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First record of the cave cricket *Troglophilus neglectus* (Ensifera, Rhaphidophoridae) in Switzerland – a new indigenous site north of the main distribution area

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The cave cricket *Troglophilus neglectus* Krauss is recorded for the first time in Switzerland. The species has been found in the Alpine Rhine Valley of the canton St Gallen, where it inhabits abandoned military galleries on a karst elevation. Only females were found, which may indicate the presence of the parthenogenetic form of *T. neglectus*. The new finding suggests an indigenous occurrence north of its main distribution area, as the sites fit the habitat requirements (i.e., fissured karst formation in a region with warm climate). A recent, natural or anthropogenic introduction seems also very unlikely.

Key words: Insecta, Orthoptera, *Troglophilus cavicola*, parthenogenetic form, first record, faunistics, Switzerland.

INTRODUCTION

Orthoptera (grasshoppers and crickets) are among the best known insects in Switzerland. In particular, their distribution is well documented by many original publications and several faunistic surveys (see Fruhstorfer 1921; Thorens & Nadig 1997; Baur *et al.* 2006, and references therein). Furthermore, various entomologists contribute a great number of finds each year that are collected by the CSCF in Neuchâtel and published on their website (CSCF 2013). Therefore, entirely new species for the Swiss fauna are nowadays rarely collected. Here we report on the discovery of such a new species for Switzerland, the cave cricket *Troglophilus neglectus* Krauss, 1879. Together with *T. cavicola* (Kollar, 1833), this is the only cave-dwelling cricket in natural sites in Central Europe. *T. neglectus* occurs mainly from Southern Austria through the Balkans to Greece (e.g., Moog 1982; Christian 2008; Pfeifer *et al.* 2011). Mařan (1958) distinguished several subspecies that are now considered invalid (Karaman *et al.* 2011). North of the Alps the species is found only in a few places in Germany and the Czech Republic (Kiefer *et al.* 2000; Zinke 2000; Heusinger & Gebhardt 2003; Kořárek *et al.* 2005; Pfeifer *et al.* 2011). These localities are quite distant from the main distribution area, which is the reason why most authors have suggested a recent colonization through deliberate release or inadvertent introduction. In our discussion we thus focus on the question of how these northern sites could possibly fit into a general distribution pattern and whether or not the newly found population in northeastern Switzerland may be considered as indigenous.

MATERIAL AND METHODS

Localities were visited during daytime where specimens could be located with flashlights. Sites are indicated in WGS 84 longitudinal and latitudinal coordinates. Voucher specimens were killed in vapor of ethyl acetate for 1–2 hours and afterwards either pinned and lyophilized or put into 90 % undenatured ethanol and stored in a freezer at $-20\text{ }^{\circ}\text{C}$. From the lyophilized specimens, the entire right mid leg was removed and also put in 90 % ethanol that will allow easy DNA extraction in the future. All material is deposited at the Natural History Museum Bern (NMBE). Adult status of voucher specimens was determined by measuring the length of the pronotum in dorsal view along a median line. An eye-piece micrometer with 12 mm subdivided into 120 units on a Leica MZ16 stereo-microscope and a magnification of 20x was used. The values were then compared with Harz (1969) who indicates a pronotal length of 4.0–5.5 mm for adults. Stack-photographs of diagnostic characters were taken with a Keyence VHX-2000 digital microscope at the NMBE. Finally, voucher specimens were identified with the key of Germann *et al.* (2005). Specimens observed in the field were usually identified by their slightly greenish coloration, another feature that reliably distinguishes *T. neglectus* from *T. cavicola* (Karaman *et al.* 2011; Pfeifer *et al.* 2011). Occasionally, the presence of teeth on the hind margin of the 10th tergum was checked with a magnifier.

