
SOER 2005 SOIL CHAPTER: SHORT NOTE ON SOIL BIODIVERSITY

The biodiversity of soil as intended here includes species living or resting in soil itself, which are often underground and thence often go unnoticed, unless intentionally unearthed (such as earthworms) or else go noticed due to the production of a fruiting body (as in the case of some mushrooms). Soil biodiversity also includes resting stages of flora and fauna, including seeds, bulbs, eggs and cysts.

Knowledge on soil biodiversity in the Maltese Islands is very limited, with the few information available mostly limited to selected group of insects (mostly beetles), molluscs, fungi (mostly mushrooms) and some invertebrate species (such as millipedes and isopods) associated with leaf-litter, particularly in wooded areas. This limited knowledge is mostly due to the cryptic nature of soil-inhabiting species, which are often small, if not minute, and not easily found.

Since Malta was essentially based on agriculture, soil movement has altered and affected soil biodiversity. However, despite the past intensive use of land for agriculture and pasture, a few natural areas are still formidably intact, and such areas were analysed for key species by a number of students of the Maltese fauna.

Important habitat types in terms of soil biodiversity include woodlands of various types, with special reference to:

- sclerophyll forest remnants with pluri-centenarian holm oak trees, as at *Il-Ballut l/o Wardija* and *Il-Bosk l/o Rabat*;
- riparian woodland remnants based on old, relict willow trees, as at *Mtahleb l/o Rabat*;
- old native maquis communities with native arar trees, as at *Wied il-Mizieb l/o Mellieha*;
- ancient millenarian olive groves, as at *Il-Bidnija l/o Mosta*;
- relatively undisturbed secondary maquis based on carob and lentisk trees, as at *Il-Buskett* and *Wied Babu l/o Zurrieq*; and
- relatively humid laurel woodlands as at *Il-Maqluba l/o Qrendi*;

A number of soil-inhabiting species have found in soil at 10-30cm depth, often under trees, many of which have been recently described as new species to science, endemic to the Maltese Islands. A few examples include:

- *Alaocyba melitensis*, an endemic beetle known only from Il-Buskett (Magnano & Mifsud, 1998);
- *Amaurops mifsudi*, an endemic beetle known from Il-Buskett and Il-Maqluba (Poggi, 1999);
- *Cnemeplatia atropos*, a beetle known from beneath carob trees at Wied Babu (Mifsud & Scupola, 1998);
- *Langelandia niticosta*, an endemic beetle known from Il-Bidnija, Il-Buskett and L-Imtahleb;
- *Testacella riedeli*, a deep-burrowing slug of indeterminate status so far known only from San Blas l/o Nadur in Gozo (Giusti *et al.*, 1995);
- *Torneuma maltense*, an endemic beetle known from Il-Ballut l/o Wardija, Il-Buskett, Il-Maqluba, L-Imtahleb, San Blas and Wied Babu (Magnano & Mifsud, 2001);
- *Torneuma strictum*, an endemic beetle known from Il-Ballut l/o Wardija, Il-Buskett and Wied il-Mizieb (Magnano & Mifsud, 2001).

Argillaceous soils (clay slopes) and karst soil pockets in garrigue, rocky steppes and *rdum* are also important for a wide array of fauna, also including threatened and endemic species, of which a few selected examples are provided below:

- *Hohenwartia hohenwarti*, a snail known from the clay slopes Ghajn Hadid l/o Mellieha and Ghajn Tuffieha l/o Mgarr;
- the very rare Filfla door-snail, *Lampedusa imitatrix*, endemic and known from karst along the western coast of Malta and the island of Filfla (Giusti *et al.*, 1995);
- the very rare Maltese door-snail, *Lampedusa melitensis*, a critically endangered endemic species found along covering an area of a few tens of square metres (Giusti *et al.*, 1995);
- the Ghar Lapsi top snail, *Trochoidea gharlapsi*, a vulnerable endemic snail known from steep-sided *rdum* in the south-western coasts of Malta and Gozo (Beckmann, 1987; Giusti *et al.*, 1995).

