Neozoan Grasshoppers: southern species in a northern town – *Eumodicogryllus bordigalensis* and *Meconema meridionale* in Eberswalde/Brandenburg / Germany

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Zusammenfassung: Neozoe Heuschrecken: südliche Arten in einer nördlichen Stadt
In diesem Beitrag wird auf das Auftreten, die Abundanz, Verbreitung und Dynamik der beiden wärmeliebenden Heuschreckenarten Südliche Grille (*Eumodicogryllus bordigalensis*; Gryllidae) und Südliche Eichenschrecke (*Meconema meridionale*; Tettigoniidae) in der nordostdeutschen Stadt Eberswalde eingegangen. Für die Südliche Grille sind mittlerweile in zwei brandenburgischen Landkreisen (bei und nördlich von Eberswalde), die bis dato nördlichsten bekannt gewordenen Funde in Deutschland und Mitteleuropa nachweisbar – und dies vor allem entlang der Bahngleise. Die Ausbreitung erfolgt offenbar hauptsächlich über transportierten Gleisschotter. Die Südliche Eichenschrecke (*Meconema meridionale*) wurde innerhalb des Eberswalder Stadtgebietes seit ihrem Erstnachweis 2013 umfangreich und systematisch in ihrer Verbreitung und mit ihren Habitatanforderungen untersucht. Studierendengruppen haben nachts zeitgleich verschiedene Baumstämmegruppierungen nach der allochthonen Südlichen Eichenschrecke und der autochthonen Schwesterart Gemeine Eichenschrecke (*Meconema thalassinum*) abgesucht. Beim Abundanzvergleich der beiden Schwesterarten konnte in den letzten Jahren eine rasante Zunahme der neozoen Schwesterart festgestellt werden. Bezüglich ihrer Gehölzwahl zur Eiablage und bezüglich ihres späteren phänologischen Auftretens scheint die Südliche Eichenschrecke euryöker als die Gemeine Eichenschrecke zu sein. Die Ausbreitung der Südlichen Eichenschrecke erfolgt hauptsächlich über Fahrzeuge, weshalb die Art innerhalb von Eberswalde eher in Stadtteilen auftritt, die verkehrsstark und mit mehr Parkplätzen versehen sind.

Key words: Südliche Grille, Südliche Eichenschrecke, Gemeine Eichenschrecke, allochthone Heuschrecken, Klimawandel, Verschleppung, Habitatanforderungen, Gehölze, Eiablage

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Introduction

In Eberswalde, a city with about 43 000 inhabitants located in the North-East German Plain, the two following neozoan grasshopper species from southern Europe were studied using different methods.

1) The Verge Cricket (*Eumodicogryllus bordigalensis* Latreille 1804), a typical mediterranean species, observed for the first time in Germany only in 1995 (van Elst & Schulte 1995).
2) The Southern Oak Bush-cricket (*Meconema meridionale* Costa 1860), which was recorded in Germany since the 1960 (Maas & al. 2002) and in Berlin in 2007 (Sczepanski 2008).

After its first sighting in the Eberswalde urban area in 2013 by O. Brauner, a further spread was observed. Like the authochthonous sister species the Common Oak Bush-cricket (*Meconema thalassinum* (De Geer 1773)) also the allochthonous Southern Oak Bush-cricket is adapted to life in shrubs and trees, where it lives mainly in the canopy and feeds there zoophagously. In late summer they go down to the trunks to lay their eggs into the bark. These nocturnal activity can be used to detect both species of *Meconema*.

Material and Methods

Because of the very different behaviors and habitat requirements, the two neozoan grasshopper species were studied in different ways. In addition, the Verge Cricket was only recently discovered, while the southern oak cricket has been established in Eberswalde for a longer time. Therefore, especially the Southern Oak Bush-cricket was studied in terms of its distribution, density and with regard to habitats on larger areas and compared with its native sister species the Common Oak Bush-cricket.

Methods for the Southern Oak Bush-cricket (*Meconema meridionale*):

A larger systematic study of the allochthonous Southern Oak Bush-cricket (*Meconema meridionale* Costa 1860) and its sister species, the autochthonous Common Oak Bush-cricket (*Meconema thalassinum* (De Geer 1773)) was carried out during nocturnal, student field work under the guidance of U. Schulz, J. Nordalm and O. Brauner. These and additional surveys by J. Nordalm were jointly evaluated (Brauner et al. 2021). For the systematic study in Eberswalde approx. 1400 trees were searched in several groups with headlamps and/or torches. Species, sex, behavior, abiotic and biotic parameters and the respective oviposition sites were recorded. A georeferenced, digital mapping was carried out with ArcGIS Survey 123 3.5 from 09. – 11.2019 and was later digitally analysed e.g. with regard to dispersions. Independently of this, numerous other woody plants colonized by *Meconema* species were documented (mainly by O. Brauner, in part by U. Schulz and J. Nordalm) using the tapping method and nocturnal illumination.

Methods for the Verge Cricket (*Eumodicogryllus bordigalensis*):

After its initial discovery by means of the species-specific high-pitched trilling in June 2018 at the Eberswalde railway station, the first author searched for the Verge Cricket (*Eumodicogryllus bordigalensis* Latreille 1804) in more than 50 daytime and nighttime walks along the railway areas and in the immediate vicinity. Song activities (diurnal and seasonal), negative detections and abiotic parameters were recorded and potential hiding places were checked.

