WINTERING AREAS AND SPRING MIGRATION OF THE BLACK-TAILED GODWIT

Bottlenecks and protection along the migration route

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SUMMARY

Introduction

The Black-tailed Godwit is a migrating bird species which breeds in temperate Europe and winters mainly in West-Africa. The core of the continental population breeds in the Netherlands, where the population has shown an alarming decline since the 1990s which is largely attributed to an insufficient recruitment and habitat loss in the breeding area. Up-to-date information on the situation in the wintering areas and during migration is lacking. To fill these gaps of knowledge the current study was initiated by Vogelbescherming Nederland and the Dutch Ministry of LNV. The study aims to present an up-to-date survey of the wintering areas and spring staging sites and to develop recommendations for an effective protection strategy.

To perform an assessment of the current situation (anno 2005-2006) in the wintering areas and along the migration route field data were gathered during the period November 2005 – April 2006. These data concerned actual and partly simultaneous counts and surveys and information on threats, habitat changees and protection. This work was done in narrow cooperation with experts and partner-organisations in the countries concerned. This network of collaborators proved to be very effective and can play a key role in future protection.

Winter distribution

As soon the breeding season ends Black-tailed Godwits migrate southward towards their wintering areas in West Africa. Godwits stay about 6-7 months in their winter quarters, from July/August to January. The main wintering areas can be divided in three areas: the Senegal delta, coastal region from Senegal to Guinea and the Inner-Niger delta in Mali. This study shows the following summarising results:

- The main wintering quarters of the Black-tailed Godwit of the West European population are situated in West Africa, mainly in the rice and mangrove zone from South Senegal to Guinea. The rice field complexes in Guinea Bissau are by far the most important wintering area, which hold– as a rough estimate - 40% of the wintering population.
- Compared to the 1980s the distribution of godwits in the winter range has not changed. However, the numbers which have been surveyed and estimated in the different wintering areas have decreased by half since the 1980s. This decline is likely to be linked to the parallel decline in the breeding population in Western Europe. In Mali, numbers of godwits aree stable over the past decades; this population mainly originates from the central European breeding population
- In the Senegal delta godwits frequent largely natural habitats during winter while in the core area they mainly forage on rice fields.
- Although large-scale habitat changes have occurred in the Senegal delta as well as severe droughts in the 1970s and 1980s - which both may have altered the distribution of godwits - in general this study did not encounter significant bottlenecks for godwits in the winter range.
- Hunting and human disturbance – though carried out in certain areas – seem to be no significant factors for the survival of godwits in the winter range. It must be stressed however, that this observation should be founded with a long-term monitoring of the annual mortality of the species.

Spring staging sites areas

From December onwards Black-tailed Godwits are migrating north towards their breeding areas. In contrast to the distribution in winter, during migration godwits are concentrated on a few staging sites, where huge numbers of godwits can be found. Summarising, the surveys and analysis of the migration pattern yielded the following results:

- By far the highest concentrations of Black-tailed Godwits can be found in the rice fields of Portugal, along the Tejo and Sado estuary, and Spain, in the Extremadura and Coto Doñana. On the Portugese spring staging sites up to 27% of the estimated breeding population of Western Europe can be present at one moment. The birds seem to forage exclusively on rice. Although presently sufficient suitable staging sites in Spain and Portugal seem to be available, these staging sites are vulnerable for changes in the rice culture.
- This study shows, that most probably an important shift has taken place during spring migration in the last decades. The traditionally important staging site the Marais Poitevin in France (Vendée) seems to have to have lost a part of its importance. Maximum counted numbers show a sharp decrease since the 1980s which can partly be attributed to the decrease of suitable habitat due to changes in land use. Also an increasing preference for the Spanish and Portugese staging sites may have played a role. Other important staging sites in France, the Moëze-Oléron and the Basses Vallées Angevines, did not show decreasing numbers. The annual quality of staging sites in France depends partly on the surface area of inundated grasslands, as a result of which large fluctuations in staging numbers occur.
- Although a part of the birds migrate via Italy to the Netherlands, a relatively small proportion of these birds use Italian spring staging sites. Comparison of spring phenology of different sites indicates that the majority of the birds in Italy are more likely to belong to the central European population.
- Based on diet choice of the Godwits at the different spring staging sites and the energetic consequences of shifts in diet, it has been hypothesized that two 'types' of migrating godwits may exist. One type – numerically most important - may maximise the time spent foraging on rice and fly from West Africa to the rice fields in Portugal/Spain and afterwards to the Netherlands. The second type may mainly forage on invertebrates and flies to Morocco and afterwards to France.
- Along the migration route in spring several threats have been observed, amongst which are climate change, habitat change and hunting. Habitat changes have had negative effects in Morocco and France, and may have contributed to a shift in the staging sites. The significance of hunting in France – the only country in the flyway where hunting on godwits is still allowed, though restricted in time - remains a question which can not be founded with adequate data. If indeed, as suggested from recent figures, an estimated number of a few thousands juvenile Black-tailed Godwits would be shot annually, than the impact of such should not be neglected.
- Hunting does not seem to be an important threat in the other countries along the flayway. However, hunting can lead to disturbance of important staging sites which are used by huge numbers of Black-tailed Godwits.

Conclusions

Although the main causes for the decline in East Atlantic population, are likely to occur in the breeding range, there are several threats and changes along the migration route that may have negative effects on the population. For the conservation of the Black-tailed Godwit it is important to adopt a fly-way approach which includes the entire fly-way and especially safe-guards crucial staging sites. This study shows that bottlenecks during the non-breeding season are more likely to occur during spring migration than in the winter range.

1. INTRODUCTION

The Black-tailed Godwit is a migrating bird species which breeds in temperate Europe and winters mainly in West Africa. The core of the continental population breeds in the Netherlands, chiefly in open agricultural landscapes. Since the 1990s the godwit population in the Netherlands shows an alarming decline which is largely attributed to an insufficient recruitment and habitat loss in the breeding area. Up-to-date information on the situation in the wintering areas and during migration is lacking. To fill these knowledge gaps the current study was initiated by Vogelbescherming Nederland and the dutch ministry of LNV. The study aims to present an up-to-date survey of the wintering areas and spring staging sites and to develop recommendations for an effective protection strategy. In this Chapter the background and goals of the study are briefly sketched.

1.1. ENDANGERED SPECIES

In a large part of its breeding range the Black-tailed Godwit shows a significant decline in population size during the last decades. As a result it has been marked recently on the IUCN Red list as a 'near threatened' species (IUCN 2006). This decline is not confined to the core population in Western Europe but concerns also the breeding numbers in Central Europe. This alarming trend calls for international protection along the entire flyway. Within this framework a European Action Plan has been developed (Jensen & Lutz 2006).

Subpopulations

For conservation purposes it is important to distinguish the subpopulations of the species in Europe: the continental population *Limosa limosa limosa* in West- and Central Europe and the Icelandic population *L. l. islandica*. These sub-populations use different migration strategies and their conservation status is different.

East-Atlantic population

The breeding range of the East-Atlantic population is situated in Western Europe with a core population in the Netherlands (49-75,000 pairs). Also significant numbers can be found in Germany (6-7,300 pairs) and Belgium (1,300 pairs). The total breeding population in Western Europe is estimated to be 53,000-60,000 pairs (Birdlife International 2004, Thorup 2006, see however Teunissen *et al.* 2004). In most countries the population is decreasing rapidly with a rate between 10 and 80 % during the last decades (Birdlife International 2004). Only in some countries the numbers have been increasing (Belgium, France). The Dutch core population shows a sharp decline since the 1990s.

The up-to-date information of each of the staging sites is used to give an update of the migration route and show which are the key wintering areas and spring staging sites (Chapter 5). An analysis of threats and changes along the migration route – as provided by this study – is used to formulate concrete recommendations for international conservation of the Black-tailed Godwit and to formulate urgent matters of research (Chapter 6).

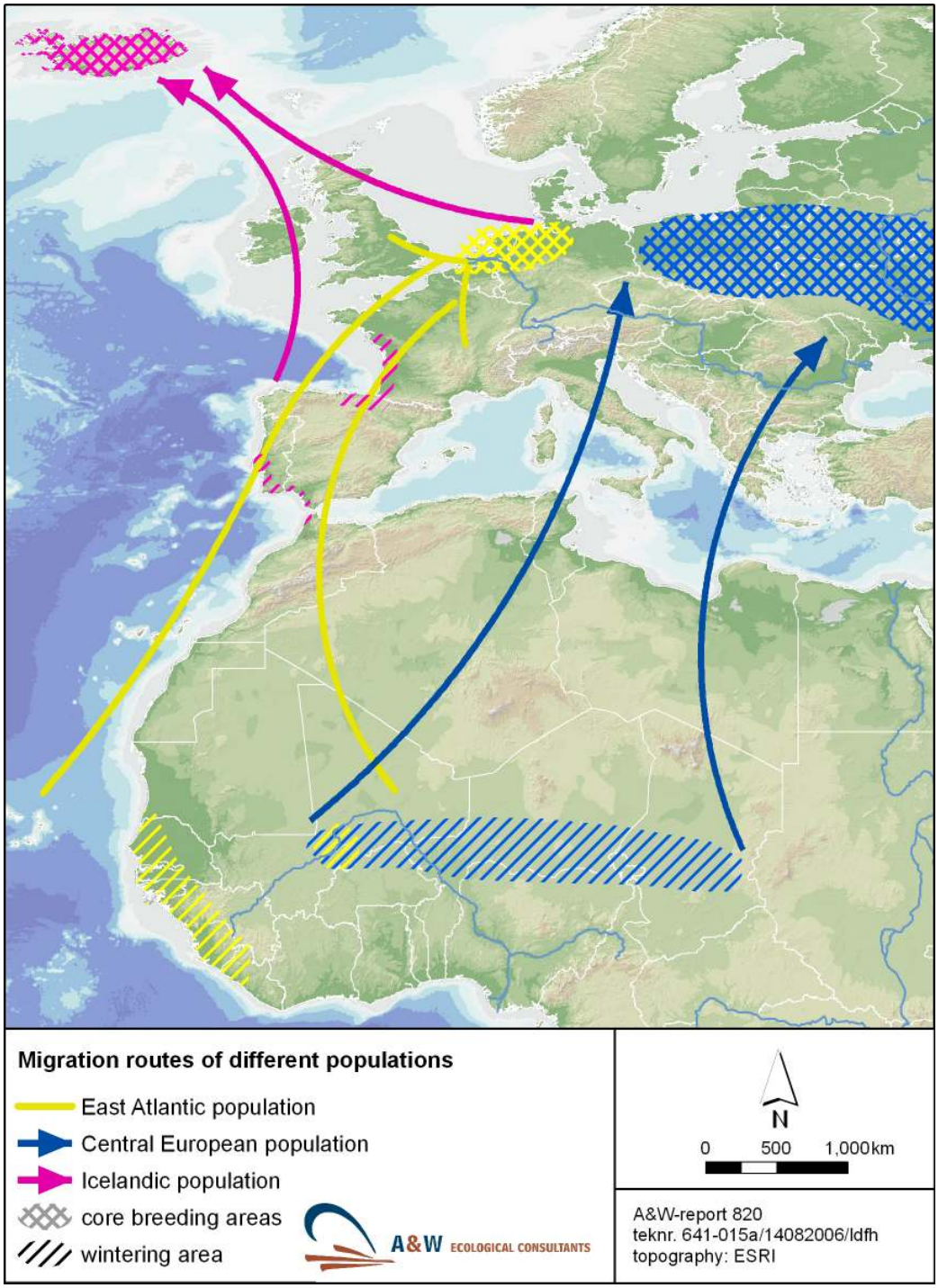


Fig. 1.1.
Simplified migration routes of the East Atlantic, Central European and Icelandic godwit population.

Central European population
The breeding range of the central European population extends from central to Eastern Europe and Russia west of the Ural Mountains. Following the survey of Thorup (2006) the highest numbers are found in Russia (15,000-32,000 pairs), Belarus (8,500 pairs), Poland (6,000 pairs) and the Ukraine (7,500-14,000 pairs). The total breeding population is estimated to be 30,500-57,000 pairs (Birdlife International 2004, Thorup 2006). Although numbers are increasing in some countries, in the core areas the population is decreasing with a rate between 0-30 % (Russia and Poland). The large population in Belarus fell from 15,000-17,000 pairs in 1990 to the present 6,000-8,500 pairs (Nikiforov & Mongin 1998, see Thorup 2006). Hence, also the Central European population is under threat.

The wintering areas are thought to be located in the Inner Niger Delta in Mali, in the Chad Basin and in other wetlands in the Sahelian belt (*e.g.* Beintema & Drost 1986). Italy and Tunisia are thought to be important staging sites during spring migration of this population. However, also other Mediterranean wetlands (for example in Greece and Turkey) and wetlands in the Balkan and around the Black Sea may be important on spring and autumn migration.

Icelandic population
The Icelandic breeding birds are considered as a subspecies: *Limosa l. islandica.* The breeding population is estimated to be 25,000 pairs (Birdlife International 2004, Thorup 2006). In sharp contrast to the East Atlantic and Central European population the Icelandic population has been increasing during the last decades with a rate of 0-19% (Birdlife International 2004, Thorup 2006).

The wintering areas are situated in Western Europe and more south to Portugal and Morocco. Icelandic godwits show a preference to forage in saline habitats such as mudflats and river estuaries. This different habitat choice compared to the continental godwits, which frequent fresh-water habitats, is also the main character to distinguish between both sub-species in countries where they both occur during spring migration (Morocco, Portugal, Spain and France). In the Netherlands in recent years between 3.015 (in 2001) and 9.811 (in 2002) birds, have been observed during spring migration (Gerritsen & Tijssen 2003). Maximum numbers were counted during the end of March and beginning of April.

The Netherlands as core area

At least since halfway the 20th century The Netherlands harbours a considerable population of Black-tailed Godwits, breeding in open low-lying grassland areas (Beintema *et al.* 1995). Despite a recent decline, The Netherlands still harbours the core breeding population of this species in Western Europe (Thorup 2006, data around 2000): up to 85% of the East-Atlantic population and up to 47% of the total continental population (East Atlantic and Central European populations combined). The large majority of this population therefore is breeding The Netherlands, which consequently plays a key role in the international conservation of the species.

The strong and continuous decrease in breeding numbers over the last decades in The Netherlands is alarming (Fig. 1.2). In 1960 the breeding population was roughly estimated at 125.000 breeding pairs and during the 80's between 85-100,000 pairs (Piersma 1986, SOVON 1987). The most recent estimate of the population, based on a country-wide inventory, amounts to 49-75,000 pairs with an annual loss of about 4% (Teunissen *et al.* 2005, Teunissen & Soldaat 2006, for more information www.grutto.nl). This more precise estimation is higher than earlier recent estimates of 45.000-50.000 pairs (SOVON 2002).

Different factors contribute to the population decline in The Netherlands. The surface area of suitable breeding habitat has been reduced drastically over the past decades through urbanisation, road construction and landscape changes (less open areas by planting of shrubs and trees). In addition the habitat quality of the remaining breeding area – about 75% of the Dutch population breeds outside protected and specially managed reserves! - is declining through intensification and changes in the agriculture system. The breeding season of the godwits is more and more pressed in a narrow time-window between arrival in The Netherlands and the start of first mowing. By using modern mowing equipment today large areas can be effectively mowed and harvested during a short period already early in the season (often late April, early May). This may result in a very low reproduction. Wymenga (1997) and Schekkerman & Müskens (2000) showed that in most breeding areas the recruitment is by far too low to sustain population levels.

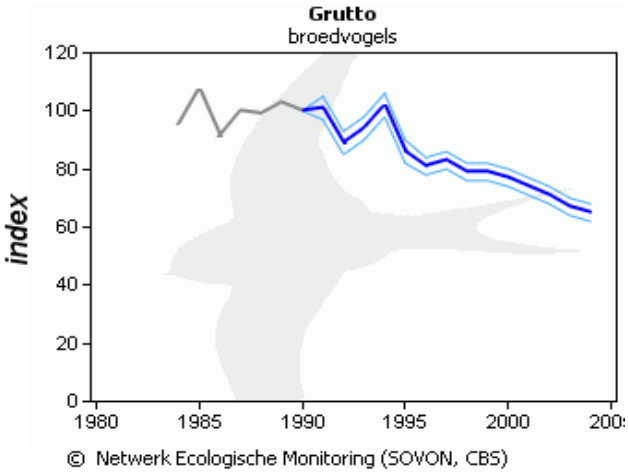


Fig. 1.2.
Population trend of the Black-tailed Godwit between 1980 and 2005, as produced by the Breeding bird Monitoring Project (BMP) of SOVON. Shown is the yearly population-index en the confidence interval, based on counts in sample areas in The Netherlands. Source: www.sovon.nl.

Another important factor affecting godwits breeding in The Netherlands is predation. A large part of eggs (24-27%) and chicks (60-75%) fall victim to a variety of predators (Teunissen *et al.* 2005b, Schekkerman & Teunissen 2006). Even though it is common that many eggs and chicks are preyed upon, changes in the landscape, such as the planting of trees in open landscapes, may increase the abundance of predators and hence the predation risk. A lower habitat quality may result also in a lower condition of the chicks which can make them more vulnerable for predation. For more information on the recent developments in the meadow bird populations in The Netherlands and the factors behind, we refer to Van Beusekom *et al.* 2006 (special issue of De Levende Natuur with English summaries).

The situation in the wintering areas and during migration

In a stable population recruitment and mortality are more or less in balance. As shown in the previous Section at least in the core population in The Netherlands the recruitment is on average far too low to maintain population levels. Reliable data on mortality of the continental Godwit populations are not available (Both *et al.* 2006) and next to nothing is known how changing conditions in the wintering quarters and spring staging sites are influencing the adult and first year mortality.

We do know, that godwits are confronted with a variety of changes and threats in their wintering areas and during migration. The past decades several developments have taken place in important wintering areas in West Africa. In the Senegal delta for instance, dams

have been constructed to regulate water levels in the area. In addition, rice cultivation is increasing in areas that used to be part of the river's natural floodplain. The development of rice cultivation is not necessarily negative for wintering and migrating godwits, since rice grains may be an important food source. The exploitability of rice grains may, however, change with new rice-growing techniques and intensification of the production. No information is yet available what these developments mean for the wintering conditions of Black-tailed Godwits.

The most important staging and wintering sites have been indicated by Beintema & Drost (1986), based on recoveries of ringed birds. An extensive survey of all important wintering sites was carried out by Altenburg & van der Kamp (1985). These data give a good overview of staging sites and wintering areas in the second half of the 1980's. Up-to-date information on flyway level is not available. In view of the recent decline there is a strong need to update this information and give an overview of the present situation.

1.2. AIM AND SCOPE OF THIS STUDY

Aim of the study

For an effective conservation of the core population of the Black-tailed Godwit in The Netherlands it is necessary to look beyond the borders of the breeding range and study also the threats godwits face during their wintering and migration. Within this framework the current study was initiated and supported by Vogelbescherming Nederland and the Dutch Ministry of LNV. The aim of this study is to update the information on the important wintering areas and spring migration sites along the fly-way of the Black-tailed Godwit. This study aims to reveal bottlenecks and chances for protection along the migration route. The study focuses on the East Atlantic godwit population and is divided in two modules:

Module I – Spring migration

Assessment of important spring staging sites through field visits, field counts of present numbers of godwits, gathering of information on protection and conservation, threats such as habitat changes, hunting or disturbance. Apart from the staging sites along the East Atlantic coastline also staging sites in Italy and Tunisia during spring migration are included in this survey. The field work and gathering of information was done by or in close co-operation with local experts and organisations.

Module II– Wintering areas

The goal of this module was to visit the wintering areas of the species in West-Africa, thereby repeating the work done by Altenburg & van der Kamp (1985) more than 20 years ago (November 1983 – January 1984). Nearly the same areas were visited as in 1983-1984. Information was gathered on numbers, habitat changes, hunting or disturbance. The project highly benfitted from the activities and network which has been developed by Wetlands International and partners in West Africa, mostly financed in the framework of the Dutch BBI-project (Beleidsprogramma Biodiversiteit Internationaal) and former projects (PIN - Programma Internationaal Natuurbeheer).

The current project aims to provide an up-to-date and coherent overview of the wintering areas and spring staging sites. This descriptive study concerns mainly the presentation of numerical data and information which is urgent from a conservational point of view (protection, threats etc). In this stage no in-depth field studies were performed on feeding

ecology (important for pre-migration fattening), migration strategy and/or mortality. This type of studies is however indispensable for a better comprehension of the migration system, the energetic bottlenecks and function of the spring staging sites as well as to analyse the quantitative contribution of different factors to the annual mortality. For further information regarding this see Chapter 6. Recommendations.

Lay-out of the report

In the present Chapter some background information is given on the developments in the different breeding population of the godwit in Europe (Section 1.1), which ultimately led to the current study. Chapter 2 provides information on the set-up of the study, the visited areas and the collaboration with partner-organisations and experts all along the flyway. The situation in the wintering areas (Module I) is addressed in Chapter 3, while the information on the spring staging sites (Module II) is presented in Chapter 4. We distinguished several regions, most per country. The chapters are written by or in close co-operation with local experts which, without exception, are well-up in this matter. Both in Chapter 3 and 4 per region the following topics are dealt with:

- *Important areas:* Description of important wintering and staging sites and the habitat use of godwits in these areas. This is based on the field surveys carried out in the period November 2005 – April 2006 and additional information provided by local experts. As far as possible for each area specific developments and/or threats are mentioned.
- *Changes in numbers*: Comparison of recent counts with – as far as available - surveys carried out in the past to investigate if numbers have been changing since the 1980's. This may be a comparison per region (country) or area, depending on the availability and quality of data.
- *Protection and threats*: For each region the protection (legal status) and threats are systematically summarized. We focussed on changes and threats that may negatively affect the suitability as staging sites for godwits. This information is based on data collected during field surveys and additional information provided by local experts. Also the available information on hunting on this species and the impact on sites is addressed.

The up-to-date information of each of the staging sites is used to give an update of the migration route and show which are the key wintering areas and spring staging sites (Chapter 5). An analysis of threats and changes along the migration route – as provided by this study – is used to formulate concrete recommendations for international conservation of the Black-tailed Godwit and to formulate urgent matters of research (Chapter 6).

2. SURVEY 2005-2006

To perform an assessment of the current situation (anno 2005-2006) in the wintering areas and along the migration route field data were gathered during the period November 2005 – April 2006. This was done in narrow cooperation with local partners in nearly all visited countries. This network of collaborators proved to be very effective and can play a key role in future protection.

In this study data collection was done through various methods. First, the countries with important winter areas and staging sites were visited. Godwit numbers were counted and information was gathered on habitat changes and possible threats. Secondly, a series of simultaneous counts has been conducted at each of the important staging sites that are used during spring migration. These data give a good impression of the Phenology of migration. In addition to the up-to-date assessment data of previous surveys have been collected. For some areas the data are rather incomplete. Nonetheless, this information gives insight in how these areas have been used as wintering areas or staging sites during the last decades.

2.1. FIELD SURVEYS AND OBSERVATIONS

Site selection

The sites which were visited for field work have been selected on the basis of earlier work. For the wintering areas we used the survey of Altenburg & van der Kamp (1985), supplemented with information from surveys in Mali (Wymenga *et al.* 2002, van der Kamp *et al.* 2005) and the data from the African Waterfowl Census (Wetlands International, amongst others Dodman *et al.* 1999). Information on spring staging sites was based on Beintema & Drost (1986) and information from former surveys (see references in the Sections on the countries). Also a Europe-wide census of migrating Ruff in spring provided information on potential godwit-sites (*cf.* Wymenga 1999).

Next to the sites which were known as important godwit-sites other potentially suitable sites were visited, depending on possibilities and time table. An overview of the countries where data were collected is given in Table 2.1.

For the field visits a protocol was developed, which was used by each of the observers. This protocol included guidelines for area selection, counting method, classification of habitats and the collection of other relevant information.

Godwit counts

All sightings of Black-tailed Godwits were noted as well as group size and the type of habitat in which the birds were located. Table 2.2 gives an overview of the list of habitat types that was used. In rice fields also the state of the rice fields was noted. These data were used to analyse the preference of godwits for habitat types. Counts of Black-tailed Godwits were carried out during the day when foraging, as well as during the evening when birds congregate at roosting sites. Both types of counts were used to estimate the total number of Black-tailed Godwits in each area. Note that in many areas, in particular in the wintering areas, no clear roosting behaviour was observed.

Field surveys in wintering areas and at staging sites of godwits were carried out in narrow co-operation with local partners and experts.

Table 2.1.
Countries where data were collected, duration and participants.

Type	Country	Period	Participants
Wintering area	Mali	5-11-05 / 5-12-05	J. van der Kamp (A&W), Bakary Kone, Bouba Fofana (Wetlands International, Sévaré).
Wintering area	Gambia and Senegal (Casamance)	19-11-05/ 2-12-05	D. Bos, R. Bijlsma (both A&W), K. Jammeh (Lands & Surveys Department), Y. Demba, M. Jallow & A. Jallow (Department of Parks Wildlife Management)
Wintering area	Guinee Bissau	10-12-05 / 9-1-05	J. van der Kamp (A&W), Joãozinho Sà, H.A.B. Monteiro, F. Djedjó, B. Coma, H. da Silva (Wetlands international, Guinée-Bissau)
Wintering area	Senegal & Mauritania	12-12-05 - 20-12-05	E. Wymenga & D. Kuijper (A&W), Mame Dagou, Oumar Ba, Idrissa Ndiaye (Wetlands International), Abdoulaye Fay (Parc National du Djoudj), Moctar Ould Daddah, Abau Thiau & Zein Elabidine Ould Sidaty (Parc National du Dwialing)
Wintering area	Niger and Burkina Faso	Jan-Feb	B. Koks & C. Trierweiler, University of Groningen
Wintering area	Guinee	2-1-06 / 16-01-06	D. Bos (A&W), M. Balla Moussa Conde, Camara, K. Soumah, I. Sory Barry (Ministère de l'Agriculture et de l'elevage), S. Sounounou Bah (Ministère de l'Environnement)
Spring staging area	Morocco	1-1-06 / 15-1-06	M. Kersten & A. Brenninkmeijer (A&W)
Spring staging area	Spain	February	N. Groen, J. Hooijmeijer & F. Mandema (University of Groningen), Godwit research group of J. Masero (University of Extremadura).
Spring staging area	Portugal	2-2-06 / 11-2-06	D.Tanger & G. Gerritsen, O. Steendam, R. Leguit, Pedro Lourenco (University of Groningen),
Spring staging area	Tunisia	27-2-06 / 5-3-06	E. Oosterveld (A&W), C. Feltrup-Azafzaf, H. Azafzaf, T. Moez, N. Hahmouda, H. Dlensi (Assocation des Amis des Oiseaux, Tunisian Birdlife partner)
Spring staging area	Italy	1-1-06 - 15-4-06	L. Serra (Istituto Nazionale per la Fauna Selvatica)
Spring staging area	France	27-3-06 / 2-2-06	C. Eikenaar & D. Kuijper (A&W), P. Triplet (Parc Ornithologique du Marquenterre), F. Noël LPO Anjou, J. Sudraud & Erwan Lagadec (LPO Vendée)

Additional information

During the field visits information was gathered on available habitats, habitat choice of godwits and possible threats for wintering and or staging godwits. Also information on hunting activity was gathered by interviewing local experts. Concrete information on hunting bags is hardly available.

Information on habitat change in the last decades and protection of areas is based on published sources and information from local managers and experts. For the situation in West Africa – the Senegal delta, the Inner Niger Delta in Mali and the coastal rice zone from south Senegal to Sierra Leone – this is mainly based on the work done by Wymenga *et al.* (2002), Zwarts *et al.* (2005) and (yet unpublished) data on habitat mapping and analysis which is done in the framework of the Dutch BBI-project (Altenburg & Wymenga ecological consultants, RIZA, Wetlands International and local partners). In the framework of this and former programmes censuses of water birds have been carried out in Mali from 1998 onwards (van der Kamp *et al.* 2005) and densities of water birds have been assessed in various habitat types in the Sahel and in the coastal rice and mangrove zone south of the Sahel. All this information was available for the current study.

Table 2.2.
Habitat types used for field surveys.

Classification of habitat type	Sub-classification for rice fields
1 – Rice field	1.1 Bare
	1.2 Cultivated (cultivated to plant rice)
2 – Mangrove	1.3 Seed bed
3 – Mudflats	1.4 Sown
4 – Fresh water swamp	1.5 Transplanted
5 – Sand banks	1.6 a. not harvested good conditions
6 – Islands	b. not harvested bad conditions
7 – Lagoons (salt water)	1.7 Stubble (harvested)
8 – Agricultural grassland (wet grasslands)	1.8 Covered with other vegetation

2.2. SIMULTANEOUS COUNTS ON SPRING STAGING SITES

In order to get a good insight in the number of migrating Black-tailed Godwits in spring and to unravel the phenology of this migrating species, simultaneous counts were organised and carried out along the flyway. To achieve this, a large number of people were contacted to participate in these simultaneous counts in countries (Table 2.3).

The counts were carried out along the complete flyway in pre-defined four day periods (Table 2.4) during the godwit's spring migration. We focused on roost counts rather then day counts because the birds tend to concentrate in large numbers on roosts during migration, while by day these numbers spread out over large foraging areas. Roost counts are therefore a good estimate of the total numbers present in a certain area. Where roosting behaviour did not occur, foraging birds were counted. Specific roost behaviour was observed mainly on the staging sites in Europe.

To get insight in the importance of different habitats, a comprehensive description of the feeding areas in the region was part of the census. This description focussed primarily on the main vegetation types in the feeding areas and the management (grazing, mowing, fertilisation, draining, flooding, and the intensity of these). Also a description of the diet was given when available. This is relevant as godwits may switch from a plant-based diet (rice) to an animal-based diet (invertebrates) during their spring migration. Information on feeding habits along the flyway can give insight in where this switch occurs.

Simultaneous counting period	Preferred date of count
6-9 January	7 January
20-23 January	21 January
3-6 February	4 February
17-20 February	18 February
3-6 March	4 March
17-20 March	18 March
31 March – 3 April	1 April

Table 2.3.
Four day period in which simultaneous counts were performed with the preferred day at which the counting should take place.

Table 2.4.

Spring staging sites where simultaneously counts of Black-tailed Godwits were carried out during spring 2006.

Area	Participants
Portugal	
rice fields in Tejo and Sado estuary	P. Lourenço (University Groningen – RUG)
Spain	
Extremadura	Niko Groen, Jos Hooijmeijer & Freek Mandema (RUG)
Extremadura	F. Santiago Quesada (Universidad de Extremadura. Área de Zoología)
France	
Basse Valée d'Angivines	F. Noël, A. Fossé (LPO-Anjou)
Parc du Marquenterre	P. Triplet, F. Sueur (Parc Ornithologique du Marquenterre)
Loire valley	F. Noël (LPO-Anjou)
Moëze-Oléron Nature Réserve	J. Gonin (Moëze-Oléron Nature Réserve)
Italy	
Alma Dannata	Giuseppe
Commune di Bentivoglio	D. Bonazzi
Delta del po, Po di Venezia, Golena ca'Cornera, Porto Viro, Valle ca'Pisani	P. Paolo, E. Verza
Foliano lake (in Nat. Park of Circeo)	F. Corbi (Gruppo Pontino Ricerche Ornithologiche)
Commune di Potenza Picena	N. Galassi
Comune die Potenza Picena	M. Fusari
mouth of Metauro river	P. Spadoni
Lago delle Grazie, Comune di Torino	P. Forconi
Comune di Porto Recanati	M. Pascucci
Oasi di Macchigrande di Focene, Monumento naturale Palude die Torre Flavia	C. Battisti, S. Ceccobelli, E. Rizzo, A. Sorace
Ortazzo, Salina di Cervia	A. Magnani, C. Campomori, M. Bonora, L. Serra (Istituto Nazionale per la Fauna Selvatica)
Orobello Lagoon (Toscany)	F. Cianchi
Salina di Tarquinia	E. Savo, Parus
Tronto river mouth	G. Marini
Alviano lake (Umbria)	S. Laurenti
Vallid i Mortizzuolo (Modena)	C. Gianella
Vasche di Maccares (Roma)	R. Gildi, A. Sorace
Province Vercelli	M. Della Toffola, G.P.S.O.
Punta Canaletta	F. Borghesi
Oasi di Macchiatonda	C. Finn
Lago delle Grazie – Comune di Tolentino	Paolo Forconi
The Netherlands	
Ameland	J.Huizinga (Staatsbosbeheer)
Frieswykpolder	R. Kleefstra, SOVON
Hunzemeander Koningslaagte	R. Jalving
Landje van Geijsel	M. Kuiper, NatuurBeleven
Ezumakeeg	S. Krap (Staatsbosbeheer)
Wijde Mar & Gruyts	S. Krap (Staatsbosbeheer)
Veerpolder	E. Bulten-Helwes
Visvlieterdiep	M. Tamminga
Westerhornepolder	M. Tamminga
Witte en Zwarte Brekken	D. Kuijper & E. Wymenga
Polder Ijdoorn	F. Groen
De Putten, Hargerpolder, Camperduin NH	H. Schekkerman

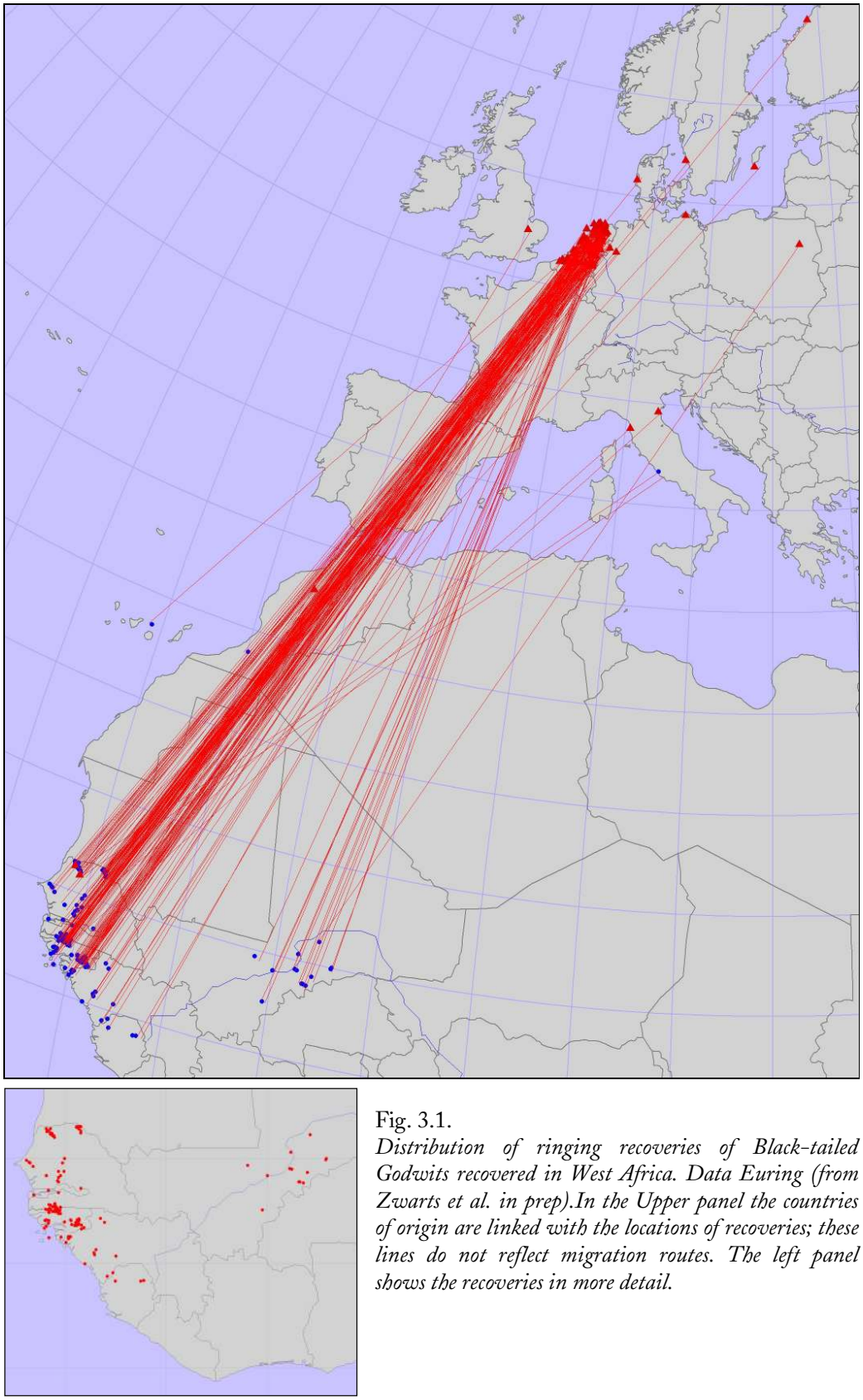


Fig. 3.1.
Distribution of ringing recoveries of Black-tailed Godwits recovered in West Africa. Data Euring (from Zwarts et al. in prep).In the Upper panel the countries of origin are linked with the locations of recoveries; these lines do not reflect migration routes. The left panel shows the recoveries in more detail.

3. WINTER DISTRIBUTION

As soon as the breeding season ends, Black-tailed Godwits migrate southward towards their wintering areas in West Africa. Already in early June unsuccessful breeders gather on staging sites in The Netherlands to prepare for migration. The majority of adult bird, however, leave the breeding grounds during mid June and mid July. Godwits stay about 6-7 months in their winter quarters, from July to January. In this report we speak of 'winter distribution' and 'wintering areas' by which we refer to the northern winter. In fact, this 'winter' period concerns the non-breeding season which lasts from July to February including migration.

In this Chapter we deal with the winter distribution of the Black-tailed Godwit based on field work in 2005-2006 and additional sources. We provide an estimate of wintering numbers but the main priority of this Chapter is to describe the wintering areas, habitat choices of godwits and changes in the wintering areas in the last decades. Each section is closed with an analysis of potential and actual threats.

3.1. INTRODUCTION

The winter quarters of the continental Black-tailed Godwit are situated in Africa, extending from Senegal and Guinea Bissau on the Atlantic coast to the Chad Basin and Sudd in the eastern Sahel. Euring data of recoveries of Black-tailed Godwits in West Africa, show this winter distribution pattern (Fig. 3.1). However, distribution maps of ringing recoveries are strongly biased towards areas where most birds are ringed (in this case The Netherlands) and where many birds are shot or collected. This concerns in particular Mali and Senegal. One can conclude from Fig 3.1 that Dutch birds are wintering in Senegal, Guinea Bissau and Mali but it does not explain the numerical distribution. Hardly any recoveries are available from the Central and East European populations due to the low numbers which are ringed there and the fact that the birds winter in the more eastern and remote parts of the Sahel.

The predominant importance of the West African wintering quarters for the West European godwit population is known already for long time (Mulder 1972, Roux 1959). Beintema & Drost (1986) analysed the migration pattern on the basis of ringing recoveries. The winter distribution was further established by an extensive field survey from November 1983 to February 1984 by Altenburg & van der Kamp (1985). Later surveys by Altenburg & van der Kamp (1991) in Guinea and several other data (Triplet & Yésou 2000, African Waterfowl Census e.g. Dodman *et al.* 1999) confirmed the winter distribution as outlined by Altenburg & van der Kamp (1985). Based on this information we distinguished the following areas of interest (Fig. 3.2) which were visited together with local partners:

- The Senegal delta, covering the Mauritanian and Senegalese part of the delta from the Atlantic coast inland to Richard Toll (the alluvial deltaic floodplain). See Section 3.2;
- The coastal region from Senegal to Guinea, with the Sine Saloum, Gambia, the Casamance and the rice and mangrove zone of Guinea Bissau and Guinea – Section 3.3;
- The Inner Niger Delta in Mali, the inland floodplain of the Niger as well as some large rice perimeters in the upstream Niger Basin (in particular Office du Niger). Section 3.4.

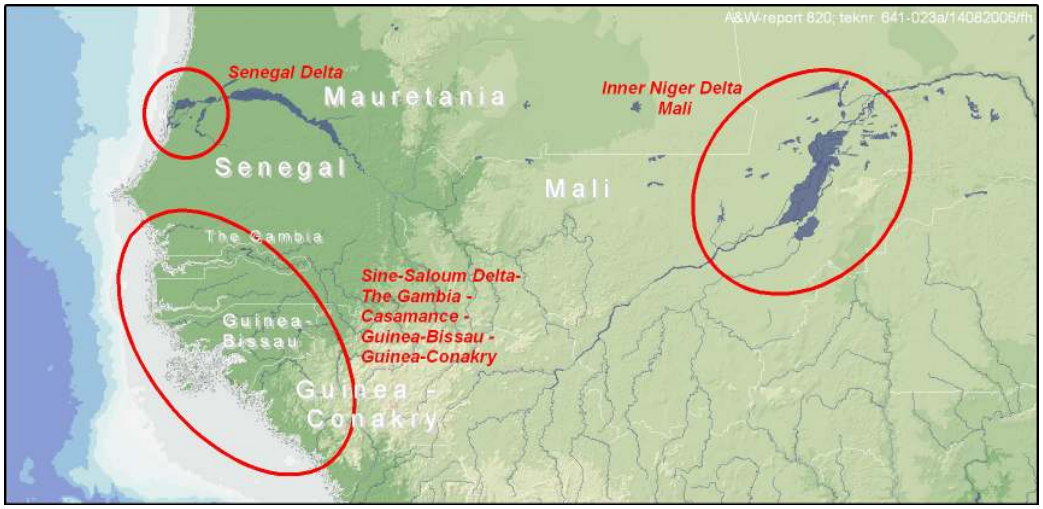


Fig. 3.2.
Wintering area of the Black-tailed Godwit in Western Africa with the areas of interest indicated.

From other regions we have no accurate data from the period 2005-2006, except that in the framework of a mission which focussed on Montagu's Harriers in Nigeria and Burkina Faso (University of Groningen, B. Koks *et al.*) several small wetlands were visited. No godwits were seen during that mission. Given the huge area to cover and the limited time available, we chose not to visit a number of scattered wetlands in the south of Mauritania, where nevertheless larger numbers of godwits have been counted in the past (van Wetten *et al.* 1990). See also the synthesis in Chapter 5.

3.2. THE SENEGAL DELTA

3.2.1. General description of the area

The Senegal River is one of the large rivers in West Africa (*c.* 1,800 km). It rises in the Fouta Djalon Mountains in Guinea from where it flows in a north-western direction through Mali. Several tributaries join the main stream. From where it leaves Mali the Senegal river forms the border between Senegal in the south and Mauritania in the north. This part forms the middle valley which can be 30 km wide. Here extensive floodplains occur which today are mostly cultivated for rice production (irrigated perimeters) and vegetables (tomatoes in the dry season). West of Richard Toll the river enters a flat alluvial plain which forms a huge delta of about 300,000 ha. This delta is one of the large floodplains in Sahelian Africa though extensive flooding belongs largely to the past through embankments and flood control (Triplet & Yesou 2000, Zwarts *et al.* in prep).

