

# Inter-locality variation in the reproductive ecology of the Linnet, *Carduelis cannabina* (Linnaeus, 1758) (Aves: Fringillidae), in Jordan

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**Abstract.** The breeding ecology of Linnets (*Carduelis cannabina bella*) was studied at three study areas in open Mediterranean scrub habitats and in large and irrigated olive plantations located in an arid environment. Breeding parameters at all of the study areas (clutch size, incubation and nestling periods, number of broods per season) were within the range described for other southern populations. Accessibility to a rich food supply at the onset of the breeding season, which coincided with the end of the rainy season, a constant water supply and the presence of woody plants with foliage providing some concealment, appeared to be important cues in the selection of nesting sites by Linnets at the study areas. In the study area with a Mediterranean climate, Linnets built their nests in native shrubs and dwarf shrubs, while in the olive plantations Linnets built nests in young olives and conifers, as well as mature olive trees. Reproductive success did not vary significantly among the study areas, although it appeared to be higher in mature olive plantations than in young plantations. Nest concealment was related to nesting success in two study areas and the main cause of nest failure was predation at all three sites. Our results suggest that Linnets colonizing novel habitats in arid regions retain responses to certain environmental cues when selecting nesting sites and that these responses have evolved in the natural habitats in which the species is confronted with a rich guild of nest-predators.

**Key words.** Breeding parameters, nesting success, novel habitat, *Carduelis cannabina*, Jordan, Middle East.

## Introduction

The Linnet (*Carduelis cannabina*) is widespread in Eurasia and North Africa where it inhabits a variety of habitats in different climatic zones (SNOW & PERRINS 1998). In the Levant, the subspecies *bella* (C.L.Brehm, 1845) breeds mainly in open shrubland and steppe habitats in the Mediterranean climatic zone and reaches the southern limit of its breeding range in the highlands of western Jordan (ANDREWS 1995, SHIRIHAI 1996, KHOURY 1998). Previously confined to scrub habitats in the highlands and higher rift margins of the western parts of Jordan (ANDREWS 1995), the Linnet has recently expanded its breeding range towards the deserts in central Jordan where it benefits from agricultural expansion, especially of irrigated olive plantations (F. KHOURY, pers. obs.).

The Linnet is generally well adapted to farmland, and is rather successful in agricultural habitats with shrubs and short hedges for nesting (HINSLEY & BELLAMY 2000), and in open fields that contain annuals for feeding with a low risk of predation (WHITTINGHAM & EVANS 2004). However, in novel or modified habitats, certain cues of the physical environment that have formerly/elsewhere been used adaptively to make behavioural and life-history decisions may become associated with reduced survival and reproduction (SCHLAEPFER et al. 2002, MISENHELTER & ROTENBERRY 2000).