

Winter crane flies (Insecta, Diptera, Trichoceridae) from caves of the Grand Duchy of Luxembourg

Andrius Petrašiūnas

Department of Zoology, Vilnius University
Ciurlionio 21/27
LT-03101 Vilnius, Lithuania
Andrius.Petrasiunas@gf.vu.lt

Dieter Weber

Kirchgasse 124
D-67454 Haßloch
dieter.weber124@gmx.de

Zusammenfassung

Von 2007 bis 2011 wurden in 82 Höhlen und künstlichen Hohlräumen des Großherzogtums Luxemburg Tiere gesammelt. Unter den rund 90.000 gesammelten Tieren waren über 1800 Wintermücken. Sie teilen sich in 3 Arten auf, von denen die folgenden cavernicol sind: *Trichocera*

(*Saltrichocera maculipennis*, *Trichocera (Saltrichocera) regelationis*. Neu für Luxemburg sind *Trichocera (Saltrichocera) maculipennis*, *Trichocera (Saltrichocera) regelationis*, *Trichocera (Saltrichocera) saltator*.

Abstract

From 2007 to 2011, animals were collected from 82 caves in the Grand Duchy of Luxembourg. Within 90,000 individuals, more than 1800 were winter gnats representing 3 species. The following species are classified

as cavernicolous: *Trichocera (Saltrichocera) maculipennis*, *Trichocera (Saltrichocera) regelationis*. *Trichocera (Saltrichocera) maculipennis*, *Trichocera (Saltrichocera) regelationis*, *Trichocera (Saltrichocera) saltator* are new for Luxembourg.

Résumé

Entre 2007 et 2011, 90 000 spécimens d' animaux ont été récoltés dans 82 cavités naturelles et artificielles du Grand-Duché de Luxembourg, parmi lesquels plus de 1800 trichocerides représentant 3 espèces. Les espèces suivantes sont considérées comme caverni-

coles: *Trichocera (Saltrichocera) maculipennis*, *Trichocera (Saltrichocera) regelationis*. Les espèces *Trichocera (Saltrichocera) maculipennis*, *Trichocera (Saltrichocera) regelationis*, *Trichocera (Saltrichocera) saltator* sont signalées pour la première fois dans ce pays.

1 Results

From 2007-2010, animals were collected from 82 caves in the Grand Duchy of Luxembourg. Altogether, slightly over 1800 specimens of Trichoceridae, generally called winter gnats or winter crane flies were collected during the research period in 27 of the investigated cavities. Almost all the specimens were identified (11 identified only to genus level) to be representatives of three species – 1013 specimens of *Trichocera (Saltrichocera) maculipennis* Meigen, 1818, 782 specimens of *Trichocera (Saltrichocera) regelationis* (Linnaeus, 1758) and six specimens of *Trichocera*

(*Saltrichocera) saltator* (Harris, 1776). No previous data on winter gnats from Luxembourg is known to the authors, so all three species are considered as new to fauna of the Grand Duchy.

It can be noticed, that specimens of *T. maculipennis* were only found in one mine of the Mosel valley and 10 iron mines in the very south of Luxembourg, whereas it seems that this species is absent in the regions of Ösling and Gutland.

T. saltator was found in two mines and a tunnel in the very north of the Ösling and in the Mosel valley. This species is absent in the greater part of the Ösling, in the Gutland and in the Minette region.



Fig. 1: *Trichocera (Saltrichocera) regelationis*. Gipsminn Bettendorf. Foto: Steiner.

Specimens of *T. regelationis* showed the widest preference to different cavities and were found in two caves and one quarry, mines (11 objects), tunnels (4 objects) and 3 forts.

There were more males of *T. maculipennis* and *T. regelationis* caught during the investigation period (fig. 1) whereas five females and only one male of *T. saltator* were caught.

