

# The African migration and wintering grounds of the Aquatic Warbler *Acrocephalus paludicola*

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## Summary

There is a clear need for protection of the migration and wintering grounds of the Globally Threatened Aquatic Warbler *Acrocephalus paludicola*, but little is known about them and the threats they face. To narrow this gap, a desk study was performed between May 1998 and October 2004. Information on known wintering grounds was sought by means of questionnaires, personal communications, ringing data, publication and internet searches. Results show that the Aquatic Warbler has so far been recorded in nine African countries, but with recent records since 1980 from only five countries (Egypt, Ghana, Mauritania, Morocco and Senegal). All present data suggest that the Aquatic Warbler migrates through north-west Africa in autumn and spring, with the wintering grounds limited to wetlands of western sub-Saharan Africa, with verified records only from Mauritania, Mali, Senegal and Ghana during the months of August to April. The species was almost always found in habitats similar to that of its breeding grounds, i.e. in *Carex*, *Juncus* or *Phragmites* (sedge, rush and reed) associations, but also in dense grasses, shrubs and other vegetation found in freshwater marshes, flooded or wet meadows, and along the edges of backwaters, flood basins, lagoons, lakes, ponds, rivers and wadis. Recent research suggests that at least some Aquatic Warblers may actually winter further south than the present data suggest, in countries such as The Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo and Benin, or maybe even in so far unexplored wetlands in Central or East Africa. Because wetlands throughout Africa face imminent threats from agricultural and tourist development, more fieldwork is urgently needed to further pinpoint the migration and wintering grounds of the Aquatic Warbler.

## Introduction

The Aquatic Warbler *Acrocephalus paludicola* is classified as Vulnerable by BirdLife International (2004) and is thus the most threatened passerine of continental Europe. Although much is known about its Palearctic breeding grounds, the same cannot be said of its African migration and wintering grounds. The published species action plan (Heredia *et al.* 1996) and recent updates of this original plan (Aquatic Warbler Conservation Team 1999, Convention on Migratory Species 2003) regard the threat of habitat loss in winter quarters as unknown and the need for protection of this species' winter habitats as high. While the protection and active management of key breeding grounds of the Aquatic Warbler (e.g. in Belarus) has been quite successful (BirdLife International 2004), a fundamental threat to the survival of this habitat specialist could still lie in the wintering grounds and potentially destroy the conservation success in the breeding grounds.

A desk study into the African wintering grounds of the Aquatic Warbler was initiated in May 1998 and finished in October 2004. The aim was to collect all available records, in the hope that with more information of winter quarters available, more can be done to conserve this threatened species. Despite the considerable effort of this desk study, we do not consider our findings as conclusive but hope that this report will promote further discussion and study. We would like to ask anyone who has any additional information about the wintering grounds of the Aquatic Warbler to contact us.

## Methods

### *Data acquisition*

We designed a short questionnaire and sent it to a wide range of African contacts that included BirdLife Partners and BirdLife Representatives, Wetlands International Country Co-ordinators, private individuals with expert African knowledge and natural history museums. A literature search was conducted and details sought of ringing recoveries in any African country. We also contacted tour operators who run holidays in the relevant areas and members of the African Bird Club. We further carried out an internet search. Around 100 requests for information were made, and the response was very encouraging at around 50% (see Acknowledgements). In addition to these efforts, a research project at the Zoological Museum, University of Copenhagen (Walther and Rahbek 2002) also acquired information by contacting over 200 individuals or organizations via mail, e-mail or telephone requesting data or references. Almost 100 people and almost all European and African ringing schemes responded and sent data, references or contact addresses (see Acknowledgements).

### *Data entry*

We entered each record into an ACCESS database with the following information:

- Sex (unknown, male or female).
- Age (using the official EURING codes).
- Number of individuals recorded (if no information was given on the number of individuals, the entry was always “equal to or greater than 1”);
- Reliability of record, classified as (1) specimen collected, (2) bird caught and released, (3) published record and (4) unpublished record; in categories 3 and 4, we further distinguish between “observed” records (i.e. the species was visually observed) and “recorded” records (i.e. the species was recorded but we do not know how).
- Habitat: we tried to stay as close to the original description as possible, but usually edited and, in many cases, translated the habitat descriptions of the original sources.
- Date.
- Locality.
- Geographical coordinates of each locality were established as follows: if the source did not provide coordinates, we consulted the *Times Atlas* (Bartholomew 1956, Anonymous 2001), various other printed gazetteers, or the internet-based gazetteer of the National Imagery and Mapping Agency (2003); if these modern

Table 1. Records of the Aquatic Warbler per decade for three regions (in our case, Macaronesia refers to the Azores and Canary Islands).

| Decade | Macaronesia | Africa   | Middle East | Total    |
|--------|-------------|----------|-------------|----------|
| 1860s  | –           | – (2?)   | –           | – (2?)   |
| 1870s  | –           | 1        | –           | 1        |
| 1880s  | –           | –        | –           | –        |
| 1890s  | –           | –        | –           | –        |
| 1900s  | 1           | – (1?)   | –           | 1 (1?)   |
| 1910s  | –           | 2        | –           | 2        |
| 1920s  | –           | 1        | –           | 1        |
| 1930s  | 1           | 1        | –           | 2        |
| 1940s  | –           | 2        | –           | 2        |
| 1950s  | –           | 7        | –           | 7        |
| 1960s  | –           | 11       | 1           | 12       |
| 1970s  | 1           | 31 (1?)  | –           | 32 (1?)  |
| 1980s  | 4           | 24 (1?)  | –           | 28 (1?)  |
| 1990s  | 3           | 35       | 1           | 39       |
| 2000s  | –           | 4        | –           | 4        |
| Total  | 10          | 119 (5?) | 2           | 131 (5?) |

Records in parentheses with a question mark denote those records where we made a best guess at the date of the record, although this was not possible for two records from Tunisia; we also *a priori* excluded five other records (see Appendix for details).

gazetteers provided better coordinates than the original sources, we corrected the coordinates provided by the original sources.

- Sources (published references or persons who communicated the record).

## Results

### *Aquatic Warbler records per decade*

Table 1 shows the total number of African, Macaronesian and Middle Eastern records per decade beginning with the 1860s. During the nineteenth century, Aquatic Warblers were recorded only in Morocco (Drake 1867), Egypt (von Heuglin 1869) and Algeria (Gurney 1871). Records from Africa were also scarce during the first half of the twentieth century. In the second half of the twentieth century, however, records started to pick up once ringing programmes and atlas work were started in the 1970s and resulted in a substantial increase in observations. Since 2000, only four Aquatic Warblers have been recorded, either because the observational effort has declined, the species has declined, or the most recent records have not reached us yet.

### *Aquatic Warbler records country by country*

We tried to obtain information for all African, Macaronesian and Middle Eastern countries that may provide migration and wintering grounds for the Aquatic Warbler. To the best of our knowledge, Aquatic Warblers have been recorded in only nine African countries (Algeria, Egypt, Ghana, Mali, Mauritania, Morocco, Senegal, Tunisia and Western Sahara), the Canary Islands, and two Middle Eastern countries (Jordan and Turkey). The records country by country are the following (for details, see Appendix and Table 2):

Table 2. Migration of the Aquatic Warbler across African countries and the Canary Islands (with countries roughly arranged from north to south and east to west).

| Country        | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Total   |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------|
| Egypt          | –   | –   | –   | 2   | –   | –   | –   | 1   | 1   | 1   | –   | 5 (2)   |
| Tunisia        | –   | –   | –   | 1   | –   | –   | –   | –   | 1   | 6   | 1   | 9 (2)   |
| Algeria        | –   | –   | –   | 1   | –   | –   | –   | 1   | 2   | 4   | 1   | 9       |
| Morocco        | –   | 1   | 4   | 4   | –   | –   | –   | 7   | 12  | 9   | –   | 37 (2)  |
| Canary Islands | –   | 1   | 2   | –   | –   | –   | –   | 2   | 4   | 1   | –   | 10      |
| Western Sahara | –   | –   | 1   | –   | –   | –   | –   | –   | –   | –   | –   | 1       |
| Mauritania     | –   | 1   | 13  | 12  | 3   | 1   | –   | 1   | 7   | 2   | –   | 40      |
| Mali           | –   | –   | –   | –   | 2   | 3   | –   | –   | –   | –   | –   | 5       |
| Senegal        | –   | –   | –   | –   | –   | 4   | 2   | 4   | 5   | –   | –   | 15 (1)  |
| Ghana          | –   | –   | –   | –   | 1   | –   | –   | –   | –   | –   | –   | 1       |
| Total          | –   | 3   | 19  | 20  | 6   | 8   | 2   | 16  | 31  | 23  | 2   | 132 (7) |

For each month, the number of records in the respective country is given. The total number of records for each month is given in the bottom row, and the total number of records for each country is given in the last column, with the number of records that were excluded or without information on month given in parentheses (see Appendix for details). The records from the Azores, Cyprus, Jordan and Turkey are not included.

**Algeria:** One very old and undocumented record from Laghouat (Gurney 1871), an old specimen from Touggourt, and seven more recent records at Réghaïa in February, April, May and October (Ledant *et al.* 1981).

**Azores:** Listed as “accidental” in Cramp (1985–1992) and Snow and Perrins (1998). The likely source of this record is the *Birds of the Western Palearctic* contact person at the time, Gerald Le Grand, Universidade dos Acores in Ponta Delgada (Mike Wilson *in litt.* 2004). However, no official record has been registered with the Portuguese Rarities Committee (Gonçalo Elias *in litt.* 2004), so this record remains unconfirmed.

**Canary Islands:** Ten records during the months of August, September, February, March and April (Martín and Lorenzo 2001). Bannerman (1920) also mentions an old record (Webb *et al.* 1842) giving Gran Canaria as the species’ habitat, but without any further information, so that Martín and Lorenzo (2001) consider this record as doubtful.

**Cyprus:** Only one unconfirmed record (Flint and Stewart 1992).

**Egypt:** Two very old, undated and undocumented records, one describing the species as “occasional” during the winter in lower Egypt (von Heuglin 1869) and another one as “fairly common” in the Nile Valley (Whymper 1909), and another five records between 1943 and 1992. Goodman and Meininger (1989) reject the Aquatic Warbler from the Egyptian list because “specimen, photographic, or observational details are lacking, vague, or at fault”, but without giving a detailed argument. Given the number of records and Meiklejohn’s (1944) statement that “the bird, which moreover can scarcely be confused with any other warbler, was very tame and excellent views of it were secured”, we cautiously include these records in our analysis.

**Ghana:** One record in November (Hedenström *et al.* 1990, Bensch *et al.* 1991).

**Jordan:** One record in May (Andrews 1995).

**Mali:** Five records in November and December (Lamarche 1981, B. Lamarche *in litt.* 2004).

**Mauritania:** Forty records from August–December and February–April (Lamarche 1988, B. Lamarche and V. Salewski *in litt.* 2004).

