Grasshopper conservation in Europe

Published on the occasion of the
third European Congress of Orthoptera Conservation
in Leiden, the Netherlands (2020)

Naturalis Biodiversity Center

kenniscentrum insecten en andere ongewervelden EIS

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UYTTENBOOGAART-ELIASEN STICHTING

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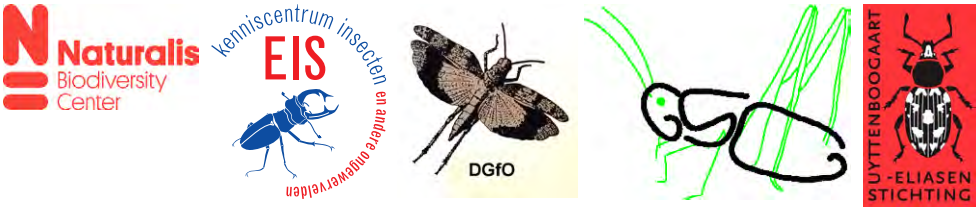

Kleukers, R. & R. Felix (eds.) 2020. Grasshopper conservation in Europe. – EIS Kenniscentrum Insecten & Naturalis Biodiversity Center, Leiden.

Citation suggestion
Skejo, J. & F. Rebrina 2020. Croatia. – In: Kleukers, R. & R. Felix (eds.) 2020, Grasshopper conservation in Europe. EIS Kenniscentrum Insecten & Naturalis Biodiversity Center, Leiden: 19-20.

Layout
André J. van Loon

Publisher
EIS Kenniscentrum Insecten & Naturalis Biodiversity Center, Leiden. eis@naturalis.nl

This publication is supported by: Uyttenboogaart-Eliasen Stichting, Naturalis Biodiversity Center, EIS Kenniscentrum Insecten, IUCN SSC Grasshopper Specialist Group and Deutsche Gesellschaft für Orthopterologie.

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Introduction

Axel Hochkirch

Since the formation of the IUCN SSC Grasshopper Specialist Group in 2010, an increasing engagement for the conservation of Orthoptera can be noticed around the world. The Grasshopper Specialist Group meanwhile counts 112 members from 44 countries with more than half of them (69) being based in 25 European countries.

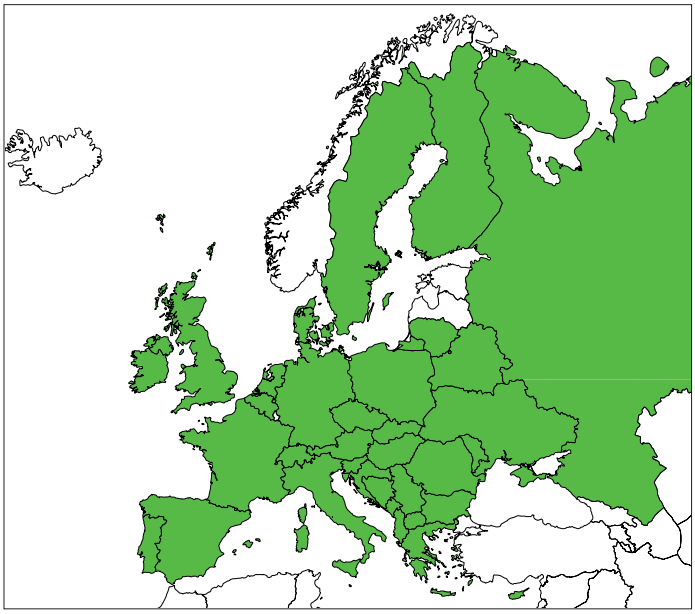
A major accomplishment that was achieved collaboratively by European Orthopterists was the European Red List of Orthoptera, which has been published in 2016. This Red List provides the first pan-European overview of the conservation status of species, but also detailed information on the distribution, ecology, threats, population trends and conservation required for each species. Distribution maps are available for the first time for all European species, which are very valuable for researchers, naturalists and conservation practitioners. The assessments also illustrate our lack of knowledge regarding the population trends and conservation status of many species. However, this has led to increased research with new information on European Orthoptera species becoming available repeatedly. For example, two species that were assessed as 'Critically Endangered (Possibly Extinct)' (*Dericorys minutus* and *Evergoderes cabrerai*) have recently been rediscovered on Gran Canaria and the Limnos Plump Bush-cricket *Isophya lemnotica* has turned out to be quite common on Limnos after it had not been recorded for 80 years.

Even more important, conservation action has been instigated for species with a high extinction risk, such as the Crau Plain Grasshopper *Prionotropis rhodanica* and the Adriatic Marbled Bush-Cricket *Zeuneriana marmorata*. For both species, conservation action plans have been compiled following the IUCN guidelines for strategic conservation planning. The implementation of these plans is challenging as it strongly depends upon the engagement of conservation practitioners on the ground. The increasing recent interest in insect declines provides a unique opportunity to increase such efforts with more funding sources becoming available for insect conservation. European Life Funding for example can be raised for projects dealing with Critically Endangered or Endangered species and the European

The IUCN Red List of European Orthoptera was published in 2016 and has greatly stimulated Orthoptera conservation in Europe.

Commission is very keen to support such projects. Still, the number of applications for such funds is quite low due to the lack of capacity in many European countries.

This booklet provides an overview on Orthoptera research and conservation across Europe. In some countries, particularly in the northwest of Europe, conservation efforts have started early and strong experiences in habitat management, captive breeding, translocation and outreach exist, like the successful reintroduction of the Field cricket *Gryllus campestris* in England or habitat restoration for the Rattle Grasshopper *Psophus stridulus* in Finland. In other countries, particularly in the species-rich Mediterranean region, conservation actions for Orthoptera available are just being instigated, like a project to protect the Critically Endangered Cika Mountain Grasshopper *Peripodisma ceraunii* in Albania. This development makes me quite optimistic



Countries which are represented in this publication.

that we will be able to protect many European Orthoptera species from extinction, even though the threats from anthropogenic pressures, such as land use changes, intensive agriculture, over- and undergrazing, climate change, drainage, damming, invasive species and wildfires appear to be constantly increasing.

Another very important and encouraging development is the increasing number of field guides, handbooks and other identification tools becoming available, like 'The Grasshoppers and Crickets of Italy' (Iorio et al. 2019), 'The Grasshoppers of Greece' (Willemse et al. 2018) or the Orthoptera App by Florin Rutschmann and Christian Roesti. These new tools will facilitate research and help to collect more data on the distribution, ecology and threats of Orthoptera all over Europe. Internet platforms like Observation.org and the associated apps (ObsMapp/iObs) greatly facilitate the collection of biodiversity data and make occurrence data available to many people. In the future, these efforts will help to improve the maps and identify areas of high conservation importance (Key Biodiversity Areas). All these constant efforts will help to retain Orthoptera high on the international conservation agenda.

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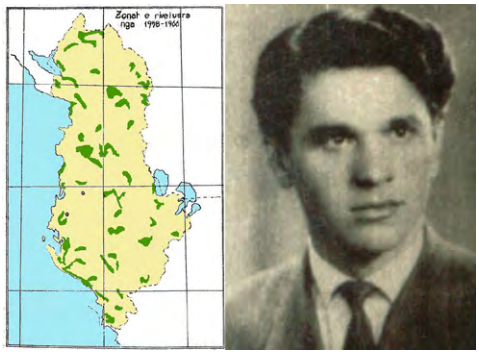
Acknowledgements

We want to thank the following organisations for their (financial) support: Uyttenboogaart-Eliasen Stichting, Naturalis Biodiversity Center (Jeroen Snijders, Berry van der Hoorn), EIS Kenniscentrum Insecten, IUCN SSC Grasshopper Specialist Group and Deutsche Gesellschaft für Orthopterologie. For photos or other contributions we are grateful to: G. Aniskevich, Guido Bonett, S. Borisov, Michał Brodacki, G. Busmachiu, José Correas, Samuel Danflous, Beranrd Defaut, V. Derjanschi, Patrícia Garcia-Pereira, Eltjon Halimi, Alex Hyde, B. Jarčuška, Vicky Knudsen, Dejan Kulijer, Marcin Kutera, Sandro Lanfranco, Malcolm Lee, Richard Lewington, O. Lozinskaya, Christian Monnerat, Ryszard Orzechowski, Denys Ovenden, Paweł Radzikowski, Gilles San Martin, M. Sehnal, Andreas Stumpner, D. Trezkova, Tomasz Wilk and M. Zacherl.

Albania

Michèle Lemonnier-Darcemont

The main historical data on Albanian Orthoptera were provided by expeditions organized by the Hungarian Academy of Sciences in 1916-17 (Csiki 1922), the collection of the Natural History Museum Vienna and the German Entomological Institute in 1961 (Čejchan 1963). The first overview of the fauna was provided by Murraj et al. (1970). During the past ten years, research has been intensified. Puskás & Szövényi (2016) provide a preliminary checklist of 164 taxa. Lemonnier Darcemont & Darcemont (2015) describe two endemic species: Albanian Mountain Grasshopper *Peripodisma llofizii* and Cika Mountain Grasshopper *P. ceraunii*.



Sampling localities of Xhelo Murraj (1958-1966). He was the first to publish an overview of the Albanian Orthoptera fauna.

Conservation

The only grasshopper on the Red List of Albanian flora and fauna in 2013 was *Saga pedo*. The two endemic species assessed as Critically Endangered should be considered as the highest priority for conservation planning: *Peripodisma ceraunii* and Albanian Saddle Bush-cricket *Uromenus dyrrhachiacus*. No conservation plans are currently implemented.

Future plans

Albania is still one of the least studied countries in Europe. Especially in the sparsely populated and isolated mountain areas, a lot remains to be discovered. The most serious threat in the mountains is intense grazing. The more densely populated lowland regions are often threatened by uncontrolled urbanization in coastal regions, overgrazing and pollution

Cika Mountain, habitat of *Peripodisma ceraunii*. Photo Michele Lemonnier-Darcemont.

Porto-Palermo Bay is still a natural area but could be threatened by uncontrolled urbanization. On the Albanian coast the endemic *Uromenus dyrrhachiacus* lives. Photos Michele Lemonnier-Darcemont (habitat) and Paolo Fontana (*Uromenus dyrrhachiacus*).

of wetlands and watercourses (agriculture, poor waste management). To be able to protect the Albanian Orthoptera fauna there is an urgent need for a conservation plan, which has to consist of:

- A Red List assessment of Orthoptera on the national level;
- A study of the sustainability of vulnerable species in relation to traditional activities such as pastoralism;
- An implementation of species protection plans for *Peripodisma ceraunii* and *Uromenus dyrrhachiacus*.

Key publications

Murraj et al. (1970) – First overview
Lemonnier-Darcemont et al. (2015) – Overview south Albania
Puskás & Szövényi (2016) – Preliminary check-list.
Lemonnier-Darcemont et al. (2018) – threats *Peripodisma*

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Austria

Thomas Zuna-Kratky

Grasshoppers were already intensively studied in the Austro-Hungarian Empire by well-known scientists such as Brunner von Wattenwyl, and a total of 14 taxa were first described in Austria. Faunistic research especially intensified with the beginning of the 1990s and led to nationwide cooperation of grasshopper-enthusiasts, forming the 'ARGE Heuschrecken Österreichs'. At present, grasshoppers are also used as indicators for the management of protected areas (e.g. alpine wild rivers) and for the evaluation of nature conservation programs (like the agri-environmental scheme).

Species composition

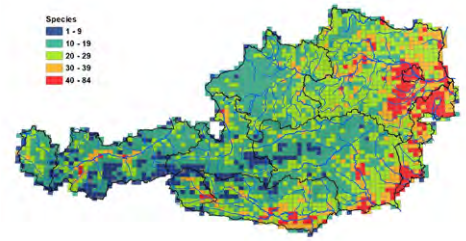
At present, 140 grasshopper species are established in Austria, 64 Ensifera and 75 Caelifera. Six Caelifera (mainly steppe-species like *Arcyptera microptera*) became extinct during the 20th century, while the last two 'newcomers' – *Eupholidoptera schmidtii* and *Rhacocleis annulata* – are introduced Ensifera. Due to the large altitudinal differences in the landscape, Austria hosts species of a wide ecological range, from lowland hoppers like *Epacromius coerulipes* to high altitude-animals like *Aeropedellus variegatus* or *Melanoplus frigidus*. Three species are (semi)endemic: *Anonconotus italoaustriacus*, *Miramella carinthiaca* and *Podismopsis styriaca*.

Acrida ungarica was believed to be extinct in Austria after the decline of grazed steppe habitats in the area of Lake Neusiedl. In 2018, a population of several 100 individuals was discovered by Maria Zacherl in a remote part of the Seewinkel, where grazing never stopped. Photo M. Zacherl.

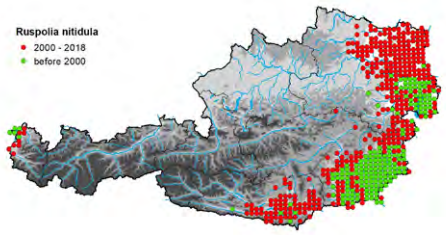
Atlas projects

Searching for species and mapping their distribution were the main drivers for orthopterological research in the 1990s and 2000s, resulting in several regional and one final national atlas project (see below). The collection of all available data on the distribution of grasshoppers is still continued by the ARGE Heuschrecken Österreichs, a private voluntary initiative. Thus, recent range alterations can be identified quickly, and the necessary data for conservation projects and a Red List update is continuously collected.

Anton 'Toni' Koschuh (1970-2013) was the last person to find a grasshopper new to science in Austria: Podismopsis styriaca. Photos H. Kerschbaumsteiner (Toni) and M. Senal (*Podismopsis*).



Species-richness of grasshoppers in a 3x5 km grid in Austria shows marked 'hot-spots' in the eastern lowlands and some alpine valleys.



The continuous collection of data on grasshoppers enables us to follow recent range-shifts over a nationwide scale, as shown here for *Ruspolia nitidula* which in the 1980s was believed to be probably extinct and is now a widespread inhabitant of very diverse habitats in eastern and southern Austria.

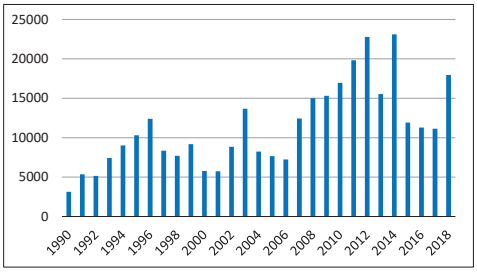
Conservation

Several Red Lists have already been published (1983, 1994, 2005), but the sharp increase in knowledge, as well as recent pronounced changes in distribution and abundance, require new estimations of threat. Grasshoppers are subject to protection by regional and national law, but specific projects to benefit endangered species are still rare. Grasshoppers of alpine rivers like *Bryodemella tuberculata* are target-species in some river restoration programs, and recent efforts to increase size and quality of habitats have also been implemented for some very rare steppe-species like *Paracaloptenus caloptenoides* and *Stenobothrus eurasius*. Several indicator-species for traditionally managed meadows were used in some districts to direct agri-environmental funds to the most suitable locations.

Future plans

At present we are working on 'missing' regional atlas projects for Vienna, Styria, and Carinthia. We are also focusing on reassessing the threat status of Austrian grasshoppers for a new national Red List. To gather data for this task we want to revisit a large set of sites where grasshoppers were mapped in the 1990s to better calculate trends and range shifts. We also want to establish a simple monitoring scheme for a cross-section of landscapes, and encourage people to take part in this long-term project to monitor grasshoppers such as it is already well established for breeding birds.

On the administration and policy level, awareness is nowadays increasing for grasshoppers as indicators for the establishment and evaluation of nature conservation measures, and we hope to contribute to this development with our expertise.



Grasshopper records collected in our database are still increasing over the years, even though several atlas projects have already been completed.

Key publications

Berg et al. 2005 – First comprehensive Red List
Zuna-Kratky et al. 2009 – First atlas (eastern Austria)
Illich et al. 2010 – Atlas for Salzburg
Ortner & Lechner 2015 – Atlas for Vorarlberg
Landmann & Zuna-Kratky 2016 – Atlas for Tyrol
Zuna-Kratky et al. 2017 – Atlas for Austria
Orthoptera.at
Forum-orthoptera.at

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Belarus

Tatyana Sergeeva

The first data about Orthoptera of Belarus were published by Arnold (1902). A large contribution to the knowledge of these insects was made by a number of researchers (e.g. Shchelkanovtsev 1907, Truscolaska 1929) and during the last decades by entomologists of the Institute of Zoology of the Academy of Sciences of the BSSR. These investigations are continued at the International Sakharov Environmental Institute of Belarusian State University.

L.M. Kopaneva.

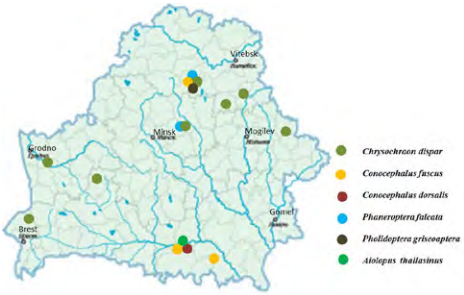
Fauna

With only 53 species the species richness of Orthoptera is relatively low. 39 species occur in the mixed forest life zone, and 49 species occur in Polesie. Two species are mainly distributed in the boreal parts of Eurasia, *Pseudochorthippus montanus* and *Metrioptera brachyptera*. Species commonly associated with steppes, semi-deserts and deserts seem to penetrate into Polesie. This phenomenon may be explained by habitat alterations caused by swamp-draining programs, that yield dry habitats. This group of dry habitat species includes, for example, *Stenobothrus stigmaticus*, *S. nigromaculatus*, *S. lineatus*, *Omocestus petraeus*, *Arcyptera fusca*, *A. microptera*, *Epacromius pulverulentus*, *Celes variabilis*, *Bryodemella tuberculata*, *Sphingonotus caerulans* (Sergeeva 2011).