Some of the cavities yielded specimens of several winter gnat species caught together. Specimens of all three species were found in Dolomitgrouf Kelsbaach, specimens of *T. saltator* and *T. regelationis* were inhabiting Gipsminn Bettendorf and Tunnel Huldange whilst specimens of *T. maculipennis* and *T. regelationis* were found together in six habitats (Minière Laange Gronn IV, Minière Laange Gronn XII, Minière Laangbieng Diddeleng, Minière Laangebieng Italien, Minière Hainaut II and Minière Hutbieng).

T. maculipennis winter gnats dominated in numbers in all the habitats they were found (e.g. fig. 2, fig. 3) while *T. regelationis* dominated only in Gipsminn Bettendorf where it was found together with three specimens of *T. saltator* (fig. 4).

None of the winter gnat species demonstrated preference to particular parts of the cave: *T. saltator* was found at distances from 5 m from the entrance in Gipsminn Bettendorf (Fig. 4) to 100 m in Tunnel Huldange; *T. maculipennis* from 2 m from the entrance in Minière Laangbieng Diddeleng, Minière Laange Gronn (Fig. 2) and Minière Hainaut II (Fig. 3) up to 200 m in Minière Hainaut II (Fig. 3) and Minière Laange Gronn X; *T. regelationis* was found from 2 m from the entrance in Schifergrouf vu Päreel, Gouffre Saint Paul, Kofferminn Stolzebuerg II and Minière Hainaut II (Fig. 3) up to 250 m from the entrance in Tunnel Huldange, which is the furthestmost place where *Trichocera* was caught in Luxembourg caves. The highest number of specimens was concentrated in the part of the cave about 40 to 100 meters from the entrance (Fig. 2-4).

2 Discussion

Out of about 110 species of *Trichocera* known worldwide (Hågvar & Krzemińska 2007), only several are found in caves. *Trichocera (Saltrichocera)*

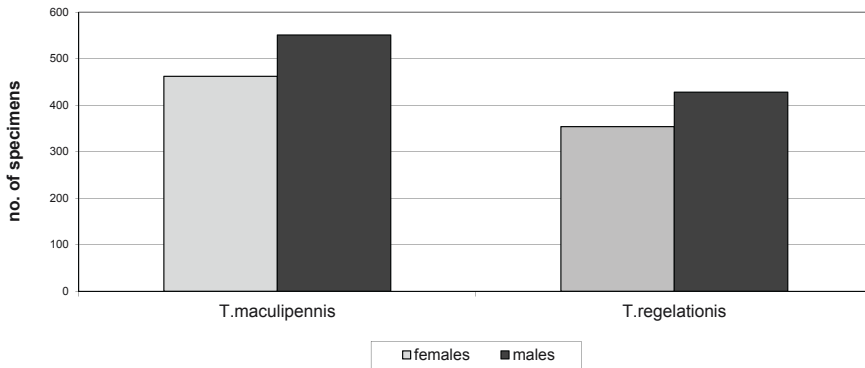


Fig. 2: Male and female numbers of *T. maculipennis* and *T. regelationis* in cavities of Luxembourg in 2007-2011.

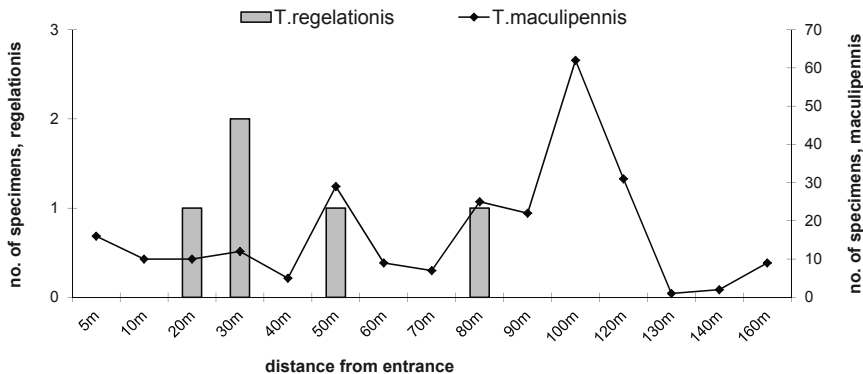


Fig. 3: Numbers of *T. regelationis* and *T. maculipennis* caught at different distances from the entrance in Minière Laange Gronn IV in 2008-2009.

annulata Meigen, 1818 was found in caves in Netherlands (Schmitz 1909), *Trichocera* (*Trichocera*) *hiemalis* (De Geer, 1776) in Austria (Wettstein-Westersheim 1923, 1926; Strouhal & Vornatscher 1975) and Germany (Weber 1989), *Trichocera maculipennis* in Germany (Weber 1989), *Trichocera regelationis* in Germany (Weber 1989) and *Trichocera* (*Saltrichocera*) *brevicornis* Alexander, 1952 in USA (Barnes & al. 2009).