**Morocco:** About 37 records from August–October and February–April (most likely more, as data often refer to “many” but do not specify exact numbers). The species was first collected near Tangier in March 1867 (Drake 1867) and caught near Essaouira in September 1911 (Lozano 1911), and was regularly sighted during autumn and spring passage at Ras El Ma and the Mouloya estuary in the 1950s (Brosset 1956, 1961, Thévenot *et al.* 2003). Most of the remaining records stretching from 1963 to 1998 are summarized in Thévenot *et al.* (2003).

**Senegal:** About 15 records from December–March (most likely more, as data often refer to “many” but do not specify exact numbers) together with one undated record, all from inside the Djoudj National Park where several ringing programmes were conducted.

**Tunisia:** Nine records from October and March–May, together with one undated and undocumented “summer” record (Heim de Balsac and Mayaud 1962). The earliest records are specimens collected by the hunter-naturalist Blanchet in 1917 and 1932 (Blanchet 1955, Thomsen and Jacobson 1979), with six further records between 1949 and 1969. Gouttenoire (1955) described the species as a “regular” migrant.

**Turkey:** One specimen was held in the Robert’s College collection (Istanbul) but has been lost (Kirwan 1997). Unsupported records concern one (or several) autumn specimens given to Braun, observations around Izmir (without dates) and one individual sighted by Smith west of Trabzon in June 1958 (Kumerloeve 1961). The only verifiable record is of one individual observed near Anamur on 5 September 1991 (Kirwan 1992, 1995).

**Western Sahara:** One record of an individual landing on a ship on 1 September 1962 near the Western Saharan coast (Stam and Voous 1963, Tuck 1964).

For the following countries, no records were found in the relevant publications and no records came forth from answers to our questionnaire: Angola (Harrison *et al.* 1997); Benin (Green and Sayer 1979); Botswana (Newman 1992); Chad (Salvan 1967–1969); Congo (Urban *et al.* 1997); Djibouti (Ash 1985); Ethiopia (Urban *et al.* 1997); Equatorial Guinea (Serle *et al.* 1977); Gabon (Brosset and Erard 1986); The Gambia (Gore 1990); Guinea-Bissau (Serle *et al.* 1977); Ivory Coast (Thiollay 1985); Kenya (Britton 1980); Libya (Bundy 1976); Liberia (Gatter 1997); Lesotho (Ambrose and Maphisa 1999); Mozambique (Newman 1992); Namibia (Urban *et al.* 1997); Niger (Giraudoux *et al.* 1988); Nigeria (Elgood *et al.* 1994); Somalia (Ash and Miskell 1998); South Africa (Newman 1992, Harrison *et al.* 1997); Swaziland (Newman 1992); Togo (Cheke and Walsh 1996); Uganda (Urban *et al.* 1997); Zaire (Urban *et al.* 1997); Zambia (Benson *et al.* 1971); and Zimbabwe (Irwin 1981). For the following countries, no records were found in the relevant publications and no reply was received to our questionnaire: Burkina Faso (Green and Sayer 1979); Burundi (Gaugris 1981); Cameroon (Louette 1981); Central Africa Republic (Carroll 1988); Eritrea (Smith 1957); Guinea (Morel and Morel 1988); Malawi (Newman *et al.* 1992); Rwanda

(Schouteden 1966); Sierra Leone (Urban *et al.* 1997); Sudan (Nikolaus 1987); and Tanzania (Britton 1980).

#### *Aquatic Warbler records by month*

Table 2 shows that the Aquatic Warbler has never been observed in Africa or Macronesia in July (except for an undated and undocumented Tunisian “summer” record cited by Heim de Balsac and Mayaud 1962). During autumn (August–October) and spring (February–May) migration, the species has been observed in five North African countries (Egypt, Tunisia, Algeria, Morocco and Western Sahara) and the Canary Islands. However, from November through to January, the Aquatic Warbler has been recorded only in Sahel countries (Mauritania, Mali, Senegal and Ghana) with no records from countries north of the Sahel zone (except for the very old, undated and undocumented Egyptian “winter” record by von Heuglin 1869). The Aquatic Warbler reaches the northern Sahel zone in Mauritania in August, moves further south to Mali, Senegal and Ghana from November to March, and leaves the northern Sahel zone in Mauritania in April.

#### *Aquatic Warbler records by type*

Records are of three types: specimens (10 records), ringing records (24 records but most likely more, as data often refer to “many” but do not specify exact numbers), with the remaining 109 records being sight observations or unspecified records. Confusion with the Sedge Warbler *Acrocephalus schoenobaenus* is certainly a possibility for all the observational records (e.g. record 108 in the Appendix), but given the experience of most fieldworkers, this should be a minor problem.

#### *Aquatic Warbler habitats and vegetation*

In general, the descriptions of the habitats and vegetation that the Aquatic Warbler uses during migration and wintering are similar to those of its breeding grounds. It is most commonly recorded in *Carex*, *Juncus* or *Phragmites* (sedge, rush and reed) associations, but also in dense grasses, shrubs and other vegetation found in freshwater marshes, flooded or wet meadows, and along the edges of backwaters, flood basins, lagoons, lakes, ponds, rivers and wadis. Quite frequently, it has been observed in the scattered bushes and shrubs found within these habitats, e.g. in *Avicennia africana* (mangrove), *Acacia ataxacantha* (= *Mimosa pigra*), *Acacia nilotica*, *Acacia raddiana*, *Nitraria retusa*, *Salvadora persica* (mustard or toothbrush tree) and *Tamarix* sp. (tamarisks or salt cedars). On migration, it has also been observed in a reed-filled ditch, salt marshes, coastal dunes and offshore bars with *Nitraria retusa*, *Salicornia* sp. and *Tamarix* sp., vegetation around a fresh water pool in an oasis, a palm plantation, gardens (e.g. once inside a *Papyrus* stand inside a hotel garden), and even in a mosque enclosure with a single tree surrounded by desert and on an ocean-going ship.

## **Discussion**

Only a century ago, the Aquatic Warbler was a widespread species in Europe and western Siberia. The translations of two of its German common names are “sparrow

of the reeds" (Wawrzyniak and Sohns 1977) or "sparrow of the fens" (M. Flade and L. Lachmann *in litt.* 2004), suggesting how numerous this species once may have been. Most of the Aquatic Warbler's habitat was drained and destroyed in western and southern Europe during the first half of the twentieth century, and consequently the species disappeared from The Netherlands, Belgium, France, southern Germany, Italy, Yugoslavia, Bulgaria and Romania (Glutz von Blotzheim 2001). The second half of the twentieth century saw massive draining projects in the remaining core breeding area of the Aquatic Warbler, with an estimated loss of 80–90% of the total breeding habitat (Aquatic Warbler Conservation Team 1999, BirdLife International 2004, M. Flade *in litt.* 2004), taking this species to the brink of global extinction.

Curiously, however, the African records of the Aquatic Warbler do not reflect this trend. While Aquatic Warbler records were very rare until the middle of the twentieth century, when the species was still rather numerous in its breeding range, the records in Africa increased in the second half of the twentieth century (Table 1), just as European populations collapsed. These opposing trends are almost certainly the result of increased ornithological fieldwork in Africa stemming from implementing ringing programmes (e.g. Smith 1979, Loske 1990, Ottosson *et al.* 2001), the compilation of atlases and checklists (e.g. Morel and Roux 1966a–c, Thomsen and Jacobson 1979, Morel 1980, Lamarche 1980, 1981, 1988, 1993, 1994, Morel and Morel 1988, 1990, Rodwell *et al.* 1996, Sauvage and Rodwell 1998, Isenmann and Moali 2000, Martín and Lorenzo 2001, Thévenot *et al.* 2003) and the resulting increased knowledge of African migration and wintering grounds of the Aquatic Warbler.

The geographical distribution of the wintering records (Table 2) probably also partly reflects the intensity of ornithological fieldwork rather than the real distribution of the birds in winter. For example, there are more records from Djoudj National Park in Senegal than from the Niger inundation zone in Mali, although the inundation zone is a much larger and possibly more important wintering site than Djoudj National Park. Despite the obvious limitations of the present data, we can conclude that Aquatic Warblers migrate through north-western Africa in the autumn and spring but winter exclusively in the sub-Saharan Sahel zone, as no records further north are known for the months of November to January (except for the somewhat dubious Egyptian "winter" record by von Heuglin 1869).

The entire sub-Saharan distribution remains relatively obscure because of the paucity of records. At present the only verified wintering countries of the Aquatic Warbler are Mauritania, Mali, Senegal and Ghana. The Ghana record, being the most southern by more than 1.5 degrees latitude, may actually be a vagrant record of a juvenile bird overshooting the usual wintering range. However, the Ghana record may also hint at the possibility that at least some Aquatic Warblers may actually winter further south in countries such as The Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo and Benin. Two lines of evidence support such a supposition. First, while birds have been observed in Mauritania and Mali in November and December, there are no January records for these countries. Unless all these birds migrate west to winter in Senegal, which seems unlikely, they probably move on to wintering grounds further south. Second, recent research on stable isotopes in moult feathers of Aquatic Warblers suggests that more easterly breeding populations (e.g. from Belarus) leapfrog more westerly breeding populations (e.g. from Poland) in their winter quarters and may winter as far south as 5 °N (Pain *et al.*

2004), which is almost 6 degrees latitude further south than the Ghana record. Therefore, there is a chance that future fieldwork in the aforementioned southern countries may find unknown wintering sites.

Finding new wintering sites further south would not only help conservation efforts but would also improve predictions from so-called inductive distribution models (Corsi *et al.* 2000). Using the available wintering records, Walther *et al.* (in preparation) modelled the sub-Saharan distribution of the Aquatic Warbler using the so-called BIOCLIM algorithm (for methodology, see Walther *et al.* 2004). The resulting distribution model suggested that suitable habitats for the Aquatic Warbler are found in a broad band stretching right across the Sahel, from the delta of the Senegal river and the Niger inundation zone all the way to Lake Chad. However, the results of this distribution model would be misleading if Aquatic Warblers have so far been overlooked in the more southern regions of West Africa.

During the autumn migration, Aquatic Warblers apparently head west/south-west via western Europe and then south through the Iberian Peninsula to West Africa (Mester 1967, Cramp 1985–1992, de By 1990, Schulze-Hagen 1993, Aquatic Warbler Conservation Team 1999, Atienza *et al.* 2001, Glutz von Blotzheim 2001). An alternative flyway has been suggested via the Middle East and Egypt south towards Lake Chad, the Salamat wetlands in south-eastern Chad, the Sudd swamps along the White Nile, the Likouala wetlands north of the Congo river, or even the vast Malagarasi-Muyovozi wetlands in north-western Tanzania, all of which are possible locations for undetected Aquatic Warbler populations. The few records from the Middle East and Egypt (see Appendix) as well as Greece and Crete (Handrinos and Akriotis 1997) may suggest such a flyway. However, despite past and present ringing projects (Dowsett 1969, Ottosson *et al.* 2002), no records from Lake Chad have emerged, nor from any other Central or East African source (see Results section). Furthermore, research on stable isotopes of moult feathers suggests that all breeding populations, even easterly ones, migrate through western Europe to West Africa (Pain *et al.* 2004). Given the present evidence, an eastern African flyway is very unlikely, and all evidence suggests that the wintering grounds of the Aquatic Warbler are indeed limited to West African wetlands. However, there remains the intriguing possibility that a hitherto unknown Siberian population of Aquatic Warbler does not migrate through western Europe towards West Africa, but through Egypt to some Central or East African wintering grounds. Only further fieldwork in these often almost inaccessible, and therefore mostly unexplored, wetlands of Central and East Africa may verify such a supposition.