Rare species

Conocephalus dorsalis, *C. fuscus*, and *Chrysochraon dispar* are indicators of natural areas and are included in the Red Data Book of Belarus. They occur locally in the basins of the Pripyat and Berezina Rivers (Pripyatsky National Park and Berezinsky Biosphere Reserve, Orsha hill). *Chrysochraon dispar*, with only 6 localities, is one of the rarest species. In 2018 *Conocephalus fuscus* was unexpectedly found by the schoolgirls of Zhodino Women's Gymnasium on the flood-plain meadow of the Plisa River. That stimulated entomologists to start studies on local

Chrysochraon dispar and *Conocephalus fuscus*. Photos G. Aniskevich and D. Trezkova.



Distribution of some rare species in Belarus

Collecting Orthoptera in Berezinsky Biosphere Reserve. Photo O. Lozinskaya.

orthopteran diversity. *Phaneroptera falcata* is also a rare species in Belarus (Lukashuk & Sergeeva 2011).

Key publications

Smirnova 1997 – Catalogue
Red book of Belarus 2004 – 2017
Borodin et al 2016 – Monography
Lukashuk & Tsinkevich 2016 – Survey

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Belgium

Koen Lock

In the second half of the 19th century, Baron de Sélys-Longchamps was a pioneer in the study of the Belgian grasshoppers. However, only in the1990s grasshoppers became really popular in Belgium.

Baron de Sélys-Longchamps. From: Coen (1982).

Atlas projects

The first atlas on the distribution of the Belgian grasshoppers was mainly based on collections in natural history musea and old literature data (Devriese 1988). Since then, Hendrik Devriese motivated a lot of people to study grasshoppers. Among these people were a lot of young enthusiasts that were active in youth organizations (Jeugdbond voor Natuurstudie en Milieubescherming & Jeunes et Nature), which in turn organized inventories. This resulted in a second atlas, which contained observations done by almost 200 volunteers. This atlas gave a much better insight into the distribution of the Belgian Orthoptera species (Decleer et al. 2000). Nowadays, there is no more need for a printed atlas, because up-to-date distribution maps of all species are always available online (Waarnemingen.be & Observations.be).

Society

After Hendrik Devriese composed the first distribution atlas of the Belgian grasshoppers, he founded the society Saltabel, derived from Saltatoria Belgica, although the territory included the whole Benelux. In addition to a yearly grasshopper weekend, also a newsletter was published, which came out until 2002. In 2011, it was tried to revive Saltabel by making it a working group under Natuurpunt, the main society responsible for the study and conservation of nature in Flanders. For a few years, excursions were organized, but now the activities have almost ceased again, probably due the lack of a clear goal.

Orthoptera publications from Belgium. From left to right: Projects of youth organisations played a major role in the inventory of the Belgian grasshoppers, Nieuwsbrief Saltabel is a newsletter about grasshoppers in the Benelux, which was distributed from 1989-2002, an updated atlas appeared in 2000, in 2013 a handbook in French.

Identification
Although the Dutch speaking community (Flanders) could always rely on the excellent keys published in the Netherlands, the French speaking community (Wallonia) had to wait until a field key was developed by Devriese (1993) and a handbook by Claerebout (2013).

Conservation
Due to the regionalization of Belgium, separate Red Lists had to be made for Flanders, Brussels, and Wallonia. Decleer et al. (2000) provided the first, preliminary Red Lists, based on the scarce data available at that time. The Saltabru-project resolved the lack of data for Brussels and since 2008, the online platforms Waarnemingen.be and Observations.be are yielding an annually increasing number of records. The second set of Red Lists (Lock et al. 2011) was based on more complete data and provided a more accurate status of the grasshoppers in Belgium. For Flanders, a third Red List was published by Maes et al. (2017), which closely matched the previous one. The most threatened species in Flanders, *Ephippiger diurnus* and *Stenobothrus stigmaticus*, are now monitored yearly. For the former species, special management strategies are carried out.

Future plans
An increasing number of people add observations to the online platforms Waarnemingen.be and Observations.be. Despite the growing knowledge, more should be done to protect the threatened species. To avoid losing the threatened species, species protection programs need to be set up, including customized measures in the field.

Key publications
Devriese 1988 – First atlas
Devriese 1993 – First field key in French
Decleer et al. 2000 – Second atlas & first Red Lists for Flanders, Brussels and Wallonia
Lock et al. 2011 – Second Red Lists for Flanders, Brussels and Wallonia
Claerebout 2013 – First handbook in French
Maes et al. 2017 – Third Red List for Flanders

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In 2009 the weekend of Saltabel took place in the area of Viroin. Several key researchers of the Belgian Orthoptera study community were present. From left to right: Koen Lock, Hendrik Devriese, Kurt Hofmans † and Kris Decleer. Photo Roy Kleukers.

Bosnia and Herzegovina

Gellért Puskás & Gergely Szövényi

The grasshoppers of Bosnia and Herzegovina are relatively well studied in the Balkans. Research started in the 19th century, in which the National Museum of Bosnia and Herzegovina (Zemaljski Muzej Bosne i Hercegovine, ZMBH) played a decisive role. The foundations of the collection were laid by Viktor Apfelbeck (1859-1934) and especially Sonja Mikšić contributed considerably to the knowledge of the fauna. Us (1967) provides the only check-list of orthopteroid insects of the former Socialist Federal Republic of Yugoslavia.

Conservation

Although no grasshoppers are legally protection in the country, populations of several Dinaric endemics and endangered species inhabit the well preserved habitats of national parks and other protected areas.

Present activities

At the moment there is no active grasshopper expert in Bosnia and Herzegovina. With collaboration of ZMBH, Hungarian orthopterists started to perform regular faunistical field trips in different regions in the last decade. Endemic, threatened and data deficient species are also in the focus of the research activities and new results may contribute to more appropriate Red List assessments in the near future.

Sonja Mikšić (1926-1987) worked 36 years for the ZMBH in Sarajevo. She created a large collection and published more than 40 faunistical, biogeographical and taxonomical papers on Bosnian grasshoppers. Source: ZMBH.

Taxonomical studies are in progress within the *Poecilimon elegans* species group and target also some interesting taxa in *Pachytrachis, Metrioptera* and *Stenobothrus*.

The Bosnian Bush-cricket *Pachytrachis bosniacus* has a very small distribution restricted to the Cincar and some adjacent mountains, living in subalpine bushy grasslands between 1300 and 1800 m. Photo G. Puskás.

The Critically Endangered Serbian stick grasshopper *Pyrgomorphula serbica* is restricted to a narrow area on the Bosnian-Serbian border. Recently a large population was discovered in the Varda Mountain in the clearings of sparse black pine forests growing on serpentine rocks. Photo G. Puskás.

Prenj Mountain. Karstic grasslands of the Dinaric Alps are home of several endemic grasshopper species. Photo G. Puskás.

Future plans

An up-to-date check-list with attention for conservation aspects is planned in the near future. For a systematic research of the country, it would be important to educate local grasshopper experts. This aim could be initialized with a prospective handbook about the Dinaric grasshoppers.

Key publications

Us 1967 – Check-list
Mikšić 1967 – Detailed overview of bush-cricket fauna

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The Dinarian Grasshopper *Rammeihippus dinaricus* was known only from the type locality (Kamešnica Mt.) for decades, but recently discovered in other mountains, also in Croatia. This tiny species has an uncommonly complex courtship song and behaviour. Photo G. Puskás.

Bulgaria

Dragan Chobanov

Research overview

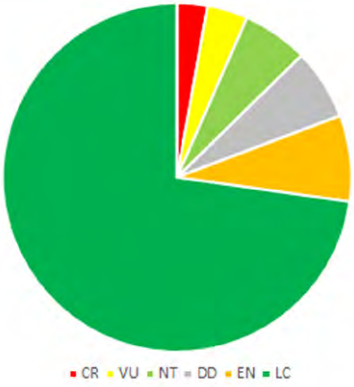
In 1883 Pančić described *Poecilimon orbelicus*, the first record of an orthopteran from Bulgaria. Ten years later Frey-Gessner (1893) mentioned 63 currently valid species. Nedelkov (1908) was the first Bulgarian author focusing on grasshoppers, publishing 126 scientific names, referring today to 115 valid taxa. The catalogues of Orthoptera by Buresch & Peschev (1955, 1957, 1958) laid the groundwork for Georgi Peshev who was active in the period 1954-1985. A new active period started in the 2000s with the research by Dragan Chobanov. His Ph.D. thesis (Chobanov 2009) is until now the most complete catalogue of the Bulgarian Orthoptera.

Poecilimon orbelicus – the first Orthoptera species described from Bulgaria. Photo Dragan Chobanov.

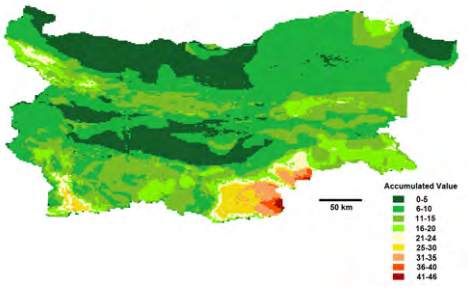
Current state

The first Red List was published in Golemanski (2015), based on rather poor data. A revised checklist and distribution atlas is in preparation, based on many new data gathered by D. Chobanov and colleagues during assessments for Natura 2000 species and habitats, in parallel with the European Red Listing of Orthoptera. The revised checklist includes ca. 220 species, of which 20 % have a threatened status and 8 % are assessed as Data Deficient. Analysis of their distribution revealed priority areas for the conservation of Orthoptera in Bulgaria.

Despite the intensified research, the knowledge of Bulgarian Orthoptera is still rather poor, in comparison to many Western and Central European countries. The public interest is lacking and not much funding can be obtained for grasshopper projects. *Paracaloptenus caloptenoides* and *Saga pedo* are the only species protected by law because they are included in the Habitats Directive of the EU. Populations of these species are monitored within the Natura 2000 network. Other, more threatened species, do not receive appropriate attention.



Threatened status of Bulgarian Orthoptera. Source: S. Borisov and D. Chobanov.



Prioritisation of territories of conservation importance for Bulgarian Orthoptera. Source: S. Borisov and D. Chobanov.

Outreach

Naturalists who want to start studying grasshoppers in Bulgaria encounter the problem that many poorly known species can occur in a small area. A well-illustrated field guide would be a welcome tool to raise interest in this attractive group of insects.

Species inhabiting steppes are among the most threatened in Bulgaria. Below left to right *Bradyporus macrogaster* (EN), *Onconotus servillei* (EN) and *Gampsocleis glabra* (CR). Source: S. Borisov and D. Chobanov.

Future plans

Recently an upsurge of interest in Bulgarian Orthoptera has occurred, mainly because the country holds a high diversity of species and many natural or semi-natural habitats and affordable prices. We need to train local experts and spread the knowledge of Orthoptera to the public. We urgently need a field guide and also to increase efforts to protect locally endangered species, not only by developing action plans but also by raising public awareness.

Key publications

Pančić 1883 – First description of a Bulgarian orthopteran
Brunner von Wattenwyl 1891 – Bulgarian records
Frey-Gessner 1893 – Bulgarian records
Nedelkov 1908 – Bulgarian records
Buresch & Peshev 1955, 1957, 1958 – Catalogues
Chobanov 2009 – Recent catalogue
Golemanski 2015 – First Red List

Photographing grasshoppers at Matochina, an Orthoptera hotspot in SE Bulgaria. Photo Christian Roesti and Florin Rutschmann

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Croatia

Josip Skejo & Fran Rebrina

Because of its unique geographical position and shape, including the Pannonian lowland, Dinaric Alps and the Adriatic coast, Croatia has always been a hotspot for orthopterological research. As a result, Croatia is second only to Slovenia in terms of exploration level in the Western Balkans.

History

The research started in the early 19th century with Friedrich Germar, Toussaint von Charpentier and Baron Ferenc Ocskay von Ocskó, who described the first orthopteran species from the Adriatic region, e.g. *Prionotropis hystrix, Barbitistes ocskayi,* and *Gryllomorpha dalmatina*. The first comprehensive data were compiled in the mid 19th century with Brunner von Wattenwyl and Hermann Krauss, followed by local experts Grgur Bučić and Ivan Krstitelj Novak from Hvar Island, and Franjo Dobijaš (M. Padewieth) from Senj. Nevertheless, only a single species was described by a Croatian researcher: *Bicolorana krausi* by Padewieth.

Between the two World Wars, Richard Ebner, Pëtr Us, Frederick Zeuner and Sándor Pongrácz were only some of the researchers who started publishing their contributions during this period. There were also regional experts on orthopterans, notably Zora Karaman, Živko Adamović and Sergej Matvejev. Us' 1967 catalogue presented the first list of orthopteran species for each country of Yugoslavia. In 2018 an updated list for Croatia was published by a combined Croatian (Josip Skejo, Fran Rebrina, and Nikola Tvrtković) and Hungarian (Gellért Puskás and Gergely Szövényi) team. This publication can be regarded as a starting point for contemporary Croatian orthopterology. Apart from the mentioned researchers recently many European orthopterists have been attracted to the rich Croatian fauna.

The first Croatian Orthoptera experts Grgur Bučić (1829-1911) and Ivan Novak (1848-1893). Source: Croatian State Archives.

Fauna

Currently 184 Orthoptera species are known to inhabit Croatia, 101 crickets and bush-crickets and 83 grasshoppers. All the species were given Croatian vernacular names. The Mediterranean region and the Dinaric Alps are particularly species rich, while the Pannonian region seems less diverse, but it has also been less studied.

The Eastern Stone Grasshopper *Prionotropis hystrix*, female (Lisac). This species can be found across the Dinaric Alps and on the central and northern Adriatic islands. In the past, children from Krk Island used to play with this large grasshopper as a toy car. Photo Fran Rebrina.

The endemic Croatian Toothed Grasshopper *Stenobothrus croaticus* is related to *Stenobothrus (eurasius) macedonicus* and represents a unique element from the past - a relict. It is known from a single locality in Velebit Mt. above Senj. Photo Josip Skejo.

Present activities

Currently, several research groups study a broad variety of Orthoptera topics, including ecological, bioacoustic, morphological, faunistic and taxonomic research. Josip Skejo and Fran Rebrina are actively recruiting new students. Biology students Karmela Adžić, Maks Deranja and Marko Pavlović investigate grasshoppers of the Adriatic islands, and are conducting social media research. Josip Skejo and Fran Rebrina are actively recruiting new students. Biology students Karmela Adžić, Maks Deranja and Marko Pavlović investigate grasshoppers of the Adriatic islands, and are conducting social media research. Other research topics are: Tetrigidae and Tridactylidae (Skejo); Metrioptera of the Dinaric Alps (Rebrina); *Troglophilus* and Dolichopoda (Tvrtković); *Poecilimon elegans* complex (Puskás, Szövényi, Heller, Tvrković); Pannonian region (Puskás and Szövényi); Istria and adjacent mountains and islands (Christian Roesti and Florin Rutschmann); Dinaric Alps (Skejo, Rebrina, Puskás, Szövényi, Tvrtković); Biokovo Mt. (Skejo and Rebrina); Pelješac peninsula (Slobodan Ivković) and Dubrovnik area (Rebrina and Tvrković).

Conservation

Only the Common Predatory Bush Cricket *Saga pedo* is protected by the national law in Croatia, but except for its occurrence in protected areas, no conservation efforts targeting this species are taking place in the country. The Alpine Groundhopper *Tetrix tuerki*, considered regionally extinct, was recently found in Croatia. New research also suggests that the IUCN Red List status needs to be reviewed for certain species, for example the Hvar Saw Bush-cricket *Barbitistes kaltenbachi* and Lesina Bush-cricket *Rhacocleis buchichii*.

We plan to prepare a publication dedicated to 27 species which are probably in need of protection, including a re-evaluation of their IUCN status at the national level. The Croatian Toothed Grasshopper *Stenobothrus croaticus* is endemic to a single locality on Velebit Mt. and it is the only critically endangered species in the country. Practical conservation measures are urgently needed for this species.

Joined efforts of the Hungarian and Croatian teams on Poštak Mt. From left to right: Gellért Puskás, Fran Rebrina, Josip Skejo and Gergely Szövényi. Photo Gellért Puskás.

Future plans

We plan to publish the Red Book of Croatian grasshoppers and crickets, as well as an atlas and identification key. We are going to continue our field and lab studies on orthopterans. Phylogeographical surveys are planned in order to understand biogeographical patterns and taxonomic problems, e.g. *Pholidoptera dalmatica* complex, *Poecilimon elegans* complex, *Dolichopoda, Gryllotalpa, Troglophilus.* Special attention will pe paid to potential hybridisation zones: *Chorthippus bornhalmi - C. brunneus, C. dorsatus - C. dichrous* and subspecies of *C. mollis*.

Orthopterists visiting Croatia are invited to upload their observations online (for example on iNaturalist).

Key publications

Us 1967 - Old checklist
Puskás et al. 2018 - Most recent records
Skejo et al. 2018 - Brand new checklist

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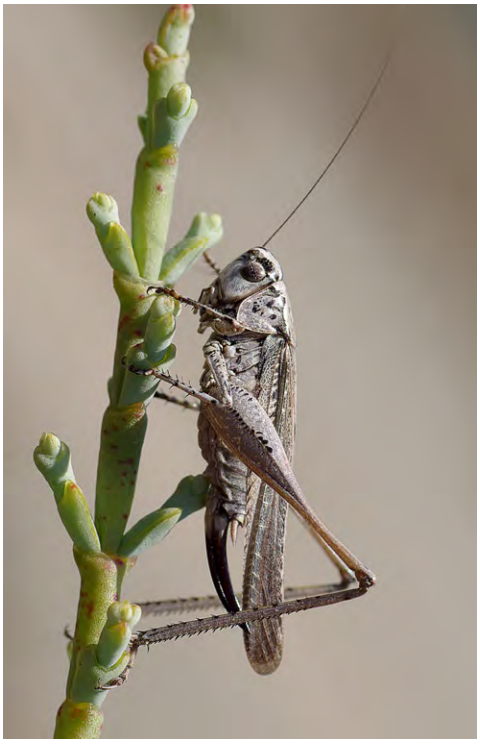
Cyprus

Klaus Siedle, Josef Tumbrinck, Elli Tzirkalli

The grasshoppers of Cyprus have been under investigation by foreign collectors in the 19th century and first half of the 20th century (Azam 1901, Brunner von Wattenwyl 1878, Uvarov 1936, 1949). A first checklist with historic and recent records led to two publications on the recent situation of the orthopterans of Cyprus (Tumbrinck 2006, Siedle et al. 2016). Siedle et al. (2016) listed 71 species and since then three species have been added to the list: *Acrida turrita*, *Pseudomogoplistes squamiger* and *Svercus palmetorum*.