All three species of *Trichocera* that were found in caves in Luxembourg are widely distributed in the world – *T. maculipennis* and *T. regelationis* are found in Holarctic while *T. saltator* is a Palaearctic species (Dahl & Alexander 1976) so their occurrence in Luxembourg could have been anticipated.

T. saltator was not earlier known from caves, so this is the first record of this species.

We consider *T. saltator* as eutrogloxene.

T. regelationis might be considered to be one of the most widely spread winter gnat species in the world (Dahl & Alexander 1976) and its occurrence in different types of cavities in Luxembourg is a feature of this species' plasticity. Specimens of *T. regelationis* were also found in natural or artificial caves in other European countries – France (Leruth 1939), Switzerland (Strinati 1965), Austria (Weißmair & Hauser 1993), Germany (Büttner 1926; Dobat 1975; Plachter 1983; Plachter & Plachter 1988; Weber 1991; Zaenker 2001),

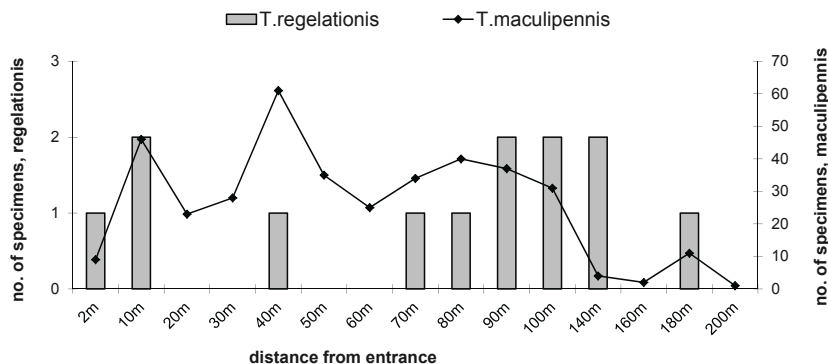


Fig. 4: Numbers of *T. regelationis* and *T. maculipennis* caught at different distances from the entrance in Minière Hainaut II in 2007-2008.

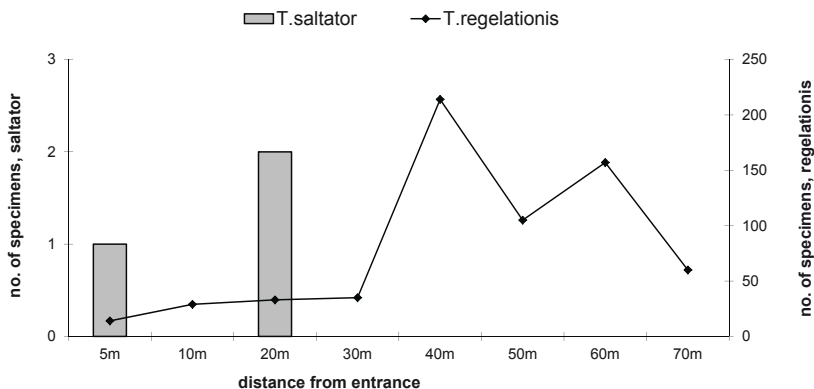


Fig. 5: Numbers of *T. regelationis* and *T. saltator* caught at different distances from the entrance in Gipsminn Bettendorf in 2010-2011.

Hungary (Dudich 1932), Slovenia (Novak 2005), Sweden (Boheman 1849; Lampa 1890); in Slovak Republic (Kosel & Horvath 1996; Papáč & al. 2007) and in an old mine in Czech Republic (Pokorný & Holec 2011).

