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SHORT REPORT

Habitat, phenology and biometrics of the Aquatic Warbler *Acrocephalus paludicola* during autumn migration through a riverine wetland in Iberia

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The Aquatic Warbler *Acrocephalus paludicola* is a small passerine which is now considered globally threatened as a result of dramatic reductions in population size and distribution in recent decades (BirdLife International 2004). Its migratory strategies from breeding areas in central Europe to wintering areas in western Africa are poorly known (De By 1990, Cramp 1992, Aquatic Warbler Conservation Team 1999, Caillat *et al* 2005, Dyrcz 2006, Julliard *et al* 2006, Schäffer *et al* 2006). In the Iberian Peninsula it was considered a scarce but regular migrant until the end of the 20th century (De By 1990, Tellería *et al* 1999, Atienza *et al* 2001). However, the recent discovery of important new stopover sites suggests possible migration in a broader front across the Iberian Peninsula (Jubete 2001, Robles & Arcas 2004, Zumalacárregui *et al* 2005). In this paper we present data from Aquatic Warblers captured in a ringing station in a small stream in inland Spain, during the post-breeding migration in the period 2004–06. The number of captures in this locality accounted for 10.6% of the total for this species in Spain, which was 264 in 2004–06 (Frías *et al* 2007), thus indicating the importance of this wetland and the lack of knowledge of the biology and migration of Aquatic Warblers.

The birds were captured in a small wetland (39 ha) associated with the Valcavado stream in Zotes del Páramo (42°15'N 5°45'W), in the south of León province (northwest Spain), situated at an altitude of 775 m above sea level. The surrounding lands are covered by irrigated crops, mostly maize (*Zea mais*). The habitat near the stream is characterised by a long strip of herbaceous and helophytic vegetation, principally *Scirpus holoschoenus* and *Juncus* spp, which is temporarily flooded during summer coinciding with crop irrigation. This provides an ideal habitat for Aquatic Warbler during migration and is very similar to the habitats at their breeding grounds (Cramp 1992, Onrubia *et al* 2005, Jubete *et al* 2006). Other vegetation in the area mostly comprises *Typha* spp, *Phalaris arundinacea* and *Scirpus lacustris*, and two arbustive species *Salix atrocinerea* and *Salix salviifolia*.

All the Aquatic Warblers caught were aged on plumage traits (Cramp 1992, Svensson 1992). Some adult females were recognised by the presence of a brood patch (Svensson 1992, Dyrcz 1993). Biometric data collected from each bird included several morphometric measures: maximum wing chord length (± 0.5 mm), eighth primary feather length (numbered proximal to distal; ± 0.5 mm), tarsus length (± 0.1 mm) and body weight (± 0.1 g; Table 1).

The species was present in the wetland for up to 55 days each year within the study period: the first individual was caught on 2 August and the last on 25 September during the sample period, with maximum capture rates occurring in the first half of August (Fig 1). This migration phenology is very close to data from studies in other Spanish regions (De By 1990, Atienza *et al* 2001, Jubete 2004).

A total of 28 individuals, 17 adults and 11 juveniles, were captured. The age ratio (1.5:1) was high in comparison with that found in other studies on migration in France and

Table 1. Biometrics (mean ± SD [N]) of Aquatic Warblers caught during the ringing sessions. The differences between age classes of biometric measurements, analysed by one-way ANOVA, were: wing length ($F = 0.06$, $P = 0.804$), P8 ($F = 0.08$, $P = 0.776$), tarsus ($F = 2.70$, $P = 0.113$) and body weight ($F = 2.90$, $P = 0.101$).

	Wing length (mm)	P8 (mm)	Tarsus (mm)	Body weight (g)
Juveniles	62.6 ± 1.6 (11)	47.3 ± 1.0 (11)	20.5 ± 0.6 (11)	11.6 ± 1.0 (10)
Adult total	62.4 ± 2.4 (17)	46.5 ± 1.4 (17)	20.4 ± 0.6 (17)	12.9 ± 2.0 (17)
Adult females	61.5 ± 1.6 (4)	46.1 ± 1.2 (4)	20.4 ± 0.6 (4)	11.5 ± 0.8 (4)
Total	62.5 ± 2.1 (28)	46.8 ± 1.3 (28)	20.5 ± 0.6 (28)	12.4 ± 1.8 (27)

