

## On regular wintering of Eurasian Penduline Tits *Remiz pendulinus* in northern Morocco

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The Eurasian Penduline Tit *Remiz pendulinus* was until recently considered to be an accidental winter visitor to Morocco. Regular wintering was suspected in the north-west of the country but had been poorly documented. The ringing data collected in the Smir marshes (north-west Morocco) during the period 2004–2008 indicate that Eurasian Penduline Tits regularly winter in Morocco. During the study period, 50 birds were caught on 68 occasions. The intra-seasonal recapture data, i.e. autumn to the following spring, and winter observations showed that some individuals over-wintered locally at this site. The inter-annual recapture data indicate that wintering birds return regularly to the Smir marshes.

### Introduction

The Eurasian Penduline Tit *Remiz pendulinus* (“Penduline Tit” henceforth) is a Palearctic species which breeds from the Iberian Peninsula eastwards to Siberia, with a discontinuous breeding range. The northern and north-eastern populations are migratory and winter in the south of Europe and the Middle East (Cramp and Perrins 1993).

The species has experienced an expansion of its breeding population from the traditional geographical centre in Central Europe towards the north, west, and south-west during the 1980s and early 1990s (Flade et al. 1986, Isenmann 1987, Valera et al. 1990, Cramp and Perrins 1993). In the secondary centres in the Iberian Peninsula, similar range expansion of the breeding population has occurred since the 1960s (Delibes et al. 1980, Valera et al. 1990, 1993, Alcántara et al. 1997). This expansion of breeding range has resulted in an expansion in the wintering range of the species in Europe, especially in the Iberian Peninsula (Valera et al. 1990, 1993).

These expansive waves have reached as far south as Morocco, where a German-ringed bird was recovered in Agadir in 1960 (Thévenot et al. 2003). In all probability the number of wintering birds reaching Morocco was scarce until the past two decades when some further records were obtained in the north-west of the country (Thévenot et al. 2003, Table 1).

Until now, the Penduline Tit has been regarded as an accidental winter visitor to Morocco (Thévenot et al. 2003, Bergier and Thévenot 2010). This is due to the paucity of data regarding the presence of the species in the country. For example, Thévenot et al. (2003) compiled only 14 records involving 25 birds (Table 1). However, with the recent increase in ornithological surveys and bird-ringing

operations within Morocco (e.g. the present study), the true status of a few species has become more apparent. The wintering of Penduline Tits presented here and the existence of a resident population of a possible new taxon of Reed Warbler in Morocco (Amézian et al. 2010) are worth mentioning.

It should be mentioned that, although bird-ringing activities begun in Morocco as early as 1932 and the ringing of passerines started in the 1950s, it was not until the 1960s–1970s that there were ringing expeditions in many Moroccan regions (Thévenot et al. 2003). During the 1990s, a study was conducted in Souss-Massa National Park (Taillandier et al. 2006), and two Moroccan sites were selected in the ESF Network on Songbird Migration (Bairlein 1993). More recently, the GIBMANATUR project was conducted in Smir marshes (Amézian et al. 2010, present study) and some other small ringing programmes in other wetlands.

The aim of this paper is to demonstrate the regular wintering of Penduline Tits in northern Morocco and to show their site fidelity to Smir marshes.

### Materials and methods

#### Study area

The Smir wetland (35°43' N, 5°20' W) is a wetland complex (freshwater marshes and brackish lagoon) situated in the north-west of Morocco, midway between the towns of Tétouan and Sebta/Ceuta, on the eastern (Mediterranean) coast of the Tangier Peninsula. The wetland consists of a lagoon surrounded by halophytic vegetation (*Sarcocornia fruticosa*, *Arthrocnemum macrostachyum* and *Juncus* sp.) and a freshwater marsh composed mainly of homogeneous

or mixed stands of three emergent species: bulrush *Typha angustifolia*, common reed *Phragmites australis* and *Scirpus* sp. There are also some isolated stands of yellow iris *Iris pseudacorus* and *Tamarix* sp. The wetland's surface is about 175 ha (Dakki et al. 2005).

#### Data collection

Birds were mist-netted, ringed, sexed (where possible) and aged; ageing was based on differences in coloration and wear of all feather tracts including the alula (Svensson 1992, Mariné et al. 1994). Bird ringing was carried out during the autumns of 2004, 2006, 2007 and 2008 and the springs of 2005, 2006, 2007 and 2008 (Table 2). Mist-netting was carried out, weather permitting, on a daily basis and took place, with some exceptions, from sunrise until 15:00–16:00. The total length of mist-nets used varied between seasons and ranged between 234 m in the autumn of 2004 and 102–142 m in other seasons.