The river itself runs through the delta and bends to the south in the direction of St Louis (Fig 3.3). The river mouth lays *c.* 20 km south of St Louis and concerns a very dynamic environment. In the past the river mouth shifted to the south under influence of the river flood, oceanic currents and oceanic swell. This has resulted in a narrow strip of sand dunes which separates the delta from the ocean. In the past the river breached frequently through

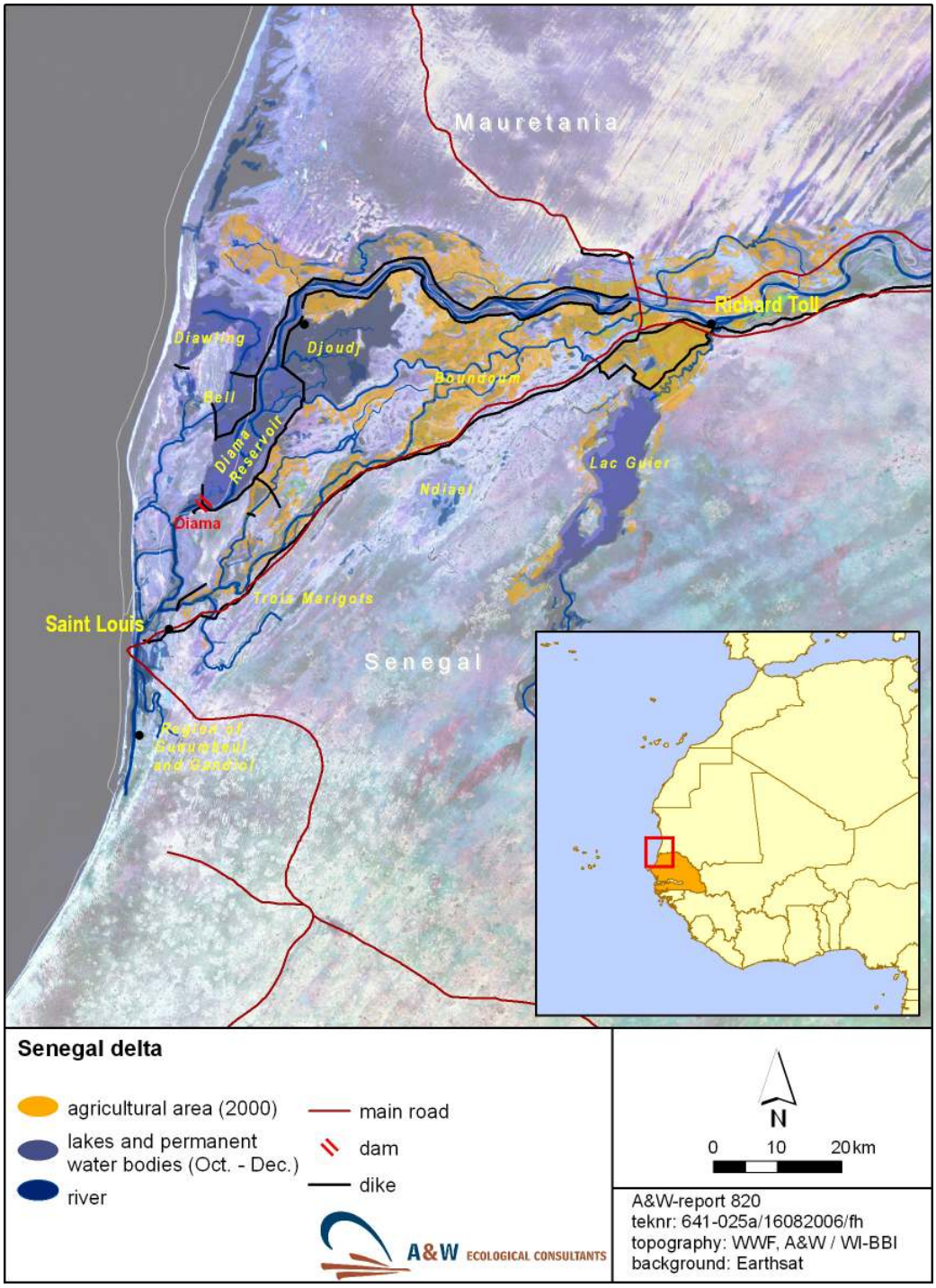


Fig 3.3.

Outline of the Senegal delta with main roads, dikes and cultivated areas. The Diama dam, in the lower part of the river, is indicated as well. The Diama reservoir lies between the embankments along the south and north bank of the river.

Freshwater marshes with shallow layers of water are important foraging habitats of godwits in Parc National du Djoudj. In the background of the picture vast Typha stands can be seen.

Godwits can often be observed in wet (deserted) rice fields in the Senegal delta.

this barrier at high floods. Recently (October 2003) an artificial breach has been made directly south of St Louis to prevent excessive flooding of the lower parts of St Louis. This breach may have serious consequences for the morphology, salinity and ecology in the lower part of the delta, especially in the parts downstream the Diama dam.

Rainfall and flooding

Like the Inner Niger Delta in Mali the Senegal delta lies in the Western Sahel where rainfall is limited to a very short period and does not exceed an annual 300 mm. The rainy season starts in July and lasts till September. Annual rainfall in West Africa shows a strong gradient and increases from north to south. While it rains hardly in the northern Sahel (north of the Senegal delta) in the Fouta Djalon mountains – where both the Niger and Senegal rise - the rainy season runs from April to November and the annual rainfall amounts to 2,000 mm.

This rainfall pattern causes a river flood from July to November. This river flood reaches the entrance of the Senegal delta normally in July and peaks in October, with a retreating flood afterwards. Lowest water levels in the delta occur in May and July when the delta is transformed in a near-desert environment. Hence, in the Senegal delta water birds encounter huge wetlands from August (rainy season) to December-January (retreating flood) while during the hot season (February – June) the very dry and often saline conditions are making life very harsh.

The pattern described above is a general picture. The rainfall in the Sahel shows a lot of variation within and between years, resulting in low or high floods in the floodplains. Over the years a cyclic pattern can be distinguished with wet and relatively dry periods (Zwarts *et al.* in prep.). In the 1950s for instance rainfall and floods were high, while (very) dry periods occurred in the 1910s, 1940s, 1970s and 1980s. The very dry years in the 1970's and 1980's are locally known as the Great Drought (La Grande Sécheresse) leading to mass starvation of cattle and famine-struck communities. The general pattern is, that rainfall and flood levels partly recovered from 1994 onwards but the high river discharges from the past were never reached again.

Controlling the flood through embankments and dams

In the past decades the Senegal delta faced drastic changes through embankments and flood control (Triplet & Yesou 2000, Zwarts *et al.* in prep.). Before the hydrological engineering the floodplain measured 300,000 ha, forming a vast complex of gullies and streams and a variety of estuarine habitats, flooded pastures and other habitats. Rice cultures hardly existed in the natural floodplain as during the dry season salt water intruded from the ocean and could reach about 200 km inland. The delta was used by local communities for fisheries, grazing and bird hunting. According to Voisin (1983) the delta was extremely rich in birds, before the engineering works started halfway the 20th century.

Triplet & Yesou (2000) summarised the hydrological engineering in the delta; historic data are found in, amongst others, Bernard (1992) and Crousse *et al.* (1991). Though the French colonial administration already looked for possibilities for cotton cultures in the delta in the 19th century, the first engineering works were realised in the beginning of the 20th century (small sluices and dams). The first large embankment encompassed the complete left bank of the river (Senegalese side) in the early 1960s. The actual cultivation of the delta however showed only limited progress in that period. After the great drought in the 1970s new plans were made in order to raise food security in this part of the Sahel. This resulted in an ambitious plan for large scale irrigation in the Senegal delta and middle valley. The plans

Impression of rice perimeters and harvest of rice fields in the Senegal delta. Some small wetland areas outside the delta are protected hunting zones, while in the delta large protected zones occur.

involved a dam in the lower part of the Senegal, to stop salt intrusion and raise water levels for irrigation as well as a dam in one of the main upstream tributaries to be able to produce hydropower. The control of the flood would also make it possible to navigate on the Senegal River during a large part of the year. The Diama dam in the lower part of the river was realised in 1983 and the Manantali dam in the upstream Bafing tributary in Mali in 1987. The engineering works were more or less completed with the embankment of the Mauritanian side of the river in the early 1990s, by which the Diama basin (the reservoir between the dam and the embanked river sides) was realised and water levels could be maintained on a high level for irrigation.

The original floodplain – flooded during maximum flood levels – finally was reduced from 300,000 ha to about 33,000 ha, resulting in a reduction with about 89% (Zwarts *et al.* in prep). The embanked surface area has gradually been developed into an agricultural area with extensive rice perimeters. The hydrological, geo-morphological, socio-economic and ecological consequences of the engineering works have been enormous leading to large-scale side effects for the local communities not to mention biodiversity (for example Adams 1999, Barusseau *et al.* 1998, Peeters 2001, Salem-Murdock *et al.* 1994, Verhoef 1996).

Habitats

Because of the hydrological engineering and cultivation of the delta the environment and habitats changed drastically during the last decades. The original floodplain habitats with *Sporobolus robustus* and *Echinochloa colona* largely disappeared and only persisted in the Djoudj National Park whereas they re-emerged after a partial flood restoration in the Diawling National Park (see hereafter). The changes in habitats due to the dams can be summarised as followed (for details see Zwarts *et al.* in prep):

- First of all, the estuarine and highly dynamic character of the former floodplain changed into a fresh water system with hardly any dynamic conditions. Brackish circumstances only remained downstream the Diama dam but due to the flood control the downstream basins became salter than before.
- Within the embanked surface areas large rice perimeters were developed, in particular in the 1980s and the 1990s. The total surface area of cultivated grounds amounts to *c.* 87,000 ha in 2005 (all perimeters combined, also abandoned perimeters). A part of the rice perimeters has been abandoned already because of salinisation. Rice is grown in the wet season (end of July to November) and partly also during the dry season (February-June). These double-crop cultures (*contre-saison*) may also concern tomatoes or other vegetables. The rice perimeters are irrigated through a system of canals and small ditches.
- The fresh water system in the Senegal delta became rapidly dominated by invasive plants as soon as the fresh water bodies became permanent and stagnant (Peeters 2001, Pieterse et al. 2003). The plant species concerned are *Pistia stratiotes*, *Typha domingensis* and *Salvinia molesta*. The occurrence of invasive plant is typical for tropical floodplains which are ecologically disturbed. The main causes in the Senegal delta are the absence of the former salt water intrusion during in the dry period, the stable instead of dynamic water table and eutrophication via drainage of fertilised rice fields. *Salvinia molesta* was successfully controlled via biological control (Pieterse *et al.* 2003). Typha stands however have developed over an area of more than 15,000 ha (Peeters 2001, L. Manding SAED). The tall, homogenous Typha stands have very low densities of birds (Bruinzeel *et al.* 2005). The Typha-invasion has led to a decrease of open and sparsely vegetated marshes and mudflats which are important foraging habitats for godwits.

- A large part of the delta which is not cultivated but located within the embanked area developed into dry mostly saline habitats which are only sparsely vegetated. These habitats are unsuitable for water birds. Formerly important wetland areas as the Ndiaël and the Trois Marigots developed for a large part in saline and very dry environments. Today, only on small scale water bodies remain.

Already in the 1970's one recognised the enormous importance of parts of the delta for Afro tropical and migrant Palearctic bird species. In 1971 therefore the *Parc National du Djoudj* was established. In this park of about 16,000 ha, artificial flooding was introduced and still large areas with more or less original floodplain vegetations can be found. An optimal water management of the park however becomes more and more complex. The park is of paramount importance for migrant birds. In 1994 – after embankment of the Mauritanian side of the river – the IUCN started a rehabilitation project in the Mauritanian part of the delta, in the *Bell and Diawling basins*. Via the construction of inlets in the Diama reservoir fresh water was introduced again in a part of the former floodplain. This artificial flooding over an area of about 6.000 ha was very successful (Hamerlynck & Duvail 2003). The most important areas in the Senegal delta are briefly described hereafter:

Parc National du Diawling
In the Diawling National Park (*c.* 16,000 ha) on the Mauritanian side of the river vast areas of the typical floodplain habitats can be found (Hamerlynck & Duvail 2003). The area was declared a National Park in 1991. The park consists of three large basins (Bell, Diawling, Ntiallakh) and includes a lagoon (fed by brackish water), estuarine and inter-tidal areas, saline mud flats, a small area of mangroves, dunes, alluvial plains and an interconnecting network of river branches. The Bell basin can be characterised as a large open brackish lake with low water levels and low vegetation cover. It is artificially flooded and kept dry in the dry season, thus simulating the original dynamic conditions. In the Diawling basin a high cover of natural floodplain vegetation - consisting of the grasses *Sporobolus robustus* and *Sp. helvetis* and *Echinochloa colona* - can be found bordering the mudflats and shallow water bodies. The Ntiallakh basin, south of lake Bell, is characterised by dry plains with low vegetation cover and mainly salt-tolerant species such as *Salicornia spp*., *Salsocali* and Tamariks bushes. Also small parts of mangrove forest can be found here. Depending on the water and flood levels this basin can be inundated for a large part during high floods in the wet season.

Next to the importance for Afro tropical birds (breeding colonies), the Diawling National Park is very important for migrant birds with for instance high numbers of spoonbills, Purple herons and large concentrations of Shovelers, Garganeys and Pintails. Today this area is one of the strongholds for water birds in the Senegal delta.

Parc National des Oiseaux du Djoudj
Parc National des Oiseaux du Djoudj (*c.* 16.000 ha) is important for a wide range of water birds, especially during the winter. The park consists of an extensive area of densely vegetated fresh water marshes alternated with open water, brackish ponds and mudflats. In the embanked areas which surround the park and which have constant water levels, the vegetation is dominated by tall, dense *Typha* vegetation. These areas are unattractive for water birds, but they may function as roosts for huge concentrations of Red-billed quelias, Sand martins and Yellow wagtails. In the park itself, high densities of birds can be found in open water bodies, near water inlets and on mud flats, where impressive assemblages of water birds can be found. This is especially the case in the central lakes (Marigot de Khar, Grand Lac). Parc National des Oiseaux du Djoudj was founded in 1971.

Réserve de faune du Ndiaël
This site (> 45.000 ha) is situated north-east of St. Louis, and west of Lac de Guiers. The Nidiaël is a natural depression which before the embankments in the delta was regularly flooded and was one of the major wetlands in the delta. After the embankments in the 1960's flooding ceased and the area became mostly dry. Nowadays the lowest parts still keep water in the wet season, partly fed by drainage water from rice perimeters in the north. Water levels in the area fluctuate yearly and the central part is bordered by *Scirpus* and *Juncus* vegetation. The site was designated in 1977 as a Ramsar site. Because of the resulting habitat change that took place as a result of the drought, the area has been placed on a list of threatened Ramsar Sites in 1987. As the area still harbours large numbers of water birds it has been designated as Important Bird Area.

Les Trois Marigots
The Trois Marigots forms a series of south-west running depressions which were, before the embankments, regularly flooded during high flood levels. The area used to be a very important wetland in the delta. Since the area became dry it lost its importance for water birds. Since the 1990's water inlet is partly restored. This resulted in stable water levels and invasion of Typha vegetations. The area however still holds concentrations of water birds.

Lagunes near St. Louis – Guembeul and Gandiol region
Brackish to salt lagoons and mudflats south of St Louis with shallow water which provide feeding sites for salt-tolerant wader species. The mouth of the river is situated some 20 kms south of St Louis. In 2003, during a very high flood, a breach was made directly south of the city in order to make a short cut to the ocean. This breach has several hydrological and geomorphologic consequences. It may reduce the flooding in the lower part of the delta and also cause hyper saline conditions in parts of the Gandiol and Guembeul gullies and lagoons. The consequences of this breach can not yet be fully examined. Given the salinity the wetland areas around St Louis are sparsely vegetated. The parts that are vegetated are dominated by salt-tolerant plant species; mainly Salicornia and on the higher parts bushes of Tamarisk. Although the river has open access to the ocean, the tidal movement in the lagoons and gullies is limited.

In a small depression south of St. Louis the nature reserve 'Réserve de Faune de Guembeul' (720 ha) is situated which was established in 1983. The reserve consists of a large lagoon with a variable salinity, with small areas of mangroves along brackish lagoons. Southwest of this reserve the Parc National de la Langue de Barbarie is situated. It consists of intertidal mud flats (salt and brackish water) and sand dunes formed on a split across the river mouth. It is listed as a world heritage site of UNESCO. Because of the earlier mentioned breach south of St Louis, the Langue de Barbarie is now separated from the mainland.

Rice fields in the Senegal delta
Next to the natural habitats in the Senegal delta, large areas are used to cultivate rice, as described before. The main complexes of irrigated rice fields can be found near Rosso and Richard-Toll, Débi and in the region of Boundoum. As can be seen in Fig 3.2 a large part of the delta is cultivated nowadays. Water levels in these rice fields are regulated by a system of channels and sluices. Rice is planted or sown in August, during the rainy season, and harvested from November onwards. In case of a double crop, fields are ploughed and made ready in the course of January. In February-March the rice is planted or sown again and it can be harvested in June/July. A part of the double crop is used for tomatoes and/or other vegetables.

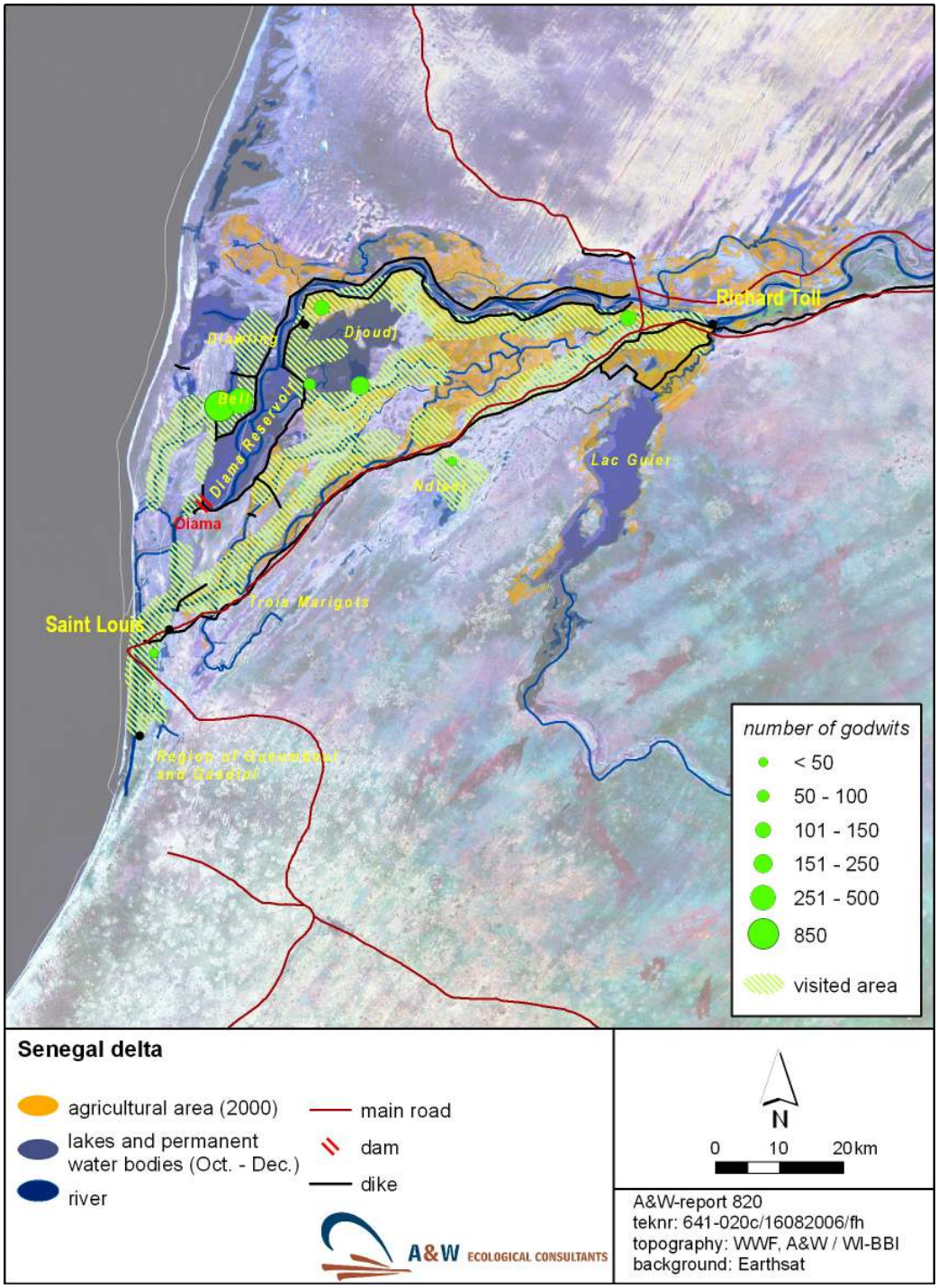


Figure 3.4.
Visited areas in the Senegal delta in December 2005 and distribution of Black-tailed Godwit

3.2.2. Presence and distribution of godwits

Phenology
Already towards the end of June and the beginning of July godwits, most likely unsuccessful breeders followed by adults and juveniles, arrive and gather in the Senegal delta. In most years, however, the majority arrives in the second half of July. There are however no recent data available on the precise Phenology of migration in Senegal. Previous studies showed that numbers increased during October and maximum numbers were counted in November (Mulder 1972). During the whole non-breeding season – e.g. the northern winter - godwits are found in Senegal, though the numbers are marginal or nearly absent at lowest water levels in May-June.

A part of the birds which stay in Senegal are thought to disperse to other areas in Western Africa during winter. In the course of January birds are migrating north again to Morocco (Tréca 1984) and other staging sites in the north (Chapter 4). However, even until March and April godwits can still be observed in Senegal (Altenburg & van der Kamp 1985). These are most probable first-year birds which spend their first year in Africa and do not return to the breeding grounds.

Numbers and distribution in 2005-2006
The Senegal delta was visited in December 2005, while another census was done in January 2006 in the framework of the African Waterfowl Census (P. Triplet *cs.* OMPO - Programme d'Oiseaux Migrateurs du Palearctique Occidental). Suitable areas in November-December were areas with a small layer of water (max. 20 cm) or moist areas where godwits can forage profitably. In the non-breeding season godwits forage on rice grains (and possibly also other grains) as well as on invertebrates (all kind of snails, worms, chironomidae, bivalves etc). Rice grains are in particular available during the planting period (July-August) and during harvest in the period November – December, (Tréca 1984).

In December 2005 almost all rice perimeters had been harvested for more than 50-75%. Most of the rice parcels were dry and not suitable for water birds anymore. Only in depressions in rice fields water birds – mostly waders like Ruff *Philomachus pugnax*, Black-winged stilt *Himantopus himantopus*, Wood Sandpiper *Tringa glareola* and Spur-winged Lapwing *Vanellus spinosus* - were encountered. Godwits were only seen in very small groups. Nearly all wet places in the delta were visited except the southern part of the Ndiaël, the Trois marigots and the northern part of the river delta (Mauritanian side). From another mission which visited the delta in December – a Spanish mission looking for European Spoonbills – we learned that in these parts no godwits were seen (Claudine de la Court *cs.*). In total 1,736 birds were counted in a rather scattered distribution. The distribution of these birds is given in Table 3.1 and Fig. 3.4.

In the Diawling National Park a relative high number (1183) of godwits was found in the Bell and Diawling basin. Both basins were filled with a small layer of fresh to brackish water. The birds were mainly observed feeding in shallow water (10-15 cm) and a large flock feeding in shallow water between floating *Echinochloa colona* vegetation. On both locations they presumably foraged on invertebrates, although one can not exclude that seeds of this grass are eaten also. In the Ntiallakh basin hardly any suitable habitat for godwits were seen; the area was for a large part dry while the gullies were fed by salt water since this basin lies downstream the Diama dam. No godwits were present in this area.

In the Djoudj National Park, which was still partly inundated during our visit while the central lakes were completely inundated, godwits were seen along the south borders of Grand Lac and Marigot de Khar and near the entrance of the Park. Godwits mainly used the open fresh water marshes and fresh to brackish mudflats with shallow water. Here they foraged on invertebrates. During the 2006 census 460 godwits (Table 3.1) were counted here. Previous surveys reported on a few thousand godwits in this area (table 3.3). As we did not visit the northern part of Grand Lac it is possible birds are missed in this area.

Table 3.1.
Numbers of Black-tailed Godwits encountered in the Senegal delta in December 2005 and the habitats in which the birds were counted.

Area's	Numbers counted	Habitat
Diawling (Mauritania)	1183	Fresh water swamp
Djoudj	98	Fresh water swamp
Grand Lac (south west)	106	Fresh water swamp
Débi-Tiguet (rice fields)	144	Rice fields – stubble
Boundoum (rice fields)	0	Rice fields – stubble
Rosso – Richard-Toll (rice fields)	150	Fresh water swamp
Lake Ndiaël	45	Fresh water swamp
St. Louis – Gandiol	10	Lagoons
Total	1736	

The Ndiaël was inundated in the central part, where it can be reached from the road Ros Bethio– Richard Toll. Small numbers (45) were counted in this area in 2006. They were observed on the borders of the lake, foraging in shallow water on invertebrates. Also previous surveys showed relatively low numbers in this area.

The rice perimeters constitute an important potential feeding habitat for godwits. During the visit in December 2006 the rice field areas of Débi-Tiguet, Savoigne, Boudoum and the area around Rosso and Richard Toll were explored. All these areas were dry (drained) and harvested to a large extent (on average for more than 75%). The soil of most rice parcels was dried up and hard (impenetrable for a godwit's bill), only in lower parts of the perimeters moist areas were found. The major part of rice perimeters in this part of the year seemed unsuitable for waders, and in general only low numbers of waders were encountered. It is a general phenomenon that in (very) dry rice fields no or hardly any waders are encountered. Even Ruff, a species which was known to be present in the Senegal delta in the 1980's in very large numbers (>100,000, OAG Münster 1989, 1997) were not seen in large concentrations (<< 5,000). In the rice fields near Débi-Tiguet 144 godwits and in the rice fields near Rosso-Richard-Toll 150 godwits were counted in 2006. In Débi the birds were seen in the rice fields, in Richard Toll the birds were present in a small fresh water marsh inside the rice field complex. As this was about 11:00 h in the morning we can not exclude that the birds foraged in the rice fields before.

In the area around St. Louis most fresh water bodies were visited as well as the gullies and lagoons of Gandiol and Guembeul. Only low numbers of godwits have been counted in this area in 2006 (10, table 3.2). Godwits were observed in brackish to fresh water marshes dominated by mudflats bordered by tall grasses and mangroves. The high salinity of a large part of the area of Gandiol and Guembeul, south of St. Louis, makes it less suitable as foraging site for godwits.

Habitat choice

In the Senegal delta the Black-tailed Godwit shows a clear preference for natural fresh to brackish water open marshes and/or water bodies with shallow water. Of all the birds counted 92% was found in fresh water marshes, in nearly all cases foraging in shallow water (10-20 cm, in a few cases moist areas). This is common pattern in the Senegal in this part of the year. Also during the mid-winter census godwits are almost exclusively found in this type of habitat (P. Triplet pers. comm.) while also in other parts of the year godwits frequent these habitats in the Djoudj and Diawling National Parks (resp. Idrissa Ndiaye & Zein Elabidine Ould Sidaty, pers. comm.). Also during their survey in October 2003 Altenburg & van der Kamp (1985) did not find any godwits in the rice fields in the Senegal delta. Rice fields may, however, be important during the arrival of godwits and at the onset of the harvest, when most parcels are still wet.

Total estimate 2006

In Fig. 3.4 the visited areas are presented and during our mission we visited nearly all areas of interest, meaning areas with shallow fresh water bodies or rice perimeters. As mentioned earlier the rice perimeters north of the river were not visited. Also Lac de Guiers was not visited nor the southern part of the Ndiaël and the Trois Marigots. We do not expect that large numbers of birds have been missed in these areas. This can be illustrated with a quick look of a satellite image (Fig. 3.5).

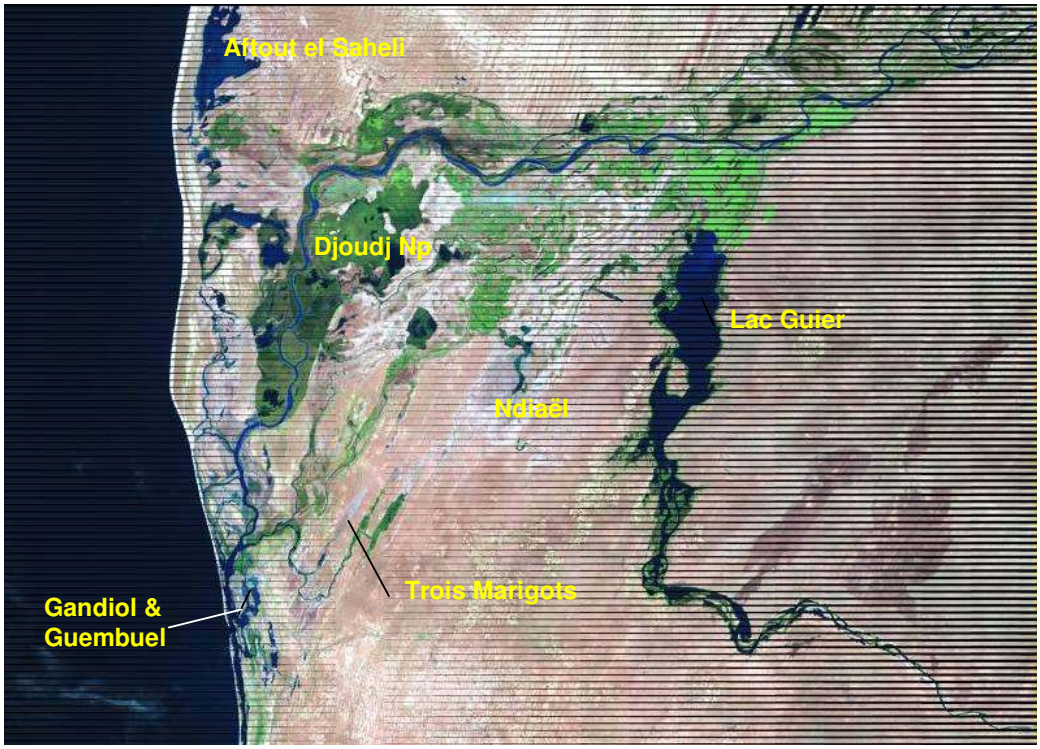


Fig. 3.5.
Quicklook of Landsat 7 satelite image of 6 December 2005, showing the Senegal delta. Clearly the embanked Diama reservoir can be seen, the Bell and Diawling basins, the Djoudj National Park

and the rice perimeters. Compare with Fig. 3.2 for names and delineations of parks and with Fig. 3.4 for visited areas.

In Fig 3.5 a quick look of a satellite image of 6 December 2005 is shown, reflecting the situation during our visit. It can be seen, that the southern part of Ndiaël is nearly dry while the Trois Marigots hardly contain any water (the green stripes are Typha stands, unsuitable for waders). In Lac de Guiers no godwits can be expected because water levels are kept high in this lake, which serves as reservoir of potable water for Dakar. The borders of the lake are vegetated by tall *Phragmites* and *Typha* vegetation and further inland thorn bush savannah occurs. Water levels in this lake are generally too deep for wader birds (Idrissa Ndiaye, pers. comm.). In the north of the delta the large water body of the Aftout Es Saheli can be seen. This is a coastal and saline lagoon with shallow water levels. As being a saline environment it is not very suitable for godwits. A Spanish mission looking for Spoonbills visited this area in December 2005 and did not encounter any godwits (Claudine de la Court *cs.* pers. comm.). Finally on the image the green cultivated areas can be seen. The light green areas north of Lac Guier are sugar cane fields which are unsuitable for water birds. The other areas are rice perimeters which were visited. As no godwits were seen in the Senegalese part of the delta, we also expect that the similar rice perimeters on the northern part of the river in Mauritania did not hold important numbers of godwits this year.

We can conclude therefore, that the suitable areas were covered quite completely. Based on the census of 1,736 godwits we expect that in total no more than 2,000-2,500 godwits were present in the Senegal delta during our visit in December 2005. In January 2006 P. Triplet *cs.* counted 2,961 birds while also covering the whole delta. In January this is even more complete because the areas with water become scarce more and more. The higher numbers in January might easily reflect an incompleteness of our census in December 2005, but more probably it could mean an influx from the south, as godwits are starting their northward migration already in the course of January.

3.2.3 Changes in numbers of godwits

Available data

The Senegal delta is one of the areas where ornithologists already payed attention to in the late 1950's. Pioneers as F. Roux, R. de Naurois and collaborators carried out many surveys in the past, though they payed in particular attention to ducks and colonial breeding water birds. Nevertheless, these former surveys yielded a lot of information on the occurrence of godwits in the area. For this study we used the summaries of data given in Altenburg & van der Kamp (1985), Triplet & Yesou (2000) and Zwarts *et al.* (in prep). Also additional sources – as far as available – were put together. A constraint using these older data (see Triplet & Yesou 2000) is that it is difficult to judge if the surveys in the past covered the complete delta and the reliability of the estimates. In most cases, the censuses can be considered as complete, but this is not always sure.

Changes

Fig. 3.6 shows the estimates and complete surveys that are carried out in the past for the Senegal delta as a whole. The numbers for the period 1993-2006 are submitted by P. Triplet *cs.* (OMPO) and are reliable censuses. The Figs. for the period 1958-1992 are based on various sources (see Fig. 3.6). Though it is tricky to draw conclusions, we can see that in general the numbers of godwits before the early 1990's (on average >10,000) were much higher than in the period 1994-2006 (average 2,400). The highest number ever was

estimated by Roux (1959) in October 1958 in the period *before* the large engineering works and during a very high flood level. This large figure may have been induced by the high floods that occurred in this period.

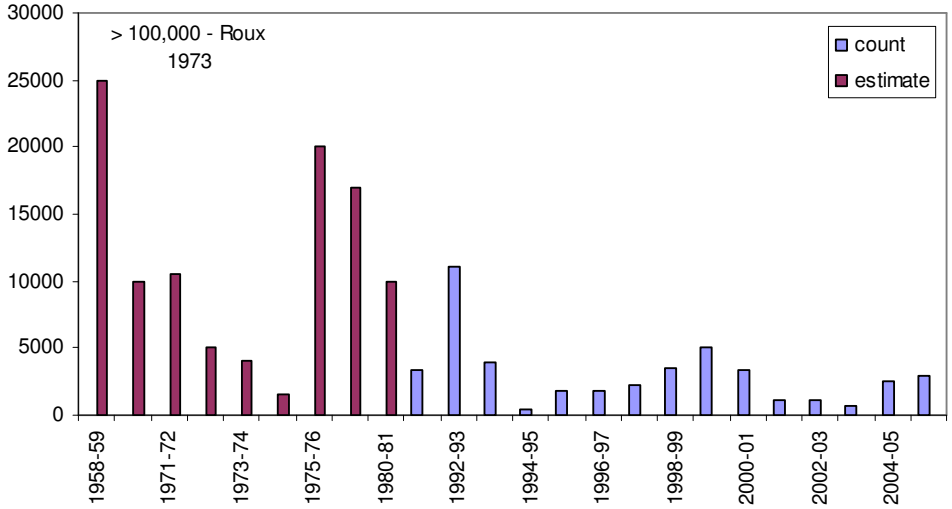


Fig. 3.6.
Available mid-winter counts (October – January) from the Senegal delta based on various sources (Altenburg & van der Kamp 1985, Roux 1959, Roux 1973, Morel & Roux 1966, Tréca 1975, Tréca 1984, Poorter et al. 1982, unpublished data L. Zwarts, 1993-2006: P. Triplet cs).

The numbers in the delta show no relationship with the level of the flood (r^2 = 0.01, data from Fig. 3.6 and water levels at Richard-Toll). This is not surprising since flooding in the delta is restricted by the embankments since the 1960s.

Other rather large estimates (up to 20,000 individuals) mostly concern October-December counts; we can not exclude that during the January counts some birds have already migrated to the north. This point however, does not account for the lower numbers from 1993 onwards, as also available December counts from these years show numbers of the same order. It is apparent, that the large engineering works were completed in the early 1990's. Triplet & Yesou (2000) already showed how these hydrological interventions in the delta altered the distribution of water birds, especially ducks (White-faced Whistling Duck. *Dendrocygna viduata*, Garganey *Anas querquedula* and Pintail *Anas acuta*). Also the huge wintering numbers of Ruff – from which in the past more than one million but at least several hundred thousands of birds have been reported (Beintema *et al.* 1995) – nearly evaporated in the Senegal delta. As the large engineering works already started in the 1960's with the embankment of the complete Senegalese side of the river (thus the largest part of the floodplain) and were completed in the early 1990's this does not account for the recent decline of godwit numbers. It may have altered, however, the winter distribution in Western Africa by which more birds are wintering to the south (Beintema *et al.* 1995). Unfortunately, this can not be supported by data from southern areas as surveys of waders in these areas are very scarce (see Section 3.3).

It is clear though, that the wintering conditions in the Senegal delta for Black-tailed Godwits changed remarkably during the past decades and after the survey of Altenburg & van der Kamp (1985). The major part of natural wetland habitats disappeared. From 1994

onwards the situation in the Bell and Diawling basins – now most important for godwits – was successfully restored, offering ample feeding habitats for waders as godwits. In the current situation – and with the current numbers present - the available habitat for godwits in the delta is - even when the habitat changes are taken into account - so large that it is hardly possible that habitat availability is a bottleneck for godwits. Hence, the lower numbers may also reflect the population decline as found in The Netherlands. As shown in Fig. 3.6 the numbers from the second half of the 1990's onwards are almost half as low as before. This also accounts for the survey of Altenburg & van der Kamp (1985) and the current study.

Within the Senegal delta there are different developments. Whereas in Djoudj National Park godwit numbers seem to be decreasing, in the Diawling National Park numbers are comparable. The restored flooding in the Bell and Diawling basins has certainly created a large area of very suitable foraging habitats (> 6.000 ha) during a large part of the non-breeding season. In general the distribution of godwits in the Senegal delta in the period October – January will depend on suitable habitat, which is available amply in this period in the National Parks (Diawling, Djoudj) and also in other areas providing that there is enough water.

Table 3.2
Number of godwits in the Senegal delta in the period 1980-2005 in several sub-basins. Numbers represent the maximum number of wintering birds in the period September-January.

Area	1980	1981	1983	1999	2001	2002	2003	2005
Djoudj			1.800 [3]	3.365 [4]	2.294 [4, 5]	207 [6]	862 [7]	490 [10]
Diawling	5.300 [1]	2.000 [1]	1.115 [3]		7.900 [5]	350 [8]	205 [9]	1.183 [10]
Debi-Tiguet-Rosso			0 [3]					338 [10]
Lake Ndiayel			0 [3]			210 [6]		45 [10]
Rice fields near R. Toll			135 [3]				105 [7]	106 [10]
Gandiol St Lois	2.270 [1]		20 [3]	75 [4]	792 [5]	657 [6]	140 [7]	10 [10]
total	*10.000* [2]		*3.300* [3]	*3.365* [4]				*1.769* [10]

1. Poorter *et al.* 1982, 2. Tréca 1975, 3. Altenburg & van der Kamp 1985, 4. DPN - Coordinateur National du Dénombrement des Oiseaux 1999 (DOEA), 5. Ministère de la Jeunesse, de l'Environment et de l'Hygiène Publique 2001, 6. S. & V. Diouf - Jan 2001, 7. S. Diouf 2003, 8. M. Poot *et al.* 2003, 9. Dénombrement annuel des Oiseaux du Parc National du Diawling et de sa zone periphérique, edition 2004, 10. This study.

3.2.4. Threats and protection

Climate
The suitability and the surface area of foraging sites for godwits depend to a large extent on annual rainfall and (indirectly) flooding. During the wet season many areas become flooded or inundated and turn into temporal lakes and fresh water marshes which constitute optimal foraging sites in the Senegal delta. The delta, however, is situated in the Sahel, where a distinct climatic variation exists with dry and wet periods. Several climatic studies – based on climate prediction models – show, that the average temperature in the Sahel increased from 1970 onwards, and increased on average with 0.6 ^{0}C per decade in the end of the 20th century (climatic studies summarised in Zwart *et al.* in prep.). Also it is predicted, that the rainfall in

the Sahel will be more or less stable for the coming 30 years but will decrease with 20% in the period thereafter (Held *et al*. 2005). This means that on a relative short term no negative effects of climate change are to be expected for godwits, but in the long run (50-100 years), the Sahelian environment may be less suitable, or in other words, more often be less suitable because of (very) low rainfall.

Habitat change

Large scale habitat changes have taken place as a direct result of the construction of dams and the cultivation of the Senegal river (see 3.2.1). The reduction of the dynamics of this delta has resulted in a strong decrease of natural floodplain habitats. This has strongly reduced the amount of suitable habitat for many waders, including the godwits. In parts of the delta natural floodplain habitats are preserved or restored in National Parks through artificial flooding regimes (see 3.2.1). Also, in particular for godwits, the rice fields may in some periods of the year – June-August - constitute an alternative habitat. As described before, the large scale degradation of the natural wetland habitat may have altered the winter distribution of godwits, and evidently lowered the surface area of suitable habitats in the non-breeding season. Although rice fields are an alternative habitat this is only partly the case in the Senegal delta, as during November-January the rice fields are (very) dry and not suitable as feeding area. This is supported by field observations, showing that the birds prefer natural habitats in that period.

Given the numbers of godwits in the Senegal delta as a whole and the large area of still available natural habitats (in the Djoudj and Diawling National Parks), it seems unlikely that this factor is at present a bottleneck for godwits in the non-breeding season in the Senegal delta. However, we have no information on available feeding resources, so the surface area of qualitatively good habitats is not clear. More information on this item would be desirable.

In the area downstream of the Diama reservoir the (geo)morphology and hydrology is changing. This is caused by the dam and flood control itself, which has altered the flood and sedimentology in the river (Barusseau *et al*. 1998) but also because of the recent breach in the sand strip just south of St Louis. During high floods – which occurred recently in 1999 and 2003 – the lower parts of St Louis were inundated. During the flood of October 2003 it was decided to breach the sand strip in order to lower the flood level in the basins downstream the Diama dam. One of the consequences has been, that fresh and/or brackish water stays shorter and possibly in lower quantities in these basins (Ntiallakh, lagoons of Gandiol, Guembeul and directly east of St. Louis) which alters the salinity of the water. Apart from the consequences for the valuable estuarine gradient, for godwits this means that in these basins saline to sometimes hyper-saline conditions occur making them less attractive as foraging area.

Human disturbance

Human disturbance can be manifold from human activity related to cultivation, to cattle-herding, fishing and deliberately chasing of birds to prevent damage to rice and other crops. In the National Parks (Diawling, Djoudj) the human activities are restricted and cause no disturbance to godwits. Since the majority of godwits stays within the National Parks human disturbance is no threat during the winter period (October-January).