Platycleis kibris was described in 2012 from Cyprus and is only known from *Salicornia*-steppes on the Akrotiri-peninsula. Photo Klaus Siedle.

Conservation

Cyprus has a lot of endemic species, several of which are endangered (see table). The threats are the same as in the rest of the Mediterranean countries. Especially coastal habitats are degraded, due to land development, building touristic infrastructure, intense argriculture with pesticides, climate change etc. Currently no Red List is available for the island but the Cypriot species are included in the European Red List (Hochkirch et al. 2016). The endemic *Platycleis kibris* is critically endangered and therefore has the highest priority for conservation. The most important known area of this species is the on Akrotiri peninsula and an action plan should be made. Also for other endangered species an action plan should be prepared.

Future plans

We expect that several new species can be added to the list of Cyprus, probably even new species to science. We want to compile all available data in an Access database (locations, data via facebook etc.). It is necessary to update the identification key and collect data on the ecology and the distribution of the endemic species, especially the critically endangered

Table of the endemic (sub)species of Cyprus. LC: Least Concern, NT: Near Threatened, EN: Endangered, CR: Critically Endangered, DD: Data Deficient, X: no assessment available.

Ensifera	**Caelifera**
Conocephalus fuscus cyprius (LC)	*Truxalis eximia cypria* (LC)
Isophya mavromoustakisi (EN)	*Pezotettix cypria* (LC)
Bucephaloptera cypria (EN)	*Chorthippus vagans cypriotus* (X)
Platycleis kibris (CR)	*Xerohippus azami* (DD)
Exodrymadusa inornata (NT)	*Xerohippus cyprius* (DD)
Modicogryllus cyprius (LC)	*Xerohippus sinuosus* (DD)
Modicogryllus pseudocyprius (DD)	*Sphingonotus caerulans insularis* (LC)
Myrmecophilus cypria (X)	*Sphingonotus eurasius cyprius* (X)
Orchamus gracilis (EN)	
Pyrgomorpha cypria (LC)	

Salicornia-steppe, habitat of *Platycleis kibris.* It was found on both sides of the track. Photo Klaus Siedle.

The endemic *Exodrymadusa inornata* seems to be widespread in the mountainous areas of Cyprus. Photo Klaus Siedle.

Platycleis kibris. Also a revision of the genus *Xerohippus* is needed. A new checklist and a publication with new data is under preparation. The next years an atlas project will be carried out, containing also data on biology and ecology.
Efforts will be made to acquire funding for further study of the orthopterans of the island. We encourage orthopteran enthusiasts that visit Cyprus to send their old and new data and photos to elli.tzirkalli@gmail.com in order to help us to develop a solid knowledge of the Cyprian orthopterans.

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Czech Republic

Petr Kočárek, Jaroslav Holuša, Pavel Marhoul, Robert Vlk

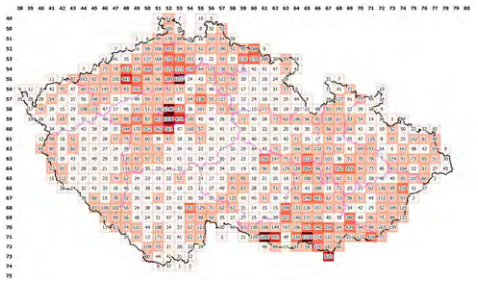
In the Czech Republic orthopteran insects have been studied since the first half of 19th century. In 1926, Obenberger published the first monograph dealing with the distribution in the former Czechoslovakia, including the Czech Republic, Slovakia, and Ruthenia. This represented an turning point in the study of these insects. The publication of a comprehensive monograph with illustrated identification keys (Kočárek et al. 2005) resulted in additional study of bush-crickets and grasshoppers, and also helped determine the conservation status of many species (Holuša & Kočárek 2005, Holuša et al. 2017). To date, 98 orthopteran species have been reliably detected in the Czech Republic.

Atlas project

More than 400 studies of orthopterans, ranging from faunistic/taxonomic reports to experimental investigations have been published in the Czech Republic. A mapping project (2012-2020) will result in the first atlas in 2021. The project has currently summarised more than 60,000 records.

Jan Obenberger (1892-1964) published the first orthopteran monograph with identification keys in 1926.

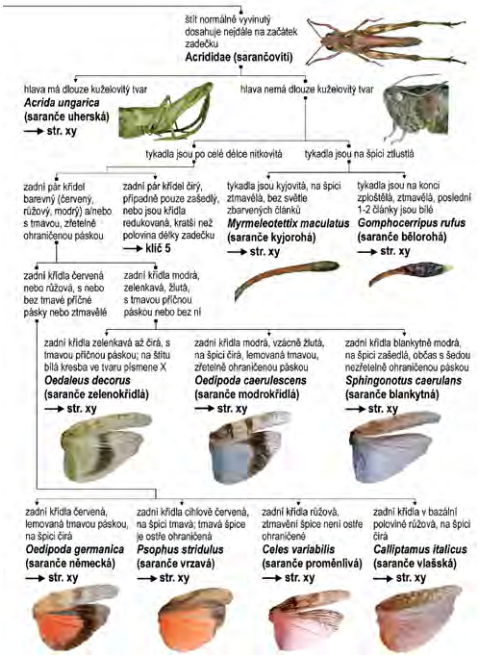
Tetrix tuerki is critically endangered in the Czech Republic. Its current distribution is limited to one locality in the foothills of the Carpathians, where it occupies gravel banks of the Morávka River. Photo Petr Kočárek.



Number of orthopteran records in each faunistic field (10x12 km) in the Czech Republic from 2000 to 2019.

Conservation

Red Lists for orthopterans were published in 2005 and 2017. Altogether, 41 species were classified to threatened categories according to the criteria of the IUCN. Seven species are considered extinct, and seven are classified as critically endangered. In the European Union, two species (*Saga pedo* and *Stenobothrus eurasiaus*) are protected by national law in accordance with Council Directive 92/43/EEC, and populations of these species are regularly monitored.



A sample of the pictorial identification key from Kočárek (2013).

Book covers of two recent monographs on Czech Orthoptera from 2005 and 2013.

Outreach

For Czech citizens who want to study grasshoppers, a recent field guide (Kočárek et al. 2013) provides simple identification keys, images of all species, and a CD with songs of all stridulating species. A Facebook page serves as a platform for discussion among scientists who study orthopterans, as well as for contact with the public. Distributional data of some easy-to-recognize species in the Czech Republic are collected on the BioLib web page (Biolib.cz), and results are presented as maps. Mobile phone applications for orthopteran identification and data collection are currently being developed.

Future plans

We are finishing the first atlas project, of which publication is scheduled for 2021. We plan to continue the extensive data collecting with the help of the public through mobile applications as well as by public web databases.

Key publications

Kočárek et al. 2005 - Blattaria, Mantodea, Orthoptera & Dermaptera of the Czech and Slovak Republics

Kočárek et al. 2013 - field guide + songs on CD

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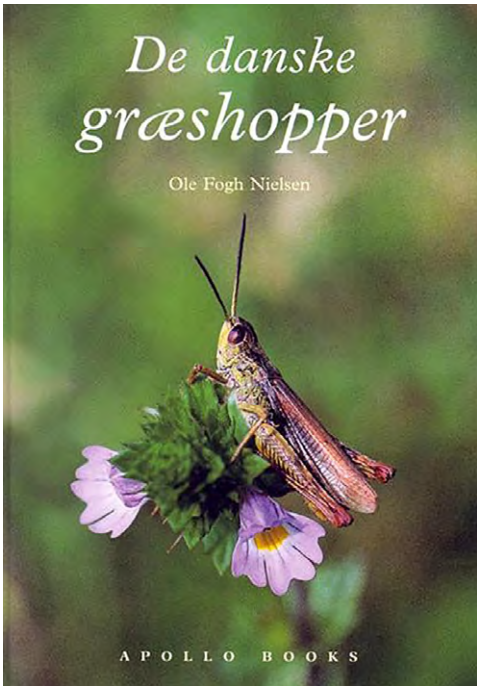
Denmark

Hjalte Kjærby

In Denmark grasshoppers have always been less popular than beetles and butterflies, and often there are many years between releases of new books. Although there has been no atlas project the distribution and status of most Danish species is relatively well known. Major publications are Petersen (1909) and Holst (1970). The last author also wrote a book in English covering the Nordic countries and Britain (Holst 1986). The most recent publication is Nielsen (2000), including a cd with the songs. No less than seven new species have been discovered in the 20 years since this publication: Jutland Bow-winged Grasshopper *Chorthippus jutlandica* (2003), Blue-winged Sand Grasshopper *Sphingonotus caerulans* (2005), Common Sickle Bush-cricket *Phaneroptera falcata* (2010), Woodland Grasshopper *Omocestus rufipes* (2014), Common Ant-cricket *Myrmecophilus acervorum* (2015), European Tree-cricket *Oecanthus pellucens* (2018), and Long-horned Groundhopper *Tetrix tenuicornis* (2018).



The latest work about the Danish Orthoptera Fauna came out in 2000

Conservation and status

All species known from before 2004 have been covered by the Danish Red List, 9 of those species (32 %) were red listed. Much of our knowledge about the current distributions come from the website Fugleognatur.dk (soon to be named Naturbasen.dk). Since 2001 users have contributed with observations to the site, and many exciting finds have first been published here. In this way the spread of the *Phaneroptera falcata* into southeastern Denmark in the last decade has been documented well, as well as the explosive expansion of Roesel's Bush-cricket *Roeseliana roeselii*.

The recent BioWide project (2014-2018) also led to interesting discoveries of rare species on new locations, for example the Orange-tipped Grasshopper *Omocestus haemorrhoidalis* and *Phaneroptera falcata*.

Omocestus haemorrhoidalis is one of the rarest grasshoppers in Denmark, and is only found on the southern parts of the Djursland peninsula. Photo Hjalte Kjærby.

Outreach

If one wants to start studying Orthopterans in Denmark there is a lot of help. Nielsen's book from 2000 is a great starting field guide and key, and Fugleognatur.dk includes both descriptions and distribution maps of all known Danish species.

Two species new to the Danish fauna. *Tetrix tenuicornis* (left) was discovered near Århus by Vicky Knudsen in 2018, *Omocestus rufipes* (right) was found on the remote island of Romsø in 2014 and is most likely a relict population. Photos Vicky Knudsen and Hjalte Kjærby.

The future

We expect several more species, for example the Southern Oak Bush-cricket *Meconema meridionale*. New data from both fugleognatur/naturbasen.dk and iNaturalist.com are expected to pour in. An atlas project focusing on Denmark's Orthoptera Fauna in the coming years could be very interesting, especially as climate change continues to change the distribution of species.

Key publications

Holst 1970 – field guide
Holst 1986 – field guide in English
Nielsen 1996 – booklet
Nielsen 2000 – latest field guide (with cd)

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Roeseliana roeselii is rapidly expanding its range in southern Denmark. Photo Hjalte Kjærby.

Finland

Sami Karjalainen

The first overview of Finnish Orthoptera fauna was published by Hisinger (1861). The information was updated by Nyberg (1901, 1905) and Fieandt (1916). Almost 100 years later Karjalainen (2009) compiled the recent knowledge into his awarded book The Grasshoppers and Crickets of Finland, with nature photos of all the Finnish species and accompanied with a cd containing sound recordings of all the species.

The cover of Karjalainen's book published in 2009.

Conservation

Finland harbours several northern specialities. Northern Groundhopper *Tetrix fuliginosa*, Alpine Thick-necked Grasshopper *Aeropedellus variegatus* and High Mountain Grasshopper *Melanoplus frigidus* occur in northern Finland but all of them are rare. The most recent Red Lists have been published in 2000, 2010 and 2019. In the latest Red List (Mannerkoski 2019), four species were classified as threatened and two as near threatened. The Speckled Buzzing Grasshopper *Bryodemella tuberculata* is the most threatened species (CR). The only population of the species lives inside a military area and is extremely small. The Common Grey Bush-cricket *Platycleis albopunctata* and the Long-horned Groundhopper *Tetrix tenuicornis* were classified as endangered (EN). The classification of the Rattle Grasshopper *Psophus stridulus* was vulnerable (VU). The Blue-winged Sand Grasshopper *Sphingonotus caerulans* has become more common in the last ten years and was placed in the category Least Concern (LC).

The most significant reason for the decline of Finnish orthopterans is the reduction of sun-exposed open habitats. The reasons behind the loss include the control of forest fires and reduced grazing. A conservation program has been published for *Psophus stridulus* (Intke & Piirainen 2014), of which most remaining localities are situated along railways and roads.

Key publications

Hisinger 1861, Nyberg, C. 1901, 1905, Fieandt 1916 – Old handbooks
Karjalainen 2009 – Most recent handbook
Intke & Piirainen 2014 – Conservation plan *Psophus stridulus*
Mannerkoski 2019 – Latest Red List

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France

David Morichon

Olivier (1791) was a pioneer of the study of grasshoppers in France. Brisout de Barneville (1851) and Finot (1890) were two major contributors during the 19th century. During the past century, Lucien Chopard dominated the discipline: at thirty years interval, he wrote two faunas of the French Orthoptera (Chopard 1922, 1951).

Improving knowledge

Towards the end of the 20th century, increasing environmental concern lead to a renewal in naturalist activity. This has since resulted in a distinct improvement in the knowledge of the diversity, distribution and vulnerability of grasshoppers. Between 1999 and 2019, the number of taxa known from France rose from 222 to 246, with 122 Ensifera and 124 Caelifera. This is the result of the assiduous surveying undertaken by the new generations of naturalists, but is also due to great taxonomical research. The identification books reflect this progress by providing increasingly reliable and educational books, hence improving the quality of surveys.

Lucien Chopard (1885-1971).

Distribution

The first national distribution atlas was edited in 2003 by the Muséum national d'histoire naturelle, the second in 2009 by the Ascete society. An update of the latter is about to be published. The accumulation in sightings should enable to replace the current county level distribution by a finer resolution. Such updates enable diachronic assessments and improve the understanding of population dynamics and of the vulnerability of species.

Red List

A first Red List of French Orthoptera was published in 2004 by the Ascete society. Since then, a large number of regional Red Lists have been established or are being finalised, which will enable an updated national list, in accordance with the IUCN criteria. Among the currently most threatened taxa in France are the endemic Vichet's Bush-cricket *Amedegnatia-*

Omocestus defauti. Photo David Morichon.

Decticus verrucivorus monspeliensis. Photo David Morichon.

na vicheti, Pyrenean Meadow Bush-cricket *Metrioptera buyssoni*, *Decticus verrucivorus monspelliensis* and taxa with a European distribution, River Blue-legged Grasshopper *Epacromius tergestinus* (Endangered) and Black Grasshopper *Celes variabilis* (Vulnerable).

Conservation

The endemic Crau Plain Grasshopper *Prionotropis rhodanica* is the most threatened species of the French fauna. It benefits from both legal protection and a conservation strategy. The species has undergone spectacular decrease and fragmentation over the last fifty years, the involved factors reamining partly unknown. The conservation strategy is based on three standard objectives: improving knowledge, raising public awareness and implement conservation management measures both in situ and ex situ.

Grasshopper surveying by the Ascete, september 2019. Photo Bernard Defaut.

Key publications

Chopard 1922, 1951 – Handbook
Defaut & Morichon 2015 – Identification book
Sardet et al. 2015 – Field guide

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Prionotropis rhodanica, Crau plain, June 15, 2009. Photo David Morichon.

Germany

Thomas Fartmann

Research on grasshoppers in Germany goes back to the mid 19th century. The first comprehensive overview over biology, ecology and distribution was provided by Harz (1957, 1960). He also founded the scientific journal Articulata in 1975, which is published since 1989 by the German Orthopterists' Society (DGfO). The publication of the first field guide by Bellmann (1985) strongly encouraged distribution surveys and scientific research on grasshoppers. The current knowledge on biology and ecology of German grasshoppers has been compiled by Ingrisch & Köhler (1998).

Kurt Harz in 1983.

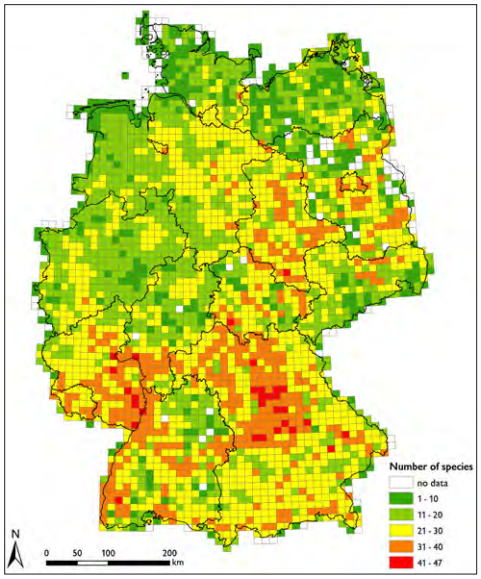
Atlas projects

The first distribution atlas was already published in 1979 for the German federal state of Hesse by Ingrisch (1979). Since then many others followed. Among them are some that became reference books. This is especially true for those of Baden-Württemberg (Detzel 1998), Bavaria (Schlumprecht & Waeber 2003) and Rhineland-Palatinate (Pfeifer et al. 2011). The first distribution atlas for the whole of Germany was published by Maas et al. (2002).

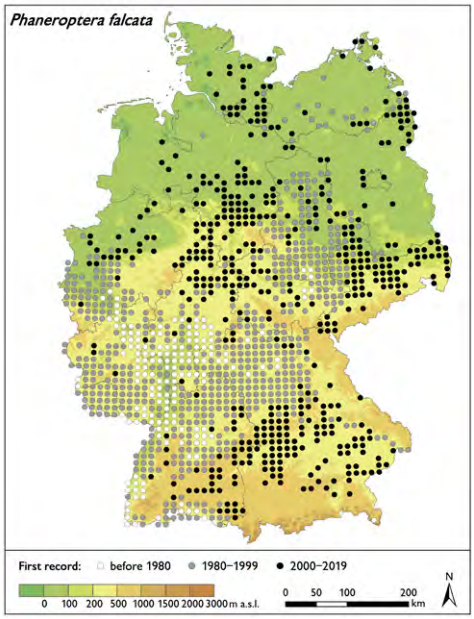
With the modern field guide of Fischer et al. (2016) identification of German grasshoppers has become much easier.

