen, identified as "*S. ferrea* Schr. (= *S. nigripes*)" surely belonged to *S. dubia* and it is the first cerambycid collected in Luxembourg. Most likely before 1890, V. Ferrant collected this species again in the canton of Capellen, at Thillsmillen, only ca. 3.5 km away from the first locality. This specimen was also identified as *S. ferrea* and recorded as such by Mousset (1969; 1973). Currently, the species has seldomly been collected in central Luxembourg (Fig. 229) but possibly it is more widespread in shady broadleaf-woods than it seems.

4.5.2.6 *Phytœcia nigricornis* (Fabricius, 1781)

Phytoecia (s. str.) nigricornis Vitali, 2012b: 237, 240 Fig. 4; Vitali, 2014: 89. *Phytoecia nigricornis* Vitali, 2013: 146.

Body size 6-12 mm. Small, cylindrical, clay-black, dorsal side covered with a dull grey pubescence, ventral side and three longitudinal lines on the pronotum covered with a whitish pubescence. Basis of the protibiae sometimes red (var. *solidaginis*), or body entirely covered with a mustard-yellow pubescence (var. *julii*).

The typical form and the var. *julii* may be very easily confused with grey and yellow varieties of *Phytœcia caerulescens* (4.5.2.9), which nevertheless has eyes completely separated in two distinct lobes. The variety *solidaginis* might be confused with *Phytœcia cylindrica* (4.5.2.7), which nevertheless has the anterior legs more extensively red and the

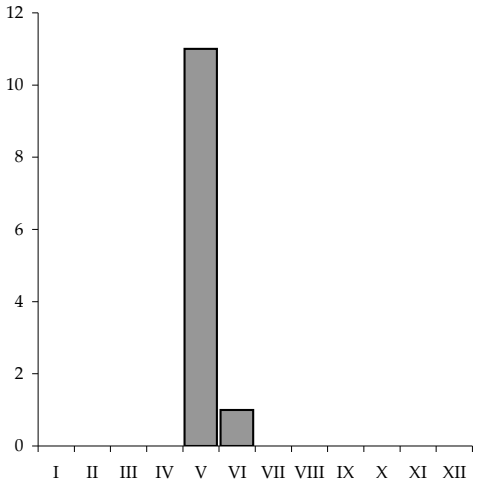


Fig. 230: Phenology of *Phytœcia nigricornis* in Luxembourg.

Fig. 231: *Phytœcia nigricornis*, Female, Italy (author's coll.).

	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980								1					1
since 1981									1				1
Total								1	1				2

Fig. 232: Distribution of *Phytœcia nigricornis* and colonised localities in Luxembourg.

pronotum deprived of both lateral white lines. Moreover, the species lives on different plants.

Life-cycle lasts one year. Female lays up to 52 eggs in stems of living Asteraceae, especially the Common Tansy. Larvae have sometimes been recorded as a pest for cultivated chrysanths (Balachowsky, 1962). Adults overwinter in the pupal cell and can be found on the host plants from late spring to early summer (Fig. 230), flying in late evening.

Host plants: *Artemisia absinthium* L., *A. campestris* L., *A. sieversiana* Willd., *A. vulgaris* L., *Glebionis segetum* (L.) Fourr., *Leucanthemum vulgare* Lam., *Solidago virgaurea* L., *Tanacetum vulgare* L.

Euro-Siberian steppic species widespread from the Altai Mts. to the Pyrenees, rarefying both north- and southwards.

In the regions neighbouring Luxembourg, it is localised in the xeric habitats, where it sometimes can be abundant; however, most ancient records must be verified since the species was often confused with other congeners (Everts, 1903; Matter 1998). In Rhineland-Palatinate, it is widespread especially in the plains along the rivers and only one finding is known from the Saarland (Niehuis, 2001). In northern Lorraine, the species is rare and only occasionally collected (Godron, 1866; Colson, 1981), while it is widespread in the Alsatian plains and hills (Matter 1998). Unknown from the French Ardennes (Ligeron, 2005) and the Netherlands (Zeegers & Heijerman, 2008), it is localised in the south-eastern Belgium (Drumont & Grootaert, 2011).

In Luxembourg, this species is very rare and confined to some xeric field of the Gutland (Fig. 232), where it seems, however, locally abundant.

4.5.2.7 *Phytœcia cylindrica* (Linnaeus, 1758)

Phytoecia cylindrica Mousset, 1969: 172; Mousset, 1973: Map. 414; Köhler, 2011: 88, 131; Vitali, 2013: 146; Vitali, 2014: 89.

Body size 5-14 mm. Small, cylindrical, black; pronotum with a fine longitudinal line of whitish pubescence, sometimes missing; protibiae and apical half of the profemurs red. Stable.

The species might be confused with *Phytœcia nigricornis* var. *solidaginis* (4.5.2.6), which nevertheless shows a more robust body, the anterior legs more extensively black and the pronotum with three

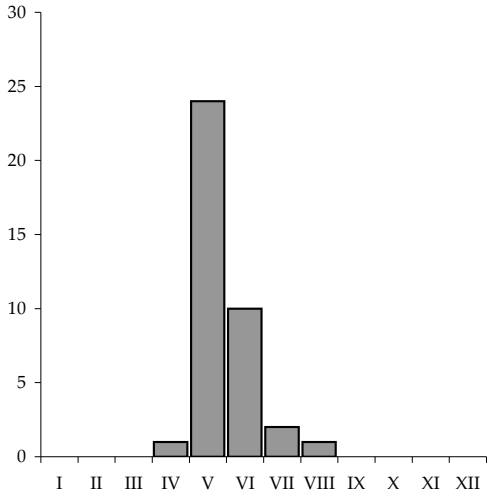


Fig. 233: Phenology of *Phytœcia cylindrica* in Luxembourg.

longitudinal white lines. Moreover, its larvae are related to different plants (Asteraceae).

Life-cycle lasts one year. Larvae in stems of living Apiaceae, sometimes recorded as a pest for cultivated carrots (Balachowsky, 1962). Recorded also from *Urtica*, probably erroneously. Pupation occurs in late autumn (Italy) or in spring (Sweden). Adults (Italy) or larvae (Sweden) overwinter in the dried basal part of the stem. Adults can be found on the host plants, especially inside shady woods, from mid-spring to mid-summer (Fig. 233).

Host plants: *Aegopodium podagraria* L., *Anthriscus sylvestris* (L.) Hoffm., *Astrantia major* L., *Bupleurum aureum* Hoffm., *Chaerophyllum aureum* L., *C. bulbosum* L., *C. temulum* L., *Daucus carota* L., *Heracleum sphondylium* L., *Laserpitium siler* L., *Torilis japonica* (Houtt.) DC.

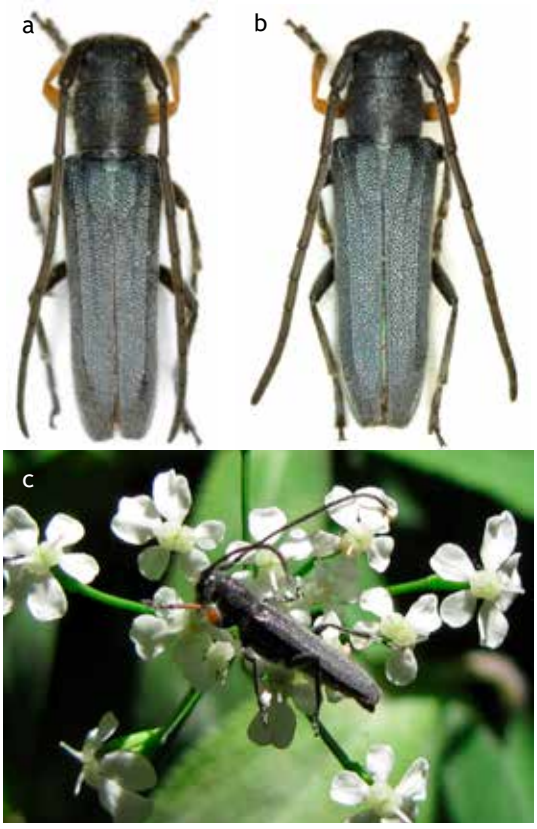
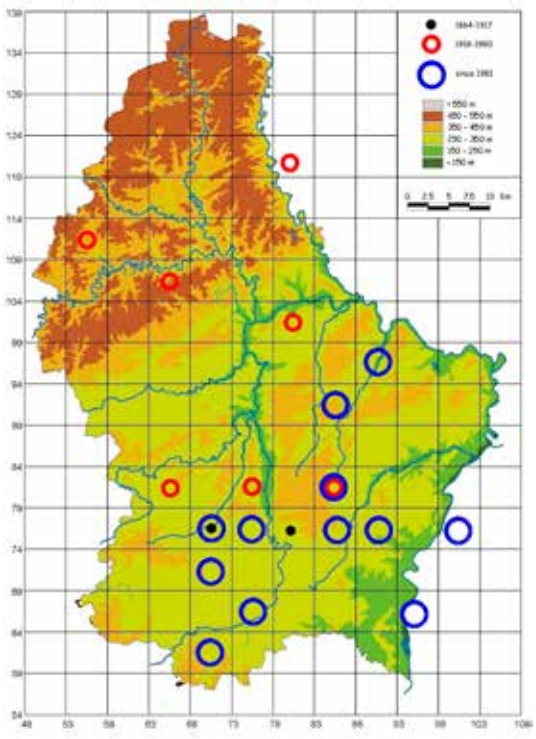


Fig. 234: *Phytœcia cylindrica*, a. Male, b. Female, c.Male, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1	1					2
1918-1980	1	3	1				2	1					8
since 1981								6	2	1	2	1	12
Total	1	3	1				3	8	2	1	2	1	22

Fig. 235: Distribution of *Phytœcia cylindrica* and colonised localities in Luxembourg.

Euro-Siberian species, widespread from Mongolia to central Spain, rarefying westwards.

In the regions neighbouring Luxembourg, it is widespread everywhere, but generally uncommon. In Rhineland-Palatinate, it is widespread and known since the second half of the 19th century, while it has been found in the Saarland only since 1979 (Niehuis, 2001). In northern Lorraine, the species is rare and occasionally collected (Godron, 1866; Colson, 1981), while it is fairly common in the Alsatian hills (Matter 1998). Rare in the French Ardennes (Ligeron, 2005), it is widespread in Belgium (Fairmaire, 1894; Desière, 1969; Lempereur et al., 2000; Troukens, 2007), being fairly common around the capital, and in southern Limburg (Horion, 1974; Zeegers & Heijerman, 2008).

In Luxembourg, the species is little common, resulting however the most common Saperdini of the country. It is widespread in shady broadleaf woods of the Gutland (Fig. 235), where it can be collected on the host plants. The analysis of the distributional data seems to suggest a south-eastern regression.

4.5.2.8 *Phytœcia icterica* (Schaller, 1783)

Phytoecia (s. str.) icterica Vitali, 2012b: 237-238, 240 Fig. 5. *Phytoecia icterica* Vitali, 2013: 146.

Body size 5-12 mm. Small, cylindrical, black; pronotum with a fine longitudinal line of yellowish to orange pubescence; elytra densely covered with a grey pubescence; protibiae and femora

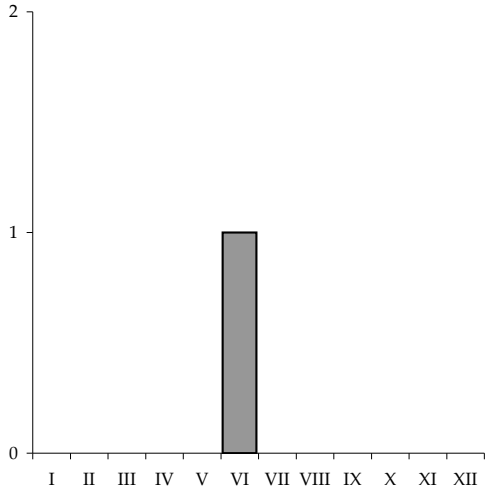
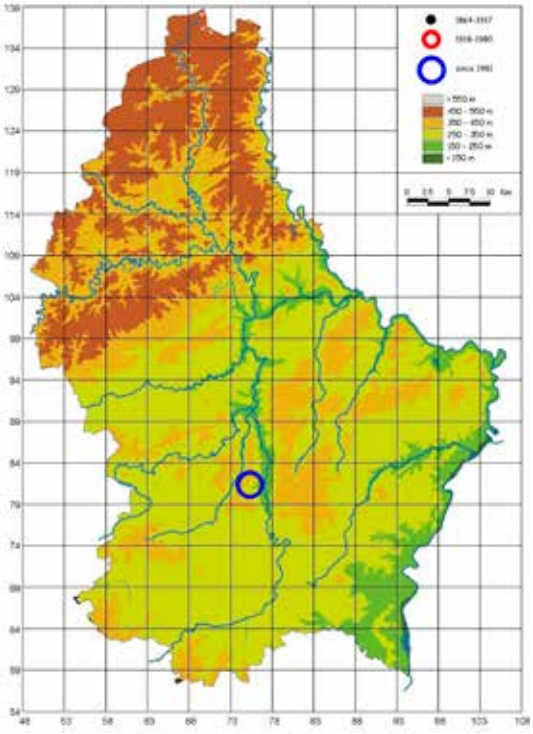


Fig. 236: Phenology of *Phytœcia icterica* in Luxembourg.

Fig. 237: *Phytœcia icterica*, Male, Bridel (coll. J. Thoma).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981							1						1
Total							1						1

Fig. 238: Distribution of *Phytœcia icterica* and colonised localities in Luxembourg.

testaceous. Stable in the studied area; meso- and metafemora widely black and pronotal band wider in the Turkish subspecies *annulipes* Mulsant, 1863.

In the study region, the species is unmistakable but in southern Europe it can be confused with several species with analogous pattern, from which it principally differs in the black abdomen.

Life-cycle lasts one year. Larvae in stems of living Apiaceae, especially the Wild Parsnip, sometimes recorded as a pest for cultivated parsnips and carrots (Balachowsky, 1962). Adults overwinter in a pupal cell in the basal part of the stem and can be found on the host plants from mid-spring to early summer.

Host plants: *Conium maculatum* L., *Daucus carota* L., *Pastinaca sativa* L., *Petroselinum crispum* (Mill.) Hill, *Pimpinella saxifraga* L.

Euro-Anatolian species, widespread from Spain to northern Iran with a distinct subspecies (*annulipes* Mulsant, 1863) in Turkey. It rarefies west- and northwards, reaching the northern limits of its distribution in the regions neighbouring Luxembourg.

In Rhineland-Palatinate, it is present only in some xeric fields of the North-east, where it was recorded since the mid-19th century, while it has been found in the Saarland only in 1979 (Niehuis, 2001). In northern Lorraine, it was once recorded as fairly rare (Godron, 1866) but no recent findings are known (Colson, 1981). The species is fairly common and sometimes abundant in northern Alsace, while it is very rare in the South (Matter, 1998). Fairly rare in the French Ardennes (Ligeron, 2005), it was once recorded from the Hainaut, southern Belgium (Lameere, 1885), where it seems to be extinct today (Horion, 1974; Zeegers & Heijerman, 2008). Absent from the Netherlands.

In Luxembourg, the species has been known by a single specimen collected by J. Thoma in the canton of Capellen in 1987 (Fig. 238). Possibly, the beetle is more widespread than it seems today.

4.5.2.9 *Phytœcia caerulescens* (Scopoli, 1763)

Phytoecia coerulescens Mousset, 1969: 172; Mousset, 1973: Map. 413; Vitali, 2013: 146; Weitzel, 2014: 218. *Phytoecia caerulescens* Vitali, 2014: 89.

Body size 6-14 mm. Small, cylindrical, clay-black, entirely covered with a dense pubescence of variable colour; pronotum with three, hardly distinct, longitudinal lines of lighter pubescence; eyes divided in two distinct lobes. The typical form shows a glaucous pubescence, but specimens entirely grey (var. *grisescens*) are frequently collected. In other specimens, the pubescence shows evident blackish, yellowish, green or blue tonalities.

Grey and yellow chromatic forms may be very easily confused with *P. nigricornis* (4.5.2.6), which nevertheless has entire emarginate eyes. Moreover, its larvae are related to different plants (Asteraceae).

Life-cycle lasts one year. Females lay up to 51 eggs in the stems of living Boraginaceae, especially the Viper's and the Pale Bugloss. *Inula conyzae* (Griess.) Meikle (Asteraceae) and *Salvia dumetorum* Andrz. ex Besser (Lamiaceae) were also recorded as hosts, maybe erroneously. Larvae bore inside the stem, overwinter and pupate in early spring. Adults can be found on the host plants, hidden on the inferior side of the flowers or on the stems, from late spring to early summer (Fig. 239).

Host plants: *Anchusa officinalis* L., *Cynoglossum officinale* L., *Echium vulgare* L., *E. italicum* L., *Lappula squarrosa* (Retz.) Dumort, *Lithospermum officinale* L., *Rochelia disperma* (L.f.) Koch.

Palaearctic steppic species, widespread from North Africa to northern Mongolia, rarefying northwards, with a weakly supported subspecies in Crete (*cretensis* Breuning, 1947).

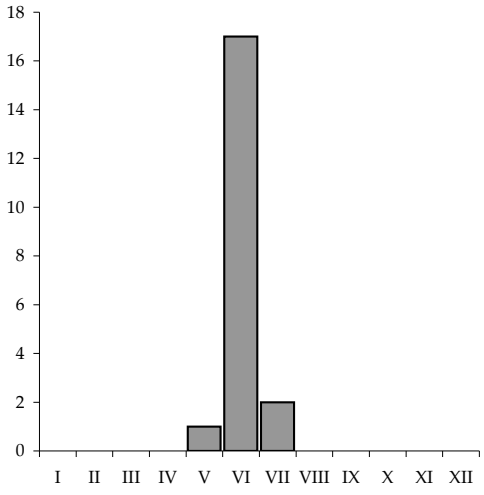
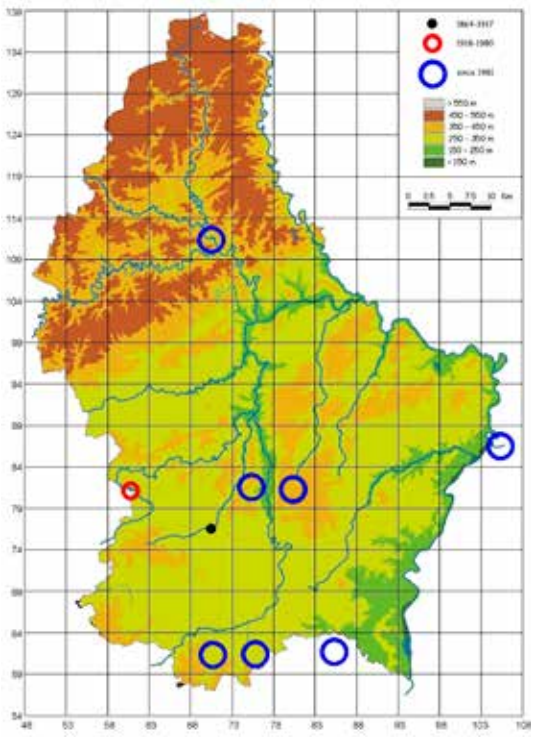


Fig. 239: Phenology of *Phytœcia caerulescens* in Luxembourg.

Fig. 240: *Phytœcia caerulescens*, Male, Eicherfeld (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1						1
1918-1980							1						1
since 1981			1				1	1	3		1	1	8
Total			1				3	1	3		1	1	10

Fig. 241: Distribution of *Phytœcia caerulescens* and colonised localities in Luxembourg.

In the regions neighbouring Luxembourg, it shows a scattered distribution, being localised in xeric localities. According to Horion (1974), the species was once more widespread and common. In Rhineland-Palatinate, it is widespread and not rare, especially in north-eastern valleys, where it has been known for a long time (Brahms, 1790), while it is localised in the Saarland (Niehuis, 2001). In northern Lorraine, the situation is controversial; however, it is not a common species. Once recorded as very rare (Fournel & Gehin, 1846) or fairly common (Godron, 1866), it has no longer been recorded nowadays (Colson, 1981). In contrast, it is common in Alsace, where it is considered the most common species of the genus (Matter, 1998). Fairly rare in the French Ardennes (Ligeron, 2005), it is common in xeric field of southern Belgium (Lameere, 1894); while it is very rare in the Netherlands and confined to the hills of the southern Limburg (Horion, 1974; Zeegers & Heijerman, 2008).

In Luxembourg, the species is widespread throughout the country, but very rare and confined to the most xerothermic localities (Fig. 241). Most likely, it is more widespread than it seems today.

4.5.2.10 *Oberea linearis* (Linnaeus, 1761)

Oberea linearis Ferrant, 1907b: 317; Ferrant, 1911: 73; Vitali, 2013: 145-148, Fig. 1.

Body size 11-16 mm. Cylindrical; body throughout black, legs and a fine area around the scutellum reddish yellow; stable.

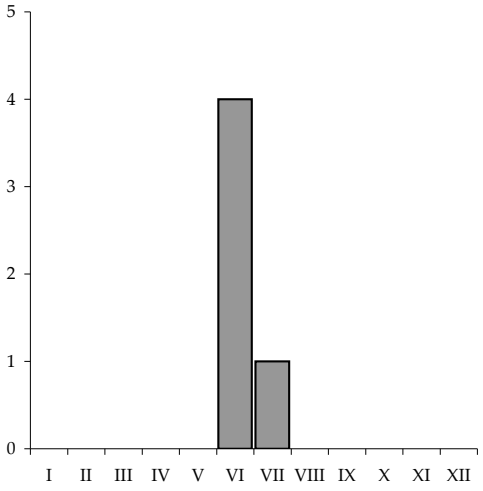


Fig. 242: Phenology of *Oberea linearis* in Luxembourg.

Life-cycle lasts two years. Larvae develop in living twigs of broadleaf trees, especially hazels, sometimes recorded as a pest for cultivated hazel and walnut trees in Russia and France, respectively (Balachowsky, 1962; Bonnemaison, 1962; Villiers, 1978). The female produces a rectangular woodcut in the bark at 10-30 cm from the apex, laying a single egg. The young larva emerges after 10 days, bores an annular gallery and then penetrates into the pith boring a gallery towards the apex; afterwards, it goes back towards the trunk. The attacked part of the twing dries and falls, while the larva penetrates half meter towards the trunk. It hibernates and prosecutes the gallery in the following year. Pupation occurs in mid-spring, while adults emerge after three weeks. Though occasionally observed on flowers of *Sambucus nigra* L. (Godron, 1866) or *Crataegus* (Niehuis, 2001), adults frequent host plants, climbing on stems and on the inferior side of the leaves during daytime, or flying around them in the evening or during the night. They can be collected beating host plants from late spring to mid-summer (Fig. 242).

Host plants: *Corylus*, *Carpinus*, *Ostrya*, *Ulmus*, *Juglans*.

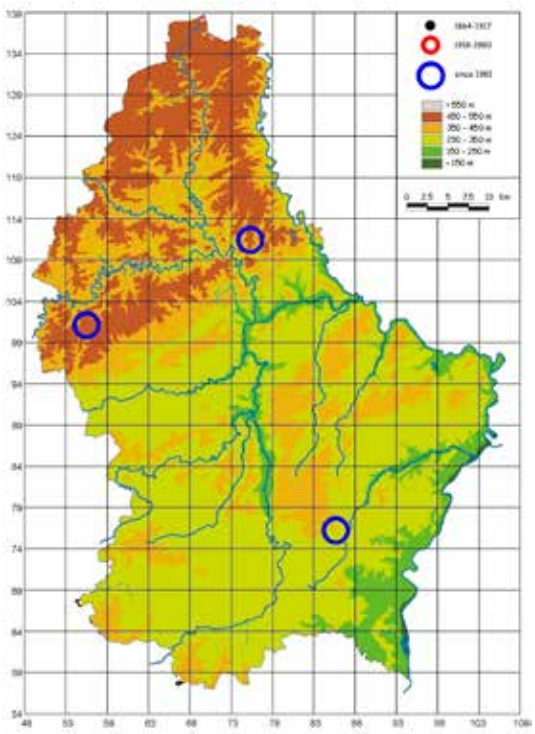
Parasitoids: *Dolichomitus messor* (Gravenhorst, 1829); *Phaenolobus terebrator* (Scopoli, 1763) (Ichneumonidae).

Predators: *Opilo pallidus* (Olivier, 1795) (Cleridae).

Euro-Turanian species, widespread from the northern half of Iberia to southern Urals. It is related to mesophilic broadleaf woods, rarefying northwards and southwards.

In the regions neighbouring Luxembourg, it has been known throughout but as scattered or rare. In Rhineland-Palatinate, it is known for a long time (Brahms, 1790), but always as uncommon and localised, while it has been recorded from the Saarland only in 1984 (Niehuis, 2001). In northern Lorraine and Alsace, the species has been known nearly always by single specimens (Fournel & Gehin, 1846, Godron, 1866, Colson, 1981; Matter, 1998), while it is rare in the French Ardennes (Ligeron, 2005). Fairly common in Wallonia, it is missing from Flanders and the Ardennes (Lameere, 1894; Lempereur et al., 2000), while it is very rare in the southern Netherlands (Zeegers & Heijerman, 2008).

Fig. 243: *Oberea linearis*, a. Male, Sandweiler b. Female, Hoscheid (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981	1				1			1					3
Total	1				1			1					3

Fig. 244: Distribution of *Oberea linearis* and colonised localities in Luxembourg.

In Luxembourg, the species was considered as a pest for hazel trees at the beginning of the 20th century (Ferrant, 1907a, 1911), but no collection specimen has been known at that time. Actually, it is apparently very rare but possibly widespread throughout the country (Fig. 244).

4.5.2.11 *Oberea oculata* (Linnaeus, 1758)

Oberea oculata Ferrant, 1907b: 316, Fig. 34; Ferrant, 1911: 73, Fig. 36; Mousset, 1969: 172; Mousset, 1973: Map. 409; Mousset, 1979: 7; Vitali, 2013: 146; Weitzel, 2014: 218.

Body size 14-21 mm. Elongated, cylindrical; head, antennae and two spots on the pronotum black, pronotum, ventral side and legs orange, elytra covered with a dense grey pubescence. Usually very stable; aberrations with doubled or absent pronotal spots have been however described.

In the area neighbouring Luxembourg, the species may be confused with *Oberea pupillata* (Gyllenhall, 1817), which differs in the pronotal black points (disposed at the basal sides of the disc) and the presence of a triangular orange spot at each side of the scutellum. Moreover, its larvae are biologically related to the Caprifoliaceae (*Lonicera* spp.).

Life-cycle lasts two years. Females lay up to 62 eggs in twigs of living young willows. Larvae have sometimes been recorded as a pest for osiers (Horion, 1974; Villiers, 1978). The larvae bore twigs descending for ca. 50 cm and pupate in spring.

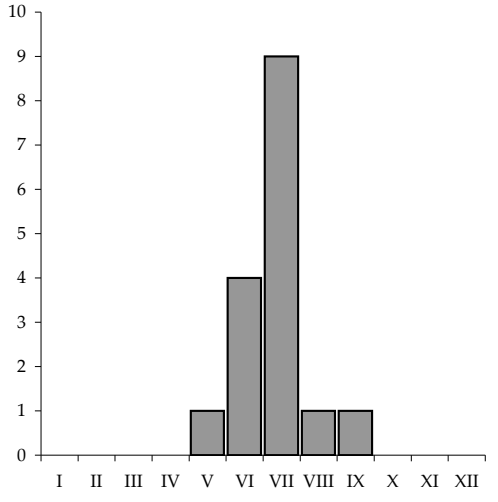
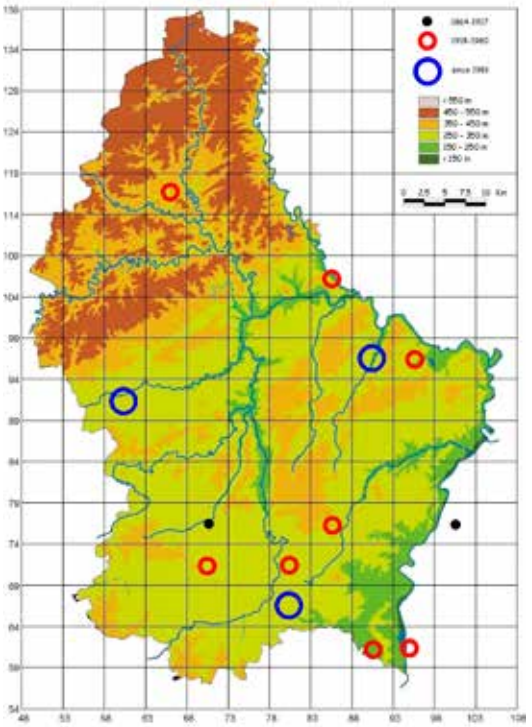


Fig. 245: Phenology of *Oberea oculata* in Luxembourg.

Fig. 246: *Oberea oculata*, Berdorf (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917							1				1		2
1918-1980		1	1					3			1	2	9
since 1981					1				1	1			3
Total		1	1		1		1	3	1	1	2	2	13

Fig. 247: Distribution of *Oberea oculata* and colonised localities in Luxembourg.

Adults can be found on the host plants, clinging on the stems or flying around them, during the whole summer (Fig. 245).

Host plants: *Salix acutifolia* Willd., *S. alba* L., *S. caprea* L., *S. pentandra* L., *S. triandra* L., *S. viminalis* L., *S.* × *fragilis* L. Erroneously recorded from *Populus tremula* L. (Bense, 1995).

Parasitoids: *Ephialtes manifestator* (Linnaeus, 1758) (Ichneumonidae).

Palaearctic species, widespread from North Africa to Korea; erroneously recorded from Japan by Sama (2002).

In the regions neighbouring Luxembourg, it is widespread both in plains and mountains but in general regression due to anthropic impact on the banks. In Rhineland-Palatinate, it is largely widespread and known for a long time (Brahms, 1790), though its frequency was often questioned, while it was found in the Saarland only in 1963 (Niehuis, 2001). The species is fairly rare, even if well-known, in northern Lorraine (Fournel & Gehin, 1846, Godron, 1866, Colson, 1981) and little common in Alsace (Matter, 1998). Fairly common in the French Ardennes (Ligeron, 2005) and Wallonia (Lameere, 1894; Troukens, 2007; Delwaide & Thieren, 2010), it misses from Kempen and the Belgian Ardennes, except for the High Fens (Collart, 1941). In the Netherlands, it is fairly common in the southern half of the country (Everts, 1903; Zeegers & Heijerman, 2008).

In Luxembourg, the species was considered as a pest for willows at the beginning of the 20th century (Ferrant, 1907b, 1911). Currently, it is apparently very rare but possibly widespread throughout the country (Fig. 247).

4.5.3 Tribe Tetraopini Thomson, 1860

4.5.3.1 *Tetrops praeustus* (Linnaeus, 1758)

Tetrops praeusta Mousset, 1969: 172; Mousset, 1973: Map. 442; Mousset, 1981a: 56; *Tetrops praeustus* Gerend, 2000: 111; Köhler, 2011: 90, 131; 2013: 65, 102; Vitali, 2013: 146; Vitali, 2014: 89; Weitzel, 2014: 219.

Body size 3-6 mm. Minute, cylindrical, depressed; head and pronotum black; elytra testaceous with a black apical spot, anteriorly undefined and sometimes advanced along the lateral margin; forelegs yellow, median and posterior ones brownish. Little variable, since most varieties mentioned by ancient authors must be attributed to different species (*T. starkii* Chevrolat, 1859 and *T. gilvipes* Faldermann, 1837). The only variation rarely observed in Luxembourg is the uniform yellow colour of the median and posterior legs.

The species is hardly distinguishable from *T. starkii*, not recorded from Luxembourg yet but present in the neighbouring regions. This species differs from *T. praeustus* in the completely yellow legs, the anteriorly convex and well-defined elytral spot, the simple long pubescence at each side of the prothorax (double in praeustus) and the genital characters. Moreover, its larvae are exclusively related to *Fraxinus*.

Life-cycle lasts one year. Larvae bore living or decaying apical twigs of broadleaf trees, especially Rosaceae, being sometimes recorded as pest for orchards of fruit trees (Balachowsky, 1962). The pupation occurs in early spring, while adults can be found on twigs and leaves of host plants from mid-spring to early summer (Fig. 248), especially by beating.

Host plants: *Quercus*, *Ulmus*, *Rosa*, *Crataegus*, *Cotoneaster*, *Malus*, *Pyrus*, *Prunus*, *Mespilus*, *Euonymus*, *Frangula*, *Salix*, *Populus*, *Tilia*.

Parasitoids: *Cenocoelius aartseni* (van Achterberg, 1994) (Braconidae); *Entedon ergias* Walker, 1839 (Eulophidae); *Eurytoma morio* Boheman, 1836 (Eurytomidae); *Dinotiscus colon* (Linnaeus, 1758), *D. tenebricus* (Walker, 1834) (Pteromalidae).

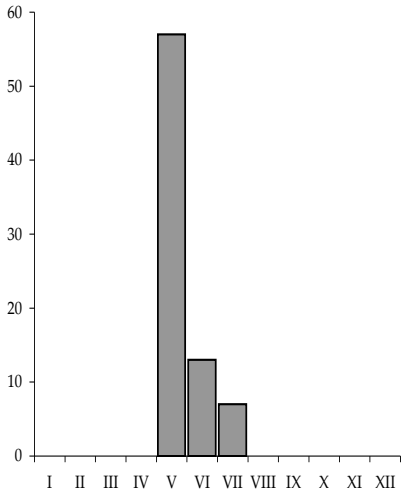


Fig. 248: Phenology of *Tetrops praeustus* in Luxembourg.

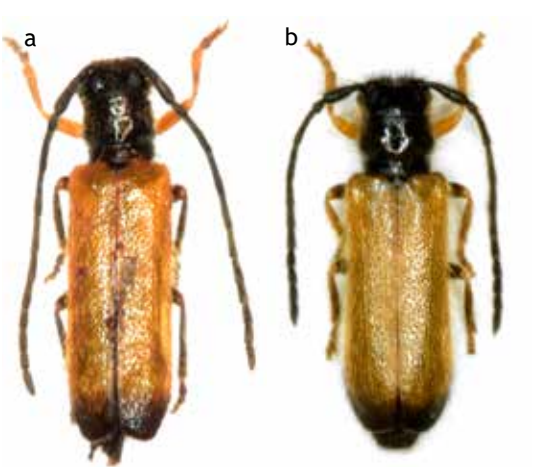
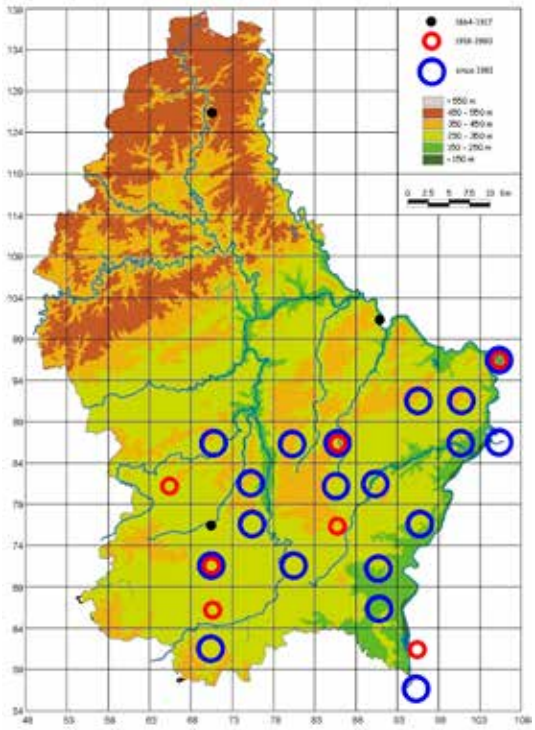


Fig. 249: *Tetrops praeustus*, a. Male, Mertert, b. Female, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917	1						1			1			3
1918-1980							1	3	1	1	2	1	9
since 1981						2		5	2	3	7	3	22
Total	1					2	2	7	3	4	8	4	31

Fig. 250: Distribution of *Tetrops praeustus* and colonised localities in Luxembourg.

Western Palaearctic species, widespread from North Africa to the Urals, with an isolated subspecies in Algeria (*algiricus* Villiers, 1946) and two ones in central (*angorensis* Pic, 1918) and south-eastern Anatolia (*anatolicus* Özdikmen & Turgut, 2008).

In the regions neighbouring Luxembourg, it is widespread everywhere. Once fairly rare in Rhineland-Palatinate (Brahm, 1790), the species became common and widespread since the mid-19th century, while it was firstly recorded in the Saarland at the beginning of the 20th century (Niehuis, 2001). Though common by mid-19th century (Fournel & Gehin, 1846, Godron, 1866), it seems to be no longer present in northern Lorraine today (Colson, 1981), whereas it is still common in Alsace (Matter, 1998) and in the French Ardennes (Ligeron, 2005). In Belgium, it is fairly common everywhere, except for the Ardennes (Lameere, 1894), where it is however present (Collart, 1941; Lempereur et al., 2000), while it is common everywhere in the Netherlands (Zeegers & Heijerman, 2008).

In Luxembourg, the species seems to be confined to the Grunland (Fig. 250), where it is commonly, and often abundantly, collected in May, by beating blossom Crataegus. The analysis of the data seems to indicate a slow south-eastern regression.

4.5.4 Tribe Desmiphorini Thomson, 1860

4.5.4.1 *Anaesthetis testacea* (Fabricius, 1781)

Anaesthetis testacea Gerend, 2008: 124; Vitali, 2013: 146.

Body size 5-10 mm. Small, cylindrical, black with reddish brown elytra; pronotal disk sometimes more or less reddish.

The species might be superficially confused with *Tetrops praeustus* (4.5.3.1), which has a much smaller depressed body, yellowish shorter legs, black elytral apex and eyes divided in two distinct lobes.

Life-cycle lasts two years. Larvae develop in dry twigs of broadleaf trees, especially oaks and walnut. Pupation takes place in wood in mid-spring. Adults can be found on twigs and leaves of host plants from late spring to mid-summer (Fig. 251), especially by beating, sometimes being attracted by light.

Host plants: *Quercus*!, *Castanea*, *Fagus*, *Alnus*, *Betula*, *Corylus*, *Juglans*!, *Pistacia*, *Salix*, *Rubus*.

Euro-Turanian thermophilic species, widespread from Portugal to the Urals and Kazakhstan, absent from Scandinavia and the British Isles. A distinct subspecies (*rufescens* Baeckmann, 1903) has been recognised in the Caucasus.

In the regions neighbouring Luxembourg, it is rare and sporadically widespread in the warmest localities. In Rhineland-Palatinate, it is manly present in the valleys and in the oriental part, where it has been known since the second half of the 19th century, whereas only one locality is known for the Saarland (Niehuis, 2001). In northern Lorraine, it was once recorded as very rare from Dieuze (Godron, 1866), but it seems no longer to be present today (Colson, 1981), while it is still present, though rare, in the Vosges (Matter, 1998), where it has been known for a long time (Fournel & Gehin, 1846). Unknown from the French Ardennes (Ligeron, 2005), it is occasional (Lameere, 1894) to very rare (Zeegers & Heijerman, 2008), maybe introduced (Everts, 1903), in Belgium and in the Netherlands.

In Luxembourg, the species was recorded for the first time in 2008, but a specimen collected by A. Mousset in 1973 was already present in the MNHNL. The beetle shows a spotted distribution in the extreme South-east of the Gutland and in some xerothermic localities of the Oesling (Fig. 253). Though localised, it is possibly much more widespread than it seems today.

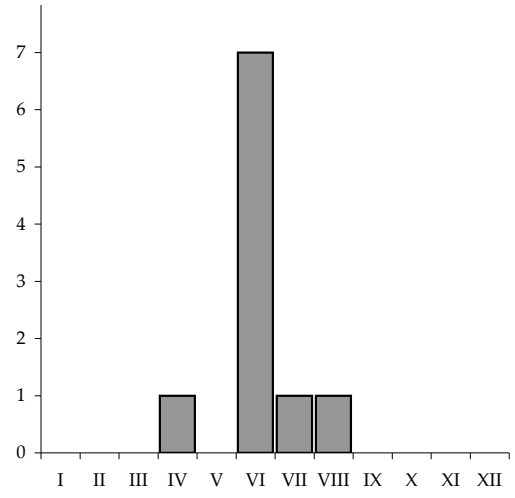


Fig. 251: Phenology of *Anaesthetis testacea* in Luxembourg.

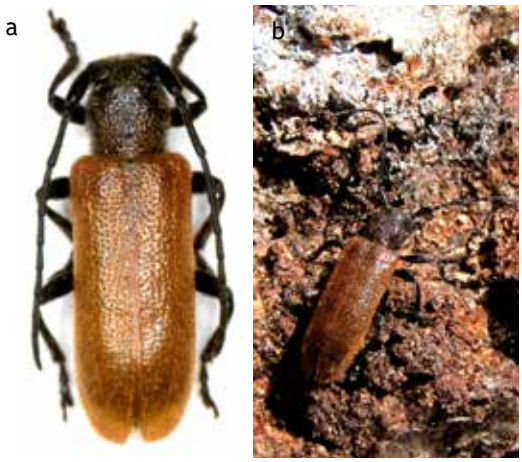
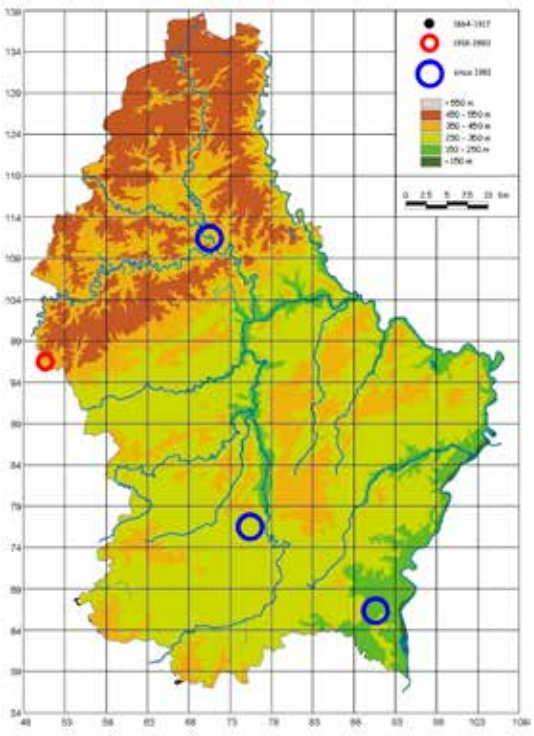


Fig. 252: *Anaesthetis testacea*, a-b. Male, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980					1								1
since 1981	1		1					1				2	5
Total	1		1		1			1				2	6

Fig. 253: Distributionof *Anaesthetis testacea* and colonised localities in Luxembourg.