RESULTS

The newly discovered localities of *T. neglectus* are situated at the edge of the Alpine Rhine Valley in northeastern Switzerland in the community of Wartau, canton St. Gallen (Fig. 1). Specimens were found at the following sites (P = pronotal length of voucher specimens):

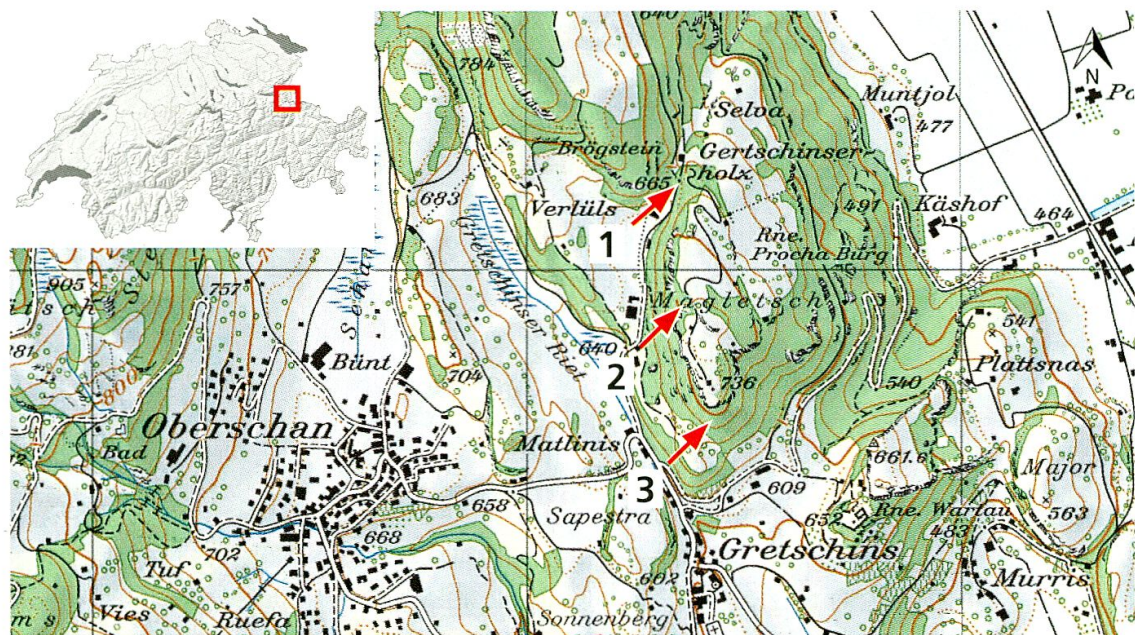


Fig. 1. Map of the community of Wartau, canton St. Gallen, Switzerland (© CSCF and SwissTopo). Arrows point to the new sites of *Troglophilus neglectus* (see results for more information).

- Site 1 Magletsch, 9.4855 E 47.1056 N, 650 m ü. M.,
leg. R. Güttinger 5.3.2013: 1 female (lyophilized, P 4.55 mm).
Site 2 Magletsch, 9.4854 E 47.1030 N, 720 m ü. M.,
leg. R. Güttinger 6.3.2013: 1 female (lyophilized, P 4.6 mm).
Site 3 Magletsch, 9.4862 E 47.1007 N, 690 m ü. M.,
leg. R. Güttinger 6.3.2013: 1 female (in alcohol, P 4.65 mm).

The collected specimens showed two small teeth at the posterior margin of the 10th tergum (Fig. 2a) and an elongate, slightly upwards bent and pointed ovipositor (Fig. 2b). Moreover, a slightly greenish coloration was visible on all specimens (Fig. 3). They thus clearly belonged to *T. neglectus*.