In the rice fields farmers are actively chasing away Red-billed Quelea *Quelea quelea* and other small seed-eating birds. Queleas ('*Mange-mils*') can be present in enormous flocks in the whole delta, ranging through the rice perimeters and using tall Typha- and Phragmites-stands as roosting site. The active disturbance of birds in the rice fields – through running,

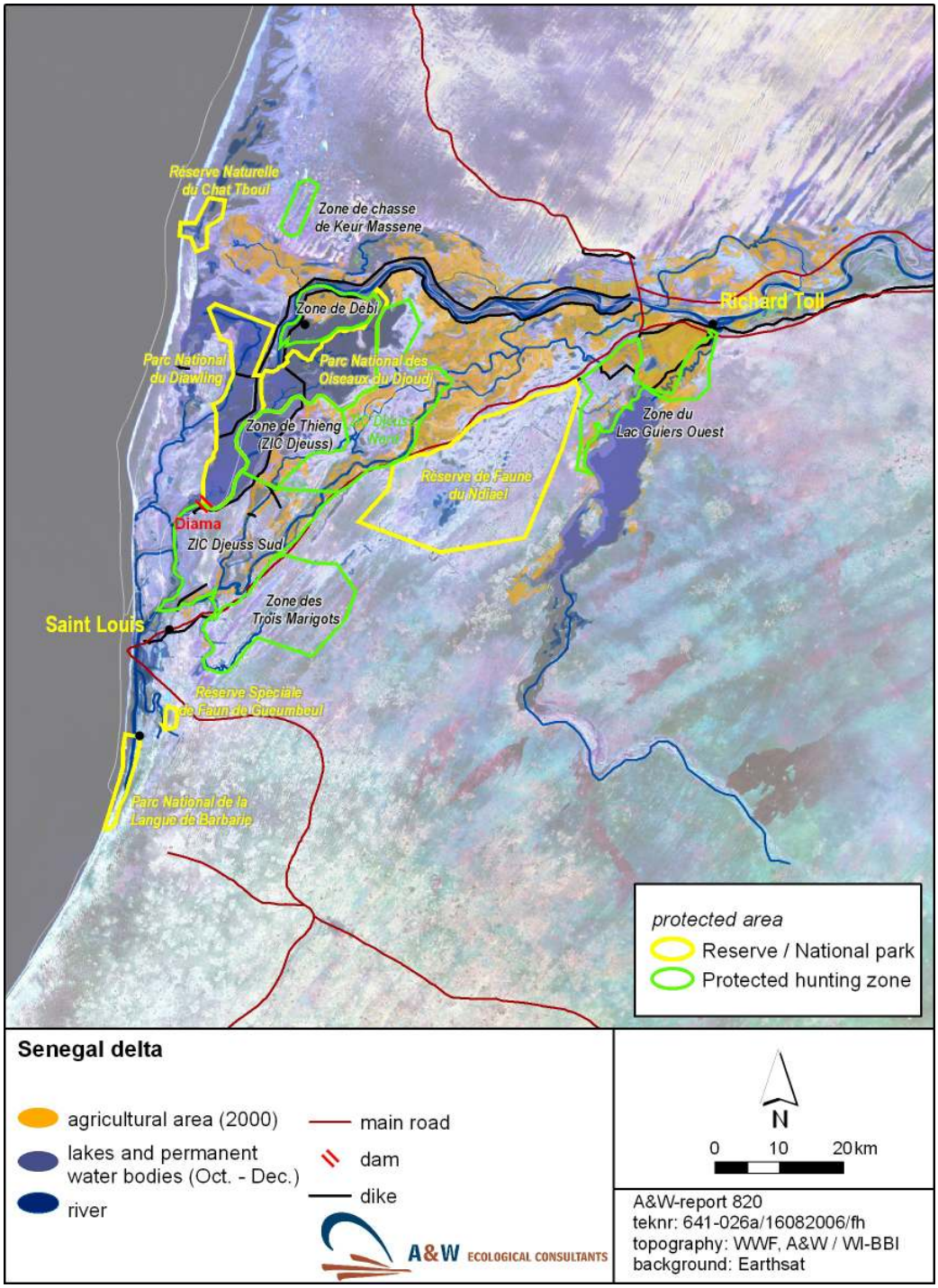


Fig. 3.7.

Protected areas in the Senegal delta (from Peeters 2001). Most of the areas which are visited by Black-tailed Godwits are protected. Hunting is practiced frequently beyond the borders of these areas, mostly on ducks which leave or go to the rice field area to forage.

clapping hands and other noise-making activities – may cause considerable disturbance for other birds too. At least during the winter period this seems no bottleneck for godwits as the rice fields are dry.

In July and August when godwits arrive in the Senegal delta their arrival coincides with the sowing and planting of rice. As reported by local experts and farmers, during this time, farmers spend hours to chase godwits and other waders off their fields to protect their parcels. The magnitude of this conflict between farmers and Black-tailed Godwits is unknown and recommended to study in an additional mission (see Recommendations).

Hunting
In the Senegal delta National Parks, a number of Nature reserves and 'Zones de Chasse' are found, where hunting is prohibited (Fig. 3.7). Nearly all godwits seen are present within these protected zones. Hunting is practised directly beyond the borders of the protected zones but (foreign) hunters concentrate on ducks rather than on waders. No data on hunting bags are available. Local experts do not mention any conflict in this matter. Hunting therefore is considered to be a minor threat for the Black-tailed Godwits wintering in Senegal.

3.2.4. Conclusions

From the analyses and the information described in this Section the following conclusions can be drawn:

- The Senegal delta constitutes an important wintering area for Black-tailed Godwits. Ringing recoveries clearly show the link with The Netherlands.
- The delta faced large-scale changes in the past decades through embankments, dams and flood control. The original floodplain has been transformed into an agricultural area which is largely being used for irrigated rice cultures. Natural floodplain habitats disappeared in the delta and remained in a few protected and restored areas.
- Water birds amongst which are Black-tailed Godwits largely depend on protected wetlands. In particular the Diawling National Park (Mauritania) and the Djoudj National Park (Senegal) are strongholds for water birds in the delta during the whole season and in particular at low water levels.
- Based on a fairly complete survey of suitable area the number of wintering godwits in the Senegal delta is estimated at 2,000-2,500, while in January 2006 2,900 birds were counted. Nearly all godwits were encountered in natural habitats.
- An analysis of available surveys in the Senegal delta shows that the number of wintering godwits dropped considerably in the course of the 1990's and stayed at this lower level. This may be linked to the general population decline but also the large-scale habitat changes may have altered the distribution of the species. The much larger concentrations from the past (1960s – 1970s) never re-appeared.
- There are currently no clear threats to Black-tailed Godwits within the Senegal delta. On the long term the Sahelian wetlands will face a climatic change, resulting in lower rainfall and accompanying droughts. This probably will affect the suitability for water birds. Human disturbance and hunting is not a bottleneck for godwits within the delta as nearly all birds frequent the protected areas. Also outside the protected areas hunting on godwits is not reported.
- The large-scale hydrological engineering and cultivation in the Senegal delta in the past decades have resulted into a large-scale degradation of natural wetland habitats

with cascading effects for biodiversity and local communities. This evidently has changed the wintering conditions for godwits in the past decades in the Senegal delta, already starting from the 1960's onwards and completed with the constructions of dams and dikes in the 1980's. In the current situation, the remaining area of natural wetland habitats offers ample opportunities for the relatively low number of staging godwits in the delta. Habitat degradation can be considered as major threats to the Senegal delta in general, but whether this poses a direct bottleneck for godwits in the current situation is unclear. More information on the quality of available habitats – in terms of food available at the onset of spring migration – is requested.

3.3. RICE AND MANGROVE ZONE

3.3.1. General description of the area

The vegetation zones in West Africa are determined by rainfall. South of the Sahel, where rainfall increases in general from 500-600 mm in the central part of Senegal to 1,500 to 2,000 mm annually in Guinea Bissau and Guinea. As a consequence, the landscape changes rapidly from north to south in the sense that it is much greener and there is much more (woodland) vegetation. The coastal plain from southern Senegal to Gambia, Guinea Bissau and Guinea harbours extensive mangroves and intertidal areas along the coastline and in the hinterland rice paddies, upland with crop land, wooded savannah and forests. In this coastal plain several relatively small rivers – most rising in the mountains in Guinea - discharge into the ocean such as the Gambia, the Rio Geba and Rio Corubal in Guinea Bissau and the Fatala, Konkouré and Kolente in Guinea.

Although there is a clear gradient in climate and landscape we treat the rice and mangrove zone from the Sine Saloum in Senegal to Guinea here as one large study area. The brief description of the area which is presented here is largely based on Bos (2006). Before a description is given of the main areas – Sine Saloum, Gambia river, Casamance, Guinea Bissau and Guinea – some general aspects are dealt with. For details on rainfall, hydrology, soils, ecology and socio-economic developments we refer to Bertrand (1999), Cormier-Salem (1999), Dodman *et al.* (2004) and Bos (2006).

Rainfall and climate change
The annual rainfall in the zone from Southern Senegal to Guinea shows a steep gradient, strongly increasing form north to south. As in the Sahel the rainfall is not constant over the years but shows cyclic variation with dry and wet periods. In the 1960s the highest rainfall was measured, while clear drought periods occurred in the 1970s and 1980s as in the Sahel. The northern estuaries and wetlands – generally north of Guinea Bissau (after Bertrand 1999) – have been more vulnerable to this climatic variation than in the south, amongst others because of the lower rainfall and higher evaporation. This had resulted in a clear salinisation of borders of the northern estuaries (Sine Saloum and to a lesser extent Gambia and the Casamance), which can be seen on satellite images (Fig. 3.9). In the course of the 1990's rainfall has recovered but not to the levels measured in the 1960's.

The extent of rice fields in the mangrove zone
As rice paddies are the main habitat of Black-tailed Godwits in this part of Africa it is important to have an idea of the surface area of this habitat. Rice fields which are important to water birds lie mainly in the mangrove zone, where mangrove has been cut and reclaimed in the past to make rice fields (*bolanhas*). Bos (2006) made an estimate of the surface area of rice paddies in the lowland in West Africa.

First, the FAO data can be used to get an impression of the rice area, but not all of the rice covered in these statistics relates to lowland rice. According to the FAO-statistics, Guinea and Sierra Leone are the major rice producing countries in the region, with harvested areas that amount to hundreds of thousands of hectares. The total area of rice harvested in the countries in this region has declined over the study period 1980-2000. This is mainly due to a decline in Sierra Leone during the last decade. In Guinea there was a strong and temporary decline in area harvested during the period 1983-1989. The total area of rice in

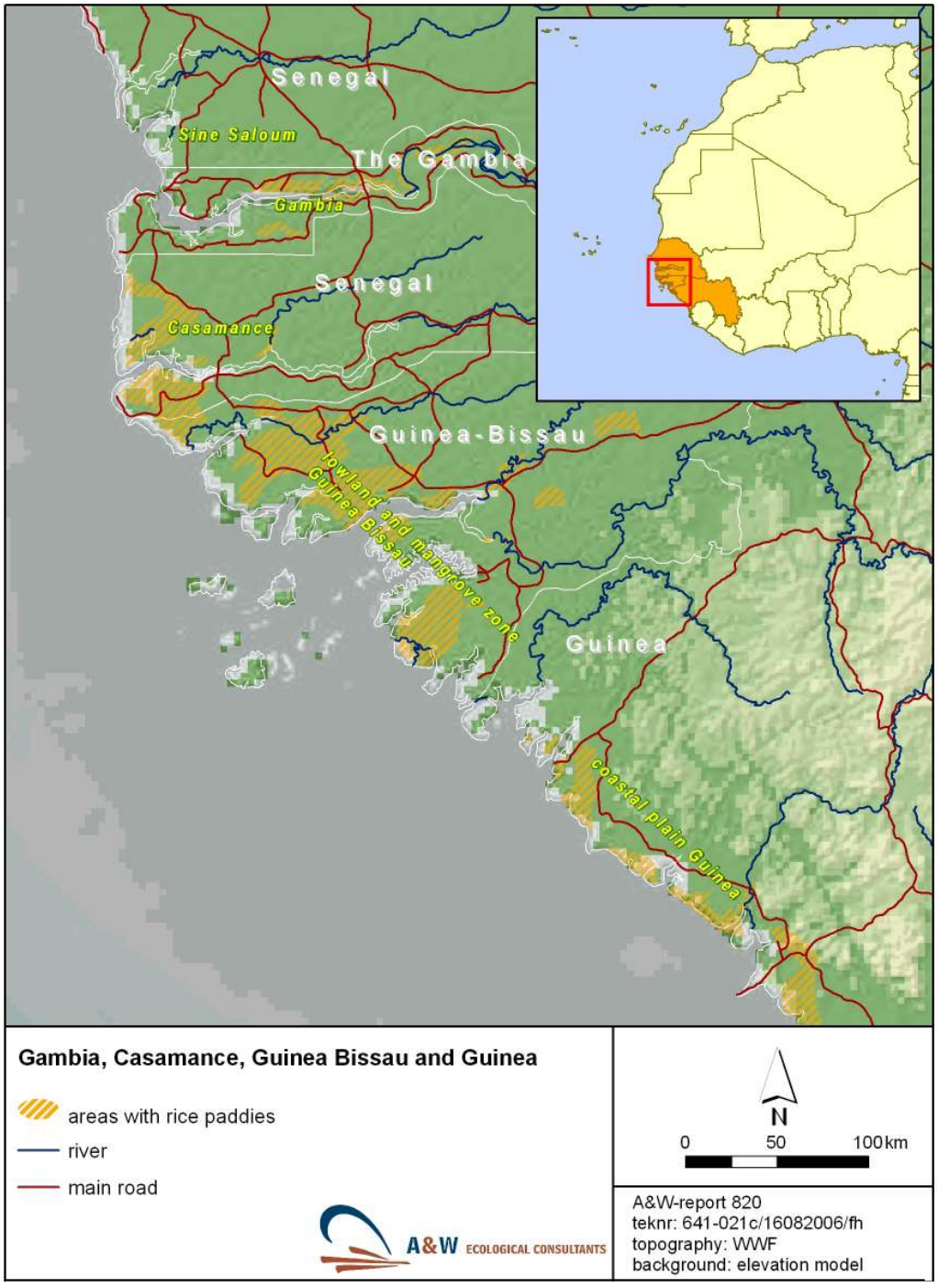


Fig. 3.8.
Lowland coastal zone from the Sine Saloum Delta in Senegal to Guinea in the south with a rough indication of the important rice field areas, based on detailed maps in Bos (2006).

Senegal is currently in the order of 85,000 hectares, and has gone up a little as compared to the 1990's. This rice area is mainly situated in the Senegal delta (Section 3.2). For Guinea Bissau the estimates of harvested area of rice are fluctuating around 65,000 ha over the past decade but the area has been considerably larger in the early eighties, with a maximum recorded value of 143,000 ha in 1982. In The Gambia the harvested area of rice was c. 14,000 ha in the past decade. For this study it is important to get an idea of the area of lowland rice, where most water birds concentrate. In West-Africa as a whole, most of the rice stems from rain-fed cultures. Mangrove swamp rice covers only 4% of all area of rice cultivation in West-Africa. In the coastal zone, however, the area of mangrove swamp rice is considerable, especially in Guinea Bissau and Guinea (for instance Altenburg & van der Kamp 1985). In Gambia and Senegal a large proportion of rice cultivated area has a rain-fed lowland ecology. The irrigated lowland cultivation in Senegal is found in the Senegal valley.

Fig. 3.8 shows the most important rice zone in the study area, generalised from maps provided by Bos (2006). For Senegal, the area of lowland and mangrove swamp rice (south of 14º30'0" N and below 30 meters altitude) is estimated at 18,000 hectares. For The Gambia, the recent estimates of lowland and mangrove swamp rice vary between 23,000 ha (JICA 2001) and 8,800 ha (Bos 2006). The core area of lowland rice is situated in Guinea Bissau and in Guinea. For Guinea Bissau, Bos (2006) estimates an area of 53,000 hectares which was under rice cultivation in 2003 while for the surface area of lowland and mangrove swamp rice for Guinea an estimation of 29,000 hectares in 2003 is given by Bos (2006). In Sierra Leone, the most southern country in the mangrove zone where extensive rice fields are found, the area of mangrove swamp rice was estimated at 4,000 ha in 2003. Bos (2006) stresses, that the user accuracy of the estimates derived from remote sensing on such a large scale using landsat maps varies considerably (from 44-61%).

The total area of lowland rice (in the mangrove zone) from the Sine Saloum in Senegal to the lowlands in Sierra Leone, which potentially harbours a lot of wetland values and forms the core wintering area for Black-tailed Godwits, is estimated at 112,000 ha by Bos (2006, Fig. 3.8). Though several other estimations are put forward in literature, there are no clear indications that the rice cultivation surface area declined on this large scale. A socio-economic study of Wetlands International (in prep.) shows that in Guinea Bissau locally rice polders are abandoned, because of lack of labour (emigration of labour to cities). This may lead to the situation, that part of the potential rice area is not exploited and is abandoned for a few or more seasons. Depending on their openness abandoned rice field can still be interesting for godwits and other water birds.

In the following text a short description of the main areas of interest are given (based on Bos 2006 and sources mentioned):

Sine Saloum

With 800 km², the Saloum Delta is the second largest national park in Senegal. This is an intertidal delta of two rivers, the Sine and the Saloum. During the dry season salt water, from the ocean, can enter deep into the delta (to Fatick and Kaolack). However, during the rainy season (when both rivers carry a lot of water and salt gets washed out of the mud flats), the level of salinity drops and some parts of the delta become completely fresh. The area is characterised by vast areas of mangrove forest with a labyrinth of creeks. The highest density of mangrove forest is located along the coast, further inland the density decreases. Here extensive open and sparsely vegetated areas can be found. These very saline areas have increased in surface area over the past decades.

Fig. 3.9.
Satellite image of the Sine Saloum delta, showing the saline areas in the north which face a die-off of mangroves (white fringes) due to low rainfall and high evaporation. Date: 31 October 1992, Landsat 4 TM bands 4 3 2. Source : http://earthshots.usgs.gov/Saloum. Below a photo of these bare saline areas in December 2005, near Ndangane (south of Samba Dia).

According to a study by RIS (1986, see also Tappan *et al.* 2004) the die-off of mangroves occurs since the late 1960's. The marginal rainfall resulted in an accumulation of salt, especially in the northern half of the delta. Due to the high salinity, they are practically devoid of vegetation and consist of sand banks and mud flats. Outside the influence of salt water, on the higher grounds, large savannah areas can be found with freshwater marshes in the depressions with a vegetation of *Cyperacea* and *Nympha lotus.* Next to natural habitats, rice areas are cultivated along the inner parts of the river, but due to low rainfall and the absence of irrigation, the surface area of rice in the Saloum is (very) low.

The outer parts of the delta along the coast have been declared National park in 1976 (Parc National du Delta du Saloum). These constitute only a small part (73,000 ha of which 60,000 ha covers water) of the total delta. Next to national park, the area has also been declared UNESCO's man and biosphere reserve. In the intertidal coastal area and in the saline tannes, where still a layer of water is present, large numbers of salt-tolerant wader species can be found.

The Gambia river

Situated as a narrow strip between the Sine Saloum and the Casamance lies The Gambia, with the capital of Banjul located at the river mouth. The river is bordered by mangroves on both sides the river. Extensive mangrove stands are present up to Manso Konko. In the past very well developed mangrove forests appeared in the Bintang Bolon tributary but in the past decades they have degraded (Ghana Wildlife Service, pers. comm.). The surface area of rice paddies is estimated at 8,800 ha. In Gambia, rice cultivation is mainly small scale and dependent on the flooding of the river. Levels of salinity are high at the river mouth and decreases moving upstream. During the dry season the salt seawater intrudes deeper into the river, up to the villages Kerewan and Kuntaur (250 km from the sea) the river water is salt/brackish in the dry season and fresh in the rainy season. As rice can only stand limited levels of salinity, rice cultivation is only possible in a limited area along the river. The rice cultivation is concentrated along the river in central Gambia, near Kudang. The rice fields in this area are characterised by a high, dense cover of rice. Outside this area, rice cultivation is small-scale and more extensive. Consequently rice cover here is relatively low and less dense.

The Casamance

This area is situated in the south of Senegal and resembles in many ways to the Sine-Saloum Delta. The area is characterised by dense mangrove forests. Due to the rainfall gradient, which exists from the north to the south of Senegal, the annual precipitation in the Casamance (1400 mm) is higher compared to the Sine-Saloum (800 mm). As a result the area of mangrove forest is more extensive and the forest is denser in the Casamance. The influence of salt water reaches far into the interior of the area (to Ziguinchor). Further inland the mangrove is bordered by open mudflats and sandbanks (tannes). Along the inner parts of the river, there are large areas where rice is cultivated. Part of the area, the "Basse-Casamance", has been declared a national park in 1970. Rice paddies are found mostly found in rather small areas, scattered in the region.

Guinea Bissau

The coast of Guinea Bissau is characterized by meandering tidal rivers lined with mangrove, forming a delta very similar to the Sine Saloum and Casamance. Salty seawater penetrates deep into the country, especially during the dry season. The Bijagos archipelago off the coast consists of mostly wooded islands surrounded by mangroves and sandy beaches. The entire coastal zone of Guinea Bissau comprises large areas of mudflats, mangrove swamps and marshes which are of great importance for Western Palaearctic waders

Rice field complex with small water bodies in the Casamance near Ziguinchor (October 2005 – above) and rice field complex in Guinea in January 2006.

(Trolliet & Fouquet 2004). Deeper inland the coastal rainforest and mangrove landscape turns into savannah or light savannah woodland.

Between mangrove and adjoining forest extensive rice fields have been created. Rice farmers face the problem of soil salinity, which would make their fields unsuitable for rice cultivation. Therefore, the rice fields are surrounded by small dikes to prevent the intrusion of salt water and retain the fresh rainwater. During the dry season, salt water is led into these 'bolanhas' to prevent acidification of the soil. It contains high levels of iron sulphide (FeS_2) which can turn into highly acid H_2SO_4 when the soil dries out. When the rainy season starts the salty water is drained away from the bolanhas via a system of sluices and the salt in the soil is washed out by the rain. Later on, between late July and September, the rice is planted out from seedbeds next to the villages, and harvested between mid-November and mid-December. For more details we refer to Dodman *et al.* (2004).

Guinea
Guinea has a hot and humid climate with a monsoon type rainy season from May till November. Temperatures vary little during the year. The coast line of Guinea is mostly covered by mangroves broken up by many estuaries, islands and peninsulas. Next to mangroves open mudflats can be found with a total surface area of approximately 80,000 ha (Trolliet & Fouquet 2004). These coastal areas are an important wintering habitat for a wide range of waders that migrate along the East Atlantic Flyway (Trolliet & Fouquet 2004). Especially near Kawass, Boffa and South of Conakry, the mangroves have been replaced by rice fields.

In Guinea 18 areas have been assigned as Important Bird Areas (IBA) covering a total area of 7,000 km² or 2.9% of the country. Most of these sites are situated along the coast. Next to these, 7 coastal areas have been assigned as Ramsar site.

3.3.2. Presence and distribution of godwits

Phenology
Although West European Black-tailed Godwits are known to migrate to sub-Saharan West Africa, and have their major winter stronghold in Guinea Bissau and neighbouring countries, information on their migration pattern at these latitudes is still patchy. Rice farmers and birding development workers are unanimous as to their obvious abundance in rice fields (local name *bolanhas*) during August and September. Also Gore (1981) states that the majority of godwits arrive around August-September in Gambia, and reaching a maximum around November.

First arrivals may now be recorded from early July onwards (see van der Kamp & Ndiaye 2006), whereas Morel & Roux (1966) mention late July. Plumage scores to make sure that no summering birds are involved have been done recently in the Senegal Delta (July 2006 – A&W) and suggest that first arrivals may be noticed in the first half of July, or even late June. Considering the idea that Black-tailed Godwits are able to fly non-stop from The Netherlands to sub-Saharan West Africa, arrivals in Guinea Bissau may therefore be assessed in this period as well.

Migration back north probably starts in December, and may depend on the state of the bolanhas by then: in relatively dry years rice fields dry out rapidly and birds are forced to shift

to more suitable bolanhas. In December 2005 most of the bolanha zones in Guinea Bissau were found dried out, whereas only along the Rio Mansoa –just north of Bissau- large(r)-scale inundated bolanhas were seen. Main godwit numbers were established in this area in 2005. Poorter & Zwarts (1984) state that migration takes place in the first half of January; these authors as well as Altenburg & van der Kamp (1985) also found major aggregations in this area, but did not observe migration departures. Actual migration in NNE direction was seen on two occasions in the first decade of January 2006, but given the relatively poor numbers observed during the December 2005 survey in all Guinea Bissau, a major part of the population might have left already. First arrivals in Portugal have been assessed by the end of December, and may concern birds coming from Guinea Bissau, but numbers stay low for some weeks and do not seem to explain major departures from Guinean grounds without a staging stop somewhere in between.

Distribution

As indicated before Black-tailed Godwits seem to occur in just-seeded rice fields all along the coast during their arrival period in July-August. However, the question on their whereabouts after September is complex and puzzling. When crops grow higher, rice habitat becomes unsuitable for godwits (and other species). They seem to reassemble in places where crops failed or had poor growing success, and in abandoned rice fields with an often lagoon-like character. The chances of poor-growing rice crops increase from south to north as rainfall weakens in this direction, and on several occasions Black-tailed Godwits were, indeed, mainly found in central-north Guinea Bissau (Poorter & Zwarts 1984; Altenburg & van der Kamp 1985; Bos 2006). However, given the relation between rainfall and crop performance, Black-tailed Godwit's distribution pattern may shift as even in Guinea Bissau – although not a sahelian country- rainfall varies through the years.

In Fig. 3.10 all visited places during the 2005-2006 survey are plotted. Most of the important rice areas were visited but it goes without saying that only a part of the actual rice paddies could be checked. In the framework of the Dutch BBI-project (Bos 2006) in total 2.847 small plots were counted on water birds in the visited areas which are indicated in Fig. 3.10. The average plot size was 3,800 m^2 ± 103 s.e. This means that in total 1,080 ha of rice paddies is counted very precise (10% of the total estimated area of 112.000 ha), while a much larger area was covered searching for godwits. Tens of thousands of ha were checked while crossing the rice field areas in the country. The distribution of godwits as seen in 2006 was as follows:

Sine Saloum: The north-western part of the Sine Saloum was visited in December 2005. Godwits were only encountered here in a natural river branch with fresh water, where they foraged in shallow water, presumably on chironomidae or other small invertebrates. This concerned a group of a 390 godwits near Fimla. Previous surveys also observed the highest numbers in these inland marshes although also high numbers have been encountered along coastal mudflats (Altenburg & van der Kamp 1985).

The Gambia: From the past there is very limited information available regarding numbers of godwits in The Gambia. Their wintering habitat consists of rice fields and marshes along the Gambia River between the coast and Georgetown. This habitat can basically be divided into two zones; the coastal zone and the river zone upstream to Georgetown (Altenburg & van der Kamp 1985). In the coastal zone godwits can be found on salt pans, sandy beaches and marshes (Jensen & Kirkeby 1980). The coastal pans near Banjul are a specific area where godwits are often seen. Here they are observed during the complete winter along the coast

Freshwater marsh near Kimla where 390 Black-tailed Godwits were observed in the Sine Saloum.

Salt pans near Banjul where godwits were found foraging in Gambia.

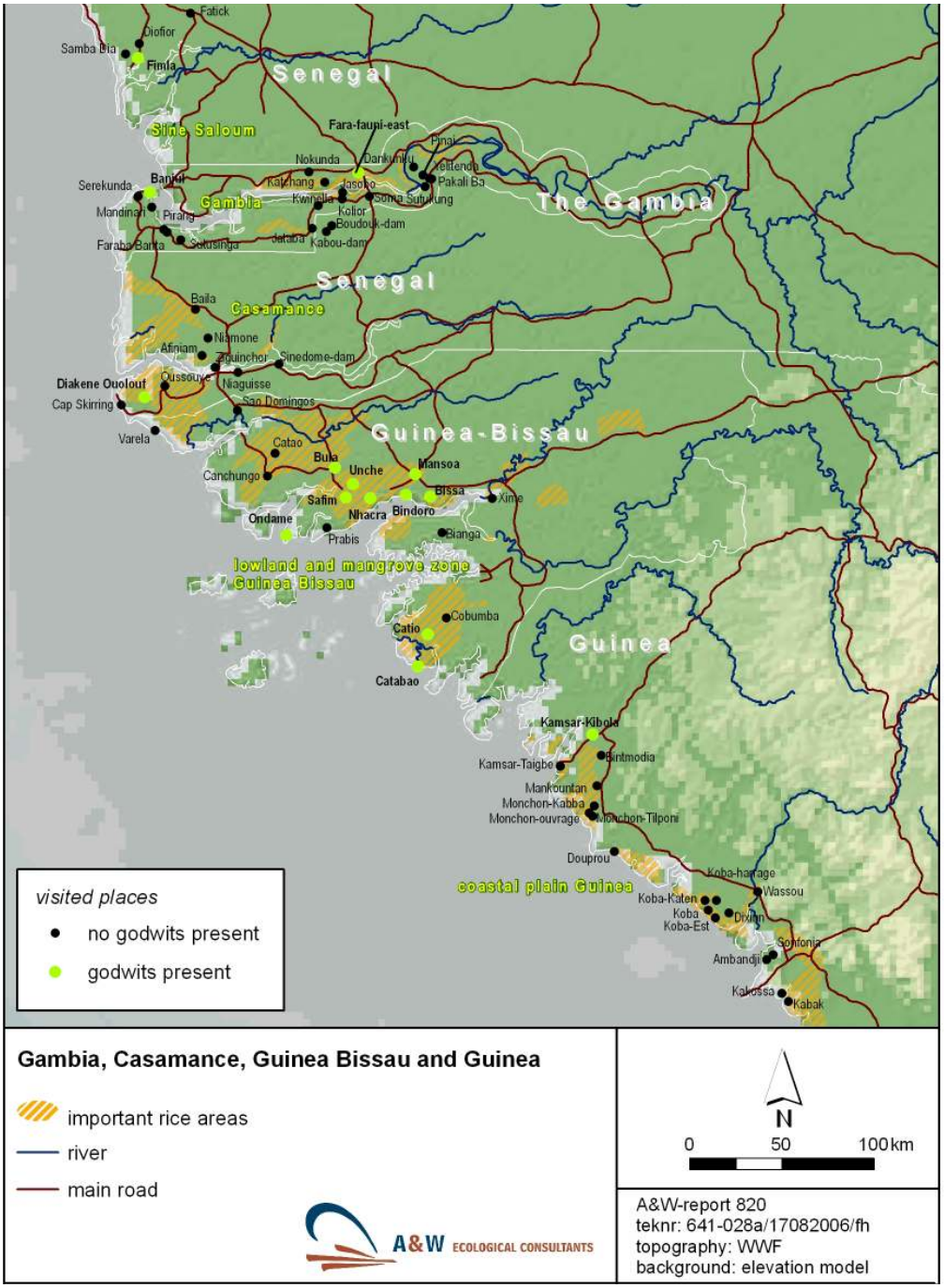


Fig. 3.10.
Areas visited in 2005-2006 in the rice and mangrove zone from the Sine Saloum in the north to Guinea in the south. It must be stressed that on this scale a dot means a large area which is visited and where several counts have been performed.

up to Georgetown (Jensen & Kirkeby 1980). In 1981 they were qualified as 'locally abundant' in the rice fields (Gore 1981) and up to a few thousand birds were estimated to occur (Beintema 1982, Altenburg & van der Kamp 1985).

During the 2005-census very few godwits (28) were recorded (Table 3.3). This makes an analysis of current important wintering areas in Gambia difficult. The locations where godwits were recorded were the salt pans near Banjul and Farafenni, a valley with some rice fields near the village Nokuna, about 100 km upstream of the Gambia river.

Casamance: In the Casamance ten areas were visited in December 2005 (Fig. 3.10). These concerned rice fields and mangrove areas with mudflats. During the survey of 2006 – which was a limited survey by which only a small part of the Casamance could be investigated - only low numbers of godwits were counted. The majority of these birds were found on the mudflats near Diakène Ouolouf.

Guinea Bissau: Visited areas were almost identical to those checked in November 1983 (cf. Altenburg & Wymenga 1985), with the exception of the north-western coastal zone around Varela where we started the 2005-2006 survey. Table 3.3 resumes the numbers observed along the entire coast, between mid-December 2005 and January 10th 2006. In total 6,000 godwits were actually counted. Core areas are rice cultures along the Rio Mansoa and Rio Gêba in central-west Guinea Bissau. A large group (3.250) was observed near Bula, in a rice field complex with adjacent abandoned bolanhas used as a day roost.

The counts that have been carried out during multiple visits in several areas show that there is a lot of movement between the different rice complexes. These movements are triggered, apart from areas drying out, by the onset of harvest in respective areas, providing contrasting effects like unrest by harvest workers and favourable feeding conditions. Important areas for Black-tailed Godwits are located in the rice complexes near Bula, Nhacra and the Safim bridge, all situated along the Rio Mansoa. They seem to represent their longest-lasting strongholds during the non-breeding period, but it should be kept in mind that their contended widespread occurrence during summer arrivals is still to be investigated. Most of the visited rice complexes were dry and did not hold godwits, also the farmers confirmed that there were no godwits (and normally they know the species).

Guinea: Guinea represents more or less the southern limit of the normal distribution range for the wintering Black-tailed Godwits using the Atlantic Flyway (Trolliet & Fouquet 2004). In principal, the main habitat type would be rice fields, but surprisingly in Guinea, Black-tailed Godwits were found feeding on tidal flats (Altenburg & van der Kamp 1991). In the period the birds were observed on tidal flats in the rainy season which means that the mudflats may have a brackish character. Also Trolliet & Fouquet (2004) counted Black-tailed Godwits on mudflats in Guinea (a total of 428 and their estimate was 1,000 for the whole mudflat zone. Tidal flats as habitat in the Bijagos archipelago in Guinea Bissau can be excluded from the distribution options as several surveys did not reveal any Black-tailed Godwit occurrence in this area (Zwarts 1988, Altenburg *et al.* 1992, Dodman et al. 2004).

Godwits are dispersed along the coast on Guinea and no large concentrations can be found, though based on the counts of Altenburg & van der Kamp (1991) and Trolliet & Fouquet (2004) three areas seem to be of more importance: from north to south these are: Kamsar-Kibola, Tatéma and Kobaya. During the census of 2006 in January only at one site godwits were observed. A group of 211 birds was found in a just planted rice field near the village of Kamsar-Kibola.

Table 3.3.
Numbers of Black-tailed Godwits recorded in different areas in the rice mangrove zone during the winter 2005/2006.

Coutnry	Area	Data	Number of godwits
Senegal	Sine Saloum - Fimla	17-12-2005	390
	Casamance	2-4 – 12 -2005	329
Gambia	Banjul	5-12-2005	27
	Farafenni	30-11-2005	1
Guinea Bissau	Prabis	15/12/2005	1
	Rice fields southeast of Ondame	16/12/2005	7
	Varela, via S. Vicente	17/12/2005	6
	Safim-bridge	17/12/2005	4
	Bula; Unche-Cuboi	22/12/2005	3.250
	North of Safim-bridge	23/12/2005	47
	South of Safim-bridge	23/12/2005	260
	Biombo, Southeast of Ondame	25/12/2005	203
	Mansoa	28/12/2005	30
	Nhacra	30/12/2005	1.898
	South of Safim-bridge	01/01/2006	260
	Buba-Enxudé	03/01/2006	100
	Tite-Biss. de Baixa	04/01/2006	51
	Rio Cumbiya; Catio	05/01/2006	380
	Rice fields location 54/29	08/01/2006	1.200
	North of Safim-bridge	08/01/2006	5
	South of Safim-bridge	08/01/2006	181
	Unche	08/01/2006	59
	South of Safim-bridge, loc 54 & 55	09/01/2006	1.150
	Total		**6.000**
Guinea	Kamsar-Kibola	11-01-2006	211

Total estimate 2006

There are two ways of estimating the total numbers of Black-tailed Godwits in their wintering areas. The first is to visit the most important areas and perform counts of the total number of birds in these areas. Based on these counted numbers and taking into account that a certain number is missed, and estimation is made of the total number of birds. This is especially feasible in open areas with a good view. The second way is to perform density counts in the most important wintering habitats and extrapolate with the surface area of the relevant habitat type. A large number of plots is needed to come to a reliable estimate. In particular with a gregarious species as the Black-tailed Godwit this poses problems (many plots with no birds give a high standard deviation).

In 2006 nearly the same areas in Guinea Bissau were visited as in 1983. In 1983, 23.558 Black-tailed Godwits have been counted and in 2006 6000. In 1983 counts were carried out during end of October to half December, whereas in 2006 the counts were carried out from half December to the beginning of January. Though birds may have migrated already to the north, we know from the surveys in Senegal, Morocco, Portugal and Spain, that arrival by

then was limited which suggests that the majority of the birds had not yet left to other staging sites. Altenburg & van der Kamp (1985) estimated, that in 1983-84 110,000-120,000 birds were present in Guinea Bissau using an extrapolation on the bases of types of rice and densities of birds. If we simply use the same ratio for 2006 – as the distribution of birds over Guinea Bissau in the counted areas was more or less the same – we arrive at an estimate of 28,000-35,000 birds.

If the density-approach is chosen, we can use the huge number of plots in which densities of water birds are counted in the framework of a larger project on the ecological developments in the rice and mangrove zone (BBI – Bos 2006). In total in the whole rice and mangrove region nearly 3,000 plots have been counted (Table 3.4). In this way the average density of Black-tailed Godwits was determined for each habitat. As only in a small number of plots (28) Black-tailed Godwits were actually observed, the standard error is large, in fact too large to provide a reliable estimate. This means that the total of 101,000 godwits (± 65,000!!), which is the result of this extrapolation, is a very rough indication. The same approach for only Guinea Bissau, with a rice area of 53,000 ha, arrives at an estimate of 41,000. This is in the same range as the estimate via the simple ratio/method. Given the field impression that besides the large concentrations were present in Guinea Bissau – apart from the Rio Mansoa region – we use as a total estimate 30,000-40,000 wintering birds, knowing this estimation has a low reliability. For the whole rice and mangrove region the grand total would arrive at 101,000 godwits (± 65,000!!), which is even a less reliable estimate (in 2005-2006 godwits were hardly seen outside Guinea Bissau).

Table 3.4.
Average density (± standard error) of Black-tailed Godwits in different habitats in Western Africa. The averages are based on plots divided over the habitats in the area ranging from Sine Saloum and Casamance (Senegal), Gambia, Guinea Bissau and Guinea (D. Bos in prep.) The total area of each habitat in this region is indicated and the estimated total numbers of Black-tailed Godwits based on extrapolation of these numbers.

Habitat	Black-tailed Godwits density per ha	Number of plots	Total area	Estimated total numbers
Rice fields	0,77 (± 0,44)	2679	112816	87.000 (± 50.000)
Natural vegetation in rice areas	0,05 (± 0,05)	168	206521	10.000 (± 10.000)
Bare uppertidal flats	0,02 (± 0,02)	65	267540	4.000 (± 5.000)
Mangroves	0	64		
Total estimate		2.976		101.000 (± 65.000)

Habitat choice

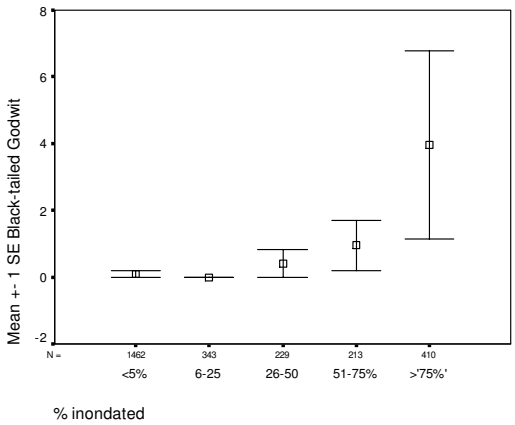
Although Black-tailed Godwits are observed in the coastal zones on mudflats (Altenburg & van der Kamp 1991; Trolliet & Fouquet 2004), the main wintering habitat is rice fields (Altenburg & van der Kamp 1985, this study). This is illustrated in Fig. 3.11 (lower panel). The highest density of Black-tailed Godwits was found on the rice fields, and more particularly in very wet bolanhas. The large standard errors in the Fig. indicate that not all rice fields are suitable as foraging site for Black-tailed Godwits. The average density in the rice was 0.77 godwits/ha ± 0.44 s.e. (n = 2657). In mangroves no godwits have been counted while in natural habitats and on bare areas (most saline and bare tannes within the mangrove) only very low densities are measured (Fig. 3.11). Hence, despite their occurrence in the Sine Saloum in a natural environment and in Guinea on intertidal mudflats, in the core area of the winter distribution they clearly prefer rice fields. It is possible that the different climatic circumstances in the north (drought, so dry rice fields) as well as the south (very wet and dense rice) play a role.

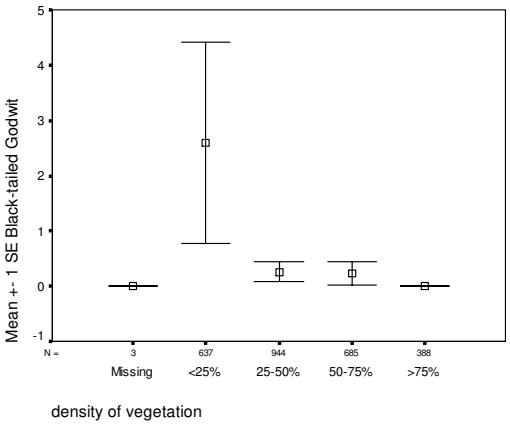
Within the rice fields godwits prefer to forage in rice fields with shallow water (0-20 cm), relatively low plant height (26-50 cm) and low density of plants (<25% cover, Altenburg & van der Kamp 1985 – Fig 3.11). Also, they have a strong preference for inundated rice fields. This may be the reason, that in the large areas of (very) dry rice fields in the Senegal delta during this study hardly any godwits were counted. In a forward linear regression, the percentage inundation and water depth were selected as the variables explaining variation best. This model was significant, but poor (r2 = 0.003). Note that these variables are correlated with each other. Vegetation density correlates strong and positively to vegetation height (pearson r = 0.55). Less importantly, areas that are inundated tend to have higher vegetation but lower vegetation density.

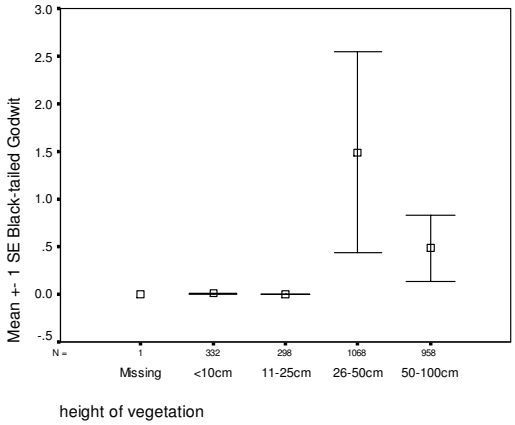
Although the diet of Black-tailed Godwits consists almost exclusively on invertebrates during the breeding season, several previous studies showed that in the wintering areas it largely consists of seeds of grasses and rushes. Guichard (1947) found in stomach contents of Black-tailed Godwits in October in the Inner Niger Delta in Mali only seeds of several herbs and seeds of *Cyperus esculentus*. Tréca (1984) concluded from analyses of stomach from North Senegal that godwits prefer especially the large grains of rice and tubers from Cyperaceae.