Further fieldwork would not only improve knowledge of wintering sites, but also shed more light on the migration of the Aquatic Warbler. For example, M. Herremans (*in litt.* 2004) used sound-luring (including song of the Aquatic Warbler) to ground- and mist-net birds on a nightly basis from 6 April to 13 May and 29 August to 24 September 2003 in the Adrar mountains in north-central Mauritania and from 29 September to 26 October 2003 along the coast just north of Nouakchott, Mauritania. During that period, he ringed *c.* 9750 Palarctic migrants, but no Aquatic Warblers. Because the Aquatic Warbler is easily sound-lured during migration at other locations, e.g. in Belgium, these negative observations probably mean that Aquatic Warblers do not migrate during these time periods in these Mauritanian regions (or alternatively migrate in such low numbers that they have escaped capture so far, or are simply immune to sound-luring at this stage of their migration). However, V.



Salewski (*in litt.* 2004) left 51 net-metres open from approximately 08h30 to 11h00 hours on 4 September 2001 near Nouakchott in Mauritania and caught only five Palarctic migrants, but the first one was an Aquatic Warbler! These two examples illustrate that negative as well as positive records add to our knowledge of the migration of the Aquatic Warbler.

Just as on their breeding grounds, Aquatic Warblers are almost invariably associated with various wetland types on their migration and wintering grounds. Conservation of wetland habitats on breeding, migration and wintering grounds thus appears crucial for the long-term survival of this species. Wetlands throughout Africa face imminent threats from agricultural and tourist development, pollution, droughts, and invasive species (<http://www.iucn.org/themes/wetlands/map.html>). Wetlands throughout the Mediterranean, including Ramsar sites, are disappearing because of tourist development and increased extraction of drinking water (De Stefano 2004). For example, in the 1950s the Aquatic Warbler was regularly recorded in Morocco at the Ras El Ma site and the Moulouya estuary (Brosset 1956, 1961); the former does not exist anymore (M. Thévenot *in litt.* 2004) while the latter is under severe threat from planned tourist developments (De Stefano 2004) and water extraction (Snoussi 2004) but still lacks any formal protection. Likewise, the Lower Loukkos marshes, where the Aquatic Warbler was recorded in the 1980s (see Appendix), are presently without protection (Gil de Vergara and Ripoll 2001). Dams, drainage projects and the resulting agricultural intensification in the Senegal and Niger river basins have had severe adverse effects on wetland habitats (<http://www.iucn.org/themes/wetlands/map.html>), such as the succession of wet grasslands into shrubbery resulting from dams separating the grasslands from the rivers (H. Hötter *in litt.* in Schulze-Hagen 1993). However, overgrazing of wet grasslands may perhaps be the most severe threat (S. Rumsey *in litt.* in Schulze-Hagen 1993). Furthermore, habitats may be destroyed by droughts as well as irrigation, resulting in salted soils (Schulze-Hagen 1993). While exact data are not available, fieldworkers visiting the wintering grounds of the Aquatic Warbler in the 1980s and 1990s witnessed habitat deterioration and loss at an alarming pace and extent (Schulze-Hagen 1993). Therefore, wetland protection at key migration and wintering sites should not be delayed, and the underlying causes of habitat loss, such as expanding agriculture and tourism, need to be addressed.

More research is still needed to close the painful gap in the knowledge about the migration and wintering grounds of the Aquatic Warbler. It is certainly very difficult to find Aquatic Warblers in Africa through field surveys, but the results from this study and two other studies (Pain *et al.* 2004, Walther *et al.* in preparation) are narrowing down the area and the habitats in which to look for them.

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## References

- Álamo Tavío, M. (1975) Avifauna Canaria. Inventario de las aves de Canarias orientales. Pp. 71–96 in G. Kunkel, ed. *Inventario de los recursos naturales renovables de la Provincia de Las Palmas (Islas Canarias, España)*. IUCN/WWF Project No. 817 (37-2).
- Ambrose, D. and Maphisa, D. H. (1999) *Guide to the Birds of the Roma Campus, National University of Lesotho*. Roma, Lesotho: National University of Lesotho Publishing House.
- Andrews, I. J. (1995) *The Birds of the Hashermite Kingdom of Jordan*. Musselburgh: I. J. Andrews.
- Anonymous (1996) Western Palearctic news: Morocco. *Bird. World* 9: 136.
- Anonymous (1997) Western Palearctic News: Canary Islands. *Bird. World* 10: 92.
- Anonymous, ed. (2001) *The Times Comprehensive Atlas of the World*. London: Times Book Group.
- Aquatic Warbler Conservation Team (1999) World population, trends and conservation status of the aquatic warbler *Acrocephalus paludicola*. *Vogelwelt* 120: 65–85.
- Ash, J. S. (1985) Midwinter observations from Djibouti. *Scopus* 9: 43–49.
- Ash, J. S. and Miskell, J. E. (1998) *Birds of Somalia*. Yale: Pica Press.
- Atienza, J. C., Pinilla, J. and Justribó, J. H. (2001) Migration and conservation of the aquatic warbler *Acrocephalus paludicola* in Spain. *Ardeola* 48: 197–208.

- Bannerman, D. A. (1920) List of the birds of the Canary islands, with detailed reference to the migratory species and the accidental visitors. Part VI. Appendix A–Appendix B. *Ibis* 11: 323–360.
- Bannerman, D. (1932) Note. *Bull. Brit. Ornithol. Club* 52: 52–55.
- Bartholomew, J., ed. (1956) *The Times Atlas of the World*. Volume IV: *Southern Europe and Africa*. London: The Times Publishing Company.
- Bensch, S., Hasselquist, D., Hedenström, A. and Ottosson, U. (1991) Rapid moult among palaeartic passerines in West Africa: an adaptation to the oncoming dry season? *Ibis* 133: 47–52.
- Benson, C. W., Brooke, R. K., Dowsett, R. J. and Irwin, M. P. S. (1971) *The Birds of Zambia*. London: Collins.
- Bergier, P., Franchimont, J. and Thévenot, M. (2000a) Les oiseaux rares aux Maroc. Rapport de la Commission d'Homologation Marocaine numéro 4 (1998). *Porphyrio* 12: 36–46.
- Bergier, P., Franchimont, J., Thévenot, M. and Committee, M. R. B. (2000b) Rare birds in Morocco: report of the Moroccan Rare Birds Committee (1995–1997). *Bull. ABC* 7: 18–28.
- Bergier, P., Franchimont, J. and Thévenot, M. (2002) Rare birds in Morocco: report of the Moroccan Rare Birds Committee (1998–2000). *Bull. ABC* 9: 122–132.
- BirdLife International (2004) *Threatened birds of the world 2004*. CD-ROM. Cambridge, U.K.: BirdLife International.
- Blanchet, A. (1955) Les oiseaux de Tunisie. Liste revue, corrigée et complétée (novembre–décembre 1943). Ouvrage revu, annoté et mis à jour en 1954 par: H. Heim de Balsac, J. Cantoni, R. Deleuil, M. G. Gouttenoire. *Mém. Soc. Sci. Nat. Tunis* 3.
- Britton, P. L. (1980) *Birds of East Africa: Their Habitat, Status and Distribution*. Nairobi, Kenya: EANHNS.
- Brosset, A. (1956) Les oiseaux du Maroc oriental de la Méditerranée a Berguent. *Alauda* 24: 161–205.
- Brosset, A. (1961) Écologie des oiseaux du Maroc oriental. *Trav. Inst. Scient. Chérif. Ser. Zool.* 22: 1–155.
- Brosset, A. and Erard, C. (1986) *Les Oiseaux des Régions Forestières du Nord-Est du Gabon*. Paris: Société Nationale de Protection de la Nature.
- Bundy, G. (1976) *The Birds of Libya: An Annotated Check-list*. London: British Ornithologists' Union (BOU Check-list no. 1).
- Carroll, R. W. (1988) Birds of the Central African Republic. *Malimbus* 10: 177–200.
- Cheke, R. A. and Walsh, J. F. (1996) *The Birds of Togo: An Annotated Check-list*. Tring: British Ornithologists' Union (BOU Check-list no. 14).
- Concepción, D. (1992) *Avifauna del Parque Nacional de Timanfaya. Censo y Análisis*. Madrid: Red de Parques Nacionales. ICONA.
- Convention on Migratory Species (2003) *Action Plan Concerning Conservation Measures for the Aquatic Warbler Acrocephalus paludicola. Annex to the Memorandum of Understanding concerning Conservation Measures for the Aquatic Warbler (Acrocephalus paludicola) under the Convention on Migratory Species (CMS)*.
- Corsi, F., de Leeuw, J. and Skidmore, A. (2000) Modeling species distribution with GIS. Pp. 389–434 in L. Boitani and T. K. Fuller, eds. *Research Techniques in Animal Ecology: Controversies and Consequences*. Second edition. New York: Columbia University Press.
- Cramp, S., ed. (1985–1992) *The Birds of the Western Palearctic*. Volumes 4–6. Oxford: Oxford University Press.
- Curry, P. J. and Sayer, J. A. (1979) The inundation zone of the Niger as an environment for Palearctic migrants. *Ibis* 121: 20–40.
- de By, R. A. (1990) Migration of aquatic warbler in western Europe. *Dutch Birding* 12: 165–181.
- De Stefano, L. (2004) *Freshwater and Tourism in the Mediterranean*. Rome: WWF Mediterranean Programme.
- Dowsett, R. J. (1969). BOU-supported research at Lake Chad in 1968. *Ibis* 111: 449–452.