The sites are located in former military galleries on the back of a hill range at the foot of the Alvier massif (Seitter 1982). The latter consists of cretaceous Schrat-tenkalk formation that is part of the Helvetic nappes. The place was covered by the ice sheet until 14'000–10'000 years ago (Keller 1988). The region shows a distinct

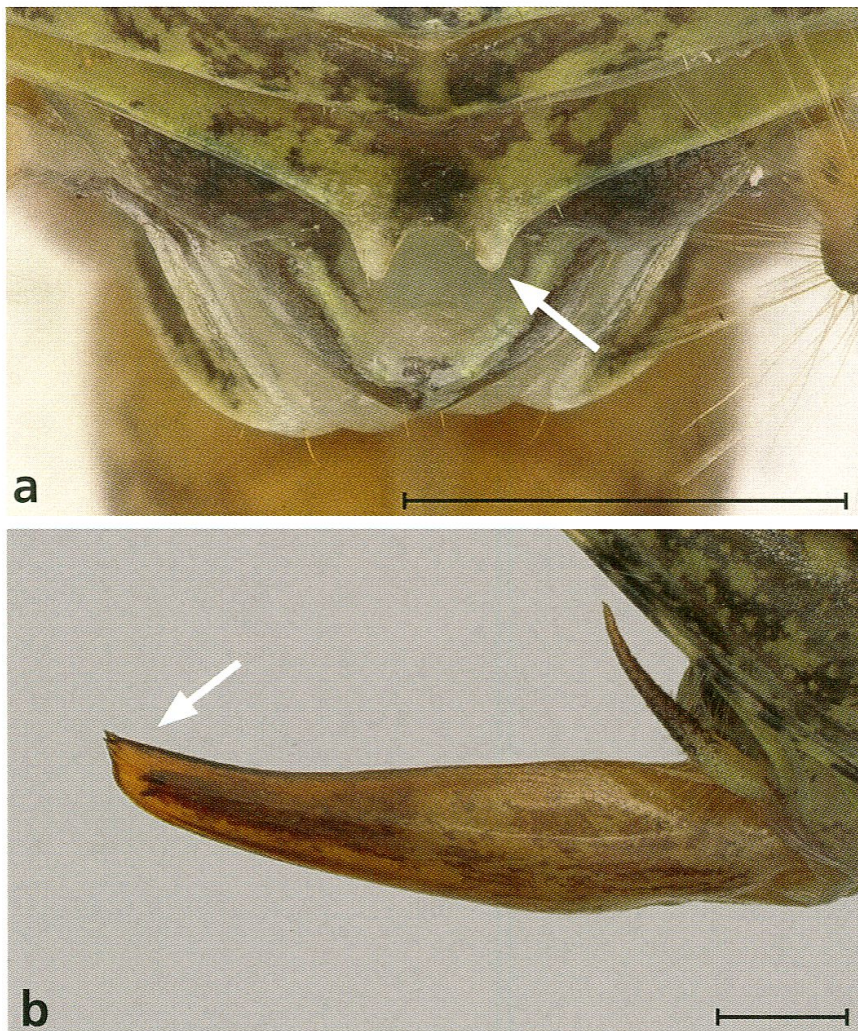


Fig. 2. *Troglophilus neglectus*, female, freshly killed specimen: a) posterior margin of 10th tergum, dorsal view; b) ovipositor, lateral view. Both figures stem from voucher specimen of site 2, with arrows pointing to diagnostic characters; scale bar 2 mm (Photos H. Baur).

