The Central Mediterranean Naturalist	3 (1): 13 - 14	Malta, June 1999

RIELLA HELICOPHYLLA (MONT.) HOOK., A NEW ADDITION TO THE MACROPHYTIC WETLAND FLORA OF THE MALTESE ISLANDS (BRYOPHYTA, MARCHANTIOPSIDA, RIELLACEAE)

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ABSTRACT

The freshwater liverwort *Riella helicophylla* (Mont.) Hook. is recorded for the first time from the Maltese Islands. A number of individuals were cultured following hydration of desiccated sediment collected from Ghadira s-Safra, a saline marshland situated on the north-eastern coast of Malta. Subsequent fieldwork has not revealed any field occurrences of the species in the Maltese Islands, indicating that this record may be due to a chance occurrence of viable spores in the sediment, possibly as a consequence of transport by means of migrating waterfowl. The apparent absence of the species in the wild may also be due to habitat degradation and to a sub-optimal physico-chemical environment.

INTRODUCTION

The macrophytic flora of wetlands of the Maltese Islands is made up mainly of angiosperms. Non-angiospermous groups recorded from Maltese wetlands include chlorophytes, charophytes, and a moss, while no aquatic liverworts have hitherto been recorded. The occurrence of *Riella helicophylla* therefore represents the first such record for the Maltese Islands. The genus *Riella* comprises twelve species, all of which are halophytic and restricted to regions of arid climate (Allorge, 1947). Five of these species [*R. affinis, R. cossoniana, R. helicophylla, R. notarisii* (= *R. reuteri*) and *R. parisii*] are of Mediterranean or peri-Mediterranean provenance (Duell, 1983). The distribution of *R. helicophylla* follows a Mediterraneo-atlantic pattern (Casas *et al.*, 1981), having been recorded from Tunisia, Algeria, Egypt, Southern France, Southern Portugal, mainland Spain and the Balearic Islands. It is interesting to note that this species has hitherto only been recorded from one island locality in the Mediterranean (Cros, 1982). The nearest records to the Maltese Islands, in terms of geographical proximity, are from Tunisia (Trabutr, 1911) and from Thau, Southern France (Dubois and Hebant, 1968), while there are no recorded occurrences of the species in nearby Sicily (Dia *et al.*, 1985).

METHOD AND RESULTS

The species appeared following hydration of desiccated sediment taken from Ghadira s-Safra, a seasonally flooded coastal wetland situated on the north-eastern coast of Malta (UTM grid reference 502787; Fig. 1). A brief overview of the habitat at Ghadira s-Safra has been given by Lanfranco and Schembri (1995). Dry sediment samples were collected on 15 July 1990 and stored in dry paper bags pending hydration. Sediment samples were placed in steam-sterilised 250ml glass measuring cylinders and hydrated with deionised water on 16 July 1990. The sediment in the cylinders was thoroughly homogenised by vigorous agitation at the beginning of the experiment. The apparatus was subsequently maintained in the laboratory, next to an east-facing window. Water in the measuring cylinders was topped up regularly in order to offset losses from evaporation. The mean electrical conductivity of the water, based over five samples with five replicates each was $1382 \pm 156\ \mu Scm^{-1}$. The first appearance of *R. helicophylla* was recorded on 13 August 1990 and the specimens were maintained in culture for several months, attaining lengths of 5cm – 9cm. The plants were subsequently harvested for identification. Identification was carried out by one of the authors (EL) and confirmed by Dr Montserrat Brugues of the Universitat Autonoma de Barcelona. Voucher specimens were deposited at the University of Malta, at the Universitat Autonoma de Barcelona and in the private herbarium of E. Lanfranco (Malta).

DISCUSSION

Subsequent fieldwork in different years has not revealed any field occurrences of *Riella helicophylla*. The apparent absence of *Riella helicophylla* in the wild may be a consequence of a number of factors, operating in isolation or in synergy:

Habitat disturbance: Ghadira s-Safra has experienced frequent anthropogenic disturbance throughout the past decade, reducing the water-retention capability of the habitat. Mean hydroperiod duration has consequently also reduced, minimising the probability of successful germination and reproduction of species comprising the ephemeral freshwater taxocene. Such degradation has exerted negative effects on locally-rare taxa recorded from this habitat, including the notostacan crustacean *Triops cancriformis* (Lanfranco and Schembri, 1995).

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Chance: Since Ghadira s-Safra is a coastal habitat, the possibility of visits by migratory waterfowl is increased. The mud adhering to the feet of birds is known to be an important source of amphipod propagules (Swanson, 1984), while resting stages of freshwater invertebrates can survive passage through the gut of waterfowl (Thiery, 1991). Viable spores of *Riella helicophylla* may therefore have been transported to Ghadira s-Safra following sporadic visits by waterfowl.

Unfavourable physico-chemical conditions: Salinity is an important factor in the germination and maturation of Riella helicophylla, where relatively high salinities, such as those characteristic of saline marshlands, inhibit germination but promote maturation (Marin Velasquez, 1982). In a temporary Mediterranean marshland, salinity would initially be low, but would progressively increase as dissolution of salts and evaporation of water proceed. Inhabitants of such marshes would therefore be adapted to respond to such conditions, germinating as soon as flooding occurs (low salinity) and maturing as water levels recede (high salinity). The salinity at Ghadira s-Safra is lower than that recorded in similar coastal habitats in the Maltese Islands (Lanfranco, 1990). This lower salinity would provide a physiological trigger for germination but may inhibit maturation. As such, individual plants may be overlooked as a consequence of small size. This may be rectified by effort-intensive sampling. Such a sampling programme is in progress.

CONSERVATION AND LEGISLATION

R. helicophylla is listed in Appendix 1 of the Berne Convention (Strictly Protected Flora). It is also legally protected in the Maltese Islands (Legal Notice 49/1993).

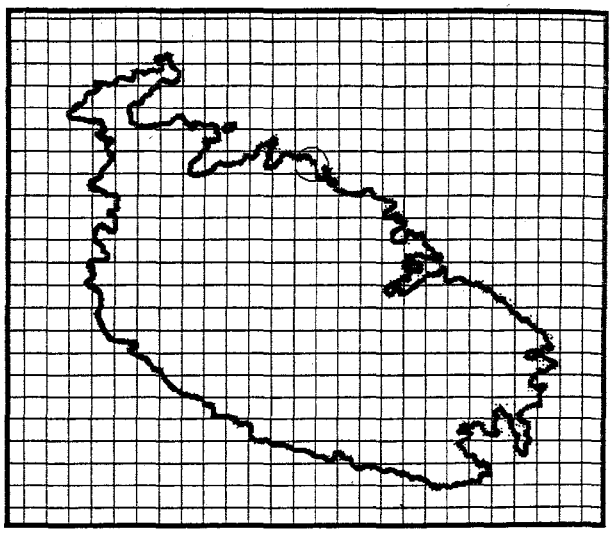

Fig. 1 Outline map of Malta. The approximate position of Ghadira s-Safra is circled.
Area of grid squares = 1 km^2. North is at top.

ACKNOWLEDGEMENTS

The authors thank Dr Montserrat Brugues (Department of Botany, Autonomous University of Barcelona, Barcelona, Spain) for identification of specimens and provision of key literature.

(Accepted 10th March, 1999)

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