4.5.5 Tribe Pogonocherini Mulsant, 1839

4.5.5.1 *Pogonocherus ovatus* (Goeze, 1777)

Pogonocherus (Pityphilus) ovatus Vitali, 2011b: 82, 84 Fig. 13. *Pogonocherus ovatus* Vitali, 2013: 146.

Body size 3-6 mm. Minute; elytra obliquely truncated at the apex, brown with a large greyish V-shaped band on the basis and two oblique triangular black spots behind it; scutellum black with a longitudinal white line; antennae ringed with a greyish pubescence. V-shaped light band rarely divided forming two lateral spots (var. *subovatus*).

This species, especially the var. *subovatus*, may be confused with *Pogonocherus fasciculatus* (4.5.5.2), which differs from it in larger size and the elytra transversally truncated at the apex.

Life-cycle lasts two years. Larvae develop in drying to dried twigs of Pinaceae, especially firs, occasionally of broadleaf trees. Pupation occurs in wood in summer. Adults emerge from late summer to autumn and overwinter in the pupal cell in fissures of the bark, being active on host plants from early spring to mid-summer. In relatively warm localities, they can also be collected in autumn.

Host plants: *Abies*, *Pinus*; *Castanea*, *Quercus*, *Betula*, *Corylus*, *Ulmus*, *Ilex*, *Viscum*.

Central European species, widespread from Spain to eastern Europe, only in mountains or missing

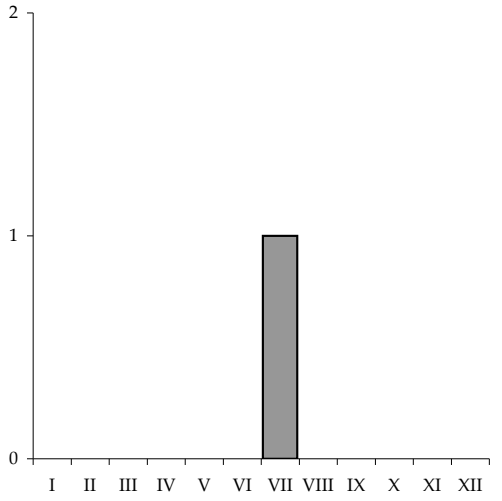


Fig. 254: Phenology of *Pogonocherus ovatus* in Luxembourg.

Fig. 255: *Pogonocherus ovatus*, Male, Niederanven (coll. Mnhn).

	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1					1
1918-1980													0
since 1981													0
Total								1					1

Fig. 256: Distribution of *Pogonocherus ovatus* and colonised localities in Luxembourg.

in southern Europe, absent from Scandinavia and the British Isles. A closely related species - *P. jaekeli* (Zang, 1905) - possibly direct ancestor of *P. ovatus* and related to conifers as well, was described from Baltic amber (Zang, 1905; Vitali, 2009).

In the regions neighbouring Luxembourg, the species is very rare; moreover, many old records must be referred to *P. decoratus* (Fairmaire, 1855), with which it was often confused (as *P. ovalis* Gyllenhall or *P. ovalis* Mulsant). Only two correctly identified specimens have been known from Palatinate (Niehuis, 2001). Once recorded from northern Lorraine (Godron, 1866, as *P. scutellaris* Mulsant), it seems no longer present today (Colson, 1981), while it is widespread, though not abundant, in the Vosges, where it seems preferably related to oaks (Matter, 1998). It is possibly extinct from Belgium and the Netherlands, where it was already very rare at the end of the 19th century (Lameere, 1894, Zeegers & Heijerman, 2008).

In Luxembourg, the species has been known by only one male collected by V. Ferrant near Oberanven (Niederanven), most likely before 1900 (Fig. 256). In the same locality, two specimens of *P. fasciculatus* have been very recently collected; hence, the habitat favourable to *P. ovalis* might still be present.

4.5.5.2 *Pogonocherus fasciculatus* (DeGeer, 1775)

Pogonocherus fasciculatus Ferrant, 1907b: 314; Ferrant, 1911: 70; Vitali, 2013: 146. *Pogonocherus fasciusculus* (sic!) Mousset, 1969: 171; Mousset, 1973: Map. 416; *Pogonocherus (Pithyphilus) fasciculatus* Vitali, 2011: 82.

Body size 5-7.5 mm. Small, dark brown mottled with whitish spots; elytra transversally truncate at the apex, with a white triangular spot at the basal third of the lateral margin; scutellum black with a longitudinal white line; antennae ringed with a white pubescence. Some populations, especially Siberian ones, show a darker colouring (var. *costatus*).

This species may be confused with *Pogonocherus hispidulus* (4.5.5.4), which differs from it in the elytra acutely toothed at the marginal apex and having a basal white band.

Life-cycle lasts two years. Larvae develop in drying to dried twigs of Pinaceae, especially pines, probably erroneously recorded from some broadleaf trees (Villiers, 1978; Bense, 1995). Pupation occurs in wood in summer. Adults emerge from late summer to autumn and overwinter in the pupal cell, being active on host plants from mid-spring to late summer.

Host plants: *Abies*, *Picea*, *Larix*, *Pinus*. *Castanea*? *Ficus*?

Parasitoids: *Blapsidotes vicinus* (Gravenhorst, 1829), *Ephialtes manifestator* (Linnaeus, 1758), *Rhimphoctona xoridiformis* (Holmgren, 1860), *Scambus sagax* (Hartig, 1838) (Ichneumonidae); *Bracon palpebrator* Ratzeburg, 1844, *Cenocœlius analis* (Nees, 1834), *Cyanopterus flavator* (Fabricius, 1793), *Lestricus secalis* (Linnaeus, 1758), *Ontsira ignea* (Ratzeburg, 1852), *O. imperator* (Haliday, 1836) (Braconidae); *Pteromalus dahlbomi* Ratzeburg, 1844, *P. pogonochœri* Ratzeburg, 1844 (Pteromalidae).

Eurasian species, widespread from Spain to Japan, with a subspecies in Honshu, Japan (*hondoensis* Ohbayashi, 1963), restricted to mountains in the southern part of its distribution.

In the regions neighbouring Luxembourg, it most likely is autochthonous and reaches the north-western limit of its distribution, being possibly favoured by the artificial conifer plantations (Horion, 1974). In Rhineland-Palatinate, it is scattered but widespread in indigenous and artificial pinewoods, where it has been surely recorded only since 1949, while it is still unknown

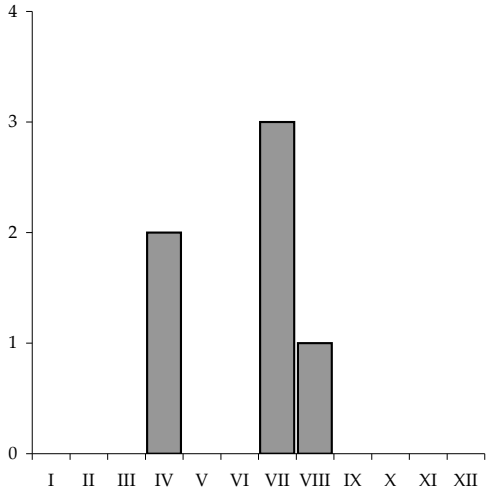
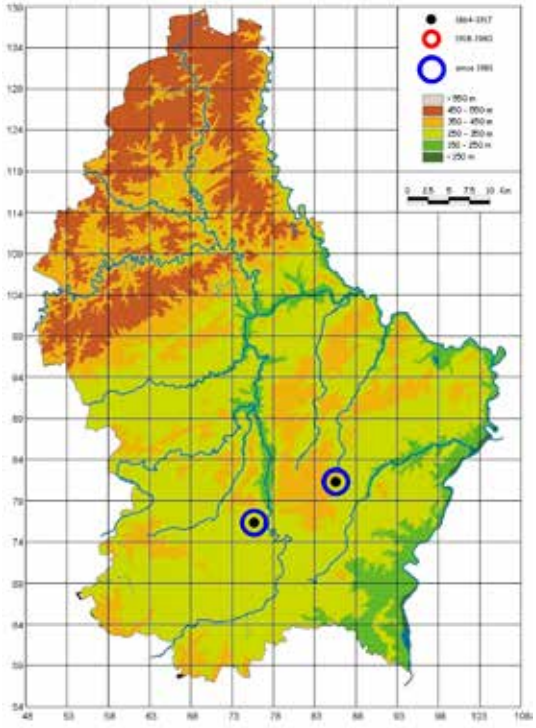


Fig. 257: Phenology of *Pogonocherus fasciculatus* in Luxembourg.

Fig. 258: *Pogonocherus fasciculatus*, Female, Luxembourg (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								3					3
1918-1980													0
since 1981								2					2
Total								4					4

Fig. 259: Distribution of *Pogonocherus fasciculatus* and colonised localities in Luxembourg.

in the Saarland (Niehuis, 2001). Unknown in northern Lorraine as well (Godron, 1866; Colson, 1981), the species has been known for a long time in Alsace (Fournel & Gehin, 1846), where it seems even more common today (Matter, 1998). Still unknown in the French Ardennes (Ligeron, 2005), it is widespread in Belgium (Drumont & Grootaert, 2011) and it was recorded several times from the Netherlands (Lameere, 1894; Everts, 1903; Zeegers & Heijerman, 2008).

In Luxembourg, the species was considered as a pest for pines at the beginning of the 20th century, (Ferrant, 1907b, 1911). Today, it is apparently very rare and localised in some pinewoods around the capital (Fig. 259). It seems that the artificial spruce plantations disfavoured this species, possibly being more common at the end of the 19th century.

4.5.5.3 *Pogonocherus hispidus* (Linnaeus, 1758)

Pogonocherus hispidus Kraus, 1894: 40; Ferrant, 1907b: 313-314, Fig. 31; Ferrant, 1911: 70, Fig. 33; Mousset, 1969: 171; Mousset, 1973: Map. 417; Mousset, 1981a: 56; Mousset, 1981b: 73; Gerend et al., 2007: 290; Gerend & Meyer, 2007: 12; Köhler, 2013: 65, 102; Vitali, 2013: 146; Weitzel, 2014: 218.

Body size 4-6.5 mm. Small; elytra acutely toothed at the marginal apex, brown with a large greyish to yellowish V-shaped band on the basis; scutellum black; antennae ringed with a greyish pubescence.

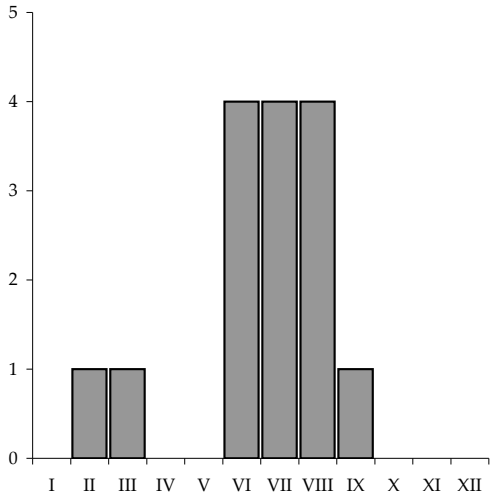


Fig. 260: Phenology of *Pogonocherus hispidus* in Luxembourg.

This species may be confused with many other *Pogonocherus* species, from which it is easily distinguishable by the entirely black scutellum.

Life-cycle lasts two years. Larvae are extremely polyphagous, in drying to dried twigs of numerous broadleaf trees and bushes, including fruit trees, ivy and mistletoe. Pupation occurs in wood in summer. Adults emerge from late summer to autumn and overwinter in the pupal cell or outside, under barks, in warmer habitats. In Central Europe, they are active on host plants from late spring to late summer (Fig. 260), while their activity in warmer regions is anticipated to early spring.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Corylus*, *Carpinus*, *Ulmus*, *Morus*, *Ficus*, *Juglans*, *Rosa*, *Crataegus*, *Malus*, *Sorbus*, *Prunus*, *Staphylea*, *Cornus*, *Hedera*, *Ilex*, *Euonymus*, *Frangula*, *Rhamnus*, *Viscum*, *Salix*, *Populus*, *Tilia*, *Nerium*, *Viburnum*, *Sambucus*, *Fraxinus*.

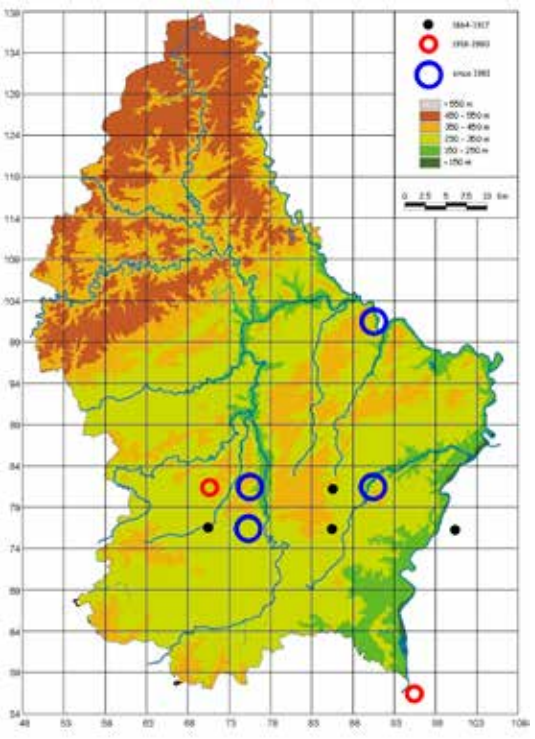
Parasitoids: *Dolichomitus agnoscendus* (Roman, 1939), *Ephialtes manifestator* (Linnaeus, 1758) (Ichneumonidae); *Cenocoelius aartseni* (van Achterberg, 1994), *C. analis* (Nees, 1834), *Lestricus secalis* (Linnaeus, 1758), *Utetes caudatus* (Wesmael, 1835) (Braconidae); *Eurytoma morio* Boheman, 1836 (Eurytomidae); *Trigonoderus filatus* Walker, 1836 (Pteromalidae).

Western Palaearctic species, widespread from North Africa to Transcaucasia.

In the regions neighbouring Luxembourg, it is largely widespread and generally fairly common to common (Lameere, 1894; Colson, 1981; Matter, 1998; Lempereur et al., 2000; Niehuis, 2001; Zeegers & Heijerman, 2008); nonetheless, the adults are difficultly collected due to their cryptic aspect and behaviour.

This species was known in Luxembourg thanks to a piece of bored wood of *Malus sylvestris* collected by Prof. E. Klein at Diekirch and shown during the meeting on 8 April 1894 (Kraus, 1894). The collection does not have trace of specimens referable to this record, as of other congeners found in the homonym canton. At the beginning of the 20th century, the species was considered as very common but also as a little important pest for apple trees (Ferrant, 1907b, 1911). Currently, it seems to be fairly rare and limited to the Gutland (Fig. 262) but it is likely more widespread than it looks like.

Fig. 261: *Pogonocherus hispidus*, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917			?				1	2			1		4
1918-1980							1					1	2
since 1981								3		1	2		6
Total			?				2	5		1	3	1	12

Fig. 262: Distribution of *Pogonocherus hispidus* and colonised localities in Luxembourg.

4.5.5.4 *Pogonocherus hispidulus* (Piller & Mitterpacher, 1783)

Pogonocherus hispidulus Gerend et al., 2007: 290; Vitali, 2013: 146; Vitali, 2014: 89.

Body size 6-7.5 mm. Small; elytra acutely toothed at the marginal apex, dark brown with a white transverse band on the basis; scutellum black with a longitudinal white line; antennae ringed with a white pubescence.

This species may be confused with *Pogonocherus hispidus* (4.5.5.3), which differs from it in the less contrasting pattern, in colour and shape of the elytral basal band and in the completely black scutellum.

Life-cycle lasts two years. Larvae develop in drying to dried twigs of broadleaf trees and bushes, very rarely of Pinales (Bense, 1995), hosts considered as unlikely by Sama (2002) but confirmed by other authors (Matter, 1998). Pupation occurs in wood in summer. Adults emerge from late summer to autumn and overwinter in the pupal cell or outside, under barks, in warmer habitats. They are active on host plants from mid-spring to mid-summer (Fig. 263). They are sometimes collected by beating dried twigs but they can be overlooked: fallen specimens display thanatosis and are easily confounded with small pieces of bark.

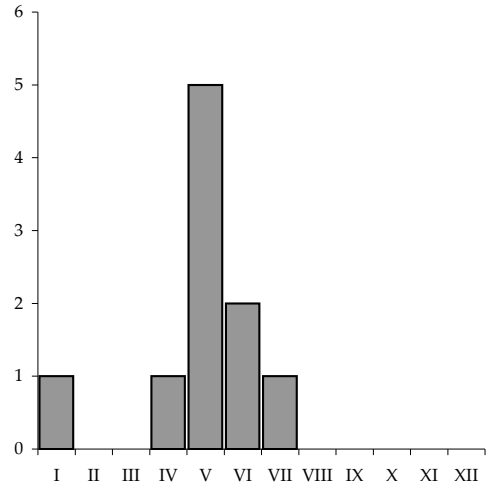
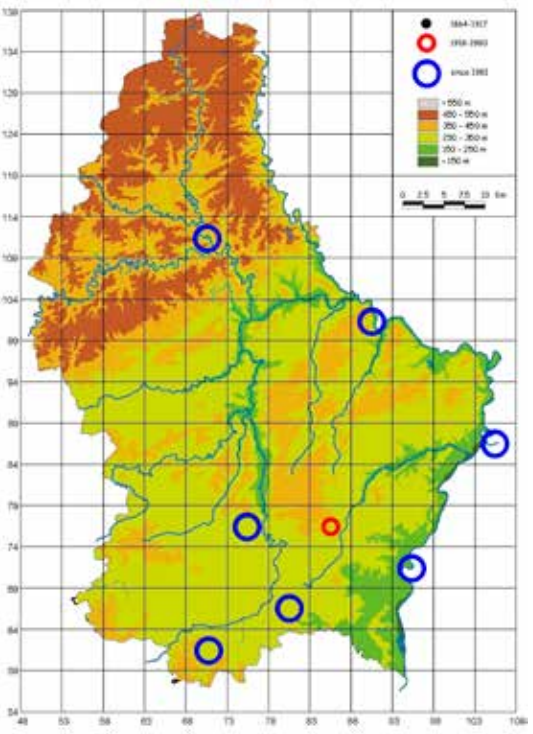


Fig. 263: Phenology of *Pogonocherus hispidulus* in Luxembourg.

Fig. 264: *Pogonocherus hispidulus*, Female, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980								1					1
since 1981			1					1	2	2		3	9
Total			1					2	2	2		3	10

Fig. 265: Distribution of *Pogonocherus hispidulus* and colonised localities in Luxembourg.

Host plants: *Castanea*, *Fagus*!, *Quercus*, *Betula*, *Corylus*, *Juglans*, *Rosa*, *Pyrus*, *Sorbus*, *Amelanchier*, *Prunus*, *Cornus*, *Euonymus*, *Rhamnus*, *Salix*, *Populus*, *Tilia*, *Viburnum*. *Larix*? *Pinus*?

Parasitoids: *Bracon palpebrator* Ratzeburg, 1844, *Cenocoelius analis* (Nees, 1834), *Doryctes undulatus* (Ratzeburg, 1852) (Braconidae).

Euro-Siberian species, widespread from Portugal to the Urals, where it is substituted by *P. dimidiatus* Blessig, 1873, which reaches Japan. It is related to mesophilic woods, rarefying north- and southwards. Erroneously recorded from North Africa.

In the regions neighbouring Luxembourg, it is largely widespread but generally little common, but maybe just found occasionally due to its cryptic behaviour. In Rhineland-Palatinate and the Saarland, it is widespread especially in the valleys, where it is relatively rare (Niehuis, 2001). In northern Lorraine, the species, once very rare (Fournel & Gehin, 1846), was later considered as fairly common (Godron, 1866), but it has been no longer collected in more recent times (Colson, 1981), while it is largely widespread in Alsace (Matter, 1998). Fairly common in the French Ardennes (Ligeron, 2005), it seems fairly rare but widespread in central and southern Belgium (Lameere, 1894; Everts, 1903; Gaspar & Verstraeten, 1972; Lempereur et al., 2000). It is also rare in the eastern Netherlands (Zeegers & Heijerman, 2008).

In Luxembourg, the species has been very rarely collected and seems to show a thermophilic character, being localised in the Gutland and in the xeric locality of Goebelsmühle (Fig. 265).

4.5.6 Tribe Acanthocinini Blanchard, 1845

4.5.6.1 *Acanthocinus aedilis* (Linnaeus, 1758)

Astynomus aedilis Kraus, 1893c: 66; Schuster, 1907a: 87. *Acanthocinus aedilis* Schuster, 1907a: 87; Mousset, 1969: 171; Mousset, 1973: Map. 380; Vitali, 2013: 146.

Body size 11-22 mm. Oval, flattened, brown; pronotum with a row of four yellow spots along the frontal margin; elytra with two apically convex dark bands; antennae four times as long as body in males, twice in females. Female with a long ovipositor.

Life-cycle lasts two years. Larvae bore under barks of fallen trees of mountain Pinaceae, especially pines of the subsections *Pinus* (Scots pine and, secondarily, Black pine). Pupation occurs in the wood in late summer. Adults overwinter in the pupal cell in the bark, rarely under it, and are active on barks from early or mid-spring to mid-summer (Fig. 266).

Host plants: *Abies*, *Picea*, *Larix*, *Pinus*.

Parasitoids: *Dolichomitus diversicostae* (Perkins, 1943), *D. mesocentrus* (Gravenhorst, 1829), *D. tuberculatus* (Geoffroy, 1785), *Heterischnus filiformis* (Gravenhorst, 1829), *Neoxorides collaris* (Gravenhorst, 1829), *Pœmenia notata* Holmgren, 1859 (Ichneumonidae); *Atanycolus initiator* (Fabricius, 1793), *A. neesii* (Marshall, 1897), *Cœloides abdominalis* (Zetterstedt, 1840), *Doryctes leucogaster* (Nees, 1834), *D. pomarius* Reinhard, 1865, *Iphiaulax impostor* (Scopoli, 1763), *Ontsira imperator* (Haliday, 1836) (Braconidae).

Euro-Siberian species, widespread from Portugal to Manchuria following the distribution of pines of the subsection *Pinus*, to which it is ecologically related: mountain or relict populations in the southern part of its distribution and sometimes introduced with artificial plantations of its hosts. Analogously to *Asemum striatum* (4.4.1.3), the Scottish population is only related to the relict population of Caledonian Scots pines. In Europe, the species has been known since 4,050 BP

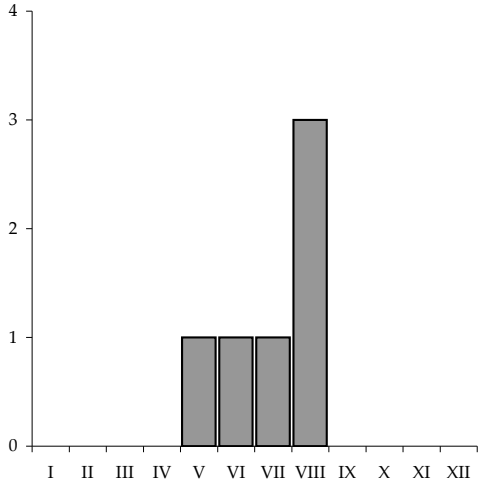


Fig. 266: Phenology of *Acanthocinus aedilis* in Luxembourg.

through sub-fossil rests preserved in Finnish peat (Koponen & Nuorteva, 1973), but its presence might be much more ancient since an apparently conspecific fossil (*A. schmidti* Schmidt, 1967) was found in Late Pliocene shale near Willershausen, Germany (Schmidt, 1967).

The species is widespread in the regions neighbouring Luxembourg, but its distribution is strictly related to the native one of its principal hosts, taking little or no advantage from plantations of different Pinaceae. In Rhineland-Palatinate, it is widespread in Palatinate, while it is very rare or extinct elsewhere, such as in the Saarland (Niehuis, 2001). It seems currently extinct from northern Lorraine, (Colson, 1981), though it was once recorded as fairly common (Fournel & Gehin, 1846), but it is still fairly common in the Vosges (Matter, 1998), where it was once very common (Godron, 1866). Fairly rare in the French Ardennes (Ligeron, 2005), it is fairly widespread in Belgium, especially in mountain regions (Lameere, 1894; Collart, 1941), whereas it is very rare in the Netherlands (Zeegers & Heijerman, 2008).

This species was known in Luxembourg thanks to some pieces of bored spruce shown by V. Ferrant during the meeting on 15 August 1893 (Kraus, 1893c). The collection still preserves two specimens referable to such records. At the beginning of the 20th century, it was considered as a pest for pines (Schuster, 1907a). Nonetheless, after a period when the species was fairly widespread around the capital (Fig. 268), it seems to have become extinct today, the last specimens having been collected in May 1948.

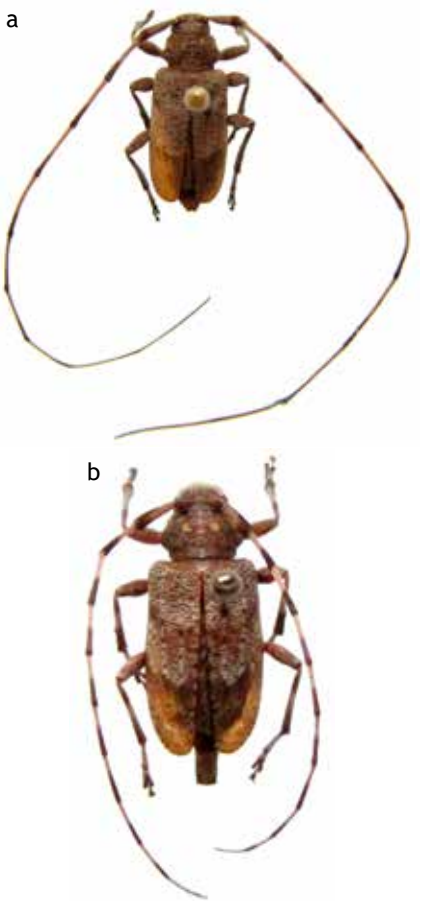


Fig. 267: *Acanthocinus aedilis*, a. Male, Mamer, b. Female, Luxembourg (coll. Mnhn).

	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917						1	1	1			1		4
1918-1980								1					1
since 1981													0
Total						1	1	1			1		4

Fig. 268: Distribution of *Acanthocinus aedilis* and colonised localities in Luxembourg.

4.5.6.2 *Leiopus femoratus* Fairmare, 1859

Leiopus femoratus Gerend & Meyer, 2007: 7-11; Gerend, 2008: 124, 126 Fig. 7; Köhler, 2013: 65, 102; Vitali, 2013: 146.

Body size 5-6.5 mm. Minute, oval, flattened; greyish to light brown; elytra mottled with dark brown to black variable spots, usually forming a wide irregular postmedian band; antennomeres black at the apex; pronotal spines small, perpendicularly directed.

The species may be confused with many other small species of the tribe Acanthocinini, from which it principally differs in perpendicularly directed pronotal spines (evidently oblique in all other species). With respect to other *Leiopus*-species, it also shows a different behaviour: if upset, *L. femoratus* reacts aggressively while its congeners display thanathosis.

Life-cycle lasts two years. Larvae develop in dead twigs of broadleaf trees; pupation occurs in the wood in spring. Adults can be found on the host plants from early or mid-spring to mid-summer (Fig. 269). They can be collected by beating or rearing.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Carpinus*, *Ulmus*, *Ficus*, *Juglans*!, *Malus*!, *Pyrus*, *Prunus*!, *Salix*, *Tilia*, *Fraxinus*.

Euro-Turanian thermophilic species in apparent westwards expansion in western Europe since the late 1990s; nonetheless, it was already recorded from southern Italy by Heyrovský in 1928 (Biscaccianti, 2005).

In the regions neighbouring Luxembourg, the species was found for the first time in France in 1997 (Berger, 1999), where nowadays it shows a mainly south-eastern distribution, northwards reaching the departments of Oise, Aube (Brustel et al., 2002) and Alsace (Callot, 2003). More recently, it was recorded for Belgium (Malderen, 2006), the Saarland (Gerend & Meyer, 2007) and the southern Netherlands (Teunissen & Jansen, 2009).

In Luxembourg, the species shows a scattered distribution in the warmest locality of the country (Fig. 271) but it is likely widespread all over the Gutland.

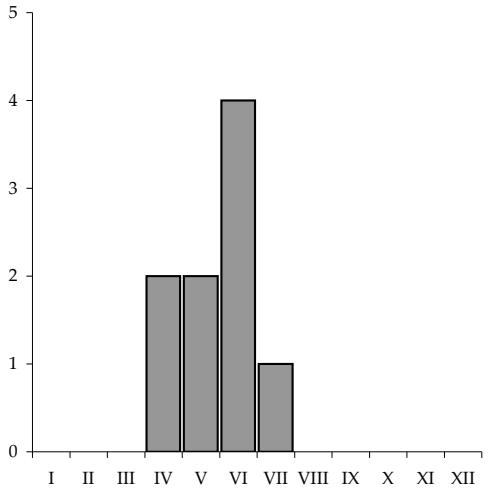


Fig. 269: Phenology of *Leiopus femoratus* in Luxembourg.

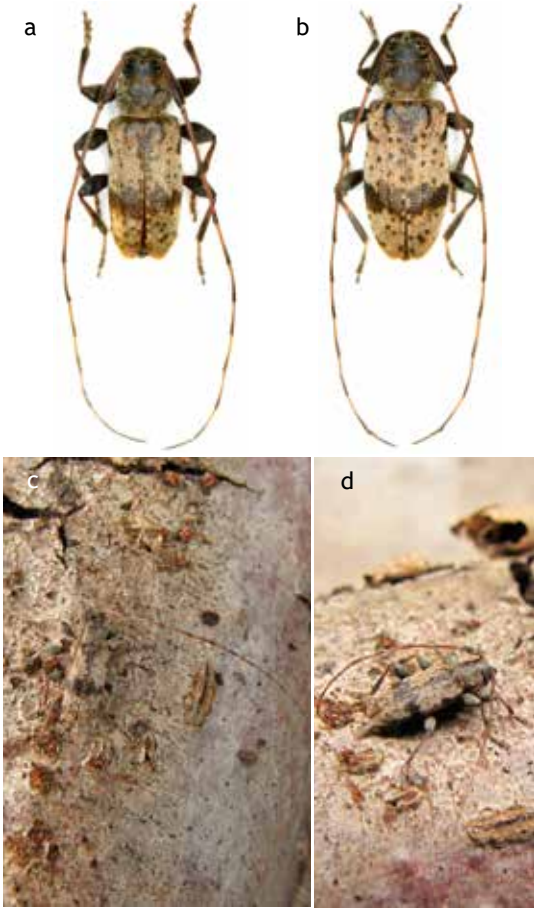
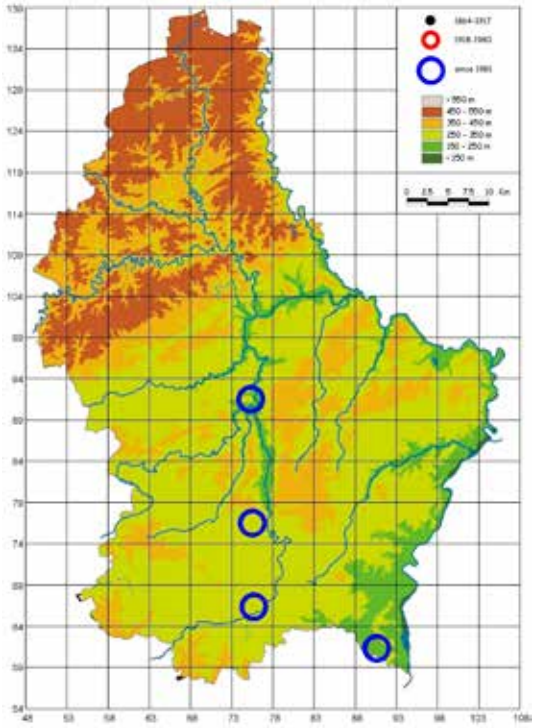


Fig. 270: *Leiopus femoratus*, a.,c. Male, b.,d. Female, Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981						1		1	1		1		4
Total						1		1	1		1		4

Fig. 271: Distribution of *Leiopus femoratus* and colonised localities in Luxembourg.

4.5.6.3 *Leiopus nebulosus* (Linnaeus, 1758)

Liopus nebulosus Ferrant, 1907b: 313; Ferrant, 1911: 69. *Leiopus nebulosus* Mousset, 1969: 171 (pars); Mousset, 1973: Map. 401 (pars); Gerend et al., 2007: 291 (pars); Gerend & Meyer, 2007: 12 (pars?); Vitali, 2011b: 82; Köhler, 2013: 65, 102; Vitali, 2013: 146; Weitzel, 2014: 218.

Body size 5.2-9 mm. Small, oval, flattened; dark brown, mottled with greyish variable spots forming three wide irregular bands, the median ones being usually more distinct; antennomeres black at the apex; legs ringed with greyish pubescence; pronotal spines obliquely directed.

The species may be confused with many other species of the tribe Acanthocinini. It differs from the *Exocentrus* species (4.5.6.5-4.5.6.6) in its hairless body (covered with raised hairs in *Exocentrus*) and the longer antennae. It differs from *Leiopus femoratus* (4.5.6.2) in the oblique pronotal spines (perpendicular to the body in *L. femoratus*), the darker pattern, the shorter antennae and the different behaviour: if upset, *L. nebulosus* displays thanathosis, while *L. femoratus* reacts aggressively. The differences with the sibling *Leiopus linnei* (4.5.6.4) are limited to the genital structures and they are sometimes very hardly detectable: the apex of the aedeagus is regularly acute in *L. nebulosus*, while it shows a minute tip in *L. linnei*; the ovipositor is margined with much longer hairs in *L. linnei*.

Life-cycle lasts two years. Larvae develop in dead twigs of numerous broadleaf trees, including fruit trees, exceptionally of Pinaceae. Pupation occurs under barks inside a typical circular cell surrounded by agglutinated sawdust in spring. Adults occur on host plants from early or mid-spring to mid-summer (Fig. 272). They can be collected by beating or rearing, sometimes also being attracted by lights.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Alnus*, *Betula*, *Corylus*, *Carpinus*, *Ostrya*, *Ulmus*, *Morus*, *Ficus*, *Juglans*, *Malus*, *Pyrus*, *Sorbus*, *Cydonia*, *Prunus*, *Robinia*, *Acer*, *Cornus*, *Frangula*, *Paliurus*, *Salix*, *Populus*, *Tilia*, *Sambucus*, *Abies*, *Picea*.

Parasitoids: *Orthocentrus fulvipes* Gravenhorst, 1829, *Phygadeuon detestator* (Thunberg, 1822), *Xorides gravenhorstii* (Curtis, 1831), *X. praecatorius* (Fabricius, 1793) (Ichneumonidae); *Bracon palpe-*

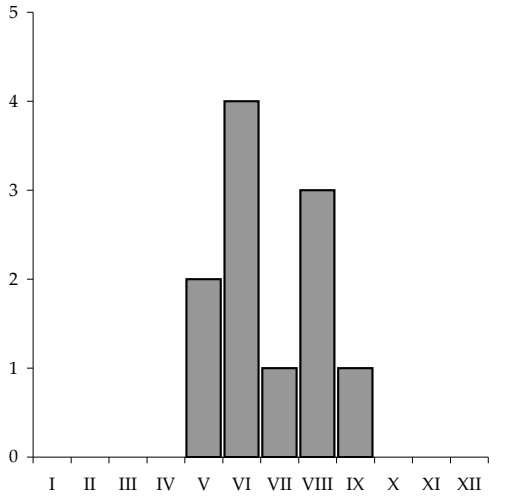


Fig. 272: Phenology of *Leiopus nebulosus* in Luxembourg.

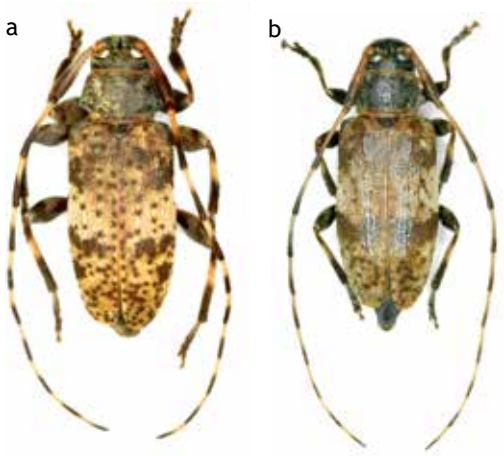
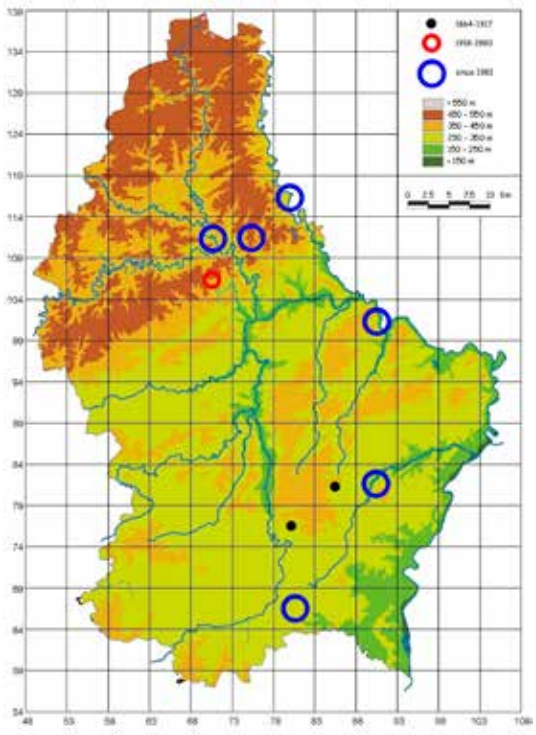


Fig. 273: *Leiopus nebulosus*, a. Male, Kuelesbaach, b. Female, Goebelmühle (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								2					2
1918-1980		1											1
since 1981	2		1							1	1		5
Total	2	1	1					2		1	1		8

Fig. 274: Distribution of *Leiopus nebulosus* and colonised localities in Luxembourg.

brator Ratzeburg, 1844, *Cenocœlius analis* (Nees, 1834), *Doryctes pomarius* Reinhard, 1865, *Iphiaulax impostor* (Scopoli, 1763), *Lestricus secalis* (Linnaeus, 1758), *Meteorus tabidus* (Wesmael, 1835), *Ontsira ignea* (Ratzeburg, 1852), *O. imperator* (Haliday, 1836) (Braconidae); *Pteromalus dahlbomi* Ratzeburg, 1844 (Pteromalidae).

Note: both hosts and parasitoids were quoted before the description of *L. linnei* (4.5.6.4); hence, they may also be referable to this species.

Euro-Turanian species, widespread from Portugal to Kazakhstan, with a subspecies in the Caucasus (*caucasicus* Ganglbauer, 1887). The exact distribution needs verification due to the recent description of the sibling *L. linnei* (4.5.6.4), with which most records are mixed.

In the regions neighbouring Luxembourg, the species is certainly widespread, being recorded by all past authors, nevertheless uncommon, most records being referable to *L. linnei*, which has usually resulted predominant (Drumont & Wallin, 2009; Gutowski et al., 2010).

In Luxembourg, the species was considered as a very common pest for numerous fruit and other broadleaf trees at the beginning of the 20th century (Ferrant, 1907b, 1911). Actually, it is widespread but scattered throughout the country, sometimes mixed with *L. linnei*, but much less common than this latter species (Fig. 274).

4.5.6.4 *Leiopus linnei* Wallin, Nylander & Kvamme, 2009

Leiopus nebulosus Mousset, 1969: 171 (pars); Mousset, 1973: Map. 401 (pars); Gerend et al., 2007: 291 (pars); *Leiopus linnei* Köhler, 2011: 90, 131; Vitali, 2013: 146; Vitali, 2014: 89.

Body size 5-9.5 mm. Small, oval, flattened; dark brown, mottled with greyish variable spots forming three wide irregular bands, the median ones being usually more distinct; antennomeres black at the apex; legs ringed with greyish pubescence; pronotal spines obliquely directed.

The species may be confused with many other species of the tribe Acanthocinini, from which it differs in the same characters shown for *L. nebulosus* (4.5.6.3). The differences with the sibling *Leiopus nebulosus* are limited to the genital structures, see above. The species is usually more robust and dark than *L. nebulosus*.

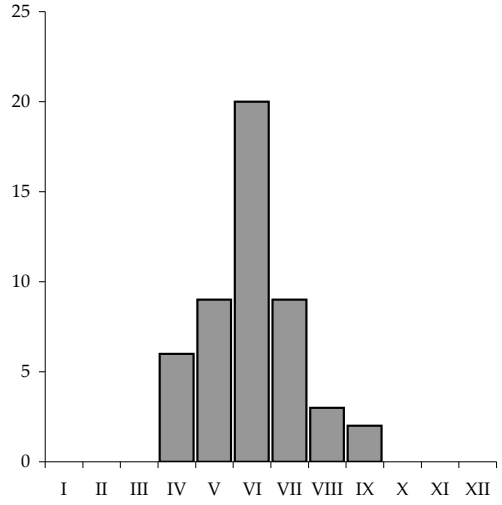


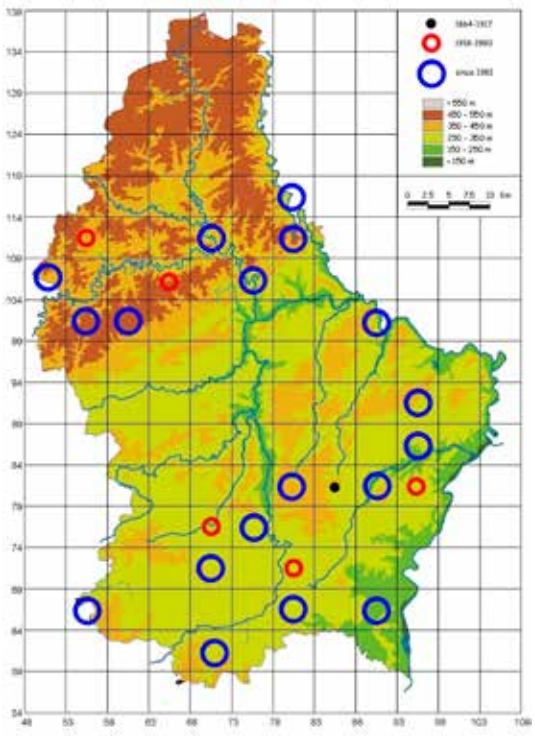
Fig. 275: Phenology of *Leiopus linnei* in Luxembourg.