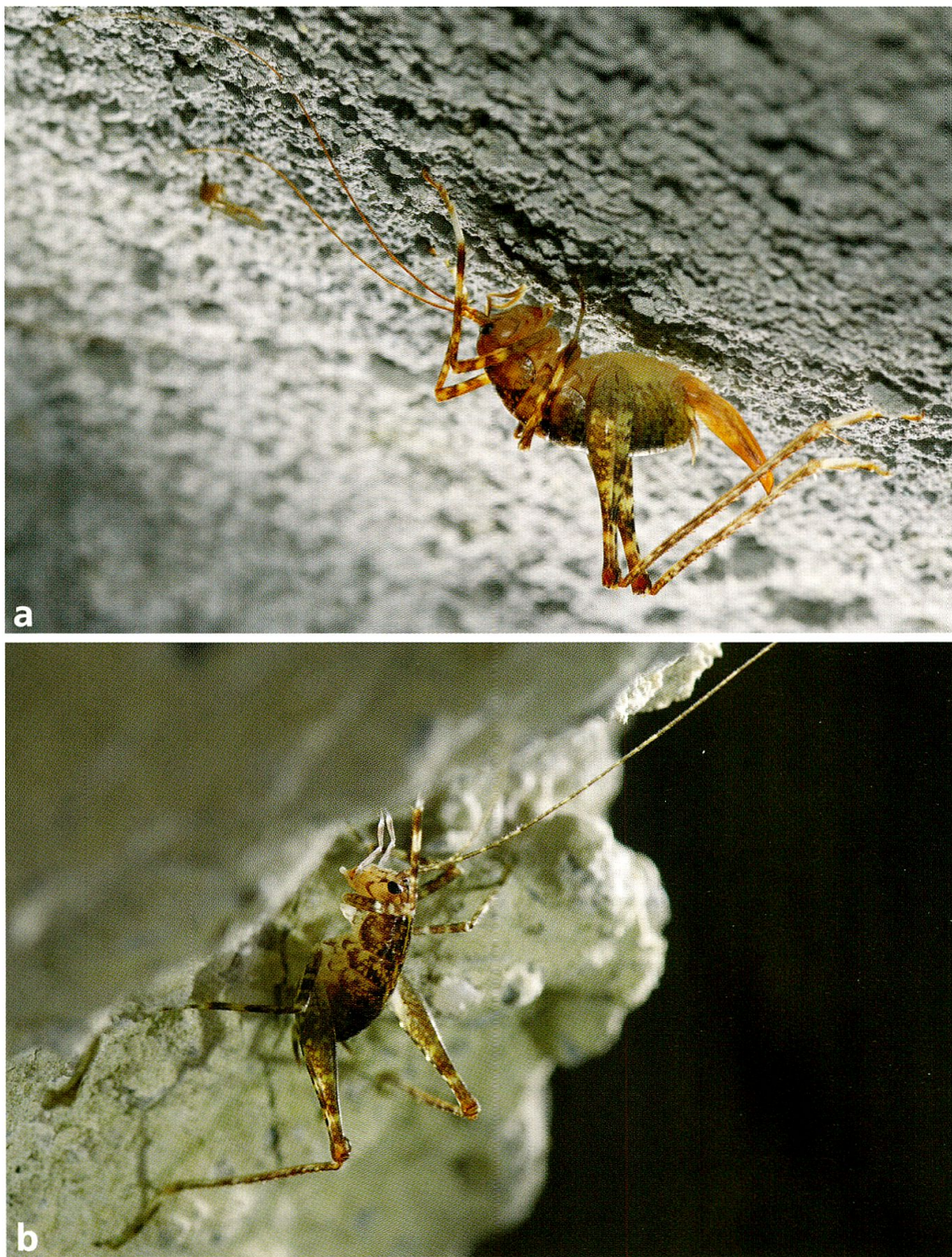


Fig. 3. *Troglophilus neglectus*, females in the natural habitat in the community of Wartau, photographed March 4, 2013: a) imago from site 1; b) nymph from site 2 (Photos R. Güttinger).

glacial overprint caused by the Rhine glacier. Because of foehn the climate is favorable and rather warm (Keller 1989). This is emphasized by the occurrence of numerous thermophile plants and animals, for instance the Mountain Cicada, *Cicadetta montana* s. str. (Scopoli, 1772) (Hertach 2007; Keist pers. com.).

The galleries are located in bare, fissured rock walls that are bounded above by a plateau composed of dry meadows and shrubbery, below by deciduous woodland (Fig. 4). The galleries were built during World War II and were used as military refuges (Fig. 5). Because of the water permeable bedrock, the walls of two of the three galleries examined were sealed with sprayed concrete. In 1997, the concrete layer was partly removed to increase relative humidity for overwintering bats. In the third gallery the limestone has been left in raw condition. All those galleries are shut by lattice doors and have never been open to the public.