T. regelationis is considered as troglone/eutroglone (Dobat 1975, 1978), eutroglone to eutroglophile (Weber 1991; Zaenker 2001) or troglophile/eutroglophile (Matile 1994).

T. maculipennis was only found in mines during our investigation, but it was more numerous in all of them compared to *T. regelationis*, so it could be considered better adapted to living in caves. This is also affirmed by the number of findings of

T. maculipennis in caves of other countries – Belgium (Leruth 1939), France (Bou 1966), Austria (Gatterer & Ulrich 1867; Fries 1874; Strouhal & Vornatscher 1975; Weißmair & Hauser 1993); Germany (Röder 1891; Arndt 1921; Büttner 1926; Dobat 1975, 1987; Arnold 1983; Plachter 1983; Fischer 1998; Weber 1991; Bellstedt 1996; Zaenker 2001; Hartmann 2004); Italy (Bezzi 1911); United Kingdom (Grimshaw 1906; Kidd 1954); Netherlands (Schmitz 1909); Norway (Kjaerandsen 1993); Slovenia (Novak & Kuštor 1983; Novak 2005); Slovak Republic (Kováč & al. 2006); Spain (Carles-Tolrá 2003); Norway (Kjaerandsen 1993), Canada (Moseley 1998) and even Afghanistan (Nielsen 1963) and Canada (Moseley 2007).

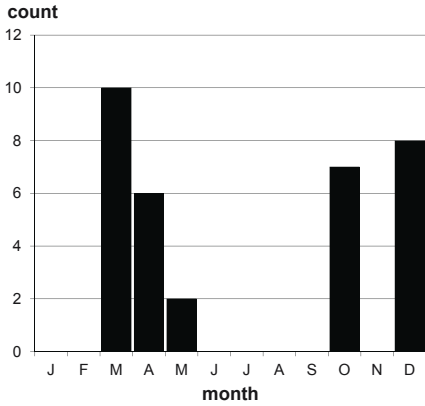


Fig. 6: Number of *T. maculipennis* collected by hand per month in Luxembourg caves.

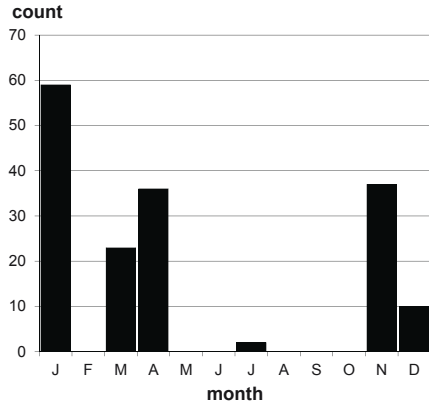


Fig. 7: Number of *T. regelationis* collected by hand per month in Luxembourg caves.

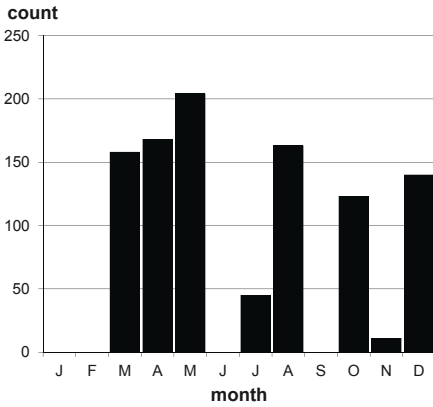


Fig. 8: *T. maculipennis* in Luxembourg caves in dependence of the month (hand and trap collection).

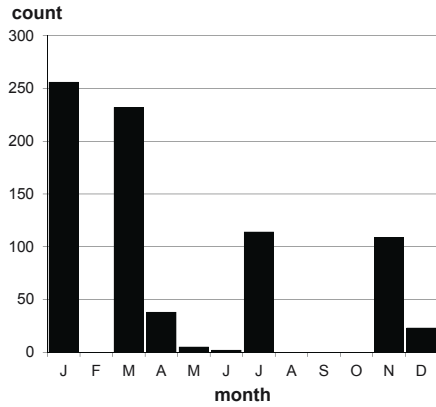


Fig. 9: *T. regelationis* in Luxembourg caves in dependence of the month (hand and trap collection).