Life-cycle lasts two years. Larvae develop in dead twigs of broadleaf trees, including fruit trees, exceptionally of Pinaceae (list in Gutowski et al., 2010). Pupation occurs under barks inside a typical circular cell surrounded by agglutinated sawdust in spring. Adults can be found on the host plants from early or mid-spring to mid-summer (Fig. 275). They can be collected by beating or rearing, sometimes attracted by lights.

Host plants: *Fagus*, *Quercus*, *Alnus*, *Corylus*, *Carpinus*, *Ulmus*, *Juglans*!, *Malus*, *Sorbus*, *Prunus*, *Rhus*, Aesculus, *Acer*, *Salix*, *Populus*, *Picea*, *Pinus*.

Recently described species, whose geographical limits are not clarified yet; currently, it seems to be focused on Central Europe, coexisting but predominating *L. nebulosus* (Wallin et al., 2009).

Fig. 276: *Leiopus linnei*, a. Male, b. Female, c. Bambësch (author's coll.).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1					1
1918-1980		2						2			1		5
since 1981	1	1	2	1	2			4	3	2	4	1	21
Total	1	3	2	1	2			7	3	2	5	1	27

Fig. 277: Distribution of *Leiopus linnei* and colonised localities in Luxembourg.

Among the regions neighbouring Luxembourg, it was recorded until today from Alsace, as abundant (Berger, 2009), and from Belgium, as much more common and widespread than *L. nebulosus* (Drumont & Wallin, 2009). The species is present in Rhineland-Palatinate, where I collected a specimen near Trier (Petrisberg, 17.VI.2013, beating *Juglans regia* L.), and in the Saarland (coll. A. Werno).

In Luxembourg, the species is fairly common and widespread throughout the country, principally in oak woods (Fig. 277). It is sometimes mixed with *L. nebulosus* (4.5.6.3) but always resulting much more abundant than this last species.

4.5.6.5 *Exocentrus adspersus* Mulsant, 1846

Exocentrus (s. str.) adspersus Vitali, 2011b: 82. *Exocentrus adspersus* Vitali, 2013: 146; Weitzel, 2014: 218.

Body size 4.5-8 mm. Small, oval, flattened; dorsal side greyish brown, covered with some raised hairs; elytra with a wide postmedian brown band covered with some whitish small spots, sometimes forming three longitudinal lines (var. *clarae*); pronotal spines small, obliquely directed. The whitish spots allow separating this species from all other congeners present in Europe.

The species may be confused with *E. punctipennis* (4.5.6.6), which differs in the elytra covered with numerous small black hairless spots and

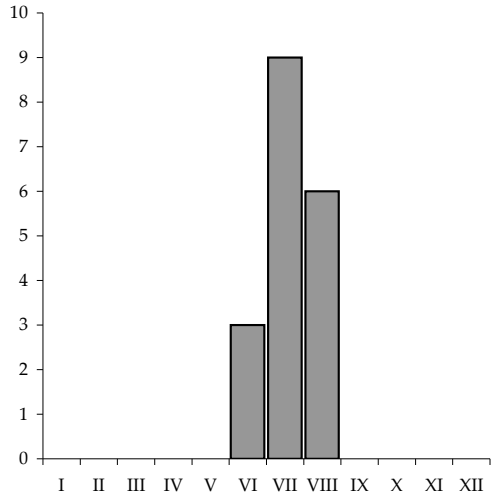


Fig. 278: Phenology of *Exocentrus adspersus* in Luxembourg.

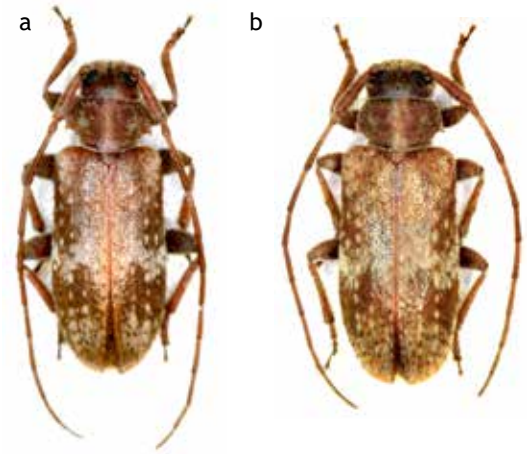
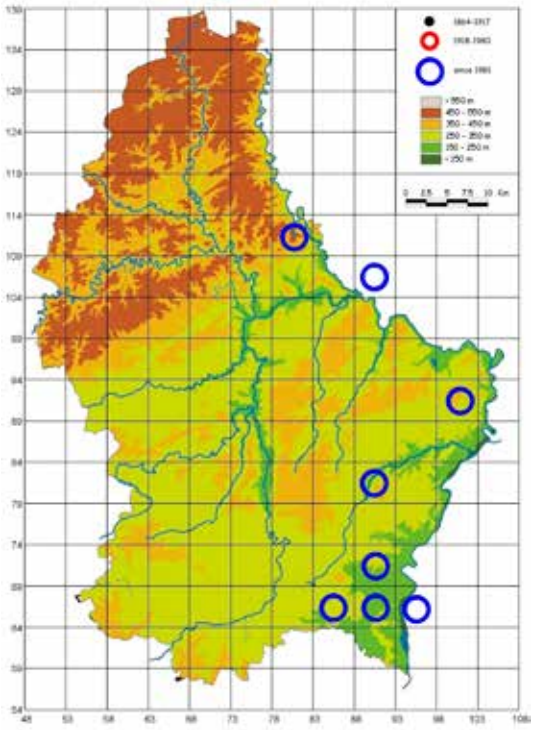


Fig. 279: *Exocentrus adspersus*, a. Male, b. Female, Roodt (author's coll).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981			1	1					1	1	1	7	12
Total			1	1					1	1	1	7	12

Fig. 280: Distribution of *Exocentrus adspersus* and colonised localities in Luxembourg.

the postmedian band without whitish spots. Moreover, it differs from all *Leiopus* species in its haired dorsal side.

Life-cycle lasts two years. Larvae develop in dried twigs of Fagales, maybe erroneously recorded from *Ulmus*. Pupation occurs in wood in spring. Adults are found on the host plants from mid-spring to mid-summer (Fig. 278). They can be collected by beating or rearing; they sometimes are attracted by light.

Host plants: *Castanea*, *Fagus*, *Quercus*, *Corylus*, *Carpinus*, *Ostrya*. *Ulmus*?

Parasitoids: *Blacus errans* (Nees, 1812) (Braconidae); *Calosota vernalis* Curtis, 1836, *Eusandalum inerme* (Ratzeburg, 1848) (Eupelmidae).

Predators: *Opilo pallidus* (Olivier, 1795) (Cleridae).

Euro-Anatolian species, widespread from the Pyrenees to the Caucasus and Syria. It is related to mesophilic broadleaf woods, rarefying both north- and southwards.

In the regions neighbouring Luxembourg, it reaches the north-western limit of its distribution, resulting rare to very rare but widespread nearly everywhere. In Rhineland-Palatinate, it is widespread but scattered along the principal rivers and in Palatinate, being recorded for the first time only in 1904, whereas it has been known for the Saarland only in 1988 (Niehuis, 2001). In northern Lorraine, the species is present but very rare (Colson, 1981), while it is widespread in Alsace (Matter, 1998), where it has been known from a long time (Fournel & Gehin, 1846). Rare in the French Ardennes (Ligeron, 2005), it is very rare in Belgium (Lameere, 1894) and in the Netherlands (Zeegers & Heijerman, 2008), where recent samples are also missing.

In Luxembourg, the species is apparently very rare and limited to the German border and to the Gutland, particularly in the south-eastern cantons (Fig. 280), where, nevertheless, it can sometimes be fairly abundant. However, it has been inserted in the Red List (RGD, 2009).

4.5.6.6 *Exocentrus punctipennis* Mulsant & Guillebeau, 1856

Exocentrus (s. str.) punctipennis Vitali, 2011b: 82.
Exocentrus punctipennis Vitali, 2013: 146.

Body size 3.5-6.5 mm. Minute, oval, flattened; dorsal side greyish brown, covered with some raised hairs; elytra with numerous small black hairless spots and a wide postmedian brown band; pronotal spines small, obliquely directed. The hairless spots allow separating this species from all other congeners present in Europe.

The species may be confused with *E. adspersus* (4.5.6.5), which differs in the elytra without hairless spots but covered with whitish spots. Moreover, it may be easily confused with *E. lusitanus* (Linnaeus, 1767), not recorded from Luxembourg yet but present in the neighbouring regions showing elytra with minute hairless points, a conspicuous praemedian lateral brown spot and pronotum as long as wide (transverse in *E. punctipennis*). Finally, it differs from all *Leiopus* species in the haired dorsal side.

Life-cycle lasts one year. Though traditionally quoted as monophagous on dead twigs of elms, larvae bore several broadleaf trees (Demelt, 1966; Vives, 1984; Bense, 1995) and even Pinaceae (Müller 1949). Pupation occurs in wood in spring. Adults are active on the host plants from late spring to mid-summer. They can be collected by beating or rearing, sometimes being attracted by light.

Host plants: *Quercus*, *Alnus*, *Betula*, *Ulmus*, *Salix*, *Tilia*, *Abies*.

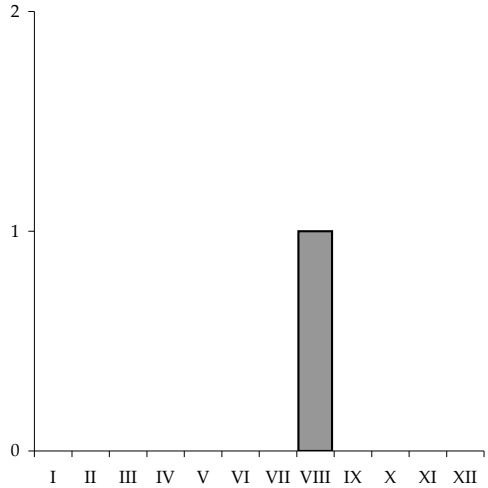


Fig. 281: Phenology of *Exocentrus punctipennis* in Luxembourg.

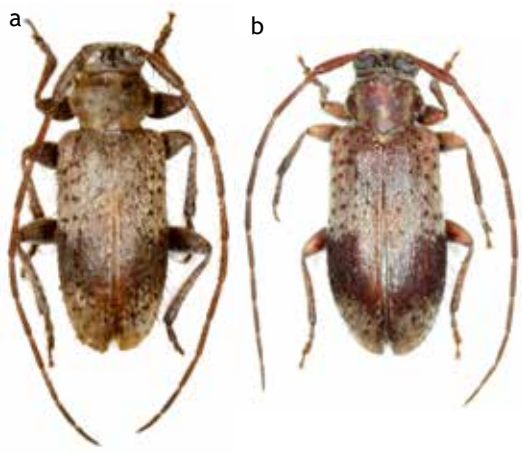


Fig. 282: *Exocentrus punctipennis*, a. Male, b. Female, Italy (author's coll.).

	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917													0
1918-1980													0
since 1981												1	1
Total												1	1

Fig. 283: Distribution of *Exocentrus punctipennis* and colonised localities in Luxembourg.

Parasitoids: *Cyanopterus extricator* (Nees, 1834), *Eubazus augustinus* (Ruthe, 1867), *E. flavipes* (Haliday, 1835) (Braconidae); *Laelius bipartitus* Kieffer, 1906 (Bethylidae); *Perilampus laevifrons* Dalman, 1822 (Perilampidae).

Euro-Anatolian thermophilic species, widespread from the Spanish Pyrenees to eastern Turkey, generally sporadic and rarefying both north- and southwards.

The regions neighbouring Luxembourg are hardly reached or are beyond the north-western limit of its distribution. Consequently, it is widespread in Palatinate, while only one recent record (1994) has been known from the Saarland (Niehuis, 2001). Never recorded from northern Lorraine (Fournel & Gehin, 1846, Godron, 1866; Colson, 1981) and the French Ardennes (Ligeron, 2005), it is little common in south-eastern Alsace (Matter, 1998). Zeegers & Heijerman (2008) quoted this species, absent from the Netherlands, for Belgium, but the distribution map of the local saproxylic beetles (Drumont & Grootaert, 2011) shows no specimen.

In Luxembourg, the species is known thanks to a single male collected at the light in the extreme south-eastern of the country (Fig. 283). It has been inserted in the Red List (RGD, 2009).

4.5.7 Tribe Dorcadiini Latreille, 1825

4.5.7.1 *Dorcadion fuliginator* (Linnaeus, 1758)

Dorcadion fuliginator Anonyme, 1873: XXII; Teunissen et al., 2005: 180.

Body size 10-17 mm. Oval, wingless; body throughout dull black; elytral pattern variable: covered with a uniform ashy-grey pubescence, without (typical form) or with little apparent longitudinal white bands (var. *fuliginosum*), or dark brown to black, without (var. *atrum*) or with 3-5 longitudinal white bands (var. *ovatum*).

Life-cycle lasts two years. Larvae develop in the soil, feeding roots of Poaceae. The females lay a single egg in each stem, as close as possible to the roots, during the nights of April. Young larvae immediately leave the stems and get into the soil.

Pupation occurs in the soil inside a cocoon made with dead plants and roots mixed with earth in mid-summer of the second year. Adults hibernate in the cocoon and emerge in early spring. They

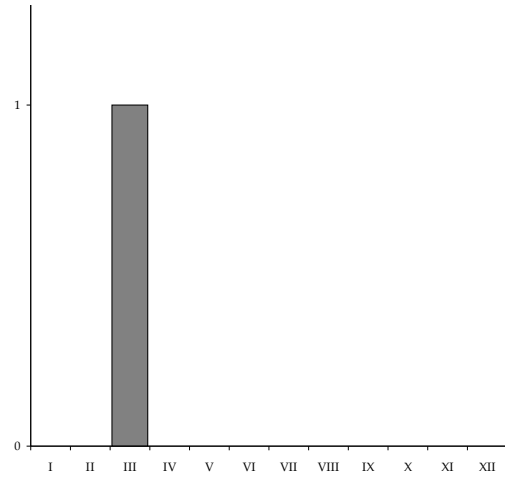
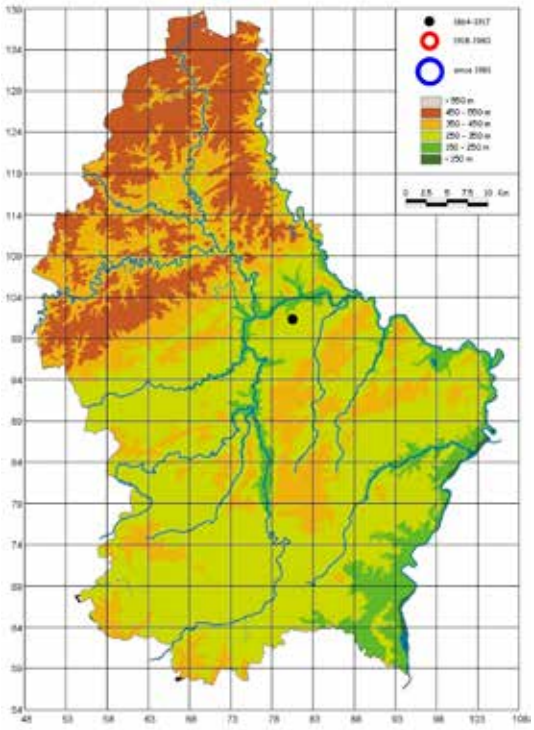


Fig. 284: Phenology of *Dorcadion fuliginator* in Luxembourg.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917			1										1
1918-1980													0
since 1981													0
Total			1										1

Fig. 285: Distribution of *Dorcadion fuliginator* and colonised localities in Luxembourg.

can be observed walking on the soil on sunny days, generally more frequently each two every second year.

Host plants: *Elymus*, *Festuca*, *Hordeum*, *Triticum*.

Predators: *Falco peregrinus* Tunstall, 1771; *F. tinnunculus* Linnaeus, 1758 (Falconidae).

Western Central European thermophilic species, widespread from northern Portugal to Thuringia. Ten more or less distinct subspecies have been recognised in the Pyrenean area and in southern France, while the nominal form settles most of Central Europe.

In the regions neighbouring Luxembourg, the species hardly reaches the north-western limit of its distribution, where it is in strong south-western regression. In Rhineland-Palatinate, it has been known for a long time (Brahm, 1790), but today it is nearly only present in the south-eastern plains, while it became extinct from the Rhine valley and in most parts of its former distribution. It was never recorded from the Saarland (Niehuis, 2001). In northern Lorraine, the species was once common (Fournel & Gehin, 1846) and later very common (Godron, 1866) but it is present in only few localities today (Colson, 1981). It is still widespread in Alsace, though in regression due to the urbanisation (Matter, 1998). Absent from the French Ardennes (Ligeron, 2005), the species was very rare in eastern Belgium (Lameere, 1894; Everts, 1903; Anonyme, 1945). According to Zeegers & Heijerman (2008), recent findings are missing, but Teunissen et al. (2005) mentioned a specimen collected in Namur province in 1989. The species is localised in the Netherlands in only one locality of the southern Limburg (Teunissen et al., 2005).

The species has been known for Luxembourg by a single specimen collected by Prof. Dewalque on the Triassic ground of Diekirch, preserved in collection Laporte de Castelnau and mentioned by Camille Van Volxem during the monthly meeting of the Belgian entomological Society on 1 March 1873 (Anonyme, 1873). No other findings have been known until today (Fig. 285).

4.5.8 Tribe Mesosini Thomson, 1860

4.5.8.1 *Mesosa nebulosa* (Fabricius, 1781)

Mesosa nebulosa Mousset, 1969: 171; Mousset, 1973: Map. 407; Gerend et al., 2007: 290; Köhler, 2011: 88, 131; Köhler, 2013: 63, 102; Vitali, 2013: 146; Weitzel, 2014: 218.

Body size 8-15 mm. Body parallel-sided, flattened, covered with a reddish to brown pubescence mottled with irregular spots of white and black pubescence; pronotum with two more or less distinct longitudinal lines of black pubescence; elytra with a large median transverse band of white pubescence, boarded by two zigzag bands of black pubescence; antennae ringed with white pubescence. The median white band is often divided into two lateral spots.

Life-cycle lasts two years. Larvae develop in dead branches of broadleaf trees, exceptionally of Pinaceae. Pupation occurs under barks in late summer. Adults overwinter in the pupal cell and emerge from mid-spring, remaining active during the night on the host plants until mid-summer (Fig. 286). They results strongly mimetic with the substrate.

Host plants: *Castanea*, *Fagus*!, *Quercus*, *Alnus*, *Betula*, *Corylus*, *Carpinus*, *Ostrya*, *Ulmus*, *Morus*, *Ficus*, *Juglans*!, *Malus*, *Pyrus*, *Prunus*, *Robinia*, *Aesculus*, *Acer*, *Hedera*, *Ilex*, *Rhamnus*, *Salix*, *Populus*, *Tilia*, *Syringa*, *Picea*.

Parasitoids: *Dolichomitus messor* (Gravenhorst, 1829), *Rhimphoctona melanura* (Holmgren, 1860), *Xorides irrigator* (Fabricius, 1793) (Ichneumonidae); *Wroughtonia spinator* (Lepeletier & Audinet-Serville, 1825) (Braconidae).

Western Palaearctic species, widespread from North Africa and Portugal to the southern Urals. An isolated subspecies has been recognised in North Africa (*algerica* Pic, 1898), while *Mesosa obscuricornis* Pic, 1894, which Sama (2002) considered as a Caucasian subspecies, is a true species, even belonging to another subgenus.

In the regions neighbouring Luxembourg, the species is widespread everywhere but little common to very rare. This rarity might be an artefact due to its cryptic behaviour. In Rhineland-Palatinate, it has been known since the second half of the 19th century as widespread but little common, while today it is mainly widespread in

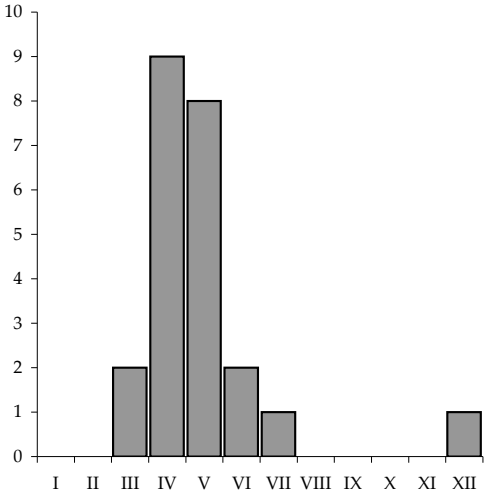
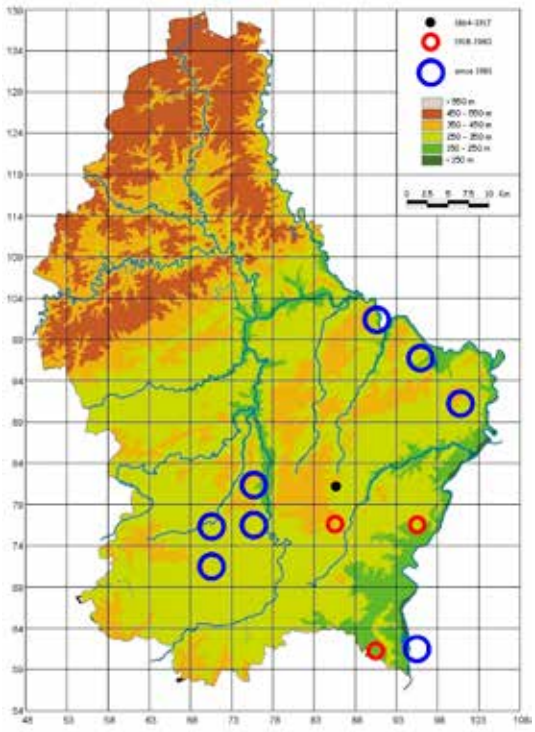


Fig. 286: Phenology of *Mesosa nebulosa* in Luxembourg.

Fig. 287: *Mesosa nebulosa*, a. Male, b. Female, Bambësch (author's coll.), c. Male on *Fagus*, Bambësch.



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917								1					1
1918-1980								1			1	1	3
since 1981							3	2		3		1	9
Total							3	4		3	1	2	14

Fig. 288: Distribution of *Mesosa nebulosa* and colonised localities in Luxembourg.

the valleys. It seems less present in the Saarland, maybe due to missing research (Niehuis, 2001). In northern Lorraine, the species, known for a long time as rare to very rare (Fournel & Gehin, 1846; Godron, 1866), seems fairly rare today (Colson, 1981), while it is widespread in Alsace, though little abundant (Matter, 1998). Fairly rare in the French (Ligeron, 2005) and Belgian Ardennes, it is little common in central Belgium (Lameere, 1894) and rare in the southern Netherlands (Everts, 1903; Zeegers & Heijerman, 2008).

In Luxembourg, the species is mainly widespread in the Gutland but scarcely collected, resulting seemingly very rare (Fig. 288). The opportunity to conduct focused rearing has allowed verifying that the species may be much more abundant than it seems today.

4.5.9 Tribe Lamiini Latreille, 1802

4.5.9.1 *Lamia textor* (Linnaeus, 1758)

Lamia textor Kraus, 1892b; 49; Ferrant, 1907a: 304, Fig. 30; Ferrant, 1911: 68-69, Fig. 32; Mousset, 1969: 171; Mousset, 1973: Map. 400; Vitali, 2013: 146; Vitali, 2014: 89-90; Weitzel, 2014: 218.

Body size 15-33 mm. Robust, throughout dull black; elytra sometimes with some sparse spots of yellowish pubescence, denser along the lateral margin.

Life-cycle lasts two years. Larvae develop in living roots of Salicaceae, rarely of other broadleaf trees. Pupation occurs in wood in spring. Adults can be found from early or mid-spring to late summer (Fig. 289), being able to live until 300 days. They can be observed during daytime walking on the soil or climbing on the basal parts of the hosts-plants.

Host plants: *Salix*, *Populus*; *Alnus*, *Betula*, *Morus*.

Parasitoids: *Dolichomitus messor* (Gravenhorst, 1829) (Ichneumonidae).

Eurasian species, widespread from the Cantabrian Mts. to Hokkaido, Japan. In northern Europe, the species is, however, in regression for some time (Horion, 1974), in Great Britain it has no longer been recorded after 1953.

In the regions neighbouring Luxembourg, the species is widespread but in regression every-

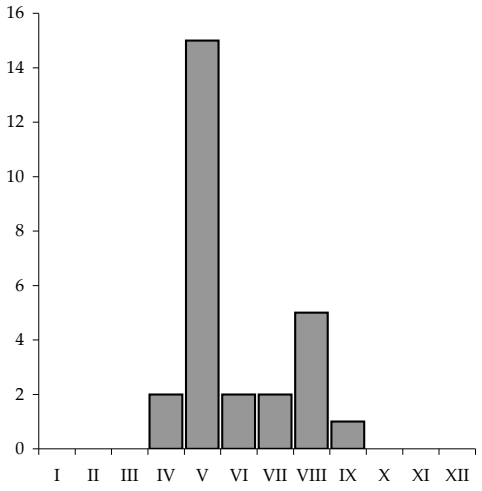


Fig. 289: Phenology of *Lamia textor* in Luxembourg.

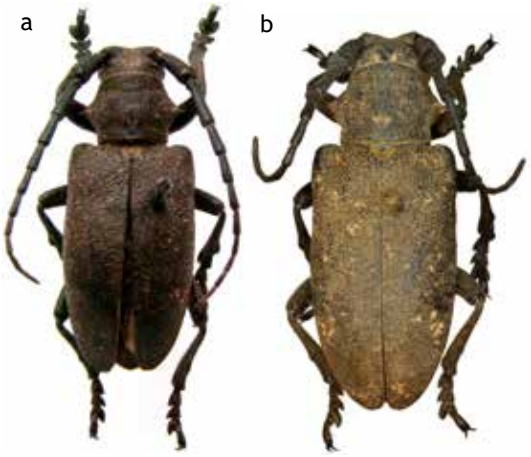
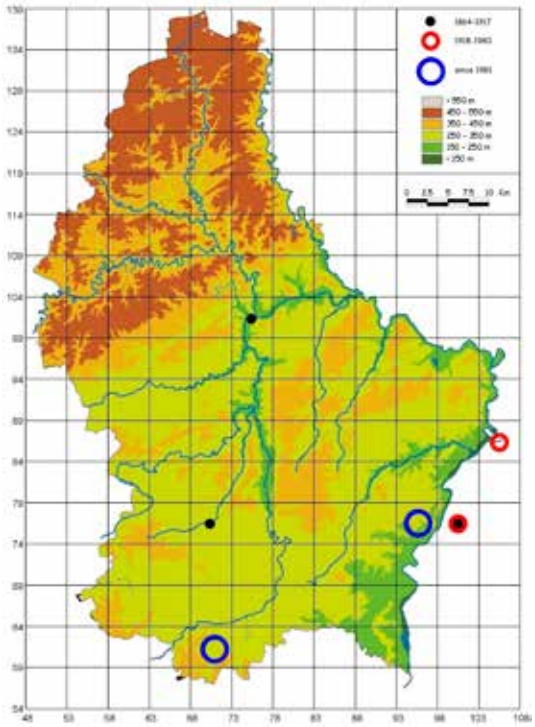


Fig. 290: *Lamia textor*, a. Male, Schieren, b. Female, Mamer (coll. Mnhn).



	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	TOT
1864-1917			1				2				1		4
1918-1980											2		2
since 1981									2		1		3
Total			1				2		2		3		8

Fig. 291: Distribution of *Lamia textor* and colonised localities in Luxembourg.

where. In Rhineland-Palatinate, it has been known for a long time as not rare (Brahms, 1790), or even common; nonetheless, it has strongly regressed since 1950, being no longer observed in some regions since the 1970s. In the Saarland, it was recorded only in 1960 (Niehuis, 2001). In northern Lorraine, it was once considered as very common (Fournel & Gehin, 1846), then common (Godron, 1866), it seems to be fairly rare today (Colson, 1981). A strong regression starting from the beginning of the 20th century has been noticed in Alsace, where the species is rarely collected as single specimens today, while it seems still common in the Franche-Comté (Matter, 1998). Fairly rare in the French Ardennes (Ligeron, 2005), the species was common in Belgium still at the end of the 19th century (Lameere, 1894), while it is rare in the Netherlands for years now (Zeegers & Heijerman, 2008).

In Luxembourg, the species was shown for the first time by J. N. Theis during the meeting 1 November 1892 (Kraus, 1892b). The locality of the sample(s) is unknown but maybe, it was about Schwarzenhof (Steinfort, canton of Capellen), where Theis was "Forst Candidat". Actually, the MNHNL still preserves four specimens collected by V. Ferrant just in the canton of Capellen before 1890. At the beginning of the 20th century, the species was considered as a pest for willows (Ferrant, 1907a, 1911). Nowadays, it is very rare and inserted in the Red List (RGD, 2009). The analysis of the data supports strong southwards regression since the beginning of the 20th century. Until recently, the species has still been found in some localities along the Mosel and the Lorraine border, with regular records in the Haardt Natural Reserve (Fig. 291); nonetheless, it seems to have no longer been observed after 2002.

5 Analysis of the Cerambycidae of Luxembourg

5.1 Biogeographical analyses

5.1.1 Abundance and frequency

Data concerning abundance and frequency of cerambycids species are only available for Rhineland-Palatinate and the Saarland (Niehuis, 2001). The comparison with the Luxemburgish data (Fig. 292-293) shows identity for the two most widespread species (*Stenurella melanura* and *Leptura maculata*) and the most abundant species (*Stenurella melanura*).

Alosterna tabacicolor, the second most abundant and the fourth most widespread species in Luxembourg, has much less important positions in Rhineland-Palatinate and Saarland (11th and 12th place, respectively). Analogously, *Grammoptera ruficornis*, the fourth most abundant and the third most widespread species in Luxembourg, is the seventh most abundant and the 12th most widespread species in Rhineland-Palatinate and the Saarland.

Moreover, *Anoplodera sexguttata*, usually considered as fairly to very rare in France (Picard, 1929; Villiers, 1978), is the 7th most abundant and the 8th most widespread species in Luxembourg, while it is the 32nd most abundant and the 34th most widespread species in Rhineland-Palatinate and the Saarland. *Rhagium mordax* is also more present in Luxembourg (sixth place in both lists) than in Rhineland-Palatinate and Saarland (12th most abundant and 11th most widespread species).

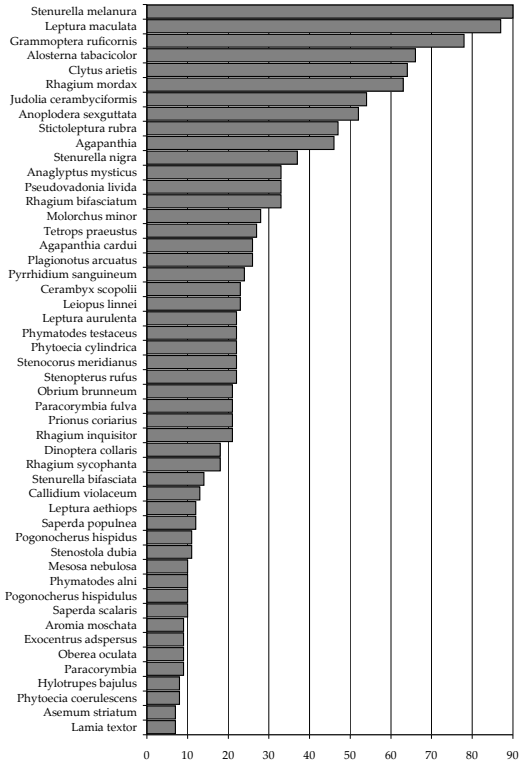


Fig. 292: Frequency of the most widespread Cerambycids in Luxembourg. The bar represents the number of the different collection localities of the first 50 most widespread species.

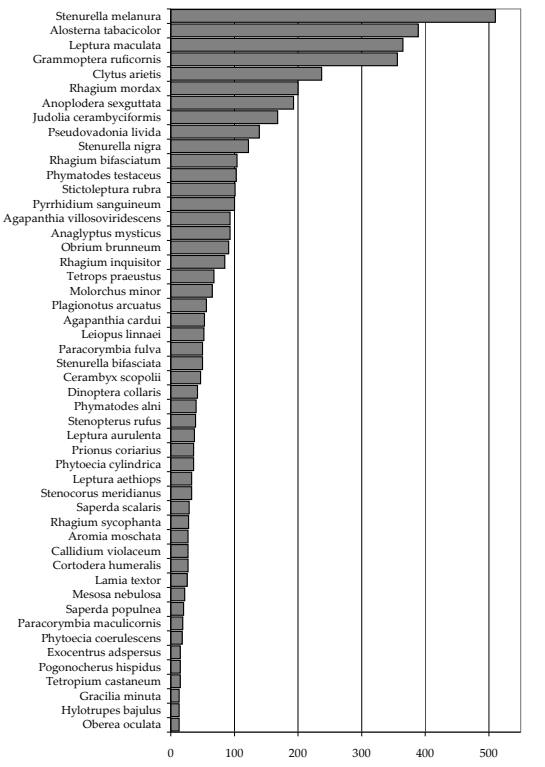


Fig. 293: Abundance of the most common Cerambycids in Luxembourg. The bar represents the number of the collected specimens of the first 50 most common species.

In contrast, *Agapanthia villosoviridescens* is more common in Rhineland-Palatinate and Saarland (sixth place in both lists) than in Luxembourg (15th most abundant and the 10th most widespread species), as well as *Calamobius filum* (16th most abundant and 13th most widespread species in Rhineland-Palatinate and the Saarland, but occupying the ~70th place in both lists of Luxembourg).

Analogously, the first most abundant *Phytœcia* species of Rhineland-Palatinate and the Saarland are ***P. caerulescens*** and *P. nigricornis* (30th and 44th place, respectively), which are very rare in Luxembourg (48th and 78th place, respectively), while the most common species of Luxembourg (*P. cylindrica*, 24th place) occupies the 48th place in Rhineland-Palatinate and the Saarland. Finally, *Chlorophorus sartor* is the 42nd most abundant species in Rhineland-Palatinate and the Saarland, while it is extinct in Luxembourg (5.2.2).

Definitively, despite a substantial similarity concerning the most present species of the area (*Stenurella melanura*, *Leptura maculata*, *Clytus arietis*, *Judolia cerambyciformis*), Luxembourg shows a prevalence of small forest species (*Alosterna tabacicolor*, *Grammoptera ruficornis*, *Phytœcia cylindrica*) and other ones, principally related to *Fagus* (*Anoplodera sexguttata*, *Rhagium mordax*), while Rhineland-Palatinate and the Saarland show a prevalence of species related to herbaceous plants (*Agapanthia villosoviridescens*) or to thermophilic grasslands (*Chlorophorus sartor*, *Calamobius filum*, *Phytœcia caerulescens* and *P. nigricornis*).

5.1.2 Synopsis of the Cerambycofauna in the regions neighbouring Luxembourg

The cerambycid species present in the regions neighbouring Luxemborg and their current status and presence are summarized in table 1 on the basis of the examined literature (see 2.1.1.1 and 2.1.1.3).

5.1.3 Biodiversity

After exclusion of the species misidentified (Vitali, 2011b) or today having a different taxonomy (Vitali, 2012b), 96 species of cerambycids have been globally recorded from the Grand Duchy of Luxembourg. The list also includes *Rosalia alpina* and *Stenocorus quercus*, though no specimens support such records (Vitali, 2011b).

The 94 supported species can be listed according to the different cantons and periods of time in the table 2 and accordingly mapped (Figs. 294-295).

Considering different cantons (Tab. 2), Luxembourg and later Grevenmacher are the richest in species, while Redange and Vianden are the poorest ones. Considering species richness and land surface of each canton, the relationship species/area does not show a significant correlation using Pearson's ($R = 0.20$, $p = 0.46$), Spearman's ($\rho = 0.04$, $p = 0.88$) and Kendall's coefficients ($\tau = 0.06$, $p = 0.78$). This, biodiversity focused around the capital seems to correspond more to a "distribution of entomologists" than a natural one. Most likely, the short favourable time available, the variability of the climate and the fact that most of the collections were done by amateurs during recreations have limited the collection to localities close to their homes.

Considering the species biodiversity according to districts or natural regions, (Tab. 3) Gutland and the district Luxemburg are the richest in species, as it occurs to other families of Coleoptera (Braunert, 1996, 2009; Braunert & Gerend, 1997; Gerend, 2003).

Certainly, some cantons have been studied inadequately, even completely ignored in the past, and their cerambycofauna is much richer than it seems today. However, the scarce biodiversity of Redange (22) is also confirmed by other taxonomic groups (e.g. Proess, 2006). Referring to the climatic maps (Pfister et al., 2005), this canton is relatively cold but also the rainiest of the country (> 900 mm rainfall from 1971 to 2000), two characteristics usually disliked by insects. For opposite reasons, Gutland and the district Luxembourg are the richest in species.

5.1.4 Introduced species

The recognition of introduced species is usually underestimated in faunistic catalogues, except for some exotic species obviously introduced in recent times. The insufficient knowledge of the bionemy of the species and their hosts, beside the fact that some of them have been introduced for an immemorial time (e.g. *Hylotrupes bajulus*), has often lead to consider species as autochthonous

Tab. 1: Cerambycid species in the regions neighbouring Luxembourg.
Al = Alsace. B = Belgium. fA = Department of Ardennes. L = Luxembourg. nL = northern Lorraine (Departments of Moselle and Meurthe-et-Moselle). NL = Netherlands. RP = Rhineland-Palatinate. SL = Saarland. E = extinct species. I = introduced species. ! = intercepted species. ? = doubtful species.

	NL	B	fA	nL	L	SL	RP	Al
Aegosoma scabricorne (Scopoli, 1763)	!	0	0	0	0	0	1	1
Ergates faber (Linnaeus, 1767)	I	IE	I	0	0	E	1	1
Prionus coriarius (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Trichoferus pallidus (Olivier, 1790)	0	0	0	0	0	0	1	1
Cerambyx cerdo Linnaeus, 1758	!	E	1	1	E	E	1	1
Cerambyx scopolii Füssli, 1775	1	1	1	1	1	1	1	1
Hylotrupes bajulus (Linnaeus, 1758)	I	I	I	I	I	I	1	1
Ropalopus clavipes (Fabricius, 1775)	E	E	0	0	E	0	E	1
Ropalopus femoratus (Linnaeus, 1758)	0	E	0	0	1	1	1	1
Ropalopus varini (Bedel, 1870)	0	E	0	0	0	0	1	1
Callidiellum rufipenne (Motschulsky, 1860)	0	!	0	0	0	0	!	0
Callidium violaceum (Linnaeus, 1758)	I	I	I	I	I	I	1	1
Callidium aeneum (DeGeer, 1775)	I	I	0	0	I	I	1	1
Pyrrhidium sanguineum (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Phymatodes testaceus (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Phymatodes alni (Linnaeus, 1767)	1	1	1	0	1	1	1	1
Phymatodes glabratus (Charpentier, 1825)	0	0	0	0	0	0	1	!
Phymatodes lividus (Rossi, 1794)	0	!	0	0	0	0	0	!
Phymatodes pusillus (Fabricius, 1787)	0	1	0	0	1	0	1	1
Phymatodes rufipes (Fabricius, 1776)	0	E	0	0	1	0	1	1
Rosalia alpina (Linnaeus, 1758)	0	0	0	0	?!	0	!	E
Purpuricenus kaehleri (Linnaeus, 1758)	0	E	0	0	E	0	E	1
Aromia moschata (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Plagionotus arcuatus (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Plagionotus detritus (Linnaeus, 1758)	1	1	0	1	1	0	1	1
Xylotrechus arvicola (Olivier, 1795)	E?	1	0	0	1	0	1	1
Xylotrechus antilope (Schönherr, 1817)	1	1	0	1	0	1	1	1
Xylotrechus rusticus (Linnaeus, 1758)	0	E	1	1	1	0	1	1
Pseudosphegesthes cinerea (Castelnau & Gory, 1839)	0	0	0	0	0	0	0	1
Neoclytus acuminatus (Fabricius, 1775)	0	0	0	0	0	0	!	0
*Clytus arietis (*Linnaeus, 1758)	1	1	1	1	1	1	1	1
Clytus tropicus (Panzer, 1795)	0	E	0	0	0	E	1	1
Clytus lama Mulsant, 1847	0	0	0	0	0	!	!	1
Chlorophorus figuratus (Scopoli, 1763)	0	E	0	1	E	0	1	1
Chlorophorus sartor (Müller, 1766)	0	E	0	1	E	E	1	1
Chlorophorus varius (Müller, 1766)	1	1	0	0	0	0	1	1
Chlorophorus herbstii (Braham, 1790)	0	0	0	0	0	0	E	0
Chlorophorus glabromaculatus (Goeze, 1777)	!	!	!	0	!	!	!	!
Anaglyptus mysticus (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Molorchus minor (Linnaeus, 1758)	I	I	0	I	I	I	1	1
Molorchus umbellatarum (Schreiber, 1759)	1	1	0	1	1	1	1	1
Molorchus marmottani Bris, 1863	0	0	0	0	0	0	1	0
Gracilia minuta (Fabricius, 1781)	!	!	!	!	!	!	!	!
Nathrius brevipennis (Mulsant, 1839)	!	!	0	0	0	!	!	!

