

At the interface of historical and present-day ecology: ground beetles in woodlands and open habitats in Upper Galilee (Israel)

(Coleoptera: Carabidae)

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Abstract. Mediterranean landscapes have been used by humans for thousands of years, particularly some areas of the East Mediterranean, e.g. in Israel. This land use has had profound effects on the dynamics of the woodlands in time and space, with the result that woodland regeneration has only been possible during periods of low human population density and hence low levels of grazing. The aim of this paper is therefore to find out how woodland species have been able to cope with the rapidly changing habitats. For this purpose, ground beetles were sampled over a period of one year using 10 pitfall traps per study site at two sites located in the Upper Galilee (northern Israel). The sites comprise two old-growth woodlands, two recent woodlands and two open habitats. The site development of all sampled species was checked. Carabid beetles belonging to 21 genera and 34 species were found. Most individuals were found in old-growth woodlands. On the basis of a detrended correspondence analysis (DCA), the habitat preferences of three ground beetle groups could be distinguished: old-growth woodland species, species of recent woodlands and species of open habitats. We found that two-thirds of the group of open habitat species are brachypterous and three out of the four woodland species are macropterous. Since woodlands with a long ecological continuity are also important for other groups of organisms such as saproxylic beetles, we recommend the conservation of all woodland development stages in the study area.

Key words. Habitat continuity, habitat selection, hindwing polymorphism, Mediterranean, Middle East, pitfall traps, *Quercus calliprinos*.

Introduction

Mediterranean lands have been used by man for thousands of years. In many regions, utilisation was very intensive and led to the disappearance of the natural evergreen oak woodlands (GROVE & RACKHAM 2003). In some areas of the Eastern Mediterranean, land use was so intensive that woodlands were only able to survive for short periods and in small areas. The Mediterranean part of Israel is an example of the interrupted habitat continuity of woodlands in the Eastern Mediterranean. It has been intensively influenced by man for at least 5000 years (cf. NAVEH & DAN 1973). Except for some very small stands surrounding sacred places, the natural arboreal vegetation has been almost completely transformed or destroyed, and now mostly forms steppe-like, intensively grazed habitats (so-called 'batha') and arable fields (e.g. LIPHSCHITZ & BIGER 1990). In correlation with population density, phases of intensive land use, accompanied by the destruction of large woodland areas, alternated with