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Green roofs provide habitat for the rare snail (Mollusca, Gastropoda) species *Pseudotrichia rubiginosa* and *Succinella oblonga* in Finland

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Snail sampling on a vegetated roof in downtown Helsinki resulted in four snail species of preference for moist habitats: *Cochlicopa lubrica*, *Oxyloma elegans*, *Pseudotrichia rubiginosa*, *Succinella oblonga*. The latter two are considered rare in Finland. In both species this is the second verified locality from the country. We provide drawings on genital morphology of *O. elegans* and *S. oblonga* and briefly discuss the potential of green roofs as habitats for invertebrates.

Introduction

Urban areas are teeming with invertebrates (Zapparoli 1997), even in the most unlikely places, such as a barren courtyard surrounded by high walls in the centre of Helsinki. The ever-changing urban matrix leads to the decline and extinction of some species (McDonald et al. 2008), while it provides shelter to others (Vilisics and Hornung 2009). The urban green spaces have often been found to support exotics and habitat generalists with a wide distribution on global scale (Lososová et al. 2011), but in some cases rare or otherwise important natives (Vilisics et al. 2012), and even new species of invertebrates are found within the city boundaries (Kerppola 2011).

Green roofs, i.e. vegetated rooftops are part of the urban green infrastructure, just like parks, cemeteries, hedges and urban forests. Green roofs are artificial constructs built in order to gain a multitude of benefits for the building owners, residents and the neighbourhood: stormwater retention, improved microclimate, extended life of roofing, enhanced insulation of the building, and aesthetic value, to name a few benefits that green roofs can provide (e.g. Oberndorfer et al. 2007). A variety of studies indicate that green roofs can serve as suitable habitat for invertebrate communities (Brenneisen 2006, Braaker et al. 2013).

During an arthropod ecology survey on the green roofs in the Helsinki metropolitan area in the summer 2012 and 2013, abundant snail colo-

nies raised our attention on the green roofs of two storage buildings. Below we report the snail species sampled on these two green roofs, with the emphasis on those species found for the second time in Finland.

Material and Methods

Sampling sites

We hand collected live snail specimens and empty shells from two vegetated roofs in an old residential area in the southern tip of Helsinki in November 2013 (60°09'21.78'' N, 24°57'02'' E). The sampling took place on top of two small low-rise roofs within a courtyard, surrounded by 4–5 -storey residential buildings. The roofs are 20 and 40 m^2 in area and 1.30 and 1.40 m in height, respectively, and adjacent on one side. Both roofs are shaded by high walls of the surrounding buildings. The lower roof is surrounded by three walls, having one open side to the east, while the upper green roof was surrounded by 2 walls, having two sides open, towards south and east.

The studied green roofs are made of *Sedum*-type prefabricated mats, constructed in 2009. Such roofs are self-sustaining (no to low intensity management) and are characterized by a thin substrate layer forming an environment not optimal for the majority of forbs (Gabrych et al., manuscript in prep.). Mosses, on the other hand, grow vigorously on the shaded roofs, forming a second plant layer under the *Sedum* cover. Most snails were collected from the walls of the adjacent buildings, or from the gutter attached to the upper roof.

Anatomical examination

One specimen of *Oxyloma elegans* (Risso, 1826) and two specimens of *Succinella oblonga* (Draparnaud, 1801) were anatomically examined. The anatomical drawings were made using digital photos of the genitalia. The collected material is deposited in the private collection of the first author (Mosonmagyaróvár, Hungary).

The identification of species belonging to the family Succineidae is usually problematic based on shell characters only. Especially, distinguishing juvenile *Succinea putris* (Linnaeus, 1758) and adult *Oxyloma sarsii* (Esmark, 1886) from *Oxyloma elegans*, and *S. oblonga* from *Quickella arenaria* (Potiez & Michaud, 1838) is difficult. The species *O. elegans* differs from *O. sarsii* by the short vagina, and from *S. putris* by the epiphallus that is not covered by the penial sheath. As for the species *S. oblonga*, it differs from *Q. arenaria* by the very long vas deferens, long vagina, the presence of epiphallus and penial sheath and the absence of large dark pigmented area on the posterior part of the penis (see schematic drawings in Kerney & Cameron 1979).

Results and discussion

The collected species are the following: 5 *Oxyloma elegans* (4 shells and 2 living specimens), *Cochlicopa lubrica* (O. F. Müller, 1774) (3 living specimens), *Pseudotrichia rubiginosa* (A. Schmidt, 1853) (4 living specimens), *Succinella oblonga* (4 empty shells and 2 living specimens).

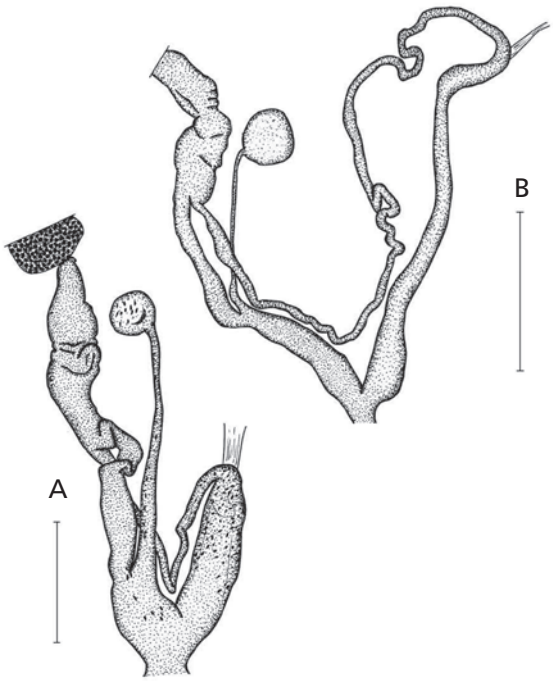

Fig. 1. Genital anatomy of A) *Oxyloma elegans* (Risso, 1826) and B) *Succinella oblonga* (Draparnaud, 1801). Scales represent 1 mm. (Original drawings by B. Páll-Gergely)