	NL	B	fA	nL	L	SL	RP	Al
Deilus fugax (Olivier, 1790)	0	1	0	0	0	0	0	0
Stenopterus rufus (Linnaeus, 1767)	1	1	1	1	1	1	1	1
Callimus angulatus (Schrank, 1789)	0	0	0	0	0	0	1	0
Obrium brunneum (Fabricius, 1792)	I	I	I	0	I	I	1	1
Obrium cantharinum (Linnaeus, 1767)	1	1	0	0	0	0	1	1
Stenocorus meridianus (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Stenocorus quercus (Götz, 1783)	0	E	0	E	?	0	1	1
Oxymirus cursor (Linnaeus, 1758)	I	I	0	0	IE	0	1	1
Rhamnusium bicolor (Schrank, 1781)	E	1	0	0	E	1	1	1
Rhagium bifasciatum Fabricius, 1775	1	1	1	E	1	1	1	1
Rhagium inquisitor (Linnaeus, 1758)	I	I	I	I	I	I	1	1
Rhagium mordax (DeGeer, 1775)	1	1	1	1	1	1	1	1
Rhagium sycophanta (Schrank, 1781)	1	1	1	1	1	1	1	1
Pachyta quadrimaculata (Linnaeus, 1758)	0	0	0	0	0	0	0	1
Akimerus schaefferi (Laicharting, 1784)	0	0	0	0	0	0	0	1
Gaurotes virginea (Linnaeus, 1758)	0	I	0	I	I	I	I	1
Acmaeops marginatus (Fabricius, 1758)	E	E	0	0	0	0	1	1
Dinoptera collaris (Linnaeus, 1758)	E	1	1	1	1	1	1	1
Pidonia lurida (Fabricius, 1792)	0	IE	0	!	0	0	I	1
Cortodera humeralis (Schaller, 1783)	1	1	1	1	1	1	1	1
Cortodera femorata (Fabricius, 1787)	0	0	0	0	0	0	1	1
Anoplodera sexguttata (Fabricius, 1775)	E	1	1	1	1	1	1	1
Anoplodera rufipes (Schaller, 1783)	0	1	0	1	1	1	1	1
Pseudovadonia livida (Fabricius, 1776)	1	1	1	1	1	1	1	1
Lepturobosca virens (Linnaeus, 1758)	0	!	I	0	0	0	0	?
Stictoleptura rubra (Linnaeus, 1758)	I	I	I	I	I	I	1	1
Stictoleptura scutellata (Fabricius, 1781)	0	1	0	1	1	1	1	1
Stictoleptura cordigera (Füssli, 1775)	0	E	0	E	0	0	!	E
Paracorymbia fulva (DeGeer, 1775)	1	1	1	1	1	1	1	1
Paracorymbia hybrida (Rey, 18859	0	0	0	E	0	0	E	1
Paracorymbia maculicornis (DeGeer, 1775)	0	1	1	1	1	1	1	1
Anastrangalia sanguinolenta (Linnaeus, 1761)	I	I	0	0	0	I	1	1
Anastrangalia dubia (Scopoli, 1763)	0	I	0	I	I	0	1	1
Grammoptera ruficornis (Fabricius, 1781)	1	1	1	1	1	1	1	1
Grammoptera ustulata (Schaller, 1783)	1	1	1	1	1	1	1	1
Grammoptera abdominalis (Stephen, 1831)	1	1	1	1	1	1	1	1
Alosterna tabacicolor (DeGeer, 1775)	1	1	1	1	1	1	1	1
Judolia cerambyciformis (Schrank, 1781)	1	1	1	1	1	1	1	1
Pedostrangalia revestita (Linnaeus, 1757)	1	1	0	1	0	1	1	1
Leptura aurulenta Fabricius, 1792	0	1	0	1	1	1	1	1
Leptura aethiops Poda, 1761	1	1	1	1	1	1	1	1
Leptura annularis Fabricius, 1801	0	0	0	0	0	0	0	E
Leptura quadrifasciata Linnaeus, 1758	1	1	1	1	0	1	1	1
Leptura maculata Poda, 1761	1	1	1	1	1	1	1	1

	NL	B	fA	nL	L	SL	RP	Al
Stenurella bifasciata (Müller, 1776)	1	1	0	1	1	1	1	1
Stenurella melanura (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Stenurella nigra (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Strangalia attenuata (Linnaeus, 1758)	1	1	0	0	E	0	1	1
Necydalis maior Linnaeus, 1758	E	1	0	E	E	0	1	E
Necydalis ulmi Chevrolat, 1838	0	0	0	1	0	0	E	1
Arhopalus rusticus (Linnaeus, 1758)	I	I	I	I	I	I	1	1
Arhopalus ferus (Mulsant, 1839)	IE	IE	0	0	IE	0	IE	IE
Asemum striatum (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Tetropium castaneum (Linnaeus, 1758)	I	I	I	IE	I	I	1	1
Tetropium fuscum (Fabricius, 1787)	I	I	0	0	0	0	1	1
Tetropium gabrieli Weise, 1905	I	I	0	0	0	IE	1	1
Anisarthron barbipes (Schrank, 1781)	0	0	0	0	0	0	1	E
Spondylis buprestoides (Linnaeus, 1758)	1	1	1	0	1	1	1	1
Agapanthia intermedia Ganglbauer, 1883	1	1	1	1	1	1	1	1
Agapanthia villosoviridescens (DeGeer, 1775)	1	1	1	1	1	1	1	1
Agapanthia dahli (Richter, 1821)	0	1	0	0	0	0	E	1
Agapanthia cardui (Linnaeus, 1767)	0	1	1	1	1	1	1	1
Calamobius filum (Rossi, 1790)	1	1	0	0	1	1	1	1
Saperda populnea (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Saperda scalaris (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Saperda octopunctata (Scopoli, 1772)	!	0	0	0	0	0	0	E
Saperda punctata (Linnaeus, 1767)	0	0	0	0	0	0	E	1
Saperda perforata (Pallas, 1773)	0	0	0	0	0	0	1	1
Saperda carcharias (Linnaeus, 1758)	1	1	1	E	1	1	1	1
Saperda similis Laicharting, 1784	0	1	1	0	0	E	1	E
Stenostola ferrea (Schrank, 1776)	0	0	0	0	0	0	0	1
Stenostola dubia (Laicharting, 1784)	1	1	1	1	1	1	1	1
Menesia bipunctata (Zoubk, 1829)	0	0	0	0	0	0	1	1
Phytœcia nigricornis (Fabricius, 1781)	0	1	0	1	1	1	1	1
Phytœcia cylindrica (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Phytœcia icterica (Schaller, 1783)	0	E	1	E	1	1	1	1
Phytœcia pustulata (Schrank, 1776)	0	0	0	0	0	0	1	1
Phytœcia rubropunctata (Goeze, 1777)	0	0	E	0	0	0	E	1
Phytœcia caerulescens (Scopoli, 1763)	1	1	1	0	1	1	1	1
Oberea erythrocephala (Schrank, 1776)	0	0	0	0	0	0	1	E
Oberea linearis (Linnaeus, 1761)	1	1	1	1	1	1	1	1
Obera pupillata (Gyllenhall, 1817)	0	1	0	1	0	0	1	1
Oberea oculata (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Tetrops praeustus (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Tetrops starkii Chevrolat, 1859	E	1	0	0	0	0	1	1
Anaesthetis testacea (Fabricius, 1781)	1	1	0	0	1	1	1	1
Stenidea genei (Aragona, 1830)	0	0	0	0	0	0	!	0
Oplosia fennica (Pakull, 1800)	0	0	0	0	0	0	E	1
Pogonocherus ovatus (Goeze, 1777)	E	E	0	0	E	0	1	1
Pogonocherus fasciculatus (DeGeer, 1775)	1	1	0	0	1	0	1	1
Pogonocherus decoratus (Fairmaire, 1855)	1	1	0	0	0	0	1	1
Pogonocherus hispidus (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Pogonocherus hispidulus (Piller & Mitterpacher, 1783)	1	1	1	0	1	1	1	1
Parmena balteus (Linnaeus, 1767)	0	!	0	0	0	0	0	0
Acanthoderes clavipes (Schrank, 1781)	0	0	1	0	0	0	E	1
Acanthocinus aedilis (Linnaeus, 1758)	1	1	0	E	E	E	1	1
Acanthocinus reticulatus (Razm, 1789)	0	0	0	0	0	0	I	1
Leiopus femoratus Fairmare, 1859	1	1	0	0	1	1	0	1
Leiopus nebulosus (Linnaeus, 1758)	1	1	1	1	1	1	1	1
Leiopus linnei Wallin, Nylander & Kvamme, 2009	1	1	0	0	1	1	1	0
Leiopus punctulatus (Paykull, 1800)	0	0	0	0	0	0	0	E
Exocentrus adspersus Mulsant, 1846	E	1	1	1	1	1	1	1
Exocentrus lusitanus (Linnaeus, 1767)	0	E	0	0	0	0	1	1
Exocentrus punctipennis Mulsant & Guillebeau, 1856	0	0	0	0	1	1	1	1
Mesosa curculionoides (Linnaeus, 1758)	0	E	0	E	0	0	1	1
Mesosa nebulosa (Fabricius, 1781)	1	1	1	1	1	1	1	1
Dorcadion fuliginator Linnaeus, 1758	1	1	0	1	E	0	1	1
Monochamus sartor (Fabricius, 1787)	0	!	0	0	0	0	!	!
Monochamus sutor (Linnaeus, 1758)	!	!	0	0	0	0	I	1
Monochamus galloprovincialis (Olivier, 1795)	I	!	I	!	0	0	1	1
Lamia textor (Linnaeus, 1758)	1	1	1	1	1	0	1	1
Total recorded	94	124	68	81	96	87	143	145
Total autochthonous	71	96	56	69	79	71	128	138
Total introduced	16	18	10	9	13	12	5	1
Total adventive	7	10	2	3	2	4	10	6
Total living today	76	94	65	68	79	76	122	129
Total autochthonous living today	61	79	55	60	68	65	118	129
Total introduced living today	15	15	10	8	11	11	4	0
Regions	NL	B	fA	nL	L	SL	RP	Al

Tab. 2: Number of cerambycid species in the different cantons of Luxembourg in the considered periods.

Species	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	total
1864-1917	20	-	11	-	-	6	40	33	1	10	14	1	66
1918-1980	19	27	23	6	9	12	32	45	16	25	22	27	60
since 1981	26	22	27	21	17	24	33	55	56	39	46	32	77
total	46	34	44	22	22	33	57	71	56	50	58	46	94
surface (km^2)	342	264	204	54	267	223	199	238	242	185	211	127	2586

Tab. 3: Number of cerambycid species in the different districts and natural regions of Luxembourg.

Species	Di	Lu	Gr	Oesling	Gutland	total
1864-1917	28	58	22	28	61	66
1918-1980	40	49	47	40	55	60
since 1981	48	70	58	48	76	77
total	63	85	71	63	89	94

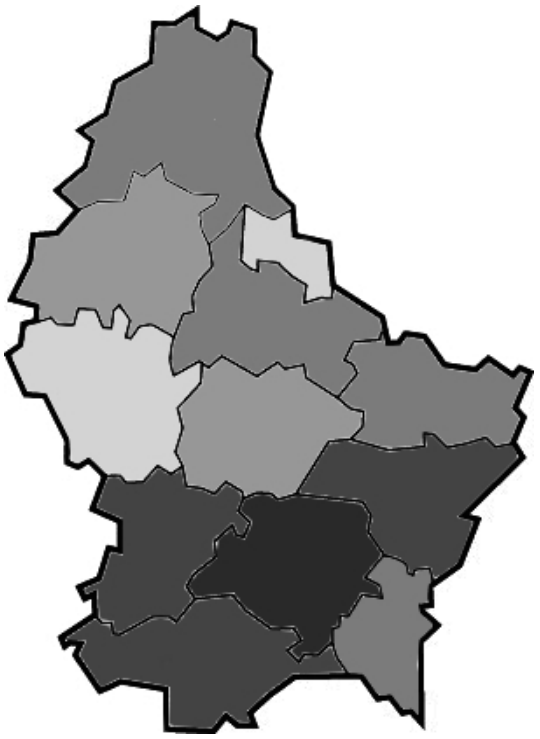


Fig. 294: Recorded species biodiversity in the cantons of Luxembourg according to six categories of species richness (I = 0 spp. II = 20-30 spp. III = 31-40 spp. IV = 41-50 spp. V = 51-60 spp. VI = 61-71 spp).

actually being extraneous to the natural biocenosis of the respective area.

A first screening excludes the synanthropic species, easily recognizable by the fact that they are not usually collected in nature in the studied area, from the autochthonous ones. The collection of a flying specimen in nature is irrelevant, since an autochthonous species should be proved to manage to live in nature beyond human habitats. For example, *Hylotrupes bajulus* (4.2.2.1) is only related to building wood in northern Europe, while it can be collected under barks of fallen trees only in the Mediterranean area.

In this case, it might be more difficult to distinguish introduced from adventive (i.e. not acclimatized) species. The kind of hosts may suggest the correct situation; e.g. *Hylotrupes bajulus* could keep its attack from house to house, while it is more difficult to hypothesise a permanent presence *of Gracilia minuta* (4.2.9.1) on osiers due to the more reduced and scattered quantity of available host-material.

In Luxembourg and the neighbouring regions, all synanthropic species (*Hylotrupes bajulus*, *Gracilia minuta*, *Nathrium brevipenne*, *Chlorophorus glabromaculatus*) are of Mediterranean origin, though their distribution has sometimes become by now sub-cosmopolite (Villiers, 1978; Bense, 1995; Niehuis, 2001). Except for the former one, they should be considered as adventive in the treated area.

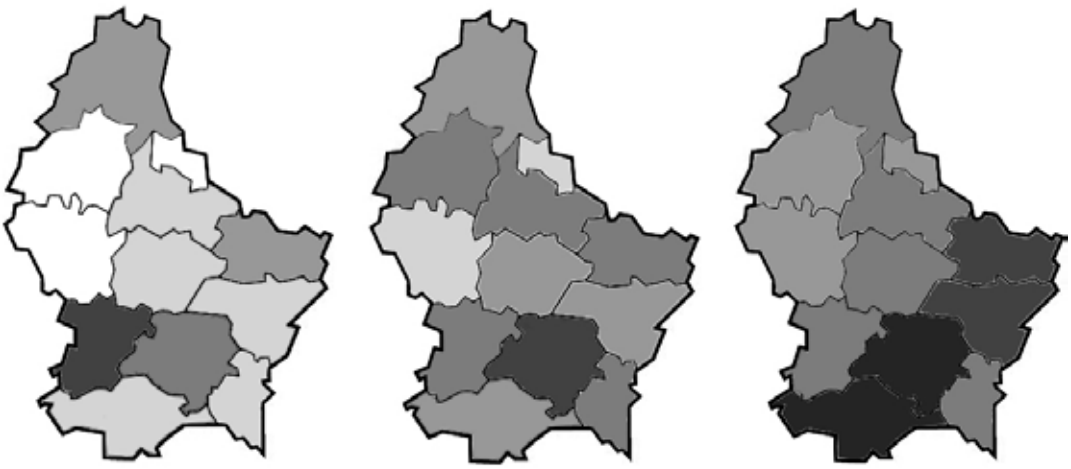


Fig. 295: Development of the recorded species biodiversity in the different periods (1864-1914, 1918-1980, since 1981), according to six categories of species richness (I = 0 spp. II = 1-11 spp. III = 12-22 spp. IV = 23-33 spp. V = 34-44 spp. VI = 45-56 spp).

A second group of species includes those exclusively related to plants not autochthonous in the studied country or in a particular region. The identification is obvious for exotic plants (e.g. *Eucalyptus*), but may be more complicated for plants autochthonous in other part of the country or in neighbouring regions. In this case, thorough knowledge of the botanical history of the studied country allows understanding the real situation. In Luxembourg, only *Pinus sylvestris* and *Juniperus communis* are autochthonous (Welter et al., 2008), whereas all other conifers have been introduced since the late 18th century. Moreover, only some Scots pines of the Müllerthal are autochthonous, while the larger majority of Scots pines have been introduced (Signoret & Signoret, 2005). Pines were used for reforestation due to their quality as pioneer plants since around 1840 (Koltz, 1875; Faber, 1901a; 1903b); later, spruce was planted due to its better growth on acid soils, greater resistance against freezing and in the production of puncheons for mines (Faber, 1913b). Consequently, all species related to conifers or to pines different from those of the Müllerthal must be considered as introduced.

The situation is more complicated with species related to different hosts. Moreover, evidently introduced species can adapt themselves to new hosts if they are comparable to the original ones. For example, European *Arhopalus* species, originally related to Eurasian Pinaceae, may be introduced in the New Zealand and attack local Pinaceae (Wang & Leschen, 2003). In this case, the disjunctive distribution or the absence of congeners suggests the introduction of the species.

Finally, the definition of introduced species may be complicated by the fact that some species are sometimes naturally present in neighbouring regions. The spreading capacity of both hosts and beetles from these countries should allow discrimination. Additionally, the history of the findings in the country may help to clarify the real situation of the local species.

Definitively, all cerambycids principally related to spruce, Mediterranean pines or Alpine conifers have been considered as introduced to Luxembourg and in the neighbouring regions, except for Alsace, where the hosts are autochthonous (Koltz, 1875).

The 13 introduced species of Luxembourg show the following distribution types: Mediterranean (1 sp. = 7.6%), Western Palaearctic (1 sp. = 7.6%), Euro-Anatolian (1 sp. = 7.6%), Euro-Siberian (1 sp. = 7.6%), Euro-Manchurian (1 sp. = 7.6%), Eurasian (4 spp. = 30.8%), Palaearctic (3 spp. = 23.1%) and Holarctic (1 sp. = 7.6%). Actually, two of the Palaearctic species (*Rhagium inquisitor* and *Stictoleptura rubra*) and the Western Palaearctic one (*Anastrangalia dubia*) have nearly exclusively trans-Siberian distribution, since their chorological classification depends on relict disjointed populations in the Algerian mountains. Consequently, the introduced species show in large majority a trans-Siberian relationship. This corresponds to the fact that locally introduced species are nearly always directly related to artificial plantations of Pinaceae.

The only species related to broadleaf trees are synanthropic adventive species of Mediterranean origin (*Gracilia minuta*, *Chlorophorus glabromaculatus*). In neighbouring regions, further species related to broadleaf trees (i.e. *Nathrius brevipennis*) must also be considered as adventive (Tab. 1).

The species can be listed according to the different periods of time and cantons (Tab. 4), districts and natural regions of Luxembourg (Tab. 5) and accordingly mapped (Fig. 296-297).

The Luxembourgish data seem to indicate an artefact distribution related to the local entomolo-

Tab. 4: Number of introduced cerambycid species in the different cantons of Luxembourg in the considered periods.

	Cl	Wi	Di	Vi	Rd	Me	Ca	Lu	Es	Ec	Gr	Rm	total
1864-1917	3	-	0	-	-	0	4	4	0	0	0	-	8
1918-1980	2	3	3	1	2	2	5	7	2	3	0	4	8
since 1981	3	3	2	1	2	4	6	8	8	6	2	0	10
total	7	5	5	2	3	5	8	10	8	6	2	4	13

Tab. 5: Number of introduced cerambycid species in the different districts and natural regions of Luxembourg in the considered periods.

	Di	Lu	Gr	Oesling	Gutland	total
1864-1917	3	6	0	3	6	8
1918-1980	5	7	6	5	7	8
since 1981	7	9	6	7	10	10
total	11	11	7	11	11	13

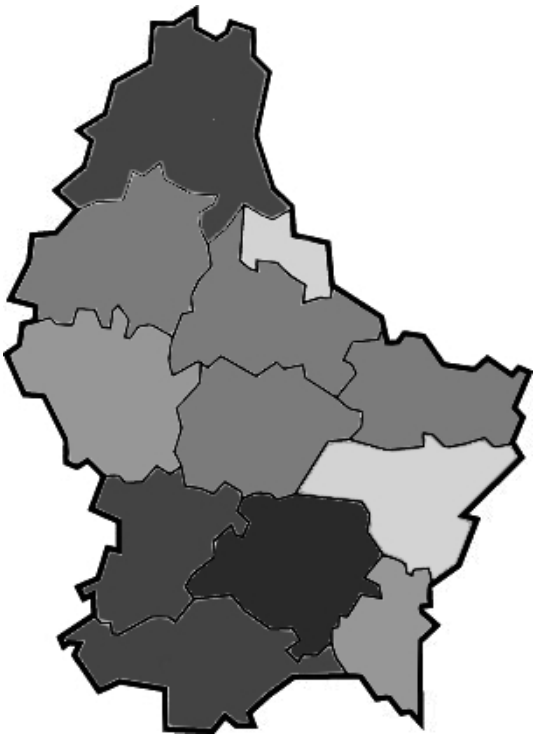


Fig. 296: Recorded introduced species in the cantons of Luxembourg according to six categories (I = 0 spp. I = 1-2 spp. III = 3-4 spp. IV = 5-6 spp. V = 7-8 spp. VI = 9-10 spp).

gists (Fig. 296-297), as suggested for the autochthonous species (6.1.1); nonetheless, they are more interpretable after merging according to political or natural regions (Tab. 5).

The region Grevenmacher is always the poorest in introduced species (6); moreover, it shows no peculiar species since they are all present in the region Luxembourg as well. This latter region includes all species of Gutland, at the same time as Diekirch includes all species of Oesling.

Comparing the natural regions (Tab. 5), the total number of species is the same (12); furthermore, Oesling and Gutland share all species since 1981. However, the analysis of the past fauna reveals that each region hosted peculiar species extinct today (*Arhopalus ferus*, *Callidium aeneum*, *Oxymirus cursor*). This different composition suggests that at least two different introductions occurred in the past: a first one, focused on the western forests of the capital, and a second one, focused on the canton Clervaux. Then, the increasingly massive imports of spruce homogenized this hexogen fauna.

Though the biodiversity of introduced cerambycids is larger around the capital, the scarcity of species in the region Grevenmacher and generally, in the eastern cantons, suggests that Belgian populations might have contributed to the colonisation of the western part of the country.

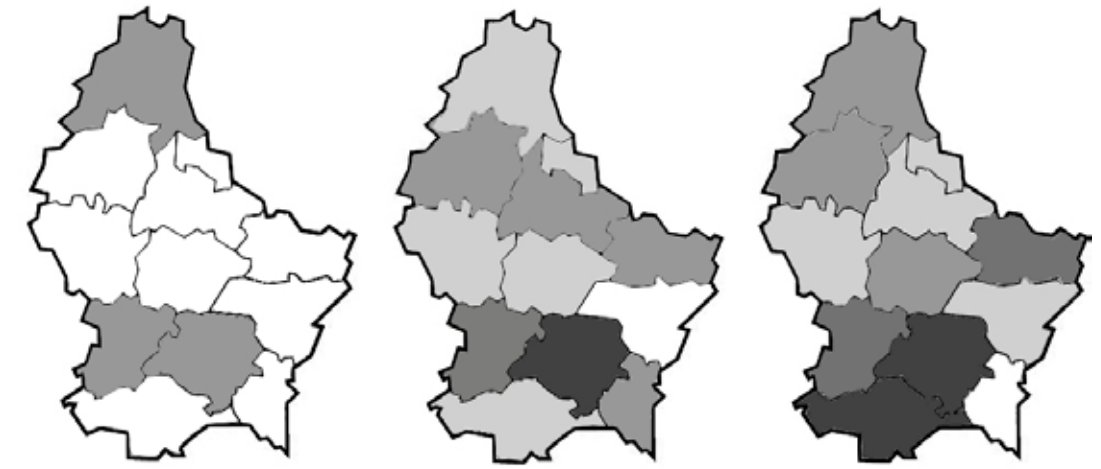


Fig. 297: Development of the recorded introduced species in the different periods (1864-1914, 1918-1980, since 1981), according to categories of species richness (I=0 spp. II = 1-2 spp. III = 3-4 spp. IV = 5-6 spp. V = 7-8 spp. VI = 9-10 spp).

Tab. 6: Number of autochthonous and introduced cerambycid species in the neighbouring regions.

Regions	NL	B	fA	nL	L	SL	RP	Al
Total autochthonous	71	96	56	69	79	71	128	138
Total introduced	16	18	10	9	13	12	5	1
Total	87	114	66	78	92	83	133	139
Land surface km²	33880	30510	526	11550	2586	2570	19835	8280
Wood surface ha x1000	365.0	692.9	150.0	355.0	88.0	98.5	828.0	317.0

5.1.5 Comparison with the neighbouring regions

Comparing the species recorded in Luxembourg with those of the neighbouring regions (Tab. 1), Luxembourg shows a number of species (96) inferior to Belgium (124), Rhineland-Palatinate (143) and Alsace (145), superior to those of the Netherlands (94), Saarland (87), northern Lorraine (81) and French Ardennes (68).

The combined rate of introduced and adventive species in the regions neighbouring Luxembourg (Tab. 1) increases north-eastwards, reaching 22.6% (Belgium) and 24.5% (Netherlands) of all species of the countries. However, the rate of the introduced species is only ~15%, for all regions neighbouring Luxembourg, except for Rhineland-Palatinate (3.7%) and Alsace (0%). In fact, some species are autochthonous in these last regions.

These differences are inflated by the number of adventive species, which are particularly abundant in Belgium and Rhineland-Palatinate (10) and much scarcer in Luxembourg (3). Actually, the relationship (Tab. 6) species/land surface does not show significant correlations using Pearson's ($R = 0.313$, $p = 0.45$), Spearman's ($\varrho = 0.428$, $p = 0.26$) or Kendall's coefficients ($\tau = 0.286$, $p = 0.32$), as well the correlation species/woodland surface ($R = 0.644$, $p = 0.08$; $\varrho = 0.381$, $p = 0.36$; $\tau = 0.286$, $p = 0.32$). Thus, since the biodiversity has statistical correlation neither with land nor woodland surface different reasons should be supposed.

5.1.6 Faunal elements

Among the 94 supported species, two have been intercepted as synanthropic, 13 have been more or less stably introduced (one of them synanthropic) and 79 are autochthonous (Tab. 1).

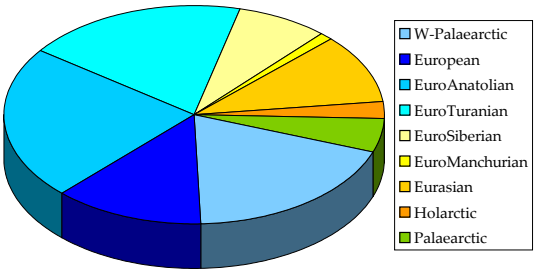


Fig. 298: Diagram of the cerambycid species of Luxembourg according to their faunal elements.

Examining the faunal elements of the 79 autochthonous species of Luxembourg, they globally show the following distributions (Fig. 296): West-Palaearctic (15 ssp. = 19%), European (10 spp. = 12.7%), Euro-Anatolian (18 spp. = 22.8%), Euro-Turanian (15 spp. = 19%), Euro-Siberian (6 ssp. = 7.6%), Euro-Manchurian (1 sp. = 1.3%), Eurasian (8 spp. = 10.1%), Palaearctic (4 spp. = 5.1%) and Holarctic (2 spp. = 2.5%).

This original or, better, natural faunistic composition has been actually modified by a consistent presence of species introduced by man through building wood or artificial plantations, which sometimes settled the country since the beginning of the history of Entomology.

5.1.7 Biogeographical classification of Luxembourg

Considering only the autochthonous species (Tab. 1), Alsace and Rhineland-Palatinate show a remarkable difference in species numbers against the remaining more western regions (129-138 against 56-96 spp.).

Accordingly, cluster analyses based on the Euclidean and Jaccard similarity coefficients support the presence of two different clusters (Fig. 299): Alsace + Rhineland-Palatinate and Netherlands + Belgium + Luxembourg + Saarland + Department of Ardennes + northern Lorraine (Departments of Moselle and Meurthe-et-Moselle).

The cluster analysis based on Jaccard similarity shows that the group of the most western countries (Netherlands, Belgium, Luxembourg and Saarland) belongs to the same sub-cluster. The cluster analysis based on Simpson similarity coefficients evidenced that Rhineland-Palatinate and Alsace belong to different regions while Belgium and the Netherlands form a unity. Moreover, northern Lorraine is nested in Alsace, but other results are little significant. This corresponds to the biogeographical regionalisation proposed by Heiser & Schmitt (2010) for the Western Palaearctic Odonata, where Alsace, Rhineland-Palatinate and Luxembourg + Saarland + Belgium + Netherlands form three different biogeographical regions.

Concerning Rhineland-Palatinate and Alsace, both regions belong to other biogeographical regions nearer to those richest in species of the European mountains. Accordingly, the abundance of the local species is more concentrated in the southern or south-eastern parts of both regions (Matter, 1998; Niehuis, 2001). Concerning Belgium, the south-western part has been colonised by thermophilic species coming from the Paris Basin, which do not reach Luxembourg, while northern Lorraine has been intensively cultivated for a long time, reducing or extinguishing the local fauna (the same can be observed in northern Alsace). Concerning the Netherlands, all original forests were cut by 1891 and artificially replanted in more recent times, causing a strong rarefaction of the original xylophagous fauna.

However, an impoverishing of the biodiversity in north-western direction is generally observed in several groups of insects (Horion A. 1974; Proess, 2004; Trockur et al., 2010; Gouverneur & Guérard 2011; Vitali, 2012a) because of the more oceanic climate. Actually, except for the species present in the most marginal parts, the regions neighbouring Luxembourg mostly show a common fauna.

The presence of some peculiar species confirms three different biogeographical regions for Cerambycids as well. First, *Deilus fugax* is only present in Belgium. This Mediterranean species related to brooms links the Belgian region to the Paris Basin, Brittany and Aquitania. Second, *Chlorophorus herbstii* and *Molorchus marmottani* are only present in Rhineland-Palatinate. These Eurasian species relate this region to eastern Europe and even to Siberia. Third, Alsace still preserves a number of peculiar species, besides those related to spruce and introduced in other regions, having opposite bioclimatic exigencies: *Pseudosphegesthes cinerea*, *Pachyta quadrimaculata*, *Akimerus schaefferi*, *Stenostola ferrea*. This group strongly characterises the Vosges region and its affinities with the Alps.

Concerning Luxembourg, cluster analyses support that its cerambycofauna is biogeographically more related to Belgium than to Alsace or Rhineland-Palatinate (Fig. 299). A proof of this fact is that the Luxembourgish extinct population of *Purpuricenus kaehleri* belonged exclusively to the variety *ruber* (4.2.4.1), the only one collected in Belgium and dominant in the Paris Basin and in Brittany (Picard, 1929; Villiers, 1978; Gouverneur & Guérard, 2011).

Moreover, cluster analyses evidenced a strong connection with the Saarland, manifestly due to their geographical proximity, since the fact that they share analogous land surface and woodland does not have any significance (5.1.6).

Analysing these three regions, the number of autochthonous species decreases from Belgium (96) to Luxembourg (77) and the Saarland (71). Some Belgian thermophilic species (*Deilus fugax*, *Stictoleptura cordigera*, *Agapanthia dahli*, *Exocentrus lusitanus*, *Mesosa curculionoides*) disappear in Luxembourg, while other ones, present in both Belgium and Luxembourg (*Ropalopus clavipes*, *Phymatodes pusillus*, *P. rufipes*, *Purpuricenus kaehleri*, *Xylotrechus arvicola*, *Chlorophorus figuratus*, *C. varius*, *Strangalia attenuata*, *Dorcadion fuliginator*), disappear in the Saarland. All are still present in eastern Rhineland-Palatinate (Niehuis, 2001).

Moreover, some thermophilic species absent in the Saarland (*Ropalopus clavipes*, *Purpuricenus kaehleri*, *Chlorophorus figuratus*, *C. varius*, *Strangalia attenuata*, *Dorcadion fuliginator*) became extinct in both Belgium and Luxembourg before WWI, even if they survive in Rhineland-Palatinate.

In contrast, the Saarland shares with Belgium and Rhineland-Palatinate some hygrophilic species lacking in Luxembourg (*Pedostrangalia revestita*, *Leptura quadrifasciata*, *Saperda similis*).

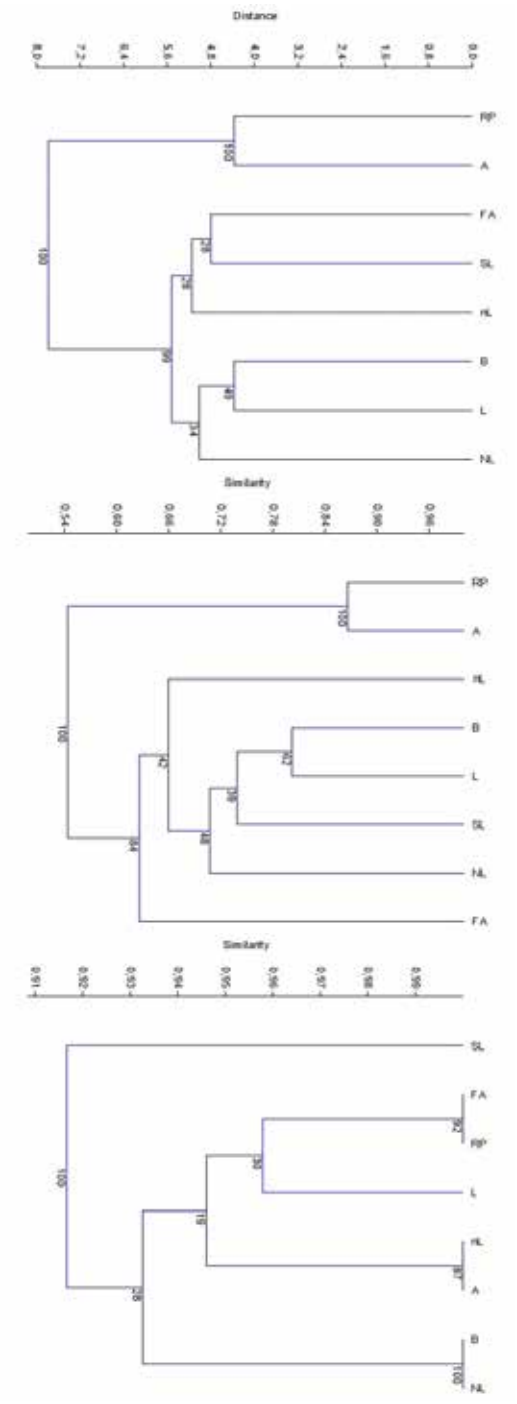


Fig. 299: Cluster analysis based on the Euclidean (a), Jaccard (b) and Simpson (c) similarity coefficients with unbiased bootstraps for the regions neighbouring Luxembourg.

On the other hand, most of the peculiar species of Rhineland-Palatinate are widespread in eastern Rhineland and Palatinate, while the western regions do not show a fauna significantly different from the Belgian one (Niehuis, 2001). Nonetheless, about 40% of the Luxembourgish population of *Cortodera humeralis* belongs to dark forms (4.3.2.1), which are prevalent in Germany but very rare in France (Fauvel, 1884; Villiers, 1978; Matter, 1998) and even absent in Belgium (Lameere, 1894: Picard, 1929). This species was found in the Saarland in 1995 and in Luxembourg only in 1999. Moreover, the colonisation of *Stenopterus rufus* (4.2.10.1) in Luxembourg seemingly occurred in westwards direction from the German border since the 1980s.

Definitively, both Belgium and Rhineland-Palatinate contributed to the fauna of Luxembourg and the Saarland, which preserve a smaller number of thermophilic (Saarland) or hygrophilic (Luxembourg) species. Evident contributions from Rhineland-Palatinate are verified only during the last decades of the 20th century. On the contrary, a Belgian thermophilic fauna colonised Luxembourg most likely after the Little Ice Age and disappeared before WWI. Nevertheless, the lack of local specimens, besides that of exact dates of the collected ones, does not allow major precision.

5.2 Analysis of the Luxembourgish Cerambycofauna and its changes

The study of the Luxembourgish Cerambycofauna during the examined period of time (1864-2014) has evidenced changes, sometimes important, in composition and consistence. The individuation of a general scheme and the main directions of the local faunistic changes (rarefaction, extinction, introduction) will be developed in the following paragraphs by comparing the local climatic (5.3.), vegetation (6.5.) and faunistic changes occurred in other groups of insects (6.4.) and the faunistic changes observed in the Cerambycids of the neighbouring regions (6.3.).

5.2.1 Premise

Taking into account the available data (Tab. 7) is sometimes a rather problematical task to identify the

Tab. 7: Number of data and percentage variation concerning the Luxembourgish Cerambycids in the considered periods of time. New recorded species are represented with "+".

	Number of data			Variation		
	1864-1917	1918-1980	1981-2015	1917-1980	1980-2015	1917-2015
Prionus coriarius	9	7	22	-22%	214%	144%
Cerambyx cerdo	2	0	0	-100%	0%	-100%
Cerambyx scopolii	5	6	21	20%	250%	320%
Hylotrupes bajulus	4	6	2	50%	-67%	-50%
Ropalopus clavipes	2	0	0	-100%	0%	-100%
Ropalopus femoratus	2	1	3	-50%	200%	50%
Callidium violaceum	4	12	4	200%	-67%	0%
Callidium aeneum	0	1	0	+	-100%	0%
Pyrrhidium sanguineum	2	12	33	500%	175%	1550%
Phymatodes testaceus	4	11	26	175%	136%	550%
Phymatodes alni	1	4	5	300%	25%	400%
Phymatodes pusillus	0	1	2	+	100%	+
Phymatodes rufipes	0	0	1	0%	+	+
Purpuricenus kaehleri	2	0	0	-100%	0%	-100%
Aromia moschata	2	3	21	50%	600%	950%
Plagionotus detritus	0	0	1	0%	+	+
Plagionotus arcuatus	8	12	14	50%	17%	75%
Xylotrechus arvicola	3	0	1	-100%	+	-67%
Xylotrechus rusticus	0	0	3	0%	+	+
Clytus arietis	6	25	90	317%	260%	1400%
Chlorophorus figuratus	2	0	0	-100%	0%	-100%
Chlorophorus sartor	2	0	0	-100%	0%	-100%
Chlorophorus glabromaculatus	4	0	0	-100%	0%	-100%
Anaglyptus mysticus	5	10	36	100%	260%	620%
Molorchus minor	2	11	19	450%	73%	850%
Molorchus umbellatarum	0	0	4	0%	+	+
Gracilia minuta	3	0	0	-100%	0%	-100%
Stenopterus rufus	2	4	19	100%	375%	850%
Obrium brunneum	0	5	24	+	380%	+
Stenocorus meridianus	3	12	16	300%	33%	433%
Oxymirus cursor	1	0	0	-100%	0%	-100%
Rhamnusium bicolor	2	0	0	-100%	0%	-100%
Rhagium bifasciatum	2	14	45	600%	221%	2150%
Rhagium inquisitor	0	5	30	+	500%	+
Rhagium mordax	5	19	89	280%	368%	1680%
Rhagium sycophanta	3	13	11	333%	-15%	267%
Gaurotes virginea	0	0	4	0%	+	+
Dinoptera collaris	4	17	7	325%	-59%	75%
Cortodera humeralis	0	0	8	0%	+	+
Anoplodera sexguttata	2	13	63	550%	385%	3050%
Anoplodera rufipes	0	0	3	0%	+	+
Pseudovadonia livida	3	6	41	100%	583%	1267%
Stictoleptura rubra	1	26	61	2500%	135%	6000%
Stictoleptura scutellata	0	1	5	+	400%	+
Paracorymbia fulva	4	9	18	125%	100%	350%
Paracorymbia maculicornis	0	1	9	+	800%	+
Anastrangalia dubia	0	0	6	0%	+	+

	Number of data			Variation		
	1864-1917	1918-1980	1981-2015	1917-1980	1980-2015	1917-2015
Grammoptera ruficornis	2	13	100	550%	669%	4900%
Grammoptera ustulata	0	0	5	0%	+	+
Grammoptera abdominalis	0	0	3	0%	+	+
Alosterna tabacicolor	6	16	93	167%	481%	1450%
Judolia cerambyciformis	6	16	69	167%	331%	1050%
Leptura aurulenta	1	4	28	300%	600%	2700%
Leptura aethiops	5	8	6	60%	-25%	20%
Leptura maculata	4	22	132	450%	500%	3200%
Stenurella bifasciata	6	7	8	17%	14%	33%
Stenurella melanura	2	10	125	400%	1150%	6150%
Stenurella nigra	4	13	41	225%	215%	925%
Strangalia attenuata	1	0	0	-100%	0%	-100%
Necydalis major	1	0	0	-100%	0%	-100%
Arhopalus rusticus	1	0	6	-100%	+	500%
Arhopalus ferus	1	0	0	-100%	0%	-100%
Asemum striatum	3	3	1	0%	-67%	-67%
Tetropium castaneum	2	4	2	100%	-50%	0%
Spondylis buprestoides	4	6	1	50%	-83%	-75%
Agapanthia intermedia	0	0	2	0%	+	+
Agapanthia villosoviridescens	4	23	33	475%	43%	725%
Agapanthia cardui	0	12	26	+	117%	+
Calamobius filum	0	0	3	0%	+	+
Saperda populnea	2	9	4	350%	-56%	100%
Saperda scalaris	2	6	9	200%	50%	350%
Saperda carcharias	6	4	5	-33%	25%	-17%
Stenostola dubia	2	1	10	-50%	900%	400%
Phytœcia nigricornis	0	1	3	+	200%	+
Phytœcia cylindrica	3	9	19	200%	111%	533%
Phytœcia icterica	0	0	1	0%	+	+
Phytœcia caerulescens	2	1	9	-50%	800%	350%
Oberea linearis	0	0	3	0%	+	+
Oberea oculata	3	10	3	233%	-70%	0%
Tetrops praeustus	4	11	25	175%	127%	525%
Anaesthetis testacea	0	1	5	+	400%	+
Pogonocherus hispidus	4	2	6	-50%	200%	50%
Pogonocherus hispidulus	0	1	11	+	1000%	+
Pogonocherus fasciculatus	3	0	3	-100%	+	0%
Pogonocherus ovatus	1	0	0	-100%	0%	-100%
Acanthocinus aedilis	5	1	0	-80%	-100%	-100%
Leiopus nebulosus	2	1	6	-50%	500%	200%
Leiopus linnei	1	5	28	400%	460%	2700%
Leiopus femoratus	0	0	7	0%	+	+
Exocentrus adspersus	0	0	11	0%	+	+
Exocentrus punctipennis	0	0	1	0%	+	+
Mesosa nebulosa	1	3	18	200%	500%	1700%
Dorcadion fuliginator	1	0	0	-100%	0%	-100%
Lamia textor	6	2	17	-67%	750%	183%
Total data	207	492	1655	138%	236%	700%

real status of each species since the total data have also increased in the considered period (see 3.2).

However, by considering that all data increased by 138% from 1917 to 1980, by 236% from 1981 to 2015 and by 700% from 1917 to 2015, the data concerning every species can be supposed showing analogous increments. A strong deviation from these values might imply increasing or decreasing populations, while increase similar to the total data may indicate stable populations.