Conservation and monitoring

Red Lists are available for all German federal states. The most recent one for the whole of Germany was published by Maas et al. (2012) and a new one is in preparation. Due to the (i) high sensitivity to environmental change, (ii) the ease with which they can be sampled and (iii) the high standardization of the sampling techniques, grasshoppers are a group of insects that is particularly suited for monitoring. Two German federal states (Baden-Württemberg, North-Rhine Westphalia) have already started with a standardized monitoring scheme in representative plots. In 2020, monitoring will be established at a national scale, too.



Grasshopper diversity in Germany (Fischer et al. 2016).



The Sickle-bearing Bush-cricket *Phaneroptera falcata* is one of the species that recently expanded its range in Germany.

Outreach

With Fischer et al. (2016) a modern field guide, including distribution maps for all species, is available. Now even amateurs are able to identify most species in the field. Current distribution maps are provided on the webpage of the German Orthopterists' Society (Dgfo-articulata.de).

Future plans

During recent decades the distribution of grasshopper species in Germany has strongly changed. Many species, especially habitat specialists, have experienced severe range losses during the second half of the 20th century. In contrast, since the 1990s many thermophilous habitat generalists have recently expanded their range (Poniatowski et al. 2018). In 2019, the online recording scheme OrthopteraWeb (Daten.heuschrecken-portal.de) was launched to generate real-time data on the distribution of the species. In future the system will be connected with other relevant data bases, such as Observation.org and MultiBaseCS, to provide a complete overview. Within this year's field season, recording via an app will also be possible.

Key publications

Bellmann 1985, Bellmann et al. 2019, Fischer et al. 2016 – Field guides
Detzel 1998 – Handbook Baden-Württemberg
Harz 1957 – Handbook Central Europe
Harz 1960 – Handbook Germany
Ingrisch 1979 – Atlas Hessen
Ingrisch Köhler 1998 – Biology Central Europe
Pfeifer et al. 2011 – Handbook Rheinland-Pfalz
Poniatowski et al. 2018 – Range changes
Maas et al. 2002 – Atlas and Red List
Maas et al. 2012 – Red List
Schlumprecht & Waeber 2003 – Handbook Bayern

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Great Britain and Ireland

Björn Beckmann & Peter Sutton

Systematic surveys of grasshoppers and related species began with the launch of the Orthoptera Recording Scheme in 1968 at the Biological Records Centre, aiming to map and monitor distributions in Britain and Ireland at a 10x10km grid scale (Orthoptera.org.uk). The launch of the scheme and the publication of David Ragge's handbook (1965) inspired many naturalists to take an interest in Orthoptera, and the scheme continues to rely on volunteers to send in their observations. In Ireland, the scheme works closely with the National Biodiversity Data Centre, established in 2007. The scheme database currently contains 180,000 observations, available at Nbnatlas.org and Maps.biodiversityireland.ie.

Chris Haes (1930-2014) co-ordinated the grasshopper recording scheme from 1977 to 1997 and co-authored two national atlases. Photo Malcolm Lee.

Atlases

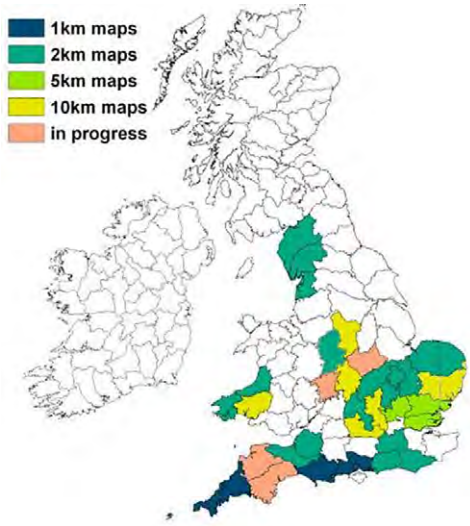
Atlases provide important milestones of current knowledge about species distributions, and about changes in those distributions. They also help to highlight gaps in recording. Following three provisional atlases, two national atlases were published in 1988 (Marshall & Haes) and 1997 (Haes & Harding). A new set of atlas maps will be published in 2021 as part of a Bloomsbury field guide to the Grasshoppers of Britain and Ireland. Provisional maps were appended to the spring 2013 scheme newsletter (Orthoptera.org.uk/newsletters). The iRecord website and iRecord Grasshoppers app have greatly stimulated the collection of records in recent years, including submission of photos and sound recordings. Detailed regional perspectives are provided by a growing number of county atlases.

The Scaly Cricket *Pseudomogoplistes vicentae* is among Britain's rarest Orthopterans. Karim Vahed and his students have set up monitoring of the populations and researched the species' life cycle - finding that eggs are likely laid in driftwood, not sand - important information for conservation! Photo Alex Hyde.

Conservation

There are 31 Orthopteran species established in the wild in Britain (with 2 additional species in the Channel Islands), and 13 in Ireland. Red Lists for the British species were published in 1987 and 2015. Biodiversity Action Plans were drawn up for two of five species assessed as threatened in the 1987 list: Wartbiter *Decticus verrucivorus* and Field Cricket *Gryllus campestris*. Captive breeding and reintroduction pro-

Large Marsh Grasshopper *Stethophyma grossum*, male and female (purple form). Illustrations by Richard Lewington for a forthcoming new field guide-plus-atlas.

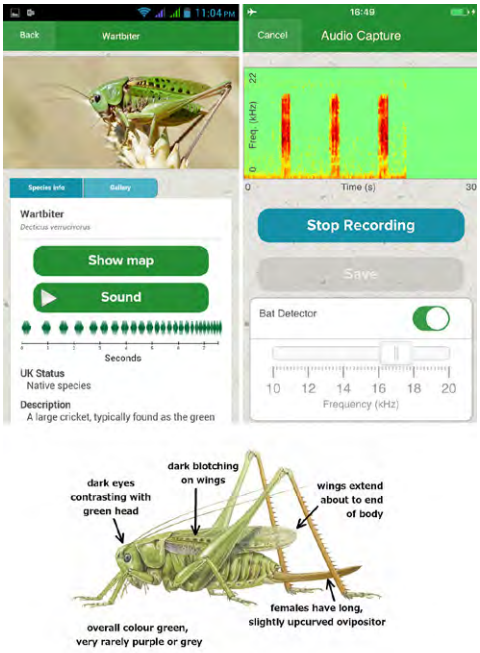


County atlases provide important regional and local perspectives (Orthoptera.org.uk/node/364).

grammes were implemented in the 1990s for both species and have likely contributed to their persistence in Britain - and lead to a reduction in the threat status of Field Cricket in the 2015 Red List. Numbers are still a long way off historical levels, however - in the naturalist Gilbert White's wonderful description from the 1770s, Field Crickets could 'make the hills echo' with their song (Gutenberg.org/ebooks/1408)! Recently, intensive surveys of other threatened or near-threatened species have been carried out, with cautiously optimistic findings for the populations of Scaly Cricket *Pseudomogoplistes vicentae* and Large Marsh Grasshopper *Stethophyma grossum*, and a very welcome confirmation that the Mole Cricket *Gryllotalpa gryllotalpa* is not extinct in Britain - albeit surviving in a single, tiny population.

Outreach

For those getting into grasshopper recording, the iRecord Grasshoppers app and Orthoptera.org.uk website provide useful free identification guides, in-



Screenshots of the iRecord Grasshoppers app. Illustration Denys Ovenden.

cluding sound recordings, labelled illustrations and current distribution maps. Evans & Edmondson's excellent photographic guide (2007) is now out of print, but still available at Atroposbooks.co.uk, and Benton's superb book in the New Naturalist series (2012) is a must-have for the aspiring Orthopterist! The recording scheme publishes periodic newsletters, and a column in 'British Wildlife'. There is an active UK Orthoptera group on Facebook and the scheme 'stridulates' as @GrasshopperSpot.

Annual meeting

Val Brown instigated an annual day of talks about all things Orthoptera in 1980, and the meeting has taken place every year since, celebrating its 40th anniversary in 2019. The audience is a mix of scientists and naturalists, and all are welcome to attend this very enjoyable event, which finishes with a buffet and wine (Royensoc.co.uk/special-interest-groups).

Future plans

We want to further increase the collection of data through the iRecord website and apps, and the use of the data for conservation and research - for example into the causes of species' declines and the effects of climate change. We would like to see a greater profile for all Orthoptera in conservation decisions, including the 'common' species. To this end we want to further improve monitoring, and will be trialling abundance monitoring with acoustic transects, and exploring the potential for automated acoustic monitoring and identification.

Key publications

Ragge 1965 – Handbook
Skelton 1974 & 1978 and Haes 1979 – Provisional atlases
Burton & Ragge 1987 – Audio tape of songs
Shirt 1987, Sutton 2015 – Red List
Bellmann, tr. Ragge & Ragge 1988 – Photographic guide
Marshall & Haes 1988 – First national atlas and handbook
Haes & Harding 1997 – Second national atlas
Ragge & Reynolds 1998 – Book and audio CD of songs
Marshall & Ovenden 1999 – Fold-out chart and key
Evans & Edmondson 2007 – Photographic guide and key
Roy et al. 2009 – Website Orthoptera.org.uk
Benton 2012 – Handbook and DVD
Beckmann et al. 2015 – iRecord Grasshoppers app

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Greece

Luc Willemse & Vasiliki Kati

With a pronounced mountainous (66 %) and island character (9800 islands), Greece is a Mediterranean country of exceptional biological wealth. The geographical position, complex topography, geological and soil diversity, landscape heterogeneity sculpted by mild human activities and the impressive co-existence of microclimatic conditions in the country explain its astonishing variety of grasshoppers (378 species) and their high degree of endemism (37 %). Orthopterists who made major dedicated contributions to our knowledge of the Greek grasshopper fauna are Boudou-Saltet, Chopard, Harz, Heller, La Greca, Ramme, Werner and Willemse. The latter, Fer Willemse (1927-2009) no doubt made the largest contribution. Between 1971 and 2009 he described from Greece 40 new species and an additional 11 subspecies new to science, in his 30 papers. In 1984 he published the first atlas of the Greek Orthoptera fauna followed, a year later, by a key to the Greek grasshopper species.

Fer Willemse in 1991. Photo Luc Willemse.

Atlasproject

A photo field guide on the Greek grasshoppers was published in 2018, including also distribution maps, on the basis of roughly 17,500 occurrence records. This is a low number still, considering the number of species described. With the Greek fauna being currently reasonably well-known (though new species still being discovered!) and the field guide making species identifications easier to non-experts, the time seems right to set up an atlas project, gaining a better insight on the species distribution patterns. It is still a risky and ambitious project, given the great richness of the Greek orthopteran fauna, the harsh and heterogeneous topography of the country, and the need to engage many people, with good knowledge on the local grasshopper fauna. A risky but not unrealistic project to start!

Conservation

Eleven cave-dwelling species of the genus *Dolichopoda* are protected in Greece by national legislation (since 1981), along with the two annexed species of the Habitat's Directive (*Stenobothrus eurasius* and *Paracaloptenus caloptenoides*. The national biodiversity law (2011) provided for the first time a legal frame for the conservation of all Greek endemic or Red-Listed species. A crucial step for grasshopper conservation, since half of the Greek species (188) merit strict protection, being either endemics (49), or falling within one of the threat categories of IUCN (48) or both (91). The Red List of the Greek fauna is outdated (2009). It included only two grasshopper species, *S. eurasius* (VU) and *Chorthippus lacustris* (CR), the latter being the first endemic Greek species assessed as critically endangered at a national and global scale.

Conservation actions for the Epirus dancing grasshopper *C. lacustris* started fifteen years ago, with several juridical and public awareness actions against its habitat loss and degradation due to humid grassland drainage, urbanization, conversion to agriculture and cattle overgrazing. With a Mohamed bin Zayed grant (2016) the current population size and distribution pattern was updated and the gene pool of the species assessed. As a result conservation activities for two Natura 2000 sites (Pamvotis and Para-

Chorthippus lacustris, Parnassiana tenuis and *Peripodisma tymphii*. Photos Michelle Lemonnier, Vasiliki Kati and Andreas Stumpner.

mythia Lakes) were planned. With funding from the Greek Ministry, management agencies are to implement the conservation activities from 2020 onwards. Around Lake Pamvotis Management Agency staff already annually monitors the population which appears to stabilize or even increase. On the other hand, around Lake Paramythia the second largest population seems to have collapsed due to ploughing that started in 2019. It is doubtful if any forthcoming conservation action can help the local population to recover.

Willemse et al. (2018).

Overall, 10 species has been assessed as critically endangered, 37 as endangered and 55 as vulnerable in Greece, according to the assessment of European species in 2014-2016. Apart from *C. lacustris* no conservation measures have as yet been taken for those 102 species and knowledge is still poor. However, the Greek Ministry has approved funding (2020-2023) for four Management Agencies to update the conservation status of 27 grasshopper species (20 threatened, 21 endemics, 1 protected under European legislation). The projects will take place in the Pindos mountain range (Mitsikeli, Tzoumerka, Vardoussia, Giona, Parnassos, Oiti, Tymphristos) and will lead to conservation measures when possible, with pilot implementation of conservation measures (fencing from cattle grazing) in one case.

Outreach

In 2019 an open database was produced and distributed to relevant authorities (ministry, management agencies of Natura 2000 areas), pinpointing the 186 Natura 2000 sites that host endemic and/or red-listed species of grasshoppers (145 species) that are under protection. Authorities were urged to implement environmental legislation, and particularly to include grasshopper species in the process of environ-

mental impact assessment of projects. Finally, in an attempt to raise public awareness for grasshopper conservation, a Greek translation of the key of the English field photo guide was produced, free to download.

Future plans

Capacity building of young scientists as future Greek orthopterists is a first priority, to foster grasshopper conservation in the country. Promoting citizen science for grasshoppers is the next step, planning to collect data through modern technological tools, in order to establish the first data collection platform for species distribution. Fundraising is a prerequisite for the above.

Key publications

Willemse 1984 – first faunistic overview
Willemse 1985 – first key to Greek grasshoppers
Kati et al. 2004 – first paper on conservation management Greek grasshoppers
Kati et al. 2006 – first study on a threatened species
Hochkirch et al. 2016 – IUCN Red List Assessments European Grasshoppers
Willemse et al. 2018 – The grasshoppers of Greece
Kati & Willemse 2019 – First open spatial database of threatened species vs Natura 2000

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Hungary

Gergely Szövényi and Gellért Puskás

History

Grasshoppers in Hungary have been studied since the beginning of the 19th century. The first comprehensive publications were by János Frivaldszky in 1868 (Monographia Orthopterorum Hungariae) and by Gyula Pungur in 1899 (Fauna Regni Hungariae: Orthoptera). During the 20th century, the amount of faunistical data gradually increased covering most of the territory of Hungary, but still there are some poorly studied parts of the country.

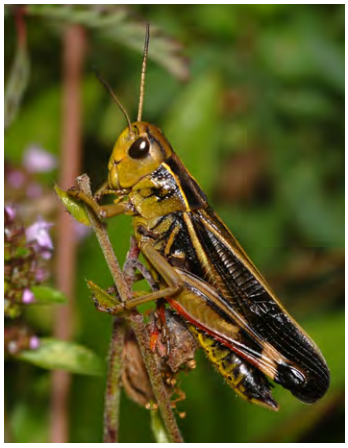
The first, and until now the only grasshopper identification key in Hungarian containing a major part of the species has been published in 1969 by Barnabás Nagy, as a chapter of a handbook on the Hungarian fauna. The most recent check list was also published by him in 2003. Since then 13 more grasshopper species, eight of them native and five introduced, have been found in Hungary. István Rácz published a zoogeographical overview of the Hungarian Orthoptera fauna in 1998.

Barnabás Nagy, doyen of the European orthopterists. During his more than 75 years long (and counting) orthopterological career he studied the Orthoptera fauna and assemblages in nearly all parts of the Carpatho-Pannonian region. He and his publications inspired several young orthopterists in their early career.

Conservation

The conservation of grasshoppers officially started in 1982 in Hungary, when two species (*Acrida ungarica* and *Saga pedo*) were included in a new, extended list of by law protected species. At the end of same decade 15 species were listed in the Red Data Book of Hungarian plants and animals. Now, after gradual modifications, roughly a quarter (32) of the Hungarian species are protected by law in the whole country. Some of these are regularly monitored at the population level, as whole Orthoptera assemblages inhabiting several grassland habitat types on designated locations in the National Biodiversity monitoring

Participants of the 1st Hungarian Orthopterists' Meeting in 2016.



The Keeled Plump Bush-cricket *Isophya costata* (left) is a Pannonian endemic, and is strictly protected in Hungary. The Large Banded Grasshopper *Arcyptera fusca* has gone already extinct from most of its former occurrences in Hungary. Recently a conservation programme started to save its remaining populations in the Bükk National Park.

System (Nemzeti Biodiverzitás-monitorozó Rendszer). This system covers also the mandatory monitoring of the six Orthoptera species involved in Annex II of Habitats Directive.

The most endangered species are connected to mountain meadows. In Bükk National Park an active conservation program of the regionally highly declining Large Banded Grasshopper *Arcyptera fusca* started in 2018. Specific grassland management practices are implemented in its habitats and by translocation experiments new populations are established.

Present activities

In 2016 a small group of researchers initiated the Hungarian Orthopterists' Meeting. The first was held in the Natural History Museum in Budapest, and more than 30 people participated from Hungary and some neighbouring countries. In 2019 the formal programme of the meeting was complemented by a mapping session in an less studied area.

The Small Blue-legged Grasshopper *Epacromius coerulipes* is a characteristic species of alkaline steppes in the Pannonian lowlands.