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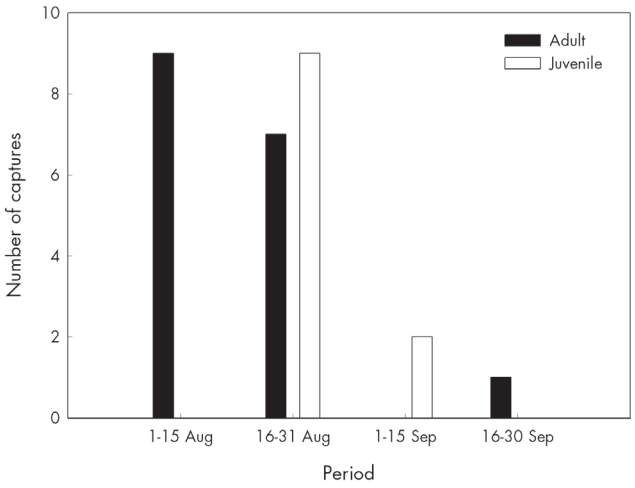

Figure 1. Aquatic Warbler phenology during 2004–06 in Valcavado stream.

Spain (Robles & Arcas 2004, Caillat *et al* 2005, Onrubia *et al* 2005, Jubete *et al* 2006). Conversely, De By (1990) indicates an increase in the proportion of adults towards southern Europe. Adult birds were captured first, mainly during the first half of August, whereas yearlings were captured later, mainly during the second half of August (Fig 1). This is similar to data reported by Jubete *et al* (2006) recorded in La Nava ringing station, which is the main ringing area for Aquatic Warbler in Spain (Frías *et al* 2007).

No significant differences were found between age classes for any of the biometric measurements analysed by one-way ANOVA (Table 1). Cramp (1992) and Svensson (1992) recorded a high level of flight-feather wear in adults during postnuptial migration, whereas the juveniles displayed new feathers. Furthermore, Dyrcz (1993) mentions differences in wing length and weight between sexes, which are lower in females. This matches our results, though the fact that differences were not significant may relate to the small sample size.

Eleven recaptures of six different individuals were made, always during the same ringing period, which, at over 21%, is considered a high rate. The mean stopover duration was almost six days, with a minimum of three and a maximum of 12 days. An increase in weight between the first capture and the last recapture was observed on five of the six recaptures, with a mean fattening rate of 0.18 g/day.

The high number of captures and the long stopover period observed suggest that this site is important for the Aquatic Warbler during post-breeding migration. Moreover, these data also reassert the importance of inland wetlands in the Iberian Peninsula for post-breeding migration (Jubete 2001, Onrubia *et al* 2005, Jubete *et al* 2006). This is in contrast to studies suggesting that the migration of Aquatic Warblers takes place mainly through coastal areas, crossing Iberia in two main migratory fronts, one along the Atlantic coast and the other along the Mediterranean coast (Aquatic Warbler Conservation Team 1999, Atienza *et al* 2001).

The principal threats and conservation measures proposed for Spain are described by Jubete (2004) and more generally were formally stated in the *Memorandum of Understanding Concerning Conservation Measures for the Aquatic Warbler* (*MoU*), concluded on 30 April 2003 in Minsk (Belarus). The *MoU*, together with a detailed Action Plan, is available at www.cms.int/species/aquatic_warbler/aquatic_warbler_bkrd.htm (last accessed 26 May 2009). In article 2.3 of the Action Plan it is stated that: 'To protect the Aquatic Warbler and its habitat in the winter quarters and along the migration route', the main known stopover sites during the migration route should be protected. However, lack of data to justify legal protection for this type of habitat in León province has led to their destruction over the last few years, mainly in areas that have been converted to poplar plantations (*Populus* x *canadensis*) and corn fields. Currently, land-consolidation and drainage-amelioration plans are likely to intensify agricultural use. One of these poplar plantations was established in the study area in spring 2006, subsidised by the European Union's Common Agricultural Policy and occupying almost the entire wetland.

We encourage other researchers to carry out studies in similar locations and report their results. Better knowledge of Aquatic Warbler migration in the Iberian Peninsula will help to preserve their severely threatened stopover sites.

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