For reasons of simplicity, values having a strong deviation were considered those having an increasing greater than the double or smaller than the half of the general trend for that period. In other words, stable species were considered those having frequency values x (%): $69 < x < 276$ for variation 1917-1980; $118 < x < 472$ for variation 1980-2014; $350 < x < 1400$ for variation 1917-2015.

Nonetheless, the fact that entomologists usually limited their collections to only few samples for hobby purposes, moreover privileging species aesthetically beautiful or having outstanding habits, remains an unsolvable problem. Consequently, the real consistence of the past fauna is actually strongly counterfeited.

My personal collections certainly cover a too limited period (2008-2015) in order to appreciate changes of consistence. They resulted helpful for correcting the real consistence of banal or minute species compared to the striking ones (Tab. 6-7). Conversely, strong increases with respect to the previous data (e.g. *Grammoptera ruficornis*, *Stenurella melanura*) might sometimes be misleading since banal species were never collected proportionally to their abundance in the past.

Thus, the identification of the status of each species cannot only derive from statistical analyses but from different objective and subjective advisements as well. For example, the abundance (i.e. the number of collected specimens) may indicate the good conservation status of a species having limited frequency (i.e. the number of colonised localities or data). Moreover, the geographical spread of old records may suggest the real past consistence of a species, since split records imply a wide distributional range. Finally, the direct observations of past authors, the situation of a species in the neighbouring regions (6.3.) and the floristic modifications occurred in the country (5.3.) can furnish further supporting elements.

For example, *Agapanthia villosoviridescens* increased by 475% from 1917 to 1980 (>138% of all data) and only by 43% from 1981 to 2014 (<236% of all data). The data seem to be contradictory, but the species increased by 725% from 1917 to 2014 (~700% of all data); thus, its presence can be considered as substantially stable.

The real situation of some species remains, however, questionable, especially for those having a cryptic behaviour (see 5.2.3).

5.2.2 Extinct species

The chronically small number of local entomologists and the fact that Luxembourg is usually disregarded by the foreign ones make it difficult to discern whether a species is really extinct or simply was not found during the recent investigations. Consequently, only the species not collected after WWI and characterised by remarkable habitus or/and diurnal activity are included in this section. Cryptic species or with a short phenology are considered as "assumed extinct", especially if they have recently been found in neighbouring countries.

The species reasonably extinct from Luxembourg are: *Cerambyx cerdo*, *Ropalopus clavipes*, *Purpuricenus kaehleri*, *Chlorophorus sartor*, *Chlorophorus varius*, *Strangalia attenuata*, *Necydalis major*, *Dorcadion fuliginator*. Among the species of this group, *Cerambyx cerdo* (4.2.1.1.) has been inserted in the local Red List (RGD, 2009).

The autochthonous Cerambycids extinct in Luxembourg may be merged in different groups according to their biological or chorological characteristics.

Dorcadion fuliginator is the only species of the region feeding on roots of herbaceous plants of grassland, while *Cerambyx cerdo*, *Ropalopus clavipes*, *Purpuricenus kaehleri*, *Chlorophorus sartor*, *Chlorophorus varius* and *Strangalia attenuata* are thermophilic species related to oaks and Rosaceae.

Examining the geonemy, they show the following distributions: Western Palaearctic (1 sp.), European (1), Euro-Anatolian (2), Euro-Turanian (2) and Eurasian (1). Only one (Strangalia attenuata) has a trans-Siberian relationship, while the large majority (6 spp. = 85.7%) belong to temperate categories (Western Palaearctic, European, Euro-Anatolian, Euro-Turanian).

Considering the neighbouring regions (Tab. 1), all species still survive in Alsace, while the Netherlands never hosted most of them (*Cerambyx cerdo*, *Purpuricenus kaehleri*, *Chlorophorus sartor*, *C. varius*). The same seems to apply to the French Ardennes, though local ancient data are presumably missing. The remaining regions show situations more or less analogous to Luxembourg: *Ropalopus clavipes*, *Purpuricenus kaehleri* and *Chlorophorus varius* have largely disappeared from all over northern Europe (Horion, 1974; Klausnitzer & Sander, 1978), while *Cerambyx cerdo* and *Chlorophorus sartor* from Belgium. *Dorcadion fuliginator* is currently considered as completely extinct (Belgium) or critically endangered (Netherlands, Rhineland-Palatinate).

Examining the host plants, all are still widespread in the country (6.5.3); thus, the extinctions have no trophic reasons. A generic environmental deterioration due to the agriculture after WWII, especially after the 1960s (Matter, 1998; Braunert, 2009), can not be invoked as a primary cause. In fact, these species became extinct already after WWI or even in the early 20th century, a long time before the use of chemical treatments or a massive agriculture. Moreover, most of them never settled the Netherlands or have already declined from northern Europe (e.g. *Cerambyx cerdo* from England and Sweden) in much more ancient epochs.

Thus, the extinctions observed in Luxembourg fit the situations observed in the entire area, especially its north-western part, in the same period. Since trophic reasons and environmental deterioration are not evidently supported, climatic reasons should be invoked.

Their absence in the Netherlands and their current survival in Alsace imply that these species are related to more continental climates. Thus, the increasing of oceanicity of the Luxemburgish climate (5.3.7) and most likely, of the whole northern coastal region, played a crucial role in their decline. Not by case, the emergences in Luxembourg of all species occurred mostly, or only, in July (Figs. 300-301), the only month subject to both decrease of temperature (Tab. 106) and increase of rainfall (Tab. 107).

To those species, some others related to conifers, especially to Scots pine (*Oxymirus cursor*, *Arhopalus ferus*, *Acanthocinus aedilis*) should be added. The first two are certainly introduced, while the last one is or was autochthonous for a long time. Their extinction is most likely related to forest management privileging spruce against pines (6.5.3).

5.2.3 Assumed extinct species

This section includes species no longer observed after WWI, but whose habit (nocturnal or cryptic) or habitus (small or mimetic) suggest a certain prudency concerning their real presence in Luxembourg. These species are *Rhamnusium bicolor*, *Pogonocherus ovatus*, *Acanthocinus aedilis*, *Arhopalus ferus* and *Oxymirus cursor*.

Rhamnusium bicolor (4.3.1.4) is related to rotten cavities of old broadleaf trees, especially those of urban avenues. Though no longer observed in Luxembourg, it is still present in the other regions where it was recorded, except for the Netherlands (Zeegers & Heijerman, 2008). The particular difficulty for this species is that not the favourable habitat has to be identified, but the plant individual hosting the species. However, urban management has nearly certainly eradicated it from the towns.

Pogonocherus ovatus (4.5.5.1) is absent from the Saarland (Niehuis, 2001) and the Franch departments neighbouring Luxembourg (Colson, 1981; Matter, 1998; Ligeron, 2005), while it is extinct from Belgium and the Netherlands (Zeegers & Heijerman, 2008). Nonetheless, there are no apparent reasons to suppose the extinction of a polyphagous widespread species. Possibly, its small and mimetic habitus might explain why it is so rarely collected.

Acanthocinus aedilis (4.5.1.1) is a mimetic autochthonous species in regression in the regions closer to Luxembourg (Ligeron, 2005; Zeegers & Heijerman, 2008) and by now extinct in the Saarland and northern Lorraine (Colson, 1981; Niehuis, 2001). *Arhopalus ferus* (4.4.1.2) is an introduced nocturnal species, which was seldomly intercepted in Rhineland-Palatinate, the Netherlands and Belgium before WWI (Lameere, 1894; Everts, 1903; Niehuis, 2001; Zeegers & Heijerman, 2008) and it is completely unknown in Saarland, French Ardennes and northern Lorraine (Fournel & Gehin, 1846; Godron, 1866; Colson, 1980b; Ligeron, 2005; Niehuis, 2001). *Oxymirus cursor* (4.3.1.3) is a prevalently nocturnal species, autochthonous in the Vosges and maybe in Rhineland-

Palatinate (Colson, 1980a; Niehuis, 2001), while it has been introduced to the northern Ardennes (Lameere, 1885; 1894; Collart, 1941).

These last three species are relatively large but their behaviour is quite cryptic, being principally collected under barks or at light. They are all related to Pinaceae, especially pines; thus, their decline in Luxembourg is possibly related to the forest management privileging spruce since the beginning of the 20th century (Faber, 1913b).

None of these species has been inserted in the local Red List (RGD, 2009).

5.2.4 Threatened species

This section includes species with a more or less sensible decrease of their presence or whose increase was lower than the increase of the research during the last century (Tab. 9). The increase of observations in the period 2009-2014 (3.2) added no or very scarce data regarding these species, confirming the trend already observed in the previous period.

The following 18 species can be inserted in this group: *Hylotrupes bajulus*, *Callidium violaceum*, *Plagionotus arcuatus*, *Xylotrechus arvicola*, *Stenocorus meridianus*, *Rhagium sycophanta*, *Dinoptera collaris*, *Leptura aethiops*, *Stenurella bifasciata*, *Asemum striatum*, *Tetropium castaneum*, *Spondylis buprestoides*, *Saperda populnea*, *Saperda carcharias*, *Oberea oculata*, *Pogonocherus fasciculatus* and *Lamia textor*. Among the species of this group, only *Lamia textor* (4.5.9.1) has been inserted in the local Red List (RGD, 2009).

Additionally, *Prionus coriarius*, *Paracorymbia fulva* and *Saperda scalaris* are possibly in slow decline.

The species of this group (5.2.4) related to broadleaf trees are all autochthonous and may be merged in some groups.

The first one includes saproxylic species principally related to oak woods (*Plagionotus arcuatus*, *Xylotrechus arvicola*, *Stenocorus meridianus*, *Rhagium sycophanta*, *Leptura aethiops*). In this case, the substitution of old oaks by beech may be invoked as the primary reason. Oak is not their only host, but possibly, they are disadvantaged in the competition with other species better adapted to beech (e.g. *Rhagium mordax*, *Clytus arietis*, *Leptura maculata* and *L. aurulenta*, all increasing species).

The second group includes species related to living Salicaceae with a very large Eurasian distribution (*Saperda populnea*, *Saperda carcharias*, *Oberea oculata*, *Lamia textor*). Analogous rarefactions have been observed in Rhineland-Palatinate, northern Lorraine and Alsace, where the regularisation of rivers was invoked as principal reason (Colson, 1980b; 1981; Matter, 1998; Niehuis, 2001). Actually, willows were also strongly reduced in Luxembourg (Niemeyer et al., 2010). In addition, the beetles were directly fought against, being indicated as pests in the forestry manuals (Ferrant, 1907a, 1911).

Stenurella bifasciata and *Paracorymbia fulva* are thermophilic species, mainly related to xeric grasslands, habitats that are disappearing more and more in the country due to agriculture and reforestation.

Finally, *Dinoptera collaris* is in regression in all regions neighbouring Luxembourg and even in Brittany (Gouverneur & Guérard, 2011), without any apparent reasons.

Among the species biologically related to conifers (*Hylotrupes bajulus*, *Callidium violaceum*, *Asemum striatum*, *Tetropium castaneum*, *Spondylis buprestoides*, *Pogonocherus fasciculatus*), a large majority is related to pines; thus, the forest management (6.5.3) is most likely the primary cause of their decline, as it occurred for the extinct *Acanthocinus aedilis* and *Arhopalus ferus*. The nearly extinction of the synanthropic *Hylotrupes bajulus* is obviously related to the improvement of construction techniques.

More difficult to explain is the seeming decline of *Tetropium castaneum*, since their larvae are related to different genera of conifers. A change in forestry can not be invoked since other species related to spruce have even increased (*Rhagium inquisitor*, *Stictoleptura rubra*) or were introduced in a more recent time (*Gaurotes virginea*, *Paracorymbia maculicornis*, *Anastrangalia dubia*). Possibly, *Tetropium castaneum* is succumbing in the direct competition with the other mentioned species or the dark coloration makes it a relatively cryptic species.

In conclusion, forestry reasons (agriculture, reforestations and privileging of some arboreal species) seem to be the main cause of the rarefaction of certain species.

5.2.5 Regressing distributions

The analysis of the distribution during the last century has evidenced that some cerambycid species are in slow regression in south-eastern direction, while no one shows a regression toward other directions.

The following seven species can be inserted in this group; some of them also show a decrease of data: *Prionus coriarius*, *Pyrrhidium sanguineum*, *Stenocorus meridianus*, *Paracorymbia fulva*, *Stenurella bifasciata*, *Phytœcia cylindrica* and *Tetrops praeustus*.

5.2.6 New introductions

The identification of species new for a country is a fact strictly related to quantity and quality of the local research. Scarcely attractive, cryptic and poorly studied groups offer a novelty rate certainly larger than other groups; consequently, recently "discovered" species showing these characteristics were probably present, but hidden, in the countries since long.

For this reason, *Phymatodes rufipes*, *Xylotrechus rusticus*, *Molorchus umbellatarum*, *Cortodera humeralis*, *Anoplodera rufipes*, *Grammoptera ustulata* and *G. abdominalis*, *Phytœcia icterica*, *Oberea linearis*, *Exocentrus adspersus* and *E. punctipennis* are not considered in this section, though only recently recorded.

Except for some particular cases, this group includes species that can be supposed reasonably introduced due to their outstanding habitus or behaviour. The considered period includes the time from WWI until today since sufficient data are not available for the species that colonised or have been introduced into the country before.

The following six species (with dates of first observation) can be mentioned: *Obrium brunneum* (1967), *Paracorymbia maculicornis* (1977), *Calamobius filum* (2005), *Leiopus femoratus* (2007), *Gaurotes virginea*, (2011) *and Anastrangalia dubia* (2011).

Obrium brunneum, *Paracorymbia maculicornis*, *Gaurotes virginea* and *Anastrangalia dubia* have most probably been introduced by man through artificial plantations of spruce. The data of *Obrium brunneum* and *Gaurotes virginea* agree with the observations from the Saarland and from Belgium, respectively, while *Paracorymbia maculicornis* was found in the Saarland and *Anastrangalia dubia* in Palatinate already in 1967 (Niehuis, 2001; Drumont & Grifnee, 2005; Drumont et al., 2012).

Calamobius filum and *Leiopus femoratus* are certainly cryptic species, but their introduction has been observed in corresponding periods in neighbouring regions and even in Brittany (Gouverneur & Guérard, 2011). The expansion of *Calamobius* seems to have started from Rhineland-Palatinate and Alsace since the 1960s (Matter, 1998, Niehuis, 2001), while that of *Leiopus femoratus* has begun from eastern Europe since the late 1990s (Berger, 1999; Brustel et al., 2002; Callot, 2003; Malderen, 2006; Gerend & Meyer, 2007; Teunissen & Jansen, 2009).

5.2.7 Increasing populations

Based on the limits mentioned in the premise, the species having an increase at least twice as that calculated for all data were inserted in this group. They are (in order of greater increase):

Stenurella melanura, *Stictoleptura rubra*, *Grammoptera ruficornis*, *Leptura maculata*, *Anoplodera sexguttata*, *Leptura aurulenta*, *Leiopus linnei*, *Rhagium mordax*, *Mesosa nebulosa*, *Pyrrhidium sanguineum*, *Alosterna tabacicolor* and *Clytus arietis*.

Though it showed important increases, *Rhagium bifasciatum* (4.3.1.5) is not considered as an increasing species since it was collected in greater number in only one locality thanks to the use of traps, a technique disregarded in the past. Among the species of this group, Leptura aurulenta (4.3.2.15) has been inserted in the local Red List (RGD, 2009).

The analysis of this group (5.2.7) shows an increase of polyphagous species related to mesophil humid woods of broadleaf trees (*Pyrrhidium sanguineum*, *Grammoptera ruficornis*, *Alosterna tabacicolor*, *Leptura maculata*, *Stenurella melanura*, *Leiopus linnei*, *Pogonocherus hispidulus*), in particular beech (*Clytus arietis*, *Rhagium mordax*, *Anoplodera sexguttata*, *Leptura aurulenta*).

Another group includes introduced species related to conifers, especially to spruce (*Stictoleptura rubra* and *Paracorymbia maculicornis*).

5.2.8 Phenological changes

Phenological changes have been observed in mites (Zhou et al., 1996), butterflies (Kuchlein & Ellis,

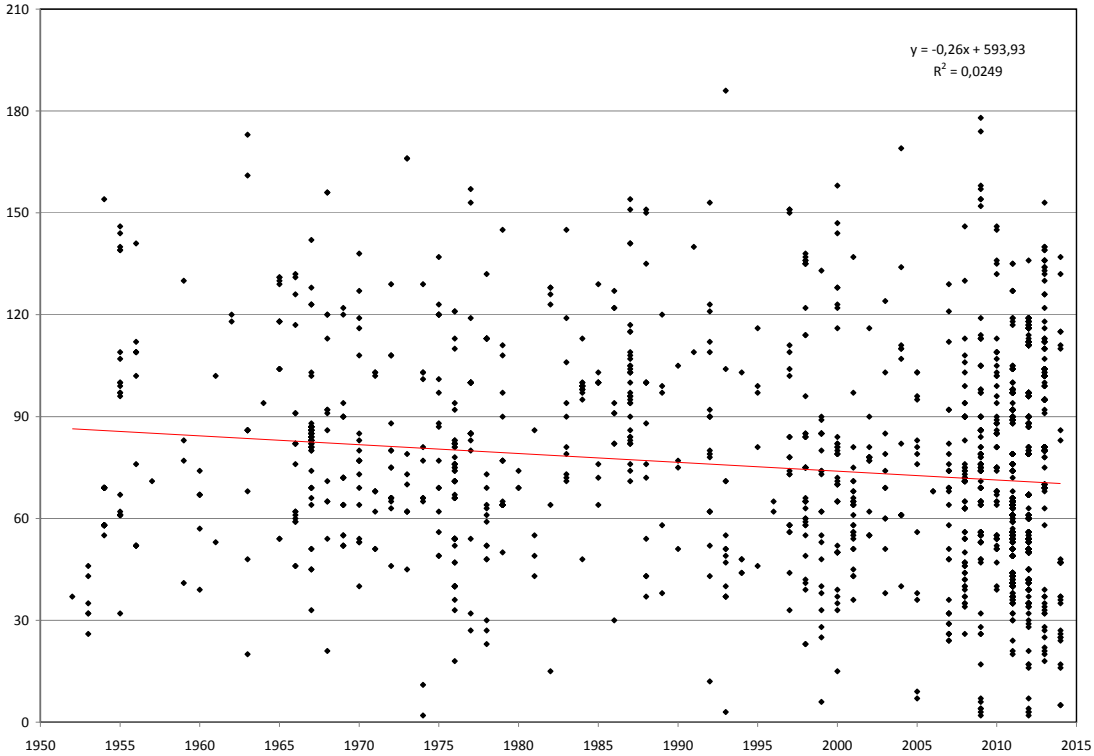


Fig. 300: Plot of the dates of all cerambycid sightings in Luxembourg since 1950. The sighting date is given as days after 1 April so that 1 April is 1, 1 May is 31 and 1 June is 62, etc.

1997; Woiwod, 1997; Roy & Sparks, 2000; Forister & Shapiro, 2003; Stefanescu et al., 2003) and plants (Bradley et al., 1999; Ellwood et al., 2013) from different parts of the world. Most authors evidenced an earlier emergence, attributing this fact to an average increase of temperature in spring.

Cerambycids of Luxembourg show an earlier phenology at least since 1950 (Fig. 300), with a significant negative correlation between time and mean date of sightings (Pearson $R = 0.135$, $p < 0.001$). The slope of the equation indicates that the mean sighting date is anticipated on average one day every four years, thus making a total shift to earlier sightings of about 17 days since 1950.

A regression might be observed for previous periods as well, but anterior data are not available since they are only assumed (see 3.1.2-3.1.4) and consequently, imprecise. Comparing the data provided by Mousset's catalogue (1969) to recent data (1970-2014), the Cerambycids of Luxembourg confirmed this tendency to anticipate their phenology (Tab. 8). This is evident both comparing the global phenology of all species (Fig. 301), as well all available collection data (Fig. 302).

Tab. 8: Global observed phenology of the Luxembourgish Cerambycids in the old (1854-1969) and the recent (1970-2014) period. The peak of phenology is marked in bold.

Month	Number of species		Percentage	
	1864-1969	1970-2014	1864-1969	1970-2014
January	5	3	2.9%	1.3%
February	2	4	1.1%	1.7%
March	3	9	1.7%	3.8%
April	3	24	1.7%	10.1%
May	26	52	14.9%	21.8%
June	38	**66**	21.7%	**27.7%**
July	**62**	49	**35.4%**	20.6%
August	28	21	16.0%	8.8%
September	4	6	2.3%	2.5%
October	2	2	1.1%	0.8%
November	0	0	0%	0%
December	2	2	1.1%	0.8%

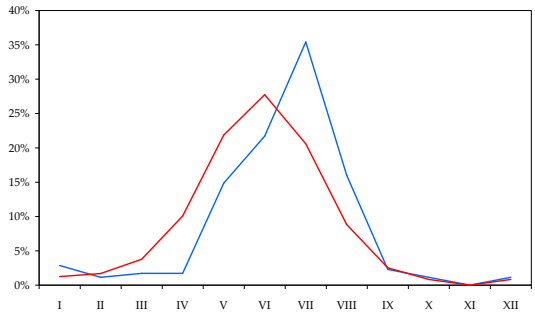


Fig. 301: Comparison of the global observed phenology of the Luxembourgish Cerambycids in the old (blue) and the recent (red) period. The number of species is expressed as percentage.

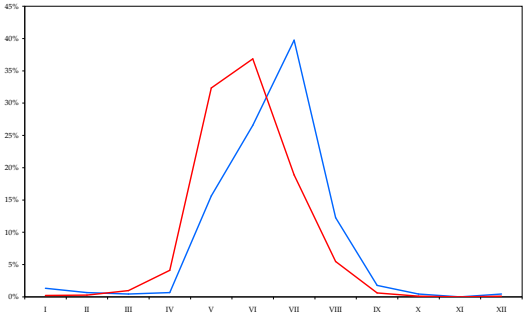


Fig. 302: Comparison of all collection data concerning Luxembourgish Cerambycids in the old (blue) and the recent (red) period. The number of specimens is expressed as percentage.

5.3 Changes observed in the Cerambycofauna of the neighbouring regions

The provided data concern all regions neighbouring Luxembourg on the basis of the available literature (2.1.1.1). The Department of the French Ardennes will not be treated here since the author (Ligeron, 2005) did not provide comments and past literature was unavailable.

5.3.1 Rhineland-Palatinate and Saarland

Niehuis (2001) evidenced and deeply discussed the faunistic changes observed in the Cerambycofauna of Rhineland-Palatinate and the Saarland. The following categories concern only the species recorded from Luxembourg as well.

The extinct species are *Ropalopus clavipes*, *Purpuricenus kaehleri* and *Chlorophorus glabromaculatus* (sub "*pilosus*"). According to the author, they are all thermophilic species, which are currently extinct all over Germany.

Cerambyx cerdo, *Chlorophorus figuratus*, *Strangalia attenuata* and *Dorcadion fuliginator* have strongly reduced their distribution in Rhineland-Palatinate or the Saarland but they are still largely widespread in the southern and/or eastern regions of Germany. Moreover, *Agapanthia villosoviridescens* and *A. cardui* (sub "*pannonica*") are considered as declining due to the reduction of fields, while *Strangalia attenuata*, *Phytœcia icterica* and *Pogonocherus ovatus* are considered as having a discontinuous occurrence (extinct and recently found again).

Gracilia minuta and *Chlorophorus glabromaculatus* are considered as adventive species of Mediterranean origin.

Hylotrupes bajulus, *Callidium violaceum* and *C. aeneum*, *Molorchus minor*, *Oxymirus cursor*, *Rhagium inquisitor*, *Gaurotes virginea*, *Stictoleptura rubra*, *Arhopalus ferus* and *A. rusticus*, *Asemum striatum*, *Tetropium castaneum*, *Spondylis buprestoides*, *Pogonocherus fasciculatus* and *Acanthocinus aedilis* are considered as expansive since the 18th century. All species are related to Pinaceae, but their consistence has not been discussed for the last century.

Finally, *Exocentrus punctipennis* and *Calamobius filum* are the only expansive species, whose larvae are not related to conifers.

5.3.2 Northern Lorraine

The analysis of the faunistic changes is not formally stated by recent authors but it can be evidenced by the comparison between old (Fournel & Gehin, 1846; Godron, 1866) and recent catalogues (Colson, 1980a; 1980b; 1981). The following categories concern only the species recorded from Luxembourg as well.

Accordingly, *Ropalopus clavipes*, *R. femoratus*, *Phymatodes rufipes*, *Purpuricenus kaehleri*, *Gracilia minuta*, *Rhamnusium bicolor*, *Rhagium bifasciatum*, *Phytœcia icterica*, *Anaesthetis testacea*, *Pogonocherus ovatus* and *Acanthocinus aedilis* are assumed extinct species.

Cerambyx cerdo, *Hylotrupes bajulus*, *Phymatodes alni*, *Chlorophorus figuratus*, *C. sartor*, *Dinoptera collaris*, *Saperda populnea*, *S. carcharias*, *Tetrops praeustus*, *Pogonocherus hispidulus*, *Dorcadion fuliginator* and *Lamia textor* have strongly reduced their distribution. *Phymatodes testaceus*, *Aromia, moschata*, *Rhagium sycophanta* and *R. inquisitor* as well as *Grammoptera ustulata* are feebly declining.

Callidium violaceum, *Stenopterus rufus*, *Anastrangalia dubia* and *Phytœcia caerulescens* showed a discontinuous occurrence.

Molorchus minor, *M. umbellatarum*, *Cortodera humeralis*, *Anoplodera sexguttata*, *Paracorymbia maculicornis*, *Alosterna tabacicolor*, *Judolia cerambyciformis*, *Leptura aurulenta*, *L. maculata*, *Agapanthia villosoviridescens* and *A. cardui* are considered as expansive species.

5.3.3 Alsace

Matter (1998) updated the Alsatian Cerambycofauna, noticing that some ancient records are actually erroneous or unverifiable due to the destruction of old collections. Nonetheless, he remarked the variation in consistence of some species, which are summarised hereafter. The following categories concern only the species recorded from Luxembourg as well.

Accordingly, *Cerambyx cerdo*, *Hylotrupes bajulus*, *Purpuricenus kaehleri* and *Lamia textor* have strongly reduced their distribution. *Aromia moschata*, *Callidium violaceum*, *Arhopalus rusticus*, *Tetropium castaneum*, *Saperda carcharias*, *Anaesthetis testacea* and *Dorcadion fuliginator* are declining.

Leiopus femoratus (Callot, 2003) and *Calamobius filum* should be considered as expansive species.

5.3.4 Belgium

The analysis of the faunistic changes was principally based on the online distribution maps of the saproxylic beetles from Belgium (Drumont & Grootaert, 2011) in comparison with the bibliographic data, especially, Zeegers & Heijerman (2008). The variations in consistence of the species also recorded from Luxembourg are summarised afterwards.

Accordingly, *Ropalopus clavipes*, *R. femoratus*, *Phymatodes rufipes*, *Purpuricenus kaehleri*, *Chlorophorus figuratus*, *C. sartor*, *C. glabromaculatus*, *Phytœcia icterica* and *Dorcadion fuliginator* resulted to be extinct species. *Cerambyx cerdo* seems to have been recorded recently again (Drumont et al., 2012), but on the basis of questionable findings.

Gracilia minuta, *Rhamnusium bicolor*, *Strangalia attenuata*, *Acanthocinus aedilis*, *Pogonocherus ovatus* and *Lamia textor* have strongly reduced their distribution. *Cerambyx scopolii*, *Arhopalus ferus*, *Dinoptera collaris*, *Leptura aethiops*, *Saperda populnea* and *Phytœcia caerulescens* seem to be declining.

Xylotrechus rusticus and *Anoplodera rufipes* showed a discontinuous occurrence.

Rhagium inquisitor, *Gaurotes virginea*, *Paracorymbia fulva*, *Anastrangalia dubia*, *Leptura aurulenta*, *Agapanthia cardui*, *Calamobius filum* and *Leiopus femoratus* are considered as expansive species.

5.3.5 The Netherlands

The data provided by Zeegers & Heijerman (2008) are doubtful, since the authors enumerate a total number of species even superior to Luxembourg, though most of them are considered as rare or very rare. Moreover, the comparison with the past literature (Everts, 1903; 1922; Horion, 1974) evidenced that some species extinct in the whole area since the early 1900, such as *Ropalopus clavipes*, or once considered as adventive, such as *Oxymirus cursor*, are listed as present. In contrast, some species such as *Dorcadion arenarium*, once considered as extinct, have been recently rediscovered (Teunissen et al., 2005).

Consequently, the analysis of the faunistic change results uncertain, except for *Leipous femoratus* (Teunissen et al., 2009) and *Calamobius filum* (Belgers, 2012), the only surely expansive species.

5.4 Faunistic changes observed in other insects of Luxembourg

5.4.1 Coleoptera

Beetles are relatively poorly studied in Luxembourg: Mousset's catalogue and maps (1969, 1973) only cover some families and few check-lists (Braunert, 1996, 2009; Braunert & Gerend, 1997, Gerend, 2003, Vitali, 2012a) have been added in more recent times.

Only some of the most recent checklists can be used, since they encompass a longer period. Nonetheless, past and current consistence of every treated species is nearly always unknown and the faunistic changes are completely overlooked or superficially analysed. Usually, 6-10% of the past fauna is considered as extinct (Braunert & Gerend, 1997; Braunert, 2009), but this rate is ambiguous since numerous new species have been added in more recent times and the reasons are not clearly identified or defined. Actually, the data are also incomplete since some important public and private collections were ignored and most of the local literature was not cited either. However, the species mentioned as lost can be merged in clearly defined groups on the basis of the known literature (Jeannel, 1941; 1942; Hoffmann, 1950; 1954).

The extinct Carabidae (Braunert, 1996; Braunert & Gerend, 1997) include a group of species related to moorlands: *Carabus nitens* Linnaeus, 1758, *Amara famelica* (Zimmermann, 1832), *Amara infima* (Duftschmid, 1812), *Cymindis vaporariorum* (Linnaeus, 1758). A second group includes species related to dry sandy soils, sometimes halophilic or coastal: *Cylindera germanica* (Linnaeus, 1758); *Dyschirius thoracicus* (Rossi, 1790), *Harpalus autumnalis* (Duftschmid, 1812), *Pseuodoophonus calceatus* (Duftschmid, 1812), *Calathus rotundicollis* Dejean, 1828, *Amara lunicollis* Schiödte, 1837, *Amara anthobia* Villa & Villa, 1833.

Gerend (2003, 2006) analysed the ecological exigencies of the locally extinct aquatic beetles (Hydroadephaga, Hydrophilidae), evidencing that 48% belonged to moorland habitats or mesotrophic waters, while the remaining ones were related to peculiar hydrologic conditions (reophilic species or such living in large ponds).

Braunert (2009) observed that the extinction rate of Curculionoidea (6%) was inferior to that of Carabidae (10%), hypothesising that the massive environmental changes due to agriculture after WWII, especially after the 1960s, deteriorated or even destroyed several habitats, causing the rarity of several species. Among the extinct Curculionoidea, all Brachyderini and 6 out of 7 Cleonini became extinct. They are all large wingless thermophilic species related to dry sandy soils. Though winged, *Lixus punctiventris* Boheman, 1836 must be added to this group. Other species (*Bagonus*, *Aulacobaris*, *Sphenophorus* spp.) are related to riparian environments. *Sphenophorus striatopunctatus* (Goeze, 1777) can be inserted in both groups, being contemporaneously thermophilic and related to marshy habitats. Finally, *Pissodes pini* (Linnaeus, 1758) and *P. harcyniae* (Herbst, 1795) are related to pines; it is about the only xylophagous species of weevils becoming extinct.

Concerning the genus *Meloe* (Meloidae), only three out of the eight species recorded in Luxembourg before WWI seem to be present today (Vitali, 2012a). Some of the most southern and steppic species (*M. variegatus* Donovan, 1776 and *M. cicatricosus* Leach, 1811) are most likely extinct, while the most generalist ones (*M. proscarabaeus* Linnaeus, 1758 and *M. violaceus* Marsham, 1802) seem to have survived but they have restricted their distribution to the south-eastern fourth of the Gutland. Definitively, just some of the most

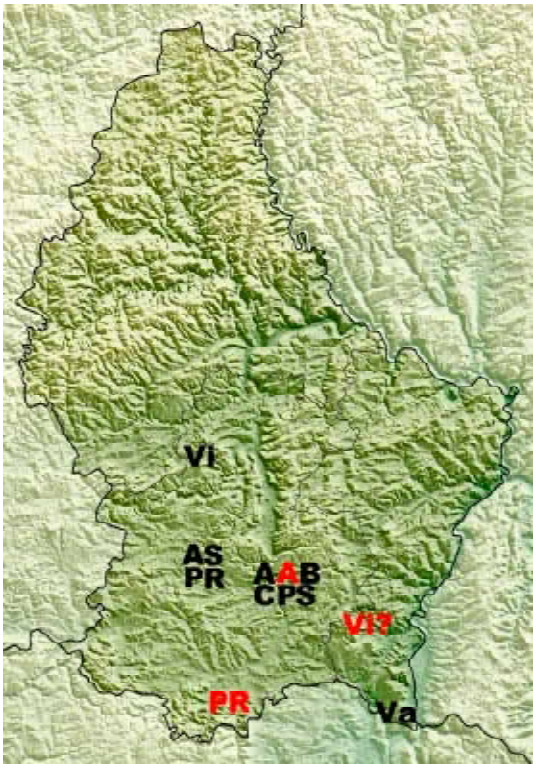


Fig. 303: Past (black) and current (red) distribution of the genus Meloe: A = *M. autumnalis* Olivier, 1792; B = *M. brevicollis* Panzer, 1793; C = *M. cicatricosus* Leach, 1811; P = *M. proscarabaeus* Linnaeus, 1758; R = *M. rugosus* Marsham, 1802; S = *M. scabriusculus* Brandt & Erichson, 1832; Va = *M. variegatus* Donovan, 1776; Vi = *M. violaceus* Marsham, 1802.

steppic species are extinct, while the most generalist ones have regressed to the south-eastern of the country (Fig. 303).

Finally, the study (Vitali et al., 2012) of two threatened species of Scarabaeidae related to rotten cavities of old living broadleaf-trees added further considerations. Accordingly, *Protaetia marmorata* (Fabricius, 1792) and *Osmoderma eremita* (Linnaeus, 1758) have no longer been collected in Luxembourg (the former one after 1962 and the latter one after WWI). The former species is more thermophilic, having become extinct from Belgium in the late 19th century but being still present in Alsace and in some relict localities along the Mosel and the Rhineland-Palatinate. The latter one is more hygrophilic but less thermophilic, being still present along rivers of eastern Belgium and Rhineland-Palatinate, but not in northern Lorraine and Alsace. In both cases, the host plants are still present; thus, different bioclimatic exigencies can explain their different regressions.

5.4.2 Orthoptera

The data provided by Proess (2004) encompasses a relatively short period of time (1958-2004) after having conducted only two months of research for each of the four sectors according to which he divided Luxembourg. Moreover, the choice to consider as extinct a species after only 20 years without records seems exaggerated by considering the scarce number of entomologists interested in this group and the fact that this setting has been proved as wrong for at least two recently "rediscovered" species.

The global historical analysis of the data is lacking, but the author provided comments and interesting distributional maps for each species.

Taking into account the eight species not found in this research, the author considered three as extinct, three as adventive and two as related to non-examined peculiar habitats: *Gryllotalpa gryllotalpa* (Linnaeus, 1758) and *Myrmecophilus acervorum* (Panzer, 1799).

Concerning the extinct ones, *Ephippiger ephippiger* (Fiebig, 1784) is a wingless large species related to thermophilic or xeric habitats, which was fairly common along the Mosel during warm summers until 1960 (Hoffmann, 1960). The species is still locally present in Belgium, Rhineland-Palatinate, very rare in Lorraine and extinct in the Saarland. *Gampsocleis glabra* (Herbst, 1786) is a fairly large thermophilic species, related to steppes or moorlands, absent from the neighbouring regions except for Belgium, where it has no longer been collected after 1951. In Luxembourg, the species was known for two localities of Gutland until 1960 (Hoffmann, 1960).

Concerning the distributional changes, three thermophilic species - *Platycleis albopunctata* (Goeze, 1778), *Sphingonotus caerulans* (Linnaeus, 1767) and *Chorthippus mollis* (Charpentier, 1825) - have regressed in southern direction, while four others related to peculiar habitats (strongly xerophilic or hygrophilic) - *Omocestus haemorrhoidalis* (Charpentier, 1825), *Omocestus viridulus* (Linnaeus, 1758), *Stenobothrus stigmaticus* (Rambur, 1839) and *Chorthippus vagans* (Eversmann, 1848) - have regressed northwards.

In conclusion, two large thermophilic species related to steppes or moorlands became extinct in the 1950-60s and three other thermophilic species have regressed in southern direction. In contrast, four other species related to peculiar habitats (strongly xerophilic or hygrophilic) have regressed northwards. This last behaviour does not find analogy in beetles.

5.4.3 Odonata

The data provided by Proess (2006) encompasses a short period (1951-2005) and the analysis of previously recorded species is ambiguously referred to observations and not to physical specimens; consequently, the author wonders whether extinct species are actually due to misidentifications. For that reason, a comparison of data was prudently overlooked.

However, further data are available in a more recent atlas focused on the Great Region (Trockur et al., 2010), where the authors evidenced species in expansion and in regression. Accordingly, a species of Mediterranean origin, *Crocothemis erythraea* (Brullé, 1832), has begun colonising the region since the late 1970s', while eight other thermophilic species have increased their presence. In contrast, at least seven species related to moorlands have regressed or even became locally extinct.

5.4.4 Rhopalocera

Though dating more than 30 years, the Atlas of Rhopalocera (Meyer & Pelles, 1981) comprises the only detailed analyses on biodiversity, consistence and development of the local fauna. Unfortunately, the data were still incomplete and partially erroneous due to the impossibility to accede to a crucial private collection, which was examined afterwards (Meyer & Pelles, 1989). Accordingly, two out of the seven species previously judged as extinct were proved as misidentified, while no trace of the remaining five was found and many other ones resulted misidentified or missing.

Based on such rectifications, only 23 decreasing species can reasonably be considered for the comparison of data. According to Meyer & Pelles (1981), the reason of this regression is principally due to the anthropization and, secondarily, to unspecified climatic reason.

Actually, the species in regression can be merged in fairly defined groups (Higgins & Riley, 1970). The largest one includes thermophilic species (*Iphiclides podalirius*, *Lysandra bellargus*, *Satyrium spini*, *Philotes baton, Pyrgus fritillarius*, *Pyrgus alveus, Carcharodus alceae*), other ones are related to calcareous or dry grasslands (*Plebejus argus, Lasiommata maera*, *Hipparchia semele*, *Euphydryas aurinia*, *Melitaea diamina*), to margins of woods and hedges (*Aporia crataegi*, *Fabriciana adippe*, *Satyrium pruni*), to moorlands or humid habitats (*Melitaea diamina*, *Lycaena hippothoe*), to wide humid forests (*Apatura ilia*, *Limenitis populi*, *Euphydryas maturna*, *Cœnonympha hero*) or are migratory (*Nymphalis antiopa*, *Colias crocea*).

5.4.5 Conclusions

Definitively, the extinct terrestrial insects mainly belong to rather well defined categories: 1) species related to moorlands, 2) species related to pines, 3) species related to riparian habitats, 4) thermophilic species related to dry sand soils or grasslands.

The first habitat has nearly completely disappeared from Luxembourg due to the artificial plantation of spruce (6.5.3). The exact status of these species (threatened / extinct) depends on their adaptability to other habitats. However, this event does not find correspondence in Cerambycids, since no species colonizes moorlands; on the contrary, some Cerambycids have taken advantage from artificial plantations of conifers (6.1.4).

Pines are declining in Luxembourg due to the forest management privileging spruce since the early 20th century (6.5.3); however, most of these species may have been temporarily introduced.

Riparian habitats have been strongly deteriorated by the regularisation of rivers; however, it has not driven to a complete extinction of any cerambycid species (e.g. *Aromia moschata*, *Oberea oculata*). Possibly, other riparian beetles might have survived, though strongly reduced in their abundance.

Finally, reforestation or cultivations have reduced and sometimes also empoisoned with insecticides and herbicides grassland and sand soils.

The loss of the habitat can explain the extinction of the peculiar species related to moorlands; as well the deterioration of particular habitats can explain the rarefaction of species related to them. Nonetheless, it explains neither their extinction, e.g. of some saproxylic Scarabaeidae (6.4.1), nor the south-eastern regression observed in many groups. Since vegetation changes are not evidently supported, climatic reasons should be invoked.

Concerning the aquatic beetles, no species has become extinct, except for those related to peculiar aquatic habitats no longer present in the country, such as moorlands. Moreover, at least seven species of Odonata related to moorlands have regressed or even became locally extinct. Both events find correspondence in the terrestrial insects related to this particular habitat. In contrast, a Mediterranean dragonfly has colonised the region since the late 1970s and eight thermophilic species have increased their presence.

The provided data suggest that aquatic groups are less or not negatively subject to climatic changes; on the contrary, the thermophilic species seem to have increased. Actually, the increase of the winter temperatures due to the climate oceanisation (5.3.7) positively acts on the waters where larval stadia of aquatic insects develop, e.g. anticipating its warming in spring and retarding or avoiding the formation of ice in winter.

5.5 Vegetation changes

5.5.1 Premise

The analysis of the vegetation changes in Luxembourg during the last century has not been directly treated by any author, unless in indirect manner; nonetheless, it is a crucial topic since all Cerambycids are phytophagous, principally xylophagous.

Further, the botanists' point of view is sometimes completely opposite to those of entomologists, especially if they study phytophagous species.

Finally, the ecological conscience against economic interests has strongly changed in this last century, producing opposite considerations with respect to the past. For example, the renowned Koltz catalogue (1875) enthusiastically enumerated more than 400 local species of trees, whose largest majority were actually introduced plants that negatively interacted with the natural biodiversity. Later, Faber (1913b) incited to massively plant spruces in order to exploit unproductive terrains, even complaining that his suggestion had not been followed for a long time. Such "unproductive terrains" were actually moorlands or sandy soils that hosted peculiar insects today extinct. Another important problem was the protection of the soil against the atmospheric agents, while the excessive moistness caused by the trees on purpose planted is the heaviest problem for saproxylic beetles.