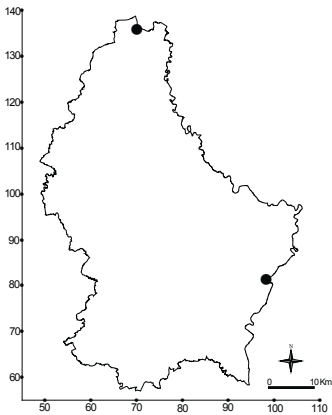


Fig. 10: Caves with *Trichocera saltator* in Luxembourg.

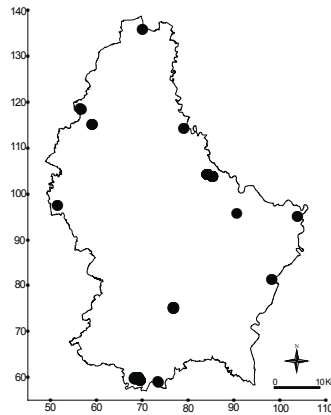


Fig. 11: Caves with *Trichocera regelationis* in Luxembourg.

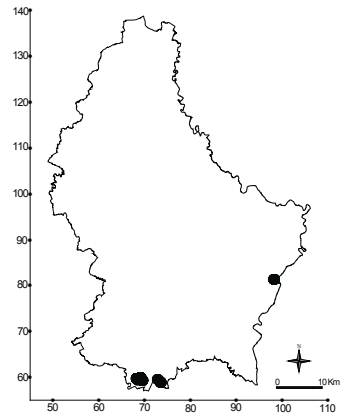


Fig. 12: Caves with *Trichocera maculipennis* in Luxembourg.

The greater part of the authors considers it as troglophile/eutroglophile (Arndt 1923, 1924; Leruth 1939; Strinati 1965; Dobat 1975, 1978; Matile 1994; Weber 1991, 1997; Moseley 1998; Zaenker 2001, Hartmann 2004).

3 Acknowledgments

We thank Jill Yager, Antioch, for checking the English. Helmut Steiner provided a photo. Stefan Zaenker, Fulda, checked the script.

