

# Migration of the Aquatic Warbler *Acrocephalus paludicola* through Morocco: historical records and new evidence from Atlantic coastal wetlands

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## Abstract

The Aquatic Warbler *Acrocephalus paludicola* is a globally threatened long-distance migrant whose occurrence in Morocco remains poorly documented, particularly during post-breeding migration. Historical records document both pre- and post-breeding migration through Morocco, although only nine post-breeding records were reported before 2000, with subsequent targeted surveys resulting in the capture of 11 individuals in the Larache area between 2009 and 2013. More recently, surveys of Moroccan Atlantic wetlands have been conducted within the LIFE AWOM programme, during one of which we captured a juvenile Aquatic Warbler on 28 August 2026 at the Sidi Moussa-Oualidia wetland complex. This new record identifies a further wetland complex on the central Moroccan Atlantic coast as a potential stopover site during post-breeding migration and provides further evidence of the use of Atlantic wetlands by the species. At a time of substantial population decline, documenting the wetlands used along this still poorly known part of the migration route is particularly important for the conservation of the Aquatic Warbler, especially in the context of increasing pressure on water resources and climate change.

**Keywords:** Atlantic flyway; marshland passerines; Sidi Moussa-Oualidia; stopover sites.

The Aquatic Warbler *Acrocephalus paludicola* is a globally threatened long-distance migratory passerine, currently classified as Vulnerable on the IUCN Red List ([BirdLife International 2022](#)), whose breeding population, largely concentrated in eastern Europe, was recently estimated at approximately 4,200 singing males in 2025 ([Tanneberger and Schulze-Hagen 2026](#)). Its known wintering grounds are located in western sub-Saharan Africa ([Schäffer et al. 2006](#)). Available evidence indicates that the species migrates through north-western Africa during both post-breeding and pre-breeding migration ([Schäffer et al. 2006](#)). More recently, light-level geolocator tracking of adult males from breeding populations in Belarus and Ukraine confirmed a south-westward and then westward post-breeding migration route, including staging in the Iberian Peninsula and, for some individuals, in north-western Africa ([Salewski et al. 2019](#)). Despite Morocco's geographical position along this western migration route, information on the occurrence of Aquatic Warblers remains limited. The compilation by [Schäffer et al. \(2006\)](#) identified 37 accepted Moroccan records of Aquatic Warblers, comprising 28 records during pre-breeding migration and nine during post-breeding migration.

Pre-breeding records included seven records in February, 12 in March and nine in April, and were distributed across several regions of Morocco, including the Tangier area, the Trifa Plain and Moulouya estuary, Figuig, the Lower Loukkos marshes near Larache, the Settat area, Barrage de Sidi Saïd Maâchou, and the Oued Massa and Oued Souss estuaries ([Schäffer et al. 2006](#)). Subsequent surveys added further evidence of pre-breeding passage. In the Lower Loukkos marshes near Larache, surveys conducted in 2008 resulted in the capture of two Aquatic Warblers, on 30 March and 1 April, while two additional individuals were observed on 31 March and 2 April ([Onrubia et al. 2009](#)). A further individual was captured in the Lower Loukkos marshes on 31 March 2009 ([Bergier et al. 2010](#)), and an adult was ringed at Aïn Chouk on 11 May 2010 ([Torralvo et al. 2016](#)). More recently, two or three Aquatic Warblers were observed at the Merja Zerga lagoon during an international survey of Moroccan wetlands in March 2024 ([LIFE4AquaticWarbler 2025](#)), and the first LIFE AWOM gap-filling survey in Morocco, conducted from 5 to 20 April 2025, confirmed the presence of the species in the Lower Loukkos ([Wetlands International Europe 2025](#)).

Post-breeding records were historically much scarcer. [Schäffer et al. \(2006\)](#) documented only nine records, with one in August, four in September and four in October, originating from the Essaouira area, including the Mogador Islands, the Trifa Plain and Moulouya estuary, Cape Spartel, the Sebou River and Tamri. In addition, an Aquatic Warbler was recorded approximately 64 km off the Atlantic Saharan coast on 1 September 1962, after landing on a ship at 22°37' N, 17°03' W ([Stam and Voous 1963](#); [Bergier et al. 2012](#)). More recent ringing

surveys conducted at three marshland sites in the Larache area during the autumn migration periods of 2009–2013 resulted in the capture of 11 Aquatic Warblers (Zerdouk et al. 2015; see also Le Névé et al. 2013). Taken together, these records document the occurrence of the Aquatic Warbler in Morocco during both migratory periods and across a broad latitudinal range, from the wetlands of northern Morocco to the Atlantic Sahara. However, available records remain substantially more numerous during pre-breeding than during post-breeding migration. Despite recent targeted surveys, available data remain insufficient to characterise migration through Morocco and to identify the wetlands and habitats that regularly function as stopover sites.