5.5.2 The tree-cover during the 18th and 19th century

Exact climatic data concerning Luxembourg lack until 1853; however, Vitis vinifera L. fructified throughout the country, including the Oesling, until the winter of 1708 (Massard, 2005) and Castanea sativa L. was fairly common until the winter of 1793 (Krombach, 1875). Definitively, the woody surface of the 18th century had more continental characteristics than that of the present day.

In order to understand the past consistence of the Luxembourgish tree-cover, Napoleon included the country in the Department of Forests between 1795 and 1814. Several cultivated areas were abandoned due to the continuous wars of the 18th century (Kohn, 1898) and forests covered 101,372 ha in 1830, a consistence that was never registered later (Schmit, 2008).

Towards the end of the Little Ice Age, trees were massively cut, reaching only 76,073 ha in 1865, the lowest consistence ever registered for this country (Schmit, 2008). Paintings of the epoch (Fig. 304) show that trees were usually cut far around fortresses, towns and farms for security reasons against potential enemies, predators and natural disasters. In some localities, the medieval tradition of wood pasture offered open oak forests with warm microclimate (Schmit, 2008). Dry fields and moorlands, today nearly fully exploited by agriculture or artificial plantations of spruce, were once widespread in the country. The same events occurred in Germany (Niehuis, 1995), where the tree-cover was completely devastated and barren vegetation covered most of the territory in the same period of time. This situation lasted until the early 19th century, when e.g. barren vegetation still reached 40% of the whole area in the Vulkaneifel in 1850.

The *Quercetum* nearly exclusively constituted the local forests (Faber, 1913a), except along the rivers, where riparian associations (*Alnetum*, *Salicetum*, *Carpinetum*) dominated. Wood was strongly used for warming, besides for building and cooking. According to Faber (1913b), 90% of forests were exploited for producing firewood still in 1907, while beech was considered as an unhelpful plant for any use. Concerning conifers, only autochthonous populations of Scots pine and Common juniper showed a relict distribution (Welter et al., 2008). Spruce and larch were introduced only in the late 18th century (Koltz, 1875), but a large amount of Scots pines was planted as pioneer plant (Faber, 1901a; 1903b) together with allochthonous pines and cedars around 1840 (Koltz, 1875).

The reforestations considerably increased after 1867, when the Treaty of London obliged Luxembourg to dismantle all fortifications and to plant a belt of trees around the town, an operation that lasted 16 years (Welter et al., 2008). Further foreign conifers were introduced at that time (Koltz, 1875) and the tree-cover reached 77,295 ha in 1879 (Schmit, 2008).

Fig. 304: "Vianden, near the bridge" lead pencil by Jean-Baptiste Fresez, c. 1857 (National Museum of History and Art Luxembourg).

5.5.3 The tree-cover in the 20th century

According to Faber (1901a), forests covered 78,800 ha (i.e. 30.4% of the land area) at the beginning of the 20th century (Fig. 305). Moreover, the phytocenosis was strongly different from that present today, since the natural one has been strongly modified by man and only very few and small forests of the country can be deemed as primeval (Diederich, 1991). Broadleaf trees occupied 74,800 ha (i.e. 95% of the tree cover and 29% of the land area) and conifers occupied only 4,000 ha (i.e. 5% of the tree cover and 1.5% of the land area). Beech was already largely predominant since oaks occupied only 22,000 ha (Faber, 1902). The exact proportion of the coniferous species is unknown, but the 12 local spruce nurseries had a total surface of 18 ha (Faber, 1903a).

In an impressive series of articles published from 1901 to 1914, the forest inspector Faber pressed to make the forests lucrative through spruce plantations for building wood, comparing costs and benefits of the operation, exalting the value of spruce and regrettably evidencing that the neighbouring countries had already planted an enormous amount of these trees. Forests reached

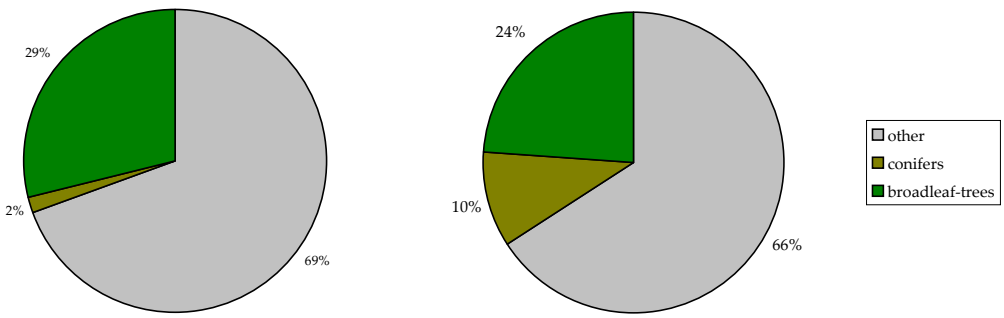


Fig. 305: Development of the tree-cover in Luxembourg: 1901 (left) and 2007 (right), according to Faber (1901a) and MCPFE (2007).

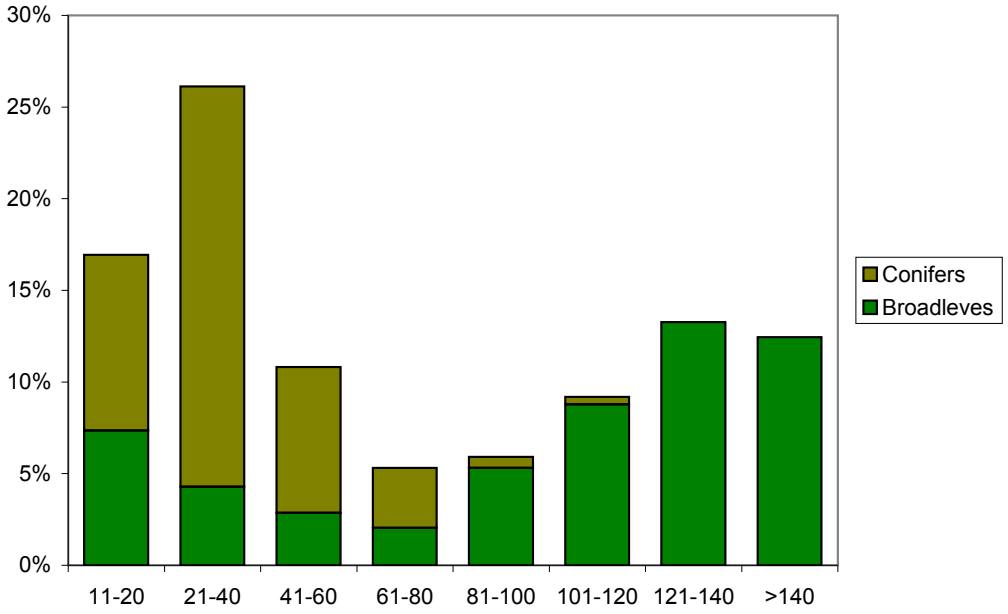


Fig. 306: Age-class distribution of all even-aged forest types in Luxembourg in 2005 (MCPFE, 2007).

83,363 ha in 1907 (Schmit, 2008) and conifers had already more than doubled in 1913, reaching 9,000 ha (Faber, 1913b).

Only few years later, Heuertz (1940) defined the damages on the natural forests as a "vandalism of reasonless exploiters" denouncing that the modernism had made disappear the luxurious flora of Echternach, with a multitude of typical plants and multifarious fauna, among which *Lucanus cervus* (Linnaeus, 1758), once common and by now only present in collections.

According to the data provided by MCPFE (2007), forests cover 88,200 ha (i.e. 34% of the land area) in 2005, broadleaf trees occupy 62,000 ha and conifers occupy 26,200 ha (Fig. 305).

According to the Administration des eaux et forêts du Grand-Duché de Luxembourg (2002), the Habitats Directive protects 37,550 ha of the local forests, but according to MCPFE (2007), 86.1% are actually available for wood supply and no tree is treated according to the World Conservation Union (IUCN) Red List.

Considering the age-class distribution of all even-aged forest types (Fig. 306), more than half of the trees (54%) are 60 years old, or less. However, the distribution is unnaturally bimodal, evidencing the overexploitation in the past. Centenarian trees cover 17,000 ha (25.8%), but those aged 80-100 yrs occupy only 2,900 ha, while those aged 60-80 yrs only 2,600 ha (MCPFE, 2007).

Luxembourg results the seventh best European country for new plantations (32% the total forest area) but also in terms of introduced species (30% the total forest area), a value surpassed only by Belgium among the neighbouring regions (MCPFE, 2007). The age-class distributions of coniferous and broadleaf trees (Fig. 306) reveals that (mostly introduced) conifers are 73.6% of the trees aged 41-60 years, 83.6% of those aged 21-40 yrs and 56.6% of those aged 11-20 yrs. In other words, the new plantations are principally devoted to artificial woods of conifers destined to be cut.

In contrast, the Grand-Duchy is the best country of the neighbouring regions for volume of deadwood (both standing and lying) and lists a number of threatened vascular plants which is more than four times bigger than those of Belgium (MCPFE, 2007).

5.6 Climate changes

5.6.1 Climatology in Luxembourg

Climatic data concerning Luxembourg are available only after 1854 since the observations made by professors N. Bodson and P. J. J. van Kerckhof from 1837 to 1852 are nearly entirely lost. Starting from 1854, Prof. François Reuter (1819-1908) published meteorological observations regarding temperature and rainfall in several books and articles. The last ones, dating 1894, were published posthumously.

The first official weather service was created in 1907 and a specific service linked to the airport of Luxembourg-Findel was opened in 1946. Prof. Eugène Lahr (1897-1981) published the results of one century of meteorological observations in 1950 and a more ample work about the Luxembourgish climate in 1964. Finally, the MNHNL published a volume of Ferrantia dedicated to historical analyses and future scenarios of the climatology of Luxembourg (Ries, 2005) and contributed to a climatic atlas (Pfister et al., 2005).

5.6.2 Classification of the Luxembourgish climate

The following results are based on the data collected by the airport Luxembourg-Findel from 1854 and 2013. They should be referred to this locality; however, the climatic indices are not very dissimilar in other localities (Pfister et al., 2005) and the data may be considered as substantially applicable to the whole country.

The climograph of Bagnouls & Gaussen (1953) based on the average month temperatures and rainfall from 1854 to 2013 (Fig. 307) shows that Luxembourg has an oceanic climate, i.e. temperate, with abundant precipitations and without arid season.

According to the Köppen (1936) climate classification based on average temperature and rainfall, the climate of Luxembourg after 1854 is classified as "Cfb", i.e. as "maritime temperate or oceanic climate". The average rainfall index (Lang, 1915) calculated for the same period of time is 88.0, corresponding to a "warm temperate climate, related to the formation of brown earths rich in humus", while the average aridity index (De Martonne, 1926) is 40.7, corresponding to a "humid climate". The average continentality index according to Gams (1931) is ~29°, corresponding to "conditions favourable to sciaphilic and microthermic species", while according to Rivas-Martinez (1987) is 17.47, corresponding to an "euoceanic climate".

Based on the data collected at Luxembourg-Findel from 1931 to 2013, the average annual sunshine is 1761.7 hours, while its distribution shows a maximum in July (Fig. 308).

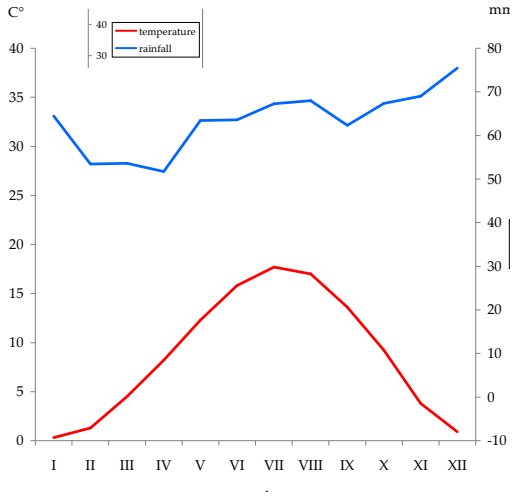


Fig. 307: Climograph Bagnouls & Gaussen (1953) based on the average month temperatures and rainfall observed at Luxembourg-Findel from 1854 to 2013.

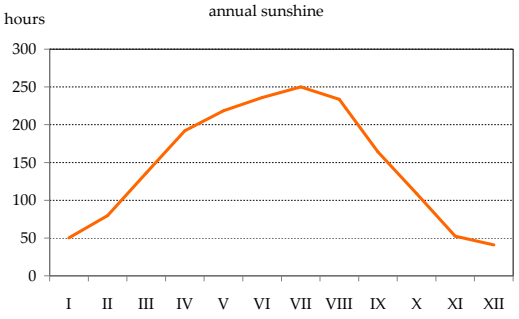


Fig. 308: Distribution of the average annual sunshine for every month, based on the data collected at Luxembourg-Findel from 1931 to 2013.

5.6.3 Historical climate changes

Exact analysis of the climatic changes is only possible since 1854, though historians refer to previous changes (Massard, 2005). Accordingly, Luxembourg enjoyed a favourable climate until the second half of the 16th century (Mediaeval Warm Period), which allowed the development of orchards and viticulture in the whole country. Then, the country was subject to the Little Ice Age, which lasted until the second half of the 19th century. Annals narrate that the Little Ice Age intensified in the winter of 1708, destroying most cultivations and all vineyards of the country except along the Mosel, and in the winters of 1816, 1831, 1840, 1842, 1847 and 1853, reaching -30°C.

5.6.4 Temperature changes

Taking into account the average annual temperature recorded in Luxembourg-Findel from 1854 to 2013 (Fig. 309), the annual mean values fluctuated from 7°C (1879 and 1891) to 10.6°C (2011). The trend line R^2 indicates a global increase of ~1°C in the considered period of time, while the 5-year moving average indicates that the average annual temperature remained almost between 8°C and 9°C until 1990, while it remained between 9°C and 10°C after 1990.

Considering the average monthly temperatures (Figs. 310-321), the trend lines show more or less consistent global increments of temperature, except for July.

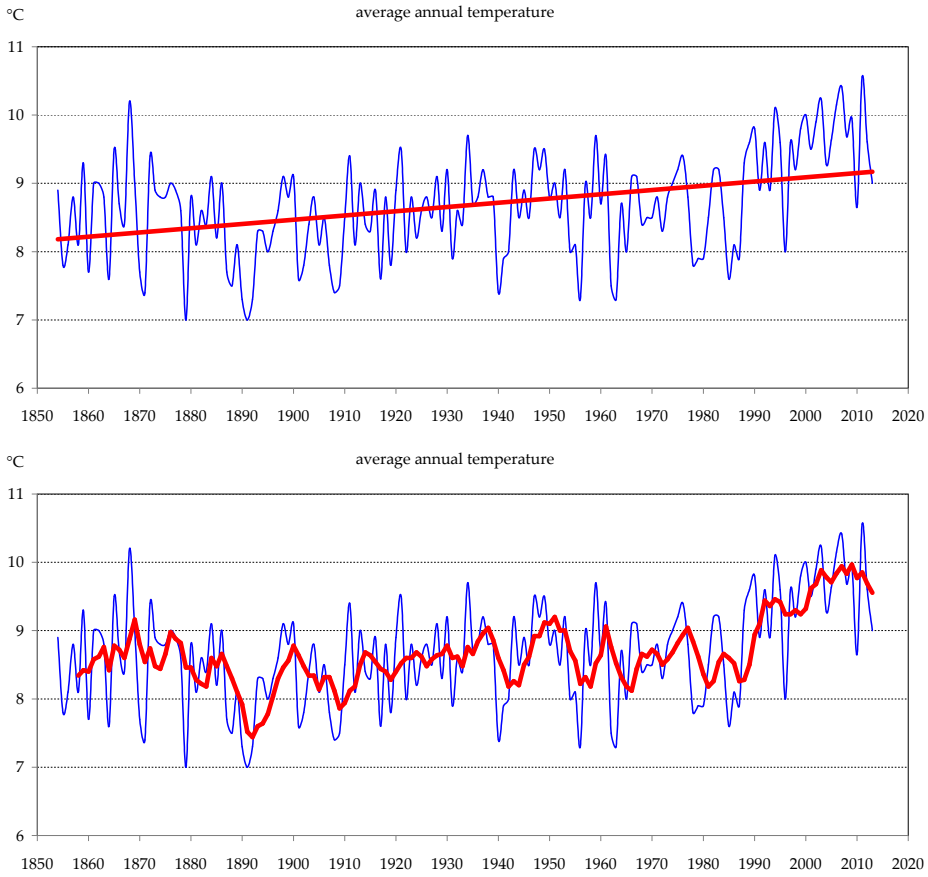


Fig. 309: Average annual temperature in Luxembourg-Findel from 1854 to 2013 (blue) with trend line (red, above) and 5-year moving average (red, below).

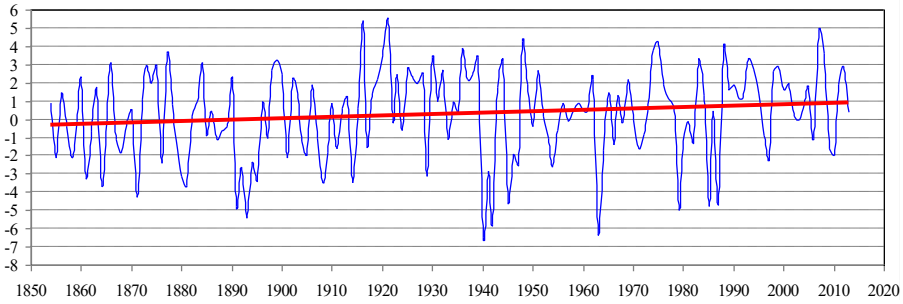


Fig. 310: Average monthly temperature recorded in Luxembourg-Findel in January from 1854 to 2013 (blue) and trend line (red).

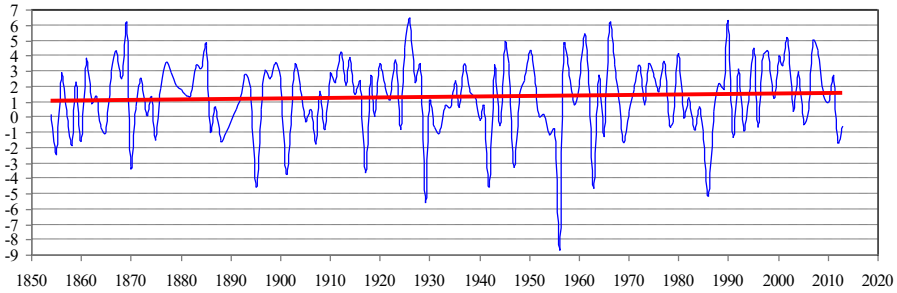


Fig. 311: Average monthly temperature recorded in Luxembourg-Findel in February from 1854 to 2013 (blue) and trend line (red).

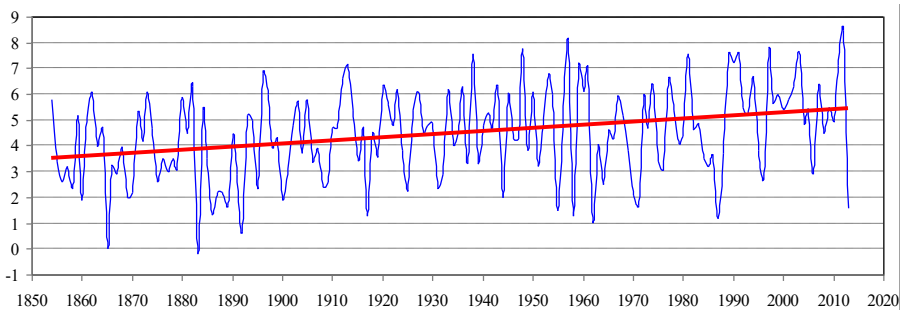


Fig. 312: Average monthly temperature recorded in Luxembourg-Findel in March from 1854 to 2013 (blue) and trend line (red).

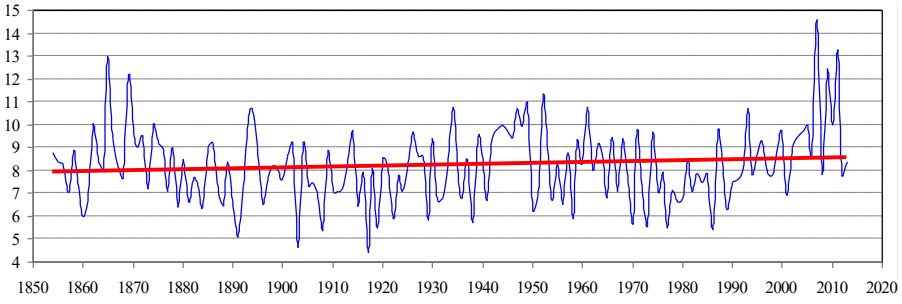


Fig. 313: Average monthly temperature recorded in Luxembourg-Findel in April from 1854 to 2013 (blue) and trend line (red).

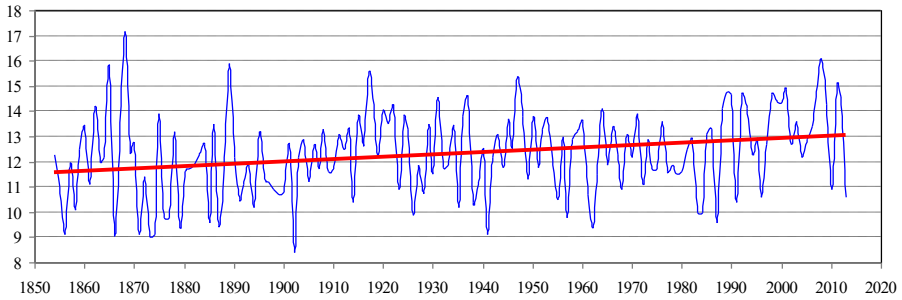


Fig. 314: Average monthly temperature recorded in Luxembourg-Findel in May from 1854 to 2013 (blue) and trend line (red).

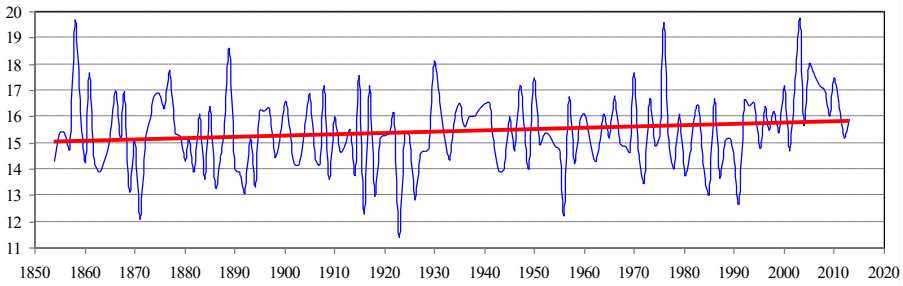


Fig. 315: Average monthly temperature recorded in Luxembourg-Findel in June from 1854 to 2013 (blue) and trend line (red).

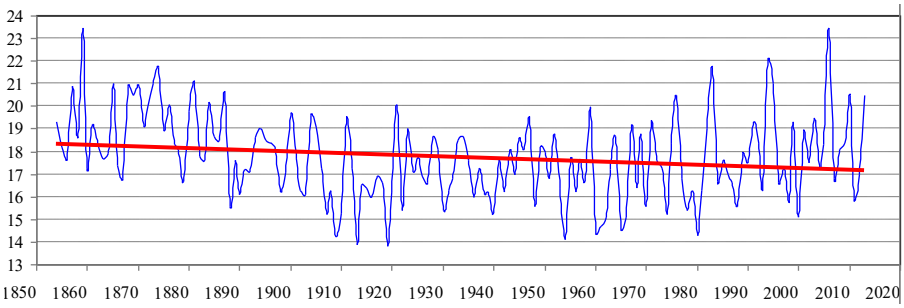


Fig. 316: Average monthly temperature recorded in Luxembourg-Findel in July from 1854 to 2013 (blue) and trend line (red).

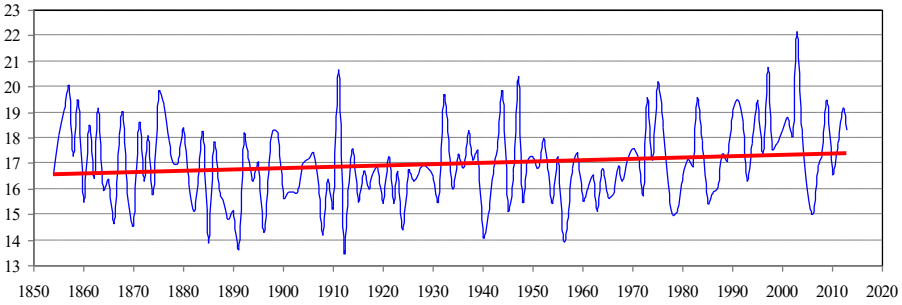


Fig. 317: Average monthly temperature recorded in Luxembourg-Findel in August from 1854 to 2013 (blue) and trend line (red).

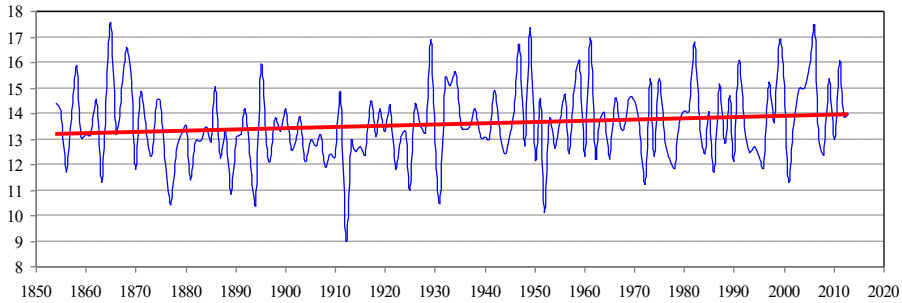


Fig. 318: Average monthly temperature recorded in Luxembourg-Findel in September from 1854 to 2013 (blue) and trend line (red).

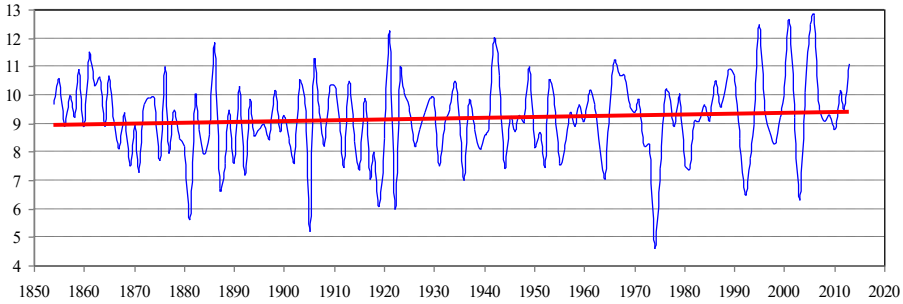


Fig. 319: Average monthly temperature recorded in Luxembourg-Findel in October from 1854 to 2013 (blue) and trend line (red).

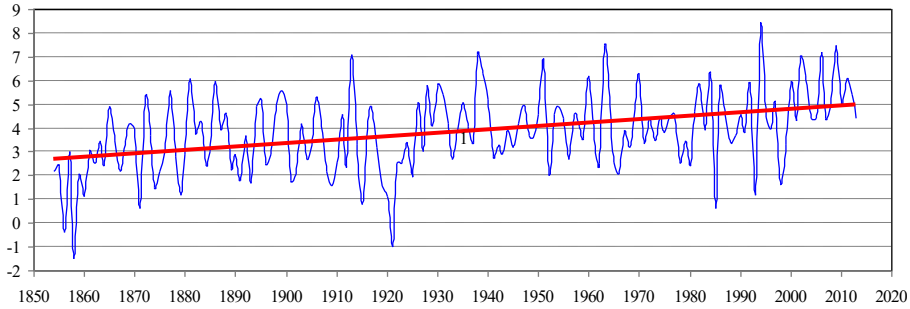


Fig. 320: Average monthly temperature recorded in Luxembourg-Findel in November from 1854 to 2013 (blue) and trend line (red).

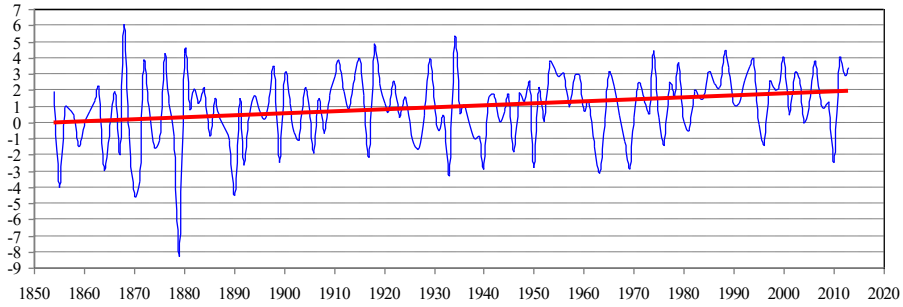


Fig. 321: Average monthly temperature recorded in Luxembourg-Findel in December from 1854 to 2013 (blue) and trend line (red).

Tab. 9: Indicative global changes of the average monthly temperatures recorded in Luxembourg-Findel from 1854 to 2013.

Temperature	1854 (°C)	1854 (°K)	2013 (°C)	2013 (°K)	Δ°	%
January	-0.35	272.8	0.9	274.05	+1.25	+4.6
February	1.0	274.15	1.55	274.7	+0.55	+2.0
March	3.45	276.6	5.45	278.6	+2.00	+7.2
April	7.9	281.05	8.55	281.7	+0.65	+2.3
May	11.55	284.7	13.05	286.2	+1.50	+5.3
June	15.05	288.2	15.8	288.95	+0.75	+2.6
July	18.35	291.5	17.15	290.3	-1.30	-4.5
August	16.6	289.75	17.4	290.55	+0.80	+2.8
September	13.17	286.32	13.95	287.1	+0.78	+2.7
October	8.93	282.08	9.39	282.54	+0.46	+1.6
November	2.66	275.81	4.985	278.135	+2.325	+8.4
December	-0.055	273.095	1.945	275.095	+2.00	+7.3

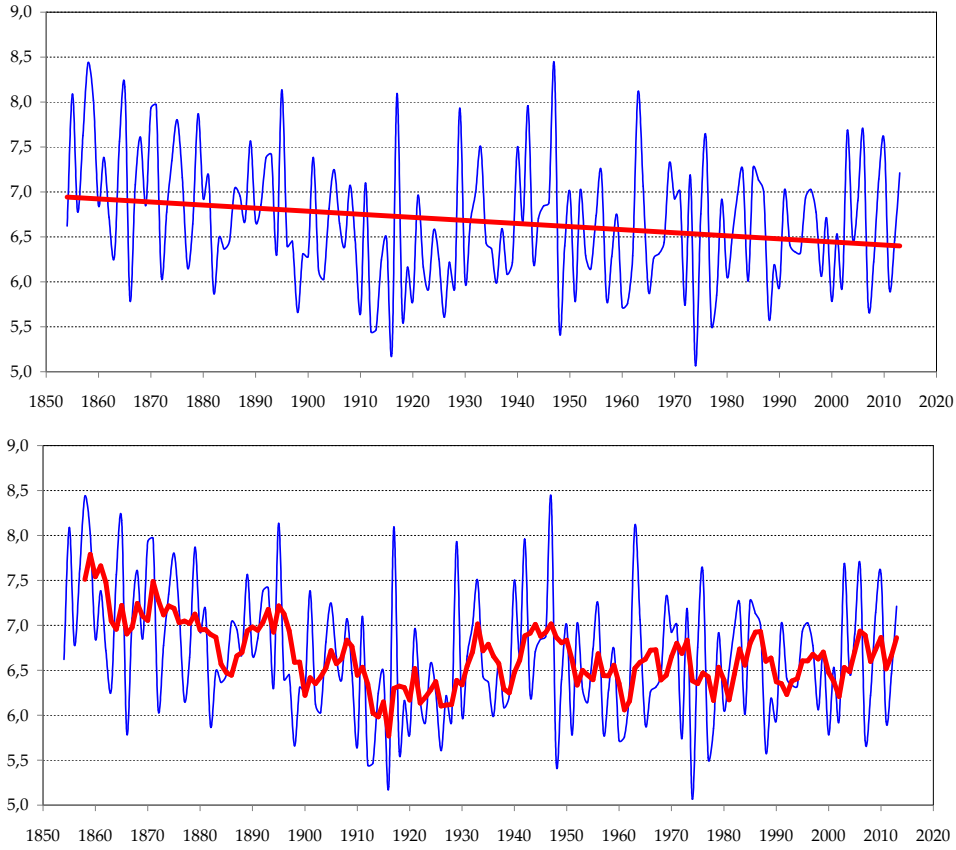


Fig. 322: Standard deviation (σ) of the annual temperature in Luxembourg-Findel from 1854 to 2013 (blue) with trend line (red, above) and 5-year moving average (red, below).

On the basis of the trend lines, the global changes of temperature could be resumed in the Table 9, where the values should not be considered as exact but indicatively referable to a trend. Accordingly, the major contributions to the temperature increase were due to March, November and December (≥2°C), while the summer months showed much less consistent contributions (June +0.75°C; August +0.8°C) or even a temperature decrease (July -1.3°C).

Considering the standard deviation (σ) of the annual temperatures (i.e. the temperature variation every year) recorded in Luxembourg-Findel from 1854 to 2013 (Fig. 322), it fluctuated between 5.07 (1974) and 8.44 (1858). The trend line R^2 indicates a decrease of half point in the considered period of time; namely, the temperatures recorded in the course of the year tend to be more and more uniform. The 5-year moving average indicates that the standard deviation stabilized between 6 and 7 since the beginning of the 20th century and, in more consistent manner, after WWI.

5.6.5 Rainfall changes

Considering the average annual rainfall recorded in Luxembourg-Findel from 1854 to 2013 (Fig. 323), the values fluctuated between 380 mm (1921) and 1059 mm (1866). The trend line R^2 indicates a global increase of >130 mm from 1854 to 2013 (from 693 to 826 mm), corresponding to a percentage increase of 19.3%. The 5-year moving average indicates that the average annual rainfall notably fluctuated in the considered period of time. Relatively dry periods were the last 20 years of the 19th century, the 1940s and the 1970s, but rainfall globally stabilized over 800 mm since 1980.

October and December, followed by November, are globally the wettest months, while the months from February to June are generally the driest ones (Figs. 324-335).

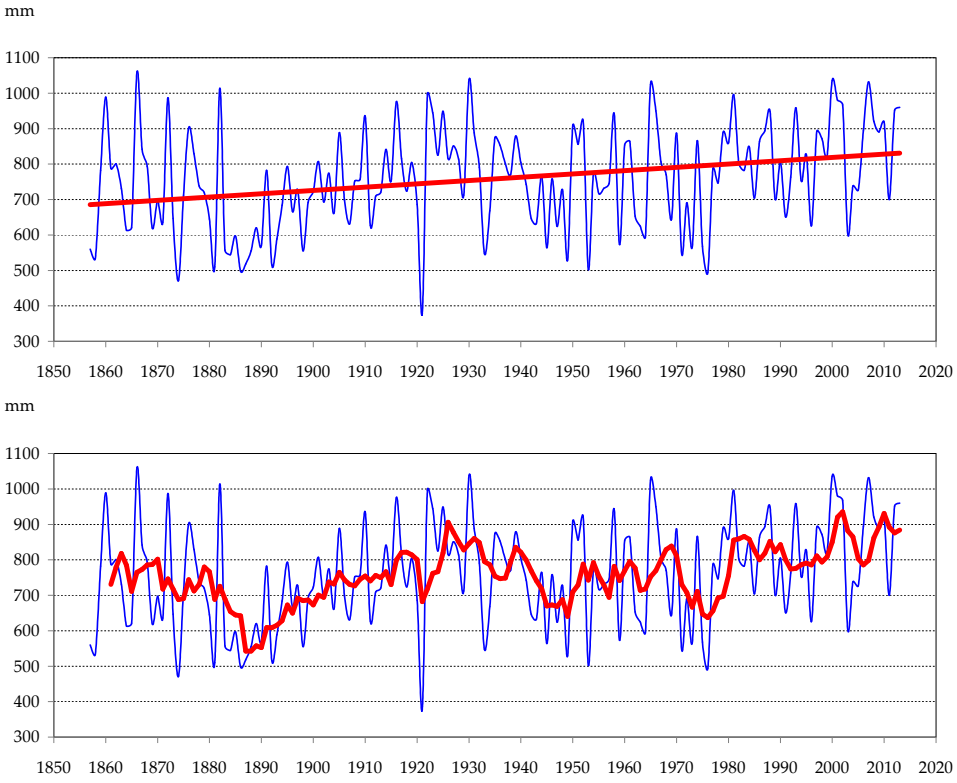


Fig. 323: Average annual rainfall in Luxembourg-Findel from 1854 to 2013 (blue) with trend line (red, above) and 5-year moving average (red, below).

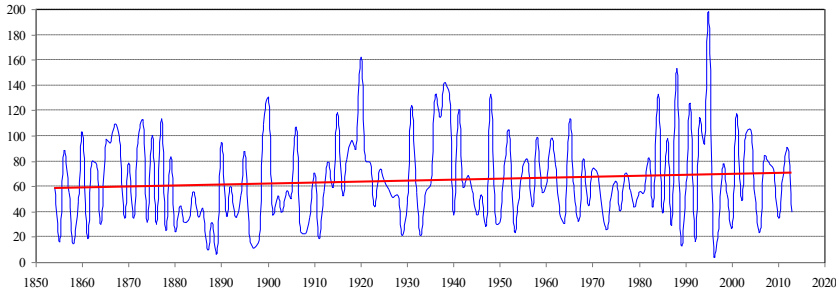


Fig. 324: Average monthly rainfall recorded in Luxembourg-Findel in January from 1854 to 2013 (blue) and trend line (red).

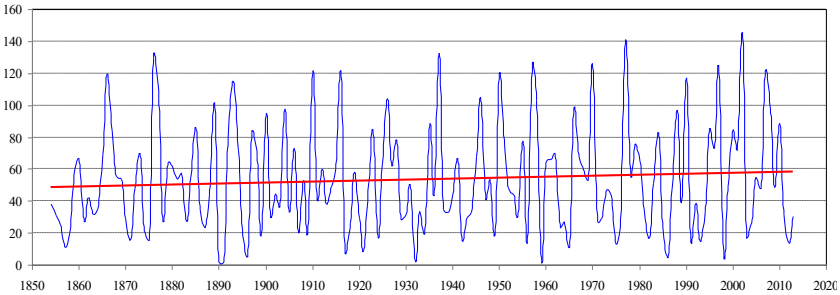


Fig. 325: Average monthly rainfall recorded in Luxembourg-Findel in February from 1854 to 2013 (blue) and trend line (red).

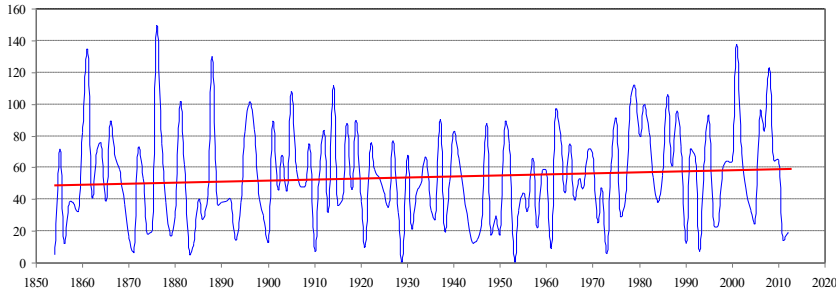


Fig. 326: Average monthly rainfall recorded in Luxembourg-Findel in March from 1854 to 2013 (blue) and trend line (red).

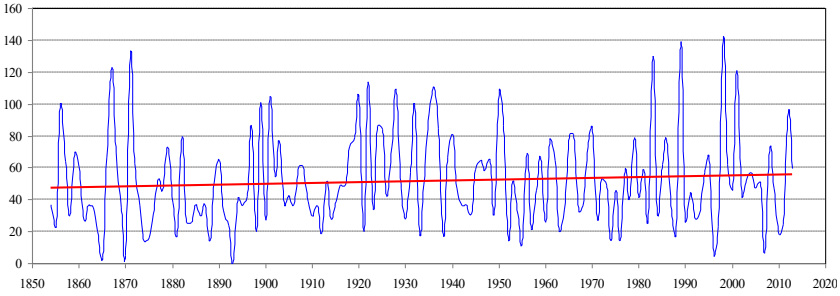


Fig. 327: Average monthly rainfall recorded in Luxembourg-Findel in April from 1854 to 2013 (blue) and trend line (red).

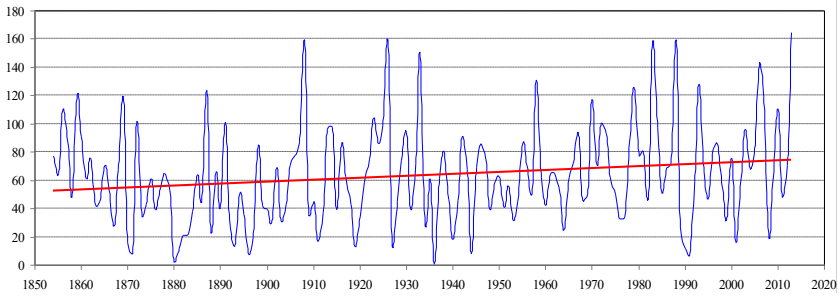


Fig. 328: Average monthly rainfall recorded in Luxembourg-Findel in May from 1854 to 2013 (blue) and trend line (red).

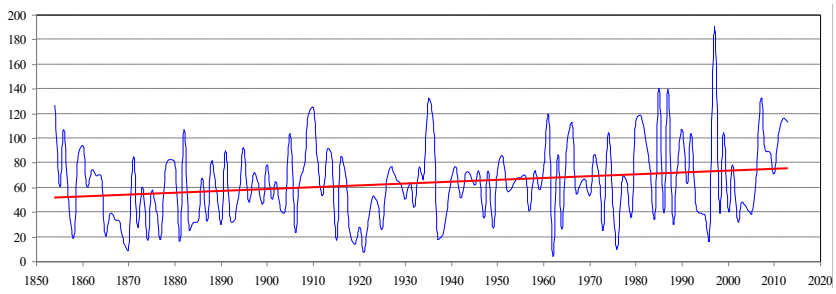


Fig. 329: Average monthly rainfall recorded in Luxembourg-Findel in June from 1854 to 2013 (blue) and trend line (red).