Results

Results for the Southern Oak Bush-cricket (*Meconema meridionale*):

The neozoic Southern Oak Bush-cricket was found on 113 trees during the standardised surveys within the Eberswalde urban area, whereas the autochthonous Common Oak Bush-cricket was found on only 62 trees. The weather-related activities of the common oak shrike seem to decrease more strongly towards late autumn than those of its southern sister species. The southern oak cricket also seems to be more euryotic in its choice of woody plants: It has already been recorded on 65 different woody species (including 22 shrub species and five climbers), whereas the Common Oak Bush-cricket has only been recorded on 31 woody species (Brauner & al. 2021).

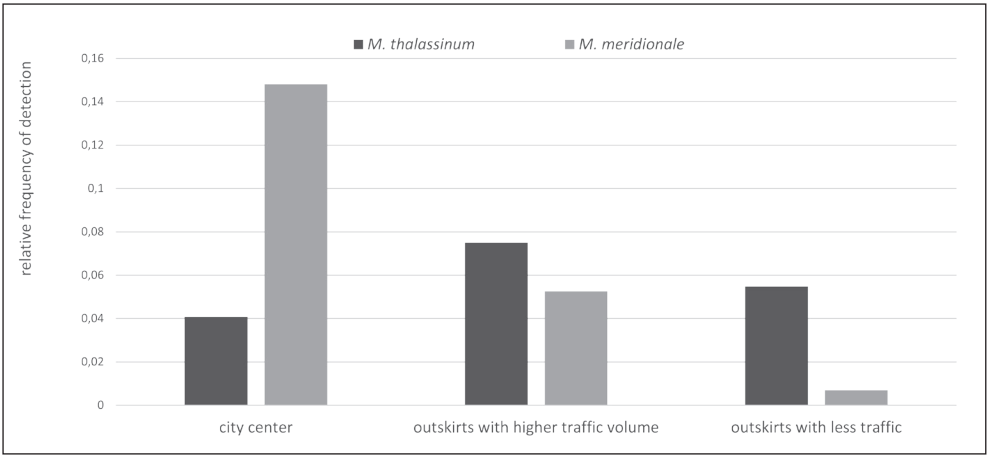

Fig.: The Southern Oak Bush-cricket occurs significantly more often than the Common Oak Bush-cricket in districts of Eberswalde that are more frequented by traffic and that have more parking spaces

The flightless Southern Oak Bush-cricket occurs particularly frequently in urban areas heavily influenced by road traffic (see Fig.) and in the vicinity of car parks. Anthropogenic displacements of the flightless species by cars and even motorbikes are well documented (e.g. Brauner & al. 2021, Detzel 1998, Köhler & al. 2022). Favoured by the high volume of individual traffic and climate change, a further spread of the non-strongly thermophilic Southern Oak Bush-cricket in north-eastern Germany, also in rural areas, is to be expected; this is indicated by further, more recent observations. In the long term, the Common Oak Bush-cricket could be displaced by the Southern Oak Bush-cricket, as Roesti & Rutschmann (2021), among others, assume.

Results for the Verge Cricket (*Eumodicogryllus bordigalensis)*

Most records of the Verge Cricket were made by calling males directly in the track ballast of well-sunlit railway sections. Starting from Eberswalde's main railway station, a clear dispersal along the tracks and in the urban area was observed in the following years, especially from the end of June 2022 (longer heat period; Brauner & Ristow 2022 and unpubl.). The animals found or heard were mostly hidden under stones and floor slabs. These are the most northerly known findings of the Verge Cricket for Central Europe so far.

Discussion

The two southern grasshopper species studied differ clearly not only in terms of their thermophily, their strata affiliation or resource availability (extensive track ballast vs. spatially more limited feeding and oviposition habitats on the stem/canopy of wooden plants ...) and their displacement potential, but also in terms of their dispersal strategies. The Verge Cricket seems to be displaced by railway traffic and gravel transport along railway lines combined with local own movements, the Southern Oak Bush-cricket mainly by motor vehicle traffic. It can be strongly assumed that the survival and reproductive abilities of the southern grasshopper species at their respective random destinations are related to climate change (see also Poniatowski & al. 2018). This also seems to be true for two other southern grasshopper species that have also arrived in Eberswalde within the last two decades: the Common Sickle Bush-cricket (*Phaneroptera falcata* (Poda 1761)) and the European Tree-cricket (*Oecanthus pellucens* (Scopoli 1763)). While the first species, which has good flight characteristics, has been found for the first time in 1999 in the Fläming region, it now colonises the whole of Brandenburg (Lehmann & al. 2016). A combination of anthropogenic introduction and its own flight seems to be responsible for the spread of the European Tree-cricket. In Eberswalde, the occurrence of the European Tree-cricket has been sporadic since its first discovery in 2016, but it is already audible; in southern Brandenburg, the species is already acoustically more dominant (Ingmar Landeck, written comm., own observation). The Common Oak Bush-cricket seems to have become rarer in the Eberswalde urban area. The abundance and dispersal of the Southern Oak Bush-cricket, on the other hand, has meanwhile increased even further. As its tarsal drumming can hardly be heard, this is only noticeable during visual searches. The less abundant Verge Crickets and European Tree-crickets, on the other hand, are clearly audible. Passengers who reach Eberswalde's main station on a warm summer evening and who have an "open ear" for grasshopper songs notice: the acoustic backdrop of Eberswalde has become more Mediterranean.

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