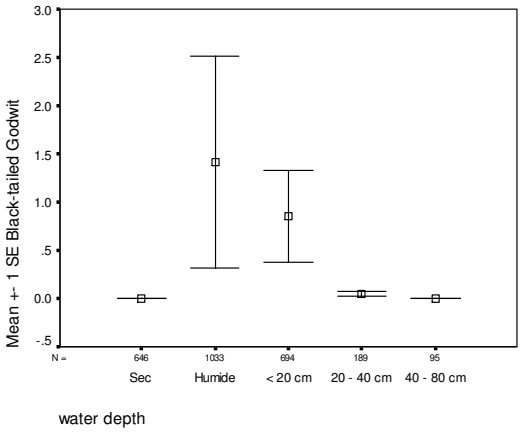
During the time when ripened rice is available (November-December) their diet may constitute 70-90 % of their food intake (Tréca 1984). Nevertheless, clear indications have been found that animal food is maintained as a non-negligible part of the diet. Altenburg & van der Kamp (1985) observed godwits foraging on larvae of mosquito's (*Chironomidae*) and seeds of the grass *Echinochloa colona*. Based on the analyses of 50 dropping samples collected in November-December in rice fields in Guinea Bissau, Altenburg & van der Kamp (1985) showed that also in the rice fields Black-tailed Godwits may forage partly on invertebrates. The largest part of these droppings consisted exclusively of remains of rice and seeds of Cyperaceae. However, in 19 samples also remains of animal origin were found. This consisted mainly of adults and larvae of *Coleoptera* and *Heterocerus spp*. The diet of godwits foraging in tidal areas, as in Guinea, will most likely exclusively consist of animal origin.

In 2005-2006 10 samples with droppings of godwits were collected in the rice field in Guinea Bissau. These consisted all of remains of (rice) kernels. On page 48 a photograph of one of the samples is shown.









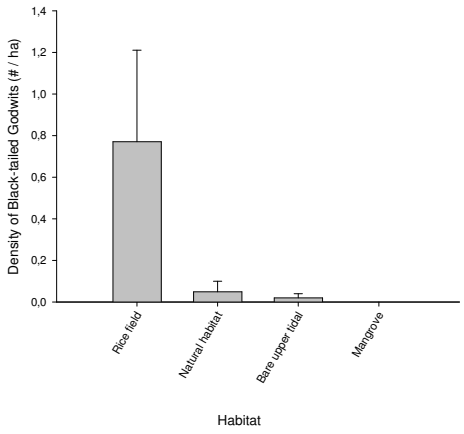


Fig. 3.11.
Overview of the habitat choice of the Black-tailed Godwit in rice fields the lowland mangrove zone from Gambia to Guinea, based on 2,657 censuses of plots of on average 0.38 ha. In all panels Figs. are expressed as densities per ha. The preference is shown for resp.:
- % inundation
- density of vegetation
- height of vegetation
- water depth
- habitat choice in general

Sample of droppings of Black-tailed Godwit consisting of remnants of rice grains and coats (pellicels) around the grains. The small panel shows small stones which are used to pulverize the grains.

3.3.3 Changes in number of godwits

Availability of data

We have to be realistic about the fact, that from the huge inland area from the Sine Saloum to Guinea only very limited data are available, which in no case provide complete estimates. Only from some smaller areas series of counts are present, for instance from the Gambia (Jensen & Kirkeby 1980). From Guinea Bissau and Guinea counts of rice fields in the hinterland of the coastal mangrove swamps are very limited (Altenburg & van der Kamp 1985, 1991 and some additional sources). This means, that comparisons of counts are only limitedly possible and should be treated very carefully, in particular estimates based on a few counts.

Changes

From both the Sine Saloum and the Casamance available data are so scattered, that no conclusions can be drawn on possible changes in the number of godwits. Although in the Sine Saloum several data are available on the coastal, intertidal mangrove zone, complete surveys of the hinterland are scarce. From both areas it is known however, that in the recent past higher numbers have been counted than during the 2005-2006 survey, suggesting a decline. For the Sine Saloum the following data have been gathered:

December 1980	2.700	Poorter et al. 1982
December 1982	1.600 (part.)	L. Zwarts unpubl. data
October 1983	2.700	Altenburg & van der Kamp 1985
January 2003	629	Direction Parc Nationaux, J. Peeters *cs*
December 2005	390 (part.)	This study

There are additional data in the African Waterfowl Census from 1999-2002 (data DPN, S. Diouf *cs*.) but these data were gathered halfway January when the spring migration of godwits is already in full swing. The available data for the Sine Saloum suggest a decline in the last decade.

For The Gambia some older data are available, which allow only for a qualitative comparison. A census of Jensen & Kirkeby (1980) recorded some hundreds of godwits inland along the river, and according to this source the number of godwits in Gambia in 1980 never exceeded 1,000 – 2,000 in total. Gore (1981) qualified the godwit common in rice fields without mentioning numbers. Beintema (1982) recorded several hundreds of godwits on the rice fields next to the Trans Gambian Highway along both shores of the river. End of September - early October 1983 at least 100 godwits were recorded along the coast. British biologists recorded some thousands of godwits in abandoned rice fields near the city of Kudang in November 1983. Based on these data Altenburg & van der Kamp (1985) estimate the total number in The Gambia for at 5,000 – 10,000. Later surveys recorded only low numbers of godwits in Gambia. The African waterbirds census recorded during January counts in 1999-2001 not more than 112 godwits. Also in October 2005 very low numbers were established. Local expert, K. Jammeh (pers. comm.) indicated that today during the period October-December several hundreds of godwits can be found in the whole country, but not thousands as was the case in the past. The overall impression is that the recent numbers of wintering godwits in The Gambia are much lower than in the 1980's.

For the inland rice field areas in Guinea Bissau there are two more or less country-wide surveys, the one in 1983-1984 and in 2005-2006 (Altenburg & van der Kamp 1985 and this study respectively). From the comparison of counts done in 1983-84 and in 2005-06 it is obvious that wintering numbers dropped considerably. While during both surveys nearly the same areas were visited the actually counted numbers in 1983-84 amounted to 23.558 individuals (estimate 110-120,000 for the whole country) while in 2005-06 6.000 godwits were counted (estimate 35.000-40.000 birds, see before). Given the timing of the survey in 2005-2006 some birds may have left the region already for northward migration, but from the censuses in the north (Senegal delta, Morocco, Portugal and Spain – see Chapter 4) we know this concerns at maximum 10-15,000 birds. It is obvious therefore, that wintering numbers in Guinea Bissau dropped about 50%. Of course this is not more than an indication of the order of magnitude, since we stated earlier that the reliability of the estimates is low. However, the counted numbers indicate a similar percentage of decrease. This change in numbers lies in the same order as the decline of the West European population.

In Guinea godwits are hardly observed in rice fields, as stated before in this Section. Altenburg & van der Kamp (1991) estimated the total number of wintering godwits in Guinea at 17,400. Trolliet & Fouquet (2004) came to a much lower number of c. 1,480 birds (Table 3.5). They remark in their report: "We do not think that we much underestimated their number. On January 9 2000 we saw a group of 950 birds in a fresh water marsh in the Koba plain very close to the coast. It is not impossible that at certain occasions this group would have frequented the next mudflat. But the rarity of birds on the mudflats we noticed in four successive winters corresponds to the reality and one may conclude that the number of Black-tailed Godwits on the Guinean coast really dropped during the 90s." In early January 2006 only one group of godwits was seen in the rice fields, but the mudflats were not checked. Also in Guinea a decline seems the case though we must stress the scarcity of data in Guinea.

The rice fields in Guinea Bissau are an important winter feeding habitat for Black-tailed Godwits.

Mudflats bordered by mangroves are and important habitat for wintering Black-tailed Godwits in Guinea.

Table 3.5.
Number of staging godwits in the coastal zone of Guinea in the period 1990–2005. Numbers represent estimates of total number of wintering birds in the period December–February.

Area	1990	1992-2002	2006
Tatéma	345 [1]	60 [2]	211 [3]
Kamsar	9 [1]		
Kobaya	358 [1]	25 [2]	
Other coastal areas	1.100 [1]	64 [2]	
Total	17.400 [1]	1.480 [2]	

Source: **1** Dec.Febr. W. Altenburg & J. vd Kamp 1991. **2** B. Trolliet & M. Fouquet 2004. **3** This study

3.3.4 Threats and protection

Climate change
The rainfall pattern in this region is a very determining factor in the environmental and physical circumstances which occur (*cf.* Bos 2006, Cormier-Salem 1999). In the southern part of the region, south of the Casamance (*cf.* Bertrand 1999), the rainfall is relatively high and no constraint for rice field cultivation. In the core area of the winter distribution climate change therefore is not be expected as a bottleneck.

In the northern part, in particular in the Casamance and in the Sine Saloum where fresh water discharge by the rivers is limited and there is no irrigation (yet), shortage of rainfall may lead to several effects. As shown in the first part of this Section, in the Sine Saloum large areas have become very saline resulting in a die-off of mangrove swamps. Also, rice cultures in these areas – which are dependent on rainfall - are facing problems during drought periods. Normally, in the rain-fed *bolanhas* there is a delicate balance between fresh and salt water which makes rice cultivation possible. The inlet of salt water in the rice fields during the dry season prevents acidification of the soil, and high amounts of rainfall should subsequently wash the salt from the soil during the rainy season (therefore rice is planted on ridges). Drying out of the soil leads to acid soils on which rice cultivation is no longer possible. As a result of this delicate balance, many rice fields have been deserted once they became unsuitable for rice cultivation. This is for instance the case in parts of the Casamance. These acid deserted fields are no longer attractive for godwits.

Similar to the climate expectation for the Sahel, in the short term no apparent changes are expected, but in the long run a decrease in rainfall may occur (See description of Senegal delta). This means, that in the northern part of this region godwits may be more and more depending on natural fresh water marshes of which the surface area is also determined by rainfall.

Habitat change
In the coastal lowland zone from the Sine Saloum to Guinea the core habitat for godwits consists of rice fields, while in the north natural habitats (open fresh water marshes, shallow water bodies) and in the south intertidal mudflats are used. There are no indications, that the mudflat area in Guinea is under threat; the situation in the north has been described above: as a result of droughts the estuaries are changing resulting in an increase of bare, saline 'tannes', which are not suitable for godwits. These changes mainly have taken place in the past decades. We have no direct information if these changes altered the distribution of godwits but can not exclude this.

As the large majority of godwits occur in rice fields potential changes in the surface area of rice fields would be most important for wintering birds. The large-scale abandonment of rice fields in the Casamance for instance in the past decades because of salinisation, must have had consequences for wintering godwits in the region. Any information to support this, is lacking however. Bos (2006) made an inventory of the surface area of mangroves and rice fields in the entire region from the Sine Saloum to Sierra Leone. From his review it can be learned, that there are – *on a regional and national scale* – no clear indications that the rice area in the lowland zone (*i.e.* the mangrove zone, where rice paddies have been made in the past through clearing of mangroves, see Bos 2006, Cormier-Salem 1999) has declined in the past decades. The availability of habitat therefore poses no threat at all for godwits in the present situation.

On a *local scale* there may be relevant habitat changes. Over the last decades many bolanhas have been abandoned, whereas new areas are only being (limitedly) created with external financial support. Embankments demand a lot of physical and financial input, which are not easy to obtain today. We visited for instance the Ponta Biombo area, where Altenburg & van der Kamp (1985) counted substantial numbers of Black-tailed Godwit in rice fields, but found only mangrove habitat; shortly after the 1983 visit the outer defence dike broke and the local population had to give the area back to the sea as they had not enough men nor financial capacity to overcome this dramatic event. This type of habitat change occurs on several places. In the framework of a large project to study the ecological developments in the rice and mangrove regions (Bos 2006), Wetlands International (Dakar, Guinea Bissau) carried out a socio-economic study which showed also, that on a local scale rice fields are abandoned because of lack of labour (emigration of men to town or abroad). As stated by the example above, lack of labour may result in less maintenance of the dikes encircling the bolanhas by which salt intrusion from the seaside occurs. Such badly maintained rice complexes are often inundated and have an open structure. This means, that they are – if enough food is available and still some rice is grown – suitable for godwits. This depends on the local situation because a full shift towards saline habitat will not be suitable for godwits.

Both *et al.* (2006) mention that intensification of the harvest of rice and/or the (future) growing of rice types which are less vulnerable for falling grains at the end of the season may affect the foraging abilities for godwits in the wintering area. Apart from the fact that rice grains less easily fall of and remain after harvest also it would be more difficult for godwits to strip the spikes of the rice plants, which means that the handling time for foraging goes up. Any quantitive information on this subject is lacking. Nevertheless new grown variation (types) of rice are easily spread within the region (Cormier-Salem 1999) which means that this may in future be an issue of attention. Presently, in particular the growing of rice variants is aimed at a shorter growing season and salt resistance (Cormier-Salem 1999).

Human disturbance

There are no indications that human disturbance poses a threat to wintering godwits in the region. Birds are being chased however from the fields during the sowing, replanting and harvest time. Slings, scarecrows and the like, and noise-producing devices are commonly used during these periods but do not really alter their distribution.

Hunting

There are no data available on hunting bags in the region. Shooting is limited and is not likely to cause a large threat to birds. We did not find any evidence that a high number of godwits is shot, nor is this reported by the local experts and in former surveys. Though

hunting occurs in the whole region, Black-tailed Godwits are not considered as favourite hunting species and numbers that are shot are thought to be (very) low.

3.3.5. Conclusions

From the analyses and the information described in this Section the following conclusions can be drawn:

- The lowland coastal zone form the Sine Saloum to Guinea constitutes a very important wintering area for Black-tailed Godwits. Within this region, the rice field areas (*bolanhas*) in Guinea Bissau are by far most important as wintering habitat.
- Based on a survey by which all countries and areas were visited - but could not be covered completely - we estimate the number of wintering godwits at about 100.000 birds, of which 40% is wintering in Guinea Bissau. It must be stressed, that this estimate has a low reliability as is the case with estimates from the past.
- In general godwits have a clear preference for rice fields in the region in the winter period in favour of mangroves, bare areas (tannes) and natural habitats. Natural habitats may be important outside the period that rice can be eaten and when rice fields have been harvested. In the north (Saloum) godwits were seen in natural habitats and in Guinea godwits are encountered almost entirely on mudflats, in contrast to the birds which stay in nearby Guinea Bissau. This may be linked to the heavy rainfall in Guinea.
- Within the rice zone godwits show a strong preference for inundated rice fields with shallow water (0-20 cm), relatively low plant height (26-50 cm) and low density of plants (<25% cover).
- An analysis of the trends in numbers of godwits in this region is hampered by the fact that available data are scarce and incomplete. Complete region-wide surveys do not exist. Nevertheless, available data show consistently that in all parts of the region the distribution of godwits is comparable but the number of godwits has declined considerably – at least by half – compared to numbers which were regularly counted in the 1980 and early 1990's.
- Despite local habitat changes in the north of the region due to low rainfall or abandonment of rice fields in Guinea Bissau, which may alter the suitability of habitats for godwits, in general we did not encounter clear threats to the birds. Hunting and human disturbance do not play a significant role. A change in the growing of types of rice which are less suitable for foraging godwits may play a role in future, but this is yet not the case.

Impressions from the Inner Niger Delta: above flooded grasslands in November and lower panel birds concentrating in shallow water bodies in the central lakes in June.

3.4. WETLANDS IN MALI

Land-locked Mali is situated in the Western Sahel. Wetlands in Mali are mainly found near the Niger river which like the Senegal river rises in the mountains in Guinea from where it runs in a north-eastern direction into Mali. The river changes its course near Timbuktu from where it runs in an eastern direction and bends to the south. After more than 4.100 km the Niger flows out into the ocean in Nigeria. By far the largest wetland in Mali is formed by the Inner Niger Delta, which is of prime importance as a wintering area for several millions of Palaearctic migrants. Also most other wetlands in Mali are connected to the Niger. In this Section a brief description is given, taken from van der Kamp *et al.* (2005). For detailed information on rainfall, flooding and other characteristics we refer to Zwarts *et al.* (2005), Wymenga *et al.* (2002) and the source mentioned.

3.4.1. General description

The catchment area of the Niger comprises two main streams, the Niger – being by far the most important in terms of water supply – and the Bani as a tributary of the Niger. Mopti is situated at the confluence of both streams. The Niger can still be largely considered as a rather natural, untamed river system. This is expressed by a variable rain-driven crue[1], the predominant absence of embankments and the presence of a very extensive floodplain, the Inner Niger Delta. Nevertheless several hydrological interventions occur (Zwarts *et al.* 2005). Important engineering works are for instance the barrage at Sotuba (1929, for power supply Bamako), the barrage at Markala (1947, for the irrigation of the Office du Niger zone) and the Sélingué dam (1981, for power supply Bamako-Koulikoro-Segou). Within the Inner Niger Delta limited embankments are found, for example near Mopti (Opération Riz Mopti) and hydrological control systems in the northern lakes (Lac Horo, Lac Faguibine, Lac Fati).

Markala barrage in the Niger river near Ségou at the downstream side – used for irrigation of the irrigation zone of the Office du Niger.

[1] 'Crue' refers to the rising of the flood between July and December (flood peaks across the Inner Niger Delta late September-December) while 'décrue' refers to the period of dropping water levels (October-April). Timing and time span of 'crue' and 'décrue' as well as period of lowest water levels ('étiage'; March-June) are related to flood volume.

The Talo Dam in the Bani is presently under construction, while a dam near Djenné dams in the Bani is planned. There are also existing plans for infrastructures in the upper reaches (Fomi, Guinea) and upstream Gao (Tossaye). Zwarts *et al.* (2005) give more and detailed information on the actual hydrological structures in the Upper Niger Basin and its expected hydrological consequences.

The Inner Niger Delta, being one of the largest floodplains of Africa, is the core area for this study, given its outstanding ecological importance, its status as a largely uncontrolled floodplain, and as a base for the livelihoods of one million people (Wymenga *et al.* 2002). Other relevant areas in the Upper Niger Basin are wetlands created through hydrological encroachments in the river system. Of these the Sélingué reservoir and the Office du Niger irrigation zone are areas of interest in the upstream region. In this respect rice paddy fields and other artificially inundated areas are also considered as wetlands. In the catchment area upstream of the Inner Niger Delta, substantial wetland habitats, in addition to the river bed, occur at both sides of the Sélingué barrage (the water basin, and the rice paddies downstream of the barrage) and in the so-called irrigation zone of the Office du Niger (Bonneval *et al.* 2000). The latter – also called the Delta Mort- is an extensive wetland, consisting of natural falas, irrigated rice paddies (74 km^2) and other wet habitats (Bonneval *et al.* 2002). Besides these two major areas, wetland habitats are nearly absent apart from the river bed, some smaller-scale paddy field polders and temporary, rain-fed wetlands (small lakes – mares). Summarising, the three major wetlands which have been taken into account are (Fig. 3.12):

- *Inner Niger Delta* between Ké-Macina and Timbuktu;
- *Irrigation zone of the Office du Niger* (Delta Mort) comprising irrigated rice paddies as well as (semi-)natural habitats;
- *Sélingué area*: barrage lake and adjoining rice polder.

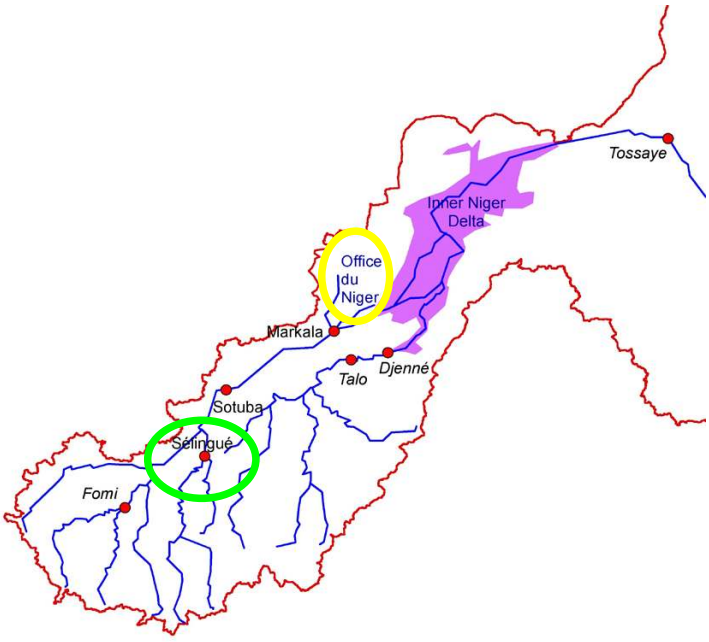


Fig. 3.12.
Study areas in Mali within the Upper Niger Basin: Sélingué lake area (green), the irrigation zone of Office du Niger (yellow) and the Inner Niger Delta (purple; see Figure 3.13 for more detail). Also not-existing barrages (in study or planned in near future) are indicated (resp. Fomi, Talo, Djenné, Tossaye).

Inner Niger Delta

The Inner Niger Delta in Mali is one of the largest floodplains in Africa, intensively used by local populations for their subsistence. Rising in the mountainous regions in Guinea, the river Niger flows through Mali, forming an immense delta between Ké Macina and Timbuktu. Though local rainfall is concentrated mainly in July and August, the maximum of the flood is reached in October-December, depending on the height of the flood. Lowest water levels occur in June, when the area has a desert-like appearance. The water discharge of the Niger is subject to a large annual fluctuation and as a consequence the inundated area varies also: in the last century the inundated area varied between 9,500 km² in 1984 and 44,000 km² in 1957 (see Zwarts *et al.* 2005). Recent series of years of severe drought occurred in the 1970's, 1980's and early 1990's. From earlier studies it is known that the production of fish – the main protein source for the local populations – is strongly related to the inundated surface area. The means of subsistence for local populations thus depends heavily on the height of the flood: water rules life in a real sense. Also biodiversity relies heavily on the flood height and flood duration (Zwarts *et al.* 2005).

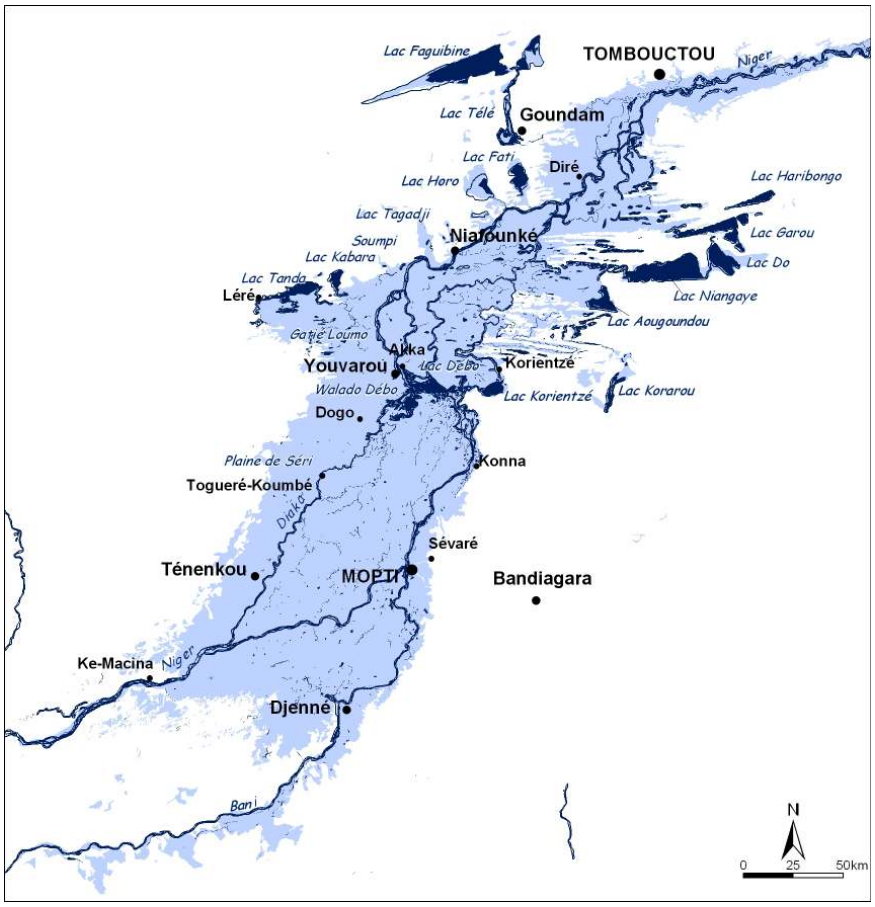


Fig. 3.13.

Inner Niger Delta with the Debo complex (Lac Debo, Walado Debo and Zone Korientzé) and the lakes (dark blue) in the north. The light blue shows the maximum inundation zone (Zwarts et al. 2005).

Remote sensing data show that consecutive series of lower and higher floods lead to a shift in the zoning of the vegetation (Zwarts *et al.* 2005). Also, local people tend to shift their rice cultures to more suitable places during long periods of drought. Flood forests, which still remained in the lower parts of the Delta, were cleared for rice cultivation, thereby eliminating roosts of granivorous birds.

In the northwestern part of the IND a group of lakes is situated; these northern lakes are also important for waterbirds in particular at low water levels. Lac Faguibine (45.000 ha) is a semi-permanent wetland located in the north of the IND, about 80 km west of Timbuktu. It is 75 km long, and maximally 12 km wide. It is connected with Lac Télé (5.600 ha) through a permanent swamp. Lac Télé is situated north-west of the town Goundam. It connects Lac Faguibine with the IND through an intermittent drainage system. Lac Horo (18.900 ha) is located some 20 km south-west of Lac Télé, but not directly connected to it. In the past this lake retained flood water from the Niger throughout the dry season in years of good rainfall, but otherwise dried out completely by April. Now it is separated by a dam with sluice gate from the Niger River. The sluice opens in mid November to allow flood water to fill the lake and closed when the desired level is reached. Lac Fati (13.500) is another lake located on the northern edge of the IND, located about 15 km east of Lac Horo and 15 km south of Lac Télé. This lake is connected to the main Niger River system by a relatively small ephemeral watercourse (Birdlife 2005).

Irrigation zone of Office du Niger

The Delta Mort (: dead delta) actually forms a secluded part of the Niger Basin since the construction of the Markala dam in the 1940's; it became operational in 1947. In this low-lying delta the irrigation zone of Office du Niger was founded in the 1930's of the former century. It was initially meant for cotton production, but this was not successful. In the first half of the century transformation to rice cultivation took place (Bonneval *et al.* 2002). Two old river branches (so-called Falas), connected with an irrigation canal system, act nowadays as water providers for agriculture in this area: one heading north through the Niono region, the other north-east towards the Macina region. By the end of the latest century 67,000 ha of arable land was available, including 51,000 ha of irrigated rice area (1999). The Malian government (1998) decided to reclaim another 17,000 ha in this delta, whereas 30000-50000 ha would be planned for the next two decades (Bonneval *et al.* 2002). At present (2004) an area of about 74,000 ha is being irrigated and expansion is still going on (Fig. 3.14).

The total irrigable area goes even far beyond these targets and is estimated at 250000 ha, from a strictly hydraulic point of view. Two major problems are then to be foreseen. First, the hydrological constraint would be an insufficient water supply during the counter-season cycle and at the start of the -traditional- wet season cycle, in May and June. Second, it is expected that the huge water demand would have a substantial effect on the inundation extent of the Inner Delta downstream the Markala dam, where economic -fisheries, cattle breeding, rice growing- and ecological interests -mortality/survival of waterbirds and other wetland-related species- are closely related to river flood performance (Kuper *et al.* 2001, Wymenga *et al.* 2002). This latter problem is a core issue in the overall project of Partners for Water (see Introduction and Zwarts *et al.* 2005a).

The Fala area must have followed the Niger flood regime before the construction of the Markala dam and its related hydraulic infrastructure into the surrounding floodable areas. The dry conditions during low water in the river's year-cycle are nowadays eliminated; the marshy area has become a permanent wetland flowing through former dry savannah transformed into a huge rice cultivation area.

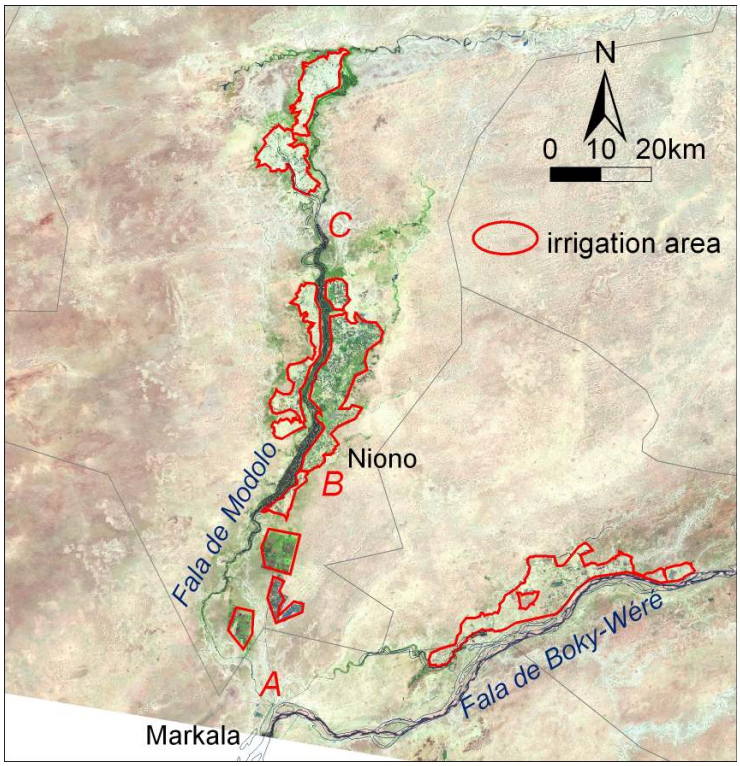


Fig. 3.14. *Irrigation zone of Office du Niger, northeast of Segou. At Markala water is taken from the Niger. At point A it is divided in two directions: towards Fala de Boky-Wéré (northeast) and Fala de Molodo (north).*

Counting birds in the Office du Niger irrigation zone. Canals and ditches create linear structures of invasive Typha vegetation.

Sélingué reservoir and rice fields

The Sélingué dam has been built in one of the major Niger tributaries, the Sankarani, and the lake covers a maximum area of 40,900 ha at the highest lake level, when it is 80 km long, about 20 m deep in some places and its width then roughly varies between 3 and 8 km (Fig. 3.15). The dam became operational in 1980 and provides electricity for the Bamako-Koulikoro-Ségou common network. Situated in woodland habitat it did not come as a big surprise to see several hundreds of emerging dead trees in the lake during our counts. Various grassy habitats develop -on sandy, clayey, gravel or even stony grounds- between woodland and waterline when the water level in the lake decreases; lowest levels are recorded in June. Downstream the dam 1,350 ha of mainly rice crop area has been reclaimed as compensation for the loss of arable land and dwelling grounds of 30 villages and hamlets. The reason to include the Sélingué area in this study is the irrigated rice area.

Main differences between the Delta Mort and the Sélingué area, apart from the Sélinkegny Lake, are their extents (Sélingué irrigation area less than 3% of DM), their crop scheme balances between counter-season and rainy season (so far Sélingué tends to grow relatively few rice during the rainy season whilst giving priority to traditional dry cultures) and their geographical situation (more rain at lower latitude in Sélingué, and situated in rather hilly woodland area compared to the flat and open Delta Mort and Inner Delta).

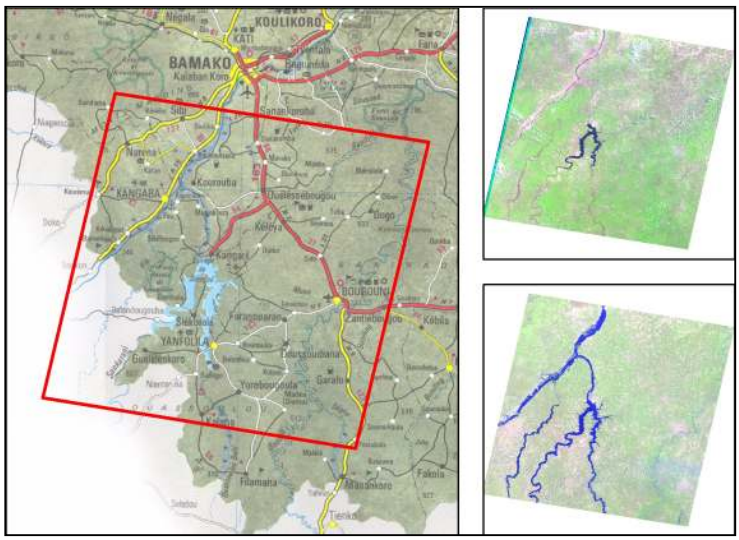


Fig. 3.15.
Map and quicklooks of the Sélinkegny Lake area, at the bottom 12 September 2001 (high water level, at the end of the rainy season) and 7 March 2002 (dry season in progress). The rice polder lies just north of the dam.

3.4.2. Presence and distribution of godwits

Phenology

Judging from ringing recoveries combined with censuses and the known distribution of godwits in Sahelian Africa (e.g. Cramp & Simmons 1983), the Inner Niger Delta in Mali looks as it were a watershed between the Western and Eastern European godwit populations (van der Kamp 1989, Beintema *et al.* 1995). Godwits are present throughout the year (van der Kamp *et al.* 2002a).

Already towards the end of July and the beginning of August godwits concentrate in the Inner Niger Delta (IND) in Central Mali. However, in some years as early as the end of June, birds have been observed arriving in the IND (J. van der Kamp, pers. obs.). The new arriving birds at this time of year can be distinguished from the birds that spend the summer

in Mali by their (remnants of) breeding plumage. Spring migration starts from the end of February. Most birds are departing at the end of February and the beginning of March (L. Zwarts, pers. comm.). However, in 2001 still more than 12.000 birds were observed in the Korientzé lake during 15-20 March (J. van der Kamp, pers. obs.), showing that there can be large fluctuations in departure date between years. In April, one month after the last birds have left, up to 3.000 have been counted in the IND (Wymenga *et al.* 2002).

The departure dates of godwits in Mali support the idea that the majority of these birds originates from breeding grounds in Eastern Europe. While the birds are leaving Mali, the arrival of godwits in The Netherlands is already in full swing. However, as shown by ringing recoveries (Fig. 3.1., Beintema *et al.* 1995) a part of the Dutch breeding birds is wintering in Mali but obviously this concerns relatively low numbers in the total number wintering in Mali.

Distribution and numbers

The Inner Niger Delta is by far the most important staging area for godwits in Mali. Though several counts have been executed in the large rice perimeters of Office du Niger and in the Sélingué area in December and February 2003-2005 no godwits were counted there. However, in June 2004 a group of 125 Black-tailed Godwits was observed in the irrigation complex of the Office du Niger (van der Kamp *et al.* 2005). Also during the survey in 2005-2006 godwits were absent in these areas and concentrated in the Inner Niger Delta.

Within the Inner Niger Delta there are several important areas. Before looking at the distribution in more detail, it is worthwhile to sketch the general pattern of waterbird occurrence in the Inner Niger Delta (van der Kamp *et al.* 2002). The occurrence of waterbirds in the Inner Niger Delta is a function of the water level. In June water is concentrated in the few lakes in the center of the delta (Walado Debo, Lac Debo, Lac Korientzé – see Fig 3.13) and the rest of the delta is nearly completely dry. Nearly all water birds then congregate in the central lakes. This pattern lasts till August when flood levels are increasing and birds are spreading over the delta. The arriving flood in the southern part of the delta then offers ample feeding possibilities. In the following period, with a rising flood, the central delta is completely inundated and too deep for waders and several other waterbirds. They spread over the delta and forage along the edges, where shallow water bodies can be found. In this period it is very difficult to assess a complete census of the huge delta. In the course of December the flood is retreating and when the water levels are sufficiently low birds return to the central delta (van der Kamp *et al.* 2002). From January onwards waders – and also godwits - concentrate more and more in the central delta where rich feeding grounds occur. This offers also good possibilities to monitor the waterbirds as birds from the major part of the delta are concentrated in a relatively small and surveyable area.

In February 2006 in total 26,851 Black-tailed Godwits were counted in the Debo-Korientzé complex (Fig. 3.13). The three lakes cover a total surface of 600 km² during high water (Wymenga *et al.* 2002). When water levels decrease, godwits concentrate here when the first sandbanks emerge in large flocks up to 25,000-40,000 birds to fatten for migration. This concentration originates basically from the south Inner Niger Delta. They start their northward migration from the end of February to mid March.

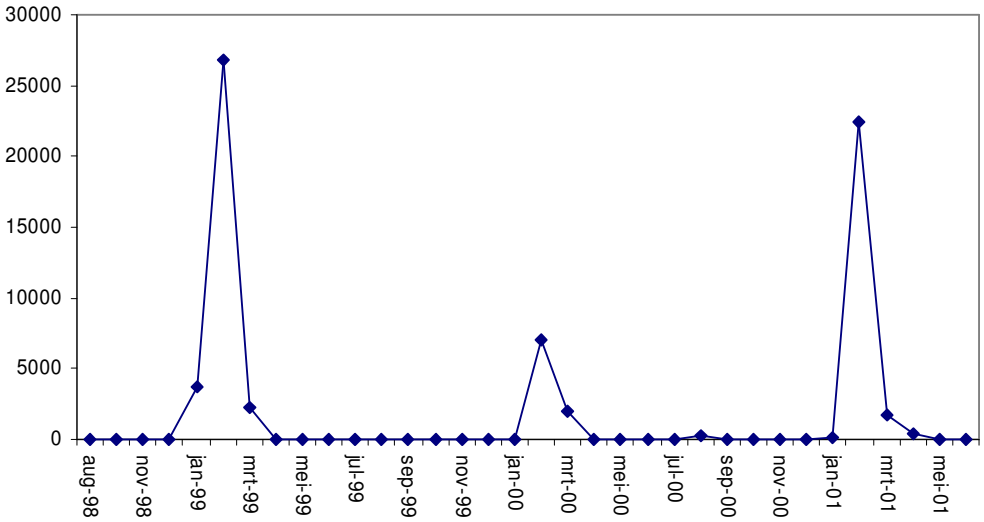


Fig 3.16.
Number of Black-tailed Godwits in the central lake area in the Inner Niger Delta in Mali from August 1998 to June 2001 (van der Kamp et al. 2002a).

Another important area is the Plaine de Seri, located in the western-central part of the IND. This is an extensive flood-plain complex (40.000 ha) on the western bank of the Diaka River some 65km north-east of Mopti. Here up to a few hundred godwits are regularly observed. In the northern lakes godwits are present in relatively small numbers (500-1,000), which has been shown through aerial counts in the past (Girard & Thal 1999-2001, van der Kamp et al. 2002). The northern lakes were not surveyed in 2006.

Total estimate
A sound total estimate of the Inner Niger Delta in Mali is not possible, as we have no information on the numbers in the northern part of the delta in January-February 2006. However, given the high number which was established in the Debo complex (26,851) we expect the total numbers in the same order of magnitude as the years before (*c.* 40.000 birds, *cf.* van der Kamp et al. 2002a).

Habitat choice
In the Inner Niger Delta godwits are nearly exclusively found on natural and flooded habitats, though they may frequent harvested wild rice parcels. With a receding flood they forage mainly on emerging mudflats and sand banks.

When they gather in the Debo-complex, they start foraging on *Corbicula*, a small bivalve which is present in the lower central lake area and offers a very important food resource for Palearctic migrants preparing for spring migration in the Inner Niger Delta (van der Kamp *et al.* 2002b). The *Corbiculas* are not available for godwits all over the year, but can only be exploited when the water level has dropped enough for the birds to reach them. This is normally the case in the course of January, but of course this depends on the flood level. Moreover, in the hot season during January-March the water levels are dropping rapidly, to 3-5 cm a day. As soon as the banks with *Corbiculas* emerge they are only interesting for a short time. This is the result of numerous birds taking the flesh of the bivalves and the left-

overs will be rotten in a few days time. In other words, the time span during which godwits can forage on these rich bivalve grounds in the central lake area is limited. The timing of migration coincides with the availability of these food resources (van der Kamp *et al.* 2002b). During very dry years, thus with a very low flood level as in the 1970s and the 1980s, the *Corbiculas* are already available in December or in the beginning of January. Then godwits – and other birds – cannot profit from these food resources and may face problems fattening up for their spring migration. This may lead even to starvation of Palaearctic birds in extreme situations (van der Kamp *et al.* 2002a).

3.4.3 Changes in numbers of godwits

Available data

In the past, several times during the mid-winter period aerial censuses in the Inner Niger Delta have been executed (see Wymenga *et al.* 2002 for details). Detailed counts of the central lakes are carried out from 1991 onwards by L. Zwarts and J. van der Kamp (Van der Kamp 1989, 1994, 1995, 1996, van der Kamp & Zwarts 1992, 1998) and from 1998 onwards in the framework of a Dutch financed socio-economic and ecological study in the delta (PIN, BBI programs – see Wymenga *et al.* 2002) and van der Kamp *et al.* 2005).

Changes

Based on aerial counts carried out in January the total number of wintering godwits in IND was stable over the period 1985-2001 (Wymenga *et al.* 2002). The number of godwits ranged between 40.000 to 45.000 during seven counts that were performed during this period (data Trollet & Girard 2001). The first count of this period in 1987 with 40.492 birds is similar to the last count in 2001 of 40.280. These figures point to a rather stable situation (Fig 3.17).

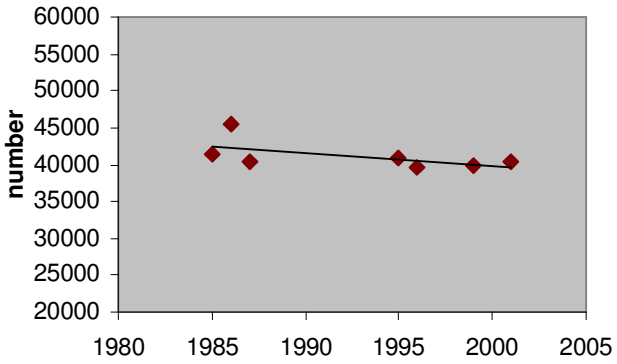


Fig 3.17.
Number of Black-tailed Godwits in the Inner Niger Delta as a whole, based on aerial counts (see Trollet & Girard 2001).

When we look closer at the maximum numbers counted in a series of counts since 1998 by van der Kamp *et al.* (2002a, 2005) in the central lakes in January-March (Fig. 3.18), we see high numbers with a dip in 2000 and 2004. As counts are done systematic in this area, the lower numbers are most likely related to the fluctuating water levels between the years. In 2005 and 2006 again high numbers were found, thereby having no indications that for a general decline or increase in the Inner Niger Delta.

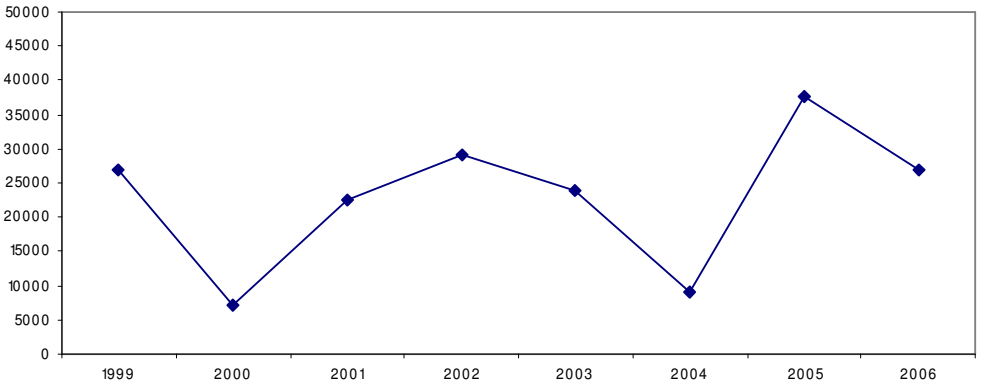


Fig. 3.18.
Maximum number of staging godwits in the central lake area in the Inner Niger delta in Mali in the period 1999-2006. Maximum numbers in the central lake area are always present from late January to March, preparing for spring migration.