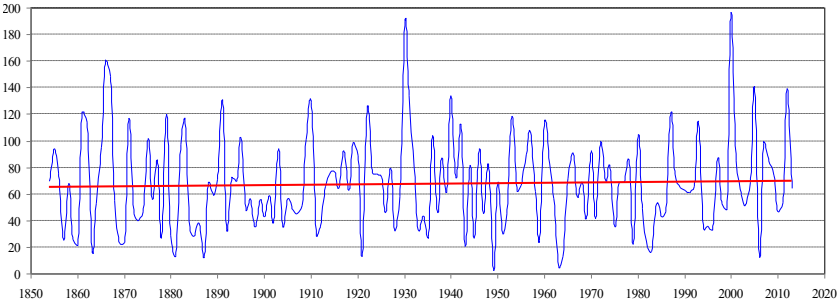


Fig. 330: Average monthly rainfall recorded in Luxembourg-Findel in July from 1854 to 2013 (blue) and trend line (red).

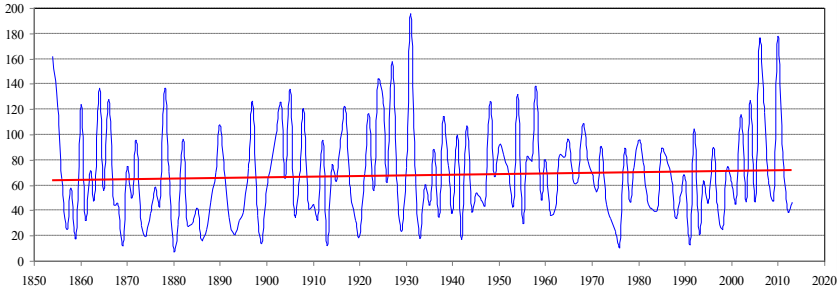


Fig. 331: Average monthly rainfall recorded in Luxembourg-Findel in August from 1854 to 2013 (blue) and trend line (red).

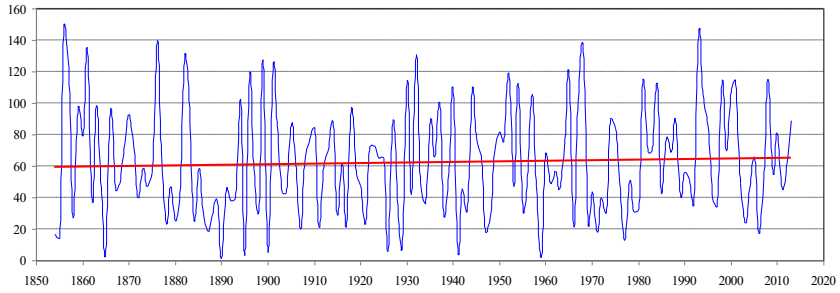


Fig. 332: Average monthly rainfall recorded in Luxembourg-Findel in September from 1854 to 2013 (blue) and trend line (red).

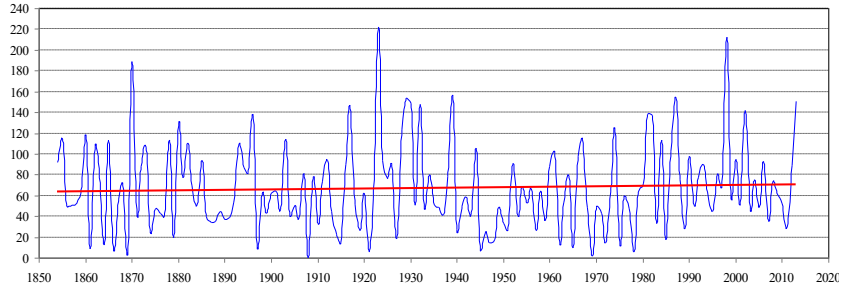


Fig. 333: Average monthly rainfall recorded in Luxembourg-Findel in October from 1854 to 2013 (blue) and trend line (red).

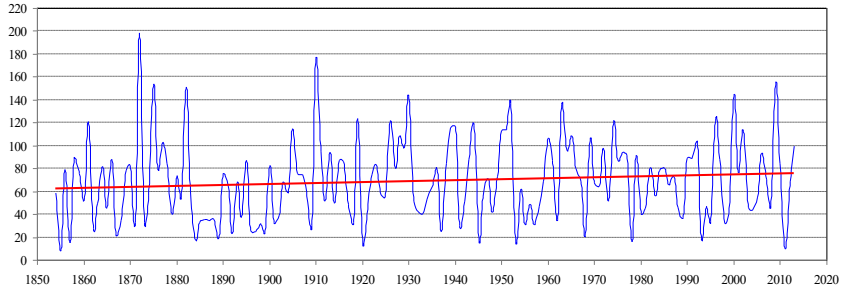


Fig. 334: Average monthly rainfall recorded in Luxembourg-Findel in November from 1854 to 2013 (blue) and trend line (red).

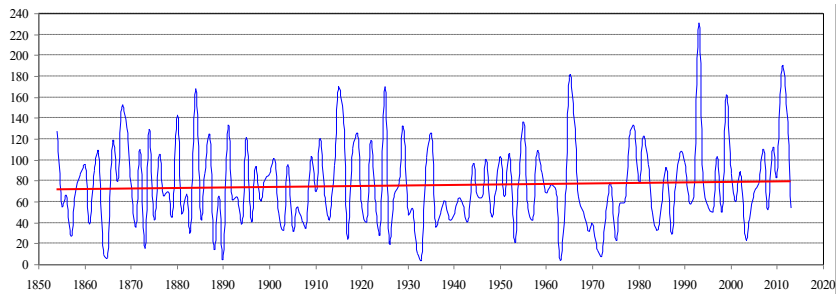


Fig. 335: Average monthly rainfall recorded in Luxembourg-Findel in December from 1854 to 2013 (blue) and trend line (red).

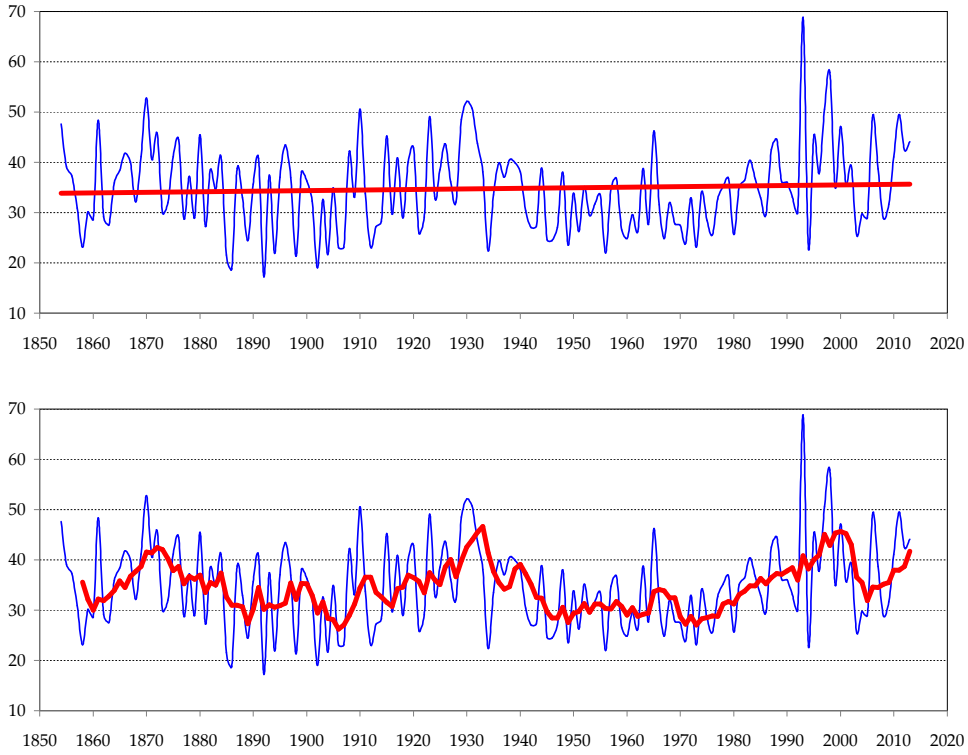


Fig. 336: Standard deviation (σ) of the annual rainfall in Luxembourg-Findel from 1854 to 2013 (blue) with trend line (red, above) and 5-year moving average (red, below).

However, the trend lines show more or less consistent global increases of rainfall for every month in the considered period of time. On the basis of the trend lines, the global changes may be resumed in the Table 10. Accordingly, May and June showed the highest rainfall increases (42-46%), tending to reach average values (~75 mm) usually recorded in November.

Considering the standard deviation (σ) of the annual rainfall recorded in Luxembourg-Findel from 1854 to 2013 (Fig. 336), it strongly fluctuated between 17.18 (1892) and 68.83 (1993). However, though the 5-year moving average also shows that the standard deviation is subject to fluctuations, the trend line R^2 shows that it was mostly stable over the considered period of time. In other words, even if the annual rainfall globally increases, the difference between most and least rainy months tends to remain constant.

Tab. 10: Indicative global changes of the average monthly rainfall recorded in Luxembourg-Findel from 1854 to 2013.

Rainfall (mm)	1854 (mm)	2013 (mm)	Δ (mm)	%
January	58.2	70.8	+12.6	+21.7
February	48.2	59	+10.8	+22.4
March	48.5	58.5	+10	+20.6
April	47.6	55.6	+8.2	+17.2
May	52.5	74.6	+22.1	+42.1
June	51.5	75.5	+24	+46.6
July	65.2	69.35	+4.15	+6.4
August	63.8	72.1	+8.3	+13
September	59.2	65.4	+6.2	+10.5
October	64	70.6	+6.6	+1
November	62.6	75.4	+12.8	+20.4
December	71.5	79.4	+7.9	+11

5.6.6 Sunshine changes

Taking into account the average annual sunshine recorded in Luxembourg-Findel from 1931 to 2013 (Fig. 337), the values fluctuated between 1503 hours (1978) and 2262 hours (2003). The years 1977-1981 and 1992-1995 were characterised by almost uniform low sunshine (1500 and 1600 hours, respectively), while no period of time was characterised by high sunshine. Though the 5-year moving average still indicates evident fluctuations, the trend line R^2 indicates a substantial stability of global data.

Since the data concerning sunshine, encompassing a different period of time, are not comparable to those about temperature and rainfall and do not show significant variations, they will not be treated in more detail.

5.6.7 Changes of climatic indexes

All climatic indexes were calculated for every month of the considered period of time.

Corresponding to the data concerning rainfall, the average rainfall index (Lang, 1915) shows an increase of rainfall, tending to 90 (Fig. 338), which, however, does not modify the climatic classification of Luxembourg as a "warm temperate climate". The 5-year moving average indicates that the index never surpassed the inferior range (60) of this climate type.

The average aridity index (De Martonne, 1926) tends to moderately overpass 40 (Fig. 339), implying that the climate tends to become more and more "humid" rather than "temperate-humid". The 5-year moving average indicates that the climate should be classified as "temperate-

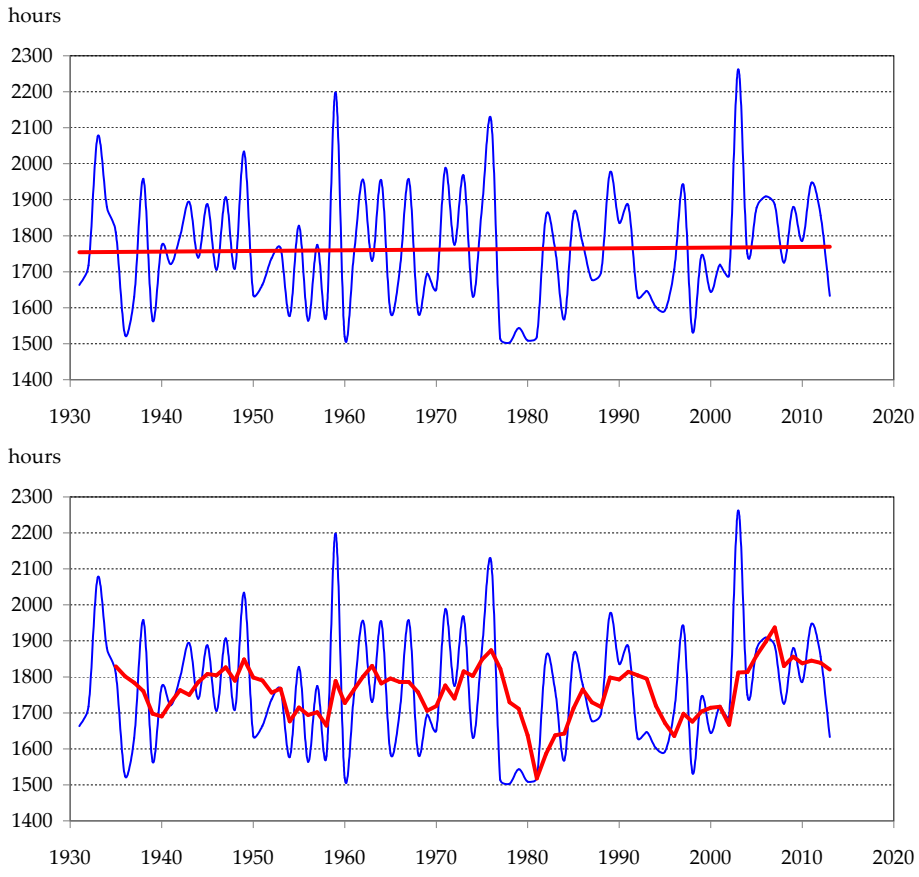


Fig. 337: Average annual sunshine in Luxembourg-Findel from 1931 to 2013 (blue) with trend line (red, above) and 5-year moving average (red, below).

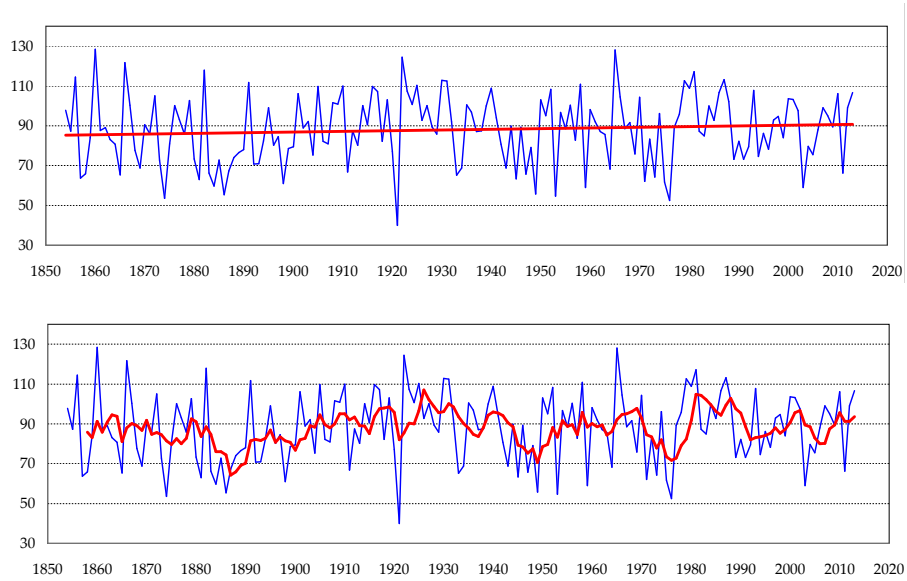


Fig. 338; Average rainfall index (Lang, 1915) calculated based on the data collected in Luxembourg-Findel from 1931 to 2013 (blue) with trend line (red, above) and 5-year moving average (red, below).

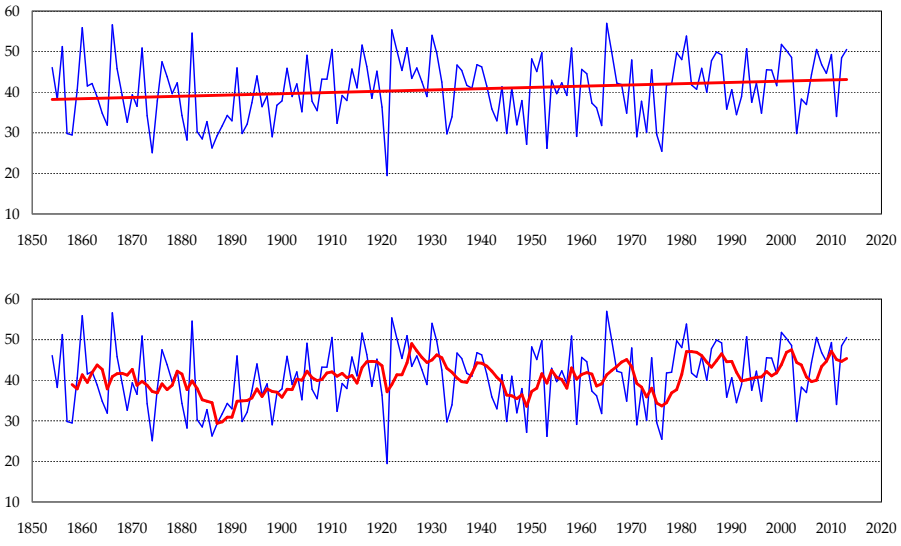


Fig. 339: Average aridity index (De Martonne, 1926) calculated on the data collected in Luxembourg-Findel from 1931 to 2013 (blue) with trend line (red, above) and 5-year moving average (red, below).

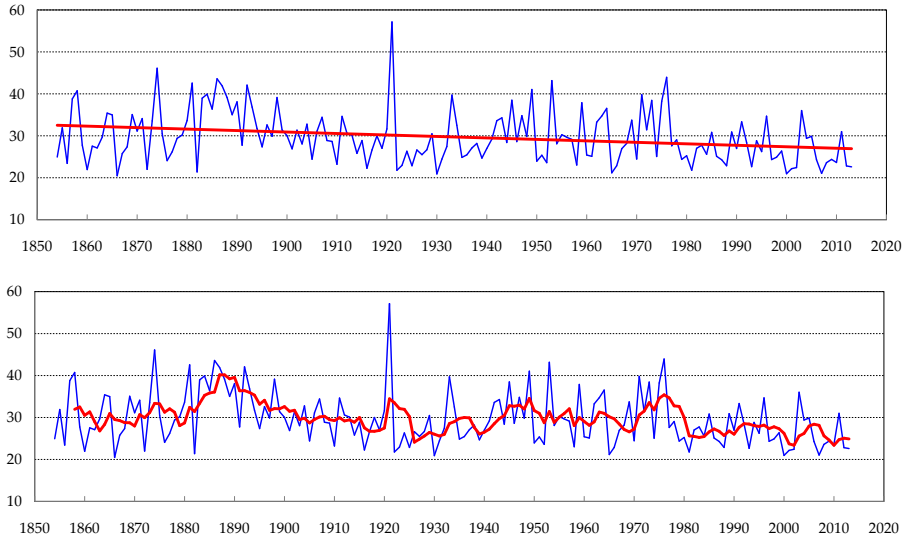


Fig. 340: Average continentality index (Gams, 1931) calculated on the data collected in Luxembourg-Findel from 1931 to 2013 (blue) with trend line (red, above) and 5-year moving average (red, below).

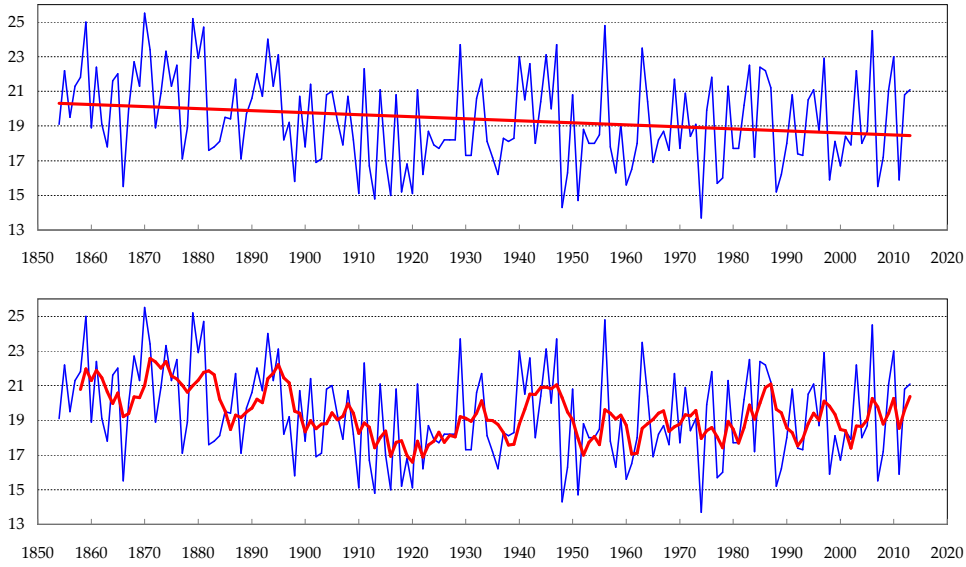


Fig. 341: Average continentality index (Rivas-Martinez, 1987) calculated on the data collected in Luxembourg-Findel from 1931 to 2013 (blue) with trend line (red, above) and 5-year moving average (red, below).

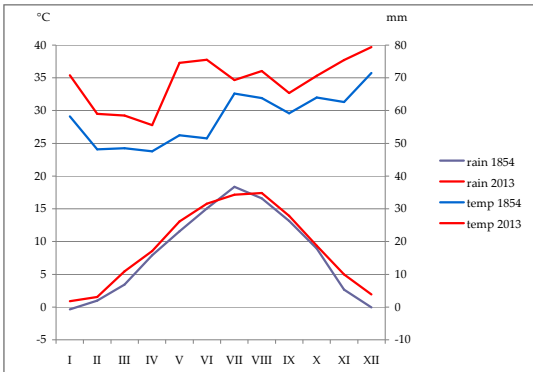


Fig. 342: Tendency climograph based on the trend lines of the data changes recorded in Luxembourg-Findel from 1854 to 2013. Climatic data do not really correspond to the mentioned dates.

humid" (or nearly "sub-humid") during the years 1880-1900, while it is "humid" for the years 1920-1940 and since 1980.

Accordingly, Gams' (1931) average continentality index tends to decrease to values <30°, (Fig. 340), which correspond to an increase of oceanicity. The 5-year moving average indicates that the Luxembourgish climate met periods of major continentality (1880-1900; 1920-25; 1970-80) and periods of major oceanicity (1925-1945); however, it seems to be stably oceanic since 1980.

The average continentality index of Rivas-Martinez (1987) tends to decrease to values >20 to <19 (Fig. 341), which correspond to a loss of continentality. The 5-year moving average indicates that the Luxembourgish climate met periods of sub-continentality (>21) in 1860s, 1870-80s and around 1895, then stabilized between values of 17 and 21, corresponding to an "oceanic climate", since the early 20th century.

Using the global tendency data of temperature (Tab. 9) and rainfall (Tab. 10), it is possible to construct a climograph Bagnouls & Gaussen (1953) showing the global changes recorded in Luxembourg-Findel from 1854 to 2013. Though extremely simplified, the climograph (Fig. 342) shows the same tendencies observed in other diagrams: increase of rainfall, feeble increase of winter temperature and feeble decrease of summer temperature; namely, increase of oceanicity and decrease of continentality.

5.7 Conclusions

The Cerambycofauna of Luxembourg is embedded in the context of the north-western European fauna, sharing climatic and faunistic changes observed during the last century.

From a biogeographical point of view, it belongs to that north-western region that also includes Belgium, the Netherlands, the Saarland and the western Rhineland. Nonetheless, it shows some faunistic peculiarities that distinguish it from Belgium and the Saarland, conserving some thermophilic species extinct in Belgium (such as *Phymatodes rufipes*) and lacking some hygrophilic species (e.g. *Leptura quadrifasciata*) present in the other regions.

The climatic changes occurring since 1850 caused floristic changes, which influenced the climate through a feed-back mechanism, where it is difficult to trace causes and effects. The human activity took part in this system, contributing to accelerate it, while the local fauna had to adapt itself to these changes.

Analogously to the neighbouring regions, Luxembourg enjoyed the climate warming occurring at the end of the Little Ice Age. The large availability of open spaces favoured a quickly warming in summer and a likewise quickly cooling in winter, in other words, a major continental microclimate. The colder winter climate had no influence on the quiescent preimaginal stadia, while adults were favoured by the climate warming in spring and summer.

The once optimal conservation of primeval forests allowed the rapid spreading of thermophilic species coming from the Paris Basin. The last 20 years of the 19th century were particularly dry, showing a sub-continental climate that was never reached later. Just in this period, Ferrant collected some thermophilic continental species (*Cerambyx cerdo*, *Purpuricenus kaehleri*, *Ropalopus clavipes* and *Chlorophorus* spp.), which are widespread contemporaneously in the region neighbouring Luxembourg. A lot of thermophilic beetles, butterflies and grasshoppers related to sand soils and grassland were also widespread during the same period, while moorlands hosted peculiar species.

The climate warming favoured the raising of the vegetation, moreover artificially incremented by man. The complete abandonment of the medieval

tradition of wood pasture, offering open oak forests with warm microclimates and thus suitable conditions for thermophilic species, and artificial plantations since the early 20th century acted in the same direction. Moorlands and dry grassland were planted with spruce, missing or disappearing throughout the country, and with them, their peculiar fauna. Open oak forests were largely replaced by spruce and beech forests, whose close planting did not allow light filters, making forests more arborous, cool and finally, humid.

In this way, rainfall water was retained by plants and slowly released during dry periods, improving the surviving possibilities but also making the climate more and more humid. This favoured species more related to humid climates as beech, through a feedback mechanism.

Mean temperature in July worsened for a long period during WWI: from 1913 to 1920 they never surpassed 17°C and even 14°C in two years. This is particularly interesting since Whitehouse (2006) considered the 17°C July isotherm as the northern limit for the distribution of many central European beetles. Surviving one bad year should not be a problem for thermophilic species, but not such a long period of consecutive permanently unfavourable years.

The climate tended to become more and more oceanic, favouring species hygrophilic (i.e. related to beech) or sensible to the spring warming (i.e. aquatic insects) but disfavouring all the resting ones. More continental and thermophilic species regressed southwards and eastwards along the Mosel valley, looking for more suitable climates, sometimes becoming extinct. In contrast, hygrophilic species dominated and new species related to conifers were introduced. Some species anticipated, however, their emergence due to the spring warming and the worsening of the climatic conditions in July.

The increase of the summer rainfall selected the most ubiquist and banal species, rarefying the resting ones. In this case as well, man contributed to the faunal impoverishment through the destruction of peculiar habitats (e.g. riparian, old trees) and the development of the agriculture and artificial plantations.

Some of the newly registered species, small and with cryptic biology (e.g. *Phymatodes* spp., *Grammoptera* spp., *Anaesthetis testacea*, *Exocentrus* spp.), were probably overlooked in the past. Consequently, the seemingly positive balance of the total species number (23 newly recorded against 15 probably extinct species) has to be interpreted cautiously. The win of species, if at all being real, is due to the establishment of allochthonous species not making part of the original fauna of the region and not making part of the autochthonous ecosystems of the study region, but the vanishing species all are typical representatives of the regional fauna. Thus, the observed changes in total have to be interpreted as a critical impoverishment of the autochthonous longhorn beetle species assemblage.

6 References

Achterberg C. van, Hemminga M. A. & Soelen J. van. 1990. - New host record of *Bracon intercessor* Nees f. *megasomides* Strand (Hymenoptera: Braconidae) a parasite of *Agapanthia villosoviridescens* DeGeer (Coleoptera: Cerambycidae) in salt marshes. Zoologische Mededelingen, Leiden 64 (1-6): 25-29.

Adlbauer K. 2001. - Katalog und Fotoatlas der Bockkäfer Namibias (Coleoptera, Cerambycidae). Taita Publishers, Hradec Kralove, 80 pp.

Administration des eaux et forêts du Grand-Duché de Luxembourg (Ed.) 2002. - Territoires écologiques du Luxembourg: domaines écologiques ("Wuchsgebiete") et secteurs écologiques ("Wuchsbezirke"): délimination de territoires écologiques pour la gestion forestière, avec carte des domaines et secteurs écologiques. Luxembourg, 67 pp.

Administration des eaux et forêts du Grand-Duché de Luxembourg (Ed.) 2006. - Der luxemburger Wald in Zahlen. Ergebnisse der luxemburger Landeswaldinventur 1998-2000. Luxembourg, 210 pp.

Alexander K. N. A. 2002. - The invertebrates of living & decaying timber in Britain and Ireland - a provisional annotated checklist. English Nature Research Reports 467, Peterborough, 142 pp.

Allegro G. 1991. - Il Picchio rosso maggiore (*Picoides major* L.) nella limitazione naturale delle popolazioni della Saperda maggiore del pioppo (*Saperda carcharias* L.). Avocetta 15: 33-41.

Anonym. 1866. - Assemblée mensuelle du 3 novembre 1866. Annales de la Société entomologique de Belgique 8, Comptes-rendus des Séances de la Société entomologique de Belgique, VII-IX.

Anonym. 1867. - Assemblée mensuelle du 1er juin 1867. Annales de la Société entomologique de Belgique 9, Comptes-rendus des Séances de la Société entomologique de Belgique, XXIII-XXVIII.

Anonym. 1869. - Assemblée mensuelle du 3 juillet 1869. Annales de la Société entomologique de Belgique 11, Comptes-rendus des Séances de la Société entomologique de Belgique, LXI-LXIV.

Anonym. 1872. - Assemblée mensuelle du 4 mai 1872. Annales de la Société entomologique de Belgique 15, Comptes-rendus des Séances de la Société entomologique de Belgique, LX-LXVIII.

Anonym. 1873. - Assemblée mensuelle du 1er mars 1873. Annales de la Société entomologique de Belgique 16, Comptes-rendus des Séances de la Société entomologique de Belgique, XV-XXIX.

Anonym. 1945. - Assemblée mensuelle du 5 mai 1945. Annales de la Société entomologique de Belgique 81, Comptes-rendus des Séances de la Société entomologique de Belgique: LXXVII-LXXIX.

Bagnouls F. & Gaussen H. 1953. - Saison sèche et indice xérothermique. Bulletin de la Société d'Histoire Naturelle de Toulouse 88: 193-240.

Balachowsky A. S. 1962. - Famille des Cerambycidae. In: Balachowsky A. S., Davatchi A. & Descarpentries A. Entomologie appliqué à l'agriculture, Masson, Paris, 2: 394-434.

Baur B., Burckhardt D., Coray A., Erhardt A., Heinertz R., Ritter M. & Zemp M. 1997. - Die Erdbockkäfer, *Dorcadion fuliginator* (L., 1758) (Coleoptera: Cerambycidae). Mitteilungen der Entomologische Gesellschaft Basel 47: 59-124.

Belgers J. D. M. 2012. - De zuidelijke halmboktor *Calamobius filum* (Coleoptera: Cerambycidae) nu ook in Nederland aangetroffen. Entomologische Berichten 72 (4): 228-230.

Berger P. 1999. - Une espèce nouvelle pour la faune de France, *Leiopus femoratus* Fairmaire 1859 (Coleoptera: Cerambycidae) Biocosme Mésogéen 15 (3): 229-235.

Berger P. 2009. - *Leiopus linnei* Wallin, Nýlander & Kvamme, 2009, espèce nouvelle pour la faune de France (Coleoptera, Cerambycidae, Lamiinae, Acanthocinini). Rutilans 12 (2): 37-41.

Berger P. 2012. - Coléoptères Cerambycidae de la faune de France continentale et de Corse. Actualisation de l'ouvrage d'André Villiers, 1978. Association Roussillonnaise d'Entomologie, 664 pp.

Binazzi A. 1973. - Note biotologiche su *Oberea linearis* L. (Coleoptera, Cerambycidae) in Toscana. Redia 55: 109-113 + 2 Tab.

Biscaccianti A. B. 2005. - Osservazioni su alcuni longicorni della fauna italiana (Insecta, Coleoptera, Cerambycidae). Aldrovandia 1: 71-80.

Biscaccianti A. B. 2007. - I Coleotteri Cerambicidi del Vesuvio. In: Nardi G. & Vomero V. (eds.,) Artropodi del Parco Nazionale del Vesuvio: ricerche preliminari. Conservazione Habitat Invertebrati 4: 249-278.

Blair K. G. 1937. - Synonymy of the Cerambycidae of New Zealand (Col.). The Entomologist's Monthly Magazine, London 73: 261-268.

Bocher J. 1988. - The Coleoptera of Greenland. Meddelelser om Grønland Bioscience 26: 1-100.

Bonnemaison L. 1962. - Les ennemis animaux des plantes cultivées et des forêts, Tome II. SEP, Paris, 500 pp.

Bradley N. L., Leopold A. C., Ross J. & Huffaker W. 1999. - Phenological changes reflect climate change in Wisconsin. Proceedings of the National Academy of Sciences 96 (17): 9701-9704.

Brahm N. J. 1790. - Insektenkalender für Sammler und Oekonomen, I. Universitätsbuchhandlung Mainz, 248 pp.

Braunert C. 1996. - Faunistik, Ökologie und Gefährdung der Sandlaufkäfer (Coleoptera, Cicindelidae) Luxemburgs. Bulletin de la Société des naturalistes luxembourgeois 97: 181-191.

Braunert C. 2009. - Verzeichnis der Rüsselkäfer Luxemburgs (Coleoptera, Curculionoidea) mit Ausnahme der Borkenkäfer (Scolytinae) und Kernkäfer (Platypodinae). Bulletin de la Société des naturalistes luxembourgeois 110: 125-142.

Braunert C. & Gerend R. 1997. - Checkliste der Laufkäfer (Coleoptera, Carabidae s. lat.) Luxemburgs. Bulletin de la Société des naturalistes luxembourgeois 98: 169-184.

Breuning S. von. 1952. - Revision einiger Gattungen aus der Gruppe der Saperdini Muls. (Col. Cerambycidae). Entomologische Arbeiten aus dem Museum G. Frey, Tutzing bei München 3: 107-213 + 3 Tab.

Bricher E. 1902. - Wander-Sitzung in Vianden von 21. September 1902. "Fauna" Verein Luxemburger Naturfreunde 12 (10): 169-172.

Bricher E. 1903. - Sitzung von 18. Oktober 1903. "Fauna" Verein Luxemburger Naturfreunde 13 (11): 161-163.

Brown W. L. & Wilson E. O. 1956. - Character displacement. Systematic Zoology 5: 49-65.

Brustel H., Berger P. & Cocquempot C. 2002. - Catalogue des Vesperidae et des Cerambycidae de la faune de France (Coleoptera). Annales de la Société entomologique de France (N. S.) 38 (4): 443-461.

Bußler H. 2013. - *Saperda scalaris* L. in der Mongolei und in China. Forstschutz Aktuell 57/58: 30-31.

Butovitsch V. 1936. - Zur Kenntnis der Paarung, Eiablage und Ernährung der Cerambyciden. Entomologisk Tidsskrift 60: 206-258.

Callot H. 2003. - Quelques coléoptères nouveaux pour la faune d'Alsace. *Rabocerus gabrieli* Gerh. (Salpingidae), *Athous difformis* Boisd. et Lac. (Elateridae), *Epuraea ocularis* Fairm. (Nitidulidae) et *Leiopus femoratus* Fairm. (Cerambycidae). Bulletin de la Société Entomologique de Mulhouse 59 (3): 52-54.

Carrière J. 2000. - Des difficultés de la systématique à l'ecobiologie d'*Agapanthia intermedia* (Ganglbauer, 1883) pour le Département de la Lozère (Coleoptera, Cerambycidae). Lambillionea 100 (3): 423-432.

Clayhills T. 2002. - Sarvijäärien *Stenostola ferrea* (Schrank) ja *S. dubia* (Laicharting) esiintyminen Suomessa (Coleoptera, Cerambycidae). Sahlbergia 7: 100.

Collart A. 1941. - Notes sur la faune des Hautes-Fagnes en Belgique III (1) Coleoptera: Cerambycidae. Bulletin du Musée royal d'Histoire naturelle de Belgique 17 (10) : 1-18.

Colson A. 1980a. - Répertoire des Coléoptères Cerambycidae (Longicornes) capturés en Meurthe-et-Moselle (Région de Nancy), 1ère partie. Alast, Bulletin de liaison entomologique 11: 3-13.

Colson A. 1980b. - Répertoire des Coléoptères Cerambycidae (Longicornes) capturés en Meurthe-et-Moselle (Région de Nancy), 2ème partie. Alast, Bulletin de liaison entomologique 12: 5-10.

Colson A. 1981. - Répertoire des Coléoptères Cerambycidae (Longicornes) capturés en Meurthe-et-Moselle (Région de Nancy), 3ème et dernière partie. Alast, Bulletin de liaison entomologique 13: 5-11.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Natura 2000).

Contarini E. & Garagnani P. 1980. - I Cerambicidi delle pinete costiere di Ravenna (Coleoptera). Memorie della Società entomologica italiana 59: 49-57.

Coope G. R. 1959. - A Late Pleistocene insect fauna from Chelford, Cheshire. Proceedings of the Royal Society of London (B) 151: 70-86.

Craighead F. C. 1923. - North American Cerambycidae larvae. A classification and biology of the North American Cerambycidae larvae. Dominion of Canada, Department of Agriculture, Technical Bulletin (N. S.) 23: 1-238 + 44 Tab.

Dajoz R. 1978. - La variabilité géographique de *Agapanthia violacea* (Col. Cerambycidae). L'Entomologiste 34 (3): 127-133.

Danilevsky M. L. 2010a. - Additions and corrections to the new Catalogue of Palaearctic Cerambycidae (Coleoptera) edited by I. Löbl and A. Smetana. 2010. Russian Entomological Journal 19 (3): 215-239.

Danilevsky M. L. 2010b. - Additions and corrections to the new Catalogue of Palaearctic Cerambycidae (Coleoptera) edited by I. Löbl and A. Smetana. 2010, Part II. Russian Entomological Journal 19 (4): 313-324.

Danilevsky M. L. 2011. - New subspecies of *Stenurella bifasciata* (Müller, 1776) (Coleoptera, Cerambycidae) from South West Turkey. Munis Entomology & Zoology 6 (1): 1-5.

Danilevsky M. L. 2012a. - Additions and corrections to the new catalogue of Palaearctic Cerambycidae (Coleoptera) edited by I. Löbl and A. Smetana. 2010, Part III Munis Entomology & Zoology 7 (1): 109-173.

Danilevsky M. L. 2012b. - Additions and corrections to the new catalogue of Palaearctic Cerambycidae (Coleoptera) edited by I. Löbl and A. Smetana. 2010, Part IV. Humanity space International almanac 1 (1): 86-136.

Danilevsky M. L. 2012c. - Additions and corrections to the new catalogue of Palaearctic Cerambycidae (Coleoptera) edited by I. Löbl and A. Smetana. 2010, Part V. Humanity space International almanac 1 (3): 695-741.

Danilevsky M. L. 2012d. - Additions and corrections to the new catalogue of Palaearctic Cerambycidae (Coleoptera) edited by I. Löbl and A. Smetana. 2010, Part VI. Humanity space International almanac 1 (4): 900-943.

Danilevsky M. L. 2013a. - Additions and corrections to the new catalogue of Palaearctic Cerambycidae (Coleoptera) edited by I. Löbl and A. Smetana. 2010, Part VII. Humanity space International almanac 2 (1): 170-210.

Danilevsky M. L. 2013b. - Six new Longicorn (Coleoptera, Cerambycidae) taxa from Russia and adjacent countries. Humanity space International Almanac 2 (supplement 2): 28-41.

Dejean P. F. M. A. 1835. - Catalogue des coléoptères de la collection de M. le comte Dejean, 5ème partie. Méquignon-Marvis, Paris: 257-360.

Delwaide M. & Thieren Y. 2010. - Liste des coléoptères observés dans l'ancienne carrière sablonneuse de Vance (Province de Luxembourg, Belgique). Entomologie faunistique - Faunistic Entomologie 62 (1): 3-10.

Demelt C. von. 1966. - Bockkäfer oder Cerambycidae. I Biology mitteleuropäischer Bockkäfer unter besonderer Berücksichtigung der Larven. Die Tierwelt Deutchlands, Fischer G., Jena, 55: 1-115.

Desière M. 1969. - Les Coléoptères longicornes de la Forêt de Férage. Bulletin de la Société Royale des Sciences de Liège 38 (1-2): 54-60.

Diederich, P. 1991. Les forêts luxembourgeoises à longue continuité historique. Bulletin de la Société des naturalistes luxembourgeois 92: 31-39.

Drumont A., Cammaerts R., Van Nuffels C. & Navez P. 2012. - *Cerambyx cerdo* Linnaeus 1758 en Belgique (Coleoptera, Cerambycidae). Lambillionea 112 (1): 61-73.

Drumont A. & Grifnee V. 2005. - Une nouvelle espèce de longicornes pour la faune de Belgique: *Gaurotes (Carilia) virginea* (Linnaeus, 1758) (Coleoptera, Cerambycidae). Lambillionea 105 (3): 433-436.

Drumont A. & Grootaert P. 2011. - Saproxylic beetles from Belgium, online distribution maps of species (Coleoptera). World Wide Web electronic publication (http://projects.biodiversity.be/beetles/) [accession date]

Drumont A. & Leduc F. 2010. - Note sur la présence en Belgique d'*Agapanthia (Epoptes) dahli* (Richter, 1820) (Coleoptera, Cerambycidae, Lamiinae). Lambillionea, 110 (3): 293-296.

Drumont A., Leduc F., Chapelle J. & Cloth H. 2012. - Confirmation de la présence de *Gaurotes (Carilia) virginea* (L., 1758) en Belgique (Coleoptera, Cerambycidae, Lepturinae). Bulletin de la Société royale belge d'Entomologie 148: 14-16.

Drumont A. & Wallin H. 2009. - First record of *Leiopus linnei* Wallin, Nylander & Kvamme, 2009 in Belgium (Coleoptera, Cerambycidae, Lamiinae). Lambillionea 109 (4): 529.

Drumont A., Smets K., Scheers K., Thomaes A., Vandenhoudt R. & Lodewyckx M. 2014. - *Callidiellum rufipenne* (Motschulsky, 1861) en Belgique : bilan de sa présence et de son installation sur notre territoire (Coleoptera : Cerambycidae : Cerambycinae). Bulletin de la Société royale belge d'Entomologie, 150: 239-249.

Duffy E. A. J. 1953. - A monograph of the immature stages of British and imported timber beetles (Cerambycidae). British Museum (Natural History), London, VIII+ 350 pp.

