Insect Conservation and Diversity (2016) doi: 10.1111/icad.12212

Host-plant-based restoration as a potential tool to improve conservation status of odonate specialists

RASSIM KHELIFA[1,2] and MOHAMMED KHALIL MELLAL[3] [1]Department of Evolutionary Biology and Environmental Studies, University of Zurich, Zurich, Switzerland, [2]Department of Biology, Faculty of Biological and Agricultural Sciences, University of Tizi Ouzou, Tizi Ouzou, Algeria and [3]Laboratory of marine and coastal environments Ecobiology, Department of Biology, Badji Mokhtar University, Annaba, Algeria

Abstract. 1. Several species worldwide show rapid range retraction due to habitat degradation, and some of them have restricted distribution and specific resource needs. Such cases deserve particular attention and need urgent conservation actions to avoid extinction, and one way is to facilitate colonisation of new habitats by resource supplementation.

2. Here, we investigate the changes in range distribution, during the last decade (2007–2016), of an endangered endemic damselfly, *Calopteryx exul* Selys, and assess the importance of its favourite host-plant (*Potamogeton nodosus*) in colonisation and population dynamics in the last existing population of Algeria.

3. We first used dynamic occupancy models to assess range distribution dynamics and we found that both occupancy and colonisation probabilities of the species were positively dependent on the occurrence of *P. nodosus*. There was also evidence that extinction probability increased with habitat disturbance but decreased with the occurrence of *P. nodosus*. Our experimental restoration showed that the augmentation of patches of *P. nodosus* increased the total number of individuals, the number of reproductive events and philopatry.

4. Our study highlights the importance of insect–plant relationship in the establishment of effective restoration plans because of their implication in colonisation and extinction processes and population dynamics.

5. Since most insect species from different orders and ecosystems are ecologically dependent on plants, our restoration approach may benefit a large range of threatened species and improve their conservation status.

Key words. *Calopteryx exul*, conservation, insect–plant relationship, IUCN, North Africa, odonate.

Introduction

Among the most critical current environmental issues is the rapid loss of biodiversity in different biotopes (Ceballos *et al.*, 2010; Barnosky *et al.*, 2011). The intensification of urbanisation, industrialisation and agriculture is the major cause of the high extinction rate (Smith *et al.*, 1999), which threatens ecosystem functioning and human well-being (Mace *et al.*, 2012). The extinction rates are expected to be highest in insects (Dunn, 2005), since they represent the mostly highly diversified group on earth (Wilson, 1992). In freshwater ecosystems, 60% of animal diversity is composed of aquatic insects (Dijkstra *et al.*, 2014). Yet, freshwater habitats have been under constant human pressure (Meybeck, 2003; Vorosmarty *et al.*, 2010) because of the growing demands for water, energy and food (Ward, 1998). For instance, estimations have suggested that a minimum of 10 000–20 000 aquatic insect species are extinct or at risk of extinction (Strayer & Dudgeon, 2010). Despite that, there has been a marked lack of applied conservation research that addresses important

Correspondence: Rassim Khelifa, Department of Evolutionary Biology and Environmental Studies, University of Zurich, Winterthurerstrasse 190, CH-8057 Zurich, Switzerland. E-mail: rassimkhelifa@gmail.com