Future plans

The publication of a field guide for the Hungarian grasshoppers has started, undoubtely increasing the popularity of this insect group among the amateur naturalists in Hungary, increasing the field data collection activity in the forthcoming years. A GIS based modern database, containing all available data is being set up. The expected increase of new distribution data will fill the gaps in the knowledge and hopefully lead to an atlas in the next decade.

Key publications

Frivaldszky 1868 – First comprehensive faunistical publication
Pungur 1891 – Monograph of crickets
Pungur 1899 – First check list with exact locations
Nagy 1969 – First key in Hungarian
Varga 1989 – Red data book
Rácz 1998 – Biogeogreaphical overview
Nagy 2003 – Last check list

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Italy

Paolo Fontana & Bruno Massa

History

Italian Orthoptera have been studied since the 19th century. Oronzio Gabriele Costa published his Fauna del Regno di Napoli in 1836, updated by his son Achille Costa between 1852 and 1855. Other important contributions were made by Adolfo Targioni Tozzetti (1878) and Griffini (1897). In the 20th century well known orthopterists like Felice Capra, Marcello La Greca, Baccio Baccetti and Antonio Galvagni published many papers on taxonomy, distribution and biogeography of Italian Orthoptera.

Portraits of Oronzio Gabriele Costa, Achille Costa and Adolfo Targioni Tozzetti (from left to right).

The first illustrated identification key (for the region Veneto) was published by Fontana et al. (2002). For the first time ample attention was paid to bioacoustics, until then rather neglected in Italy. The book contained description of the songs and was accompanied by an CD.

The book by Massa et al. (2012) was the first overview of the whole Italian fauna. It contained a DVD with a digital key for identification and audio tracks. This book led to the first national field guide by Iorio et al. (2019). Now the Italian Orthoptera are rather well known and the field studies are greatly facilitated by the availability of modern identification tools.

A brochure, written in Italian and English and published by the municipality of Sappada, to inform citizens and tourists about the importance of the population of *Chorthippus pullus* along the Piave River

The Italian fauna

Of the 382 Italian species and subspecies 160 (42 %) are endemic. Five genera (*Sardoplatycleis*, *Italopodisma*, *Pseudoprumna*, *Chortopodisma* and *Italohippus*) and one subgenus (*Italoptila*) are endemic to Italy. Most endemic species are restricted to the Alps, the Apennines and Sardinia and Sicily. In addition, lowland areas in central southern Italy host many endemic taxa, probably of Balkan origin..

Conservation

Many Italian Orthoptera are endangered due to different reasons and are included in the IUCN European Red List. Generally, when an environment is disturbed by human activities some Orthoptera with restricted ecological niches are the first to disappear, e.g. *Chorthippus pullus* along disturbed rivers and *Epacromius tergestinus* in coastal habitats. In total 94 taxa included in one of Red List categories, 15 Critically Endangered (all endemic), 31 Endangered (28 endemic), 25 Vulnerable (17 endemic) and 23 Near Threatened (NT). Most of these threatened species live in grasslands and ecotones and mountain areas (see table). The only critically endangered species living in inland wetlands is *Chrysochraon beybienkoi*.

There have been some particular nature protection actions. In 2004, the presence of *Chorthippus pullus* along the banks of the Piave river, prevented the construction of a hydroelectric power plant. A few years later, the presence of one of the rare *Tylopsis liliifolia* stations in the Italian Alps, prevented the opening of a mine in a nature area. Likewise a population of *Barbitistes viceti-*

Table. Distribution of threatened species over Italian habitats. Abbreviations: E - endemic to Italy, DSB - dunes and beaches, HUZ - humid zones, APM - Apennines, ALM - Alps, ISM - island mountains GES grasslands and ecotones, CAV - caves.

	HUZ	ALM	APM	ISM	DSB	GES	CAV
Taxa	8	11	28	4	7	30	6
CR	**1**	**0**	**9**	**3**	**0**	**2**	**0**
EN	**0**	**6**	**11**	**0**	**4**	**10**	**0**
VU	**5**	**1**	**5**	**0**	**1**	**7**	**6**
NT	**2**	**4**	**2**	**1**	**2**	**10**	**0**
E	3	10	28	4	5	17	6

Three recent books on the Italian Orthoptera fauna.

Chrysochraon beybienkoi, the only critically endangered species form inland wetlands. Photo Roy Kleukers.

nus obstructed the construction of a new highway in a pristine area of the Lessini Mountains.

The future

Although the Italian Orthoptera fauna is rather well known, still a lot remains to be discovered. Surely new species to Italy and even new species to science can be found. The increased knowledge on Italian Orthoptera has already proven its worth for the conservation of Italian habitats, but also in that respect there is still a lot of work to be done.

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Kosovo

Slobodan Ivković & Gellért Puskás

History
The Orthoptera fauna of Kosovo is one of the least studied in Europe. Most of the papers are published before 1990. The first country checklist was provided by Us (1967), later in 1975 Adamović listed all species occurring in Kosovo, thus we can consider this as the second checklist.

Conservation
In an 'Administrative Instruction Nr. 18/2012/ for Proclamation of Wild Species Protected and Strictly Protected' two Orthoptera species are listed as autochthonous strictly protected wild species and 10 as strictly protected foreign wild species.

Present activities and future plans
Studying grasshoppers in Kosovo still has to take off. Presently no local entomologist works on Orthoptera. Serbian and Hungarian orthopterologists occasionally do some field work on the territory of the country but the systematic research, necessary for conservational evaluations, are still waiting for their turn.

Key publications
Us 1967 – First checklist
Adamović 1975 – Second checklist

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The Relict Plump Grasshopper *Podismopsis relicta* has a small distribution, restricted to Hajla Mt. at the border between Montenegro and Kosovo. Photo Gellért Puskás.

Balkan Toothed Grasshopper *Stenobothrus posthumus*. Photo Gellért Puskás.

Lithuania

Eduardas Budrys

The earliest check-lists of the Lithuanian Orthoptera were published in the beginning of the 20th century (Fedorowicz 1915, Szeliga-Mierzeyewski 1927, Grochowska 1935). The latest full check-list (Budrys & Pakalniškis 2007) included 42 species. It stimulated further studies and supplementing it up to 48 currently known species (Budrys et al. 2019).
Some of southern species, e.g. *Phaneroptera falcata*, have been observed for the first time recently and became widespread and common across the country due to the climate change (Budrys et al. 2015).

Conservation
Five species of Orthoptera are included in the latest national Red List (2019):

	Localities before 2000	Localities since 2000
Modicogryllus frontalis (VU)	-	1
Montana montana (EN)	-	2
Podisma pedestris (CR)	4	1
Bryodemella tuberculata (CR)	3	2
Sphingonotus caerulans (EN)	1	4

Outreach
Most useful information on grasshoppers of Lithuanian fauna is currently provided by members of the Lithuanian entomological society (Entomologai.lt/lietuvos-fauna/orthoptera-tiesiasparniai) and nature photographers (Macrogamta.lt/lt/fotogalerija).

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Distribution of *Bryodemella tuberculata* in Lithuania. Black dots: observations after 2000; empty dot: extinct (observation before 1940)

Bryodemella tuberculata is one of the most threatened grasshoppers in Lithuania. Photo Eduardas Budrys.

Malta

Louis F. Cassar

Historical overview

The Orthoptera of the Maltese Islands has drawn the attention of the scientific community since at least the former half of the 20th century (Borg 1939), when a number of species were listed in an edition of *Archivium Melitense* in a contribution entitled 'Our Insect Visitors'. The first lists on the Orthoptera of the Maltese Islands were published by Valletta (1954, 1955) and Lanfranco (1955, 1957). Subsequently, other workers, both local and foreign, followed suit (Baccetti 1966, 1973, Cilia 1975, Cassar 1979, 1988, 1990, 2008, 2019, Schembri & Ebejer 1983, 1984, Schembri 1984, 1989, Harz 1985, 1986, Cassar & Conrad 2008, Cassar et al. 2017, 2018), enhancing the local knowledge of the orthopterous fauna of the small island group within the central Mediterranean area.

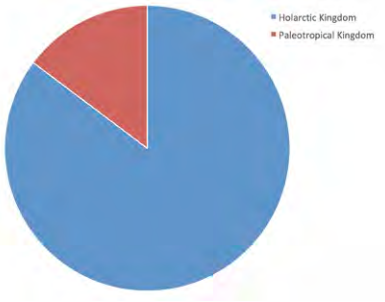
Biogeographical context

The Mediterranean region is a hotspot of biological diversity that is characterized by a high degree of endemism and, concurrently, by a high level of threat (Myers et al. 2000). In the context of geographic location, isolation and associated endemism (both palaeoendemism and neoendemism), the Maltese Island group is interesting from the biogeography point of view.

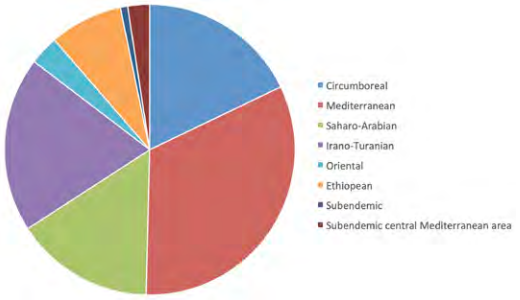
Maltese limestone stratigraphy owes its formation to marine sedimentary bioclastic and biogenic processes during the late Oligocene and subsequently during the Miocene. The Islands emerged from beneath the sea during the late Miocene. It is evident that during the Messinian salinity event (5.59-5.33Mya), the central Mediterranean area was connected with the north African mainland. Moreover, the Islands' land-surface continued to vary in synch with Pleistocene epoch glacio-eustatic sea-level fluctuations, as the central Mediterranean area experienced a number of Quaternary glacial and interglacial episodes. Such processes would have had a significant influence on evolutionary development through vicariance as marine regressions allowed the Maltese Islands to establish physical connections to landmasses to the north which facilitated dispersal of biota, shaping the region's biogeography in the process.

Guido Lanfranco FRES. Photo S. Lanfranco.

The late Anthony Valletta FRES. Photo Louis F. Cassar.



The vast majority of species that occur within the Maltese Islands share a Holarctic distribution. The pie chart reflects some double counting due to overlap in the range of a number of species.



While the majority of species share a Mediterranean subregional distribution, Circumboreal, Irano-Turanian and, to a slightly smaller extent, Saharo-Arabian subregions are also well represented; this attests to the Maltese Islands' geographical position and proximity to Europe, North Africa and Asia Minor. The pie chart reflects some double counting due to overlap in the range of a number of species.

Orthoptera species

Around 50 species of Orthoptera, comprising both Ensifera and Caelifera, occur within the Maltese Islands, the status of which varies from indigenous to sporadic or accidental. Their geographical provenance has been subdivided as indicated above. The subdivision follows the regionalization proposed by Takhtajan (1978, 1986), which identifies 35 floristic regions. These mostly coincide with distinct topographical and environmental entities, which, in biogeographical terms, presumably provided those physical barriers to species dispersal that shaped and, naturally, continue to influence evolutionary development of the biotic assemblages that occur within these regions.

Brachytrupes megacephalus in its habitat. Photo Louis F. Cassar (habitat) and Guido Bonett (*Brachytrupes*).

Conservation

The Maltese Islands have been inhabited for thousands of millennia, since the Neolithic, over which time the terrain was modified considerably for agricultural purposes, both cultivation and grazing. However, it was only since Independence, in 1964, that the economy started to diversify at a relatively fast and steady pace, bringing with it significant changes to the islands' semi-natural landscapes. Ground and sub-surface freshwater resources have been depleted or heavily impacted over the years, while fragmentation of habitats due to infrastructural development has led to the degradation and/or isolation of ecologically valuable biotopes, with attendant negative impacts to metapopulation structure. Cases in point include the crepuscular sand-dwelling gryllid *Brachytrupes megacephalus* and the likewise stenotopic acridid *Heteracris adspersa*, both coastal species, the habitats of which have been fragmented considerably by road construction and ancillary coastal amenities.

Species still persist in remaining habitat remnants, pocketed by an ever-encroaching urban and infrastructural spread. The way forward would be to ensure connectivity between homogenous habitat patches and to invest in restoration in order to recreate appropriate habitat that ensures a positive conservation status into the future.

Key publications

Borg 1939 – first known publication on the Orthoptera of Malta

Valletta 1954, 1955, Lanfranco 1955, 1957 – first attempts to publish entire lists on the Orthoptera of the Maltese Islands

Cilia 1975 – first review of the Gryllidae

Cassar 1979 – first record of *Brachytrupes megacephalus* on mainland Malta

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Republic of Moldova

Nadejda Mocreac

The Moldavian chronicler Grigore Ureche wrote in his 'Chronicles of the Land of Moldavia' (*Letopiseţul Ţării Moldovei*) (1359-1594) about plagues caused by locusts (*Locusta migratoria*) in Moldova. Another ancient source is the inestimable work of Dimitrie Cantemir's 'Description of Moldova', written in Latin between 1714 and 1716, while the former ruler of Moldova lived in Russia. E. Recalo (E. Рекало) described in nine studies (1885-1889) the most harmful Orthoptera species and the crops they attacked. In the period 1900-1969 the first papers on diversity, biology and ecology appeared. Teslinsky (1932) lists 45 species from the collections of the Natural History Museum in Chisinau, belonging to 14 families, 4 superfamilies and 31 genera, of which 39 were collected on the territory of the Republic of Moldova. Bey-Bienko (1967) in 'Keys to the Insects of the European U.S. S.R. Vol. 1' cites 14 species from the Republic of Moldova. Malchenkova (1983) presents *Tettigonia viridissima*, *Saga pedo* and *Ephippiger ephippiger* as new species to the country. Jantiev (1991) describes *Gryllotalpa stepposa* new to science, from the Republic of Moldova.

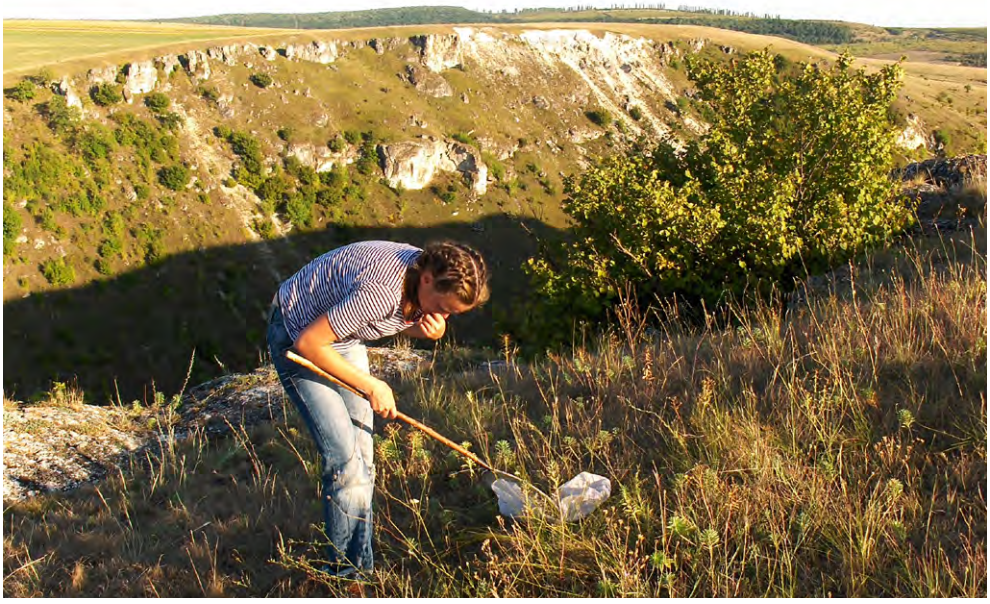
In 2003, Vedenina and von Helversen described a grasshopper hybrid from the territory of Republic of Moldova (Bălţi): *Chorthippus albomarginatus x oschei* and in 2009 *C. oschei pusztaensis*. Recently the first comprehensive review of the Orthoptera fauna of the Republic of Moldova was published (Stahi 2011), which lists 113 species, of which one subfamily (Gryllomorphinae), 10 genera and 35 species were new to the fauna.

Orthoptera collection points in Moldova during 2005-2011.

Conservation

During the last decades *Callimenus montandoni*, *Poecilimon ukrainicus*, *Saga campebeli gracilis* and *Paracoleptenus caloptenoides* have not been observed in Republic of Moldova and seemed to be locally extinct. There are three editions of the Red Book. In the first (1978) and the second (2001) only *Saga pedo* was included, classified as Critically Endangered. In the last edition from 2015 *Onconotus servillei*, *Saga pedo* and *Poecilimon ukrainicus* are Critically Endangered. Other rare species unfortunately are not protected: e.g., *Isophya kraussii*, *Decticus verrucivorus*, *Gampsocleis glabra*, *Pachytrachis gracilis*, *Pholidoptera fallax*, *P. griseoaptera*, *P. frivaldskyi*, *Metrioptera fedtschenkoi vasilii*, *Conocephalus dorsalis*, *Gryllomorpha dalmatina*, *Xya variegata*, *Pteronemobius heydenii, Chrysochraon dispar* and *Stenobothrus stigmaticus*.

Three typical species from Moldova: *Saga pedo*, *Onconotus servillei* and *Gampsocleis glabra* (nymph).



The author during fieldwork.

Outreach
Moldovian citizens can access the works of Nadejda Stahi, the red book and other bibliographic sources. Furthermore the collections stored in the museums of Institute of Zoology and of National Museum of Ethnography and Natural History can be studied.

Future plans
In the coming years we want to increase our research in different habitats all over the country. In addition, we intend to publish an atlas, either online or as a book. We hope to attract young researchers to these studies. We wish to expand our efforts to protect the endangered species, rare ones and their habitats. Also, it would be great if species included in the red book could be reared under laboratory conditions, and then released, thus contributing to enhancing the threatened populations.

Key publications
Derjanschi et al. 2012 – Atlas of invertebrates
Stahi 2015 – Red Book
Stahi 2011 – Overview
Iorgu et al. 2013 – Orthoptera Prut River Basin
Stahi 2010 – Analysis Orthoptera fauna

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Montenegro

Slobodan Ivković & Laslo Horvat

Orthoptera in Montenegro are studied since 19th century, but this has resulted in publications with only few records. Thus this country is one of the least explored on the Balkan. Us (1967) published his checklist, including all countries of the former Socialist Federal Republic of Yugoslavia. The first comprehensive checklist was published in Čejchan (1984), listing 164 species. Nikčević (2009) published the 'Catalogue of the orthopteroid insects (Dermaptera, Dictyoptera, Cheleutoptera, Grylloptera, Orthoptera, Isoptera, Embioptera) of Montenegro'.