4 References

- Arndt W. 1921. - Beitrag zur Kenntnis der Höhlenfauna. Ergebnis einer faunistischen Untersuchung der Höhlen Schlesiens. Zoologischer Anzeiger 52: 310–315.
- Arndt W. 1923. - Speläobiologische Untersuchungen in Schlesien. Speläologisches Jahrbuch, 4 (3/4): 95 - 114, Wien.
- Arndt W. 1924. - Die Dunkelfauna Schlesiens. Ostdeutscher Naturwart. 3: 1-12, Breslau.
- Arnold A. 1983. - Katalog der Höhlentiere der Höhlen der DDR, unveröffentlichtes Typoskript
- Barnes J. K., Slay M. E. & Taylor S. J. 2009. - Adult Diptera from Ozark Caves. Proceedings of the Entomological Society of Washington 111: 335–353.
- Bellstedt R. 1996. - Zur Insekten- und Wirbellosenfauna. Zur Natur des Seeberges bei Gotha: 85-91, Gotha.
- Bezzi M. 1911. - XX. Diptères (Première Série) suivi d' un Appendice sur les Diptères cavernicoles reueilles par le Dr Absolon dans les Balcans. Archies de Zoologie expérimentale er générale 5e Série, 8: 1-87, Paris.
- Boheman C. H. 1849. - Myggor i Fahlu grufvor. Öfversigt af Kongliga Vetenskaps-Akademiens Förhandlingar 6: 155–156.
- Bou C. 1966. - Faune souterraine du Sud-Ouest du Massif Central. 1. - Contribution a la Connaissance des Invertébrés cavernicoles. Annales des Spéléologie, 21(3): 689–706.
- Büttner K. 1926. - Die Stollen, Bergwerke und Höhlen in der Umgebung von Zwickau und ihre Tierwelt. Jahresbericht des Vereins für Naturkunde, Jg. 1926: 1-22, Zwickau.
- Carles-Tolrá M. 2003. - Some dipterans taken in caves in Andalusia (Diptera). Boletín de la Sociedad Eentomologica Aragonesa 32: 242.
- Dahl C. & Alexander C. P. 1976. - A world catalogue of Trichoceridae Kertész, 1902 (Diptera). Entomologica Scandinavica 7(1): 7–18.
- Dobat K. 1975. Die Höhlenfauna der Schwäbischen Alb mit Einschluss des Dinkelberges, des Schwarzwaldes und des Wutachgebietes. Abhandlungen zur Karst- und Höhlenkunde, Reihe D, Paläontologie, Zoologie, 2: 260-381, München.
- Dobat K. 1978. - Die Höhlenfauna der Fränkischen Alb. Abhandlungen zur Karst- und Höhlenkunde, Reihe D, Paläontologie, Zoologie, 3: 11-240, München.
- Dudich E. 1932. - Biologie der Aggteleker Tropfsteinhöhle Baradla. Speläologische Monographien, 13: 1-246, Wien.
- Fischer C. 1998. - Erste Ergebnisse einer faunistischen Erhebung (Arthropoden) in der Sontheimer Höhle (7524/02). Laichinger Höhlenfreund, 33(2): 83-88, Laichingen.
- Fries S. 1874. - Die Falkensteiner Hohle, ihre Fauna und Flora. Ein Beitrag zur Erforschung der Hohlen im schwabischen Jura mit besonderer Berücksichtigung ihrer lebenden Fauna. Jahreshfte des Vereins für vaterländische Naturkunde in Württemberg 30: 86–163.
- Gatterer F. & Ulrich K. 1867. - Die Rothelsteiner-Grotte bei Mixnitz. Mittheilungen des naturwissenschaftlichen Vereines für Steiermark 1(4): 71–75.
- Grimshaw P. H. 1906. - On the occurrence of a new British fly (*Trichocera maculipennis*, Mg.) in the Forth district. Annals of Scottish Natural History 15: 210–211.
- Hågvar S. & Krzemińska E. 2007. - Contribution to the winter phenology of Trichoceridae (Diptera) in snow-covered southern Norway. Studia dipterologica 14(2): 271–283.