- Drake, C. F. T. (1867) Notes on the birds of Tangier and Eastern Morocco. *Ibis* 2: 421–430.
- Duhart, F. and Descamps, M. (1963) Notes sur l'avifaune du delta central Nigérien et régions avoisinantes. *L'Oiseau et RFO* 33 (Special Issue): 1–106.
- Elgood, J. H., Heigham, J. B., Moore, A. M., Nason, A. M., Sharland, R. E. and Skinner, N. J. (1994) *The Birds of Nigeria: An Annotated Check-list*. Second edition. London: British Ornithologists' Union (BOU Check-list no. 4).
- Flint, P. R. and Stewart, P. F. (1992) *The Birds of Cyprus: An Annotated Check-list*. Second edition. Tring, U.K.: British Ornithologists' Union (BOU Check-list no. 6).
- Gatter, W. (1997) *The Birds of Liberia*. Yale: Pica Press.
- Gaugris, Y. (1981) Additions et corrections à l'avifaune du Burundi. *Gerfaut* 71: 3–39.
- Gee, J. P. (1984) The birds of Mauritania. *Malimbus* 6: 31–66.
- Gil de Vergara, C. V. and Ripoll, M. G. (2001) *Action Plan for the Conservation of Purple Gallinule (Porphyrion porphyrio)*. Cambridge, U.K.: BirdLife International.
- Giraudoux, P., Degauquier, R., Jones, P. J., Weigel, J. and Isenmann, P. (1988) Avifaune du Niger: état des connaissances en 1986. *Malimbus* 10: 1–140.
- Glutz von Blotzheim, U. N. (2001) *Handbuch der Vögel Mitteleuropas*. CD-ROM. Aula-Verlag.
- Goodman, S. M. and Meininger, P. L. (1989) *The Birds of Egypt*. Oxford: Oxford University Press.
- Gore, M. E. J. (1990) *Birds of the Gambia: An Annotated Check-list*. Second revised edition. Tring, Herts: British Ornithologists' Union (BOU Check-list no. 3).
- Gouttenoire, G. (1955) Inventaire des oiseaux de Tunisie. *Alauda* 23: 1–64.
- Green, A. A. and Sayer, J. A. (1979) The birds of Pendjari and Arli National Parks (Benin and Upper Volta). *Malimbus* 1: 14–28.
- Gurney, J. H. (1871) On the ornithology of Algeria. *Ibis* [1871]: 68–86, 289–301 (corrections in 1875: 140–142).
- Handrinos, G. and Akriotis, T. (1997) *The Birds of Greece*. London, U.K.: Christopher Helm.
- Harrison, J. A., Allan, D. G., Underhill, L. G., Herremans, M., Tree, A. J., Parker, V. and Brown, C. J., eds. (1997) *The Atlas of Southern African Birds*. Volume 2: *Passerines*. Johannesburg: BirdLife South Africa.
- Hedenström, A., Bensch, S., Hasselquist, D. and Ottosson, U. (1990) Observations of Palaearctic migrants rare to Ghana. *Bull. Brit. Ornithol. Club* 110: 194–197.
- Heim de Balsac, H. and Mayaud, N. (1962) *Les Oiseaux du Nord-ouest de l'Afrique*. Paris: Éditions Paul Lechevalier.
- Heredia, B., Rose, L. and Painter, M., eds. (1996) *Globally Threatened Birds in Europe: Action Plans*. Strasbourg: Council of Europe Publishing F-67075.
- Hüe, F. and Etchécopar, R. D. (1970) *Les Oiseaux du Proche et du Moyen Orient de la Méditerranée aux Contreforts de l'Himalaya*. Paris: Éditions N. Boubée.
- Irwin, M. P. S. (1981) *The Birds of Zimbabwe*. Salisbury (Harare), Zimbabwe: Quest Publishing.
- Isenmann, P. (1979) Wo überwintert der Seggenrohrsänger (*Acrocephalus paludicola*)? *Beitr. Vogelkd.* 25: 366–367.
- Isenmann, P. and Moali, A. (2000) *Oiseaux d'Algérie (Birds of Algeria)*. Paris: SEOF (Société d'Études Ornithologiques de France, Muséum National d'Histoire Naturelle).
- Jarry, G. and Larigauderie, F. (1974) Notes faunistiques sur quelques oiseaux du Sénégal. *L'Oiseau et RFO* 44: 62–71.
- Jarry, G. and Roux, F. (1982) Le baguage des oiseaux au Sénégal. Résultats des années 1957 à 1977. *Mém. Inst. Fr. Afr. Noire* 92.
- Kirwan, G. M. (1992) A record of aquatic warbler from Turkey. *OSME Bull.* 28: 18–19.
- Kirwan, G. (1993) Around the region. *OSME Bull.* 30: 39–48.
- Kirwan, G. (1995) Recent records of rare birds in Turkey. *Zool. Middle East* 11: 37–46.
- Kirwan, G. M. (1997) A list of bird specimens held in the Robert's College, Bebek (Istanbul, Turkey) collection, with some comments on Mathey-Dupraz (1920–24). *Sandgrouse* 19: 30–38.

- Kumerloeve, H. (1961) Zur Kenntnis der Avifauna Kleinasiens. *Bonn. Zool. Beitr. Sonderheft* 12: 1–318.
- Lamarche, B. (1980) Liste commentée des oiseaux du Mali. Part 1: Non-passereaux. *Malimbus* 2: 121–158.
- Lamarche, B. (1981) Liste commentée des oiseaux du Mali. Part 2: Passereaux. *Malimbus* 3: 73–102.
- Lamarche, B. (1988) Liste commentée des oiseaux de Mauritanie. *Etud. Sahariennes et Ouest-Afr.* I: 1–159.
- Lamarche, B. (1993) *Atlas de Répartition des Oiseaux du Mali et de Mauritanie*. Nouakchott/Paris: IMRS/ISS/MNHN.
- Lamarche, B. (1994) *Atlas de Répartition des oiseaux du Mali et de Mauritanie*. Nouakchott/Paris: IMRS/ISS/MNHN.
- Ledant, J.-P., Jacob, J.-P., Jacobs, P., Malher, F., Ochando, B. and Roché, J. (1981) Mise à jour de l'avifaune algérienne. *Gerfaut* 71: 295–398.
- Lombard, A. L. (1965) Notes sur les oiseaux de Tunisie. *Alauda* 33: 1–33, 206–235.
- Loske, K.-H. (1990) Spring weights and fat deposition of Palaearctic passerine migrants in Senegal. *Ringing Migration* 11: 23–30.
- Louette, M. (1981) The birds of Cameroon: an annotated check-list. *Verhandelingen van de Koninklijke Academie voor Wetenschappen, Letteren en Schone Kunsten van België, Klasse der Weetenschappen* 43 (163): 1–295.
- Lozano (1911) Contribución al estudio de las aves de Mogador. *Mem. Real Soc. Esp. Hist. Nat.* 8: 63–108.
- Mahé, E. (1985) Contribution à l'étude scientifique de la région du Banc d'Arguin. 21°20 N/19°20 N. Peuplements avifaunistiques. Two volumes. Thesis.
- Martín, A. and Lorenzo, J. A. (2001) *Aves del Archipiélago Canario*. La Laguna: Francisco Lemus.
- Martín, A. and Nogales, M. (1993) Ornithological importance of the Island of Alegranza (Canary Islands). *Bol. Mus. Mun. Funchal* Suppl. 2: 167–179.
- Mayaud, N. (1990) Les oiseaux du nord-ouest de l'Afrique. Notes complémentaires. *Alauda* 58: 135–140, 143–148, 187–194.
- Meiklejohn, M. F. M. (1944) Bird notes from Egypt, autumn 1943. *Bull. Zool. Soc. Egypt* 6: 16–18.
- Mester, H. (1967) Über den Zug des Seggenrohrsängers. *Anthus* 4: 1–6.
- Moreau, R. E. (1961) Problems of Mediterranean-Saharan migration. *Ibis* 103a: 373–427, 580–623.
- Moreau, R. E. (1972) *The Palaearctic-African Bird Migration Systems*. London: Academic Press.
- Morel, G. (1980) *Liste Commentée des Oiseaux du Sénégal et de la Gambie*. Supplement No. 1. Dakar: ORSTOM (Office de la Recherche Scientifique et Technique Outre-Mer).
- Morel, G. J. and Morel, M.-Y. (1988) Liste des oiseaux de Guinée. *Malimbus* 10: 143–176.
- Morel, G. J. and Morel, M.-Y. (1990) *Les oiseaux de Sénégalambie*. Paris: Editions de l'ORSTOM, Collection Didactiques.
- Morel, G. and Roux, F. (1966a) Les migrateurs paléarctiques au Sénégal. I. Non passereaux. *Terre et Vie* 20: 19–72.
- Morel, G. and Roux, F. (1966b) Les migrateurs paléarctiques au Sénégal. II. Passereaux et synthèse générale. *Terre et Vie* 20: 143–176.
- Morel, G. and Roux, F. (1966c) Les migrateurs paléarctiques au Sénégal. notes complémentaires. *Terre et Vie* 20: 523–550.
- Morel, G. and Roux, F. (1973) Les migrateurs paléarctiques au Sénégal: notes complémentaires. *Terre et Vie* 27: 523–550.
- National Imagery and Mapping Agency (2003) Search: Geographic Names Database (GNDB).
- Newman, K. (1992) *Newman's Birds of Southern Africa*. Johannesburg: Sappi.