Ellwood E. R., Temple S. A., Primack R. B., Bradley N. L. & Davis C. C. 2013. - Record-Breaking Early Flowering in the Eastern United States. PLoS ONE 8 (1): 1-9.

Erpelding É. 1981. - Die Mühlen des Luxemburger Landes. Borschette E., Luxembourg, 800 pp.

Everts J. E. 1903. - Coleoptera Neerlandica: de schildvleugelige insecten van Nederland en het aangrenzend gebied, vol. 2. M. Nijhoff, The Hague, I + 798 pp. + VIII Tab.

Everts J. E. 1922. - Coleoptera Neerlandica: de schildvleugelige insecten van Nederland en het aangrenzend gebied, vol. 3. M. Nijhoff, The Hague, XVIII + 668 pp.

Fauvel A. 1884. - Les Longicornes Gallo-Rhénans. Catalogue (suite). Revue d'Entomologie 3: 317-390.

Faber G. N. E. 1901a. - Beiträge zu einem "Luxemburger Waldbau". Bulletin de la Société des naturalistes luxembourgeois 11: 442-446.

Faber G. N. E. 1901b. - Beiträge zu einem "Luxemburger Waldbau" (Fortsetzung). Bulletin de la Société des naturalistes luxembourgeois 11: 491-496.

Faber G. N. E. 1902. - Beiträge zu einem "Luxemburger Waldbau" (Fortsetzung). Bulletin de la Société des naturalistes luxembourgeois 12: 28-31.

Faber G. N. E. 1903a. - Beiträge zu einem "Luxemburger Waldbau" (Fortsetzung). Bulletin de la Société des naturalistes luxembourgeois 13: 7-14.

Faber G. N. E. 1903b. - Beiträge zu einem "Luxemburger Waldbau" (Fortsetzung). Bulletin de la Société des naturalistes luxembourgeois 13: 55-60.

Faber E. 1913a. - Verbreitung und Anbauwürdigkeit der Nadelhölzer im Grossherzogtum Luxemburg. Eine forstliche Plauderei aus Theorie und Praxis. Bulletin de la Société des naturalistes luxembourgeois 23: 58-64.

Faber E. 1913b. - Verbreitung und Anbauwürdigkeit der Nadelhölzer im Grossherzogtum Luxemburg. Eine forstliche Plauderei aus Theorie und Praxis (Fortsetzung). Bulletin de la Société des naturalistes luxembourgeois 23: 86-96.

Ferrant V. 1891. - Ornithologische Notizen, gesammelt in der Zeit vom 1. Mai 1872 - 1891. "Fauna" Verein Luxemburger Naturfreunde 1: 28-31.

Ferrant V. 1897. - Briefkasten. "Fauna" Verein Luxemburger Naturfreunde 7 (7): 132.

Ferrant V. 1907a. - Die der Landwirtschaft schädlichen Insekten, deren Lebensweise und Bekämpfung (Fortsetzung). "Fauna" Verein Luxemburger Naturfreunde 17: 290-304.

Ferrant V. 1907b. - Die der Landwirtschaft schädlichen Insekten, deren Lebensweise und Bekämpfung (Fortsetzung). "Fauna" Verein Luxemburger Naturfreunde 17: 313-328.

Ferrant V. 1911. - Die Schädlichen Insekten der Land- u. Forstwirtschaft, ihre Lebensweise und Bekämpfung. Praktisches Handbuch für Ackerbautreibende, Gärtner u. Forstwirte. P. Worré-Mertens, Luxemburg, 615 pp.

Ferrant V. 1917. - Ueber den Massenfang des Rebenstechers an unserer Mosel. "Fauna" Verein Luxemburger Naturfreunde 27: 235-248.

Fitton M. G., Shaw M. R. & Gauld I. D. 1988. - Pimpline Ichneumon-flies: Hymenoptera, Ichneumonidae (Pimplinae). Handbooks for the Identification of British Insects 7 (1): 1-110.

Forister M. L. & Shapiro A. M. 2003. - Climatic trends and advancing spring flight of butterflies in lowland California. Global Change Biology 9 (7): 1130-1135.

Fournel D.H.L. & Gehin J.P.J. 1846. - Catalogue des insectes coléoptères des environs de Metz. Imprimerie, librairie et lithographie de Verronnais, Metz, 110 pp.

Frieser R. 1976. - Cerambycidenstudien. Nachrichtenblatt der Bayerischen Entomologen 25 (3): 43-44.

Gahan C. J. 1906. - The Fauna of British India, including Ceylon and Birma. Coleoptera, Vol. I (Cerambycidae). Taylor & Francis, London, 329 pp.

Gams H. 1931. - Die klimatische Begrenzung von Pflanzenarealen und die Verteilung der hygrischen Kontinentalität in den Alpen. Zeitschrift der Gesellschaft für Erdkunde zu Berlin 1931: 321-346.

Ganglbauer L. 1883. - Bestimmungs-Tabellen der europäischen Coleopteren. VIII. Cerambycidae (Schluss). Verhandlungen des Zoologisch-Botanischen Vereins Wien 33: 437-586.

Gaspar C. & Verstraeten C. 1972. - Recherches sur l'écosystème forêt. Série C: La chênaie à Galeobdolon et à Oxalis de Mesnil-Eglise Férage.

Contribution no. 26. Biocénose des coléoptères. Bulletin de la Société Royale des Sciences de Liège 41 (3-4): 227-249.

Gerend R. 2000. - Die Käferfauna eines Kalkmagerrasens über Steinmergelkeuper im Luxemburger Gutland: 'Schléidelbierg' bei Junglinster (Insecta: Coleoptera). Bulletin de la Société des naturalistes luxembourgeois 100: 103-134.

Gerend R. 2003. - Vorläufiges Verzeichnis der Wasserkäfer Luxemburgs (Coleoptera: Hydradephaga, Hydrophiloidea part., Dryopoidea part., Microsporidae, Hydraenidae, Scirtidae). Bulletin de la Société des naturalistes luxembourgeois 104: 67-78.

Gerend R. 2006. - Erster Nachtrag zum Verzeichnis der Wasserkäfer Luxemburgs (Insecta, Coleoptera: Hydraenidae, Hydrophilidae, Scirtidae). Bulletin de la Société des naturalistes luxembourgeois 106: 117-122.

Gerend R. 2007. - In memoriam Alfred Mousset. Bulletin de la Société des naturalistes luxembourgeois 108: 105-109.

Gerend R. 2008. - Nachweise neuer und bemerkenswerter Käfer für die Fauna Luxemburgs (Insecta, Coleoptera). Bulletin de la Société des naturalistes luxembourgeois 109: 107-131.

Gerend R., Köhler F. & Braunert C. 2007. - Die Totholzkäfer (Coleoptera) des "Schnellert" bei Berdorf: ökologische Analyse der Xylobiontenfauna eines Altwaldes in der luxemburgischen Sandsteinlandschaft. Ferrantia 50: 265-295.

Gerend R. & Meyer M. 2007. - *Leiopus femoratus* Fairmaire, 1859 ein für Mitteleuropa neuer Bockkäfer in Luxemburg und im Saarland (Coleoptera: Cerambycidae). Mitteilungen der Arbeitsgemeinschaft Rheinischer Koleopterologen 17: 7-13.

Godron D. A. 1866. - Zoologie de Lorraine ou catalogue des animaux sauvages observés jusqu'ici dans cette ancienne province. Ve Raybois, Nancy, 283 pp.

González Peña C. F., Vives E. & de Sousa Zuzarte A. J. 2007. - Nuevo catálogo de los Cerambycidae (Coleoptera) de la Península Ibérica, islas Baleares e islas atlánticas: Canarias, Açores y Madeira Monografías de la Sociedad Entomológica Aragonesa 12: 1-136.

Gouverneur X. & Guérard P. 2007. - Présence d'un rare coléoptère Buprestidae dans l'agglomération rennaise (Ille-et-Vilaine): *Agrilus (Anambus) auricollis* Kiesenwetter, 1857 (Coleoptera). Rutilans X-3: 83-85.

Gouverneur X. & Guérard P. 2011. - Les longicornes armoricains. - Atlas des coléoptères Cerambycidae des départements du Massif armoricain. Invertébrés armoricains, les Cahiers du GRETIA 7, 224 pp.

Guilleaume F. 1909. - Coléoptères intéressants des environs de Genval (Belgique). Annales de la Société entomologique de Belgique 53: 124-126.

Guinet J.-M. 2002. - Victor Ferrant (1856-1942). Ferrantia 33: 1.

Gutowski J. M. & Hilszczanski J. 1997. - *Phymatodes (Reitteroderus) pusillus* (Fabricius, 1787) (Coleoptera: Cerambycidae) w Polsce. Wiadomosci Entomologiczne 16 (1): 11-19.

Gutowski J. M., Hilszczaski J., Kubisz D., Kurzawa J., Miłkowski M., Mokrzycki T., Plewa R., Przewozny M. & Wełnicki M. 2010. - Distribution and host plants of *Leiopus nebulosus* (L.) *and L. linnei* Wallin, Nylander et Kvamme (Coleoptera: Cerambycidae) in Poland and neighbouring countries. Polskie Pismo Entomologiczne 79: 271-282.

Haagen N. 1986. - Schmetterlinge (Lepidoptera) und andere Insekten aus dem Ellegrund bei Esch/Alzette. Paiperlek 8 (3): 49-52.

Haldeman S. S. 1847. - Material towards a history of the Coleoptera Longicornia of the United States. Transactions of the American Philosophical Society (2) 10: 27-66.

Han Y. & Liu D. 2010. - Taxonomic review of the genus *Xylotrechus* (Coleoptera: Cerambycidae: Cerambycinae) in Korea with a newly recorded species. Korean Journal of Applied Entomology 49 (2): 69-82.

Harde K. W. 1966. - Familie Cerambycidae, Bockkäfer. In: Freude H., Harde K. W. & Lohse G. A. Die Käfer Mitteleuropas 9. Cerambycidae, Chrysomelidae, Goecke & Evers, Krefeld: 1-94.

Heiser M. & Schmitt T. 2010. - Do different dispersal capacities influence the biogeography of the western Palearctic dragonflies

(Odonata)? Biological Journal of the Linnean Society 99: 177-195.

Hepp A. 1934. - Zur Lebensweise von *Dorcadion fuliginator* L. (Col. Cerambycidae). Entomologischer Anzeiger 14: 48-50.

Heuertz F. 1917. - Monatsversammlung vom Sonntag, 28. Oktober 1917. "Fauna" Verein Luxemburger Naturfreunde 27: 249-253.

Heuertz F. 1940. - Souvenirs d'Echternach. Animaux, plantes et métiers qui s'en vont. Bulletin de la Société des naturalistes luxembourgeois 50: 231-252.

Heyden L. F. von. 1890. - Europäisch-nordamerikanische Coleopteren-Synonyma. Wiener Entomologische Zeitung 9 (5): 131-132.

Higgins L. G. & Riley N. D. 1970. - A Field Guide to the Butterflies of Britain and Europe. Collins, London, 380 pp.

Hoffmann A. 1950. - Coléoptères Curculionides (1ère partie). Faune de France 52, Lechevalier P., Paris, 486 pp.

Hoffmann A. 1954. - Coléoptères Curculionides (2ème partie). Faune de France 59, Lechevalier P., Paris, 720 pp.

Hoffmann J. 1960. - Les Orthoptères du Luxembourg (Arthropoda, Hexapoda, Orthopteroidea, Orthoptera). Archives de la Section des Sciences de l'Institut Grand-Ducal N. S., 27 : 239-284.

Horion A. 1974. - Cerambycidae-Bockkäfer. Faunistik der Mitteleuropäischen Käfer. 12, Schmidt Ph. C. W., Neustadt a. d. Aisch, 228 pp.

Hostie E. 1951. - Insectes observés au Grand-Duché de Luxembourg du 10 au 13 juin 1950. Bulletin de la Société des naturalistes luxembourgeois 55: 373-374.

Jeannel R. 1941. - Coléoptères Carabiques. Tome I. Faune de France 39, Lechevalier P., Paris, 571 pp.

Jeannel R. 1942. - Coléoptères Carabiques. Tome II. Faune de France 40, Lechevalier P., Paris, 600 pp.

Johnson W. F. & Halbert J. N. 1902. - A List of the Beetles of Ireland. Proceedings of the Royal Irish Academy, III (6): 535-827.

Klausnitzer B. & Sander F. 1978. - Die Bockkäfer Mitteleuropas: Cerambycidae. 2nd ed. Ziemsen A., Wittenberg Lutherstadt, 224 pp.

Koponen M. & Nuorteva M. 1973. - Über subfossile Waldinsekten aus dem Moor Piilonsuo in Südfinnland. Acta Entomologica Fennica 29: 1-84.

Köhler F. 2009. - Die Totholzkäfer (Coleoptera) des Naturwaldreservates "Laangmuer". In: Murat D. - Zoologische und botanische Untersuchungen "Laangmuer" 2007-2008. Naturwaldreservate in Luxemburg, 5. Naturverwaltung Luxemburg: 48-115.

Köhler F. 2011. - Die Totholzkäfer (Coleoptera) des Naturwaldreservates "Enneschte Bësch" (2007-2009). In: Murat D. - Zoologische und botanische Untersuchungen "Enneschte Bësch" 2007-2010. Naturwaldreservate in Luxemburg 8. Naturverwaltung Luxemburg: 78-136.

Köhler F. 2013. - Die Totholzkäfer (Coleoptera) des Naturwaldreservates "Grouf" (2008-2009). In: Murat D. - Zoologische und botanische Untersuchungen "Grouf" 2007-2011. Naturwaldreservate in Luxemburg 10. Naturverwaltung Luxemburg: 50-107.

Kohn C. 1898. - La culture de la vigne et la fabrication des vins dans le Luxembourg (Suite XIV.). "Fauna" Verein Luxemburger Naturfreunde 8: 211-215.

Koltz J. P. J. 1875. - Dendrologie luxembourgeoise. Catalogue des arbres, arbrissaux et arbustes spontanés, subspontanés ou introduits dans les cultures du Grand-Duché de Luxembourg. Buck V., Luxembourg, 217 pp.

Köppen W. 1936. - Das geographische System der Klimate. In: Köppen W. & Geiger G. Handbuch der Klimatologie, Gebr. Bornträger, Berlin, 3: 1-44.

Kovács T., Hegyessy G. & Medvegy M. 1998. - Foodplant data of longhorn beetles from Europe (Coleoptera: Cerambycidae). Folia Historico Naturalia Musei Matraensis 23: 333-339.

Kraus M. 1892a. - Vereins Angelegenheiten. "Fauna" Verein Luxemburger Naturfreunde 2 (3): 33-35.

Kraus M. 1892b. - Vereins Angelegenheiten. "Fauna" Verein Luxemburger Naturfreunde 2 (4): 49-51.

Kraus M. 1893a. - Vereins Angelegenheiten. "Fauna" Verein Luxemburger Naturfreunde 3 (3): 33-35.

Kraus M. 1893b. - Vereins Angelegenheiten. "Fauna" Verein Luxemburger Naturfreunde 3 (4): 49-51.

Kraus M. 1893c. - Vereins Angelegenheiten. "Fauna" Verein Luxemburger Naturfreunde 3 (5): 65-66.

Kraus M. 1894. - Sitzung von 8. April 1894. "Fauna" Verein Luxemburger Naturfreunde 4: 39-40.

Kraus M. 1895. - Sitzung von 24. November 1895. "Fauna" Verein Luxemburger Naturfreunde 5 (7): 99-101.

Kraus M. 1896. - Wanderversammlung zu Grevenmacher, am 13. September 1896. "Fauna" Verein Luxemburger Naturfreunde 6: (11) 165-167.

Krombach J. H. G. 1875. - Flore du Grand-Duché de Luxembourg. Plantes phanérogames. Luxembourg, 564 pp.

Kuchlein J. H. & Ellis W. N. 1997. - Climate-induced changes in the microlepidoptera fauna of the Netherlands and the implications for nature conservation. Journal of Insect Conservation 1: 73-80.

Kvamme T. & Wallin H. 2011. - The genus *Stenostola* Dejean, 1835 (Coleoptera, Cerambycidae) in Norway, with a review of the biology and the distribution in Fennoscandia. Norwegian Journal of Entomology 58: 93-108.

Lays P., Drumont A., Verhoeyen K. & Fagot J. 2013. - Nouvelles observations faunistiques de *Gaurotes (Carilia) virginea* (L. 1758) en Belgique (Coleoptera: Cerambycidae, Lepturinae) Entomologie Faunistique 66: 69-76.

Lambinon J., N. Schneider & F. Feitz. 2012. - Contribution complémentaire à la connaissance des zoocécidies du Luxembourg. Bulletin de la Société des naturalistes luxembourgeois 113: 167-187.

Lameere A. 1885. - Catalogue des Longicornes Gallo-Rhénans. Additions et corrections concernant la Belgique. Revue d'Entomologie 4: 162-163.

Lameere A. 1894. - Révision du catalogue des Longicornes de la Belgique. Annales de la Société entomologique de Belgique 88: 294-309.

Lang R. 1915. - Versuch einer exacten Klassification der Boden in klimatischer und geologischer. Internationalen Mitteilungen für Bodenkunde 5: 312-346.

Laugsand A. E., Olberg S. & Reiråskag C. 2008. - Notes on species of Cerambycidae (Coleoptera) in Norway. Norwegian Journal of Entomology 55 (1): 1-6.

Lempereur J. M., Drumont A. & Muret P. 2000. - Contribution à l'étude de la faune entomologique de la Gaume: les Cerambycidae. Lambillionea 100 (4): 541-544.

Ligeron J.-M. 2005. - Catalogue des coléoptères des Ardennes françaises. Société d'histoire naturelle des Ardennes, Aiglemont, 103 pp.

Löbl I. & Smetana A. (ed.) 2010. - Catalogue of Palaearctic Coleoptera. Vol. 6. Chrysomeloidea. Apollo Books, Stenstrup, 924 pp.

Löbl I. & Smetana A. 2011. - Catalogue of Palaearctic Coleoptera. Errata (Vol. 7). Apollo Books, Stenstrup 373 pp.

Loi. 2004. - Loi du 19 janvier 2004 concernant la protection de la nature et des ressources naturelles. Mémorial A-10: 148-169.

Luce J. M. 1996. - *Cerambyx cerdo* Linnaeus, 1758. Invertebrates of the habitats directive and the Bern Convection. Part. I. Crustacea Coleoptera and Lepidoptera. Nature and Environment 79, Council of Europe, Publication and documents division, Strasbourg: pp. 22-26.

Malderen M., van. 2006. - *Leiopus femoratus* Fairmaire, 1859, een nieuwe soort voor de Belgische fauna? (Coleoptera Cerambycidae Lamiinae). Bulletin de la Société Royale Belge d'Entomologie 142: 37-38.

Martonne E., De. 1926. - Une nouvelle fonction climatologique: l'indice d'aridité. La Meteorologie 2 : 449-459.

Massard J. A. 1990. - La Société des Naturalistes Luxembourgeois du point de vue historique. Bulletin de la Société des naturalistes luxembourgeois 91: 5-214.

Massard J. A. 2005. - Aspects de l'histoire de la météorologie au Luxembourg. Ferrantia 43: 9-20.

Matter J. 1998. - Cerambycidae. Catalogue et atlas des coléoptères d'Alsace, 1, Musée Zoologique de l'Université et de la Ville de Strasbourg, 101 pp.

MCPFE 2007. - State of Europe's forests 2007. The MCPFE report on sustainable forest management in Europe. Ministerial Conference on the Protection of Forests in Europe, Liaison Unit Warsaw, 247 pp.

Meyer M. 1977. - Groupe de travail pour l'étude des Invertébrés: Entomologischer Bericht für die Jahre 1974 und 1975. Bulletin de la Société des naturalistes luxembourgeois 80: 59-78.

Meyer M. & Pelles A. 1981. - Atlas provisoire des insectes du Grand-Duché de Luxembourg. Lepidoptera. 1ère partie. Ferrantia 1: 1-147.

Meyer M. & Pelles A. 1989. - Eléments pour une révision faunistique des Macrolépidoptères du Grand-Duché de Luxembourg. 1. Les Rhopalocères de la collection C. Wagner-Rollinger. Paiperlek 11 (2): 63-80.

Miroshnikov A. I. 2011. - The longicorn beetles (Cerambycidae) in "Catalogue of Palaearctic Coleoptera. Stenstrup. 2010" remarks and additions. Entomologia Kubanica, Supplement 1: 1-113.

Moreno C. M., Martín M. C., Santiago Y., De Evan E. & Peláez H. 2004. - Prospección de síntomas externos de *Xylotrechus arvicola* (Olivier, 1795) (Coleoptera: Cerambycidae) en viñedos de Castilla y León. Resultados año 2003. Reunión del Grupo de Trabajo de la Vid, Palma de Mallorca (Spain) 29: 129-134.

Mousset A. 1969. - Les Coléoptères du Grand-Duché de Luxembourg. Bulletin de la Société des naturalistes luxembourgeois 70: 139-174.

Mousset A. 1973a. - Atlas provisoire des insectes du Grand-Duché de Luxembourg. Coleoptera Cartes 227 à 445 (Hygorbiidae, Haliplidae, Dytiscidae, Gyrinidae, Scarabaeidae, Lucanidae, Cerambycidae). Publication du Musée d'Histoire Naturelle et de l'Administration des Eaux et Forêts. Luxembourg: 227-245.

Mousset A. 1973b. - Weiler/Hachiville 1979 - Contribution à l'étude des Coléoptères Luxembourgeois. Paiperlek 1(3): 6-8.

Mousset A. 1977. - Nova Coleopterologica. Bulletin de la Société des naturalistes luxembourgeois 80: 79-83.

Mousset A. 1981a. - Les coléoptères des sablières de Remerschen-Wintrange. Bulletin de la Société des naturalistes luxembourgeois 83-84: 53-70.

Mousset A. 1981b. - Nova Coleopterologica. Bulletin de la Société des naturalistes luxembourgeois 83-84: 71-73.

Mulsant E. 1839. - Longicornes. Histoire Naturelle des Coléoptères de France, Maison, Paris, VII-XII + 304 pp.

Mulsant E. 1862-63. - Longicornes. Histoire naturelle de Coléoptères de France 2, Magnin, Blanchard & C., Paris, 590 pp.

Müller J. 1906. - Cerambycidae Dalmatiae. Verhandlungen des Zoologisch-Botanischen Vereins Wien 56: 653-695.

Müller J. 1915. - Die europäischen Arten der Gattung *Stenostola* Muls. (Col. Ceramb.). Wiener Entomologische Zeitung 34 (8/10): 293-297.

Müller J. 1949. - Coleoptera Phytophaga (Cerambycidae, Chrysomelidae, Bruchidae). 1. I Coleotteri della Venezia Giulia, catalogo ragionato con tabelle dicotomiche per la classificazione delle specie della regione adriatica orientale, del Veneto e della Pianura Padana 4, Centro Sperimentale Agricolo, Trieste, 685 pp.

Murray L. 1973. - Predation on *Prionoplus reticularis* (Cerambycidae) by *Thoramus wakefieldi* (Elateridae). Weta 5 (3): 360-362.

Nash D. R. 1983. - *Chlorophorus pilosus* Forst var. *glabromaculatus* Gze (Col.; Cerambycidae) from an imported cheese board. The Entomologist's record and journal of variation 95: 195.

Niehuis M. 2001. - Die Bockkäfer in Rheinland-Pfalz und im Saarland. Gesellschaft für Naturschutz und Ornithologie Rheinland-Pfalz e. V., Mainz, 604 pp.

Niemeyer T., Ries C. & Härdtle W. 2010. - Die Waldgesellschaften Luxemburgs. Vegetation, Standort, Vorkommen und Gefährdung. Ferrantia 57: 1-122.

Olm K. 1892. - Ausflug vom 6. Juni 1892. "Fauna" Verein Luxemburger Naturfreunde 2: (3): 36-37.

Osborne P. J. 1974. - An insect assemblage of early Flandrian Age from Lea Marston, Warwickshire and its bearing on the contemporary climate and ecology. Quaternary Research 4: 471-486.

Özdikmen H. 2011a. - Additions and corrections to the new Catalogue of Palaearctic Cerambycidae (Coleoptera) edited by I. Löbl and A. Smetana (2010) for Turkish taxa Munis Entomology & Zoology 6 (2): 686-734.

Özdikmen H. 2011b. - A propose for acceptation of a single genus as *Judolia* Mulsant, 1863 instead of the genera *Judolia* Mulsant, 1863 and *Pachytodes* Pic, 1891 (Coleoptera: Cerambycidae: Lepturinae: Lepturini). Munis Entomology & Zoology 6 (2): 900-904.

Özdikmen H. 2013. - An attempt on subgeneric composition of the genus *Stenurella* Villiers, 1974 (Cerambycidae: Lepturinae: Lepturini). Munis Entomology & Zoology, 8 (2): 509-531.

Özdikmen H., 2015. - A new subspecies of *Pseudovadonia livida* (Fabricius, 1777) from Turkey (Cerambycidae: Lepturinae). Munis Entomology & Zoology 10 (2): 319-321.

Özdikmen H., Mercan N., Cihan N. & Özbek H. 2012. - Subspecific status of *Rutpela maculata* (Poda, 1761) (Coleoptera: Cerambycidae: Lepturinae). Munis Entomology & Zoology 7 (1): 516-522.

Palli F. & Gambetta A. 1962. - Su due Cerambicidi distruttori del legno (*Hylotrupes bayulus* L.; *Hesperophanes cinereus* Vill.). Contributi scientifico-pratici per una migliore conoscenza ed utilizzazione del legno, V (n. 7), CNR, Centro Nazionale del legno, Firenze, 30 pp.

Papi R. & Ceccolini F. 2013. - Vesperidae e Cerambycidae del massiccio del Pratomagno (Preappennino toscano): sintesi delle conoscenze e nuovi dati (Coleoptera: Cerambycoidea). Onychium 10: 133-164.

Paulian A. 1994. - Discussion a propos du *Chlorophorus pilosus* Forster et de sa sous-espece *glabromaculatus* Goeze (Coleoptera Cerambycidae). Bulletin de la Société Sciences Nat 81: 25-27.

Paulus H. F. 1974. - Einiges zur Biologie und Ethologie von *Agapanthia violacea* Fabricius (1775) (Col. Cerambycidae, Lamiinae). Koleopterologische Rundschau 51: 3-31.

Pfister L., Wagner C., Vansuypeene E., Drogue G. & Hoffmann L. 2005. - Atlas climatique du grand-duché de Luxembourg. Musée national d'histoire naturelle, Société des naturalistes luxembourgeois, Centre de recherche public Gabriel Lippmann, Administration des services techniques de l'agriculture, Luxembourg, 79 pp.

Philippo S. (ed.) 2004. - 150 Joer Musée national d'histoire naturelle du Luxembourg. Luxembourg, 278 pp.

Picard F. 1929. - Coléoptères Cerambycidae. Faune de France 20, Lechevalier P., Paris, VII + 167 pp.

Podaný C. 1964. - Monographie des Genus *Rhagium* Fabricius (Col., Cerambycidae, Stenocorini). Acta Zoologica Mexicana 7 (1-3): 1-55.

Proess R. 2004. - Verbreitungsatlas der Heuschrecken des Grossherzogtums Luxemburg. Ferrantia 39: 1-178.

Proess R. 2006 . - Verbreitungsatlas der Libellen des Großherzogtums Luxemburg. Ferrantia 47: 1-164.

Quentin R. M. 1951. - Sur la ponte du *Dorcadion fuliginator* L. L'Entomologiste 7 (2/3): 83-84.

Rapuzzi P. & Sama G. 2006. - Cerambycidae nuovi o interessanti per la fauna di Sicilia (Insecta: Coleoptera: Cerambycidae). Quaderno di Studi e Notizie di Storia Naturale della Romagna 23: 157-172.

Rapuzzi P. & Sama G. 2010. - Considerazioni tassonomiche su alcuni cerambicidi di Sicilia e descrizione di tre nuove sottospecie (Coleoptera: Cerambycidae). Lambillionea 110 (1): 127-131.

Reitter E. 1912. - Fauna Germanica - Die Käfer des Deutschen Reiches. Band IV. Lutz K. G., Stuttgart, 236 pp + Tab. 129-152.

RGD. 2009. - Règlement grand-ducal du 9 janvier 2009 concernant la protection intégrale et partielle de certaines espèces animales de la faune sauvage. Mémorial A-4: 34-41.

Richards O. W. 1964. - The entomological fauna of Southern England with special reference to the country round London. Transactions of the Society for British Entomology 16: 1-48.

Ries C. (ed.). 2005. - Contribution à la climatologie du Luxembourg. Analyses historiques, scénarios futurs. Ferrantia 43: 1-138.

Rivas-Martinez S. 1987. - Nociones sobre fitosociologìa, biogeografìa y bioclimatologìa. In: Peinado Lorca M. & Rivas-Martinez S. (eds.). La vegetatiòn de España. Servicio de publicaciones, Universidad de Alcalà de Henares: 19-46.

Rouard M. 2001. - Insectes intéressants pour la faune Belge. Bulletin de la Société royale belge d'Entomologie 137 (7-12): 106.

Roy D. B. & Sparks T. H. 2000. - Phenology of British butterflies and climate change. Global Change Biology 6: 407-416.

Saalas U. 1936. - Über das Flügelgeäder und die phylogenetische Entwicklung der Cerambyciden. Annales Zoologici Societatis Zoologicae-Botanicae Fennicae Vanamo 4 (1): 1-193.

Sama G. 1999. - Aggiunte e correzioni alla fauna dei Cerambycidae d'Italia (Insecta Coleoptera Cerambycidae). Quaderno di Studi e Notizie di Storia Naturale della Romagna 11 (suppl.): 41-56.

Sama G. 2002. - Atlas of Cerambycidae of Europe and the Mediterranean area, 1: Northern, western, central and eastern Europe, British Isles and continental Europe from France (excl. Corsica) to Scandinavia and Urals. Kabourek, Zlín, 173 pp.

Sama G. 2008. - Preliminary note on the cerambycid fauna of North Africa with the description of new taxa (Insecta Coleoptera Cerambycidae). Quaderno di Studi e Notizie di Storia Naturale della Romagna 27: 217-245.

Schmit L. 2008. - Mensch und Wald in der Geschichte Luxemburgs. Forum für Politik, Gesellschaft und Kultur in Luxemburg 280: 23-27.

Schmidt G. 1967. - Die Bockkäfer (Cerambycidae) von Willershausen. Bericht der Naturhistorischen Gesellschaft Hannover 111: 113-120.

Schneider N. & Thoma J. 2004. - Malformation antennaire observée chez *Callichroma velutinum* (Fabricius, 1775) (Coleoptera, Cerambycidae). Bulletin de la Société des naturalistes luxembourgeois 105: 105-108.

Schoenstein O., Gaillard M., Jager C. & Bastien P. E. 2015. - Document d'objectifs : Site Natura 2000 " Complexe des Hauts de Meuse ". Parc Naturel Régional de Lorraine, Pont-à-Mousson, 303 pp.

Schott C. 1984. - *Cerambyx cerdo* dans des bois fossiles. Bulletin de la Société entomologique de Mulhouse 40: 48.

Schuster W. 1907a. - Vögel und Insekten. Übersichtliche, systematische Zusammenstellung der Hauptschädlinge einiger Pflanzenarten und der hauptsächlichsten Schädlings-Feine aus dem Insekten- und Vogelreiche. Bulletin de la Société des naturalistes luxembourgeois 17: 82-88.

Schuster W. 1907b. - Vögel und Insekten. Übersichtliche, systematische Zusammenstellung der Hauptschädlinge einiger Pflanzenarten und der hauptsächlichsten Schädlings-Feine aus dem Insekten- und Vogelreiche (Schluss). Bulletin de la Société des naturalistes luxembourgeois 17: 98-103.

Schweigert G. 2003. - Hirschkäfer und Alpenbock im Pliozän von Willershausen. Fossilien 2003/3: 178-182.

Selys-Longchamps M. H. de. 1867. - Addictions et corrections au Catalogue raisonné des Orthoptères et des Névroptères de Belgique. Annales de la Société entomologique de Belgique 9: 23-42.

Stefanescu C., Penuelas J. & Filella I. 2003. - Effects of climatic change on the phenology of butterflies in the North-west Mediterranean Basin. Global Change Biology 9 (10): 1494-1506.

Sturani C. 1981. - Notizie biologiche e corologiche su alcuni Coleotteri Cerambicidi d'Italia, specialmente delle regioni settentrionali, insulari e limitrofe. Rivista Piemontese di Storia Naturale 2: 17-54.

Švácha P. 2001. - 17. Überfamilie: Chrysomeloidea, 114. Familie: Cerambycidae, 7. Unterfamilie: Lamiinae. In: Klausnitzer B. Die Larven der Käfer Mitteleuropas, 6, Polyphaga. Spektrum Akademische Verlag, Heidelberg-Berlin: 248-298.

Teunissen A. P. J. A. 2007. - *Agapanthia intermedia* (Coleoptera: Cerambycidae), een nieuwe boktor voor de Nederlandse fauna. Entomologische Berichten 67 (3): 109-111.

Teunissen A. P. J. A., Brugge B. & Hamers B. 2005. - Een bijzonder insect op de Brunssummerheide de grondboktor *Dorcadion fuliginator* (Coleoptera: Cerambycidae). Entomologische Berichten 65 (6): 178-181.

Teunissen A. P. J. A. & Jansen R. P. 2009. - Noordwestelijke areaaluitbreiding van de kleine nevelboktor *Leiopus femoratus* (Coleoptera: Cerambycidae). Entomologische Berichten 69 (1): 13-15.

Thirion C. 2005a. - Regards naturalistes sur la coupe à blanc! 1ère partie. Silva Belgica 112 (2): 27-33.

Thirion C. 2005b. - Regards naturalistes sur la coupe à blanc! 2ème partie. Silva Belgica 112 (3): 30-34.

Thoma J. 2009. - *Xylotrechus rusticus* (Linnaeus, 1758), coléoptère longicorne nouveau pour la faune de Luxembourg (Insecta, Coleoptera, Cerambycidae). Bulletin de la Société des naturalistes luxembourgeois 110: 153-154.

Troukens W. 2007. - De boktorren uit de collectie Remi Guinez (Coleoptera: Cerambycidae). Phegea 35 (1): 37-39.

Trockur B., Boudot J. P., Fichefet V., Goffart P., Ott J. & Proess R. 2010. - Atlas der Libellen / Atlas des Libellules. Fauna und Flora in der Großregion 1. Zentrum für Biodokumentation, Landsweiler-Reden, 201 pp.

Tudor C. 1969. - Chalcidoidea parasitic on Coleoptera (Scolytidae and Cerambycidae). Studii si Cercetari de Biologie (Seria Zoologie) 21 (1): 29-30.

Twinn P. F. G. & Harding P. T. 1999. - Provisional atlas of the longhorn beetles (Coleoptera, Cerambycidae) of Britain. Biological Records Centre, Huntingdon, 96 pp.

Sundkvist L. 2010. - Habitat preferences and reproductive success for the threatened longhorn beetle *Plagionotus detritus*. Master's Thesis Biology, Uppsala, 20 pp.

Shaw M. R. 2006. - Notes on British Pimplinae and Poemeninae (Hymenoptera: Ichneumonidae), with additions to the British list. British Journal of Entomology and Natural History 19: 217-238.

Signoret J. & Signoret S. 2005. - Les pineraies à caractère naturel au Grand-Duché de Luxembourg: caractéristiques, conservation et suivi. Ferrantia 4: 123-126.

Švácha P., Wang J. J. & Chen S. C. 1997. - Larval morphology and biology of *Philus antennatus* and *Heterophilus punctulatus*, and systematic position of the Philinae (Coleoptera: Cerambycidae and Vesperidae). Annales de la Société entomologique de France (N. S.) 33 (3): 323-369.

Villiers A. 1978. - Faune des Coléoptères de France 1, Cerambycidae. Encyclopédie Entomologique 42, Lechevalier P., Paris, 611 pp.

Vitali F. 2004. - Palaeological consideration about a *Paracorymbia hybrida* (Rey, 1885) relict station (Coleoptera, Cerambycidae, Lepturinae). Biocosme Mesogéen 20 (3-4): 137-144.

Vitali F. 2009. - The cerambycids included in Baltic amber: current knowledge status with the description of new taxa (Coleoptera, Cerambycidae). Denisia 69: 231-242.

Vitali F. 2011a. - Short Notes IV. *Saperdopsis robusta* Schmidt, 1967: an extant Chinese species? (Coleoptera Cerambycidae). Entomapeiron (P. S.) 4 (1): 35-36.

Vitali F. 2011b. - Observations faunistiques sur les Cérambycidés luxembourgeois conservés dans la collection du Musée national d'histoire naturelle de Luxembourg (Coleoptera, Cerambycidae). Lambillionea 111 (3): 278-284.

Vitali F. 2012a. - Les espèces de *Meloe* L., 1758 au Grand Duché de Luxembourg (Coleoptera, Meloidae). L'Entomologiste 68 (1): 49-52.

Vitali F. 2012b. - Nouvelles données faunistiques sur les Longicornes du Grand-Duché de Luxembourg (Coleoptera, Cerambycidae). Lambillionea 112 (3): 235-240.

Vitali F. 2013. - *Oberea linearis* (Linné, 1761) nouvelle espèce pour le Grand-duché de Luxembourg (Coleoptera, Cerambycidae). Lambillionea 113 (2): 145-148.

Vitali F. 2014. - Les longicornes de la Reserve naturelle de la Haardt près de Dudelange (Grand-Duché de Luxembourg) (Coleoptera Cerambycidae). L'Entomologiste 70 (2): 87-91.

Vitali F. 2016. - *Plagionotus (s. str.) detritus detritus* (Linné, 1758), nouveau pour le Grand-Duché

de Luxembourg, avec des notes synonymiques sur l'espèce (Coleoptera, Cerambycidae). L'Entomologiste 72 (5) : 315-318.

Vitali F., Drumont A. & Renneson J. L., 2012. - Note sur la distribution de *Protaetia (Liocola) marmorata* (Fabricius, 1792) au Grand-duché de Luxembourg (Coleoptera, Scarabaeidae, Cetoniinae). Cetonimania N.S. 3: 14-19.

Vitali F. & Schmitt T. 2016 - Ecological patterns strongly impact the biogeography of western Palaearctic longhorn beetles (Coleoptera: Cerambycoidea). Organisms Diversity & Evolution 17 (1): 163-180.

Vives E. 1984. - Cerambícidos (Coleoptera) de la Península Ibérica y de las Islas Baleares. Treballs del Museu de Zoologia, Barcelona 2: 7-137.

Vives E. 2000. - Fauna Iberica 12. Coleoptera Cerambycidae. Museo Nacional de Ciences Naturales CSIC, Madrid, 716 pp.

Wagner-Rollinger C. 1950. - Les Lépidoptères du Grand-Duché de Luxembourg (et des régions limitrophes), I. Rhopalocera - Sphingoidea - Bombycoidea. Archives de l'Institut grand-ducal de Luxembourg, section des sciences naturelles, physiques et mathématiques N. S. 19: 449-508.

Wallin H., Lundberg S. & Hägg T. 2005. - Finns de båda palearktiska arterna av lövgrenbock, *Stenostola dubia* och *S. ferrea* (Coleoptera, Cerambycidae) i Norden? Entomologisk Tidskrift 126: 173-179.

Wallin H., Nylander U. & Kvamme T. 2009. - Two sibling species of *Leiopus* Audinet-Serville, 1835 (Coleoptera: Cerambycidae) from Europe: *L. nebulosus* (Linnaeus, 1758) and *L. linnei* sp. nov. Zootaxa 2010: 31-45.

Walter H. & Lieth H. 1960. - Klimadiagramm-Weltatlas. G. Fischer, Jena.

Wang Q. & Leschen R. A. B. 2003. - Identification and distribution of *Arhopalus* species (Coleoptera: Cerambycidae: Aseminae) in Australia and New Zealand. New Zealand Entomologist 26 (1): 53-59.

Weitzel M. 2014. Bockkäferfunde (Coleoptera, Cerambycidae) im Großherzogtum Luxemburg. Dendrocopos 41: 215-219.

Welter A., Turk A. & Trossen J. 2008. Les arbres introduits au Luxembourg : inventaire des essences arborescentes non indigènes de pleine terre présentes sur le territoire du Grand-Duché de Luxembourg. Ferrantia 53: 1-111.

Whitehouse N. J. 2006. - The Holocene British and Irish ancient forest fossil beetle fauna: implications for forest history, biodiversity and faunal colonisation. Quaternary Science Reviews 25: 1755-1789.

Woiwod I. P. 1997. - Detecting the effects of climate change on Lepidoptera. Journal of Insect Conservation 1: 149-158.

Zang R. 1905. - Coleoptera Longicornia aus der Berendtschen Bernsteinsammlung. Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin 1905: 232-245 + 1 Tab.

Zeegers T. W. P. & Heijerman T. 2008. - De Nederlandse boktorren (Cerambycidae). Entomologische Tabellen 2, Nederlandse Entomologische Vereniging, Leiden, 120 pp.

Zhou X., Harrington R., Woiwod I. P., Perry J. N., Clark S. J. & Bale S. J. 1996. - Impact of climate change on aphid flight phenology. Aspects of Applied Biology 45: 299-305.

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Marshall C. R. 1987. - Lungfish: phylogeny and parsimony, in Bernis W. E., Burggren W. W. & Kemp N. E. (eds), The Biology and Evolution of Lungfishes, Journal of Morphology 1: 151-152.

Röckel D., Korn W. & Kohn A. J. 1995. - Manual of the Living Conidae. Volume 1: Indo-Pacific Region. Christa Hemmen, Wiesbaden, 517 p.

Schwaner T. D. 1985. - Population structure of black tiger snakes, *Notechis ater niger*, on off-shore islands of South Australia: 35-46, in Grigg G., Shine R. & Ehmann H. (eds), Biology of Australasian Frogs and Reptiles. Surrey Beatty and Sons, Sydney.

Gerecke R., Stoch F., Meisch C. & Schrankel I. 2005. - Die Fauna der Quellen und des hyporheischen Interstitials in Luxemburg unter besonderer Berücksichtigung der Milben (Acari), Muschelkrebse (Ostracoda) und Ruderfusskrebse (Copepoda). Ferrantia 41, Musée national d'histoire naturelle, Luxembourg, 140 p.

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