The relative constant numbers of godwits in the IND contrasts to the general decrease in population size of the Western European population and the corresponding lower numbers which are encountered in the Senegal delta and in the rice and mangrove area of Guinea Bissau (Section 3.2-3.3). As the departure dates of godwits in Mali suggest, the majority of these birds belong to the Eastern European population which (in this period) did not show such a dramatic decrease in population size (though also decreasing, see Chapter 1).

3.4.4 Threats and conservation

Climate change
The central position of the Malian wetlands in the Sahel means that they are subject to the cyclic wet and dry periods that occur in the Sahel. As described for the Senegal delta, the expectation is, that the temperature in this part of Africa will gradually increase while rainfall will on average be constant (but with large variation within and between years) in the short term (30 years) but decrease in the long term (50-100 years). In the present situation this poses no threats for waterbirds in the Inner Niger Delta. The dry periods in the Sahel – which are characteristic and of natural origin - do however, have a clear impact on the mortality of wintering and staging birds (Zwarts *et al.* in prep).

Habitat change
The Inner Niger Delta constitutes an enormous wetland (between 9,500 and 44,000 km^2 of inundated area) where suitable habitat is amply available during the floods. In general the availability of habitat is no bottleneck for waders in general and the Black-tailed Godwit in particular. However when water is scarce, competition for resources may play a role. Upstream dams (reservoirs) and irrigation cause lower flood levels downstream in the Inner Niger Delta. This effect is felt most in relative dry years with a low river discharge (Zwarts *et al.* 2005). Such an effect may influence the timing of the exploitability of food resources in the central lake area for Palearctic spring migrants, including Black-tailed Godwits.

Human disturbance
Humans intensively exploit the natural resources of the IND (cattle grazing, fishing, hunting) since more than a million people live in the area and are depended on natural resources (Wymenga *et al.* 2002, Zwarts *et al.* 2005). Although human disturbance is not considered as a threat, it occurs in the central lake area during low water levels, when fishermen, pastoralists and thousands of birds concentrate in the central lake area where the last water bodies are found in the dry period.

Hunting
Bird exploitation through hunting and catching is widespread in Mali and being practiced actively, in particular during a receding flood. Tens of thousands of birds are caught with fishhook-lines and nets, and are used for local consumption or sold fresh on the market. Birds form an important protein source, though the economic importance of the trade is marginal on a national scale. Kone & Diallo (1999) and Kone *et al.* (2000) investigated the bird exploitation in the IND. Most important groups of birds are ducks and waders (Wymenga *et al.* 2002). Of the waders especially Ruffs (*Philomachus pugnax*) are favourite species. Godwits are rarely caught as they are difficult to catch. The numbers caught are low (estimated at a few dozen per year). A new development in the IND is that through the planned building of ice factories, birds which are caught can be stored for longer time (with the aid of ice cubes), which may lead to an increase of the catches.

3.4.5. Conclusions

From the analyses and the information described in this Section the following conclusions can be drawn:

- The Inner Niger Delta in Mali constitutes a very important wintering area for Black-tailed Godwits, which mainly belong to the East European population. Ringing recoveries show clearly that at least partly also breeding birds from the Netherlands are staying in Mali.
- In total 26,851 godwits have been counted in the central lake area of the Inner Niger Delta, at the moment that the delta is nearly dry because of the low water level in January - March. Maximum numbers for the whole delta are expected to be in the same order of magnitude as in other years (*c.* 40.000).
- Godwits occur in the delta in natural habitats. With a receding flood they forage mainly on emerging mudflats and sand banks. In the period January-March they concentrate in the shallow water bodies of the central lake complex where they forage on small bivalves.
- An analysis of the trends in numbers of godwits in the Inner Niger Delta show rather stable numbers, this in contrast to the situation in coastal West Africa.
- In Mali bird exploitation is practiced in the Inner Niger Delta on a rather large scale. Thousands of waders are caught annually. Amongst these only small numbers of godwits occur. Other threats like habitat change and human disturbance do not play a role at this moment. Future plans for dams in the upstream river may influence the exploitability of food resources during the period godwits prepare for spring migration. This has to be looked at more closely.

4. SPRING MIGRATION

Already from early January onwards the first Black-tailed Godwits which spend their non-breeding season in West Africa start their northward spring migration. In total they have to cover a distrance of about 5.000 km to their breeding grounds in Europe, where they arrive from the end of February onwards. The majority of godwits follows a migration route via the East Atlantic coast, using staging sites in Morocco, Portugal, Spain and France. A part of the birds stays and migrates via Tunisia and Italy.

In this Chapter the spring migration is dealt with based on field work in spring 2006 and additional sources. Using a series of simultaneous counts on some of the staging sites we are able to quantify the progression of the migration during spring 2006. The main goal of this Chapter is however to describe the relative importance of the different sites, their protection status and the possible threats for godwits during their spring migration. The spring staging sites concerned are discussesed per country.

4.1. INTRODUCTION

After having spent the post-breeding season (August-December/January) in different areas in Western Africa, the Black-tailed Godwit migrates north again towards their breeding grounds. During their spring migration godwits use a number of staging sites along the East Atlanctic coastline. In the 1980s and early 1990s this migration pattern has been unraveled by A. Beintema and co-workers via the analysis of ringing recoveries (Beintema & Drost 1986, Beintema *et al.* 1995) and surveys and visits along the migration route (amongst others Beintema 1984, Visser & Ligtvoet 1985, Beintema *et al.* 1987). Although godwits can be found in several wetlands in Southern Europe in spring they gather annually in huge numbers at a select number of sites. Important areas which are known to be used by high numbers of staging godwits are located in the north of Morocco, in the rice fields in southern Portugal and Spain and along the west coast of France. Also a portion of the godwits which breed in the Netherlands migrate via Tunisia and Italy, as resightings in the Netherlands of coloured birds caught in Italy and Tunisia demonstrate (Visser & Ligtvoet 1985, Beintema *et al.* 1987).

During the field work in 2006, the known important staging sites in each of these countries were visited to do an inventory of the present situation. Italy was not visited, as the knowledge of local experts provided usefull and up-to-date information and a well-organised network of ornithologists performed counts throughout the country. In all countries visited local experts provided valuable information and performed a part of the survey. With the exception of Morocco and Tunisia, simultaneous counts in the other countries with important staging sites were organised to follow the progress of spring migration (Chapter 2). Nearly all of these counts were executed by local experts. Their co-operation and support was indispendable and proved to be very effective.

In this each section of this chapter we deal with the phenology of migration, the important staging sites and their numbers of godwits in 2006, as well as known changes in numbers of staying godwits in the last decades and last but not least possible threats for the birds during their northward migration.

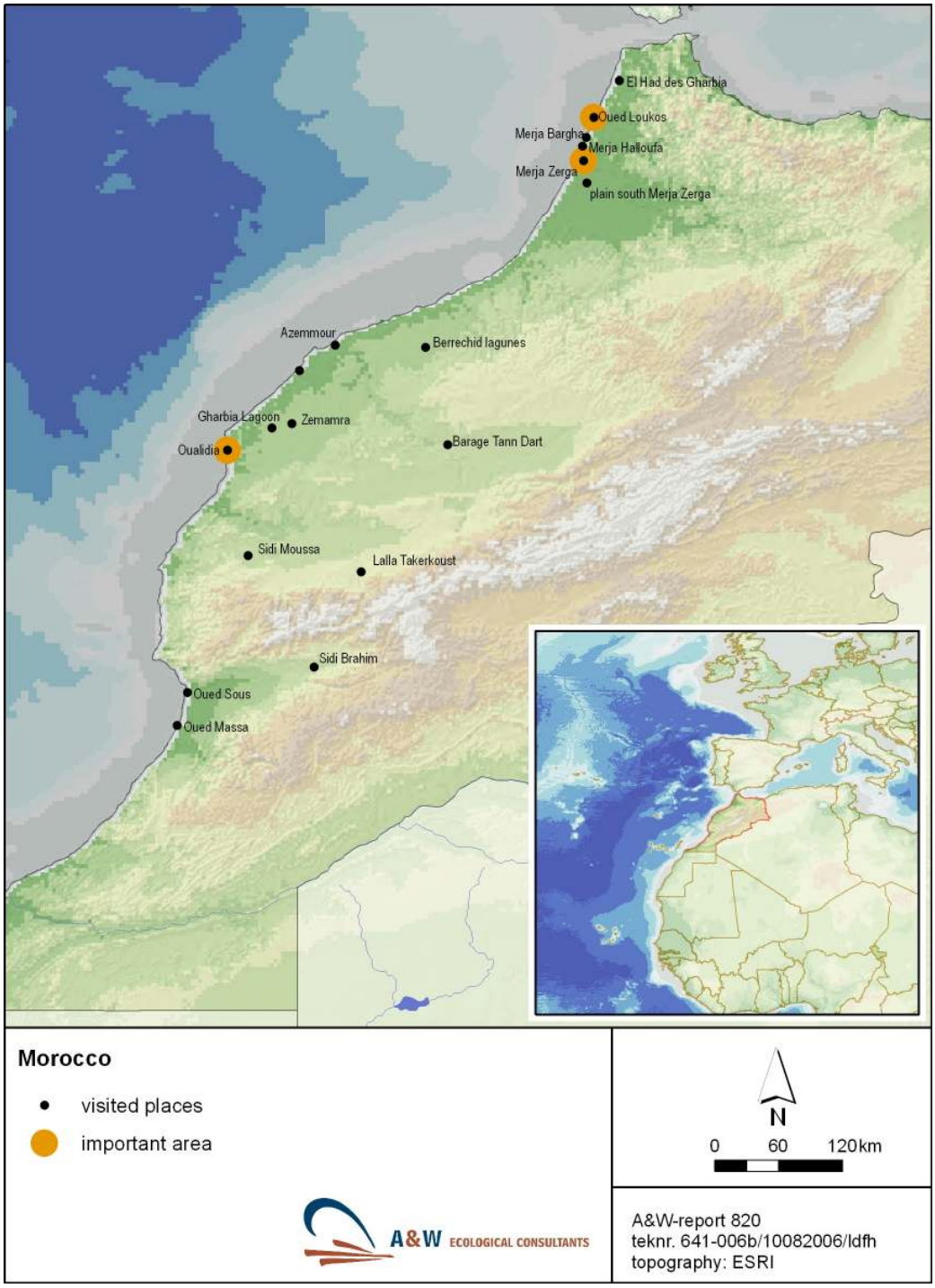


Figure 4.1.
Important spring staging sites for Black-tailed Godwits in Morocco and areas visited during the 2006 survey.

4.2 MOROCCO

Halfway the migration route from Western Africa to Europe, Morocco has a strategic position as staging area for migratory birds. This accounts for several waders, including the Black-tailed Godwit, who use the wetlands in Morocco in particular during spring migration. Wetlands in Morocco are mostly situated along its East Atlantic coastline, where several small rivers discharge into the ocean. The Moroccan coastal wetlands offer the first good opportunities to rest and feed after crossing the Sahara.

Ring recoveries (2) indicate that at least small numbers of Icelandic godwits winter in the Moroccan wetlands (D. Tanger pers.com), which means that during the spring migration of West European godwits both subspecies may be present. The numbers presented in this chapter, therefore, include both sub-species. During the time godwits stay in Morocco (winter, January-February) it is very difficult to distinguish between both subspecies on the basis of their plumage.

4.2.1 Phenology of migration

Adult and juvenile godwits on their post-breeding migration use Morocco partly as staging site when going to West Africa. The first birds arrive here as early as the beginning of July-August. However, the majority of the godwits flies directly – in one single flight from the Netherlands - towards their wintering quarters in West Africa. This is not surprising, as most of the wetlands in Morocco are dried up in summer and autumn and only some coastal wetlands are suitable then, but have a saline character. The godwits in late summer and in autumn may, therefore, be chiefly of Icelandic origin. We have however no quantitative information on the ratio between subspecies.

After having spent the winter in Western Africa, the Black-tailed Godwits are observed again on staging sites in Morocco duirng their first part of the spring migration. In the 1980s peak numbers occurred in mid January. In the course of February many freshwater areas dried out and birds left (D. Tanger, pers. obs.). The last records of birds migrating through Morocco are from the beginning of April (M. Kersten, pers. obs.). The moment of peak number occurrence may depend on the (highly varying) annual rainfall, though we have no (series of) data to test this. In dry years many birds may fly directly to the spring staging sites in Spain and Portugal which are situated 200 to 450 km more to the north.

4.2.2 Spring staging sites

All important spring staging sites are situated along the coast. The main staging areas, the Merja Zerga, the mouth of the Loukos and the Sidi Moussa - Oualidia complex, consist of extensive marsh lands and mudflats which are fed by fresh water rivers and comprise, in spring, suitable feeding sites for migrating godwits (Figure 4.1).

Merja Zerga

Merja Zerga is a coastal lagoon located at the Atlantic coast. The oval-shaped lagoon is measuring approximately 7,300 hectares. It is characterised by its special hydrology influenced by salt water coming in through the open connection to the Atlantic Ocean, by fresh water entering from two canals and by seepage of ground water. Sea water, however, is responsible for 98% of the lagoon's ecosystem.

Upper panel: View on the Merja Zerga from the North (Moulay Bousselham). The extensive marshlands are on the eastern and southern shore. Lower panel: brackish marshes which are preferred by Black-tailed Godwits in Morocco.

Merja Zerga harbours a diversity of habitats. The largest surface area is occupied by brackish mudflats - which are preferred by Black-tailed Godwits - and surrounding marshes mainly covered by *Suaeda spp*. and rarely with Reed (*Phragmites spp.*). Merja Zerga is one of 24 Ramsar sites in Morocco and the one supporting the highest number of waterbirds. It therefore receives considerable attention from nature conservation organisations.

For Black-tailed Godwits Merja Zerga is the most important staging site in Morocco. During the 2006-census from 4-18 January a total of 4.456 godwits was recorded in this wetland (Table 4.1). Also previous data indicate that this is by far the most important site for godwits in Morocco as between 2.000 and 16.000 have been counted here (see Figure 4.2). The godwits were mainly observed foraging on brackish marshes with shallow layers of water feeding on invertebrates (mainly worms). In years with high rainfall godwits are also observed to feed on inundated and harvested agricultural fields (sunflowers) south of the Merja Zerga (D. Tanger pers. obs.).

During post-breeding migration in August to September up to 3.000 godwits have been observed in the Merja Zerga. During this period they also forage on harvested dry fields of cereals, in the direct vicinity of drinking water, where they eat the wasted grain (D. Tanger pers. obs.). As stated in the introduction of this Section, we know from ringing recoveries that both Icelandic and West European godwits are present in this period (Beintema & Drost 1986, Beintema *et al*. 1995) but we do not have sound information on the numerical presence of both subspecies.

Threats
The Nador Channel transports around 450,000 tons of sediment annually into the lagoon. This causes prolific sedimentation and salt marsh formation in the southern part of the Merja Zerga at the expense of mudflats which constitute the most important habitat for godwits. The extraction of water for agricultural purposes has caused a decline in debit of the channel. This has lead to decreased water levels in Merja Zerga and has even influenced the groundwater level in the area (www.wetlands.org/rsis/). In the northern part of Merja Zerga most temporary water pools have disappeared due to these changes in water management for irrigation purposes. During the visit to this area in 2006 it was observed that despite heavy rain, very few water pools persisted.

Agriculture, which consists mainly of growing vegetables, has become very intense in this area. Due to cultivation of marshes there are now several kilometres of agricultural land between the motorway and the Merja Zerga. This increase in surface area of agriculture land has lead to a decrease of suitable natural habitat for staging and wintering godwits. A further increase of agricultural activities in this area is expected in the near future.

Loukos

Loukos is a 3,600 ha large marsh area north of Larache. At the mouth of the Loukos river, west of the old road to Tanger, the river is surrounded by salines. To the east of this road, the river is bordered by fresh water marshes. The wetland is surrounded by irrigated agricultural land, developed in the (former) wet zones that are drained. The natural marshes provide good foraging areas for godwits. Loukos has been designated as Ramsar sites in Morocco.

Loukos forms the second most important staging site in Morocco. In 2006 a total of 242 Black-tailed Godwits were counted here. Previous records indicate that up to 5.000 birds can occur.

Threats
Loukos is an important area for a large number of water birds. Despite the construction of a dam upstream the river, it remains a high quality wetland. The major threat to the Loukos marsh at this moment is posed by intense hunting of water birds during winter time. Hunting is prohibited in the surroundings of the dam, which therefore provides a safe haven for birds.

Agricultural developments occur on a small scale, resulting in parts of the marshland being drained. Plans for large-scale drainage by the regional agricultural body (ORMVAL) were prevented because of hunting interests (Green 2000). Currently many rice fields, which were located in the wetland, have been abandoned (www.wetlands.org/rsis/).

Sidi Moussa - Oualidia complex
This area is situated along the Atlantic coast and measures approximately 10,000 hectares. It consists of a series of wetlands disconnected from the sea by a line of dunes starting from the village Sidi El Abed in the north to the small village Oualidia in the south. It consists of two large lagunes, surrounded by marsh land and many salt pans. The Sidi Moussa- Oualidia complex has also been designated as a Ramsar Site.

In 2006, 375 godwits have been counted in this area. Although the maximum counted numbers are lower than in the Merja Zerga and Loukos, up to 950 birds have been counted here during the 1990s (see Figure 4.2). The fresh to brackish marshes with shallow layers of water form the most important habitats for godwits in this area.

Threats
The most important threats to the area are connected to agriculture. Reclamation of saltmarsh for agriculture has taken place in the last decades on a large scale. As a consequence large areas of suitable habitat for godwits have disappeared. Next to the increase in the surface area of agricultural land the practise of agriculture intensified in the past years. The extraction of ground water for irrigation has lead to a decrease in the area of wetlands (www.wetlands.org). Also the increasing use of pesticides poses a threat to staging water birds.

Other areas
Other areas in Morocco where relative large numbers of godwits were observed in 2006 are Merja Halloufa (185 ind.) and the Gharbia Lagoon (163 ind.).

Threats
Many areas in Morocco are intensively used by local people for the gathering and production of food. In many natural areas collection of fire wood is taken place as well as grazing by sheep or cattle. The reduced cover of vegetation can lead to a destabilisation of dunes. These moving dunes may have large consequences for wetlands. This is shown in the Oued Massa, a former estuary, where an immense dune has blocked the river outlet. At this site the problem is that no fresh water reaches the river mouth due to dam construction upstream. This enabled the blocking of the estuary by the dune since there was no discharge to keep the entrance open. Nowadays the Oued Massa has turned into a lake, lacking the dynamic nature that used to characterise this area.

Another example is found in the Oued Souss. The entrance to the sea in this estuary is in the process of becoming blocked by a sand dune. The main water that reaches the river mouth is waste water from surrounding cities.

Table 4.1.
Most important staging sites in Morrocco for Black-tailed Godwits and the numbers that were counted during the visit of these areas in the period 4–18 January 2006. These numbers have been compared to the average number in the period of 1970–1980 in the same areas by the same counter.

Area	Numbers counted 2006	1970-1980 [1]
Oued Loukos	242	400
Merja's north of Merja Zerga	185	?
Merja Zerga	4.456	10.000
Plain South of Merja Zerga	0	4.500
Berechid lagunes	4	?
Oued Rrbia cazamout	0	0
Sidi-Moussai - Oualidia complex	375	500
Gharbia Lagoon	163	?
Oued Souss	37	50
Oued Massa	2	10
Total	**5.411**	**15.500**

[1]Kersten & Smit (1984).

4.2.3 Changes in numbers of godwits

In the past very high numbers of godwits have been found from Moroccan wetlands. In January 1964 Blondel & Blondel (1964) reported – as a very rough estimate – 80.000-120.000.000 godwits from the Merja Zerga and vicinity. This exceptionally high number has never been recorded again nor comparable large concentrations. Though we have no information on the accuracy of this figure, we do know that very large numbers were present and that 1964 was an exceptional wet year as well. The whole of the Merja Zerga was inundated including the surrounding plaines (L. Zwarts, pers com.). In January 1970 inundation of the Merja Zerga was modest and the number of godwits amounted to *c.* 10.000 (Zwarts 1972). For a recent overview of the long-term trends of godwits in Morocco, the midwinter counts that have been organised by Wetlands International (www.wetlands.org) and fall halfway January, have been used in combination with other counts. The data for the three most important staging sites are shown in Figure 4.2.

The highest numbers of godwits are usely present in the Merja Zerga. NoTable are the large fluctuations in numbers that are reported, ranging from 2,000 to 16,000 birds. Though these might be explained by the surface area of suitable foraging habitat the relationship with winter rainfall is relatively weak (r^2=0.34 - Nov+Dec rainfall combined for Tanger, Casablanca and Rabat data untill 1996). Given the relative short distance between Morocco and the staging areas in Spain and Portugal it should not be excluded that during unfavourable circumstances in Morocco godwits migrate directly to Spain and Portugal. The long-term trend shows – apart from the large fluctuations between years - a general increase in the period 1983-2006 (r^2=0.31, $F_{1,15}$=6.28, P = 0.025). However from the last pentade (2000-2006) we have only limited data, and the numbers available show a decline in the Merja Zerga. There is no trend in the numbers counted in Sidi Mousa – Oualidia (r^2=0.016, $F_{1,14}$= 0.21, P = 0.66) and Loukos (r^2=0.19, $F_{1,15}$= 3.3, P = 0.091).

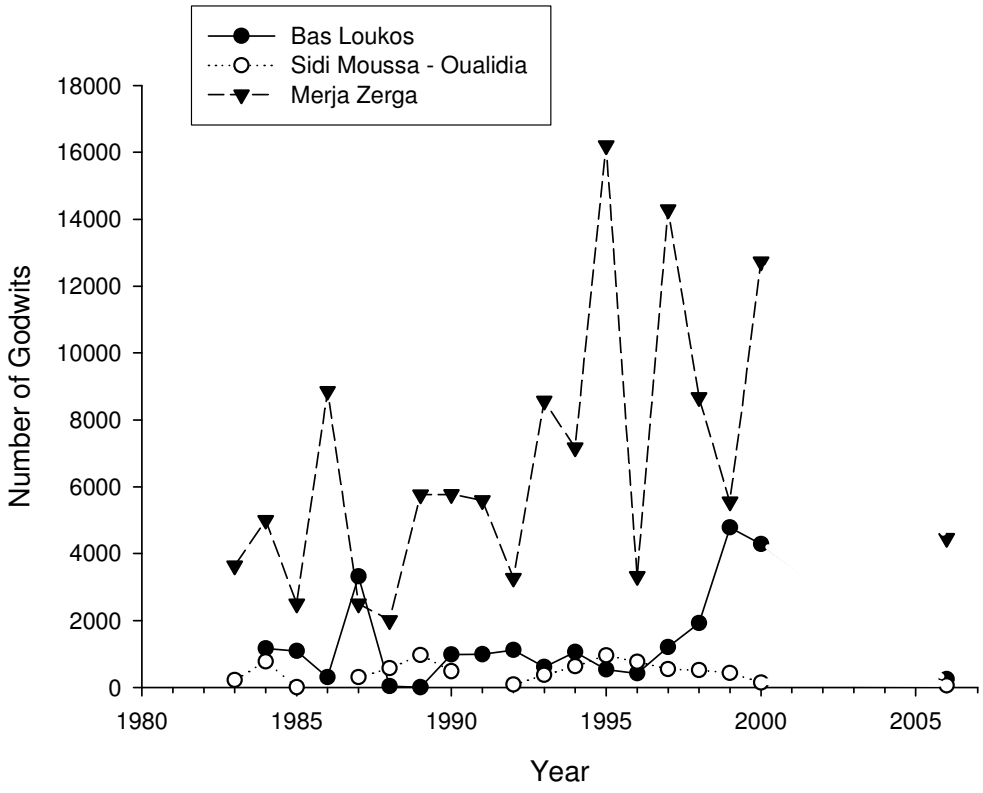


Figure 4.2
Changes in numbers of Black-tailed Godwits in Morocco on important staging sites in the period 1983-2006. The numbers are based midwinter counts organised by Wetlands Internatioal (www.wetlands.org.rsis) in combination with other midwinter counts in the period of January-February. Other sources: Van den Berg (1988), Muusers et al. (1990), Groen & Zomerdijk (1994), D. Tanger unpubl. data.

4.2.4 Threats and protection

Climat change
An important factor in Morocco that determines the suitability of staging sites for godwits (and all 'fresh water' species) is the availability of fresh and brackish shallow water bodies. The occurrence of such habitats depends strongly on the rainfall during the preceding winter. The annual precipitation in Morocco is low and is fluctuating yearly. Parallel to the situation in the Sahel the overal and average rainfall dropped from the 1960s onwards. For the long term (50-100 years) a climate change is predicted with lower precipitation (Section 3.2 – Senegal). This means that in a long run the coastal wetlands in Morocco will dry up more easily and the influence of salt sea water will increase. During dry springs several wetlands can dry out and become unsuitable as staging site. The many hydrological construction works in the Moroccan rivers (dams and reservoirs) worsen the vulnerability to climatic changes.

Habitat change
An additional problem which reduces the number of suitable staging sites is caused by the drainage and extraction of fresh water from rivers and canals for agricultural purposes. This causes a shortage of fresh water running into lagoons and estuaries, and also reduces the

seepage of groundwater from elevated dune complexes. This may lead to sediment accumulation which may cause obstruction of water ways. Because of this, the estuary Oued Massa is blocked from fresh water supply and the Oued Souss is in the process of becoming blocked from fresh (river) water supply by dune formation (Green 2000). These areas will eventually become brackish lakes which will be less attractive as feeding site.

In Morocco many dams are constructed in rivers in order to retain fresh water and have sufficient water supplies for agricultural purposes. Many of these dams are located in or near godwit staging sites. Dams and reservoirs reduce the river discharge and thereby lead to changes in the wetlands concerned.

Hunting
As part of the international action plan to protect the Slender-billed Curlew, *Numius tenuirostris* (Gretton 2006) hunting has been prohibited since 1995on all wader species which resembled the Slender-billed Curlew. This included also the Black-tailed Godwit. Although hunting is not allowed on Black-tailed Godwits, hunting still takes place for many other waterbirds in most areas (possibly including illegal hunting for godwits). This may lead to disturbance of important staging sites. At the most important staging site, the Merja Zerga, a hunting concession is located on the boundaries of the area at Merja Kahla.

4.3. PORTUGAL

In Portugal both Icelandic and continental godwits are present. Icelandic birds winter in fair numbers and West European birds use Portugal mostly in spring. During spring migration West European godwits are very concentrated in only two areas, the Tejo and the Sado estuaries. During spring migration the maximum numbers that are counted in Portugal and Spain (Section 4.4) exceed by far the numbers counted in Morocco. This suggests that for a large number of birds the spring staging sites in Portugal and Spain are the first staging areas halfway their migration route, which makes them as such of strategic importance. In particular in Portugal and Spain it is difficult to distinguish between Icelandic and continental godwits. The numbers presented here, therefore include both subspecies. However, in the brackish and inland habitats where this survey in 2006 was carried out, continental godwits will dominate the numbers.

4.3.1 Phenology of migration

During post-breeding migration only low numbers of adult godwits are passing through Portugal. In very dry summers in the breeding areas, already early July the first godwits arrive in Portugal (R. Rufino pers. com. in Wymenga *et al.* 2001). The influx of godwits that is generally observed during August to September will mainly consist of first year birds (Beintema & Drost 1986) or of Icelandic godwits (D. Tanger pers. com.). During the winter up to a few thousand (5,000-6,000) Icelandic godwits winter on the mudflats of the Tejo estuary (D. Tanger pers. com.).

In late December or early January Black-tailed Godwits start to arrive from their wintering areas in Portugal. Figure 4.3 shows the phenology in two important staging sites, the Tejo and Sado estuaries in 2006. During the first half of January numbers are very modest; in the last weeks of January an influx of birds occurs with peak numbers early February in 2006.

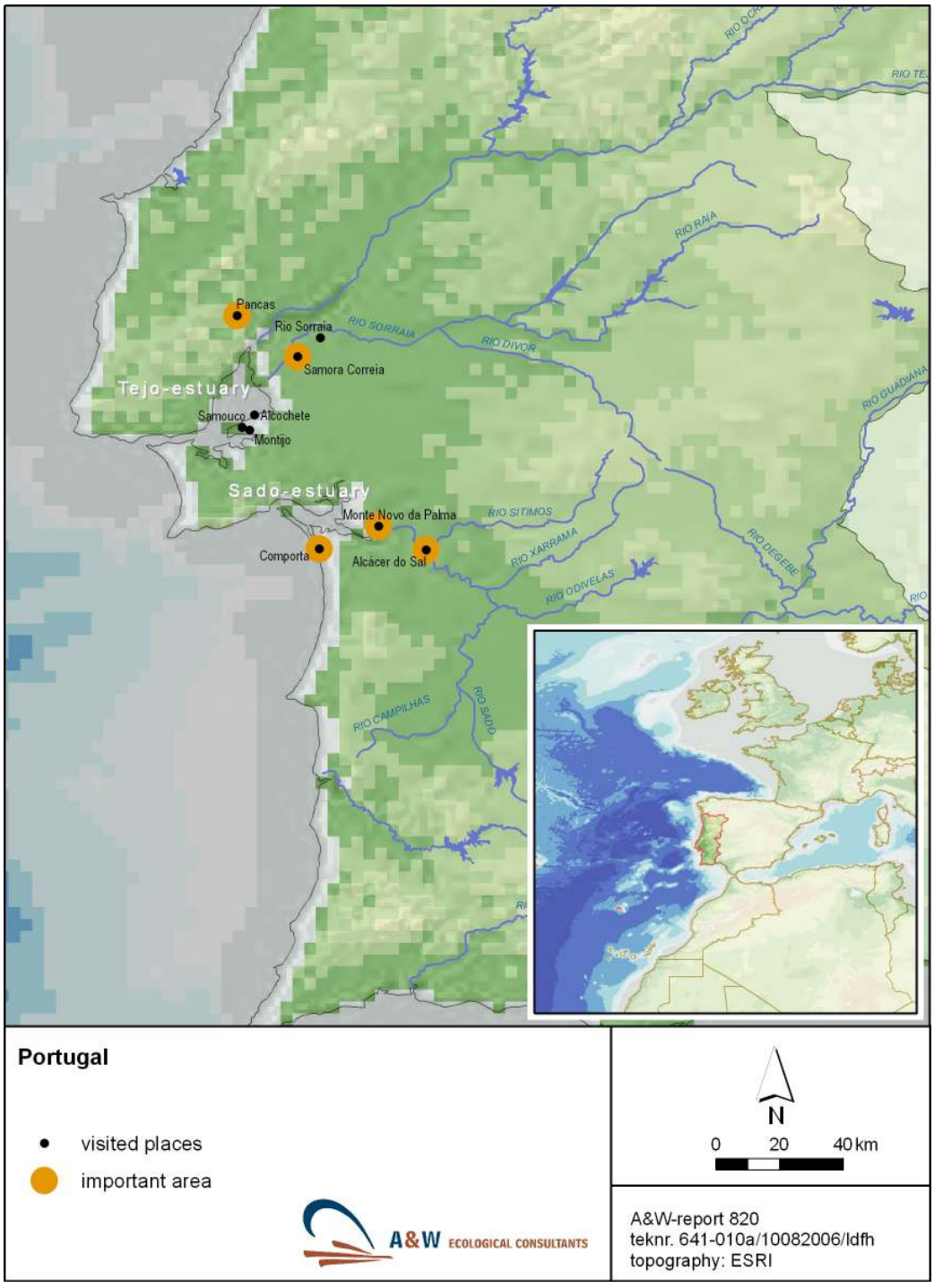


Figure 4.4.
Important spring staging sites for Black-tailed Godwits in Portugal in the Tejo and Sado estuaries, and areas visited during the 2006 survey.

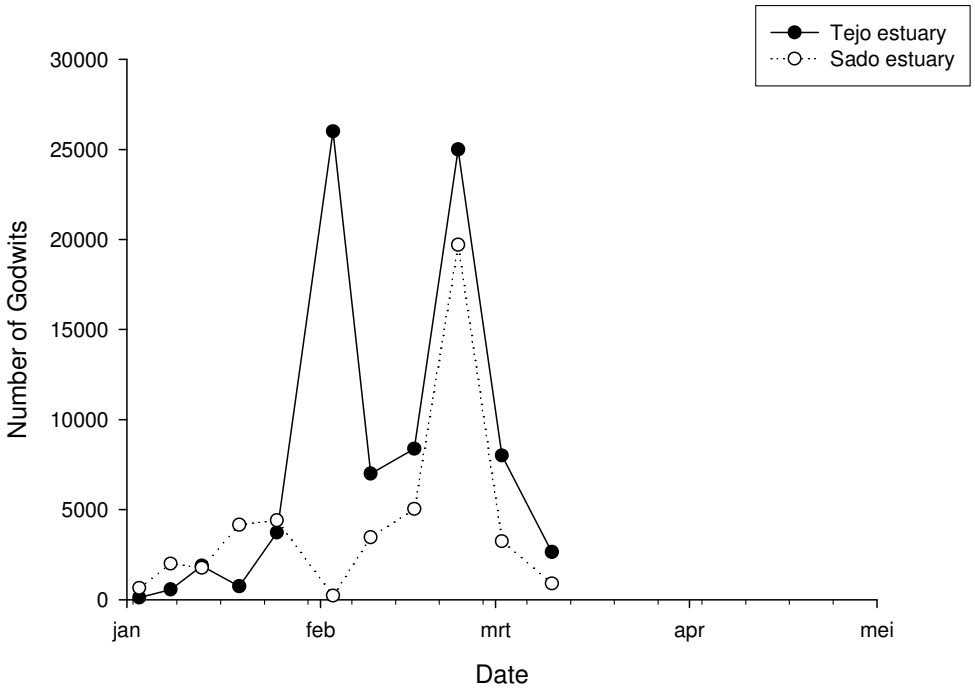


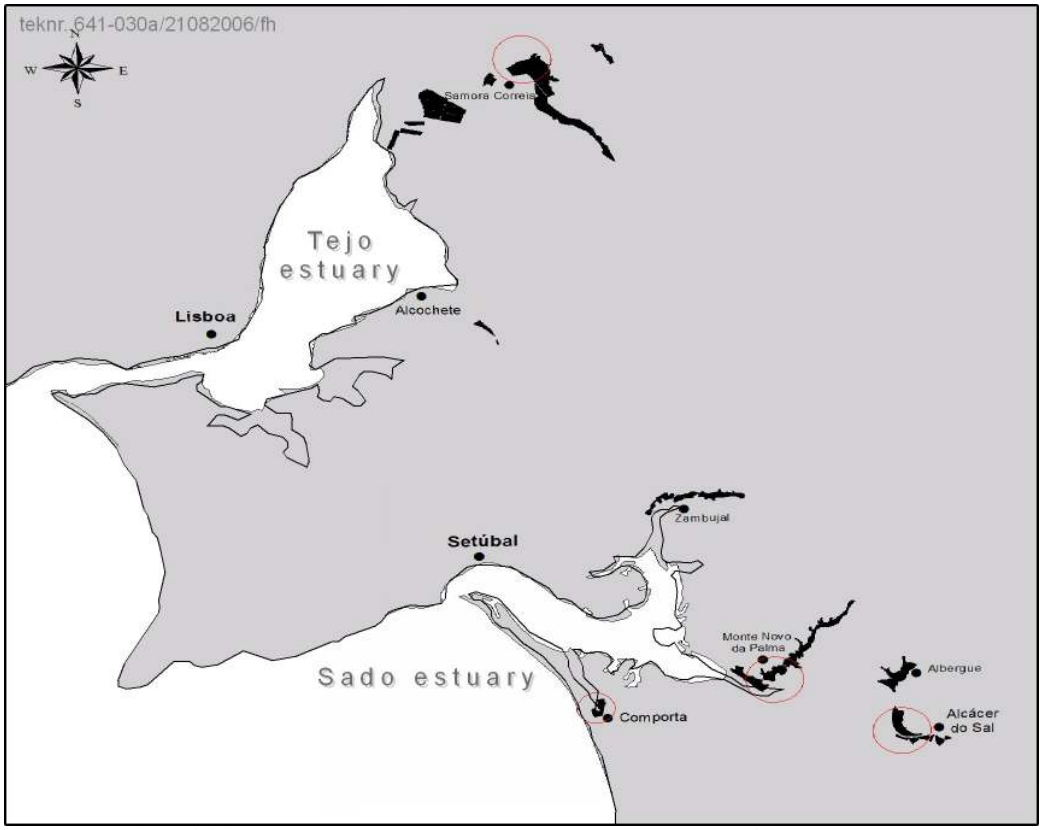
Figure 4.3.
Phenology of spring migration in the two important staging sites in Portugal in 2006. Counts from P. Lourenço, University of Groningen.

In 2006 two peaks were observed, one in the beginning of February (3/02) and one in the last week of this month (23/02). The high numbers in the Tejo estuary at the beginning of February probably explain the low numbers in the Sado estuary. In between these peaks the total number dropped sharply. This drop in numbers can only be explained by birds that move to the staging sites in nearby Spain (Section 4.4). As the distance between important staging sites in the Extremadura in Spain and the Tejo and Sado estuary in Portugal is 270 kilometres, both areas could be seen as one staging site. Birds might be moving between both sites. There are indeed indications that birds move (partly) first to Spain before migrating further north (Gerritsen & Tanger 2006). However, the second peak in both the Tejo and Sado estuary suggest that birds also may return to Portugal. A second influx from the wintering areas in West Africa can not be excluded, but this is less likely as the dried up wintering areas have been mostly deserted by then.

In the first week of March most birds leave Portugal for more northern staging sites or by a direct flight to the breeding grounds in the Netherlands. By mid March nearly all birds have left the staging sites in Portugal.

As 2006 was a late spring, the arrival period in Portugal is later than has been observed in other years. Previous counts in the 1990s showed that birds are arriving in large numbers in Portugal as early as the last week of December with a peak in number the last week of January and the beginning of February (Unpubl. data L. Zwarts & A. Blomert). Virtually all birds in these years had left by 20 February (D. Tanger pers. observ.). The two peaks of migration that were observed in 2006 is therefore not a characteristic picture. It may well be related to cold conditions during the end of February in 2006.

Enormous flocks of Black-tailed Godwits congregate on rice field in Samora Coreirra in the Tejo estuary (O. Steendam).



Overview of the Tejo and Sado estuary with in black the rice fields. The rice fields which often harbour large numbers of Black-tailed Godwits are indicated by the red circles (picture of P. Lourenço).

4.3.2 Spring staging sites

The most important spring staging sites in Portugal are situated in the estuaries of the Tejo and Sado river (Fig. 4.4). Large concentrations of godwits can be observed especially in the extensive rice fields in these areas. Outside the Tejo and Sado estuaries the spring numbers of godwits are low, though small numbers of birds have been observed staying in wetlands near Faro (Ria Formosa).

Tejo estuary

The Tejo estuary is situated Northeast of Lisbon and measures *c.* 45,071 ha. Ornithologically this is the most important estuary in Portugal with a total of over 240 species recorded during winter and migration. The site includes the upper and central parts of the River Tejo estuary and the valley of a small tributary (Ria Enguias). The estuary is very wide with large expanses of mudflats, salt marshes and reed beds. Next to these natural habitats large parts are used for agricultural purposes, such as rice fields and on a smaller scale for saltpans and fish-farming. To make this possible there is a system of dykes and drainage ditches around the river. In 2004 approximately 30,000 ha of rice fields occurred in Portugal. Most of the rice field complexes can be found along the river Tejo.

The entire surface of this Important Bird Area is covered by the Nature reserve Estuário do Tejo and has been assigned as a Special Protection Area. Over 14,500 ha is designated as a Ramsar site (Heath & Evans 2000).

Black-tailed Godwits mainly use the rice fields as foraging site, while they gather on large roosts during night. Important complexes where large number of birds can often be observed foraging are situated near the village of Samora Correia (Table 4.2). A large roosting site is situated in a salt marsh in Pancas, near the Vasa-Sacos saltpans. In this region the birds forage mainly on rice fields with shallow water or fields that have recently been ploughed. Also it is reported that the birds feed on sunflower seeds (A. Blomert, pers. com.). This habitat choice is only true for the continental godwits *L.l. limosa*. The Icelandic godwits mainly use mudflats but are also found on rice field, especially near the village Montijo. They gather in large roosting flocks in salt pans during high tide.

Threats

The main changes that have taken place in the Tejo estuary are related to the growing urban encroachment of the estuary. Many natural areas have been drained and replaced by urban and industrial areas during the last 50 years. These changes have been taking place even inside the nature reserves. The best example of this is the construction of an enormous shopping mall (Freeport Alcochete) near the town of Alcochete. This shopping mall is situated right next to Rio das Enguias, well inside the nature reserve, where there used to be natural habitats.

As rice fields form the most important staging habitat, it is likely that changes in the areal extent of rice culture will directly affect the number of staging godwits. Rice culture in Portugal has decreased in importance during the last decades as a result of competition with Spanish rice farmers after entering the EU. However, during the last few years the surface area of rice culture is increasing again. This is the result of an EU-regulation to promote the special Portuguese rice-variety that is being cultivated in the area. Due to this subsidy it became profitable for many farmers to cultivate rice again. At the moment there seems to be a sufficient amount of rice fields available to provide a good staging site for the thousands of godwits that use this area (D. Tanger pers. obs.).

Table 4.2.
Important staging sites in Portugal and the number of Black-tailed Godwits that were counted during the February 2006 visit and during additional counts in the area. For the estimated total, the maximum number counted during simultaneous counts on 23-2-2006 was used..

Area's	Numbers counted	Estimated total
Tejo estuary		**25.000** [3]
Samora Correira (rice fields)	33.000 [1]	
Alcochette (salt pans)	378 (probably Icelandic) [1]	
Montijo	280 [1]	
Barroca d'Alva	0 [1]	
Pancas	565-12.300 [2]	
Sado estuary		**19.700** [3]
Monte Novo da Palma	900 [1]	
Alcacer (rice fields0	0	
Camporta	7.500 [2]	
west Sado (mudflats)	3.800 [1]	
Total		**44.700**

1. Counts Tanger & Gerritsen 2006. 2. Unpub. data P. Potts 3. Simultaneous counts *P. Lourenço.*

The suitability of the rice fields as staging site for godwits in the estuary depends to a large extent on the water level. In years with low rainfall, the fields can be dry. The hardened soils are almost impossible to penetrate for godwits. Another important factor is ploughing. On fields which have recently been ploughed rice kernels are easily accessible for foraging godwits. The highest numbers of godwits during the 2006 census were also counted in these recently ploughed wet fields. Both the conditions in winter (precipitation) and the amount of ploughing in the area determine to a large extent the area of suitable rice fields that is available for foraging godwits.