- Newman, K., Johnston-Stewart, N. and Medland, B. (1992) *Birds of Malawi: A Supplement to Newman's Birds of Southern Africa*. Halfway House, South Africa: Southern Book Publishers.
- Nikolaus, G. (1987) Distribution atlas of Sudan's birds with notes on habitat and status. *Bonner Zool. Monogr.* 25: 1–322.
- Ottosson, U., Rumsey, S. and Hjort, C. (2001) Migration of four *Sylvia* warblers through northern Senegal. *Ringing Migration* 20: 344–351.
- Ottosson, U., Bengtsson, D., Gustafsson, R., Hall, P., Hjort, C., Leventis, A. P., Neumann, R., Pettersson, J., Rhönnsstad, P., Rumsey, S., Waldenström, J. and Velmala, W. (2002) New birds for Nigeria observed during the Lake Chad Bird Migration Project. *Bull. ABC* 9: 52–55.
- Pain, D. J., Green, R. E., Giessing, B., Kozulin, A., Poluda, A., Ottosson, U., Flade, M. and Hilton, G. M. (2004) Using stable isotopes to investigate migratory connectivity of the globally threatened aquatic warbler *Acrocephalus paludicola*. *Oecologia* 138: 168–174.
- Pineau, J. and Giraud-Audine, M. (1974) Notes sur les migrateurs traversant l'extrême Nord-Ouest du Maroc. *Alauda* 42: 159–188.
- Pineau, J. and Giraud-Audine, M. (1975) Notes complémentaires sur les migrations dans l'extrême Nord-Ouest du Maroc. *Alauda* 43: 135–141.
- Pineau, J. and Giraud-Audine, M. (1979) Les oiseaux de la Péninsule Tingitane. Bilan des connaissances actuelles. *Trav. Inst. Sci. Rabat Sér. Zool.* 38: 1–132.
- Rodwell, S. P., Sauvage, A., Rumsey, S. J. R. and Bräunlich, A. (1996) An annotated check-list of birds occurring at the Parc National des Oiseaux du Djoudj in Senegal, 1984–1994. *Malimbus* 18: 74–111.
- Salvan, J. (1967–1969) Contribution à l'étude des oiseaux du Tchad. *L'Oiseau et RFO* 37, 38, 39: 255–284; 53–85, 127–150, 249–273; 38–69 [Erratum: 1971, 41:181].
- Sauvage, A. and Rodwell, S. P. (1998) Notable observations of birds in Senegal (excluding Parc National des Oiseaux du Djoudj), 1984–1994. *Malimbus* 20: 75–122.
- Schouteden, H. (1966) La faune ornithologiques du Ruanda. *Doc. Zool. Mus. Afr. Centr. Tervuren* 10: 1–130.
- Schulze-Hagen, K. (1993) Winter quarters of the Aquatic Warbler and habitat situation there - short review of recent knowledge. Unpublished report.
- Serle, W., Morel, G. J. and Hartwig, W. (1977) *A Field Guide to the Birds of West Africa*. London: Collins.
- Smith, G. A. (1979) Spring weights of selected trans-Saharan migrants in north west Morocco. *Ringing Migration* 2: 151–155.
- Smith, K. D. (1957) An annotated check list of the birds of Eritrea. *Ibis* 99: 1–26, 307–337.
- Smith, K. D. (1968) Spring migration through southeast Morocco. *Ibis* 110: 452–492.
- Snoussi, M. (2004) *Review of Certain Basic Elements for the Assessment of Environmental Flows in the Lower Moulouya*. Gland, Switzerland: IUCN.
- Snow, D. W. and Perrins, C. M. (1998) *The Birds of the western Palearctic: Concise Edition*. Volumes 1–2. Oxford: Oxford University Press.
- Stam, D. and Voous, K. H. (1963) African record of aquatic warbler. *Ardea* 51: 74.
- Thévenot, M., Bergier, P. and Beaubrun, P. (1980) Compte-rendu d'ornithologie Marocaine, année 1979. *Docum. Inst. Sci. Rabat* 5: 1–68.
- Thévenot, M., Bergier, P. and Beaubrun, P. (1981) Compte-rendu d'ornithologie marocaine, année 1980. *Docum. Inst. Sci. Rabat* 6: 1–95.
- Thévenot, M., Vernon, R. and Bergier, P. (2003) *The Birds of Morocco: An Annotated Check-list*. London: British Ornithologists' Union (BOU Check-list no. 20).
- Thiollay, J.-M. (1985) The birds of Ivory Coast: status and distribution. *Malimbus* 7: 1–59.
- Thomsen, P. and Jacobson, P. (1979) *The Birds of Tunisia*. Copenhagen.
- Thouy, P. (1978) Nouvelles captures et observations hivernales au Maroc. *Alauda* 46: 87–93.
- Tuck, G. S. (1964) Reports of land birds at sea. *Sea Swallow* 16: 40–59.
- Urban, E. K., Fry, C. H. and Keith, S. (1997) *The Birds of Africa*. Volume V. London: Academic Press.

- van den Berg, A. B. (1997) WP reports. *Dutch Birding* 19: 83–88.
- Vere Benson, S. (1970) *Birds of Lebanon and the Jordan Area*. London & New York: International Council for Bird Preservation.
- von Heuglin, M. T. (1869) *Ornithologie Nordost-Afrika's, der Nilquellen- und Küsten-Gebiete des Rothen Meeres und des nördlichen Somal-Landes*. Volume 1. Cassel, Germany: Verlag von Theodor Fischer.
- von Thanner, R. (1908) Ein Sammelausflug nach La Palma, Hierro und Fuerteventura. *Orn. Jahrb.* 19: 198–215.
- Walter, H. (1968) Zur Abhängigkeit des Eleonorenfalke (*Falco eleonora*) vom mediterranen Vogelzug. *J. Ornithol.* 109: 323–365.
- Walther, B. A. and Rahbek, C. (2002) Where do Palearctic migratory birds overwinter in Africa? *Dansk Orn. Foren. Tidsskr.* 96: 4–8.
- Walther, B. A., Wisz, M. S. and Rahbek, C. (2004). Known and predicted African winter distributions and habitat use of the endangered Basra reed warbler (*Acrocephalus griseldis*) and the near-threatened cinereous bunting (*Emberiza cineracea*). *J. Ornithol.* 145: 287–299.
- Wawrzyniak, H. and Sohns, G. (1977) *Der Seggenrohrsänger*. *Neue Brehm-Bücherei Nr. 504*. Wittenberg Lutherstadt: Ziemsen Verlag.
- Webb, P. B., Berthelot, S. and Moquin-Tandon, A. (1842) Ornithologie Canarienne. Pp.1–48 in P. B. Webb and S. Berthelot, eds. *Histoire Naturelle des Iles Canaries*. Volume 2. Paris: Béthune.
- Whymper, C. (1909) *Egyptian Birds, for the Most Part Seen in the Nile Valley*. London: Adam and Charles Black.

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Appendix. African and Middle Eastern records of Aquatic Warbler (*Acrocephalus paludicola*) available to us in October 2004. For every record, columns contain an ID number referring to additional details for each record below the table (with an asterisk indicating that the record was excluded from our analyses for reasons given below), the date of the record, the number of individuals recorded, the habitat, the reliability of the record (1, specimen collected; 2, bird caught and released; 3, published record; 4, unpublished record), the locality and its corresponding coordinates (given as degrees and minutes latitude and degrees and minutes longitude). Note that the abbreviation "sp." may refer to one or several species (not always clearly stated in the sources).

| ID                            | Date               | Number | Habitat  | Rel. | Locality   | Coordinates      |
|-------------------------------|--------------------|--------|--|------|--|------------------|
| <b>Algeria</b>                |                    |        |  |      |  |                  |
| 1                             | 22.3.1870-9.4.1870 | ≥1     | Small half-dry marsh   | 3    | Laghouat   | 33.48 N, 2.53 E  |
| 2                             | 16.3.1923          | 1      | —  | 1    | Touggourt  | 33.06 N, 6.04 E  |
| 3                             | 1.4.1977           | 1      | Among <i>Typha</i> and <i>Phragmites</i> sp. with some sparse <i>Tamarix</i> sp. in coastal marsh located behind dunes barring the mouth of the Réghaïa wadi | 3    | Réghaïa, 30 km E of Alger                          | 36.45 N, 3.20 E  |
| 4                             | 17.4.1977          | 1      | As above   | 2    | Réghaïa, 30 km E of Alger                          | 36.45 N, 3.20 E  |
| 5                             | 10.10.1977         | 1      | As above   | 3    | Réghaïa, 30 km E of Alger                          | 36.45 N, 3.20 E  |
| 6                             | 18.2.1978          | 1      | As above   | 3    | Réghaïa, 30 km E of Alger                          | 36.45 N, 3.20 E  |
| 7                             | 8.4.1978           | 1      | As above   | 3    | Réghaïa, 30 km E of Alger                          | 36.45 N, 3.20 E  |
| 8                             | 17.4.1978          | 1      | As above   | 3    | Réghaïa, 30 km E of Alger                          | 36.45 N, 3.20 E  |
| 9                             | May (1978?)        | ≥1     | —  | 3    | Réghaïa, 30 km E of Alger                          | 36.45 N, 3.20 E  |
| <b>Azores (Portugal)</b>      |                    |        |  |      |  |                  |
| 10*                           | —                  | ≥1     | —  | 3    | Unknown  | —                |
| <b>Canary Islands (Spain)</b> |                    |        |  |      |  |                  |
| 11                            | 14.3.1905          | 1      | Dense grass  | 3    | Fuerteventura                                      | 28.23 N, 14.05 W |
| 12                            | Sept. 1931         | 1      | Barren islet   | 1    | Isla Roque del Este, islet N of Lanzarote          | 29.16 N, 13.20 W |
| 13                            | 9.2.1974           | 1      | Cliffs   | 2    | Guinate, Lanzarote                                 | 29.11 N, 13.29 W |
| 14                            | 30.8.1983          | 1      | —  | 2    | Alegranza  | 29.23 N, 13.30 W |
| 15                            | 4.4.1984           | 1      | —  | 3    | Las Peñitas, Fuerteventura                         | 28.20 N, 14.00 W |
| 16                            | 14.2.1988          | 1      | —  | 3    | Timanfaya, Parque Nacional de Timanfaya, Lanzarote | 29.00 N, 13.50 W |
| 17                            | 13.3.1989          | ≥1     | —  | 3    | Máguéz, Lanzarote                                  | 29.09 N, 13.29 W |
| 18                            | 15.9.1990          | 1      | —  | 2    | Montaña Clara                                      | 29.18 N, 13.32 W |
| 19                            | 5.3.1997           | 1      | —  | 3    | Amarilla Golf (San Miguel), Tenerife               | 28.19 N, 16.34 W |



Appendix. Continued

| ID            | Date           | Number        | Habitat  | Rel. | Locality                                 | Coordinates      |
|---------------|----------------|---------------|--|------|--|------------------|
| <b>Cyprus</b> |                |               |  |      |  |                  |
| 21*           | 4.4.1958       | 1             | —  | 3    | Curium Marsh (= Kourion, Kurion, Kurium) | 34.40 N, 32.53 E |
| <b>Egypt</b>  |                |               |  |      |  |                  |
| 22            | Winter (1869?) | Occasional    | —  | —    | 3  | Lower Egypt      |
| 23            | (1909?)        | Fairly common | —  | 3    | Nile Valley                              | —                |
| 24            | 17.10.1943     | 1             | Scattered reeds and low-growing palms by lake edge   | 3    | Ismailiya (= Ismailia)                   | 30.35 N, 32.16 E |
| 25            | 19.4.1964      | 1             | —  | 3    | Lake Maryut                              | 31.09 N, 29.54 E |
| 26            | 19.2.1966      | 1             | —  | 3    | Lake Maryut                              | 31.09 N, 29.54 E |
| 27            | 8.3.1984       | 1             | —  | 3    | Wadi Kabrit                              | 29.40 N, 33.15 E |
| 28            | 20.10.1992     | ≥1            | —  | 3    | Hurghada                                 | 27.12 N, 33.48 E |
| <b>Ghana</b>  |                |               |  |      |  |                  |
| 29            | 15.11.1987     | 1             | Old dried-up river bed, densely vegetated with rank grass and shrubs, surrounded by extensively cultivated open-grass savanna with a few scattered trees                                 | 2    | Tono, 4 km W of Navrongo                 | 10.51 N, 1.05 W  |
| <b>Jordan</b> |                |               |  |      |  |                  |
| 30            | 3.5.1965       | 1             | —  | 3    | Azraq (= Azraq ash Shishan)              | 31.50 N, 36.49 E |
| <b>Mali</b>   |                |               |  |      |  |                  |
| 31            | 12.12.1957     | 1             | Dense vegetation consisting of <i>Leersia hexandra</i> , <i>Echinochloa stagnina</i> and <i>Oryza barthii</i> growing in a large river flood basin in the inundation zone of Niger delta | 1    | Diengo, Lake Takadji (= Tagadje)         | 16.00 N, 4.10 W  |
| 32            | 28.12.1975     | 1             | Large rain flood basin with <i>Acacia ataxacantha</i> (= <i>Mimosa pigra</i> ) in the inundation zone of Niger delta   | 3    | Lake Gossi                               | 15.48 N, 1.19 W  |
| 33            | 8.12.1976      | 1             | Thick solid masses of <i>Acacia ataxacantha</i> (= <i>Mimosa pigra</i> ), in flooded meadows in the inundation zone of Niger delta   | 2    | Bamako                                   | 12.39 N, 8.00 W  |