Conservation

Three species, *Conocephalus ebneri*, *Saga natoliae* and *Saga pedo*, are protected by law in Montenegro ('Resolution on protection of individual plant and animal species').

Plans

In the past few years, several international experts started to investigate the Orthoptera fauna in different parts of Montenegro, partly published in 2020. Several more papers are in preparation, thus in future we expect an updated country checklist.

Key publications

Čejchan 1984 – First checklist
Nikčević 2009 – Second checklist

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Female of the Montenegrin Glandular Cricket *Ovaliptila willemsei.* Photo Slobodan Ivković.

Netherlands

Roy Kleukers

Grasshoppers have been studied since the beginning of the 20th century. Duijm & Kruseman (1983) and Beukeboom (1986) greatly stimulated young entomologists to work on this group. This paved the way to the recent atlasprojects and integration of grasshoppers in Dutch nature conservation.

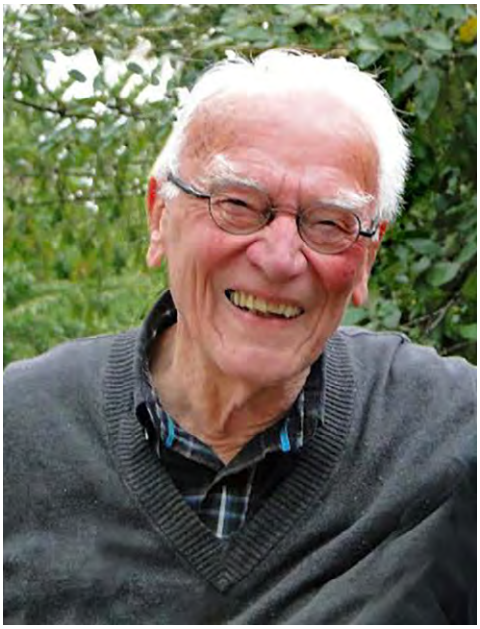
Atlasprojects

Atlasprojects are an important tool in faunistic studies. For grasshoppers we have had two atlasprojects in the Netherlands, one from 1990-1995 and one from 2006-2014. Recently the website Waarneming.nl has greatly stimulated the collection of records.

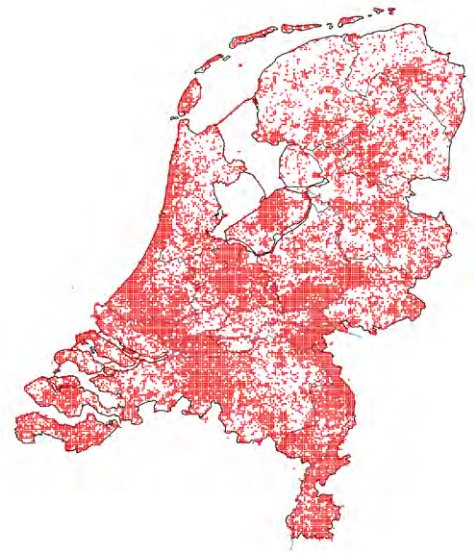
Conservation

Red Lists have been published in 1999 and 2012. This has led to inclusion of grasshoppers as the third insect group in nature conservation, after butterflies and dragonflies. Monitoring of some species is now mandatory in the evaluation of the efficiency of management of nature reserves (Subsidiestelsel Natuur en Landschap, SNL).

Species protection plans have been published for endangered species as the Common Wart-biter *Decticus verrucivorus*, Steppe Spiny Bush-cricket *Gampsocleis glabra*, White-clubbed Grasshopper *Gomphocerippus rufus* and Western Saddle Bush-cricket *Ephippiger diurnus*.



Thijs Duijm (1920-2013) published the first handbook with Gideon Kruseman in 1983.



Studied 1x1km squares during the second atlasproject (2006-2014).

Outreach

Dutch people who want to start studying grasshoppers have much useful material available. Experienced naturalists can use the recent key by Bakker et al. (2015) and beginners can start with a brochure with a quick key. Also the digital key (Soortzoeker) is used much in the field. A poster is freely available for nature study centers and private naturalists.

All distribution data are available on Waarneming.nl. Recently grasshoppers have been incorporated in ObsIdentify, the automated image recognition system of Waarneming.nl.

Future plans

We expect that the collection of data through Waarneming.nl will increase in the coming years as

The Western Saddle Bush-cricket *Ephippiger diurnus* is one of the most threatened grasshoppers in the Netherlands. Recently a protection plan has been set up (Felix et al. 2019).

many people will be stimulated by Waarneming.nl and ObsIdentify. It is unclear if we want to publish a new atlas soon, as the information can be easier updated online.

We want to increase our efforts to protect locally endangered species. Not only through species protection plans but also by giving input in discussions on the causes of grasshopper decline (e.g. agricultural practices). Probably new statistical methods will be more precise in identifying the trend of the Dutch species.

A poster with the beautiful photos of Paul van Hoof hangs in many nature study centers.

Key publications

Duijm & Kruseman 1983 – First handbook
Beukeboom 1986 – Field key
Kleukers et al. 1997 – First atlas project
Reemer 2012 – Second Red List
Kleukers 2015 – Soortzoeker sprinkhanen (digital key)
Bakker et al. 2015 – Second atlas project

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Grasshoppers have become a popular insect group in the Netherlands. Many naturalists and nature photographers upload their records to Waarneming.nl, thus contributing to the knowledge of the fauna.

North Macedonia

Vladimir Krpach

The first Orthoptera investigations in North Macedonia begin in the First World War, by entomologists involved in the military operations, and published few years after. Later on, Us, Ramme and Matvejev contributed to the knowledge of the fauna. At the end of 1950s, through the 1960s and 1970s, Mladen Karaman published many papers.

Atlasproject

An atlasproject is not yet in place but a summary, including localities, of the collection of the Macedonian Museum of Natural History in Skopje has been published by Chobanov & Mihajlova (2010).

Conservation

Lemonnier-Darcemont et al. (2014) published the first Red List. This has helped to consider grasshoppers in conservation plans of national parks. For the time being, there is no conservation planning dedicated to Orthoptera species but only associated to management of each national park (e.g. Galicica, Mavrovo).

One species to be considered in the near future is Vodno Bright Bush-cricket *Poecilimon vodnensis*, an endemic considered as extinct during decades and rediscovered in 2012. The current area is not a protected area and threatened by anthropogenic and quarrying activities. A species protection plan has to be prepared and published.

Mladen Karaman has described many new species and subspecies. His son, Ivo Karaman, continues his work through recent publications.

The Kadiytsa Bright Bush-cricket *Poecilimon pechevi* is a critically endangered species and a plan should be prepared in coordination with Bulgaria. The area is potentially subject to mining activities.

Vodno Bright Bush-cricket *Poecilimon vodnensis*, an endemic species considered as extinct on Vodno mountain but recently discovered in the south of Prilep. Photo Michele Lemonnier-Darcemont.

Big-Bellied Glandular Bush-Cricket *Bradyporus macrogaster*, a species extinct in North Macedonia? Field surveys need to be intensified. Photo Michele Lemonnier-Darcemont.

Michèle Lemonnier-Darcemont and Vladimir Krpach monitoring*Saga pedo* on Galicica Mt. Photo Christian Darcemont.

The first book on North Macedonian Orthoptera with keys and photos, concerning the Pelister National Park.

The Shar Mountain chain, an important chain between North Macedonia, Kosovo and Albania. Photo Michele Lemonnier-Darcemont.

Future plans

Besides the species conservation plans which need to be published, more in depth studies have to be implemented on threatened species. This is the case for the Wood-louse Glandular Bush-cricket *Bradyporus oniscus*, Big-bellied Glandular Bush-Cricket *B. macrogaster* and Saginae of the low lands, especially the Common Predatory Bush- cricket *Saga pedo* and Lesser Predatory Bush-cricket *Saga campbelli*. Studies in key areas, such as the Shar Mountain, need to be continued.

Outreach

Publications on North Macedonian Orthoptera remain rather scarce. Micevski et al. (2003) published a book on the Orthoptera fauna of Pelister National Park, located in the south of the country. It will be important to prepare a field guide with keys, photos and maps for the whole country.

Key publications

Micevski et al. 2003 – First handbook (National Park Pelister)
Chobanov & Mihajlova 2010 – Summary of data of Museum of Skopje
Lemonnier-Darcemont et al. 2014 – Red List

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Poland

Przemysław Żurawlew

Research on Orthoptera in Poland has a long tradition, starting at the end of the 18th century with an unpublished manuscript of royal cartographer Charles de Perthées. In the period 1806-1901 there are 44 publications, including the first monograph with 17 species (Jarocki 1827), followed by 140 publications in the first half of the 20th century, including the first catalogue (Szeliga-Mierzeyewski 1928). The research intensified after 1951, with more than 200 papers published up to 2019. The greatest contribution to the knowledge of Polish orthopterofauna was made by Władysław Bazyluk (1910-1988) and Anna Liana (b. 1937) of the Museum and Institute of Zoology of the Polish Academy of Sciences.

Władysław Bazyluk. Source: Bazyluk & Liana 2000.

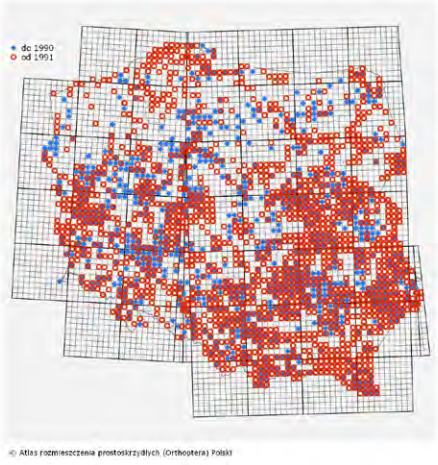
Atlas project

In 2018 a group of seven entomologists (P. Żurawlew, R. Orzechowski, S. Grobelny, M. Brodacki, M. Kutera, P. Radzikowski and S. Czyżewski) started working on distribution atlas of Orthoptera in Poland. The website Orthoptera.entomo.pl was launched to collect distribution data and inspire grasshopper research. As of January 2020, the database contains over 30 000 records, both historical (up to 1990, mainly from literature) and recent. The website also presents photos of all species and a proposal for common names.

Conservation

In 1992 and 2002 Polish Red Lists of Orthoptera were published (A. Liana, in: Głowaciński 1992, 2002) which listed 23 and 33 species, respectively. The latest red data book gave detailed information on eight rare, threatened or extinct Orthoptera: *Poecilimon ukrainicus*, *Gampsocleis glabra*, *Modicogryllus frontalis*, *Nemobius sylvestris*, *Calliptamus italicus*, *Bryodema tuberculatum*, *Mecostethus paraplerus* and *Psophus stridulus* (A. Liana, in: Głowaciński & Nowacki 2004). As of 2020, the only orthopterans that are subject to species protection in Poland are *Gampsocleis glabra* and *Isophya stysi*. Some rare and threatened species (e.g. *Poecilimon ukrainicus*, *Gampsocleis glabra*, *Modicogryllus frontalis* and *Tetrix ceperoi*) are protected within nature reserves or Natura 2000 protection areas. In 2012-2016 the Institute of Soil Science and Plant Cultivation (State Research Institute in Puławy) conducted a grasshopper monitoring program to evaluate the effect of different agricultural practices and selected agri-environment packages. At present, the greatest threats t in Poland are habitat loss due to landscape transformation and infrastructure development, intensification of agricultural production, and chemisation of forestry (especially large-scale usage of the insecticide Dimilin in forests).

Covers of two influential Orthoptera books in Poland.



The atlas database contains more than 30.000 records.

Podisma pedestris. Photo Tomasz Wilk.

Important publications

Bazyluk (1956) provides the first and only identification key in his monograph. The Catalogue of Fauna of Poland (Bazyluk & Liana 2000) is a milestone in Polish orthopterology. It summarises all the knowledge available at that time. Sokołowski (1960) wrote a popular book describing some Polish species but it was the Polish translation of Bellmann's Kosmos Heuschreckenführer in 2009 which was the first accessible, non-technical work presenting most Polish species. At present, Polish orthopterists mostly use Kočárek et al. (2005, 2013), Fischer et al. (2016) and Bellmann et al. (2019).

Future plans

The most important task is to gather and all published and unpublished records for inclusion in the distribution atlas. Thanks to the rising interest in Orthoptera among Polish nature enthusiasts and photographers it is now possible to obtain numerous and verifiable records via popular social media like Facebook groups and internet forums. Besides that, it is particularly important to study the distribution of several new or less explored species in Poland, like all *Isophya* species, *Leptophyes punctatissima*, *Meconema meridionale*, *Ruspolia nitidula*, *Eumodicogryllus bordigalensis*, *Nemobius sylvestris*, *Pteronemobius heydenii*, *Oecanthus pellucens*, *Aiolopus thalassinus*, *Calliptamus italicus*, *Chorthippus pullus*, *Mecostethus parapleurus*, *Podisma pedestris* and *Psophus stridulus*.

Poecilimon ukrainicus. Photo Michał Brodacki.

Gampsocleis glabra. Photo Michał Brodacki.

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Portugal

Sónia Ferreira and Sílvia Pina

The first records on Portuguese grasshoppers date back 1789 by Baptista. Bolívar, Aires & Menano and Seabra published some data in the 19th and 20th century, but this insect group has received limited attention until recently. Both Portuguese and foreign researchers have published papers and uploaded records on digital platforms (iNaturalist and Observation.org). Despite the increasing interest in this group no up-to-date checklist is available and new species to science are still being described.

Conservation

The first red list of Portuguese Invertebrates is ongoing and all known species to occur in Portugal are being evaluated. New distribution data are collected and further studies regarding species distribution and taxonomy are in place. Habitat loss by wildfires, agricultural intensification and urbanisation are the major threats.

Outreach

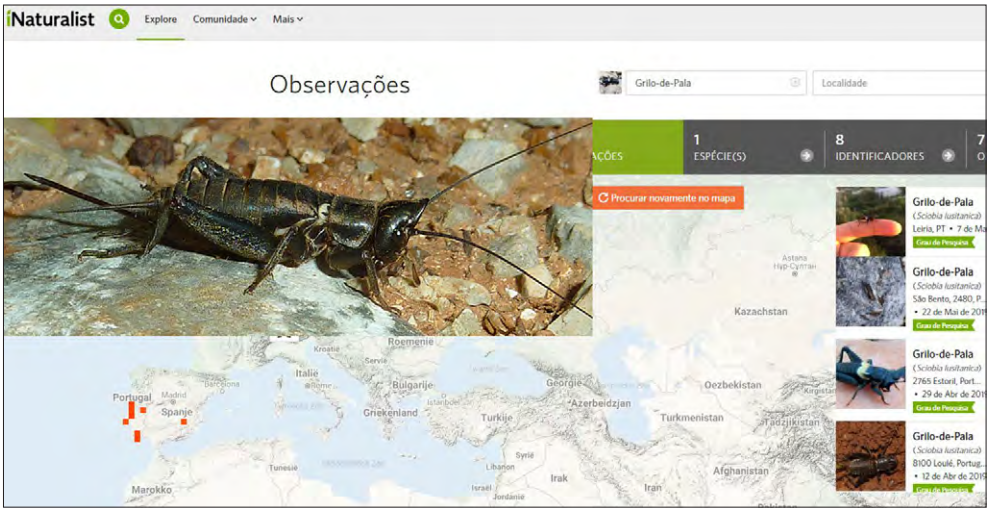
While there aren't handbooks to identify Portuguese Grasshoppers fauna it might be useful the use of the available Spanish catalogues, such as Llucia Pomares (2002), and the field guides from Europe, France and Italy (e.g., Bellmann et al 2017, Sardet et al. 2015, Iorio et al. 2019). Nevertheless, the high levels of Iberian endemisms, especially in tettigonids will prove identification of many species to be challenging and specific literature is needed. Literature to identify all known species is scattered in a diversity of publications. Distribution data available is very limited and is not yet centralized.

The collection of new data regarding Portuguese Grasshoppers in ongoing in the context of the first Portuguese Invertebrate Red List. Sílvia Pina is identifying material for the collection. Photo Patrícia Garcia-Pereira.

There are still new species to science to be discovered in Portugal, like this *Petaloptila* sp. nov. that is being described by Pablo Barranco and Sónia Ferreira. Photo Sónia Ferreira.

Future plans

There is still a lot to be discovered in the Portuguese Orthoptera fauna. With the National Invertebrate Red List project there is an opportunity to gather all available distribution data. We want to publish an new checklist, which will hopefully lead to a field guide. We want to increase the taxonomic training for biologists and other naturalists. We expect that the collection of data will increase in the coming years as new enthusiasts are joining the digital platforms. The use of INaturalist is encouraged. Hopefully we can work towards an atlas in the future. It will be important to make protection plans for endangered species.



Digital platforms play a very important role in the collection of new data on Portuguese grasshoppers, especially in easily identifiable species like the Lusitanian Spade-cricket. Photo Sónia Ferreira.

Wildfires have been one of the major threats to grasshoppers in Portugal, both by direct death and habitat loss. Two partly burned specimens, the one below is the endemic *Ctenodecticus lusitanicus* from Serra da Estrela. Photo Sónia Ferreira.

Francisco Barros recording sounds for bioacoustics studies. Photo Patrícia Garcia-Pereira.