In the 1990s a large area of the rice fields was ploughed by the time godwits arrived in the area. In 2004 and 2006 a much smaller number of parcels had been ploughed. As a result the godwits concentrated in these years on the ploughed fields and left the area as soon as rice was depleted (D. Tanger pers. obs.). This is one factor that can explain the more irregular phenology of spring migration during 2006 compared to other years.

Sado estuary

The Sado estuary (24,633 ha) is situated approximately 50 km south of Lisbon and flows in the Bay of Setúbal which is sheltered from the open sea by a sand bar. The main town in the vicinity of this large estuary is Setúbal. The inner part of the estuary is bordered by mudflats, salt marshes and reed beds. Large parts within the estuary are used for the cultivation of rice. The Nature reserve Estuário do Sado covers 20,011 ha of this Important Bird Area. The entire area has been assigned as Special Protection Area and Ramsar site (Heath & Evans 2000).

As in the Tejo estuary the rice fields form the most important staging habitat for godwits. Important areas where often large numbers of godwits can be observed are situated in the rice fields near the villages of Monte Novo da Palma, Alcàcer do Sal and Comporta. Next to the rice fields large numbers can be found on the extensive mudflats of the estuary (Table 4.2). The mudflats serve as roosting sites for godwits that have been foraging in the rice fields. Next to that, hundreds of Icelandic godwits use the mudflats as feeding site.

Threats

In the rice fields of the Sado estuary, similar threats occur as in the Tejo estuary. Other threats for godwits in this area consist of the transformation of salt pans. Over 30% of the available area of saltpans has been transformed into fish-farms in the course of the last decade, thus decreasing potential habitats for godwits. There are plans for large-scale dredging at the mouth of the estuary that may affect water-flow and sediment deposition inside the estuary. This may indirectly affect the bird community by decreasing the areal extent of mudflats or salt marshes (www.birdlife.org).

4.3.3. Changes in number of godwits

From the 1980s only one complete census is available while during the 1990s in most years the godwits were counted (Table 4.3). Since 1984 the number of godwits counted in the early 1990s in the Tejo estuary increased to a maximum of 51,385 in 1992. Since then the numbers have been fluctuating from year to year. Of the second most important site, the Sado estuary, less data are available which show large fluctuations.

These fluctuations can be explained by two factors. The first is the condition of the rice fields at the moment the godwits arrive in Portugal. The second factor is the time of year these counts have been performed. As the arrival and departure dates are different each year, depending on conditions in spring, the peak number that was counted during the relatively short visits to Portugal during the years can fluctuate. In some years the peak in migration was within the counting period whereas in other years it might have been beyond this period. It is not clear yet which factors trigger the timing of migration from and to Portugal (and at the same time: the departure from African winter quarters). Besides the local conditions, the weather conditions on more northern latitudes may play a role and/or the conditions in the wintering areas. To analyse this, a reliable set of long term counts is needed. Up till now such data are lacking (except for Mali).

Table 4.3.
Changes in number of godwits at important staging sites in Portugal in the period 1984–2006. Numbers represent the maximum number that was counted in the period January–February.

Area	1984	1991	1992	1993	1994	1995	1997	1998	1999	2004	2006
Sado					3.250 [2]	7.450 [3]				2.900 [2]	19.700 [6]
Tejo	20.635 [1]	34.000 [1]	51.385 [1]	41.538 [1]	33.200 [2]	34.000 [3]				23.910 [2]	33.000 [5]
Total country							13.432 [4]	8.614 [4]	2.293 [4]		

1. L. Zwarts & A. Blomert unpubl. data, 2. D. Tanger unpub. data 1994 and 2004, 3. Leguijt *et al.* 1995, 4. Gilissen *et al.* (2002), 5. D. Tanger census 2006, 6. Data P. Lourenço.

4.3.4. Threats and protection

Climate change

The suitability of the main staging sites for godwits depends to a large extent on the annual rainfall. During dry years, when the topsoil dries out and hardens, large parts of these fields become unattractive as feeding site. Annual rainfall may, therefore, on the short-term as well as on the long-term influence the staging possibilities in these areas.

Habitat change

The main threats – and chances - in both the Tejo and Sado estuaries are related to increasing agricultural use or expansion of urban areas and the exploitation of the rice fields. Many natural areas have been drained and replaced by agricultural fields, urban and industrial areas during the last 50 years.

The increasing agricultural use of the area is not necessarily detrimental for Black-tailed Godwits as explained. During the last few years the surface area of rice culture increased again, seeming to offer a sufficient area of suitable staging habitat for godwits in the present situation. It is, however, also clear that the dependence of godwits on two major sites makes them vulnerable to local changes.

Hunting and disturbance

The Black-tailed Godwit is listed on Annex II/2 in the EU Birds Directive, which indicates that it can be hunted in all those Member States which have defined a hunting season for this species. Within the European Union this is only the case in Denmark and France; Portugal does not have such a regulation.

In 2003, Portugal had 295,000 registered hunters. During spring migration godwits should be safe from hunting according to the Birds Directive. At the moment there is officially no hunting on godwits. However, during the hunting season from mid-August till the end of February - exactly the period when the godwits stay and arrive in Portugal - other (wader) species are hunted intensively. In the region where the godwits stay, there are two hunting days per week. During these days there is hunting *in* the rice fields on Commom Snipe, Meadow Lark and Meadow Pipit. The hunting results in a frequent disturbance of foraging godwits. This disturbance lowers the quality of the staging sites as the godwits spend more time on flying while disturbed. Through this their energy expenditure is increasing while the possibilities for food intake are decreasing. It should be investigated what this means for their final energy intake and process of fattening for the last stretch of migration to the Netherlands.

Although Portuguese hunting laws comply with the Bird Directive, there is illegal hunting. Some illegal hunting also includes shooting godwits but there is no reliable information on the numbers of godwits being shot. At present, hunting is not considered by local experts to be a serious threat in this region as no significant numbers are being shot (P. Lourenço pers. com.). Birdlife Portugal (SPEA) has been promoting better laws concerning the game species list and hunting law enforcement (www.rspb.org.uk).

Protective status of staging sites

The Tejo estuary and Sado estuary are both Important Bird Areas and Special Protection Areas. However, the rice fields which are of prime importance for the wintering godwits have no special protective status. Human activities determine to a large extent the suitability of these staging sites. For example, ploughing of the soil increase the amount of rice kernels in the top soil and hence the amount of food for godwits. On the other hand, human activities during the peak of migration may lead to disturbance of birds. As large concentrations of birds occur in a few fields a better management and timing of human activities would be desirable during peak migration.

4.4. SPAIN

Together with Portugal, the staging sites in Spain constitute the 'gateway' to the European continent during spring migration. As the staging sites in Spain are relatively close to those in Portugal they may be considered as one staging area. Spain is used by both Icelandic and continental godwits. Icelandic godwit also winter in Spain. The presented numbers in this chapter include therefore both subspecies. However, in the brackish and inland fresh water habitats continental godwits will dominate the numbers.

4.4.1. Phenology of migration

During post-breeding migration mainly juvenile birds use staging sites in Spain and the peak of migration is during July while total numbers are usually relatively low (Sánchez-Guzmán *et al.* 2006). During winter small numbers of godwits are found in the coastal salt pans near Cadiz (Beintema *et al.* 1995). These birds are mainly wintering Icelandic Black-tailed Godwits.

The first godwits arrive at the end of December or early January from the south in areas at the westcoast of Spain. Beintema *et al.* (1995) report a mean stopover time of two days. As far as known, the godwits fly from these areas on the coast more inland to the rice fields in the Extremadura. Here the number increases during January and reaches a peak at the beginning of February. In the Extremadura, the most important staging site in Spain, a maximum number of 21,000 birds was counted on 2 February during the 2006 census (Fig. 4.5). These numbers include both subspecies. The number of Icelandic godwits in the area during this period is estimated between 5 and 10% of the population (Groen *et al.* 2006). The birds leave the Spanish staging sites in the end of February and early March.

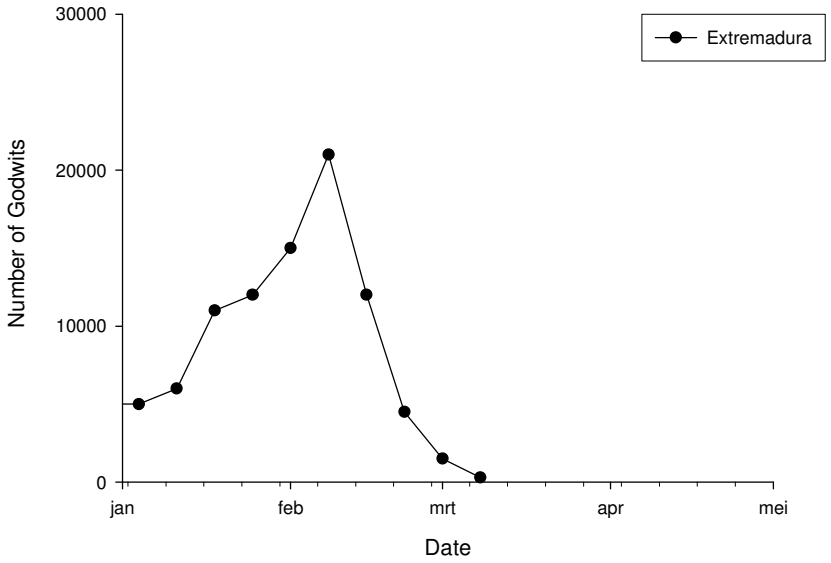


Figure 4.5.
Phenology of spring migration in Extremadura in Spain in 2006. Counts performed by F. Santiago Quesada, University of Extremadura, Área de Zoología.

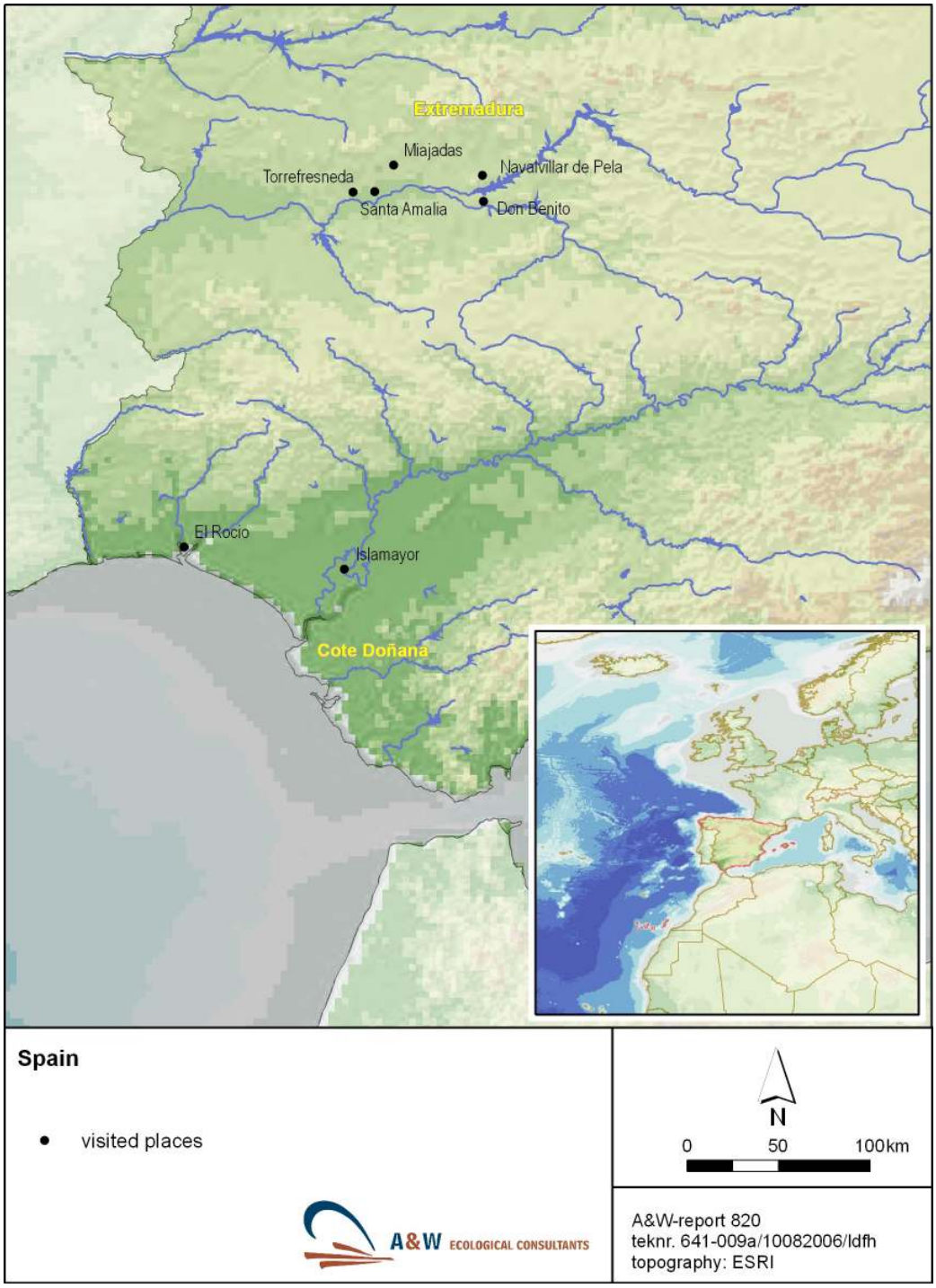


Figure 4.6.
Important spring staging sites for Black-tailed Godwits in Spain and areas visited during the 2006 survey.

4.4.2. Important staging areas

The most important staging sites in Spain are the rice fields in the Extremadura region (close to the City of Badajoz) and the wetlands and rice fields of Cota Doñana (Fig. 4.6).

Extremadura

The inland rice fields near the city of Badajoz in Extremadura are the preferred staging sites for godwits. In the middle basin of the Guadiana river around 30,000 ha of rice fields have been created since the 1960s. This transformation took place by irrigation of historical extensive drylands, both wooded and unwooded. At least five basins in the eastern part of the catchment area of the Guadiana supply the area with water to irrigate the rice fields and other crops in spring and summer.

The annual production cycle of rice begins with the preparation of the rice fields from March until mid April, followed by flooding and sowing from the second half of April until the end of May. Harvesting rice takes place in October and the first half of November. The final treatment of the parcels carried out then is rolling the standing straw flat into the mud under flooded conditions, leaving large expanses of shallow water which – provided that the autumn rains are normal - remain flooded throughout the winter until the cycle begins again (Sánchez-Guzmán *et al.* 2006). Godwits arrive in Spain during their spring migration when still large areas are inundated with a shallow layer of water. The rice fields then provide excellent foraging opportunities, allowing the godwits to fatten up on the rice left over after harvesting. The importance of these staging sites is illustrated by the maximum number of 21,000 birds that were counted in 2006 (Table 4.4). It is even possible that more birds were present on not discovered roosts. The rice kernels make up their complete diet during their stay in this area.

Threats

Since the suitability of this staging site is positively related with the cultivation of rice, the threats as a staging site for godwits are mainly related to the existence and maintenance of rice fields. The surface area that is planted annually with rice depends on the availability of water. In years with low or hardly any rainfall the planted area may drop from 18,000 to 220 hectares (Ballesteros 1996). In these years the available area for godwits is drastically reduced. In addition, a lack of rainfall in autumn causes the rice fields to dry up in winter which makes that the rice kernels are difficult to exploit; in dry fields the grains are not accessible for the birds. Black-tailed Godwits were observed in the area in 2006 only on those rice fields which had recently been ploughed and were inundated by a few centimetres of water (N. Groen pers. obs.). On these fields the rice kernels are easily exploitable for the birds. Thus, the availability of water limits the abundance and the quality of the foraging area for godwits.

A shortage of water also implies an additional problem. Due to the high evaporation as a result of the warm temperatures, there is a risk of salinization during dry periods. This will affect the production of rice and thus the amount of suitable habitat for godwits. In recent years there is a transition from rice fields towards the production of fruit, such as peaches and pears. This mainly takes place at the higher and drier parts of the area.

Despite these threats the number of godwits is still increasing on the rice fields in Spain (pers. com. J. Masero). This may partly be explained by the support by the EU to revitalise the area and promote the rice culture.

Large concentrations of Black-tailed Godwits can be found in rice fields in Spain and Portugal.

Coto Doñana

Coto Doñana is situated in the estuary of the Guadalquivir River in the southwest of Spain. The core of the estuary is the protected area of Cota Doñana National Park, consisting of a complex of marshes, streams and lagoons. On the fringes of this system – and surrounding the National Park area – 25,000 ha of rice fields are found.

As far as we have information on turn-over (Beintema *et al.* 1995), the godwits remain here for only a very short time (2 days). Despite the abundance of potentially suitable foraging area, no godwits were recorded here on rice fields during the 2006 census (Table 4.4). The only godwits were observed in the salt marshes in the National Park near Lucio del Lobo and fresh to brackish inundated pastures near El Rocio. Here in 2006, 4,600 godwits were recorded, foraging on invertebrates, possibly chironimids (N. Groen pers. obs.). Aerial counts that have been performed by the Estación Biológia de Doñana (CSIS) in 2006 showed a maximum number of 18,350, which probably included both Icelandic and continental godwits. In other year this number was even higher: 31,281 godwits in 2004. It illustrates that next to the Extremadura this is also a major staging site (www.rbd.ebd.csic.es).

Threats

The extraction of ground water for urban and agricultural purposes leads to long term falls in the level of saturation within the aquifer. This could adversely change the hydrology of the systems being supplied with groundwater (lagoons and creeks). In addition, this has a negative impact on the timing and the volume of flows in La Rocina and peripheral streams, essential for the ecological health of the marshes. Ironically the 2.000 hectares of rice fields, usually forming suitable foraging area for godwits, irrigated with groundwater add to this

problem through its needs of roughly 30 million m^3 of water per year (www.wetlands.org/rsis). The run-off water resulting from rice cultivation pollutes the marshes of Cota Doñana with pesticides. Eventually the rice fields may thus be a threat to the marshes of Cota Doñana.

Other areas

There is a number of areas (5 in total) in Spain with large amounts of rice fields, for example in the north of Spain near Valencia and in the Ebro-delta in north-east Spain. These areas are potentially important staging sites for Black-tailed Godwits. Up to a few thousand Godwits can occur in the rice fields of the Ebro delta and near Valencia (D. Tanger pers. com.). Good information on numbers of Black-tailed Godwits in other rice areas than those that have been surveyed during this study, is currently lacking. These areas may harbour large numbers and serve as alternative feeding sites.

Table 4.4.
Important staging sites in Spain for Black-tailed Godwits and the numbers that were counted during the visit to these sites in February 2006 and during simultaneaous counts.

Area's	Numbers counted	Estimated total
Extremadura	21.000	21.000
Coto Doñana		4.600-18.350[1]
Isla Mayor	0	
Lucio del Lobo	4.250	
El Rocio	350	
Total	**25.600**	

1. Arial counts of Las Marismas (www.rbd.ebd.csic.es), including both Icelandic and continental godwits.

4.4.3. Changes in number of godwits

There are no data available for the number of godwits during the 1980s. Therefore not much can be said about long-term changes in numbers on the Spanish staging sites. Counts that have been performed from 1999 onwards in the Coto Doñana do not show a clear trend (Table 4.5). These numbers may include some thousands of Icelandic godwits (1,000-5,000), thus the number of continental godwits staging in this area is lower. The fluctuations between years are probably a result of the condition of the rice fields (see Section 4.3). Although there is a general lack of data, the number of godwits using Spain as a staging site during spring migration seems to have increased. Sánchez-Guzmán *et al.* (2006) state that the number of godwits in their study area, situated in the rice fields of the Extremadura, is increasing rapidly.

Table 4.5.
Changes in number of godwits in Spain on important sites in the period 1999-2006. Numbers represent the maximum number that was counted in the period January-February.

Area	1997	1998	1999	2000	2002	2003	2004	2005	2006
Cota Doñana			9.330 [2]	22.830 [2]	13.810 [2]	7.190 [2]	31.281 [2]	14.075 [2]	18.350 [2]
Extremadura									21.000 [3]
Total country	10.514 [1]	25.801 [1]	29.854 [1]						

1. Gilissen *et al.* 2002, 2. Arial counts of Las Marismas (www.rbd.ebd.csic.es), 3. F. Santiago Quesada unpub. data.

4.4.4. Threats and protection

Climate
The area that annually is planted with rice depends on the availability of water and hence is depending on rainfall. In years with low rainfall the planted area may be reduced strongly. In addition, a lack of rainfall in autumn causes the rice fields to dry up in winter which results in a reduced exploitability.

Habitat change
The areal extent of rice has been increasing during the last decades. In the Extremadura 30,000 ha of inland rice fields have been created since the 1960s. These rice fields did not result from the direct transformation of natural wetlands but used to be extensive dry, wooded and unwooded areas. As a result the areal extent of suitable wet staging sites has increased for Black-tailed Godwits. This increasing amount of anthropogenic wetlands can serve as a buffer against the loss of natural habitats on other sides.

Human disturbance
The suitability of the rice fields as staging sites for godwits depends to a large extent on the amount of water on the fields during winter. This is mainly a human induced process as the dikes around the rice fields retain the rain water. A second important factor is the amount of standing straw from the previous summer. The number of birds using the zones with standing straw appeared to be very limited (Sánchez-Guzmán *et al.* 2006). Thus human activities on the rice fields can influence to a large extent the attractivity to waterbirds of these fields. Of course during activities on the fields there may be disturbance.

Hunting
There is no hunting season for Black-tailed Godwits in Spain. The hunting season in Spain varies per species and per region, but runs roughly from October to February. During the visit of 2006 no active hunting was observed. However, clear signs of hunting such as empty catridges, could be seen on many locations. It appears that intensive hunting is taking place in these areas during other parts of the year but not during the peak of migration of godwits. During autumn many migratory birds are hunted in Spain. To what extent godwits are hunted around this time is not known; data on hunting are not available.

Protective status of staging sites
The salt marshes in Coto Doñana used by godwits as foraging areas, fall under the protection of Coto Doñana National Park. The rice fields surrounding the National Park fall within the Natural Park or 'Entorno de Doñana' (a protected buffer zone). Thus the staging sites in the Coto Doñana are well protected.

However, the rice fields in Extremadura belong to an agricultural area without a protective status. Next to important staging sites for godwits they are of international importance for several waterbirds of special conservation interest with population levels reaching values of international importance (Sánchez-Guzmán *et al.* 2006).

4.5. FRANCE

The staging sites in France comprise the last staging sites during spring migration before the Black-tailed Godwits disperse to their breeding areas. Both Icelandic and continental godwits use France as staging site during spring migration and Icelandic godwits winter in coastal areas in France. As indicated for Spain and Portugal the presented numbers in this chapter include both subspecies, but in the brackish and inland habitats continental godwits will dominate.

4.5.1. Phenology of migration

During post-breeding migration, the majority of adult birds is believed not to stop at the staging sites in France. The ones that do stop are thought to stay for only short periods. However, large numbers of juveniles are migrating through France, based on ring recoveries of shot birds (Beintema & Drost 1986). However, numbers are not thought to be large as only small groups have been observed during late summer (D. Tanger pers. obs.).

The number of migrating Black-tailed Godwits in France in 2006 started to build up in the second half of February. The highest numbers were counted in the first two weeks of March after which there was a sharp decline (Fig. 4.7). Interestingly, the peak number of godwits in the southern area Réserve Naturelle de Moëze-Oléron near Rochefort is at 7-9 March whereas in the 180 km more northern Basses Vallées Angevines is already at 3-6 March. This suggests that the majority of godwits use only one of these two staging site before migrating to the Netherlands. A second interesting point that can be seen in figure 4.7, is the second peak of migration in the period 20-27 March in the Moëze-Oléron area. It is unclear what causes this pattern. This could be caused by a second wave of migration. It is striking, that each year two or three peaks are seen in especially the Anjou, probably reflecting departures and new arrivals afterwards.

The pattern of migration corresponds to findings of previous years. The peak of migration in the Basses Vallées Angevines during 1996-2005 was normally at the end of February to beginning of March, with some exceptional late years around 10 March. Birds normally arrive in the second week of February and virtually all birds had left by the end of March (data LPO-Anjou, www.lpo-anjou.org).

4.5.2 Spring staging sites

In France there are two important areas which have traditionally been used by Black-tailed Godwits as staging areas especially during spring migration: the Marais Poitevin along the Atlantic coast and the Basses Vallées Angevines near Angers (Fig. 4.8). Next to that, high numbers can be observed in the Réserve Naturelle de Moëze-Oléron. The most northern area is the Baie du Somme which harbours only low numbers of Black-tailed Godwits.

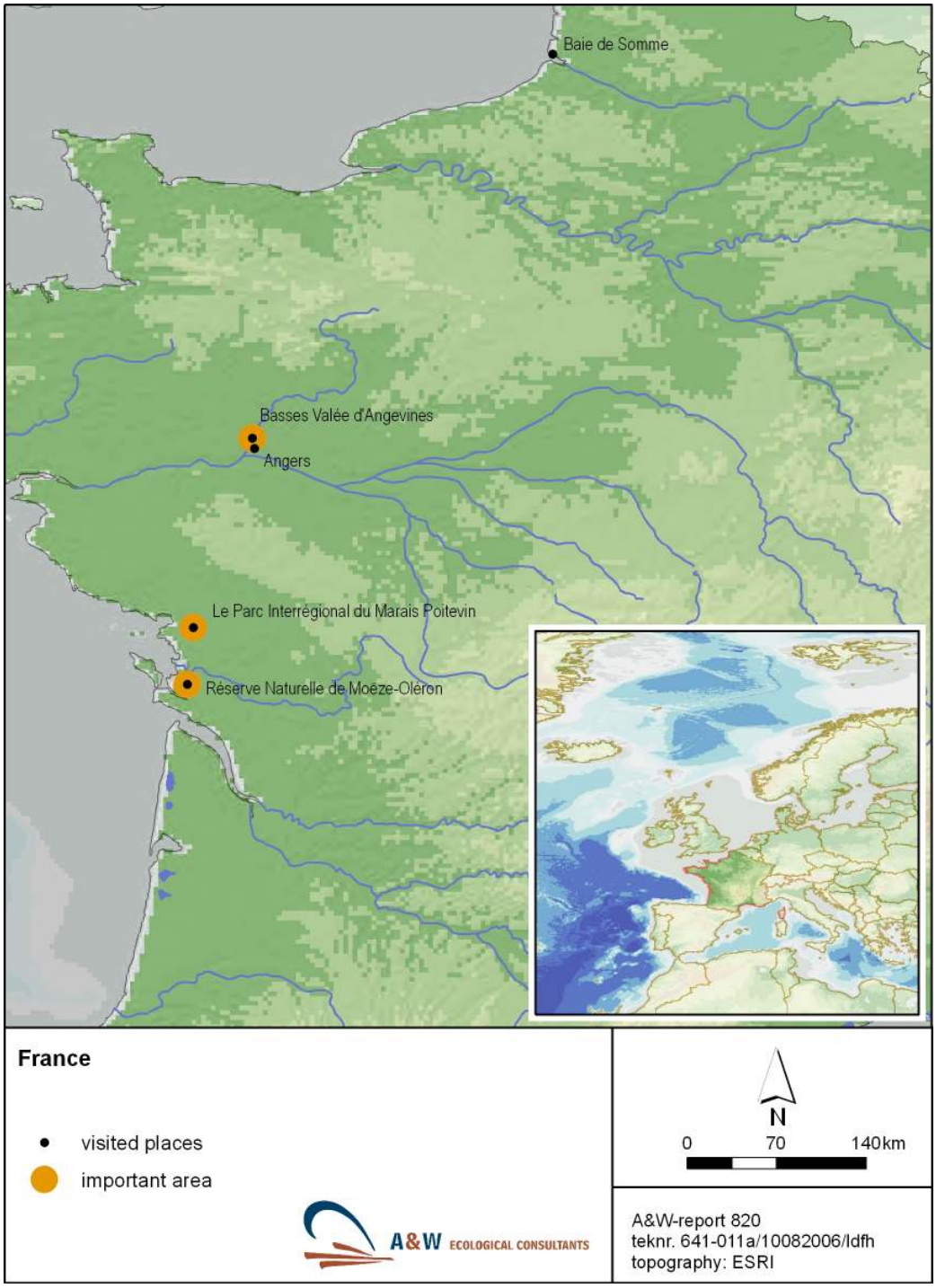


Figure 4.8.
Important spring staging sites for Black-tailed Godwits in Portugal and areas visited during the 2006 survey.

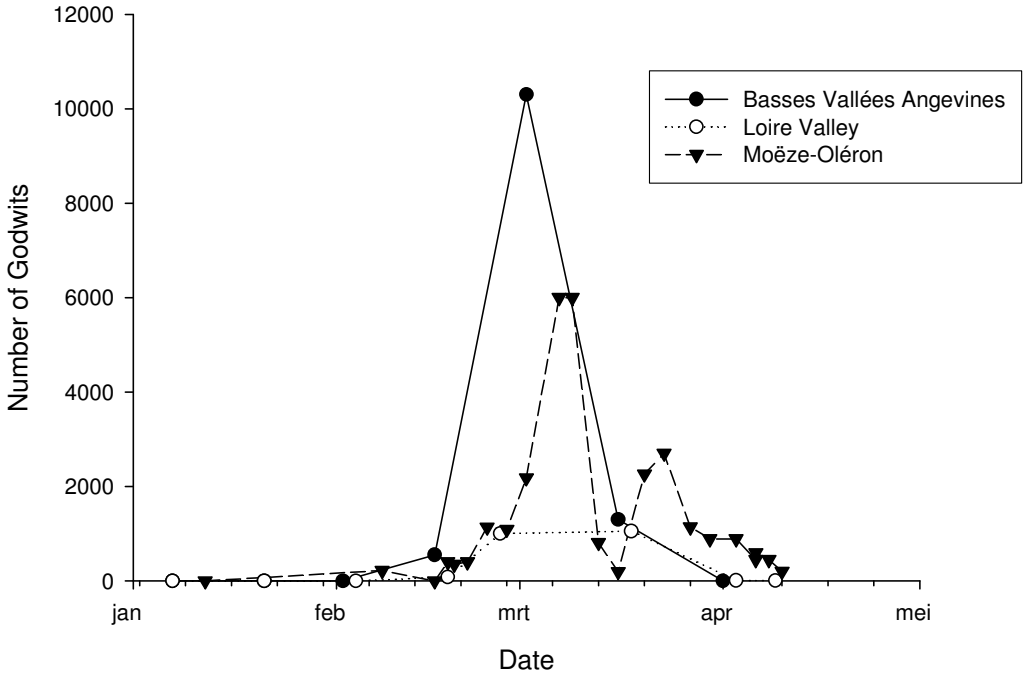


Figure 4.7.
Phenology of spring migration in three important staging sites in France in 2006. Counts performed by LPO Anjou and LPO Plaisance.

Basses Vallées Angevines (Maine et Loire)

This area (6,450 ha) consists of the floodplains of the three rivers Mayenne, Sarthe and Loir which come together north of Angers into the Maine river. South of Angers the area consists of floodplains of the river Maine which flows eventually into the Loire. As these rivers are all rain-fed, there are large fluctuations in the water level depending on the winter precipitation. Due to the interconnection of these rivers, the drainage of one river depends entirely on the water level of the other rivers. For example when the water level in the Loire is high because of extensive rainfall, the water level in the Maine rises as a consequence. Due to these interconnecting river systems, the yearly amount of flooding in the area depends on rainfall in the entire river basin. Normally in spring large parts of the area are flooded which creates suitable staging areas for migrating Black-tailed Godwits. Large parts of the area consist of highly productive grasslands which are used mainly for hay making. Also extensive cattle grazing occurs. In summer the grass can grow up to one meter high, which makes the area unattractive for breeding meadow birds like Black-tailed Godwits, but up to 2,000 pairs of Whinchat (*Saxicola rubetra*) breed there and it is one of the most important breeding areas for Corncrake (*Crex crex*) in France. The area has been assigned as a Ramsar site and a small part (361 ha) is covered by a Private Reserve managed by the LPO (Ligue Pour la Protection des Oiseaux). Since recently the Basses Vallées Angevines is also part of the Natura 2000 network as an area of Special Conservation Interest (SCI) (http://natura2000.-environnement.gouv.fr/sites).

Typical view in the Basses Vallées Angevines in early spring. Flooded grasslands whereas the Poplar plantations in the background reduce the amount of suitable staging areas.

In spring the low grasslands in the Parc Interrégional du Marais Poitevin are inundated and constitutes excellent staging sites for Black-tailed Godwits.

In early spring when the vegetation is short, Black-tailed Godwits mainly forage in the inundated grasslands. They prefer to forage on the edges or in the shallow water of the flooded areas. The main diet consists of invertebrates, such as worms (pers. com. Franck Noël). During spring 2006 up to 10.300 godwits were counted in this area (Table 4.6).

Threats in the Basses Vallées Angevines

There have been large-scale changes in the land use in this area during the last decades. Since the early 1970s large areas of grassland have been converted to poplar plantations subsidised by the EU, when farmers lost interest in hay making. Poplars are planted for the production of baskets and wood shavings for the making of linen and paper. After approximately 20 years the trees are being harvested and for some old farmers the planting of poplars is a way to secure their pension. In the entire Basses Vallées Angevines 8,000 ha has been planted with poplars since the 1970s (F. Noël pers. com.). Nowadays, a compromise has been reached between nature conservationists and farmers that no further increase of poplars should take place in the area. The policy is aimed at making the tradional hay making more attractive by means of ecological farming and the production of eco-meat. The areas which have been planted with poplars are not used by staging Black-tailed Godwits and thus contributed to a reduction of the available habitat for these birds.

The yearly fluctuating water levels determine the area which is flooded in spring throughout the Basses Vallées Angevines. These floodings entirely determine the suitability of the area for staging godwits. In years with low amounts of flooding the area of suitable habitat is low as the dry soil which contains gravel is not penetrable for foraging godwits. On the other hand, in years with extremely high floodings the amount of suitable foraging sites is limited because of too high water levels. Because of this dependence on the water level, the maximum number of Black-tailed Godwits that are staging in this area shows large fluctuations (Fig. 4.9). The correlation between the Loire-level and godwit-numbers from 1996-2006 was however low ($r^2 = 0.16$). Throughout the area a large number of hunting huts are present. Although hunting for Black-tailed Godwits is prohibited from 1 February onwards, there is hunting for godwits in autumn and winter. See further Section 4.5.4).

Parc Interrégional du Marais Poitevin and Baie de l'Aiguillon

The Parc Interrégional du Marais Poitevin is situated along the Atlantic coast of France roughly in between Luçon in the north and La Rochelle in the south. The area consists mainly of extensively and intensively cattle-grazed grasslands. There is an extensive system of small channels and ditches for drainage of the area. Next to agricultural fields, salt marshes can be found in the area along the Baie d'Aiguillon. Most of these salt marshes are extensively grazed by cattle or sheep and they consist of a mosaic of short and tall vegetation. Large numbers of godwits can be found foraging on the mud flats in the Baie de l'Aiguillon and large high water roosts are found on the salt marshes and at Pointe d'Arçay (pers. com. Julien Sudraud, LPO-Vendée). In these salt-water habitats it is most likely that the occurring godwits are mainly from the Icelandic race (*Limosa limosa islandica*). They seem to be separated from the Black-tailed Godwits that are staging more inland.

In the area (Marais Poitevin and Baie de l'Aiguillon, 77,900 ha) four hunting reserves can be found. Parts are protected by the Nature reserves Saint-Denis-du-Payré (207 ha) and Baie de l'Aiguillon (2.300 ha) and by the private reserves existing of parcels near Champagné (255 ha) managed by the LPO. 5,290 ha has been assigned as Special Protection Area (Marais Poitevin-Baie de l'Aiguillon), 19,960 ha as Special Protection Area (Marais Poitevin Intérieur), 1,000 ha as Special Protection Area (Pointe d'Arçay), 3,540 ha as Special Protection Area (Marais doux Charentais).

Large areas of grasslands have been converted to corn fields which are unsuitable for staging godwits in the Marais Poitevin during last decades.

Many communal grasslands in the Marais Poitevin are managed by hunting organisations.

The most important feeding habitat for staging Black-tailed Godwits in the area are the extensively grazed communal grasslands, 'les communaux' (Blanchon 1989, Sériot 1993). These communal grasslands consist of a complex of low-elevated grasslands with a surface area of often a few hundred hectares. They belong to a village and during summer these areas are collectively used by farmers for hay making and cattle grazing. Next to the communal grasslands, Black-tailed Godwits also use other habitats (grasslands) but here the numbers are never so high as on the communal grasslands. On average the birds spend approximately three times as much time on the communal grasslands compared to other sites (Blanchon 1989). Godwits prefer to forage on sites which were inundated with shallow water, with the highest number of birds at sites with 0-5 cm of water (Blanchon 1989, Sériot 1993). The quality as staging site for godwits of the Marais Poitevin thus depends much on the amount of flooding each spring. Sériot (1993) showed that the number of godwits that was counted on the most important staging site, the communal de Lairoux, was strongly correlated with the area that was inundated. As the communal grassland have conserved many of the physical conditions and are frequently flooded during spring they play an important role in this system for migrating godwits. The most suitable are found in the area in between the villages Luçon, Triaize and Lairoux. Just like in the Basses Vallées Angevines, the godwits mainly forage on invertebrates on the inundated fields.

During spring 2006 a maximum number of 10.000 godwits have been counted throughout the entire Marais Poitevin (J. Sudraud LPO-Vendée pers. com.). A large proportion of these

birds probably included Icelandic godwits from the coastal areas in the Baie de L' Aiguillon. Counts performed in 2005 showed only 1.100 Black-tailed Godwits in inland habitats (D. Tanger pers. obs.). Based on this number approximately 1-2,000 continental Black-tailed Godwits are estimated to use nowadays the inland habitats of the Marais Poitevin as staging site (D. Tanger pers. com.). It must be stressed, however, that a precise estimate of the ratio remains difficult.

Threats to Parc Interrégional du Marais Poitevin

Considerable changes in land use have been taken place in the Marais Poitevin during the last 20 years. By increasing the drainage by ditches, fields that were formerly used as grassland have been made suitable for growing corn. Nowadays, a large proportion of the total area in the Marais Poitevin consist of corn fields. In the vicinity of the villages Chaillé, Champagné and Sainte-Radégonde up to 50% is made up of corn fields. The area in between the village Triaize until Digue des Wagons near the Baie de l'Aiguillon are drier and are dominated by corn fields and cereals (approximately 80 % of area). Most of the communal grasslands are still used as such, although some have been converted to corn fields. One example is the large communal du Poiré (north of Vouillé) which used to be a staging site but is now a corn field and no longer used by godwits.

The total area of cornfields within the Marais Poitevin has increased with more than 50% in this period (J. Sudraud, LPO-Vendée pers. com.). This conversion coincides with a better drainage of these fields which reduces the suitability as foraging sites for Black-tailed Godwits. These changes in land use have taken place mainly in the southern parts of the Marais Poitevin close to the Baie d'Aiguillon. In the northern part, near Lairoux and Triaze, grasslands still dominate. These were in the past, and still at present, the core areas for the staging Black-tailed Godwits.

Many of the still existing communal grasslands are managed by hunting organisations. Although hunting for godwits is prohibited in these areas during spring migration, hunting for a number of other species (ducks, geese) takes place and decreases the attractivity for godwits as well.

Réserve Naturelle de Moëze-Oléron and Brouage Marshes

The Moëze-Oléron Nature Reserve covers an area of 6,500 ha near the Charente Estuary, south-west of Rochefort. The area is characterised by tidal mudflats, dunes, salt marshes, large lagoons and wet grassland. The Brouage Marshes and Rochefort Marshes at 5 to 20 km of the reserve, consist mainly of fresh water marshes and mudflats (J. Gonin, Réserve Naturelle de Moëze-Oléron / LPO-Plaisance pers. com.).

The Brouage marshes are included in a Special Protection Area (Ile d'Oléron, Marais Brouage: Saint-Agnant) with a total area of 22.000 ha.

In February continental Black-tailed Godwits arrive in this area. In early March up to 6,000 birds can stay in this area (Table 4.6). They use the nature reserve to roost and start early in the morning to feed in the Brouage Marshes and Rochefort Marshes. Only low numbers stay on the wet grassland of the reserve to feed. The roosting area is localised on seasonally flooded freshwater grassland (not fertilised). The main diet of the birds consists mainly of invertebrates (worms). In the nature reserve 2,000 to 4,000 Icelandic Black-tailed Godwit are wintering (J. Gonin unpub. data. They use the tidal mudflats to feed and roosting sites are found in the lagoon. The majority of these birds start migrating northwards at the end of February and in March (J. Gonin pers. com.).

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View on the Brouage marshes near the Charente estuary, which are important feeding sites for godwits (Julien Gonin).

Threats to Réserve Naturelle de Moëze-Oléron and Brouage Marshes
The main threats of the areas that are used by godwits consist of drainage and cultivation of the wet graslands. This would decrease the suitability as feeding sites for the godwits. Hunting is allowed inside the area. The high hunting pressure for other species than godwits, including hunting at night, may result in disturbance of the main roost sites.

Camargue
On the rice fields in this large wetland area in the southeast of France some hundreds up to a few thousand birds can be found (D. Tanger pers. com.).

Parc Ornithologique du Marquenterre
This park is situated in the Baie de Somme. It consists of small fresh and brackish water lakes bordered with wet grasslands which are extensively grazed by horses. In spring large parts of these grasslands are inundated. During the entire winter small flocks of max. 250 Black-tailed Godwits are present in the area that leave in March. They forage only in the fresh water habitats on small invertebrates (pers. com. P. Triplet, Parc Ornithologique du Marquenterre). Extensive mud flat areas of the Baie du Somme are just bordering the park area. The strict use of freshwater habitats suggests that these are continental Black-tailed Godwits and not Icelandic godwits. This is interesting as this could be the most northern wintering area of continental Black-tailed Godwits.

Baie de Somme

This area consist of extensive tidal mudflats which provide important staging sites for a number of waders. A few hundred up to a few thousand Black-tailed Godwits are counted in this area but presumably all belong to the Icelandic subspecies.

Tabel 4.6.

Most important staging sites in France for Black-tailed Godwits and themaximum numbers that were counted during the visit to these areas in the period of 27 February- 1 March 2006. Numbers were relatively low due the late spring and just started to built up.

Areas	numbers counted	Habitat
Basses Vallées Angevines (Angers)	10.301 [1]	Inundated grassland
Loire Valley	1.050 [1]	Inundated grassland
Marais Poitevin	1 - 2.000 [2]	Inundated grassland
Moëze-Oléron	6.000 [3]	Inundated grassland
Parc Ornithologique du Marquenterre (Baie de Somme)	204 [4]	Inundated grassland
Total	**19.375**	

1. Counts by F. Noel (LPO-Anjou), 2. Pers. com. J. Sudraud LPO-Vendee (2006), 3.Counts by J. Gonin (Réserve Naturelle de Moëze-Oléron / LPO-Plaisance), 4. Counts by D. Kuijper (A&W).

4.5.3 Changes in number of godwits

Two investigate the long-term changes in the number of godwits we will focus on the two most important staging sites.