Cave crickets were located only at the most humid places in the very back of the galleries at about 15–25 meters from the entrance. Imagines were encountered together with nymphs. In the same place we observed the cave spider *Meta menardi* (Latreille, 1804) (Araneae, Tetragnathidae), silverfish (*Zygentoma*), millipedes (Julidae), and woodlice (Isopoda), near the entrance also the harvestman *Leiobunum limbatum* L. Koch, 1861 (Opiliones, Sclerosomatidae) and the Herald moth *Scoliopteryx libatrix* (Linnaeus, 1758) (Lepidoptera: Noctuidae).

DISCUSSION

The new sites of *Troglophilus neglectus* in northeastern Switzerland concern abandoned military galleries that are surrounded by deep crevices on a karst elevation. The community of Wartau is furthermore situated in the Alpine Rhine Valley that benefits from a rather warm climate (Keller 1989). These conditions suit very well the requirements of the species. The species is generally found at localities with



Fig. 4. Hill at the edge of the Alpine Rhine Valley with the new sites of *Troglophilus neglectus* (Magletsch, community of Wartau, canton St Gallen; viewed from the West) (Photo R. Güttinger).



Fig. 5. Limestone rock wall with the entrance of a gallery (site 2) (Photo R. Güttinger).

a favorable climate (Moog 1982), where it inhabits various kinds of natural caves, but also artificial galleries (e.g., Moog 1982; Pfeifer *et al.* 2011), crevices (Moog 1982; Hellrigl 2006), and block fields (Steiner & Schlick-Steiner 2000), during summer even some shelter outside of larger cavities, such as leaf litter (Moog 1982; Kögler 1981; Hellrigl 2006). It usually forms smaller or larger aggregations and occasionally shares the same place with *T. cavicola* (see Moog 1982). At night, specimens may be encountered at the entrance or even outside their dens where they forage for various smaller insects and other arthropods (Moog 1982). Caves are not strictly necessary, as long as some sort of frost-proof cavity systems, such as stone runs or larger fissures, are available for hibernation (Moog 1982; Pfeifer *et al.* 2011; Karaman *et al.* 2011; Germann *et al.* 2005 for *T. cavicola*). In Wartau only female nymphs and imagines were encountered. The lack of males is not really surprising, as *T. neglectus* reproduces parthenogenetically over a large part of the distribution area, especially also at the northern boundary (e.g., Moog 1982; Karaman *et al.* 2011; Pfeifer *et al.* 2011). The occurrence of different stages at the same time has often been noticed and is due to a prolonged nymphal development and imaginal stage lasting altogether up to 25 months (Pehani *et al.* 1997). Both life history traits have also been observed in the single Swiss population of *T. cavicola* from Brusio in the Val Poschiavo (canton Grisons) (Germann *et al.* 2005).

Wartau in the Alpine Rhine Valley is one of only a few, rather distant places where *T. neglectus* is known to occur north of the Alps (Fig. 6). The other places are situated in the German states of Rhineland-Palatinate (Mayener Grubenfeld near Mayen, Kiefer *et al.* 2000; Pfeifer *et al.* 2011), Bavaria (Glockenhöhle near Wunsiedel, Michel 2001; Heusinger & Gebhardt 2003), and Saxony (Elbsandsteingebirge near Pirna, Zinke 2000), or in the Czech Republic (Olmütz, Kočárek *et al.*