#### Results

A total of 50 individual Penduline Tits consisting of 48 non-ringed birds and two Spanish-ringed controls were captured. Twelve of these locally ringed birds were subsequently recaptured on a further 18 occasions, making

a total of 68 encounters in all (Table 2). At first capture, juveniles ( $n = 37$ ) were more numerous than adults ( $n = 13$ ). The difference between the two age groups was statistically significant (chi-squared test:  $\chi^2_1 = 11.52$ ,  $P = 0.001$ ). At first capture, males ( $n = 25$ ) were more numerous than females ( $n = 11$ ). Fourteen first-winter birds, all captured in autumn, could not be sexed. The calculated sex ratio was significantly different from 1:1 ( $\chi^2_1 = 5.44$ ,  $P = 0.02$ ).

Of the 12 birds retrapped more than once, in four cases birds were recaptured in different winter seasons and in eight cases birds were recaptured within the same winter season but first in autumn and subsequently in spring (Table 3). The proportion of marked individuals that were recaptured in different winter seasons (an approximate estimate of return rate) was 13.3% (four recaptures out of 30 ringed birds; birds ringed during the last winter season were omitted; Tables 2 and 3).

#### Discussion

This study demonstrates that the overwintering of the Penduline Tits in northern Morocco is a more regular phenomenon than previously thought (Thévenot et al. 2003). Taking into account the expansion of the species in Europe, and especially in the Iberian Peninsula during the

**Table 1:** Available information on Eurasian Penduline Tits in Morocco prior to this study. References: 1 = Thévenot et al. (2003); 2 = F Schneider et al. (pers. comm.); 3 = Bensusan et al. (2006); 4 = H Rguibi Idrissi et al. (pers. comm.)

Date	Number of birds	Locality	Method	Reference
30 October 1960	1	Agadir	Recovery of a German-ringed bird	1
November 1976–February 1977	3	Settat	Netted	1
1 April 1982	1	Massa estuary	Seen	1
29 January 1988	4	Lower Loukkos	Seen	1
11 February 1989	1	Merja Zerga	Seen	1
December 1989–January 1990	3	Merja Zerga	Seen	1
11 January 1990	2	Douyiet	Seen	1
4 November 1990	1	Merja Zerga	Seen	1
5 December 1990	3	Merja Zerga	Seen	1
25 December 1990	1	Lower Loukkos	Seen	1
4–30 January 1993	2	Lower Loukkos	Seen	1
20 December 1993	2	Merja Bargha	Seen	1
4 January 1995	3	Lower Loukkos	Seen	1
7 January 2005	5	Lower Loukkos	Seen	2
28 January 2005	6	Smir wetland	Seen	3
October 2009	7	Lower Loukkos	Netted	4

**Table 2:** Ringing periods with the number of working days, and numbers of captures and (recaptures) of Eurasian Penduline Tits during each season in Smir marshes (the captures include two Spanish-ringed controls)

Season	Year	Period	Working days	Captures (recaptures)
Autumn	2004	15 September–28 November	37	6
	2006	12–26 November	12	10
	2007	18 October–10 November	9	9 (2)
	2008	18 September–27 December	20	1 (1)
Spring	2005	13 March–28 May	25	–
	2006	20 February–26 May	28	1 (1)
	2007	19 February–25 May	35	4 (9)
	2008	16 February–03 June	36	19 (5)

last decades (Delibes et al. 1980, Valera et al. 1990, 1993), the lack of data on wintering Penduline Tits in Morocco, especially since the 1980s, is surprising. The range expansion within Europe most likely included northern Morocco as the few known records suggest (Thévenot et al. 2003, Table 1). It is probable, however, that low observation effort and the scarcity of ringing operations meant that their presence had gone relatively unnoticed.

Despite the methodological limitations due to lack of ringing during the central winter period (December–January), the present data and, particularly, the existence of recaptures from autumn to the following spring suggest that at least some birds overwintered at the Smir wetland. Many winter observations (e.g. a group of six birds, including one with a ring on 28 January 2005, Bensusan et al. 2006), further supports this conclusion. It is also possible that some birds winter as far south as Agadir, where a German-ringed bird was recovered on 30 October 1960 (Thévenot et al. 2003). However, most wintering Penduline Tits have been recorded from the wetlands of north-western Morocco (Table 1).