Basses Vallées Angevines

From the area Basses Vallées Angevines (Maine et Loire) a long-term data set was available from the LPO-Anjou. The maximum number of Black-tailed Godwits that are counted during each spring shows large fluctuations (figure 4.9). Statistically there is no trend in these numbers (linear regression, $r^2 = 0.01$, $F_{1,36} = 0.36$, $P = 0.55$). There were also data available of the maximum number of godwits that was counted on one day during each spring. Also these numbers do not show a significant trend over this period (linear regression, $r^2 = 0.002$, $F_{1,36} = 0.062$, $P = 0.80$). This lack of a trend in this area is in contradiction to the general decline in the populations level of the Black-tailed Godwit in Western Europe. There are two important factors that could explain this.

Firstly, the Basses Vallées Angevines is used as a stop-over site by both continental and Icelandic godwits. Both subspecies are diffficult to distinguish with certainty during this time of year. Therefore, an unknown number of Icelandic godwits are staging in the area and their numbers probably fluctuate each year (pers. com. Franck Noël, LPO Anjou). The decreasing trend in the total populations of continental godwits could be compensated by increasing numbers of the growing Icelandic population, thus obscuring a possible trend in the number of staging continental Black-tailed Godwits in this area. A second factor, which is likely to be the most important, is that the overall number of staging godwits in the Basses Vallées Angevines is highly variable. This can mainly be explained by the yearly fluctuating water levels of the main rivers in this area. The water level determines to a large extent the number of staging godwits in the area (pers. comm. Franck Noël, LPO Anjou). During dry years the numbers are low, for example the springs of 1992-1995 were exceptionally dry. During these years the amount of suitable feeding habitat is limited and most birds fly straight from staging areas in Portugal or Spain to their breeding areas without stopping in France.

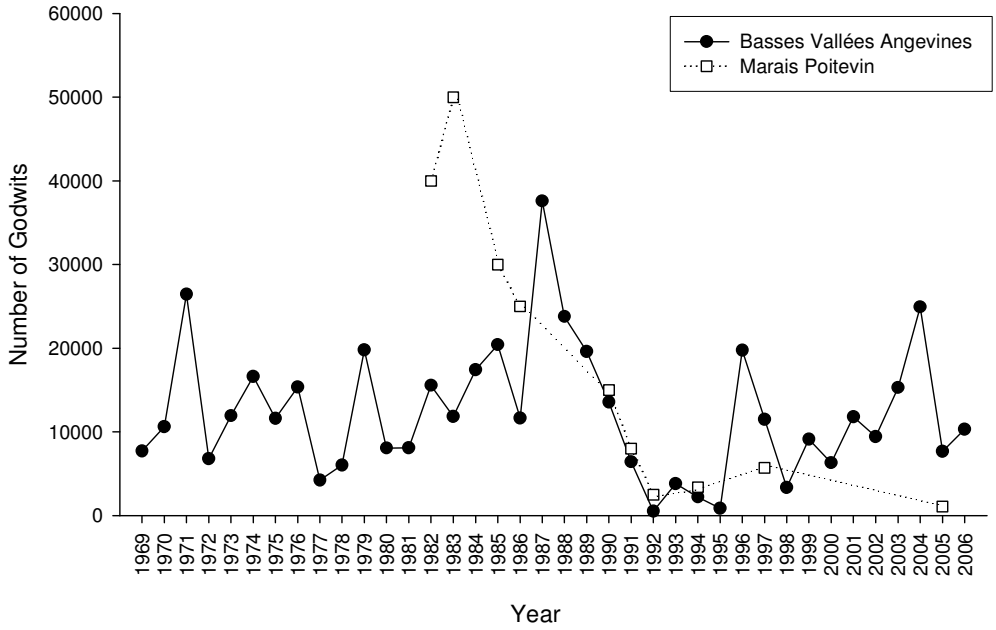

Figure 4.9.
Maximum number of Black-tailed Godwits counted during spring migration (Februari-March) per year in the Basses Vallées Angevines and Marais Poitevin. Data from the Basses Valées Angevines are based on counts organised by the LPO Anjou. Counts of the Marais Poitevin are based on different sources: 1982-1983 Wymenga &. Altenburg (1989); 1985 Blanchon (1989); 1991 Sériot (1993); 1990, 1991, 1992, 1994, 1997, 2005 Unpub. data D. Tanger.

Marais Poitevin

The numbers of godwits that have been counted during spring migration in the Marais Poitevin have decreased significantly (linear regression, $r^2 = 0.59$, $F_{1,10} = 12.99$, $P = 0.006$) in the period of 1982-2006. In the early 1980s maximum numbers of 40,000-50,000 were counted. During the 80s and early 90s these numbers steadily decreased. Since than, the numbers stayed low with annual maxima ranging between 2,500 and 8,000 during the 1990s and 1,100 birds in 2005. The relatively low number of 1,100 that was counted in 2005 is likely caused by the severe winter conditions during early March of that year, but numbers are thought not to exceed only a few thousands during recent years. The high numbers of godwits that have been counted here during the 1980s have not been counted here during the last 20 years and indicate that the area has lost much of its importance as a spring staging site for godwits.

One of the major factors that have changed in the Marais Poitevin area during the last decades is the conversion of grasslands to corn fields and the drainage of the fields. Both factors decrease the suitability as feeding site for migrating Black-tailed Godwits. Also the existing grasslands have changed. The intensification of agricultural use together with drainage has probably decreased the quality as feeding sites of these grasslands. These factors explain to a large extent the decreasing numbers in the Marais Poitevin.

4.5.4. Threats and protection

Climate
The suitability of the main areas in France as staging sites for godwits is determined to a large extent by rainfall during winter, which means that climatic changes may be important on the long run. It is not clear yet how this will work out for the staging sites in France.

Habitat change
Large scale changes in habitat have taken place during the last decades in the two main staging areas. In the Marais Poitevin, the drainage and conversion of grassland to arable land has strongly reduced the amount of suitable foraging sites. In the Basses Vallées Angevines, the amount of grasslands has been reduced by the increase of poplar plantation which can not be used by godwits.

Hunting
The Black-tailed Godwit is a hunted species in France. There is little know of the numbers that are shot each year. Trolliet & Girard (2000) come to an estimate of the yearly hunting bags. This paper reports on the results of a national enquiry on hunting bags in the hunting season 1998-1999. Hunting bags had been summed for different species and it was impossible to distinguish between them. Therefore, the exact number of shot godwits is not known, while also confusion between species is possible, even with Bar-tailed Godwits *Limosa lapponica*. Based on extrapolation of these figures possibly <10,000 godwits (both continental and Icelandic) and <5,000 continental godwits (*L. l. limosa*) may have been shot in the hunting season of 1998-1999 (B. Trolliet *in litt*, Office National de la Chasse et de la Faune Sauvage). We have no indication on the reliability of these figures.

Since then (from 1999 onwards), hunting bags have decreased. Firstly the number of hunters would have decreased, but numerical information is lacking. Secondly the hunting has been reduced in August and - more important - hunting in February is no longer allowed. The hunting season varies in different regions in France but generally starts in August until the 1st of February. This means that in summer, mainly juvenile birds migrating through France will be shot. Recent figures report less than 2,000 godwits that are shot annually on grassland, especially in the late summer (G. Gerritsen pers. comm.). Again, we have no indication how reliable this estimate is. The number of adults that is shot in summer is thought to be (very?) small as during summer they do not stop in large numbers in France. Most of the adults migrate already in July to the south and most staging sites are dried up by then, so the number of continental godwits is very low then. During spring migration the peak numbers are normally counted during the first two weeks of March which means that the majority of adults can pass safely through France.

A discussion on the significance of hunting on the Black-tailed Godwit population is hampered by the fact that reliable figures on hunting bags are lacking and related estimates are highly unreliable (see further Chapter 5). At the same time, it is clear that the species is concentrated on a few spring staging sites which makes it vulnerable. Though hunting organisations support and work on habitat restoration, at the same time regulated hunting takes places in and around these areas. Next to the numbers that are shot, hunting will lead to disturbance of staging birds.

Legal status of Black-tailed Godwit in France
France as well as the European Union have signed the "Agreement on the conservation of African-Eurasian migratory waterbirds", giving France a responsibility to conserve the

godwit population. In addition its legislation must comply with the EU Bird Directive (Council Directive 79/409/EEC), which means that France must see to it that godwits are not hunted during their migration to the breeding grounds. French hunting legislation was recently adapted to this by shortening the hunting season in spring (pers. com. Triplet, 2006).

The large wetland Sebkhet Sedjoumi, bordering Tunis (E. Wymenga, 1988) and offering at that time good feeding conditions for waders. Nowadays this wetland is less attractive to waterbirds.

4.6. TUNISIA

Tunisia is situated in the central part of the Mediterranean which means that during migration birds from a wide breeding range are passing through. This accounts also for godwits. The birds staying and migrating through Tunisia are thought to belong largely to the Central European population (Beintema & Drost, 1986). However, observations of birds that were caught and colour-marked in Tunisia showed that at least a part of the from Tunisia fly to Italy and the Netherlands during spring migration (Visser & Ligtvoet 1985, Beintema *et al.* 1987).

4.6.1. Phenology of migration

Beintema & Drost (1986) state that during post-breeding migration there is a peak in numbers in Tunisia in July and August of birds that most likely are migrating to their wintering areas in Mali. Numbers are (very) low during the post-breeding migration as most of the wetland areas are dried up in that time.

The phenology of spring migration in Tunisia is hardly documented. A winter and spring survey of coastal wetlands in 1984 by van Dijk *et al.* (1986) showed maximum numbers in February and a clear influx from January to February. From 26-28 January between Sfax and Shkira el Kedima 437 godwits were present and in the same area from 10-11 February 1,644 birds. Beintema *et al.* (1987) observed high numbers near Lac Ichkeul during the last week of February 1986. On the 10th of March they observed large-scale departure of godwits and most birds had left by mid March. Counts of Gaulthier (1989), that were carried out in 1988, showed increasing numbers from the beginning of January onwards and reaching a peak during the last week of February and first week of March in Lac Ichkeul and Lac de Tunis. In some areas, like in the Salines de Thyna peak numbers were reached later, during the last week of March (Gaultier 1989). The general picture is, that peak numbers occur late February and most birds leave before mid March.

During the visit from 27 february to 5 March in 2006 relatively low numbers of godwits were observed and no data on the progress of migration could be gathered.

4.6.2. Spring staging sites

In Tunisia wetlands occur largely along the coast while more inland lakes, river delta's and smaller wetlands are found. Several missions in the past have shown, that relatively high numbers of godwits can can be found in Lac Ichkeul, Lac Tunis, Lac Rades and more to the south in Lac Kelbia (if it is inundated) and in the Salines of Thyna (van Dijk *et al.* 1984, Visser & Ligtvoet 1985, Beintema *et al.* 1987, Wymenga & Klazenga 1989).

Gulf de Gabes

In the Gulf of Gabes a vast area of salt marshes and tidal mudflats is situated (14,600 ha including Kneiss Island), which forms an important location for wintering and migrating waders (van Dijk *et al.* 1984). Brackish ponds can occur in the salt marshes after high rainfall during winter, but mostly these ponds dry out during spring. The entire area has been declared a Wetland of International Importance in 1984. Black-tailed Godwits are rare in this salty area, except in the Salines of Thyna and near in Hachichina and Gorine (H. Azafzaf pers.comm).

Figure 4.10.
Important spring staging sites for Black-tailed Godwits in Tunisia and areas visited during the 2006 survey.

Salines de Thyna

The Salines are saltpans just south of Sfax and exploited by the COTUSAL-salt company. These salt pans (*c.* 860 ha) are, together with the Monastir saltpans, the only remaining commercially exploited saltpans in Tunisia. The succession from deeper water to shallow pools, varying in depth and salinity, provide prime habitat for waterbirds of all kinds. The disturbance by human activity is kept to a minimum by the constant supervision and wardening. As these salt pans are still commercially exploited it means that there is water available throughout the year, even in dry summers (Birdlife 2005). The site is owned by the salt factory and is a hunting reserve. It has been declared Important Bird Area and Wetland Zone of National Importance

Virtually all Black-tailed Godwits that were observed during the 2006-visit were seen in the Salines de Thyna: 691 individuals. Comparable numbers have been counted in the months before this survey; 733 on 12 January and 674 on 22 Januray (H. Dlensi & N. Mahmouda pers. com.). Also previous surveys found high numbers here (Table 4.7). Godwits use the salines both for resting and foraging. They have special preference for certain basins, which persists through the years (H. Dlensi per. com.). In these basins the salt concentration is 90-100 g NaCl/l, which is three times as salt as the water from the Mediterranean sea. The main diet seemed to consist of *Annelid*-worms and/or *Artemia*. The very high frequency of (successful) pecks indicated a high food abundance in these salines. Although Black-tailed Godwits are mainly seen in freshwater habitats during their annual cycle, they prefer extreme saline conditions in Tunisia. This habitat preference is already known for years in Tunisia.

Threats

The saltpans are in the immediate vicinity of the suburbs of the large city of Sfax. One of the potential threats is expansion of this city. The management of the salines is an indispensable condition for the quality of the site. However, as long as the salt-production is maintained guards from the salt company provide basic wardening and prevent excessive disturbance. There are no immediate changes expected in the exploitation of the area (H. Dlensi pers. com.). There is nevertheless some disturbance from fishermen and casual visitors. Better wardening, especially of breeding colonies, is desirable (Birdlife 2005).

Lac Ichkeul NP and Salines of Thyna, with foraging Black-tailed Godwits in the Salines (1988, photograps E. Wymenga and B. Klazenga).

Ichkeul National Park

Ichkeul National Park (12,600 ha) is located near Bizerte on the Mateur plain in north-eastern Tunisia. Together with the Doñana in Spain, the Camargue in France and the El Kala wetlands in Algeria, it is one of the four major wetlands of the Western Mediterranean. Next to the importance as breeding area, it provides habitat for passage and wintering waterbirds from the Palearctic. The park consists of a wooded massif (Djebel Ichkeul), a permanent fresh to brackish water Lac Ichkeul (8.500 ha) and a regular inundated plain and freshwater marshland (Garaet Ichkeul). Lac Ichkeul is fed by a number of rivers and is (indirectly) connected to the sea by a marine lagoon (via Lac de Bizerte). The site was declared a National Park in 1980. It has also been assigned as UNESCO Biosphere Reserve, World Heritage Site and Wetland of International Importance (Ramsar Site).

Previous surveys in the 1980s in this area yielded numbers of godwits ranging from a few hundred birds up to a few thousands birds (Table 4.7). In 1988 550-650 Black-tailed Godwits were present (Wymenga & Klazenga 1989). More recent counts show no godwits at all (Azafzaf 2002, Azafzaf & Feltrup-Azafzaf 2003). Also during the 2006 visit to the area no Black-tailed Godwits were observed, although seemingly suitable habitat - flooded grasslands - were present. The absence of godwits could be the result of the very high water levels during the visit, which made traditionally favourite locations not accessible for waders.

Threats to Ichkeul

During the last 10 years the lake's ecology and that of the surrounding area has changed dramatically. This is mainly the result of the construction of dams (Joumine in 1983, Ghezala in 1984, Sejenane in 1994) in affluent rivers (Birdlife International 2005). In the near future three more dams are planned as part of a broader hydrological management plan.

The amount of freshwater inflow has decreased and has been replaced by an inflow of saltwater from the sea. The resulting increase in salinity has destroyed the freshwater vegetation, followed by a decline in numbers of water birds. A large number of studies have been carried out under the auspices of the Tunisian government, and a restoration plan has been developed with a planned allocation of fresh water. It remains to be seen whether this plan will be successful, and whether the wetland may lose some of its international designations (Birdlife International 2005).

Lac Tunis and Lac Radès

Lac Tunis (3.000 ha) is a large and shallow lagoon, separated on the eastern side from the sea by coastal dunes. The city of Tunis is situated on higher ground to the west of the lake. The city is gardually spreading all round the lake, joining up with Radès on the southern side. Lac de Tunis is divided in two by a ship canal and motorway. The southern half of the lake includes the former salt-production pans of Radès/Mégrine. This part of the lake, Lac Radès, and its salines are 2.000 ha (Birdlife International 2005).

Lac Tunis and Lac Radès were both declared Natural Reserves in 1970. The reserve is, however, poorly wardened and there is much disturbance from people, dogs and rats, so that breeding birds rarely succeed (Birdlife International 2005).

In 2006 no Godwist were observed in this area and area seems no longer attractive for godwits due to the loss of natural habitats (see next alinea's). During the 1980s still up to a few hundred godwits could be counted here (Table 4.7).

Threats
In the past the lake received most of the sewage and rainwater from Tunis, but during the 1960s and 1970s the waste water was piped to a treatment station in Ariana. In the 1980s, most of the northern shores of the lagoon were reclaimed for urban expansion and industrial development (H. Azafzaf pers.com.). The same has occurred in the late 1990s in the southern half of the lagoon, and the saltpans have been closed and filled in. The reclamation work on the south of the lake is still in progress (Birdlife International 2005).

As a result, in both Lac Tunis (north) and Lac Rades the saline marshes, mudflats and sandbanks dissappeared and were not replaced by new habitats. In particular in Lac Rades the former salt pans were an exceptional habitat for waders, partly because of the waste water which resulted in nutrient-rich conditions and good feeding sites with high densities of larvae from chironomidae (E. Wymenga pers. observations). These habitats were present from the 1960s to the 1980s. In the past these locations were visited by a maximum of some hundreds of godwits (up to 350, E. Wymenga).

Sebkhet Halk el Menzel and Lac Kelbia

Halk el Menzel (1.500 ha) consists of a coastal lagoon and saline depression and is linked to the more inland situated Lac Kelbia (and Oued Sed). It receives water from different sources. In very wet years, Kelbia flows out to the sea and reaches it through Halk el Menzel. The fresh water springs round Oued Sed supply a part of fresh water in the summer. During rainfall or high tide the vegetation in Oued Sed (consisting mainly of Salicornia bushes) is flooded. After these periodes an excellent feeding habitat for waders remains in the mudflats and pools. Lac Kelbia (15.000 ha) is one of the great floodplain wetlands in Tunisia. It receives water of three rivers in the mountains (Dorsale, Nebhana, Merguellil and Zeroud). Rainfall over these mountains varies enormously from year to year, resulting in large fluctuations in the water levels in the lake. In some years the lake can completely dry out (for instance 1988). No salt crusts are being formed in this area as a result of the water which seems to drain away rapidly and efficiently, flushing salts out of the system. The vegetation consists mainly of bushes (*Tamarix africana*) and reed (*Phragmites communis*, Birdlife International 2005).

Halk el Menzel was declared Wetland Zone of National Importance in 1987 but has no further protective status. Lac Kelbia was declared a Wetland Zone of National Importance in 1948. Two-third of the lake surface (8,000 ha) has been designated as a Natural Reserve, but proposals to reclaim the area for agriculture or to use it for storage of waste-water from neighbouring cities such as Sousse still recur (Birdlife International 2005).

During the survey of 2006, only 6 godwits have been observed in this area (Table 4.7). Previous surveys also show relatively low numbers, with a maximum of 30 in 2003 (Table 4.8).

Threats to Sebkhet Halk el Menzel and Lac Kelbia
The dams which have been built on the three major inflow rivers in the last 20 years have totally changed the water regime of the site. The main impact of these dams is that the area became drier. In years of high rainfall, water is still released from the dams, creating shallow water bodies in the area. However, these wet conditions remain only for a short time and are completely absent in dry years (Birdlife International 2005).

Most recent information indicates that no further significant changes have occurred in this area (H. Azafzaf, C. Azafzaf-Feltrup, T. Moez, N. Mahmouda, pers. com.). Depending on the amount of rainfall there can still be huge areas of suitable habitat available.

Tabel 4.7.
Most important sites in Tunisia for Black-tailed Godwits and the numbers that were counted during the visit to these sites in February-March 2006.

Area	Numbers counted
Ichkeul National Park	-
Lac de Tunis and Lac Radès	-
Sebkhet Halk el Menzel	6
Lac Kelbia	-
Hachichina	-
Gorine	-
Salines de Thyna	691
Total	**698**

4.6.3. Changes in number of godwits

Counts in Tunisia do not have a constant character, which makes a comparison between years and areas difficult. Only since recently, regular country-wide surveys are being performed organised by the Tunisian Birdlife Partner 'Association les Amis des Oiseaux' (AAO).

However, the available data show that some areas, where in the past relatively large numbers of godwits have been observed, are no longer used as staging area (Table 4.8). In Ichkeul National Park a few hundred up to 2,000 birds have been counted during the 1980s. Recent surveys did not observe godwits in this area. Also in Lac Kelbia there are no recent records, although numbers in the past were also low. During counts in 2002 and 2006 no godwits were seen in the complex of Lac Tunis and Lac Rades; in 2003 a small numbers was present. Presently, the highest number of Black-tailed Godwits are found in the Salines de Thyna.

In 1988 a fairly complete survey of suitable wetlands in Tunisia yielded a maximum of c. 2,500 godwits in the country (Wymenga & Klazenga 1989). It seems that the number of godwits passing through Tunisia has dropped in the past decades to a maximum of 1,000-1,500 birds. These low numbers also mean, that only a very small part of the birds wintering in Mali (c. 40,000) is passing through Tunisia.

Tabel 4.8.
Number of godwits in Tunisia on important sites in the period 1971-2006. Numbers represent the maximum number that was counted in the period February-March.

Area	1972	1973	1974	1975	1982	1984	1986	1988	2002	2003	2006
Salines de Thyna			300 [3]	4 [5]		1553 [7]		1250 [10]	446 [11]	1210 [12]	691 [13]
Sebkhet Halk el Menzel								2 [10]	0 [11]	30 [12]	6 [13]
Lake Kelbia		26 [2]		10 [5]		2 [6]		0 [10]	0 [11]	0 [12]	0 [13]
NP Ichkeul			160 [4]	81 [5]	200 [4]	2000 [6]	2000 [8]	500 [10]	0 [11]	0 [12]	0 [13]
Lake Tunis & Rades	1 [1]	1 [2]		21 [5]		307 [7]		300 [7]	0 [11]	48 [12]	0 [13]

Hovette & Kowalski 1972, 2. Goldschmidt & Hafner 1975, 3. IWRB Wader Working Group 1971-1975, 4. Skinner *et al.* year unknown, 5. Anonymous 1975, 6. Beintema 1984, 7. Van Dijk et al. 1986, 8. Beintema *et al.* 1987, 9 Wymenga & Klazenga 1989, 10.Gaultier 1988. 11. Azafzaf 2002. 12. Azafzaf & Feltrup-Azafzaf 2003. 13. Data E. Oosterveld 2006.

4.6.4. Threats and protection

Climate
The suitability of the main staging areas in Tunisia for godwits is determined to a large extent by rainfall during winter. Analogous to the situation in Morocco climate change may reduce the amount of rainfall on the a long-term.

During dry winters, most of the inland aride areas will not be suitable as feeding site. Soils will dry out and due to a high evaporation salt crusts can be formed. However, during winters with a high rainfall, vast areas of flooded mudflats and sandbanks develop which provide excellent feeding conditions for several waders including godwits. The main staging site in the Salines de Thyna will not be influenced by annual rainfall due to the inlet of seawater.

Habitat change
Large scale changes in habitat have taken place during the last decades as a result of the construction of dams. This has certainly reduced the surface area and quality of suitable wetlands. For example in Lake Ichkeul the salinity has increased as a result of reduced freshwater inflow, leading to a decline of the freshwater vegetation and several bird species. A management plan has been developed to increase the inflow of fresh water in this area which may restore the ecological values of this area in the future.

In Sebkhet Halk el Menzel and Lac Kelbia the building of dams has resulted in a decreased period of wet conditions which provided suitable forgaing conditions for waders. As a result of these changes several areas seem to have lost their importance as foraging site for godwits. Also, as a result of urban expansion and industrial development natural habitats have been reclaimed in Lac Tunis and Rades. These disappearing natural wetland habitats are often not being replaced by alternative habitats.

Hunting and human disturbance
Although hunting is taking place in Tunisia no hunting activity was observed during the 2006 visit. Godwits are not listed as game species in Tunisia. In the most important site, Salines de Thyna, no hunting on godwits occurs. From the other sites we have no accurate information. In the 1980s illegal hunting occurred regularly in Ichkeul National Park. Presently, hunting poses no significant threat on godwits in Tunisia. Hunting around important staging areas may, however, lead to disturbance of godwits. Human activity is restricted in the main staging area (Salines de Thyna) as the area is not freely accessible for public.

Protective status of areas
Some sites have more than one designation; for instance Natural Reserve and Hunting Reserve. Protection is often characterised by poor legal regulation and law enforcement, a lack of resources and capacity. Projects concerning these problems have been developed and established by different partners, for Tunisia these are, among others, Birdlife International and the 'Association les Amis des Oiseaux' (AAO). Only one Tunisian wetland (Ichkeul National Park)is currently listed under the Ramsar Convention (Birdlife International 2005). However, the Tunisian authorities have announced in 2005 that 15 wetlands are to be recognised as Ramsar sites.

4.7. ITALY

Recoveries of ringed birds show that Dutch Black-tailed Godwits are migrating through Italy during spring migration. Several 1,000s of godwits, especially in their second and third calendar year, from the Netherlands are thought to use this migration route (Beintema & Drost 1989). Birds that were caught in Italy and coloured-marked have been observed in the Netherlands afterwards (Beintema *et al.* 1987, Visser & Ligtvoet 1985). This illustrates that at least part of these birds return as breeding bird to the Netherlands. The majority of the Italian migrants, however, are thought to originate from central European breeding grounds (Poland and further east).

4.7.1. Phenology of migration

During post-breeding migration mainly birds from the central European population pass through Italy (Beintema & Drost 1986). Spring migration starts during the second half of February and peak numbers are reached mid March. At the end of March birds migrate further north and by the beginning of April virtually all godwits have left the staging sites in Italy (Fig. 4.11).

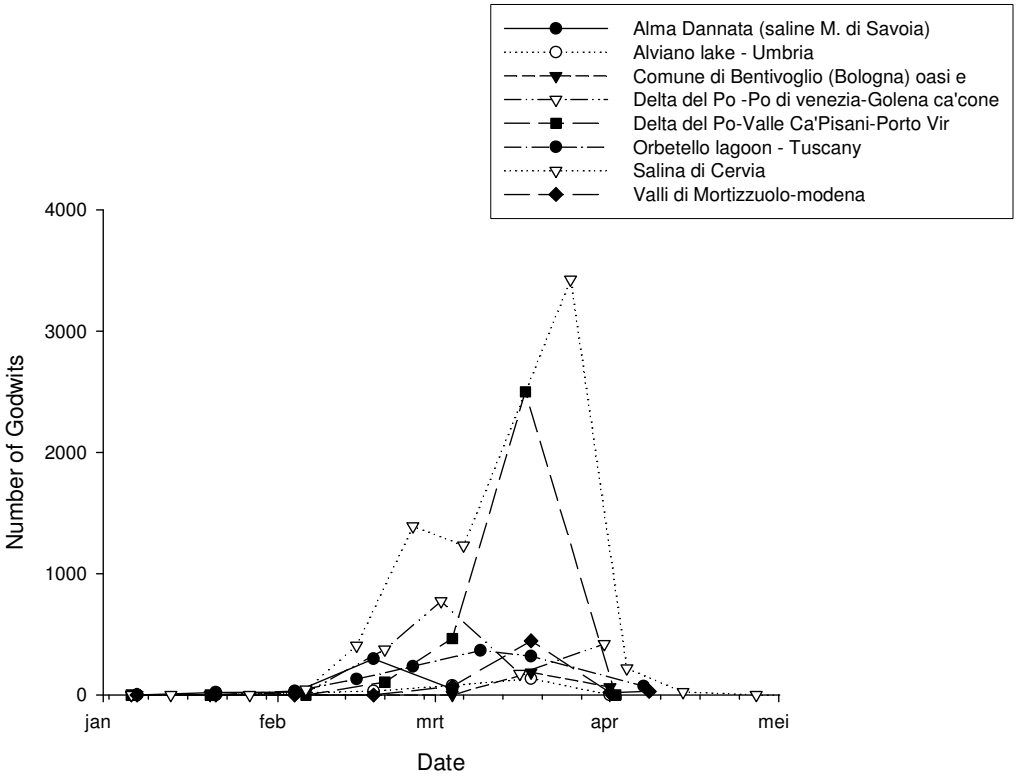

Figure 4.11.
Phenology of spring migration at diffenet staging sites in Italy during spring migration 2006. Counts from different Italian counters, see Table 2.3 in chapter 2.

Figure 4.12.
Important spring staging sites for Black-tailed Godwits in Italy and areas where simultaneous counts have been performed in spring 2006.

4.7.2. Important staging areas

The areas where the highest numbers were counted in 20006 are found in Salina di Cervia, Valle Ca'Pisani and Po di Venezia (Fig. 4.12). These areas are all situated in the Po Delta, which constitutes the main staging area for godwits. This picture is confirmed by counted numbers of godwits from recent and past counts, which also show that the Po Delta is of prime importance.

Po Delta

The Po Delta is located on the Adriatic coast of Italy. It is a vast area that runs through three provinces: Rovigo (Veneto region), Ferrara and Ravenna (both Emilia-Romagna region). It forms one of the largest wetlands in Europe. The overall delta consists of a variety of habitats such as embankments, pinewoods, fresh water wetlands, lagoons, sandbars and fossil dunes. It is an area created both by the sedimentation of the river and by men (who controlled its course and used the land around it). Within this extensive area a few sites are important for godwits (pers. com. L. Serra):

- *Parco Regionale Veneto del Delta del Po*
  The "Parco Regionale Veneto del Delta del Po" (58,000 ha) covers the north part of the delta where the Po river flows into the sea. It is located in the Rovigo province.
- *Valli di Comacchio*
  The Valli di Comacchio is a complex of wetlands, including lagoons, coastal lakes, salines and marshes, originating from a larger area which was drained in the 19th century for agricultural reasons. The site consists of different types of habitat ranging from shallow brackish lagoons connected with the sea to sandbanks and islands.
- *Salina di Cervia*
  The Salina di Cervia is an important godwit staging site. It is a large complex of salt pans, divided by a network of small canals and embankments which are linked to the sea. Submerged aquatic flora and salt tolerant plants grow here. This site is important for both nesting water birds and staging migratory birds (www.ramsar.org).
- *Valli Campotto*
  This site is artificially impounded at the confluence of the Idice and Reno rivers, just east of Valli di Comacchio. Various aquatic plants colonize the open water, while at the fringes there are reed beds and areas of wet forest. The rich fish fauna is important for the nesting water birds. Numerous migratory and wintering birds pass through this area (www.ramsar.org).

All these areas have been assigned under the EU Birds Directive as Special Protection Areas and as Ramsar sites. Next to that, Salina di Cervia has been assigned as a State Natural Reserve and a Provincial Wildlife Sanctuary.

The majority of godwits in Italy in spring 2006, in total up to 6.346, have been counted in different areas in the Po delta (Table 4.9). Throughout Italy godwits mainly use fresh water habitats such as marshes, where they mainly forage on invertebrates (pers. com. L. Serra).

Threats in the Po Delta

The "Parco del Delta del Po" is an inhabited and economically developed area. Land reclamation activities have been carried out in the past, turning thousands of hectares of marshes and other wetlands (wet pasture lands and fishing valleys) into agricultural land.

Human activities, such as professional and sport fishing, gathering of molluscs, and aquaculture, are allowed in the National Park. Many of these are of economical importance or have historical and traditional value. Fishing is carefully regulated by the Park authority in order to ensure conservation of the fish fauna in the protected areas (www.parks.it). Also many other human activities take place in other areas. In the Salina di Cervia the main land use is salt production. Valle Campotto is used for intensive fish farming, angling and general recreation (www.ramsar.org). To what extent these activities pose a threat for staging godwits is unknown. In most of these areas also hunting takes place, but the effects are thought not to be large (pers. comm. L. Serra, see Section 4.7.4).

Other areas

In West Italy on the Tyrrhenian coast in the Tuscany region (Grosseto province) the national parc "Parco Naturale della Maremma" (19,800 ha) is situated. The area is delimited by the railway line Liverno-Roma and stretches along the coast from Principina a Mare to Alberese, and up to Talamone. The park consists of a variety of landscapes including salt marshes, which are extensively grazed by cattle, in the mouth of the Ombrone river. More inland fresh water grasslands can be found. Beintema *et al.* (1987) found between 700-1,000 godwits here in spring 1986. Nowadays, in spring it is still an important staging site for godwits (pers. com. L. Serra).

Table 4.9.
Most important sites in Italy for Black-tailed Godwits during spring migration. Numbers represent the maximum numbers that were counted during simultaneous counts in spring 2006 (see chapter2 for participants in these counts).

Area's	Number counted
Salina di Cervia	3.426
Delta del Po : Valle Ca'Pisani – Porto Viro	2.500
Valli di Mortizzuolo (Modena)	446
Delta del Po : Po di Venezia – Golena Ca'Conera – Porto Viro	420
Orbetello Lagoon (Tuscany)	368
Alma Dannata (Saline M. di Savoia)	299
Comune di Bentivoglio oasi ex Risaia (Bologna)	186
Lake Alviano (Umbria)	135
Salina di Tarquinia	85
Lake Fogliano (Pontini lakes in NP of Circeo)	71
Vercelli Province	53
Vasche di Maccarese (Roma)	50
Sentina	45
Laghetti de caccia alla foce del fiume Metauro	30
San Rossore (Pisa)	26
Comune di Potenza Picena (MC) – Località S. Girio	11
Ortazzo	10
Lago delle Grazie – Comune di Tolentino (MC)	5
Monumento naturale palude di torre flavia (Ladispoli)	2
Località Scossici	1
Oasi di Macchiagrande di Focene	0
Punta Canaletta – Valli di Comacchio	0
Total	**8.143**

4.7.3. Changes in number of godwits

Table 4.10 shows an overview of other available counts of Black-tailed Godwits throughout Italy. Based on the available data no conclusions can be drawn on changes in numbers of staging godwits in Italy. Despite a general lack of data, according to L. Serra (wader specialist in Italy) the numbers of godwits have strongly decreased in Italy over the last 20 years with the exception of the Po Delta area, where numbers have increased. For the Po Delta, numbers seem to have increased as a result of the new hunting regulation (see 4.7.4).

A decrease is particularly evident in southern and central Italy, where there were roosts of hundred to about thousand birds. Presently godwits are absent or there are a few birds only (e.g. in San Rossore, Pisa or Orbetello Lagoon, Grosseto). The loss or degradation of suitable habitat is thought to be the main cause of the decrease. This has also affected the presence and distribution of the Ruff with the same geographical and temporal pattern.

Tabel 4.10.
Changes in number of godwits in Italy on important sites during spring migration. Numbers represent the maximum number that was counted in the period February-March.

Area	1984	1985	1986	1990	2006
Cassa di Campotto	1.500 [1]				
Valli di Comacchio		750 [2]		1.000 [4]	
Salina di Cervia				203 [5]	3.426 [6]
Total delta del Po (Cervia excluded)					2.920 [6]
Vercelli rice fields				50 [5]	
Grosseto			1.000 [3]	1.200 [5]	368 [6]
Pisa			500 [3]	500 [5]	26 [6]
Povlakte			60 [3]		
Salina di Tarquinia				170[5]	

1. Beintema 1984, 2. Visser & Ligtvoet, 1985, 3. Beintema & van den Bergh, 1987, 4. Serra & Baccetti 1991, 5. Serra *et al.*1992, 6. Simultaneous counts 2006 see chapter 2 for participants.

4.7.4. Threats and protection

Climate
Conditions in the Po Delta depend on the amount of rainfall. With high rainfall many wet grasslands and ponds are available which provide good foraging habitats for godwits. How future climate changes will affect this is unknown (see also Spain).

Habitat change
The reclamation of land for agricultural purposes has resulted in the decline of natural marshes and wetlands throughout Italy during the last decades. This loss of natural habitats is thought to be the main factor explaining the decrease of godwits in southern and central Italy. Also in the Delta del Po in the North, these land reclamations have taken place turning thousands of hectares of marshes and wetlands into agricultural land.

Human disturbance
Although many human activities (e.g. fishing, gathering of molluscs, recreation) take place in the National Park Delta del Po (in which the main staging sites are situated), it is unclear to what extent they pose a threat to staging godwits.

Hunting

Hunting is taking place in many areas throughout Italy. In the recent past, many godwits were shot in February at traditional Lapwing and Golden Plover catching sites in northern Italy, and at Garganey catching sites in southern Italy. At present these traditions have diminished and almost disappeared. As a remarkable result many species have been rapidly increasing in Italy. Next to increasing numbers, the effects of hunting can be seen in the changing distribution of many bird species (amongst which is the Black-tailed Godwit) since the 1990s (L. Serra, pers. com.).

The situation for godwits improved since 1992 when the hunting season was restricted from the third week of September to the end of January (Italian hunting law 157/92). Moreover, in order to protect the critically endangered Slender-billed Curlew, Italy signed the Memorandum of Understanding concerning 'Conservation Measures for the Slender-billed Curlew *Numenius tenuirostris*', in 1994. Part of this memorandum of understanding was the legal protection of all 'look-alikes' of the Slender-Billed Curlew, especially species from the genera *Numius* and *Limosa*, to prevent misidentification by hunters (see also Gretton 2006). Since 1997 the Black-tailed Godwit is not on the hunting list anymore.

The impact of hunting on the population is thought to be limited. This is mainly the result of the fact that the peak of autumn migration is much earlier than September and of the low numbers of birds that use Italy as staging site during autumn migration. The effects of hunting are also thought to be small for the wintering population of (Icelandic and continental) godwits in Italy. Firstly, because there are only low numbers wintering in Italy. Secondly, because the birds are concentrated in a few protected areas in southern Italy, Sicily and Sardinia (L. Serra pers. com.).

There is poaching during spring passage, especially in southern Italy and in Sicily, but the effect on godwits has decreased over the last years. This is the result of the closing of the hunting season which makes unnoticed poaching difficult during this period. Some hunters still go out poaching even in February, March and April but the numbers are lower than before 1992. Another important factor is that poaching is not directly addressed to godwits which are not considered a very palatable species in southern Italy. They are taken as a 'by-product' of poaching of Curlews and Garganeys (L. Serra pers. com.).

There is no reliable estimate of hunting or poaching bags in Italy. The only hunting organisation which has collected some data on hunting bags is the Association of Waterbird Hunters (Associazione Cacciatori Migratori Acquatici). These data were not available for this report.

Legal status of Black-tailed Godwits:

The Black-tailed Godwit is a protected species since the hunting season 1997/1998.

5. SYNTHESIS

In the preceding chapters the winter distribution and the situation along the migration route is treated per site or country. In this Chapter a synthesis of the current knowledge and protection is made, combined for the winter quarters and for the migration route in spring. This migration route and the progress of migration is sketched, based on the simultaneous counts and information on phenology which has been gathered. Secondly, the winter and spring situation is analysed briefly, in order to indicate the main threats and gaps in knowledge.

5.1. MIGRATION ROUTE

Post-breeding migration

As soon as breeding birds in the Netherlands have finished their breeding cycle they gather in the Netherlands on pre-migration sites and roosts to prepare for their migration. Birds which failed to raise young may already gather in the second half of May on these roosts and leave in the course of June (Wymenga 1997). The timing of departure depends to a large extent on the availability of food. In dry summers for example birds leave early (end of June, early July) since foraging in the dry soils of (drained) peat and clay soils is impossible (Zwarts 1993). In some years godwits can concentrate in shallow water bodies and surrounding pastures in and near large wetlands before their departure. In general there are two 'waves' of migration, though showing much overlap in timing. The first starts as early as June and consists of failed breeding birds followed by the other adults in July. These birds partly moult their primaries in the Netherlands before they leave (van Dijk 1980, Beintema & Drost 1986). A second migration flux concerns juvenile birds, which leave from the end of July onwards. Before, juvenile Black-tailed Godwits gather in freshwater marshes, such as the Oostvaarderplassen, to prepare for migration. Large concentrations, which used to be common in the 1970-1980s, are rare nowadays.

Ring recoveries of birds ringed in the Netherlands illustrated that there is a difference in migration pattern between adults and juvenile birds. In the 1980s over 80% of all Black-tailed Godwits that were shot in France were young birds (Beintema & Drost 1986). They concluded that juvenile birds use staging sites in France, whereas most adults made a direct flight to Spain or Morocco, a distance of over 2,000 km without stopping in France. Presently, in France, Spain and Morocco hardly any suitable staging sites for Black-tailed Godwits are present in (late) summer. The spring staging sites by then are dried up and characterised by tall vegetation and dry soils. Also the rice fields in Spain are not suitable as foraging habitat due to a lack of water. Only dozens of birds have been observed in summer in July in the Marais Poitevin (D. Tanger unpubl. data) and no high numbers are known from Spain and Morocco either. However, Black-tailed Godwits may use to some extent mudflat areas along the coast of France and Portugal at this time of year where they mix with Icelandic godwits. As far as known, these concern very low numbers.

The absence of significant numbers in southern Europe and Morocco in July-September makes it much more likely that the majority of birds fly directly from the Netherlands - in one single flight - to their wintering areas in Africa. Only small numbers, most juveniles, stop in France, Spain, Portugal and Morocco. Measurements on energy intake rate and flight costs in the Netherlands, showed that Black-tailed Godwits could easily travel the distance

of 4,500 km from the Netherlands to the Sahel in West Africa. This flight would take the birds approximately three times 24 hrs of flying (L. Zwarts, unpubl. data). Studies on other closely related migratory waders, such as a subspecies of the Bar-tailed Godwit (*Limosa lapponica baueri*) showed that even longer non-stop flights may be possible. On the basis of estimated travel costs and fat deposition a non-stop flight of 6 – 8,000 km was predicted (Battley & Piersma 2005). Some other Bar-tailed godwits may even make a non-stop flight of up to 11,000 km (Gill *et al.* 2005). The early arrival of Black-tailed Godwits in the Sahel also suggests that birds do not use in-between staging sites. During the first two weeks of July, the first adult birds already arrive in the Senegal delta, followed by first juveniles in this month's last pentade (van der Kamp & Ndiaye 2006).

Spring migration

To unravel the migration pattern of a bird species several methods can be used. First of all, an analysis of ringing recoveries is possible as for the Black-tailed Godwit has been performed by Beintema & Drost (1986). Ringing recoveries provide real evidence of a bird's origin. A constraint of such an analysis is, that is provides no quantitative information and it is easily biased towards area's were many birds are shot. A second method is to colour-dye birds which makes them easily visible and large numbers of birds can be checked, as was done by Beintema *et al.* (1987). Thirdly, simultaneous counts at different sites provide information on the numerical distribution and phenology. All these methods combined can provide a good insight in the migration strategy of a bird species. Finally, tracking of individual birds with satellites would give precise information on routes, stop-over sites and duration of stops. This requires however very light tracking devices, which for the Black-tailed Godwit are not (yet) available. In this study, counts and existing literature have been consulted to accentuate our understanding of the birds' spring migration.