- Hartmann R. 2004. - Die Fauna der Höhlen und Bergwerke des Westharzes – Abhandlungen zur Karst- und Höhlenkunde, 35: 1-66, München.
- Kidd L. N. 1954. - *Scolioecentra villosa* (Meigen) (Dipt., Helomyzidae) and *Trichocera maculipennis* Meigen (Dipt., Trichoceridae) taken in Derbyshire caves. *Journal of the Society for British Entomology* 5: 87–88.
- Kjaerandsen J. 1993. - Diptera in mines and other cave systems in Southern Norway. *Entomologica Fennica* 4(3): 151–160.
- Kosel V. & Horvath M. 1996. - Temporal and spatial dynamics of Nematocera (Insecta, Diptera) in a cave of the Western Carpathians (Slovakia). *Acta Zool. Univ. Comenianae*, 40: 75-114.
- Kováč L., Mock A., Luptáčík P., Višňovská Z., Fend'a P. 2006. - Invertebrates of the Dobšinská Ice Cave, Slovak Paradise, Slovakia. *Research, Utilization and Protection of Caves* 5: 179–186.
- Lampa S. 1890. - Annu en myggart funnen i Salatgrufvor. *Entomologisk Tidskrift* 11: 89–94.
- Leruth R. 1939. - La Biologie du domaine souterrain et la Faune cavernicole de la Belgique. *Memoires du Musee royal d'histoire naturelle de Belgique*, 87: 1-506, Bruxelles.
- Matile L. 1994. - Diptera. *Encyclopaedia biospeologica*, 1: 341-357, Moulis, Bucarest.
- Moseley M. 2007. - Acadian biospeology: composition and ecology of cave fauna of Nova Scotia and southern New Brunswick, Canada. *International Journal of Speleology* 36(1): 1–21.
- Moseley M. 1998. - Invertebrate Fauna of Nova Scotia Caves. *Nova Scotia Museum, Curatorial Report* 86: 1-37, Halifax.
- Nielsen P. 1963. - Records and description of Nematocera from Afghanistan. *Stuttgarter Beiträge zur Naturkunde* 118: 1–8.
- Novak T. & Kuštor V. 1983. - On the Ecology of an Alpine ice cave. *Mémoires de Biospéologie* 10: 117–125.
- Novak T. 2005. - Terrestrial fauna from cavities in Northern and Central Slovenia, and a review of systematically ecologically investigated cavities. *Acta carsologica* 34(1): 169–210.
- Papáč V., Luptáčík P., Fend'a P. 2007. - Terrestrial arthropods of the Obrovská Shaft (Slovak Karst, Dolný vrch Plateau). *Aragonit* 12: 51–53.
- Plachter H. 1983. - Cave-dwelling flies in Central Europe: adaptation to environment, especially to low temperatures (Diptera, Nematocera: Trichoceridae et Sciaridae). *Oecologia* 58: 367–372.
- Plachter H. & Plachter J. 1988. - Ökologische Studien zur terrestrischen Höhlenfauna Süddeutschlands. *Zoologica. Originalabhandlungen aus dem Gesamtgebiet der Zoologie*, 47, 1. Lieferung (139):1-67, Stuttgart.
- Pokorný R. & Holec M. 2011. - Biological research of the old mine in Julinčino údolí near Rokytnice v Orlických horách. *Acta Musei Reginaehradecensis S. A.* 33: 145–148.
- Röder V. 1891. - Dipteren gesammelt von Herrn F. Grabowsky in der Bielshöhle und neuen Baumannshöhle (Tropsteinhöhlen) im Harz. *Entomologische Nachrichten* 17(20): 346–347.
- Schmitz H. 1909. - Die Insectenfauna der Höhlen von Maastricht und Umgebung: unter besonderer Berücksichtigung der Dipteren; mit Anhang: *Ischnopsyllus schmitzi* n.sp. von AC Oudemans. *Tijdschrift voor Entomologie* 52(1/2): 80.
- Strinati P. 1965. - Faune cavernicole de la Suisse: 1 - 484, o.O.
- Strouhal H. & Vornatscher J. 1975. - Katalog der rezenten Höhlentiere Österreichs *Ann. Naturhistor. Museum Wien*, 79: 401-542, Wien.
- Weber D. 1989. - Die Höhlenfauna und -flora des Höhlenkatastergebietes Rheinland-Pfalz/Saarland, 2. Teil. *Abhandlungen zur Karst- und Höhlenkunde*, 23: 1-250, München.
- Weber D. 1991. - Die Evertebratenfauna der Höhlen und künstlichen Hohlräume des Katastergebietes Westfalen einschliesslich der Quellen- und Grundwasserfauna. *Abhandlungen zur Karst- und Höhlenkunde*, 25: 1-701, München.
- Weber D. 1997. - Einführung in die Biospeläologie mit Schwerpunkt Deutschland. *Mitteilungen der Höhlenforscherguppe Karlsruhe*, 11 (2. Aufl.): 1-112, Karlsruhe.
- Weißmair W. & Hauser E. 1993. - Fauna der Rettenbachhöhle. *Linzer biologische Beiträge* 25 (1): 373–385.

Wettstein-Westersheim O. 1926. - Zoologische Beobachtungen. Speläologische Monographien: Die Eisriesenwelt im Tennengebirge (Salzburg), 6, Wien.

Wettstein-Westersheim O. 1923. - Zoologische Beobachtungen. Speläologisches Jahrbuch, 4(1/2): 66-68, Wien.

Zaenker S. 2001. - Das Biospeläologische Kataster Hessen. Die Fauna der Höhlen, künstlichen Hohlräume und Quellen. Abhandlungen zur Karst- und Höhlenkunde, 32: CD-Version, München.