As part of the LIFE AWOM gap-filling effort in Morocco, targeted surveys have recently been conducted during both pre- and post-breeding migration at Oued Massa since spring 2025 and at the Sidi Moussa-Oualidia wetland complex since spring 2026. Within this framework, post-breeding fieldwork was conducted at Sidi Moussa-Oualidia from 28 August to 4 September 2026, during which a juvenile Aquatic Warbler was captured. The survey was conducted at El Hotba marsh, in the municipality of Ouled Ghanem (32.916033° N, 8.814718° W), within the Sidi Moussa-Oualidia wetland complex on the Atlantic coast of Morocco. The sampling area consisted of a mosaic of *Typha angustifolia* and *Schoenoplectus lacustris* stands, bordered by halophytic vegetation dominated by *Salicornia fruticosa* and surrounded by extensive stands of *Juncus acutus* (Figure 1). At the time of the survey, the marsh was dry at the surface, although the soil remained cool and moist in the mist-netting area. Birds were captured using two mist-net lines set within the *Typha* and *Schoenoplectus* stands, totalling 72 m (2 × 36 m). Nets were opened one hour before local sunrise and operated for four hours each morning, except on 2 September, when the session was shortened to two hours because wind speeds exceeded 30 km h<sup>-1</sup>. Aquatic Warbler playback was used following the ACROLA protocol, with one tape lure placed at the centre of each of the two mist-net lines (Julliard et al. 2006).

During this survey, 37 birds belonging to seven species were captured. Passerines of the genus *Acrocephalus* accounted for most captures, with 17 Eurasian Reed Warblers *Acrocephalus scirpaceus*, 12 Sedge Warblers *A. schoenobaenus* and one Aquatic Warbler *A. paludicola*, together representing 30 of the 37 captures (81.1%). The remaining captures comprised three Savi's Warblers *Locustella luscinioides*, two Zitting Cisticolas *Cisticola juncidis*, one Common Nightingale *Luscinia megarhynchos* and one Western Yellow Wagtail *Motacilla flava*. On the morning of 28 August 2026, during the first net check at 07:00, a juvenile (1CY) Aquatic Warbler was found in one of the mist nets (Figure 2). The bird was fitted with a Moroccan metal ring (BB 02 082). Biometric measurements were as follows:

wing length, 63 mm; body mass, 11.0 g; fat score, 4 ([Kaiser 1993](#)); and tarsus length, 20.35 mm, measured according to [Svensson \(1992\)](#) using a dial caliper to the nearest 0.05 mm. The bird was released at the capture site after ringing and measurements.

The capture of a juvenile Aquatic Warbler at Sidi Moussa-Oualidia in August 2026 adds to the scarce evidence of post-breeding passage through Morocco and identifies this Atlantic wetland complex as a potential stopover site during post-breeding migration. The date of 28 August is consistent with the known timing of the species' south-westward migration towards western Africa ([Salewski et al. 2019](#)). Nevertheless, the scarcity of records from Morocco precludes a robust characterisation of local post-breeding migration phenology and limits our ability to identify the wetlands and habitats that regularly function as stopover sites and may therefore represent conservation priorities. Of particular interest is the condition of the habitat at the time of capture. During field surveys conducted at the same site in spring 2026, water levels were high and extensive areas of the marsh were inundated ([Musseau 2026](#)). By late August, no surface water remained in the trapping area, although the soil beneath the *Typha* and *Schoenoplectus* stands remained cool and moist. These conditions followed an exceptionally wet winter in Morocco. According to data from the Direction Générale de la Météorologie (DGM), mean national precipitation during December 2025–February 2026 reached 136 mm, almost twice the 1991–2020 winter average of 71 mm, making it the third wettest winter since 1981, with 41 rainy days recorded at El Jadida during the same period, the highest number on record for this station ([Médias24 2026](#)).