Key publications

Bolívar 1876, 1898, Aires & Menano 1915, 1916, Seabra 1939, Fernandes 1960, Miranda-Arabolaza & Barranco 2005, Ferreira et al. 2007, Lemos et al. 2016, Pina et al. 2017

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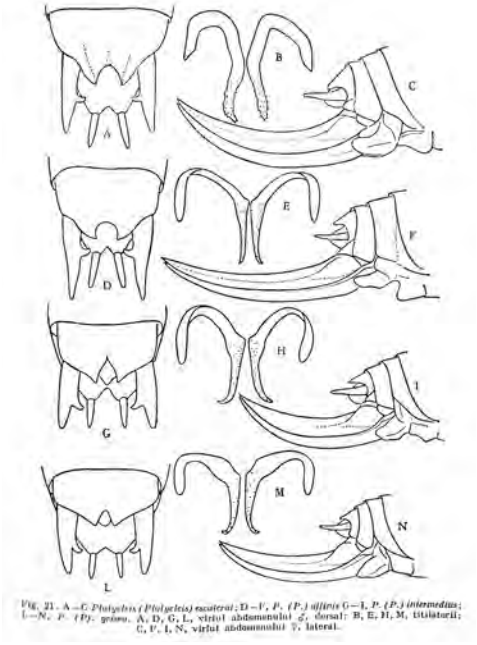
Romania

Ionuț Ștefan Iorgu & Elena Iulia Iorgu

Short history

In Romania, the study of the orthopterans began in with the publications of Fischer (1853), Fuss (1853, 1855, 1869), Frivaldsky (1867, 1871, 1875), Herman (1870) and Brunner von Wattenwyl (1882). In 1959, a volume on Orthoptera is published within the series 'Fauna of R. P. Romania' by Knechtel and Popovici-Bâznoșanu. In the period 1957-1997, B. Kis, one of the best known orthopterists, published more than 60 papers focusing on taxonomy, distribution and ecology. He described eight new species to science and 46 new species for Romania. Iorgu & Iorgu (2008) provide a book with an identification key and distribution of the species in the historical region Moldavia. The attractiveness of orthopteran behaviour is showcased by the movie 'The Orthoptera of Dobrogea', presented in 2017, and a new cinematographic project is in preparation.



The artwork of Béla Kis in his keys to the Romanian Orthoptera (1975 and 1978).

Conservation

There is no national Red List concerning the Romanian Orthoptera. However, 28 species are included in the Red Book of Romanian Invertebrates, ready to be printed. Also, the monitoring of the eight species listed in the EU Habitats Directive led to a better management of the sites of community interest. Several endemic species face the threat of extinction. A once wide-spread bush-cricket, *Callimenus montandoni* nowadays lives only in some meadows in the surroundings of Craiova (S. Romania). Other species, restricted to very small montane areas in the Southern Carpathians, such as *Isophya harzi*, *Zubovskya banatica*, *Podismopsis transsylvanica* and *Chor-*

A male *Tylopsis lilifolia* singing at sundown in a meadow close to the Black Sea shore. Movie frame from 'The Orthoptera of Dobrogea' (2017).

The grasslands of the Danube Delta are home to a remarkable diversity, including *Phaneroptera spinosa*, *Gampsocleis schelkovnikovae*, *Gryllotalpa unispina*, *Bruntridactylus tartarus* and *Epacromius coerulipes*. Photo Ionuț Iorgu.

The spectacular *Callimenus montandoni* is one of the most endangered Romanian endemic bush-crickets. Photo Ionuț Iorgu.

The analysis of acoustic signals may reveal previously unrecognized, morphologically cryptic species: producing a peculiar stridulation, *Isophya dochia* is one of the rarest Carpathian jewels. Photo Ionuț Iorgu.

thippus acroleucus, may become extinct in the next years. For instance, a recent wildfire in Cozia mountains decimated the only known populations of *I. harzi* and *C. acroleucus*.

Future plans

In the past years, many naturalists took photos of orthopterans and sent us the GPS data via online social media, enhancing the overall knowledge on species distribution. While preparing a first national atlas, we are focusing also on species ecology and behaviour, struggling to understand and protect the most endangered species. Another book project, 'The Orthoptera of Dobrogea', is scheduled for publication in the near future. We are looking forward to a brighter future for our small singers.

Key publications

Knechtel & Popovici-Bîznoşanu 1959 – Handbook
Kis 1975, 1978 – Keys
Iorgu & Iorgu 2008 – Handbook region Moldavia
Kis & Vasiliu 1970, Iorgu et al. 2008 – Checklist

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Russia (European part)

Michael Sergeev

European Russia covers about 40 % of the continent. Its territory is characterized by a high diversity of landscapes, from the tundra in the north up to the deserts in the south-east and from the nival belts of high mountains in the North Caucasus to the salt flats of the Caspian Depression. A few orthopteran species occur in the northern parts of this territory, but many inhabit its southern plains, especially the steppes, semi-deserts and deserts, and the mountains of the North Caucasus.

G.Ya. Bey-Bienko.

Conservation

The last edition of the Red Data Book of the former USSR in 1984 included three species from European Russia, *Bradyporus multituberculatus*, *Saga pedo* and *Ceraeocercus fuscipennis*. All are bush-crickets mainly associated with steppes (*Bradyporus multituberculatus* and *Saga pedo*) or deserts (*Ceraeocercus fuscipennis*). The only edition of the Red Book of the Russian Federation (2000) includes the first two species. Besides, almost all Russian Federation subjects prepared their regional red books. Many of them include orthopteran species. It is vitally important that all official red books are legislative documents in Russia.

For many decades *Bradyporus multituberculatus* was considered as a very rare, almost extinct species in the steppes of European Russia and Ukraine. In 2008 this species was found again in the steppes of Kabardino-Balkar Republic (Yakimov & Shapovalov 2012). On the contrary, *Saga pedo*, one of the world's largest Orthoptera, the katydid is widely distributed in the steppes and semi-deserts and commonly occurs in transformed habitats. Despite its huge sizes it is hard to find this species, especially in dense vegetation, because it moves very slow.

The mountain deciduous forests, meadows and steppes in the central part of the North Caucasus (Kabardino-Balkar Republic), habitat of *Poecilimon scythicus*, *P. heroicus*, *Montana decticiformis*, *Parapholidoptera noxia* and *Chorthippus loratus*. Photo Michael Sergeev.

Regional Red Lists include more than 50 species of Orthoptera, Gryllo-idea (4 species), Rhaphidophoridae (1), Tettigoniidae (29), Tetrigidae (2), Pamphagidae (1), and Acrididae (16 species). In the northern parts of European Russia, there are widely distributed species with extremely localized populations (e.g., *Bryodemella tuberculata* and *Sphingonotus caerulans*). In the forest-steppes and steppes, the lists commonly contain forms with relatively small ranges and associated with steppe habitats, e.g., both species of the genus *Onconotus*, several species of the genera *Isophya* and *Poecilimon*.

The small bush-cricket *Miramiola pusilla,* described from the Biosphere Reserve Askania-Nova (Ukraine). The range of the species is limited by the steppes and semi-deserts of S. Ukraine, S. European Russia, S. West Siberia and N. Kazakhstan. It inhabits the dry steppes with short grasses. Photo Michael Sergeev.

Future plans

Unfortunately, for many species data on population size and development is lacking. This results either in some dubious suggestions (e.g., to protect *Acheta domesticus*) or, on the contrary, in missing some species eligible for global and regional conservation programmes. Many endemics with restricted ranges and small populations occur in the mountains in the southern parts of European Russia. Among them are some bush-crickets from the tribes Odonturini, Drymadusini, Platycleidini and Pholidopterini, and several grasshoppers, for instance, *Podisma teberdina*, *Chorthippus elbrusianus* and *Eremippus sobolevi*.

Saga pedo is one of the most threatened bush-crickets in Russia. Photo Michael Sergeev.

This means that populations of many species, especially in the steppes, semi-deserts, deserts and in the local mountains should be studied in the near future. However, opportunities of Russian orthopterists are limited, because their density is too low for the huge country and some of them are involved in many projects on different fields of fundamental and applied ecology, biogeography and taxonomy, especially in the Asian part of Russia.

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Serbia

Slobodan Ivković & Laslo Horvat

Orthoptera research in Serbia started with Carl Brunner von Wattenwyl and Josif Pančić in the middle of 19th century. In the following years more than 50 papers concerning Orthoptera in Serbia were published. The first national checklist was published by Josif Pančić in 1883, the second followed in 1975 by Adamović. Since 2013 study of Orthoptera in Serbia shows steady progress and recently more is known about distribution, calling songs, ecology and threats of the present species.

Josif Pančić (1814-1888) published the first national checklist in 1883.

Conservation

In the 'Rulebook on declaration and protection of protected and strictly protected species of plants, animals and fungi (Serbia)', 28 Orthoptera species are listed as protected, while 20 as strictly protected in Serbia, but currently there are no conservation projects. A National Red List proposal, which gave an insight on which species more research is necessary, was published in 2015, but recent surveys showed that for majority of the species the assesments need to be adapted.

In 2013, Rufford Small Grants funded the project 'Research and Conservation of 3 Attractive Bush-crickets: *Bradyporus dasypus*, *Callimenus macrogaster*

Pyrgomorphula serbica, a critically endangered species, male. Photo Slobodan Ivković.

Pyrgomorphula serbica, a critically endangered species, female. Photo Slobodan Ivković.

and *Saga natoliae* in the Steppe Habitats of Southern Serbia', which resulted in the first National Red List assesment for *Bradyporus dasypus*.

Outreach

All distribution data of Orthoptera in Serbia are available on Alciphron.habiprot.org.rs and Biologer.org. People who are interested in a grasshopper research can register and see and upload data on these two websites.

Future plans

As there is no identification key for Orthoptera in Serbia we want to publish a handbook with a key. This will stimulate people to collect more data, thus contributing to conservation of vulnerable taxa. Previous research was based mostly on faunistic data, but our future plans include several conservation projects, especially in steppe and sandy habitats. We plan to make a National Red List with a better back-up of data.

Key publications

Pančić 1883 – First checklist
Adamović 1975 – Second checklist
Pavićević & Ivković 2015 – Red List

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Slovakia

Anton Krištín, Benjamín Jarčuška & Peter Kaňuch

History

The first works concerning orthopteran insects in the territory of recent Slovakia were published in the 19th century (Bartsch 1846, Frivaldszky 1868, Bíró 1885, Pungur 1891, Petricskö 1892, Chyzer 1897). The turning point was the first monograph on Orthoptera in the former Kingdom of Hungary (Frivaldszky 1868, with 69 species in Slovak territory) and a monograph of former Czechoslovakia (Obenberger 1926, with 61 species in Slovakia). Dobšík (1959) published the first identification key. Relatively few Orthoptera papers appeared before 1990s, when the most active authors were Adolf Čejchan, František Chládek, Ján Gulička and Josef Mařan.

The first complete checklist of Orthoptera species for both Czech and Slovak Republics was compiled by Mařan & Čejchan (1977). This publication did not contain distribution data, neither did the next checklist (Kočárek et al. 1999). Kočárek et al. (2005) is the first comprehensive monograph with an identification key on the Czech and Slovak Orthoptera. Since than faunistic surveys and mapping of many new areas have increased the knowledge considerably. Several new species to the fauna were recorded, *Isophya costata*, *I. modesta*, *I. posthumoidalis*, *Meconema meridionale, Pezotettix giornae* and *Paracaloptenus caloptenoides* or even described new for science, *Isophya fatrensis*, *Chorthippus tatrae* and *Pseudochorthippus smardai*. During the last 25 years, intensive faunistic surveys have concentrated on less known areas, endangered and expanding species (Holuša 1996, Gavlas 2004, Vlk et al. 2012, Krištín & Kaňuch 2013, Jarčuška et al. 2015, Krištín & Jarčuška 2016, Nuhlíčková et al. 2017, Krištín et al. 2019). Until now, more than 430 papers ranging from short faunistic reports to ecological studies of some areas or taxonomical groups have been published (Kočárek et al. 2005, Orthoptera.sk, own literature collection). To the present time, 128 orthopteran species have been reliably detected in Slovakia.

Atlas projects

The Orthoptera atlas project in Slovakia started in 2006 (Orthoptera.sk), where the data of 83 co-workers are presented. Recently the Orthoptera database covers data from > 2000 sites in Slovakia.

Ján Frivaldszky (17.6.1822, Rajec – 29.3.1895, Budapest) published the first monograph on Orthoptera in Slovakia in 1868.

Publication of the mapping results is expected within two years.

Conservation

Seven endangered and rare Orthoptera species were included in the first Red book of fauna in Czechoslovakia in 1992 (Gulička 1992). The first Red List of Orthoptera in Slovakia has been published in 2001, where 33 species in four threat categories were listed (Krištín 2001). This has laid the basis for inclusion of Orthoptera species in legal protection by national law. A comprehensive Red List of 142 Carpathian Orthoptera species (including Slovakia) was published in 2014 (Krištín & Iorgu 2014).

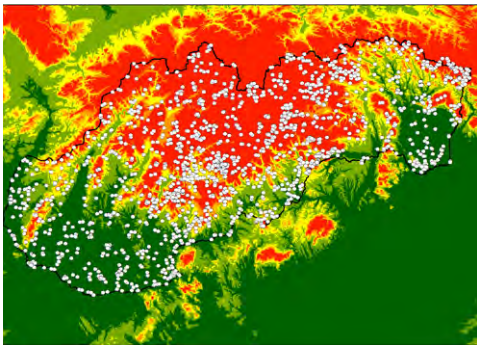
Since 2014 seven species of European importance (*Saga pedo, Isophya stysi, I. costata, Pholidoptera transsylvanica, P. caloptenoides Odontopodisma rubripes, Stenobothrus eurasius*) are regularly monitored in the scheme of EU habitat directive monitoring and species protection plans have been published for them. Based on recent knowledge, new Special Protected Areas for these species were designated in Slovakia.

Outreach

Naturalists can find study material available in museums and institutes in Bratislava, Zvolen, Banská Bystrica, Prague, Hradec Králové, Budapest and Wien. Regarding to literature and web resources, beginners can use the atlas by Kočárek et al. (2005) and information on Orthoptera.sk. In 2018, the second European Congress on Orthoptera Conservation was organized in Slovakia.

Future plans

A new annotated checklist of Orthoptera in Slovakia, covering all 128 species, is ready to be published in 2020. Special attention will be devoted to the endemic and critically endangered bush-cricket *Isophya beybienkoi*.



Study sites (n=1950) of Orthoptera mapping in Slovakia in 1994-2019. Altogether 99 % of 430 grid cells (11x12km) were mapped and occurrence data collated. Source: B. Jarčuška.

Key publications

Frivaldszky 1868 – Monograph
Gulička 1992, Krištín 2001 – Red List
Mařan & Čejchan 1977, Kočárek et al. 1999 – Check list
Kočárek et al. 2005 – Handbook

Anton Krištín, Benjamín Jarčuška & Peter Kaňuch
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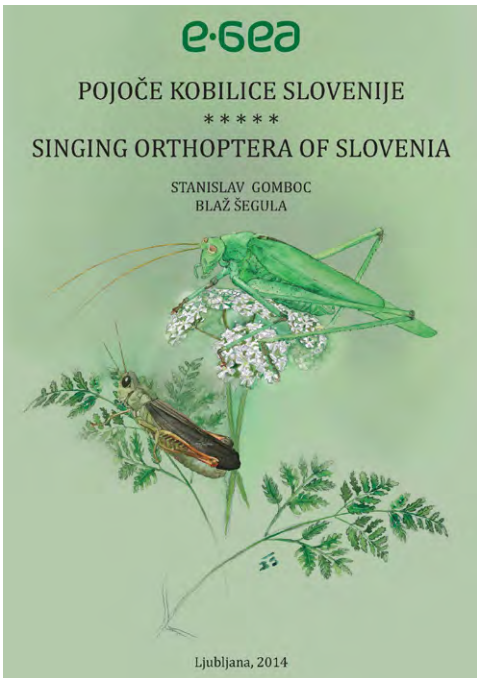
Isophya beybienkoi is a critically endangered bush-cricket, endemic to Slovakia. Photo Anton Krištín.

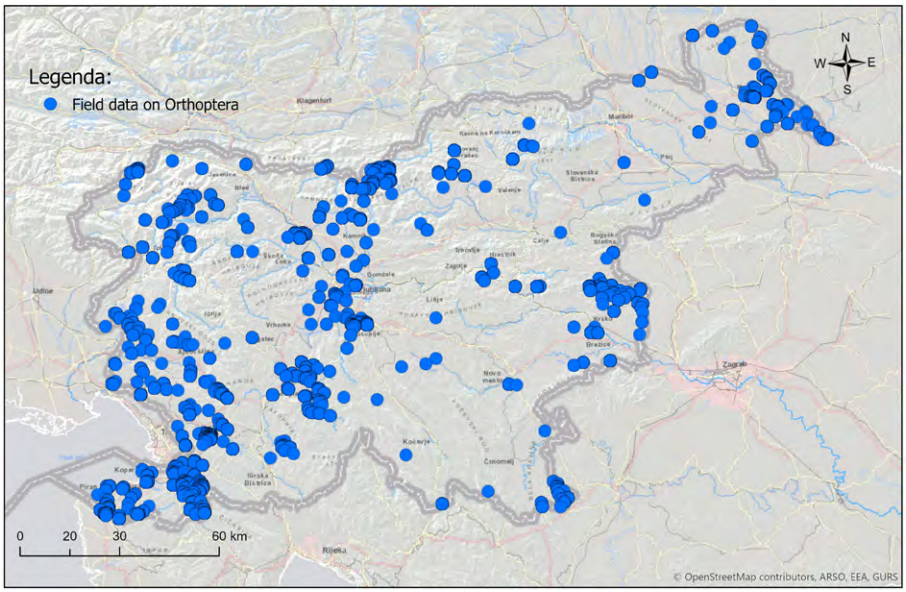
Slovenia

Stanislav Gomboc

The first data on Slovenian grasshoppers were collected by Austrian entomologistst at the end of the 19th century. Ferdinand Schmidt from Ljubljana was very active and he published an important contribution. He was collaborating with several colleagues who described some Orthoptera. Giuseppe (Josef) Müller, coleopterist and orthopterist, brought together a large collection of Orthoptera on the grasshoppers of the (wide) surroundings of Trieste, including parts of Slovenia. He compiled a large manuscript which unfortunately was never published. The manuscript is held by the Museo di Storia Naturale in Trieste. Us (1992) provided the first key to the Slovenian grasshoppers, based on occasional own observations and published sources. It was published almost 20 years after his death. In this period, other orthopterists visited Slovenia and published some papers. The Us key and field guides published abroad have stimulated research and since 1995 the knowledge on the fauna has progressed significantly. Today 157 species are known from Slovenia.