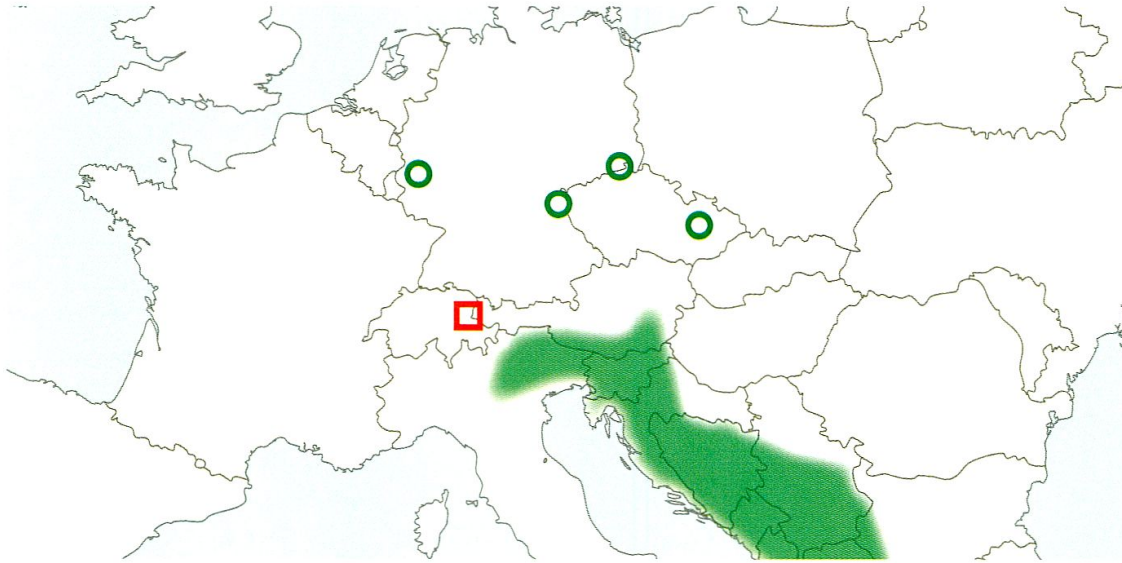


Fig. 6. Distribution of *Troglophilus neglectus* in Central Europe. Red rectangle: new locality at Wartau (Switzerland). Green circles, from left to right: Mayen, Wunsiedel, Pirna, and Olmütz (see text for further information). Main distribution after Pfeifer *et al.* (2011).

2005). This suggests a disjunct distribution in the north of the main area reaching from Southern Austria to the Balkans. Disperse patterns at a distribution boundary are amply documented for the Central European fauna, not least for many arthropods (e.g. Holdhaus 1954; De Lattin 1967). A typical example is the Rattle Grasshopper *Psophus stridulus* (Linnaeus, 1758) (see map in Kleukers *et al.* 1997: 224). Its compact southern and eastern area is highly fragmented at the northwestern border where suitable habitats are apparently becoming scarce.

Up to now, all northern sites of *T. neglectus* have been considered as of a very recent origin through release, natural or anthropogenic transport (Kiefer *et al.* 2000; Zinke 2000; Heusinger & Gebhardt 2003; Christian 2008; Pfeifer *et al.* 2011). The main arguments, summarized by Zinke (2000) and Pfeifer *et al.* (2011), concern carryover by means of transportation (with goods in transit, along railroads), deliberate release by breeders, dispersion of eggs by bats, and the sudden occurrence in artificial, already well known galleries. We do not agree with these assertions. First, anthropogenic dissemination seems improbable, as for instance the sites in Wartau do not lie along major transportation routes. Second, cave crickets are quite simply not such fancy and common creature to be reared and released by just everyone; to the contrary, even specialists rarely encounter them, and certainly very few have ever kept them alive. Pfeifer *et al.* (2011) discuss at length an alleged case of deliberate release in the Mayener Grubenfeld, but even they admit the highly speculative nature of such reports. Third, dispersion of eggs by bats has, as far as we know, never been documented. It is furthermore unclear how bats should carry eggs, as these are probably laid outside the caves (Pehani *et al.* 1997; Christian 2008). Fourth, as mentioned above, cave crickets do not depend on artificial galleries and accept all kinds of cavity systems. Natural structures, such as deep crevices, surround the galleries at all the northern sites. Specimens are merely attracted by galleries, in which they are of course much easier to detect, especially in places like Wartau, where the walls are still partly smooth because of sprayed concrete. Finally, the galleries in Wartau have not been accessible to the public and are therefore

unknown to speleologists. Hence, the new find cannot be interpreted as a recent occurrence in an already well known place.