Snail species *C. lubrica* and *O. elegans* (referred to as *O. pfeifferi* in some publications) are abundant and widely distributed throughout Finland (Kerney & Cameron 1979, Welter-Schultes 2012). On the other hand, *S. oblonga* and *P. rubiginosa*, which both inhabit large part of Eurasia, are very rare in the country. The first record of *S. oblonga* was published recently from Turku, a major city in SW Finland (Routio and Valta 2011), and our information represents the second verified record from Finland. Similarly, the species *P. rubiginosa* was first reported from Ruissalo, an island just off the shores near the city of Turku (Routio & Valta, 2009), whereas our findings, 180 km east from Turku, represent the second record of *P. rubiginosa* in Finland.

From the four species captured in downtown Helsinki, *C. lubrica* is the most ubiquitous, found in all (32) cities in a study including Belgium, The Netherlands, Germany, Czech Republic, Austria, Slovakia, Poland, Switzerland, Slovenia and Hungary (Horsák et al. 2013). In the same study, *S. oblonga* was found in one third of the cities, while *P. rubiginosa* and *O. elegans* were not reported at all.

All the species reported here are common in wet meadows, in vegetation along streams and in various, rather permanently moist habitats, however, all these species, especially *S. oblonga*, tolerate temporary drought events. The wide global distribution suggests that these snails have good spreading ability, although it remains speculative how exactly these species disperse to new habitat patches.

Since we have records of the snails being present on the studied roofs for at least two years, we conclude green roofs have the potential in supporting sensitive, open habitat invertebrates, even in highly unlikely places such as a courtyard in the centre of Helsinki. Our findings support earlier studies suggesting that green roofs can be important in providing new habitats for invertebrates in urban areas and that along widely distributed ones, colonies of locally rare species may also establish on roofs.

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References

Braaker, S., Ghazoul, J., Obrist, M. K. & Moretti, M. 2014: Habitat connectivity shapes urban arthropod communities: the key role of green roofs. Ecology 95: 1010–1021.

Brenneisen, S. 2006: Space for Urban Wildlife: Designing Green Roofs as Habitats in Switzerland. — Urban Habitats 4(1): 27–36.

Horsák M., Lososová, Z., Čejka, T., Juřičková, L. & Chytrý, M. 2013: Diversity and Biotic Homogenization of Urban Land-Snail Faunas in Relation to Habitat Types and Macroclimate in 32 Central European Cities. — PLOS One DOI: 10.1371/journal.pone.0071783

Kerney, M.P. & Cameron, R.A.D. 1979: A Field Guide to the Land Snails of Britain and Northwest Europe. — 288 pp. London.

Kerppola, S. 2011: Helsingin Vanhankaupunginlahden ja reuna-alueiden kukkakärpäset (Diptera, Syrphidae). — Sahlbergia 17(2): 5–19.

McDonald, R., Kareiva, P. & Forman R. 2008: The implications of current and future urbanization for global protected areas and biodiversity conservation. — Biological conservation 141(6): 1695–1703.

Lososová, Z., Horsák, M., Chytrý, M., Čejka, T., Danihelka, J., Fajmon, K., Hájek, O., Juřičková, L., Kintrová, K., Láníková, D., Otýpková, Z., Řehořek, V. & Tichý, L. 2011: Diversity of Central European urban biota: effects of human-made habitat types on plants and land snails. — Journal of Biogeography 38: 1152–1163. doi: 10.1111/j.1365-2699.2011.02475.x

Oberndorfer, E., Lundholm, J., Bass, B., Coffman, R.R., Doshi, H., Dunnett, N., Gaffin, S., Köhler, M., Liu, K.K.Y. & Rowe, B. 2007: Green Roofs as Urban Ecosystems: Ecological Structures, Functions, and Services. — BioScience 57(10): 823–833.

Routio, I. & Valta, M. 2009: Molluscs Pseudotrichia rubiginosa Rossmässler 1838 and Limax maximus Linnaeus 1758 found in SW Finland. — Memoranda Societatis pro Fauna et Flora Fennica 85: 68.

Routio, I. & Valta, M. 2011: Succinea oblonga (Draparnaud, 1801) in Finland. — The Malacologist 57: 20.

Vilisics, F. & Hornung, E. 2009: Urban areas as introduction hot-spots and shelters for native isopod species. — Urban Ecosystems 12: 333–345.

Vilisics, F., Bogyó, D., Sattler, T. & Moretti, M. 2012: Occurrence and assemblage composition of millipedes (Myriapoda, Diplopoda) and terrestrial isopods (Crustacea, Isopoda, Oniscidea) in urban areas of Switzerland. — ZooKeys 176: 199–214.

Welter-Schultes, F.W. 2012: European non-marine molluscs, a guide for species identification. — 679 pp. + Q78. Göttingen.

Zapparoli, M. 1997: Urban development and insect biodiversity of the Rome area, Italy. — Landscape Urban Plann. 38: 77–86.