The high spring water levels observed at Sidi Moussa-Oualidia may have contributed to maintaining residual soil moisture within the *Typha* and *Schoenoplectus* stands into late summer. Such vegetation falls within the range of wetland habitats known to be used by Aquatic Warblers during migration ([Schäffer et al. 2006](#)). More broadly, the Sidi Moussa-Oualidia wetland complex is a Ramsar site of international importance and comprises a mosaic of coastal lagoons, salt marshes, and fresh to brackish marshes ([El Hamoumi et al. 2022](#); [Ramsar Convention 2025](#)). Its hydrological functioning is subject to substantial anthropogenic pressures, particularly those associated with intensive agriculture and groundwater abstraction for irrigation ([El Himer et al. 2013](#); [Ramsar Convention 2025](#)). The wetland is partly groundwater-fed, with groundwater discharge providing freshwater inputs to the lagoons, while the regional aquifer is affected by salinisation, particularly in the coastal zone where seawater intrusion contributes to elevated groundwater salinity ([El Himer et al. 2013](#)).

The situation at Sidi Moussa-Oualidia reflects a broader issue concerning the future functioning of wetlands along the Moroccan Atlantic coast. Several of these systems occur in regions where water resources are under substantial pressure from intensive irrigated agriculture and groundwater abstraction, compounded by recurrent droughts and climatic variability (Bouchaou et al. 2008; Hssaisoune et al. 2020). This is also the case in the Souss-Massa basin, where intensive groundwater abstraction for irrigation has contributed to declining groundwater levels and salinisation (Bouchaou et al. 2008). At Oued Massa, these pressures are compounded by upstream river regulation, with the Youssef Ben Tachfine dam having substantially modified river flows and the functioning of the estuary-lagoon system (Fox et al. 2001; El Bekkay et al. 2014). Although their hydrological settings differ, Sidi Moussa-Oualidia and Oued Massa therefore illustrate a broader question concerning the capacity of Moroccan Atlantic wetlands to maintain the hydrological conditions, vegetation structure and trophic resources required by migratory marshland passerines under substantial constraints on water availability.

For the Aquatic Warbler, this question may be particularly relevant because Morocco lies along the migration route connecting European breeding populations with sub-Saharan wintering grounds, while the distribution and persistence of suitable stopover habitats within the country remain poorly understood. The conservation issue may therefore extend beyond identifying where Aquatic Warblers occur during migration to understanding whether the network of Atlantic wetlands potentially available to them will continue to provide suitable stopover conditions under increasing constraints on water availability. Further standardised surveys combining information on wetland hydrology, vegetation and trophic resources would help assess the role of Moroccan Atlantic wetlands as stopover sites for marshland passerines and how this role may change with future water availability.

## **Acknowledgements**

The summer 2026 survey at Sidi Moussa-Oualidia was carried out within the framework of the LIFE AWOM programme (LIFE23-NAT-NL-LIFE-AWOM/101148382) by BioSphère Environnement and the Institut Scientifique, Mohammed V University in Rabat. We are grateful to Alejandro Onrubia (Fundación Migres), Christine Blaize and Mallaury Lacombe (Bretagne Vivante – SEPNEB) for facilitating the survey and providing financial support within the LIFE AWOM programme. The LIFE AWOM project is co-funded by the European Union through the LIFE Programme. We sincerely thank the Agence Nationale des Eaux et Forêts (ANEF) of the Kingdom of Morocco for granting the authorisation required to conduct bird capture and ringing activities (Permit No. 38/25 ANEF/DPNAPPN/DPNAP/SCFF).

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## **Disclosure statement**

The authors report no conflicts of interest.

## **Generative AI statement**

Generative AI was used for improvement of English phrasing. All scientific content, interpretations and references were reviewed and verified by the authors, who take full responsibility for the final content of the manuscript.

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Figure 1. Habitat at the capture site at El Hotba marsh, Ouled Ghanem, within the Sidi Moussa-Oualidia wetland complex, Morocco. © BioSphère Environnement (2026).



Figure 2. Juvenile (1CY) Aquatic Warbler *Acrocephalus paludicola* captured at Sidi Moussa-Oualidia on 28 August 2026. © BioSphère Environnement (2026).