Troglophilus neglectus is the 108th Orthopteran species in Switzerland. Baur *et al.* (2006) list only 106 species, however, one of the species considered extinct in that survey, *Epacromius tergestinus* (Charpentier, 1825), has since been successfully re-introduced (Werner 2006). The other most recent additions to the Swiss fauna already date back some years and concern the grasshopper *Acrotylus patruelis* (Herrich-Schäffer, 1838), the bush cricket *Leptophyes albobittata* (Kollar, 1833), and the cave cricket *Troglophilus cavicola* (Kollar, 1833). These species occur locally on the eastern and southern parts of the Swiss Alps, in the cantons Ticino and Grisons. While *A. patruelis* apparently migrated recently from nearby Italian populations (Sardet *et al.* 2005), *L. albobittata* and *T. cavicola* were «re-discovered» in some places where they had been suspected to occur long before (Baur *et al.* 2001; Germann *et al.* 2005). In contrast, the occurrence of *T. neglectus* in Wartau looks like an entirely unexpected addition to the Swiss fauna. However, if the sites at the northern boundary are understood as representing a natural, disjunct distribution pattern, then the discovery at further localities should come as no surprise.

ZUSAMMENFASSUNG

Erstnachweis der Höhlenschrecke *Troglophilus neglectus* (Krauss, 1879) (Ensifera, Rhabdophoridae) für die Schweiz – ein neues, autochthones Vorkommen nördlich des Hauptverbreitungsareals – Krauss' Höhlenschrecke *Troglophilus neglectus* Krauss wird erstmals für die Schweiz nachgewiesen. Der Ort liegt in der Nordostschweiz im St. Galler Rheintal, wo die Art ehemalige Militärstollen in einem karstigen Hügel besiedelt. Nur Weibchen konnten nachgewiesen werden, was auf das Vorhandensein der parthenogenetischen Form schliessen lässt. Beim Fund handelt es sich höchstwahrscheinlich um ein autochthones Vorkommen, da die natürlichen Lebensraumsprüche (Karstformation in einer klimatischen Gunstlage) erfüllt sind. Eine natürliche oder anthropogene Verschleppung kann ferner weitgehend ausgeschlossen werden.

ACKNOWLEDGMENTS

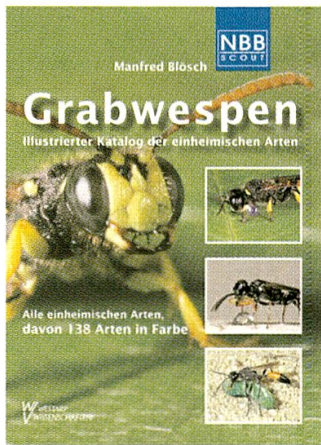
We thank Bruno Keist, Ebnat-Kappel, for field assistance and discussion. Beda Hoffmann and Christian Kropf, both NMBE, Andreas Rohner, Rheinfelden, Harald Rupf, Mels, and Urs Weber, Altstätten, provided helpful information. We are also grateful to two reviewers for useful comments.

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Blösch M. 2012: Grabwespen; Illustrierter Katalog der einheimischen Arten.

NBB Scout (Westarp Wissenschaften, Hohenwarsleben),
2: 219 pp. CHF 30.90.
ISBN 978-3-89432-257-1. Erhältlich im Buchhandel.

Unter dem deutschen Namen «Grabwespen» (Spheciformes) werden 3 eng miteinander verwandte Familien (Ampulicidae, Crabronidae, Sphecidae) der Stechimmen (Hymenoptera: Aculeata) zusammengefasst, die in der Schweiz mit insgesamt über 250 Arten vertreten sind. Ihre nächsten Verwandten sind die Bienen (Apidae). Anders als diese tragen Grabwespen für ihre Brut aber keinen Honig (Nektar und Pollen) ein, sondern erbeutete Insekten oder Spinnen. Alle europäischen Grabwespen sind solitär, die meisten davon selbstständig. Nur die Vertreterinnen von zwei Gattungen (*Nysson*, *Brachystegus*) betätigen sich parasitisch als «Kuckucksgrabwespen», indem sie ihre Eier in artfremde Nester legen.