With the data presented here, the Penduline Tit should be regarded as a regular winter visitor to Morocco. It should be stressed that Penduline Tits are much more common (M Amezian and I Thompson pers. obs.) than the figures presented here suggest. For instance, during our study Penduline Tits, either single individuals or in small flocks, were seen and/or heard almost every day in November and February ringing sessions, and they were also recorded in winter (see above). It is noteworthy that in other North-West African areas (i.e. Maghreb), the species has only been recorded from Tunisia (four records involving 15 birds in the period 1975–1990; Iseemann et al. 2005).

The age-ratio was in favour of juveniles. This was also observed during the expansive phases of the species during the last decades in Spain (Valera et al. 1993, Alcántara et al. 1997). The juveniles lead the winter expansion by colonising new wintering areas and winter further south

than the preceding generation (Valera et al. 1993, Alcántara et al. 1997).

The sex-ratio of birds trapped was biased in favour of males. This could be attributed to sex-related differential wintering, which seems to be the case in the Iberian Peninsula (Alcántara et al. 1997, Villarán 2001, Villarán 2003); however, females would be expected to be more common than males in southern latitudes and males would be expected to remain on or near the breeding area (reviewed in Cristol et al. 1999). It has also been shown that variation in sex-ratio was negatively correlated with population growth (i.e. years with more females followed by years with population growth, Alcántara et al. 1997). However, this could also be attributed to non-biological reasons (e.g. small sample size and differences in catchability between sexes).

The observed proportion of birds trapped in different winter seasons at the Smir wetlands is rather high (13.3%) compared to that observed in a reedbed from central Spain, where Villarán and Pascual-Parra (2003b) obtained only one between-winter recapture out of 100 birds ringed in six seasons between 1982 and 1993 (return rate of 1%). Besides the effect of capture effort on return rate, this difference can also be explained by the fact that Smir is at the very south of the winter distribution of the species in comparison to the Spanish site, and the proportion of overwintering among transient birds is expected to be higher at (or near to) the end of the migratory journey (Cтры et al. 2004). Previous studies showed that many migratory bird species are known to exhibit a rather strong site fidelity to their wintering (Salewski et al. 2000, King and Hutchinson 2001, Villarán and Pascual-Parra 2003a, Bermejo and de la Puente 2004, Markovets and Yosef 2005, Yohannes et al. 2008) and stopover sites (Cantos and Tellería 1994, Merom et al. 2000). The likely advantages of site fidelity to faithful individuals include the use of previous familiarity with the site to acquire better foraging areas as well as for predatory avoidance (Baker 1978).

**Table 3:** Capture history of Eurasian Penduline Tits in Smir marshes with the length of time between the first and the last capture occasion. The duration between recaptures are shown in brackets where appropriate. Age (Euring age codes 3/5 and 4/6 for first-winters and adults, respectively) and sex (F = female, M = male) are shown between brackets after the dates of capture and recapture

Ring number	Initial capture dates	Recapture dates	Days since first capture
AYR749	18 November 2004 (3F)	24 February 2006 (6F) 20 February 2007	463 824 (361)
T221385	13 November 2006 (3)	20 February 2007 (5 F) 24 February 2007	99 103 (4)
T221410	14 November 2006 (3)	20 February 2007 (5F)	98
T221411	14 November 2006 (3)	06 November 2007 (4F)	357
T221418	15 November 2006 (3)	21 February 2007 (5M) 21 February 2008 (6M) 30 October 2008 (4M)	98 463 (365) 715 (252)
T221419	15 November 2006 (3)	20 February 2007 (5F)	97
T221420	15 November 2006 (4M)	20 February 2007 (6M) 24 February 2007	97 101 (4)
T221422	16 November 2006 (3F)	24 February 2007 (5F)	100
BDN867	24 February 2007 (5M)	04 March 2008 (6M)	374
T222112	05 November 2007 (4M)	06 November 2007	1
T222114	05 November 2007 (3)	21/02/2008 (5F) 04 March 2008	108 120 (12)
T222134	09 November 2007 (3)	03 March 2008 (5M)	115

Valera et al. (1993) have suggested a process of expansion based on the association between migration, wintering and expansion of the breeding areas. Wintering, a principal factor in the process, becomes an indicator of future expansion because some of the juveniles that lead the winter expansion may remain behind and colonise new areas during spring (Valera et al. 1993). The Penduline Tit should henceforth be regarded as a regular winter visitor to Morocco, with the possibility that this may be followed by colonisation as a breeder.

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