Wooded areas and garigue are also important for various fungi. Many fungi live in soil and are mostly inconspicuous to the naked eye. An exception is provided during the fruiting period of the so-called macrofungi, which produce various fruiting bodies, of different forms and shapes, many of which are popularly known as 'mushrooms'. A few examples include:

- the very rare Ovoid Grisette, *Amanita ovoidea*, known from under pine trees at Il-Ballut l/o Wardija (Briffa & Lanfranco, 1986);

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- the very rare Red Basket or Cage Fungus, *Colus hirudinosus*, known as *faqqiegh tal-gagga*, known from a small number of garrigue communities; Maltese populations belong to the form *minor*, which is believed to be endemic to the Maltese Islands (Lanfranco, 1989);
 - the very rare White Morsel, *Helvella crispa*, known from under holm oaks at Il-Ballut l/o Wardija and Il-Buskett (Briffa & Lanfranco, 1986);
 - the very rare Blushing Wax-Cap, *Hygrocybe ovina*, only known from the forest remnant of Il-Ballut l/o Wardija (Briffa & Lanfranco, 1986);
 - the rare and edible Blood Milk-Cap, *Lactarius sanguifluus*, known as *faqqiegh tad-demm*, confined to the Ix-Xaghra tal-Borghom garrigue at L-Imtahleb (Briffa & Lanfranco, 1986);
 - the rare Pretty Russula, *Russula lepida*, only known from beneath rockrose shrubs at the garigue in the area of Ta' Wied Rini at l-Imtahleb (Briffa & Lanfranco, 1986);
 - the rare Violet Crown-Cap, *Sarcosphaera coronaria*, known as *faqqiegh tal-kuruna*, only known from beneath pine trees at Il-Buskett and Verdala (Lanfranco, 1989).

The soil of kamenitzae, a specialised habitat type, is also important for its biodiversity. Kamenitzae are essentially karstic structures in coralline limestone that fill with freshwater during the wet season forming temporary rock pools (Maltese: *ghadajjar fil-blat*). Since this water is short-lived, because of the percolating nature of coralline limestone, these pools house a transient flora and fauna which grows rapidly and is capable of reproducing in the limited time available. Such flora and fauna persist from one cycle to another as seeds, eggs or cysts in the shallow soil layer in the karstic structure that eventually fills with water. Important species thriving in such resting stages in the soil include:

- the rare Maltese horned pondweed, *Zannichellia melitensis*, endemic to the Maltese Islands (Brullo *et al.*, 2001);
- the rare Maltese waterwort, *Elatine gussonei*, known from the Maltese Islands and the Pelagian Islands only (Brullo *et al.*, 1988);
- the very rare Mediterranean star-fruit, *Damasonium bourgaei*, of restricted distribution in the Mediterranean;
- the very rare tadpole shrimp, *Triops cancriformis*, one of the oldest species inhabiting this planet.

Specialised habitats, including saline marshlands, freshwater wetlands and other humid areas, and sand dunes also house important species, which depend on the soil (or its equivalent, sand, in sand dunes). A few important examples include:

- *Cardiophorus exaratus*, a very rare beetle associated with the roots of dune grasses at L-Ghadira and Ramla l/o Xaghra;
- *Miktoniscus melitensis*, a woodlouse known from soil samples from Il-Maghluq l/o Marsaskala and L-Ghallis (Hili, 1990);
- *Otiorhynchus ovatulus*, and endangered endemic beetle associated confined to the Ramla dunes (Magnano, 1993);
- *Spelaeoniscus vallettai*, a woodlouse known soil in humid areas close to the sea from Id-Dwejra l/o San Lawrenz and Il-Mistra (Caruso & Lombardo, 1982);
- *Xanthomus pallidus*, and endangered beetle found in association with the roots of dune plants in sand at the Ramla dunes (Mifsud, 1999).

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