Appendix. Continued

| ID                | Date       | Number | Habitat   | Rel. | Locality                  | Coordinates      |
|-------------------|------------|--------|---|------|---------------------------|------------------|
| 34                | 17.11.1978 | 1      | Mosque enclosure in village surrounded by large moving dunes in Sahara desert   | 1    | Arawan                    | 18.54 N, 3.33 W  |
| 35                | 18.11.1978 | 1      | As above  | 1    | Arawan                    | 18.54 N, 3.33 W  |
| <b>Mauritania</b> |            |        |   |      |                           |                  |
| 36                | 14.9.1972  | 1      | Tamarisk ( <i>Tamarix</i> sp.) thickets running more or less continuously along the landward side of coastal dunes on the coast | 3    | c. 2 km W of Nouakchott   | 18.05 N, 15.58 W |
| 37                | 15.9.1977  | 1      | Inside <i>Papyrus</i> stand in a hotel garden   | 3    | Nouâdhibou (= Nouadhibou) | 20.54 N, 17.04 W |
| 38                | 16.3.1982  | 1      | Garden  | 3    | Nouâdhibou (= Nouadhibou) | 20.54 N, 17.04 W |
| 39                | 18.10.1982 | 1      | Edge of backwater with <i>Tamarix</i> sp. and <i>Phragmites</i> sp.   | 3    | Keur Massène              | 16.33 N, 16.14 W |
| 40                | 20.3.1983  | 1      | Garden  | 4    | Baie de Cansado           | 20.52 N, 17.04 W |
| 41                | 20.10.1983 | 1      | Edge of the Senegal river and rice plantations  | 3    | Boghé (= Bogue)           | 16.35 N, 14.16 W |
| 42                | 22.10.1983 | 1      | As above  | 3    | Kaédi                     | 16.09 N, 13.30 W |
| 43                | 12.11.1983 | 1      | As above  | 3    | Gouraye                   | 14.55 N, 12.25 W |
| 44                | 17.10.1986 | 1      | Vast flood basin with multiple belts of vegetation  | 3    | Lac d'Aleg                | 17.07 N, 13.59 W |
| 45                | 14.3.1993  | 1      | Sandy offshore bar with <i>Tamarix</i> sp. and <i>Nitraria retusa</i>   | 4    | Nouakchott                | 18.05 N, 15.59 W |
| 46                | 21.4.1993  | 1      | Edge of backwater with <i>Tamarix</i> sp. and <i>Phragmites</i> sp.   | 4    | Rosso/Garrak              | 16.30 N, 15.49 W |
| 47                | 17.9.1995  | 1      | Sandy offshore bar with <i>Tamarix</i> sp. and <i>Nitraria retusa</i>   | 4    | Nouakchott                | 18.05 N, 15.59 W |
| 48                | 26.9.1995  | 1      | Palm plantation with date palms <i>Phoenix dactylifera</i> and <i>Tamarix</i> sp.   | 4    | Toungad                   | 20.03 N, 13.08 W |
| 49                | 14.10.1995 | 1      | Edge of the Senegal river and rice plantations  | 4    | Kaédi                     | 16.09 N, 13.30 W |
| 50                | 18.3.1996  | 1      | Edge of backwater with <i>Tamarix</i> sp. and <i>Phragmites</i> sp.   | 4    | Rosso / Garrak            | 16.30 N, 15.49 W |
| 51                | 21.4.1996  | 1      | Very small freshwater spring and wetland surrounded by desert   | 4    | N'Séirat                  | 18.02 N, 8.03 W  |
| 52                | 5.9.1996   | 1      | Edge of the Senegal river and rice plantations  | 4    | Boghé (= Bogue)           | 16.35 N, 14.16 W |
| 53                | 21.9.1996  | 1      | Sandy offshore bar with <i>Tamarix</i> sp. and <i>Nitraria retusa</i>   | 4    | kilomètre 60              | 17.35 N, 16.00 W |

Appendix. Continued

| ID | Date       | Number | Habitat  | Rel. | Locality                      | Coordinates      |
|----|------------|--------|--|------|-------------------------------|------------------|
| 54 | 13.10.1996 | 1      | Edge of the Senegal river and rice plantations   | 4    | Koundel (= Koundélé)          | 15.47 N, 13.16 W |
| 55 | 13.10.1996 | 1      | As above   | 4    | Sivé (= Civé, Givé)           | 15.42 N, 13.12 W |
| 56 | 21.10.1996 | 1      | Vast flood basin with multiple belts of vegetation   | 4    | Lac d'Aleg                    | 17.07 N, 13.59 W |
| 57 | 21.10.1996 | 1      | As above   | 4    | Lac de Mâl                    | 16.58 N, 13.23 W |
| 58 | 26.3.1997  | 1      | Border lagoon with relict mangroves <i>Avicennia africana</i> , surrounded by halophilous steppe   | 4    | Cap Timirist (= Râs Timirist) | 19.23 N, 16.32 W |
| 59 | 20.9.1997  | 1      | Sandy offshore bar with <i>Tamarix</i> sp. and <i>Nitroaria retusa</i>   | 4    | Nouakchott                    | 18.05 N, 15.59 W |
| 60 | 24.9.1997  | 1      | Edge of the Senegal river and rice plantations   | 4    | Boghé (= Bogué)               | 16.35 N, 14.16 W |
| 61 | 14.10.1997 | 1      | Flood basin with multiple belts of vegetation, e.g. <i>Acacia ataxacantha</i> (= <i>Mimosa pigra</i> )                                     | 4    | Lac R'Kiz                     | 16.50 N, 15.19 W |
| 62 | 6.11.1997  | 1      | Vast flood basin with multiple belts of vegetation   | 4    | Lac de Mâl                    | 16.58 N, 13.23 W |
| 63 | 6.11.1997  | 1      | Edge of backwater with <i>Tamarix</i> sp. and <i>Phragmites</i> sp. and some <i>Acacia ataxacantha</i> (= <i>Mimosa pigra</i> )            | 4    | Rosso/Garrak (= Roco)         | 16.30 N, 15.49 W |
| 64 | 17.2.1998  | 1      | Vast rain flood basin  | 4    | Chlim (= Chelim)              | 16.24 N, 9.03 W  |
| 65 | 6.3.1998   | 1      | Offshore bar with <i>Tamarix</i> sp. and <i>Sesuvium portulacastrum</i>  | 4    | Cap Blanc                     | 20.50 N, 17.04 W |
| 66 | 21.3.1998  | 1      | Large-sized rain flood basin, with <i>Acacia ataxacantha</i> (= <i>Mimosa pigra</i> ) and <i>Acacia nilotica</i>                           | 4    | Maghmouda                     | 16.27 N, 7.37 W  |
| 67 | 13.9.1998  | 1      | Sandy offshore bar with <i>Tamarix</i> sp. and <i>Nitroaria retusa</i>   | 4    | Port chinois                  | 18.00 N, 15.56 W |
| 68 | 26.10.1998 | 1      | Edge of the Senegal river and rice plantations   | 4    | Bahabé                        | 16.20 N, 13.57 W |
| 69 | 19.8.1999  | 1      | Edge of a small and almost drained rain flood basin surrounded by <i>Acacia raddiana</i>   | 4    | Graret Douéminé               | 19.45 N, 16.05 W |
| 70 | 18.9.1999  | 1      | Very broad sandy offshore bar with <i>Tamarix</i> sp., <i>Nitroaria retusa</i> and <i>Salvadora persica</i> overhanging fresh water source | 4    | Chott N'Boul                  | 16.36 N, 16.26 W |
| 71 | 17.10.1999 | 1      | Vast flood basin with multiple belts of vegetation   | 4    | Lac d'Aleg                    | 17.07 N, 13.59 W |
| 72 | 9.12.1999  | 1      | Large rain flood basin, with <i>Acacia ataxacantha</i> (= <i>Mimosa pigra</i> ) and <i>Acacia nilotica</i>                                 | 4    | Maghmouda                     | 16.27 N, 7.37 W  |
| 73 | 5.9.2000   | 1      | Offshore bar with <i>Tamarix</i> sp. and <i>Sesuvium portulacastrum</i>  | 4    | Baie de l'Etoile              | 21.00 N, 16.55 W |

Appendix. Continued

| ID             | Date              | Number   | Habitat  | Rel. | Locality   | Coordinates      |
|----------------|-------------------|----------|--|------|--|------------------|
| 74             | 5-9.2000          | 1        | Sandy cord with <i>Tamarix</i> sp. and <i>Sesuvium portulacastrum</i>      | 4    | Cap Blanc  | 20.50 N, 17.04 W |
| 75             | 4-9.2001          | 1        | Coastal scrub  | 2    | Near Nouakchott  | 18.05 N, 15.59 W |
| <b>Morocco</b> |                   |          |  |      |  |                  |
| 76             | March (1867?)     | ≥1       | –  | 1    | Near Tanger (= Tangier), E Morocco                           | 35.47 N, 5.49 W  |
| 77             | 1-9.1911          | 1        | –  | 2    | Near Essaouira (= Mogador)                                   | 31.31 N, 9.46 W  |
| 78             | Sept. 1954        | Numerous | Salt marshes with <i>Salicornia</i> sp. and <i>Tamarix</i> sp.             | 3    | Moulouya estuary, plaine des Trifa, E Morocco                | 35.06 N, 2.20 W  |
| 79             | 28-9.1954         | Numerous | Freshwater marshes with <i>Juncus</i> sp.                                  | 3    | Ras El Ma, plaine des Trifa, E Morocco                       | 34.59 N, 2.25 W  |
| 80             | 5-10.1954         | Numerous | As above   | 3    | Ras El Ma, plaine des Trifa, E Morocco                       | 34.59 N, 2.25 W  |
| 81             | Feb. 1955         | Numerous | Salt marshes with <i>Salicornia</i> sp. and <i>Tamarix</i> sp.             | 3    | Moulouya estuary, plaine des Trifa, E Morocco                | 35.06 N, 2.20 W  |
| 82             | 27.2.1955         | Numerous | Freshwater marshes with <i>Juncus</i> sp.                                  | 3    | Ras El Ma, plaine des Trifa, E Morocco                       | 34.59 N, 2.25 W  |
| 83             | 3-3.1955          | Numerous | As above   | 3    | Ras El Ma, plaine des Trifa, E Morocco                       | 34.59 N, 2.25 W  |
| 84             | 11–17.4.1963      | 1        | Pools of fresh water with cover for birds in oasis lying in a shallow wadi | 2    | Defilia, 10 km W of Figuig                                   | 32.10 N, 1.23 W  |
| 85             | 23–26.8.1966      | 2        | –  | 1    | Essaouira islands (islands near Essaouira = Iles de Mogador) | 31.30 N, 9.48 W  |
| 86             | 9–14.9.1966       | 1        | –  | 1    | Essaouira islands (islands near Essaouira = Iles de Mogador) | 31.30 N, 9.48 W  |
| 87             | 10.3.1971         | 1        | –  | 3    | Larache  | 35.12 N, 6.10 W  |
| 88             | 1-3.1972          | ≥1       | –  | 3    | Tangérois, near Tanger (= Tangier)                           | 35.47 N, 5.49 W  |
| 89             | 23-3.1972         | 1        | Meadow   | 2    | Tangérois, near Tanger (= Tangier)                           | 35.47 N, 5.49 W  |
| 90             | 23-3.1972         | Numerous | As above   | 3    | Tangérois, near Tanger (= Tangier)                           | 35.47 N, 5.49 W  |
| 91             | 28-3.1972         | 1        | –  | 3    | Tangérois, near Tanger (= Tangier)                           | 35.47 N, 5.49 W  |
| 92             | 16-4.1972         | 1        | –  | 3    | Tangérois, near Tanger (= Tangier)                           | 35.47 N, 5.49 W  |
| 93             | 4-3.1974          | 1        | –  | 2    | Near Settat  | 33.04 N, 7.37 W  |
| 94             | 7.10.1974         | 1        | –  | 3    | Cape Spartel, near Tanger (= Tangier)                        | 35.47 N, 5.56 W  |
| 95             | End of March 1977 | 2        | –  | 4    | Wadi Massa (= Oued Massa)                                    | 30.05 N, 9.40 W  |
| 96             | 4-4.1979          | 2        | –  | 2    | Near Settat  | 33.04 N, 7.37 W  |
| 97             | 7-4.1979          | 1        | –  | 4    | Mouth of Wadi Massa estuary (= Oued Massa)                   | 30.05 N, 9.40 W  |