Dies und sehr viel Wissenswertes mehr zu Körperbau, Lebensweise und Ökologie der Grabwespen erfahren wir bereits auf den ersten 15 Seiten dieses kleinen (15.2 cm x 11.2 cm x 1 cm) und somit höchst feldtauglichen Büchleins. Mit altmeisterlichem Blick aufs Wesentliche gelingt es dem erfahrenen Autor (Jg. 1934), alles Wichtige mitzuteilen und erst noch in vorbildlich klarer, leicht verständlicher Sprache. Da bleibt kaum eine Frage offen und wo doch, helfen Verweise auf das vierseitige Literaturverzeichnis.

Den grössten Teil (S. 16–211) des Buches nimmt der illustrierte Artenkatalog ein. Er enthält 309 Arten, also mehr als in jedem einzelnen der 3 deutschsprachigen Länder (D, A, CH) vorkommen, für die das Buch gedacht ist. Damit dürfte der Katalog zumindest für Deutschland (max. 263 Arten) so vollständig wie möglich sein. Angesichts der Klimaerwärmung können sich invasive (z.B. *Sceliphron curvatum*) oder eingeschleppte Arten (z.B. *Isodontia mexicana*) zunehmend besser halten. Selbst angezweifelte Arten wie *Psenulus fulvicornis* sind berücksichtigt (S. 56). Auch für die Schweiz ist der Katalog zufriedenstellend, wenn auch nicht vollständig. So fehlen Arten wie *Argogorytes hispanicus*, *Astata rufipes*, *Bembix oculata* und andere, also solche, die nie in Deutschland vorkamen und dort in absehbarer Zeit offenbar auch nicht erwartet werden.

Gegliedert ist der Katalog nach Familien, Unterfamilien, Tribus (Gattungsgruppen), Gattungen und Arten, aber erstaunlicherweise auch innerhalb einer Kategorie nicht immer alphabetisch. So kommen die Sphecidae vor den Crabronidae, die Sphecinae vor den Ammophilinae, die Sphecini vor den Prionychini, die Gattung *Sphex* vor der Gattung *Isodontia* und bei der Gattung *Ammophila* die Art *A. sabulosa* vor *A. heydeni*. Gut aufgebaut und übersichtlich ist hingegen die Information zu den einzelnen Taxa. Kurze, aber gehaltvolle einleitende Texte zu den Gattungen (und allenfalls auch zu höheren Taxa) führen den Leser unverzüglich zu den einzelnen Arten. 137 davon sind auf je einer oder einer halben Doppelseite bebildert (rechts), fast so viele auch ausführlich beschrieben (links) und zwar nach Kennzeichen, Grösse, Flugzeit, Verbreitung, Lebensraum und Lebensweise gegliedert. Die übrigen Arten werden mit je einem knappen, aber allemal spannenden Textblock charakterisiert und in wenigen Fällen ebenfalls bebildert.

Wenn das Buch eine Schwäche hat, dann eindeutig im grafischen Bereich. Die Fotos sind namentlich bei kleineren und düster gefärbten Arten oft unscharf und unterbelichtet. Fehl am Platz ist auch das Wespenfoto auf Seite 12 oben, weil ein Anfänger die mit hinweisenden Strichen bezeichneten Körperteile darauf kaum erahnen kann. Hier wäre eine saubere Strichzeichnung wesentlich hilfreicher gewesen. Fehlerhaft ist im Übrigen die Beindarstellung auf der gegenüberliegenden Seite (13), denn gezeigt werden lediglich Tarsomere (Fussglieder), aber keine Tarsen (Füsse).

Alles in allem überwiegt aber das Positive bei Weitem, weshalb man das Buch als Feldführer für Deutschland und den angrenzenden Bereich der Schweiz bedenkenlos empfehlen kann. Auch als Einstiegslektüre für Leute, die naturschutzfachlich mit Grabwespen arbeiten möchten, eignet es sich zweifellos.

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