



# Mitteilungen des Entomologischen Vereins Stuttgart

In Zusammenarbeit mit dem Staatlichen Museum für Naturkunde in Stuttgart

Jahrgang 53, Heft 1, 5. Oktober 2018

ISSN 0937-5198



## Wild bees (*Anthophila*) of Porto Santo (Madeira Archipelago): Taxonomy, diversity, distribution patterns and bee-plant interaction networks

Anselm Kratochwil<sup>1\*</sup> & Angelika Schwabe<sup>2</sup>

<sup>1</sup>University of Osnabrück, Department of Biology/Chemistry, Ecology Section,  
Barbarastraße 13, D-49069 Osnabrück, Germany,

<sup>2</sup>Technische Universität Darmstadt, Department of Biology, Schnittspahnstraße 4,  
D-64287 Darmstadt, Germany

\*E-Mail: anselm.kratochwil@biologie.uni-osnabrueck.de

Porto Santo is the oldest island in the Madeira Archipelago (11.1-14.3 Ma). The altitudes are low and therefore the main part of the island is characterised by xeric vegetation and a semiarid climate. Subhumid conditions with trade-wind clouds are only present in a small area of the summits and under special site conditions. We were able to study the wild-bee fauna with pan traps and hand-netting or observation and the bee-plant network mainly during three stays in March 2005, 2012 and 2017. Until now, 9 wild-bee species have been detected. Two species are endemic to Porto Santo, and two species along with one sub-species are endemic to the Madeira Archipelago. The two endemic species have been described recently by Kratochwil & Scheuchl (2013) and Kratochwil et al. (2014) and further information is published in Kratochwil et al. (2008) and Kratochwil (2015, 2018).

An actualised and annotated check list of the wild-bee species will be presented, including a comparison with Madeira Island and Desertas. The colonisation history of the endemic species *Andrena dourada* Kratochwil & Scheuchl, 2013, and *A. portosanctana* Cockerell, 1922, will be discussed. The distribution patterns of the bee species of Porto Santo, which we got from 628 new data and 69 data from other authors show a wide distribution of the endemic and native bee species in the xeric zone. Nevertheless, population sizes are small in the case of the endemic species; therefore, *A. dourada* and *A. portosanctana* are endangered. *A. portosanctana* was already included in the IUCN list of threatened species. Only *Bombus terrestris lusitanicus* Krüger, 1956 (formerly *B. maderensis*, Erlandson, 1979) is restricted to the subhumid area.

All in all, we detected about 300 bee-plant interactions. In contrast to mainland networks, e.g. in the warm-temperate zone, which are as a rule characterised by many more bee than plant species, the bee-plant network of Porto Santo shows many more plant than bee species and is highly asymmetric. Six wild-bee species used 27 different plant species. Bee and plant species were highly interconnected, showing that under difficult environmental conditions and resource limitations, alternative nectar and pollen resources were available. In particular, the woody *Echium* species *E. nervosum* (endemic to the Madeira-Archipelago) and *E. portosanctensis* (endemic to Porto-Santo) are on one hand key species as resources for wild bees and on the other side self-incompatible outbreeders and depend on pollination. Even in very dry periods (e.g. from November 2011 to March 2012 there was no precipitation), *Echium* showed rich flower production and was intensively visited by wild-bee species. In the wet spring of 2017 (October 2016-March 2017: 301 mm), there was a difference in the number of bees compared to the dry spring (15 % reduction per day, but more detections without flower visits and fewer detections on flowers).



Brassicaceae species are important for the endemic species *A. portosanctana*; the key species is *Cakile maritima*, also flowering intensively after the dry winter of 2012.

A comprehensive publication on the bee fauna of Porto Santo, the distribution pattern of the species and the bee-plant network is in preparation (Kratochwil & Schwabe in prep.).

### Acknowledgements

We thank cordially for cooperation: Antonio M.F. Aguiar (Laboratório Agrícola, Camacha, Madeira, Portugal), Jan Smit (Nationaal Natuurhistorisch Museum, Leiden, The Netherlands), Pater Andreas Werner Ebmer (Puchenau, Austria), Holger Dathe (German Entomological Institute, Müncheberg, Germany), Patricia Gentili-Poole and Brian Harris (Department of Entomology Smithsonian Institution, Washington DC, USA), Ysabel Gonçalves (Museu de História Natural do Funchal, Madeira, Portugal), Fritz Gusenleitner (Biology Centre Museum Linz, Austria), James Hogan (Hope Entomological Collections, Oxford University, United Kingdom), Michael Kuhlmann (Kiel University, Zoological Museum, Germany), Vincent F. Lee (Department of Entomology, California Academy of Sciences, San Francisco, CA, USA), Volker Lohrmann and Herbert Hohmann (Übersee-Museum Bremen, Germany), David Notton (Natural History Museum, London, United Kingdom), Hans-Richard Schwenninger (Stuttgart, Germany), Erwin Scheuchl (Ergolding, Germany).

### References

- Kratochwil, A. (2015): Revision of the *Andrena* (*Micrandrena*) *tiaretta* group: redescription of *A. tiaretta* Warncke (1974) and description of two new species (*A. cyrenaica* nov.sp. and *A. orientalis* nov.sp.) demarcating the central and eastern part of the range (Libya, Israel, Syria). – Linzer biologische Beiträge 47 (2): 1403-1437.
- Kratochwil, A. (2018): Type specimens of *Andrena wollastoni* Cockerell, 1922 (Hymenoptera, Anthophila): Deposition, evaluation and designation of a lectotype. – Linzer biologische Beiträge 50 (1): 1-14.
- Kratochwil, A., A.M.F. Aguiar & J. Smit (2008): Hymenoptera - Apoidea. – In: Borges, P.A.V., C. Abreu, A.M.F. Aguiar, P. Carvalho, R. Jardim, I. Melo, P. Oliveira, C. Sérgio, A.R.M. Serrano & P. Vieira (eds.): A list of the terrestrial fungi, flora and fauna of Madeira and Selvagens archipelagos. – Direcção Regional do Ambiente da Madeira and Universidade dos Açores, Funchal and Angra do Heroísmo: 346. Funchal, Madeira.
- Kratochwil, A. & E. Scheuchl (2013): *Andrena* (*Micrandrena*) *dourada* nov.sp. from Porto Santo, Madeira Archipelago, Portugal. – Linzer biologische Beiträge 45 (1): 755-774.
- Kratochwil, A., A. Schwabe & E. Scheuchl (2014): *Andrena* (*Suandrena*) *portosanctana* Cockerell, 1922 and *A. (Suandrena) maderensis* Cockerell, 1922 – new taxonomical and ecological data for two closely related endemic bee species of the Madeira Archipelago, Portugal. – Linzer biologische Beiträge 46 (2): 1535-1567.
- Kratochwil, A. & A. Schwabe (in prep.): Wild bees (Anthophila) of Porto Santo (Madeira Archipelago) and their habitats: species diversity, distribution patterns and bee-plant network. – Linzer biologische Beiträge.