Appendix. Continued

| ID             | Date                   | Number | Habitat   | Rel. | Locality   | Coordinates      |
|----------------|------------------------|--------|---|------|--|------------------|
| 98             | 15.4.1979              | 1      | -   | 2    | Near Settat  | 33.04 N, 7.37 W  |
| 99             | 22.4.1979              | 1      | -   | 2    | Near Settat  | 33.04 N, 7.37 W  |
| 100            | 2.3.1980               | 1      | Marshes   | 2    | N of Larache ("Lower Loukkos")                         | 35.12 N, 6.10 W  |
| 101            | 4.4.1982               | 1      | -   | 4    | Barrage de Sidi Saïd Maachou                           | 33.10 N, 8.07 W  |
| 102            | 3.10.1982              | 1      | <i>Phragmites</i> sp. in freshwater pond  | 3    | Souk Es-sebt near Wadi Sebou (= Oued Sebou), NW of Fès | 34.02 N, 5.00 W  |
| 103            | 7.2.1984               | 1      | -   | 3    | Mouth of Wadi Massa estuary (= Oued Massa)             | 30.05 N, 9.40 W  |
| 104            | 18.3.1985              | 1      | Small water pond covered with young <i>Tamarix</i> sp.  | 2    | Marais du Bas-Loukkos (Larache)                        | 35.12 N, 6.10 W  |
| 105*           | 1.2.1987               | 1      | -   | 4    | Mouth of Wadi Massa estuary (= Oued Massa)             | 30.05 N, 9.40 W  |
| 106            | 7.4.1988               | 2      | -   | 4    | Mouth of Wadi Massa estuary (= Oued Massa)             | 30.05 N, 9.40 W  |
| 107            | 17.2.1989              | 1      | -   | 4    | Mouth of Wadi Massa estuary (= Oued Massa)             | 30.05 N, 9.40 W  |
| 108*           | 2.4.1989               | 1      | -   | 4    | Aoulouz, Haut Sous                                     | 30.42 N, 8.09 W  |
| 109            | 13.2.1990              | >10    | -   | 4    | Wadi Massa estuary (= Oued Massa) at Sidi Rbat village | 30.05 N, 9.40 W  |
| 110            | 13.2.1990              | 1      | -   | 2    | Wadi Massa estuary (= Oued Massa) at Sidi Rbat village | 30.05 N, 9.40 W  |
| 111            | 28.2.1990              | 1      | -   | 4    | Mouth of Wadi Massa estuary (= Oued Massa)             | 30.05 N, 9.40 W  |
| 112            | 27.3.1996              | 1      | -   | 3    | Mouth of Wadi Souss estuary (= Oued Souss)             | 30.22 N, 9.37 W  |
| 113            | 29.10.1998             | 1      | -   | 3    | Haha, Tamri  | 30.42 N, 9.50 W  |
| 114            | 17.4.2003              | 1      | In a dead arm of Wadi Moulouya in <i>Phragmites</i> sp. bordered by tufts of <i>Juncus</i> sp. and <i>Carex</i> sp.               | 4    | E shore of the mouth of the Moulouya estuary           | 35.06 N, 2.20 W  |
| <b>Senegal</b> |                        |        |   |      |  |                  |
| 115            | 2.3.1972 and 17.3.1972 | 1      | Shallow backwater (c. 1 ha) covered by dense and uniform 40 cm high graminaceous carpet, surrounded by a narrow belt of tamarisks | 2    | Parc National des Oiseaux du Djoudj                    | 16.24 N, 16.18 W |
| 116            | 5.3.1972               | 2      | As above  | 2    | Parc National des Oiseaux du Djoudj                    | 16.24 N, 16.18 W |

Appendix. Continued

| ID                    | Date           | Number | Habitat  | Habitat | Rel. | Locality   | Coordinates      |
|-----------------------|----------------|--------|--|---------|------|--|------------------|
| 117                   | 12.12.1973     | ≥1     | -  | -       | 3    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 118                   | 9.2.1974       | 1      | Lightly inundated <i>Juncus</i> -covered meadow  | -       | 2    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 119                   | March 1974     | 26     | -  | -       | 2    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 120                   | 17.3.1974      | ≥1     | -  | -       | 3    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 121                   | (1982?)        | 1      | -  | -       | 3    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 122                   | 28.12.1985     | 3      | -  | -       | 3    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 123                   | 6.1.1986       | 2      | in <i>Tamarix</i> sp.  | -       | 3    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 124                   | Feb.1986       | 1      | Dense reeds and tamarisks adjacent to small lake   | -       | 4    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 125                   | Jan. 1987      | 1      | Guard post near low sedges and some reeds  | -       | 3    | Poste de Gainthe, Parc National des Oiseaux du Djoudj                          | 16.24 N, 16.16 W |
| 126                   | Feb. 1987      | 1      | As above   | -       | 3    | Poste de Gainthe, Parc National des Oiseaux du Djoudj                          | 16.24 N, 16.16 W |
| 127                   | 11.3.1987      | 6      | In <i>Tamarix</i> sp.  | -       | 3    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 128                   | Dec. 1987      | ≥1     | Inundated 80 cm high grassy <i>Carex</i> -like associations with scattered <i>Acacia</i> trees, covering several square kilometres | -       | 2    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 129                   | Dec. 1987      | 1      | As above   | -       | 3    | Parc National des Oiseaux du Djoudj  | 16.24 N, 16.18 W |
| 130                   | 8.2.1993       | 1      | Reed beds  | -       | 2    | EM2 ringing site, Parc National des Oiseaux du Djoudj                          | 16.24 N, 16.18 W |
| <b>Tunisia</b>        |                |        |  |         |      |  |                  |
| 131                   | 25.3.1917      | 1      | -  | -       | 1    | Wadi Hamdoune (= Oued Hamdoune), mouth of the beach at Sousse, central Tunisia | 35.50 N, 10.38 E |
| 132                   | 20.10.1932     | 1      | -  | -       | 1    | Wadi Aouina (= Oued Aouina), Cap Bon   | 37.05 N, 11.02 E |
| 133                   | Summer (date?) | 1      | -  | -       | 3    | Edge of Medjerda   | 36.45 N, 9.00 E  |
| 134                   | 22.4.(year?)   | ≥1     | -  | -       | 3    | Hamman-Lif   | 36.40 N, 10.20 E |
| 135                   | 14.4.1949      | 1      | In the scattered reeds in the mouth of a small wadi near the sea   | -       | 3    | Gabes  | 33.53 N, 10.07 E |
| 136*                  | 22.5.1949      | 1      | -  | -       | 3    | N of Sousse  | 35.50 N, 10.38 E |
| 137                   | 8.4.1964       | 1      | Marsh near Medjerdah river mouth   | -       | 4    | Utique   | 37.03 N, 10.04 E |
| 138                   | 7.4.1968       | 1      | -  | -       | 3    | Near Anamur, southern coastlands   | 36.05 N, 32.50 E |
| <b>Western Sahara</b> |                |        |  |         |      |  |                  |
| 143                   | 1.9.1962       | 1      | Ship M.V. <i>Joseph Frering</i> on ocean   | -       | 3    | Off the coast near Dakhla (= Ad Dakhla)  | 22.37 N, 17.03 W |

## Appendix. Continued

Below we give additional comments and references for each record above. We do not know the sex or age of recorded birds unless indicated below:

- (1) Gurney (1871) found *Calamodyta aquaticus* [= *A. paludicola*] between 22 March and 9 April; in our analyses, we use the midpoint of this period, thus making this record a "March" record. (2) Male specimen (BMNH 1951-13-994) collected by Col. W. A. Payn. (3) Observed by Jean-Paul Jacob (in 1985 letter to Paul Isenmann) and later mentioned in Ledant *et al.* (1981). (5)–(8) Observed by Jean-Paul Jacob (in 1985 letter to Paul Isenmann) and later mentioned in Ledant *et al.* (1981). (9) Recorded by Jean-Paul Jacob in May as mentioned in Ledant *et al.* (1981) but not mentioned in the 1985 letter to Paul Isenmann; therefore this record is either an error by Ledant *et al.* (1981) or an oversight by Jean-Paul Jacob in his letter. 1978 is the most likely year for this record given the information in Ledant *et al.* (1981), but it is not definitely stated. (10) Listed as "accidental" in Cramp (1985–1992) and Snow and Perrins (1998) but excluded from our analyses; see text for further details. (11) von Thanner's (1908) observation of *Calamoherpe aquatica* [= *A. paludicola*] was later cited in Bannerman (1920), Stam and Voous (1963) and Martín and Lorenzo (2001). (12) Found dead, but in good condition, by Hugh Cott and subsequently mentioned by Bannerman (1932); later cited in Moreau (1961) and Martín and Lorenzo (2001). (13) Cited in Alamo Tavío (1975) and later in Martín and Lorenzo (2001). (14) This individual had been ringed on 14 August 1981 in Woermer-en Jisperveld Wormer, northern Netherlands (Martín and Lorenzo 2001) and is probably the source for its mention in Martín and Nogales (1993). (15) Recorded by D. R. Collins and cited in Martín and Lorenzo (2001). (16) Recorded by D. Concepción and cited in Martín and Lorenzo (2001) and without details in Concepción (1992). (17) Recorded by D. Concepción and cited in Martín and Lorenzo (2001). (18) This individual had been ringed on 24 August 1990 in Etang de Trunvel, Finistère, France (Martín and Lorenzo 2001). (19) First mentioned by Anonymous (1997) and van den Berg (1997) and later cited in Martín and Lorenzo (2001). (20) Caught by D. Concepción and cited in Martín and Lorenzo (2001). (21) Omitted from the Cyprus list because the description was "too brief to confirm the identification" (Flint and Stewart 1992) and therefore excluded from our analyses; mentioned as a 1956 record in Hüe and Eichéscopar (1970). (22) We give the year of publication as no exact date is given by von Heuglin (1869) for his record of *Acrocephalus aquaticus* [= *A. paludicola*]; later cited in Goodman and Meininger (1989). (23) We give the year of publication as no exact date is given by Whympner (1909) for his listing of *Calamodyta aquatica* [= *A. paludicola*]; this record was overlooked by Goodman and Meininger (1989). (24) Observed by Meiklejohn (1944) and later cited in Goodman and Meininger (1989). (25)–(26) Observed by J. W. Wall and cited in Goodman and Meininger (1989). (27) Observed by S. Howe and D. Mierrie and cited in Goodman and Meininger (1989). (28) Recorded by S. Madge/Birdquest and cited in Kirwan (1993). (29) This individual was a juvenile with fresh remiges and rectrices (Hedenström *et al.* 1990; Bensch *et al.* 1991). (30) Recorded by Andrews (1995); this record may originate from I. J. Ferguson-Lees (see Vere Benson 1970, appendix II). (31) Collected by Duhart and Descamps (1963) and later cited in Moreau (1972), Curry and Sayer (1979) and Lamarche (1981). (32) Observed by B. Lamarche (*in litt.* 2004) and cited in Lamarche (1981). (33) Caught by B. Lamarche (*in litt.* 2004) and cited in Curry and Sayer (1979). Lamarche (1981) and Mayaud (1990), erroneously cited as a "1973" record in Curry and Sayer (1979). (34)–(35) These two individuals were found dead, but in fresh condition, by B. Lamarche (*in litt.* 2004) and cited in Lamarche (1981) and Mayaud (1990). (36) Observed by John P. Gee (*in litt.* 2004) as the individual was moving south with large numbers of other migrants, cited in Gee (1984) and Lamarche (1988). (37) Observed "in the interior court of a hotel while strong winds reigned outside" by B. Lamarche (*in litt.* 2004). (38) Observed by Mahé (1985) and later cited in Lamarche (1988); additional details provided by B. Lamarche (*in litt.* 2004). (39) Observed by B. Lamarche (*in litt.* 2004) and later cited as "Delta" record in Lamarche (1988). (40) Observed by B. Lamarche (*in litt.* 2004). (41) Observed by B. Lamarche (*in litt.* 2004) and later cited as "Boghé" record in Lamarche (1988). (42) Observed by B. Lamarche (*in litt.* 2004) and later cited as "Kaédi" record in Lamarche (1988). (43) Observed by B. Lamarche (*in litt.* 2004) and later cited as "moyenne vallée" record in Lamarche (1988). (44) Observed by B. Lamarche (*in litt.* 2004) and later cited as "Aleg" record in Lamarche (1988). (45)–(74) Observed by B. Lamarche (*in litt.* 2004). (75) Caught by V. Salewski (*in litt.* 2004). (76) We give the year of publication as no exact date is given by Drake (1867) for his collection of *Salicaria aquatica* [= *A. paludicola*] although his statement that the observation was made "during my stay there from January to the beginning of April last" suggests 1866: later cited in Heim de Balsac and Mayaud (1962) and Thévenot *et al.* (2003). (77) Lozano's (1911) record was later cited in Moreau (1961), Heim de Balsac and Mayaud (1962) and Thévenot *et al.* (2003). (78)–(83) Brosset's (1956, 1961) observations were later cited in Heim de Balsac and Mayaud (1962) and Thévenot *et al.* (2003). (84) Netted by E. D. H. Johnson and reported in Smith (1968) who gives the period from 11 to 17 April for its

## Appendix. Continued

capture, while Thévenot *et al.* (2003) give the exact date of 15 April, possibly gathered from the original ringing data (M. Thévenot and R. Vernon *in litt.* 2004). (85)–(86) Prey remains found by Walter (1968) around Eleonora's falcon *Falco eleonorae* nests, later cited in Thévenot *et al.* (2003); the coordinates that Walter gave were those of the city of Mogador (= Essouira) and not the "Îles de Mogador" where the remains were found. (87) Observed by Pineau and Giraud-Audine (1974); additional details provided by M. Thévenot (*in litt.* 2004). (88)–(92) Observed by Pineau and Giraud-Audine (1974) who on 23 March also caught and photographed one individual, later cited in Pineau and Giraud-Audine (1979) and Mayaud (1990) who extended the period of observational records to 1 March; additional details provided by M. Thévenot (*in litt.* 2004). (93) Caught by Thouy (1978) and later erroneously cited as an "April" record in Mayaud (1990). (94) Observed by Pineau and Giraud-Audine (1975), later cited in Pineau and Giraud-Audine (1979) and Thévenot *et al.* (2003). (95) Recorded by Rod Martins (*in litt.* 2004). (96) Caught by Thévenot *et al.* (1980). (97) Observed by T.A. Walsh and Steve Whitehouse (M. Thévenot and R. Vernon *in litt.* 2004). (98) Caught by Thévenot *et al.* (1980). (99) Caught by P. Thouy (Thévenot *et al.* 2003) and cited in Thévenot *et al.* (1980). (100) Caught by Pierre Ch. Beaubrun (M. Thévenot *in litt.* 2004) and cited in Thévenot *et al.* (1981, 2003). (101) Observed by Jean-Paul Julliard (M. Thévenot *in litt.* 2004). (102) Observed by R. Destre and B. Libis (M. Thévenot *in litt.* 2004) and cited in Thévenot *et al.* (1980) as "near Fes" record. (103) Observed by J. Vestergaard-Jensen (M. Thévenot *in litt.* 2004) and cited in Thévenot *et al.* (1980) as earliest February record. (104) Caught by Jacques Franchimont (M. Thévenot *in litt.* 2004). (105) Observed by Christopher Bowden (M. Thévenot *in litt.* 2004) but not accepted by Moroccan Rare Birds Committee (Bergier *et al.* 2000), and therefore excluded from our analyses. (106) Observed by Alan Brown (M. Thévenot *in litt.* 2004). (107) Observed by Dave J. Odell (M. Thévenot *in litt.* 2004). (108) Mark Piper recorded a singing male as "Sedge Warbler *Acrocephalus paludicola*"; therefore this record is highly doubtful (M. Thévenot *in litt.* 2004) and was thus excluded from our analyses. (109) Observed by Marten Ajne *et al.* (M. Thévenot *in litt.* 2004). (110) Caught by Marten Ajne *et al.* (M. Thévenot *in litt.* 2004). (111) Observed by J. Komi, T. Lindrous, T. Missonen and H. Nurmi (M. Thévenot *in litt.* 2004). (112) Observed by Ian Rowlands (M. Thévenot *in litt.* 2004) and cited in Anonymous (1996). (113) First-winter bird observed by C. Edginton and D. Walsh (M. Thévenot and R. Vernon *in litt.* 2004) and cited in Bergier *et al.* (2000, 2002) and Thévenot *et al.* (2003). (114) Observed by Benoît Maire, submitted and accepted by the Moroccan Rare Birds Committee as observation no. 2003/06 (M. Thévenot *in litt.* 2004). (115) Caught on 2 March and retrapped on 17 March by Jarry and Larigauderie (1974) and cited in Morel and Roux (1973), Isemann (1979) and Rodwell *et al.* (1996). (116) Caught by Jarry and Larigauderie (1974) and cited in Morel and Roux (1973), Isemann (1979) and Rodwell *et al.* (1996). (117) and (120) About 50 individuals were recorded in the time period from 12.12.1973 to 17.3.1974, including the 26 ringed individuals mentioned in record 119 (Karl Schulze-Hagen, personal communication in Rodwell *et al.* 1996). (118) Caught by G. Jarry (*in litt.* to Isemann 1979), but curiously not mentioned in later publications. (119) Caught by the CRBPO (François Baillon *in litt.* 1989) and cited in Schulze-Hagen (1993) and Rodwell *et al.* (1996). (120) See record 117. (121) We give the year of publication as no exact date is given by Jarry and Roux (1982) as cited in Rodwell *et al.* (1996). (122) Recorded by François Baillon (*in litt.* 1989) and cited in Schulze-Hagen (1993). (123) Observed by François Baillon (*in litt.* 1989) and cited in Schulze-Hagen (1993). (124) Recorded by Matthias Scholten (personal communication from Christopher Schmidt). (125)–(126) Recorded by Rodwell *et al.* (1996); additional details provided by Stephen Rumsey (*in litt.* 2004). (127) Observed by François Baillon (*in litt.* 1989) and cited in Schulze-Hagen (1993). (128) Caught by Hermann Hörker (*in litt.* 1989) and cited in Schulze-Hagen (1993). (129) Observed by Hermann Hörker (*in litt.* 1989) and cited in Schulze-Hagen (1993). (130) Caught by Rodwell *et al.* (1996); additional details provided by Stephen Rumsey (*in litt.* 2004). (131) Specimen mentioned in Blanchet (1955) and later cited in Heim de Balsac and Mayaud (1962) and Thomsen and Jacobson (1979). (132) Male specimen mentioned in Blanchet (1955) and later cited in Heim de Balsac and Mayaud (1962) and Thomsen and Jacobson (1979). (133) Recorded by J. I. S. Whitaker and cited without giving an exact date of record in Heim de Balsac and Mayaud (1962). (134) Recorded by A. Koenig and cited without giving year of record in Heim de Balsac and Mayaud (1962). (135) Observed by Lombard (1965) and later cited in Thomsen and Jacobson (1979). (136) Record attributed to Lombard (1965) in Thomsen and Jacobson (1979), but not mentioned in Lombard (1965), and therefore excluded from our analyses. (137) Recorded by Mike Smart (personal communication). (138) Recorded by Brathay Exploration Group and cited in Thomsen and Jacobson (1979). (139)–(140) Recorded by Guy Jarry, CRBPO (personal communication from Mike Smart). (141) Recorded by K. Frost Larsen and cited in Thomsen and Jacobson (1979). (142) Observed by Kirwan (1992) and later cited in Kirwan (1995). (143) Observed by Captain D. Stam on board the M.V. *Joseph-Frering* (Stam and Voous 1963) and later cited in Tuck (1964), Moreau (1972), and as an undated record "off Dakhla" in Urban *et al.* (1997).