The latest book with checklist.



Field data on Orthoptera in Slovenia.

Conservation

Protection of Orthoptera in Slovenia is limited due to a lack of finances, as is the case in other areas of nature conservation. Most work is done on voluntary basis. The list of endangered species (Rules on the inclusion of endangered plant and animal species in the Red List 2002, 2010) includes 35 species. However this list was prepared on historical data and is outdated. The national list of protected species (Decree on protected wild animal species 2004 with revisions) contains 17 Orthoptera species and also this list is outdated.

The European Red List (Hochkirch et al. 2016) includes six Slovenian species. Of these, three were only recently discovered in Slovenia: *Metrioptera prenjica*, *Zeuneriana marmorata* and *Epacromius coerulipes*. Of the other three we only have historical data: *Pachytrachis frater*, *Tetrix transsylvanica* and *Aeropedellus variegatus*.

The conservation activities are currently focused on the conservation of the Adriatic Marmored Bush-cricket *Zeuneriana marmorata*. This species holds only a few populations in northern Italy and Slovenia and the biggest population is located in Slovenia, on Ljubljansko barje. This area is under protection and managed by Ljubljansko barje Nature Park. In cooperation with the park the population is monitored yearly and a management plan is in place.

Future plans

Due to the significant changes in land use, forestry, agriculture and climate change, the Orthoptera fauna is changing rapidly. It would be advisable to monitor these changes and document the changes in publications. The lists of endangered and protected species should be updated, but there is currently no political support. We want to continue to raise interest for grasshoppers and for this cause we are considering the preparation of an identification key and atlas.

Key publications

Us 1992 – First identification key
Gomboc & Šegula 2014 – Sound and photo guide
Gomboc et al. 2015 – eBook of regional fauna.

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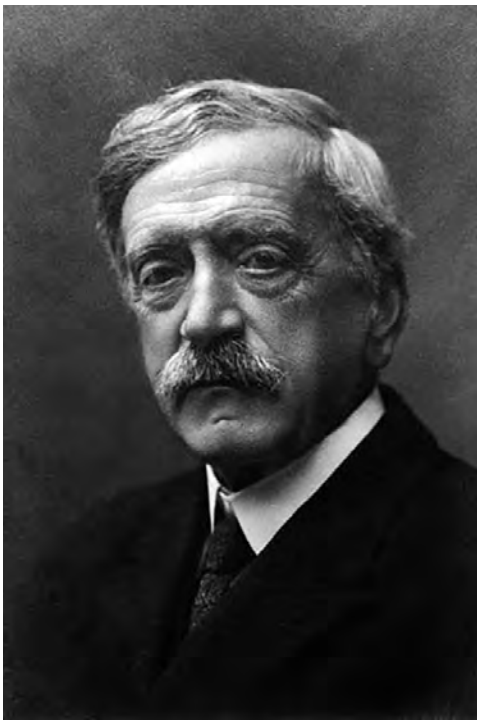
Female of the critically endangered Adriatic Marmored Bush-cricket *Zeuneriana marmorata*. Photo Stanislav Gomboc.

Female of the endangered Prenj Meadow Bush-cricket *Metrioptera prenjica*. Photo Stanislav Gomboc.

Spain

Juan José Presa & María-Dolores García

Orthoptera have been studied in Spain from the late 19th century. Ignacio Bolívar (1850-1944) built the foundations for their knowledge (Bolívar 1875-1878, 1900). Later, Eugenio Morales-Agacino (1914-2002) and Vicenta Llorente (b. 1930) were the only researchers devoted to the group during the dark time of dictatorship. From then on young researchers take up studies on Orthoptera again. Despite the long tradition there are no recent national works. However, there are some papers focusing on the genus or family level, e.g. Llorente & Presa (1997) on Iberian Pamphagidae.



Ignacio Bolívar (1850-1944) published the first works on Orthoptera in Spain. Image from Wikipedia CC BY-SA 3.0 es

Conservation

The protection of fauna (especially insects) has only taken off recently with the Catálogo Nacional de Especies Amenazadas (1996, 2011). The latest national list includes only three Orthoptera, but there are many regional catalogues and Red Lists, including a wide variety of Orthoptera. The first Red Book dedicated to Orthoptera at the national level was Gangwere et al. (1985), the Libro Rojo de los Invertebrados Españoles was published in 2006 and the Atlas and the Atlas y Libro Rojo de los Invertebrados amenazados de España appeared in 2011. The latter laid the base for national protection of Orthoptera. Among the regional Red Lists, those from Andalucía

Lluciapomaresius panteli is the only orthopteran species having a protection plan in Spain. Photo José Correas.

A selection of publications on conservation of Spanish grasshoppers.

and Catalonia stand out, the latter being the only region that has published an atlas of Orthoptera (Olmo-Vidal 2006). The increase in wildlife protection has made it possible to carry out some protection plans for certain orthopteran species such as *Lluciapomaresius panteli*, an endemic species from the Monsant, or *Saga pedo* in Catalonia.

Plans

We hope to increase the knowledge and protection of Orthoptera in our country, mainly thank to the development of new technologies, especially the websites where many data are being collected (Biodiversidad Virtual, Asturnatura, etc.). Such websites facilitate access to information for the general public as well as stimulate collaboration and the pressure on the authorities for increasing Orthoptera protection.

A page of the website Biodiversidadvirtual.org.

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Sweden

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Observation data

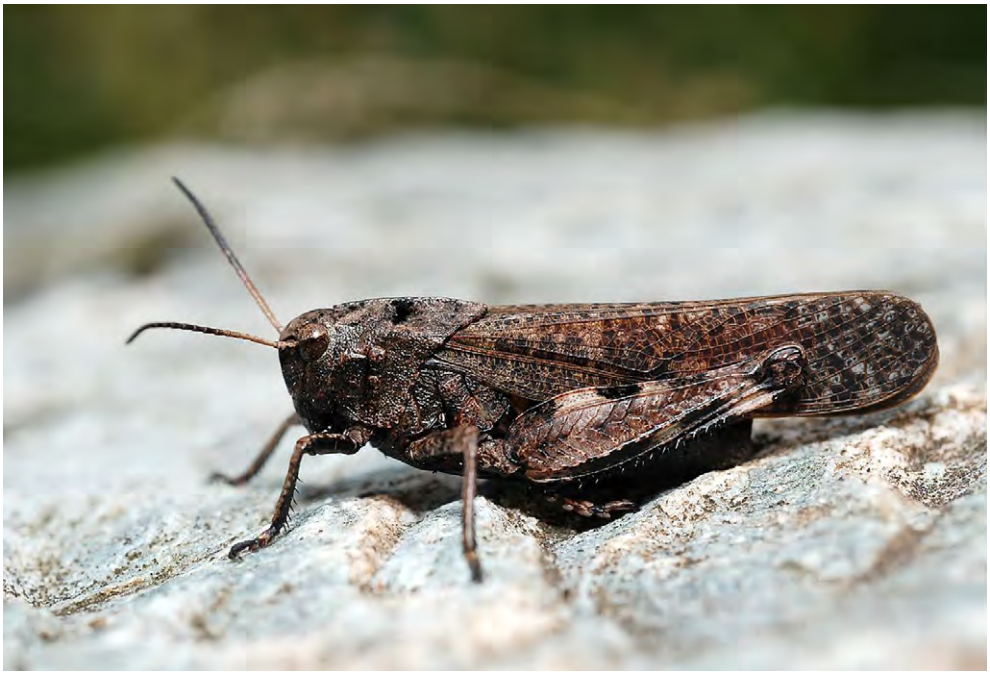
Artportalen.se (The Species Observation System) is an open system for searches and recording of sightings of all species in Sweden, including grasshoppers. The intention behind the system is to stimulate interest and increase public understanding of conservation measures, while at the same time rendering the conservation efforts more efficient. It has greatly stimulated the knowledge of grasshoppers in Sweden. The portal contains an occurrence catalogue (Kindvall 2008), that is continuously updated with sightings from the portal. The occurrence catalogue is important for the continuous validation of observations entered into the system.

Conservation

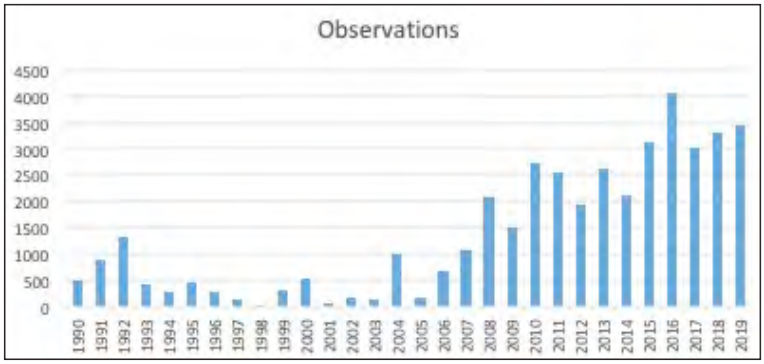
Red Lists in Sweden have been published every fifth year from 2000. The next Red List is now in preparation for release in 2020. The changes in the list compared to last Red List from 2015 will be small. Five out of 38 resident orthopteran species in Sweden is on the Red List. The number of residential species is also increasing, most probably as a result of climate change. One species is included in environmental monitoring programs in Sweden, the Rattle Grasshopper *Psophus stridulus*. This species is also included in a national action program for threatened species, together with the Ladder Grasshopper *Stauroderus scalaris*. Restoration efforts for the rattle grasshopper have mainly been carried out in south-eastern Sweden. In places where restoration work has been carried out the population has increased. *Stauroderus scalaris* is only found on the northern part of the island Öland and the population is decreasing due to overgrowth of sandy areas (Kindvall 2018).

Outreach and NGOs

The NGO Sveriges Entomologiska förening (the Swedish Entomological society) is a very active umbrella organisation that has many local entomological organisations under it. The organisation publish-



Rattle Grasshopper *Psophus stridulus*. Photo Gilles San Martin.



Number of observations of Orthoptera in the Species Observation System reported over the years.

es Entomologisk Tidskrift, one of the oldest entomological journals in the world (started in 1880). They also work to stimulate the interest for orthopterans and other insects through local activities like lectures and excursions.

Key publications

ArtDatabanken 2015 – Online database
Kindvall 2008. – Online overview
Kindvall 2018 – Analysis expanding species
Strid et al. 2010 – Field guide

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Switzerland

Florin Rutschmann

Although the area of Switzerland is pretty small compared to other European countries it contains a wide range of different habitats from the Jura in the north to the southern Alps. This is reflected in a rich Orthoptera fauna, with about 109 present species. Orthoptera research has a long tradition in the country. One of the first game-changing publications leads back to Fruhstorfer (1921), who gives a basic overview. Thorens & Nadig (1994, 1997) published the first Red List and atlas. The fundaments for these works were laid by Adolf Nadig during his 60 years of fieldwork till 2003. Coray & Thorens (2001) presented the first illustrated key and five years later Baur et al. (2006) published the book Die Heuschrecken der Schweiz. This monograph has led to the upsurge of recent fieldwork in Switzerland. Christian Roesti and Florin Rutschmann started the website Orthoptera.ch together with an application for smartphones (that allows the combination of descriptions, songs and pictures) to provide information about the group to a wider audience. This has greatly increased the interest of new orthopterists.

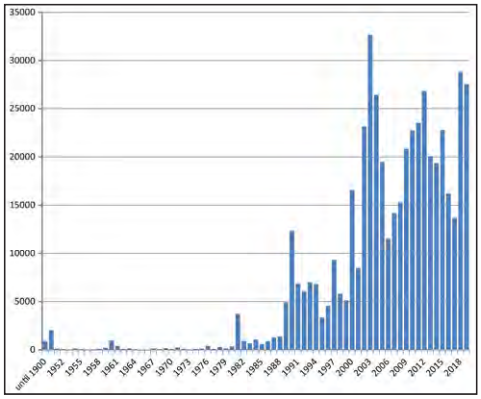
Epacromius tergestinus has been unofficially reintroduced in the Canton Valais after its extinction around 1990. Photo Florin Rutschmann.

The number of observations that are received at the national data center info fauna (CSCF) are on a high level for almost ten years.

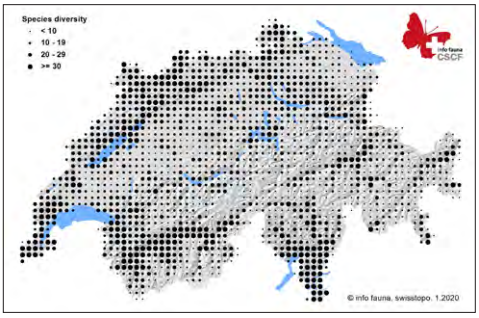
Species richness and conservation

In Switzerland, we can spot four regions with a high species richness. On the northern border lies the Jura, with species like *Stenobothrus stigmaticus*, *Calliptamus barbarus* and *Ephippiger diurnus*. On the

At the national grasshopper meeting 2019 in Bern.



Development of observation data in the national database of info fauna between 1900 and 2019 (info fauna 2020).



Orthoptera species richness in Switzerland based on 5x5 km squares (info fauna 2020).

south side the Valais and the Tessin are famous for many rareties. The fourth region are the southwards bound valleys in Grison. One of the major highlights is *Podismopsis keisti,* that has been discovered in the 1980s by Bruno and Lotti Keist and is the only endemic species in Switzerland. Due to intensive farming and the loss of habitat during drainage of the wetlands almost 40 % of the species are endangered according to the Red List (2007). There are several local conservation plans on endangered species like *Saga pedo*, *Conocephalus dorsalis* and *Oedaleus decorus*.

Male of *Miramella formosanta*. The species only occurs south of Gotthard in Canton Tessin and Grison. Locally it is found in high densities. Photo Florin Rutschmann.

Actual activities

In recent years data field work is performed for a revision of the Red List, co-ordinated by Christian Monnerat (info fauna - CSCF) and will be published 2022 or 2023. On a regional scale, there are some local initiatives aimed at improving the lack of actual data. Once a year a national grasshopper meeting with all language regions of Switzerland is held in Bern.

Key publications

Fruhstorfer 1921 – Handbook
Thorens & Nadig 1997 – Atlas
Coray & Thorens P. 2001 – Identification key
Baur et al. 2006 – Handbook
Monnerat et al. 2007 – Red List
Roesti & Keist 2009 – Handbook of songs
Rutschmann & Roesti 2015 – Orthoptera-App

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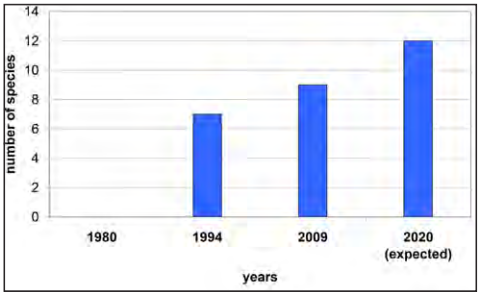
Ukraine

Taras Pushkar

History

In Ukraine the study of the Orthoptera insects began in the 19th century (Fischer 1846, Ivanov 1887). During the 20-21th century Dirsh (1926), Medvedev (1929), Kryshtal (1949), Bey-Bienko, Mishchenko (1951), Bey-Bienko (1954), Lykovych (1957, 1958, 1964), Goncharov (1995, 1999) and Pushkar (2009, 2011) contributed to the study of the Orthoptera fauna of Ukraine.

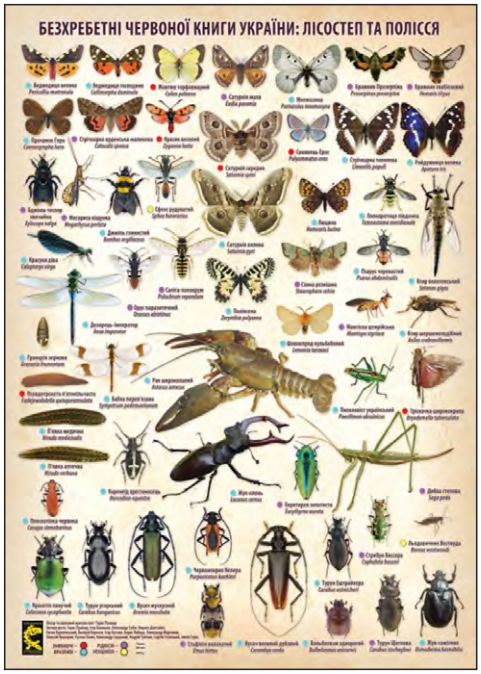


Grasshopper number of different editions of the Red List.

Conservation

Ukrainian Red Lists have been published in 1980, 1994 and 2009. In the first list no Orthoptera were included, the second included seven species: *Anadrymadusa retowskii*, *Callimenus multituberculatus*, *Poecilimon boldyrevi*, *Poecilimon pliginskii*, *Poecilimon schmidtii*, *Poecilimon ukrainicus* and *Saga pedo*. V.M. Yermolenko prepared the first scientific abstracts about the species. The third edition contains the supplemented and revised abstracts by T.I. Pushkar, and two more species are added to the list: *Bryodemella tuberculata* and *Pseudomogoplistes byzantius*. In the new edition (ready to be published) four species will be added: *Isophya modesta*, *I. zubowskii*, *Pholidoptera frivaldszkyi* and *Poecilimon scythicus*. Regional Red Lists are published in four Ukrainian oblasts (Donetsk, Kharkiv, Dnipropetrovsk, Ivano-Frankivsk), and in the Autonomous Republic of Crimea.

New addenda to Red List: *Pholidoptera frivaldszkyi*, *Isophya zubowskii*, *I. modesta* and *Poecilimon scythicus*.



A poster with photos of Red List invertebrates.

Promotion

A team of authors from the Institute of Zoology of the National Academy of Sciences of Ukraine produced a series of educational posters depicting the animals of The Red List of Ukraine, one of which includes Orthoptera. The posters were distributed to educational institutions and administrations of the nature conservation areas of Ukraine.

Species protection plans

In the nearest future a new edition of The Red List of Ukraine and the regional Red List of Chernivtsi Oblast are to be published. We plan to extend the series of posters with animals of the Red List. An atlas or a handbook should be issued to promote the study of Orthoptera and to enhance the knowledge and protection of rare species.

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