First-year birds

In spring, first year birds are underrepresented in Europe. Until now, it is unclear where they spend their second calendar year. The majority of these birds is thought to stay in West Africa (Beintema & Drost 1986). Records of godwits from April-June are virtually absent from Senegal and Guinea-Bissau, however at the same time there are hardly any counts from this period available. In Mali at maximum 1,000 godwits are observed in summer (van der Kamp *et al.* 2002, 2005). Some first-year birds may join adult birds during spring migration and spend the summer in Morocco or Spain (Beintema & Drost 1987). This is indicated by the small numbers of Black-tailed Godwits that are seen during the entire summer in Spain (Beintema *et al.* 1995). However, observations on colour-ringed individuals showed that up to 7% of the first-year birds arrive in breeding areas in the Netherlands (Kruk 1993). Recent studies carried out on a population in the Workumerwaard in Friesland (northern province of the Netherlands) showed that these first year birds may have a first breeding attempt during their first year, which seems to be a recent development (Both *et al.* 2006). Summarising, we still do not know where the majority of first-years birds (order of magnitude 10-20,000 birds in total) are staying in the non-breeding season. A scattered distribution over the limited number of suitable wetlands in this period in Africa and southern Europe is very well possible.

Adult birds

Adult birds fly from their wintering areas in West Africa in a non-stop flight to staging sites in Morocco and Portugal/Spain. In this time of the year, the wetlands in Morocco and the rice fields in Spain and Portugal offer good foraging conditions. In Morocco the birds arrive late December – early January (Beintema *et al.* 1995). During this time also high numbers can be present in Portugal. In 2006 peak numbers were counted here from late January

onwards, whereas previous studies showed that birds already arrived in Portugal in large numbers in the last week of December (with a peak in the last week of January to early February). Given this timing and the relative low numbers in Morocco we expect the majority of the birds to fly directly to Spain – Portugal.

By comparing the timing of migration at different sites, based on simultaneous counts, the spring migration in 2006 can be reconstructed (Figure 5.1). To make a comparison between sites more easy the number of godwits has been expressed relative to the maximum number that was counted in a certain country (for maximum numbers see Table 5.3).

The first birds arrive in Spain already in the end of December. From the start of January numbers build up in Portugal and the counted numbers in Spain and Portugal are simultaneously increasing. This pattern of simultaneously increasing numbers suggests that Spain and Portugal can be seen as one entity. A large number of birds arrives at the same time on these spring staging sites. The first peak in the numbers in Portugal is counted in the first week of February, when numbers in Spain did not reach their maximum yet. The following drop in numbers in the first week of February in Portugal coincides with the peak value in Spain, and the second peak at the end of February in Portugal coincides with a sharp decline of godwits in Spain. This pattern suggests that birds are moving up and down between staging sites in Portugal and Spain. This is not unlikely considering the staging sites in the Tejo estuary in Portugal and staging sites in the Extremadura in Spain are approximately 270 kilometers (in a straight line) apart. A distance that birds could easily travel. However, direct proof for these movements – for instance through sightings of colour-marked birds –is not available.

The number of godwits counted in Spain decreased much earlier (2nd week February) than the increase on staging sites in France (last week February), while godwits would be able to fly such a distance within a day. This again suggests a movement to the staging sites in Portugal, though we have no prove for that. One week after the peak in Portugal, a maximum in France is observed, showing that the godwits migrated from Portugal directly to France and successively to the Netherlands (Fig 5.1). Given the large numbers in Portugal and Spain compared to France, we expect the majority of the birds to fly directly from southern Europe to the Netherlands.

Based on the foraging habitats in the different staging sites, godwits forage on two main sources, either invertebrates or vegetable. During the winter, Black-tailed Godwits forage mainly in rice fields on rice kernels (Table 5.1). Also on the staging sites in Portugal and Spain rice fields constitute the main foraging habitat. However, in Morocco, France and on the breeding grounds birds are foraging mostly on invertebrates. Hence, during migration birds have to switch from a plant-based to an animal-based diet. Studies on other waders show that a switch in diet is an energy-consuming process (Piersma *et al*. 2004) which can take several days (Dekinga *et al*. 2001). Dekinga *et al*. (2001) showed that the switch from a diet of hard food items to soft items in Red Knots took longer than the switch vica versa (8.5 days vs. 6.2 days). The switch in diet requires adaptations in the digestive tract to be able to digest the food. The changes in stomach structure, which have been observed in migrating Red Knots and Bar-tailed Godwits, are likely to be associated with diet changes (Piersma *et al*. 1993). In both species a reduced stomach mass was associated with a relatively soft diet.

Studies on Black-tailed Godwits in captivity showed that a switch between an animal-based diets (worms) to a plant-based diet (corn) is a difficult process. When birds were forced to

switch from one diet to the other they directly lost weight. Only after several days of adaptation to the new diet, birds gained

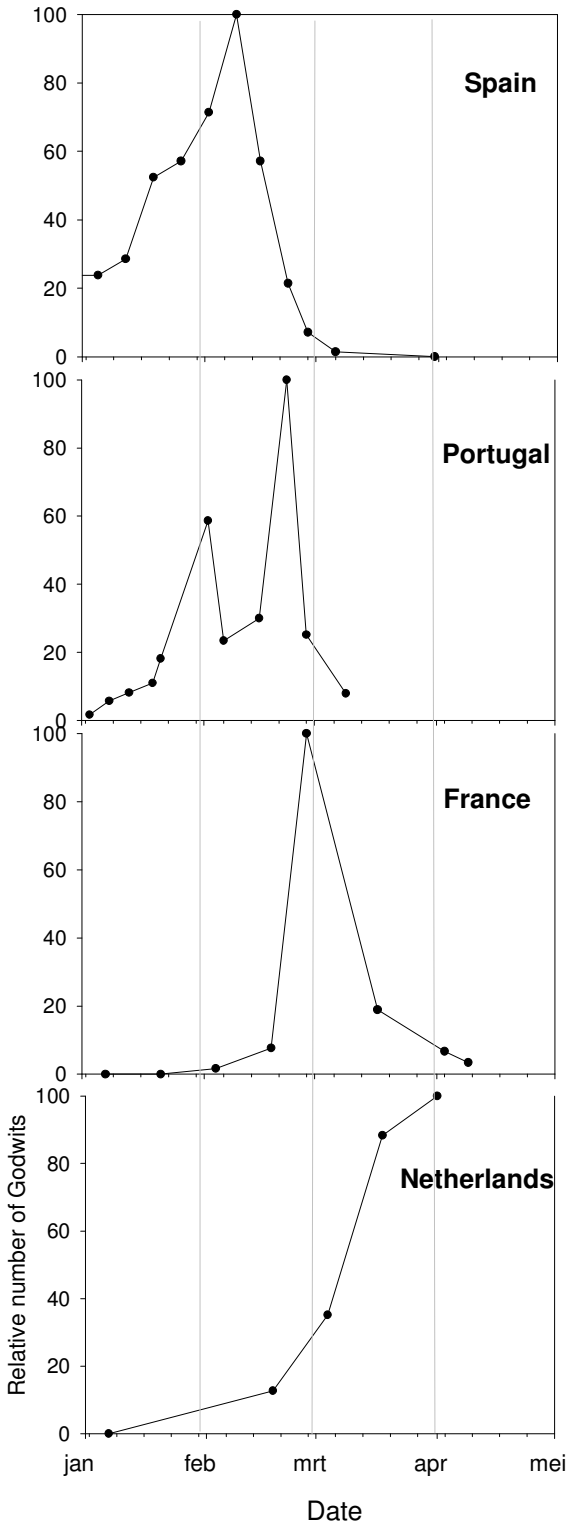

Figure 5.1.
Number of Black-tailed Godwits counted during simultaneous counts in 2006. Numbers are summed per country and are expressed as a percentage of the maximum number that was counted.

weight again (M. Kersten unpub. results). Based on these studies it is highly unlikely that godwits will switch several times during their migration. The existence of two groups or two 'types' of birds is a much more likely hypothesis (Fig. 5.2). One type may maximise the time of foraging on a plant-based diet and flies from Guinea-Bissau and neighbouring countries to Portugal/Spain and than directly to the Netherlands. The second 'type' – probably much smaller in number - will switch earlier to an animal-based diet. They fly from Senegal (also mainly animal-based? – see Chapter 3) to Morocco where no rice fields are available and forage there on a diet consisting of invertebrates. These birds will not stop in the rice fields of Portugal and Spain (where they would have to switch again in diet) but fly to France and the Netherlands where they can maintain their animal-based diet. Based on the physiological adaptations that are required for a switch in diet it is likely that these two patterns exist; whether they truly occur should be further studied.

Tabel 5.1.
Main staging habitat and diet in the most important winter areas and spring staging areas of Black-tailed Godwits.

Area	Main staging habitat	Main diet
Guinea Bissau – rice & mangrove zone	Rice fields	Rice
Senegal	Natural habitats / rice fields	invertebrates / rice
Morocco	Natural habitats	Invertebrates
Spain/Portugal	Rice fields	Rice
France	Natural habitats	Invertebrates
Netherlands	Natural habitats	Invertebrates

That there are exceptions to the pattern suggested above proves an observation in the Marais Poitevin in March 1987 (Wymenga & Altenburg 1987). A group of a few hundred godwits was seen foraging on a maize parcels, fanatically foraging on maize kernels. This was just after their arrival during a very late spring, when in France most birds only arrived in the first week of March. However, it might be that these birds were forced to make a temporary stop in France as in the Netherlands at that time it was still very cold for the time of the year (E. Wymenga, pers. observ.).

The Italian connection

On the bases of a high proportion of recoveries of birds ringed in the Netherlands, previous studies suggest that several thousands of Dutch birds pass annually through Italy. These birds could either fly to breeding grounds in central Europe or become a breeding bird of the West-European population (Beintema & Drost 1986). Visser & Ligtvoet (1985) demonstrated, by marking and colour-dying birds in Italy, that indeed a proportion of the birds passing through Italy flies to the Dutch breeding grounds. However, when we look at the phenology of the migration in Italy and the arrival in the Netherlands, it is not likely that large numbers are involved (Fig. 5.3). The phenology in Italy shows a similar pattern as the migration in the Netherlands. Godwit numbers increase in Italy from the second week of February onwards and reach a peak mid March. At the same time the majority of birds are arriving in the Netherlands (on average 50% of the population has arrived by mid March – Zwarts *et al.*, in prep.). This illustrates that the majority of the Dutch breeding birds do not use Italy as a staging site, and at the same time that most Italian migrants belong to the central European population (as suggested by Beintema & Drost 1986).

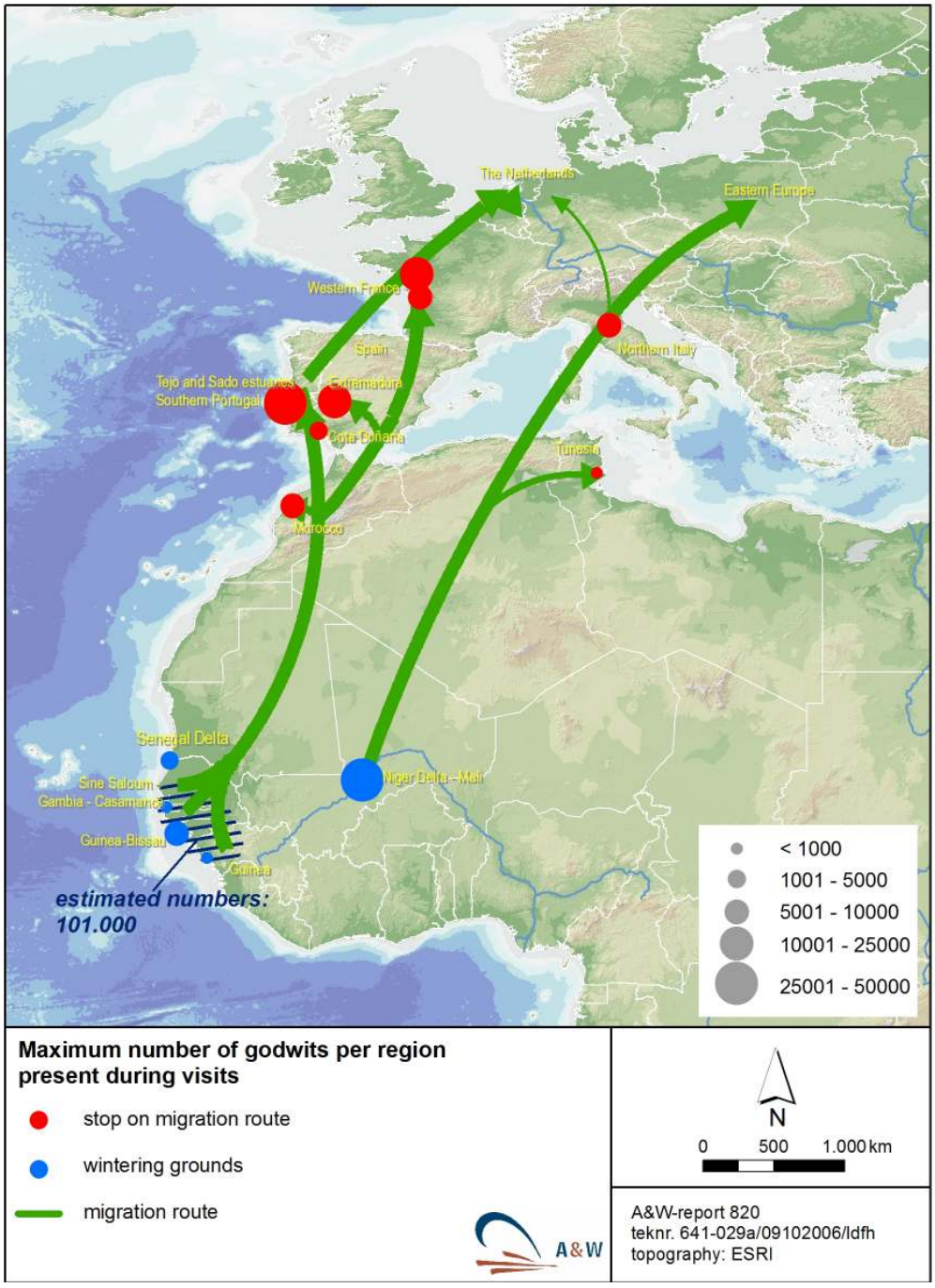

Figure 5.2.
Suggested pattern of spring migration of the Black-tailed Godwit in spring. For an explanation see the text. Dots indicate maximum numbers that have actually been counted during the survey of 2005-2006 and hence indicate the importance of each site. The estimated numbers of the total winter population in West-Africa, based on extrapolation, are higher than these figures (> 100,000 birds, see paragraph 3.3).

This picture is supported by the departure dates of Black-tailed Godwits observed in Mali. Here, the majority of birds leaves between the end of February and in the first half of March. A part of the birds may well be stopping in Italy (Fig. 5.4). The relatively low numbers of godwits passing through Tunisia (<1,500 recently) shows that the majority of wintering godwits in Mali does not make a stop in Tunisia.

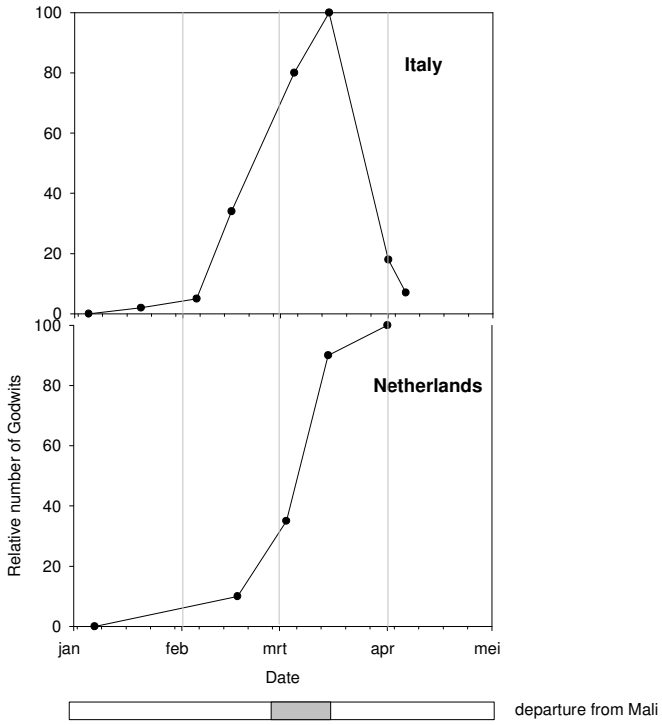

Figure 5.3.
Phenology of spring migration of Black-tailed Godwits in Italy and the Netherlands. Also the period when bird are departing from Mali is given. Numbers are counted during simultaneous counts in 2006 and are summed per country, expressed as a percentage of the maximum number present.

5.2. WINTERING AREAS: POPULATION AND PROTECTION

Total wintering population

The survey that was carried out in 2005-2006 covered most of the important countries/regions for wintering godwits, but was far from complete. This is logical, given the vastness of the area to cover and the logistical difficulties. Nevertheless, in combination with density counts of a huge number of small plots, a lot of information was gathered. At least in the Senegal delta and in Mali the survey can be considered as nearly complete.

In the rice and mangrove zone from the Casamance to Guinea, about 10% of the rice area of 112,000 ha was counted precisely via density counts, while tens of thousands of ha was scanned for godwits. The wintering population in this zone was estimated at *c.* 100,000 godwits with about 40% in Guinea Bissau (Section 3.3). As shown, this estimate has a low reliability. In particular for Guinea Bissau the field observation showed that nearly all large rice complexes were dry, by which they are not used as foraging area. A large part of the country was crossed during the survey to look for suitable rice complexes but they were only found in the Rio Mansoa basin. This suggests that the estimate of 30,000-40,000 for the

country as a whole is too high. Consequently, the question is: did an important part of the birds leave already and where did they go then? Our surveys in Mali, the Senegal delta, Morocco, Spain and Portugal show that they did not move in larger numbers to these areas. Also other parts of southern Europe are highly unlikely destinations because of the coldness in that period (end of December – first half of January).

Regions which were not covered during this mission are the southern part of Mauritania and the middle valley of the Senegal. As shown by van Wetten *et al.* (1990) in (semi)wetlands as Lac Aleg, Lac Rkiz and other similar wetlands concentrations of up to 2,000 godwits can be present. This is, however, only true if enough water is available. Around half January large parts of these areas are dried up. One would also expect this from the middle valley of the Senegal, but we can not exclude that a part of the godwits moved to these regions. An interesting point is the relatively low proportion of birds that is counted in the wintering areas in 2006 (and during the 1980s) compared to the numbers observed in the spring staging areas. In the wintering areas Black-tailed Godwits are spread out over vast and remote areas, and they are not concentrated in a few relatively small areas that can be counted easily, except for Mali. As a result, a higher proportion of birds is likely to be missed.

We do know, however, that the most important wintering areas for Black-tailed Godwits are situated in the rice and mangrove zone ranging from southern Senegal (Casamance) to Guinea, with the rice field complexes of Guinea-Bissau as core area. The maximum number of Black-tailed Godwits that is estimated to be wintering in this zone comprises a considerable part of the estimated East-Atlantic breeding population. Also in the 1980s Guinea-Bissau was by far the most important wintering area. Also the Senegal delta is still important as wintering area, despite the large-scale changes which have taken place in delta as a result of the construction dams and cultivation.

Main threats to winter areas

In contrast to the situation during spring migration, during winter godwits are distributed over a vast area, living partly in natural habitats but for a large part in agricultural habitats which are intensively used by local communities. This varies from the growing of rice or vegetables to the grazing of (flooded) pastures by nomadic communities, like in the Inner Niger Delta in Mali and parts of the Senegal delta. The major part of these areas do not have a very strict protection, and in particular in the core area of the winter distribution – the rice and mangrove zone from the Casamance in southern Senegal to Guinea – godwits live mainly outside protected areas. Outside as well as inside waterbirds – and biodiversity in general – meet several difficulties and threats, which in Chapter 3 are discussed per region. Here they are briefly summarized for the whole winter range (Table 5.2).

Climate

There is a steep rainfall gradient along the coast of West Africa. In the Senegal delta the average annual rainfall is 300 mm per year which increases up to >2.000 mm in the north of Guinea. Rainfall in the Sahel is characterized by a large variation, within as well as between years. In the last century a pattern of wet and dry years can be distinguished. The last dry periods fell in the 1970s and 1980s while a recovery of rainfall has been measured in the past decade. During these periods of severe drought living conditions in the Sahel are extremely difficult.

For many migratory species their survival is linked with the conditions in the Sahel (Zwarts *et al.* in prep.). This accounts only for a small part for the Black-tailed Godwit as it winters

mainly south of the Sahel. However, more northern wintering areas are affected by Sahelian droughts (Senegal delta, wetlands in southern Mauritania, Inner Niger delta). These droughts are expected to become more severe, as climate models predict a decline in rainfall on the long term.

Habitat change

In the past decades large-scale habitat changes have occurred in the Senegal delta as a result of the construction of dams and cultivation of the delta. From 1960 onwards, this has resulted in an enormous decrease of natural floodplain habitats which in the Senegal delta seem to be the prime foraging habitat of Black-tailed Godwits. The large scale changes mainly took place in the 1980s and 1990s and may have altered the distribution of the godwits in the winter range. Also the severe droughts in the 1970s and 1980s may have played an important role in this shift. During the survey of Altenburg & van der Kamp (1985) for instance, the Senegal delta was nearly completely dry except for some relatively small areas where water remained. Moreover, their total number was low compared to the numbers wintering more to the south. Although the conditions for godwits improved substantially through artificial wetland restoration (1994) in the Bell and the Diawling basins on the Mauretanian side of the Senegal river (Hamerlynck & Duvail 2003), the number of wintering godwits in the Senegal delta is clearly lower from the early 1990s onwards. Therefore, these lower numbers may express the drop in the total wintering population; habitat availability does not seem to be a bottleneck for godwits in the Senegal delta with the present population levels. However, we have no information on the quality of these habitats as feeding grounds (but see Van der kamp & Ndiaye 2006).

In the Malian Inner Niger Delta currently there are indications for human induced habitat changes caused by upstream water intake and reservoirs. Presently, the availability of habitats is no bottleneck at all for godwits, but possible further flood control may have a negative influence on the possibilities for waders – including godwits – to prepare for spring migration. This is particularly the case in years with a low flood level (Zwarts *et al.* 2005).

In the other parts of the region no large changes occurred, apart from salinisation in the Sine Saloum and Casamance caused by a rainfall shortage in the 1970s and 1980s. Results of a recent survey, that has been carried out in the rice and mangrove eco-region of Senegal, Gambia, Guinea-Bissau and Guinea-Conakry, showed that no large scale changes could be observed in either of the areal extent of rice fields during the last decades (Bos 2006). This indicates that no large-scale changes have taken place in the core wintering areas of Black-tailed Godwits.

Hunting and human disturbance

In general the West African winter quarters of godwits are intensively used by local communities, which depend on natural resources or are involved in the exploitation of irrigated rice field. Exploitation of natural resources involves the grazing of (flooded) pastures, fishing and for a small part, and almost exclusively the Inner Niger Delta in Mali, the exploitation of birds (Wymenga *et al.* 2002). This means, that human activities are numerous in these areas and birds may be easily disturbed. However, people and birds are often in close vicinity of one another, and human activities do not seem to alter the birds distributrion on the scale of an area. In the case of crop-protection intentional disturbance can chase the birds away to avoid foraging on the rice fields. This chasing is essentialy aimed at Queleas (small seed-eating birds) which can forage in enormous flocks in irrigated rice fiels. Also in the bolanhas in the rice and mangrove zone they are present. Through these activities godwits (and Ruff) may be disturbed as well, but this does not pose serious

constraints. Godwits and Ruff mostly feed on parcels which have just been harvested or are poorly developed (open structure, not well developed), while Queleas have a strong preference for the better rice fields.

Hunting and poaching occurs in most of the important wintering areas of the Black-tailed Godwits but active hunting on godwits is not recorded. In the Senegal delta most godwits frequent the protected areas. Only in Mali bird exploitation is widespread in the Inner Niger Delta, and concerns an additional source either for auto-consumption or economically via selling the birds on the market. Monitoring shows that mainly ducks and waders are caught, in particular Ruff and Garganey. The number of godwits offered on the market – if caught at all; this species is difficult to catch - is very low (see Kone & Diallo 2000, Wymenga *et al.* 2002). Hence, hunting in the present situation is not considered to be an important threat to wintering Black-tailed Godwits.

Summarising
If we consider the threats mentioned afore, in particular climate changes and habitat changes in the Sahel (Senegal delta) are the most important factors, affecting the distribution and survival of godwits. Hunting and human disturbance – though carried out in certain areas – seem to be no significant factors for the survival of godwits in the winter range in Africa. In general, during this survey we did not encounter significant bottlenecks for godwits in the winter range. It must be stressed, however, that this observation should be founded with a long-term monitoring of the annual mortality of the species (see recommendations).

Table 5.2.
Summary of threats to important wintering areas of Black-tailed Godwits situated in different countries. Symbols: -- large threat, - threat, 0 no threats, + possitive change, between () possible change in future. For an explanation see the text.

Threat	Senegal	Gambia	Guinea-Bissau	Guinea	Mali
Climate	- -	0	0	0	- -
Habitat change	- - / +	0	0	0	0 / (- -)
Human disturbance	0	0	0	0	0
Hunting	0	0	0	0	-

5.3. SPRING STAGING SITES: THREATS AND PROTECTION

Population on staging sites
In this paragraph the most important staging sites at present are indicated and compared with the situation in the 1980s. Fig. 5.4 shows a combination of all simultaneous counts that have been performed in spring 2006. All areas from which counts were available have been summed to calculate a total number of godwits per country. Since we performed simultaneous counts adding up the counted numbers is allowed.

By far the highest total numbers have been counted in Spain and Portugal, which illustrates the importance of these sites for godwits. The numbers which have been counted in France are much lower than observed in Portugal (max. Portugal 44,700 and France 14,571). Important to note for the interpretation of these numbers is that the simultaneous counts were not complete. In most countries the major staging sites have been counted, which means that the total number must have been higher. Also, we know nothing about the turn-over per site.

From France no accurate counts were available from the Marais Poitevin, formerly an important staging site. The maximum recorded numbers during the recent years in this area reached up to 10,000 (including both continental and Icelandic godwits) (J. Sudraud, LPO pers. comm.). Based on previous counts, an estimated number of 1-2.000 are thought to be continental Black-tailed Godwits. The total number of godwits in France is thus being underestimated. But even when taking this into account, the Portuguese sites are by far the most important. This strongly suggests that the majority of birds do not use France as a staging sites after leaving from Portugal, but fly directly to their breeding areas (see before). An alternative but less likely explanation would be, that birds stay only for a very short time in France. This would result in high turn-over rates of birds which would cause the numbers never to reach as high values as counted in Portugal.

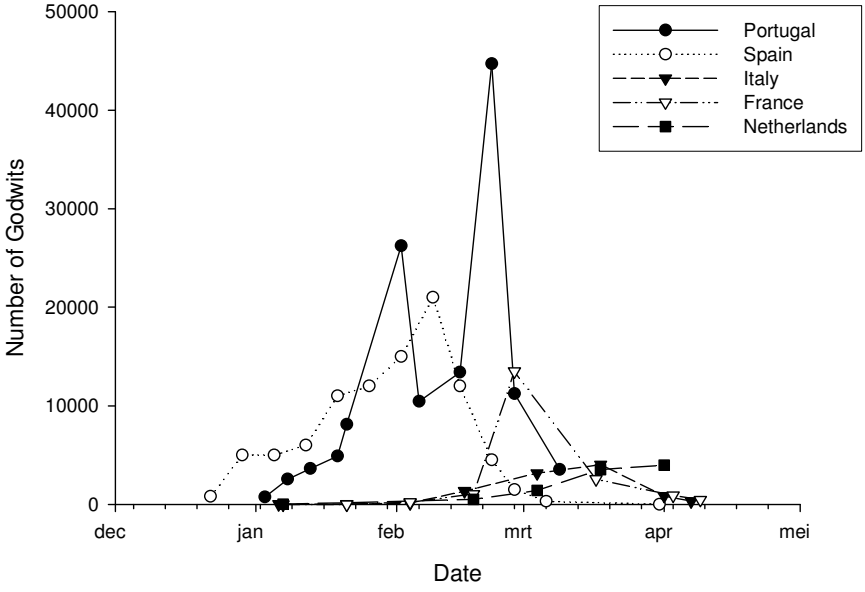

Figure 5.4.
Maximum number of Black-tailed Godwits that were counted during simultaneous counts in 2006. The numbers represent the total number of godwits counted per country.

The numbers counted in the Netherlands are much lower than the peak values counted in the other countries (Fig. 5.4). This simply can be explained by the small number of sites counted simulate in 2006 and because birds spread over at least more than 100 roosts. Roost counts in the northern part of the Netherlands were most of the godwits breed showed at maximum 20,000 birds (1998, Wymenga 2005).

In Table 5.3 the maximum numbers that have been recorded on each of the staging sites is shown and compared to known maxima from the 1980s. To be able to compare these figures each number is expressed also as a proportion relative to the estimated population size in that year. In the 1980s the most important staging site during spring migration was the Marais Poitevin where up to 23% of the population could be counted at one moment. The staging sites in the Basses Vallées Angevines in France, Tejo estuary in Portugal and the Cota Doñana in Spain were less important (4- 9% of the estimated population). In 2006, by far

the most important staging site is the Tejo Estuary where up to 27% of the current population can be found at one moment. Also the Sado estuary is of high importance (16%). The situation in this area during the 1980s is unknown. Next to Portugal, the staging sites in Spain belong at present to the most important staging sites. In the Extremadura up to 18% of the estimated population was observed in 2006. These data suggest that an important shift has taken place during spring migration in the last decades. The main staging site in the 1980s, the Marais Poitevin in France, seems to have lost its importance to the increasing importance of the staging sites in Portugal and Spain. The sites in Morocco play a less important role, although they are also used in another part of the season and surveys may be less complete.

We must treat this comparison with a little caution, however, as the number of counts between sites and between the 1980s and today is varying (compare the data in Chapter 4). However, the general picture is supported by local experts who know the situation in their countries for a longer period.

Table 5.3.
Comparison of important spring sites for Black-tailed Godwits of the East-Atlantic Fly-way based on old data (mainly from the 1980s) with the counts performed in 2006. Numbers represent the maximum number that was counted or estimated during spring migration. These numbers are expressed as a percentage of the East-Atlantic population estimate at that period, based on van Dijk (1983), Birdlife International (2004) and Thorup (2006). As a comparison the numbers of Black-tailed Godwits (mainly from the central European population) on the most important staging sites in Italy and Tunisia are shown. Note that the percentages may not be summed.

		Population estimate: 110.000 pairs		Population estimate: 60.000 pairs.	
Country	**area**	**Maximum number 80's**	**% of population**	**Maximum number 2006**	**% of population**
East-Atlantic fly-way					
France	Basse vallée d'Angevines	11.850 (1983)	5	10.300	9
	Marais Poitevin	50.000 (1983)	23	2.000	2
	Moëze-Oléron			6.000	5
	Baie du Somme			204	< 1
Spain	Coto Doñana	9.330 (1994)	4	4.600	4
	Extremadura			21.000	18
Portugal	Tejo	20.635 (1984)	9	33.000	27
	Sado			19.700	16
Morocco	Merja Zerga	5.000 (1984)	2	4.456	4
	Loukos	1.200 (1984)	< 1	242	< 1
	Sidi Moussa-Oualidia	800 (1984)	< 1	375	< 1
Central European fly-way					
Italy	Salina di Cervia			3.426	
	Po-delta			2.929	
Tunisia	Thyna salines	1.500		691	

Main threats to spring staging sites

In general godwits are much more vulnerable during their spring migration than during winter. During spring migration they are concentrated on relatively few sites and have to gain enough fat to be able to cover the distance to the breeding grounds. Also, it would be in their favour to reach the breeding grounds in an as good as possible condition which gives them an advantage while occupying their territories. Changes and threats at spring staging sites are thus of great importance to the population.

Climate

During spring migration Black-tailed Godwits are dependent on freshwater wetlands and/or the availability of fresh water to flood the ricefields. The amount of rainfall therefore is an important factor, partly determining each year the quality of the staging sites. In Morocco and Tunisia for example climatic change led in the past decades and still tends to lead to lower precipitation. Wetlands are more often dry in spring or provide less suitable circumstances. In both countries, however, human induced changes in the hydrology (dams, water intake) largely contribute to these hydrological constraints. In southern Europe and France too, the quality of staging areas depends on the rainfall in winter and early spring. Rice fields and other habitats with shallow water provide excellent feeding habitat whereas the soil is impenetrable on dried-out fields.

The dependence on especially rainfall, causes large fluctuations in the amount of suitable foraging habitat in spring. This is being reflected in the fluctuating numbers of Black-tailed Godwits at individual sites. As a result, it is highly important that a range of suitable staging areas is available along the migration route of Black-tailed Godwits. In years, when conditions are poor at one site, birds have the opportunity to migrate to alternative staging sites. A migration route with only a small number of suitable staging sites will make the population vulnerable. As shown below, presently this is the case.

Habitat change

The amount of (semi)natural wetlands being suitable as staging site for Black-tailed Godwits has been and is still decreasing. This habitat change is mainly the result of drainage, reclamation of land for agricultural purposes or changes in land use. In Morocco and Tunisia, the construction of dams and the extraction of groundwater have resulted in a decreased flow of freshwater to several wetland areas. As a result, these areas dried out or became brackish. In a few cases these changes can be linked to changes in the staging number of godwits, but mostly accurate long-term data are lacking. In the staging sites in France, the amount of suitable foraging habitat has decreased as a result of changes in the agricultural system. This could be one of the reasons to explain the decreasing numbers of Black-tailed Godwits in the Marais Poitevin which used to be one of the most important staging sites during spring migration.

The loss of semi-natural wetlands, suitable as staging site, along the migration route may pose a high risk for the population. However, not all habitat changes are detrimental for Black-tailed Godwits. The current study showed that nowadays by far the most important staging sites are situated in rice fields of Portugal and Spain. The majority of birds is staging at these sites and do not stop in France anymore. This shift of important staging sites to the south inevitably results in a longer final flight towards towards the breeding areas. The energetic consequences of this shift are not known. The question is if they are related to a later arrival date and a lower condition during arrival at the breeding areas.

The importance of agricultural systems as staging site for Black-tailed Godwits opens new opportunities for conservation. During spring migration a large part of the entire Black-tailed Godwit population is using the staging sites in the rice fields in Portugal and Spain. Due to the limited availability of suitable wetland areas elsewhere, the Black-tailed Godwits have limited possibilities to fly to alternative feeding sites. As the birds are building up reserves for the rest of the northward migration but also for the coming breeding season, the conditions during early spring on the sites in Portugal and Spain are likely to be reflected in the future breeding success of the birds. It is therefore, highly important to provide good

feeding conditions during this time of year. The amount of water on the fields and the amount of ploughed fields determines to a large extent the amount of suitable feeding sites. Thus management can play an important role in safeguarding these rice fields in order to provide enough feeding sites for large numbers of migrating godwits.

Human disturbance
Although a large proportion of the natural wetlands used as staging sites by Black-tailed Godwits is situated in nature reserves or otherwise protected areas with restricted human activities, the most important feeding sites are situated in agricultural areas with no protective status. However, the present study did not find indications that human disturbance (except for hunting, see next) on the staging sites poses a serious threat.

Hunting
Countries where traditionaly hunting is an important activity are France, Spain, Portugal and Italy. Due to the general lack of good statistics on annual hunting bags, there have been several estimates of the annual numbers that are shot. Beintema & Drost (1987) come to rough estimates of 400 birds in Italy, 900 birds in Morocco and between 1,100 and 1,300 in France and the Iberian Peninsula in the 1980s.

The present study showed that in many countries hunting has been restricted. In Morocco, Portugal, Spain and Italy hunting for Black-tailed Godwits is prohibited. However, still intensive hunting in these countries takes place on other species which often share Black-tailed Godwits' habitat, for instance Common Snipes *Gallinago gallinago*. The hunting season in Portugal runs from mid August to the end of February, and in Spain from October to February. This implies that during the period that large numbers of Black-tailed Godwits are present on the staging sites in these countries, hunting is taking place. This may lead to disturbance of foraging birds. These indirect effects of hunting are largely unknown. In Morocco also hunting occurs on waterbirds. The hunting season in Italy is open from the end of September to the end of January. As the peak of spring migration occurs in March, the majority of migrating Black-tailed Godwits can pass Italy safely. Also, hunting in Italy on the very rare Slender-billed Curlew *Numenius tenuirostris* and look-a-like species – amongst wich is the Black-tailed Godwit - is prohibited since 1997.

In all of these countries an unknown number will be illegally shot. However, numbers are thought to be low as in neither of these countries Black-tailed Godwits are considered to be a favourable hunting species and local ornithologists, who know the situation very well, don't report active hunting or the actual shooting of godwits.

France is the only country where hunting for Black-tailed Godwits is still allowed. However, there are no reliable numbers on the actual hunting bags. The only numbers that are available are based on a national enquiry by the French hunting organisation (ONCFS, Office National de la Chasse et de la Faune Sauvage) in the hunting season of 1998-1999. The estimated annual hunting bag based on this enquiry is 5.000 godwits. As elaborated in Chapter 4, during post-breeding migration mainly juveniles will be shot. Recent figures report less than 2.000 godwits (which mainly consist of the continental godwit) that are shot annually on grassland, especially in the late summer (G. Gerritsen pers. comm.). We have no information on the reliability of this figure. As during spring hunting is prohibited from the first of February onwards, and peak numbers are normally counted during the first two weeks of March, the majority of adults can pass safely through France. Nevertheless, still adult birds may be shot when arriving early in France.

Do the (unknown) numbers of Black-tailed Godwits that are shot annually in France pose a serious threat for the population? Based on an annual adult survival rate of 81% for Dutch Black-tailed Godwits (Groen & Hemerik 2002) and a juvenile survival rate of 60% in their first year, approximately 0.70 young per pair would be needed to maintain a stable population (Both *et al.* 2006). For a population size of 49-75,000 pairs in the Netherlands (Birdlife International 2004), an annual production of 34,300 – 52,500 juveniles would be needed. Recent estimates show an annual reproduction which is often far below the necessary reproduction (Both *et al.* 2006, Groen & Hemerik 2002, Schekkerman & Müskens 2000, Wymenga 1997, Kleefstra 2006). If indeed 2 – 5,000 birds (mainly juveniles) are shot in France, this would comprise 4-15 % of the necessary annual production. Taken into account that the annual reproduction is often far below the necessary recruitment, the numbers that may be shot in France are not be neglected.

The calculated number of juveniles needed to maintain population levels are highly dependent on adult survival rates. When the adult survival drops, the amount of juveniles needed to maintain the population increases. Again, due to a general lack of long-term data on survival and reproduction rates of this population, we can currently not come with a robust quantitative prediction on the exact amount of juveniles that is needed to maintain a constant population level (Both *et al.* 2006, Kruk *et al.* 1997). It goes without saying that it is indispensable to have reliable figures on long-term annual reproduction and mortality rates in the wintering and spring migration areas. Next to that, independent estimates of yearly hunting bags in France are necessary.

Table 5.4.

Summary of threats to important spring staging sites of Black-tailed Godwits situated in different countries. The percentage of the East Atlantic population that can occur on each staging site is shown (from table 5.3). Symbols: -- large threat, - threat, 0 no threats, + possitive change. Note that the asterisk in the hunting column indicates that hunting may lead to disturbance of staging sites. For an explanation see the text.

Country	area	% of population	Habitat change	Human disturbance	Hunting
France	Basse vallée d'Angevines	9	-	0	- -
	Marais Poitevin	2	- -	0	- -
	Moëze-Oléron	5		0	- -
Spain	Coto Doñana	4	+/-	0	*
	Extremadura	18	+	0	*
Portugal	Tejo	27	+	0	*
	Sado	16	+/-	0	*
Morocco	Merja Zerga	4	-	0	*
	Loukos	< 1	+/-	0	*
	Sidi Moussa-Oualidia	< 1	-	0	*
				0	
Central-European fly-way					
Italy	Salina di Cervia		0	+/-	*
	Po-delta		-	+/-	*
Tunisia	Thyna salines		0	-	

6. CONCLUSIONS & RECOMMENDATIONS

6.1. CONCLUSIONS

Winter areas

This survey gives an update of the situation in the wintering areas of Black-tailed Godwits and shows that several changes have occurred during the last decades. The following summarising conclusions can be drawn:

- The main wintering quarters of the Black-tailed godwit of the West European population are situated in West Africa, mainly in the rice and mangrove zone from South Senegal to Guinea.
- The rice field complexes in Guinea Bissau are by far the most important wintering area, which hold– as a rough estimate - 40% of the total wintering population in the region. Here they mainly forage on rice fields.
- Compared to the 1980s the distribution of godwits in the winter range is comparable, but the numbers in the different wintering area have decreased by half. This decline is likely to be linked to the declining breeding population in Western Europe. In Mali numbers of godwits were stable over the past decades; this population mainly originates from the central European breeding population
- Although large-scale habitat changes have occurred in the Senegal delta as well as severe droughts, which both may have altered the distribution of godwits, in general we did not encounter significant bottlenecks for godwits in the winter range.
- Hunting and human disturbance – though carried out in certain areas – seem to be no significant factors for the survival of godwits in the winter range in Africa. It must be stressed, however, that this observation should be founded with a long-term monitoring of the annual mortality of the species.

Spring staging sites areas

The spring staging areas of the Black-tailed Godwits have shown large changes during the last decades. This has resulted in changes in the presence and distribution of godwits.

- In 2006, by far the most important staging site is the Tejo Estuary in Portugal where up to 27% of the current population can be found at one moment. Also the Sado estuary in Portugal is of high importance (16%). Next to Portugal, the staging sites in Spain belong at present to the most important staging sites. In the Extremadura up to 18% of the estimated population was observed in 2006.
- This study shows, that probably an important shift has taken place during spring migration in the last decades. The main staging site in the 1980s the Marais Poitevin in France, seems to have increasingly lost its importance in favour of the staging sites in Portugal and Spain. The sites in Morocco play a less important role, although they are also used in another part of the season and surveys may be less complete. Spring staging sites in Tunisia are quantitatively of low importance for Black-tailed Godwits
- Although a part of the birds migrate via Italy to the Netherlands, a relative small proportion of these birds use Italian spring staging sites. Comparison of spring phenology of different sites indicates that the majority of the birds in Italy are more likely belong to the central European population.

- Although at the moment sufficient suitable staging sites in Spain and Portugal seem to be available, these staging sites are vulnerable for changes in the rice culture. The enormous importance of the sites in southern Europe offers also options for management and protection.
- Along the migration route in spring several threats have been observed, amongst which are habitat change and hunting. Habitat changes have had negative effects in Morocco and France, and may have contributed to a shift in the staging sites. The significance of hunting in France remains an important question, which can not be founded with adequate data. If indeed, as suggested from recent figures, an estimated number of a few thousands juvenile Black-tailed Godwits are shot annually, than the impact of such should not be neglected.
- Hunting does not seem to be an important threat in the other countries along the flayway. However, hunting can lead to disturbance of important staging sites which are used by huge numbers of Black-tailed Godwits.

6.2. RECOMMENDATIONS

In this chapter we will give an enumeration of recommendations for management and research that result from this survey.

Management and protection

The threats to many wintering areas and staging sites and the large importance of some staging sites during migration of Black-tailed Godwits calls for good management of these sites.

Protection of Black-tailed Godwit fly-way.

Although the main causes for the decline in East Atlantic population, are likely occurring in the breeding areas (especially in the Netherlands), there are a number of threats and changes along the migration route that have negative effects on this populations. For the conservation of the Black-tailed Godwit it is important to adopt a flyway approach which includes the entire flyway. This requires a international approach and could be done in the framework of the 'flyway reserve-concept' under the African-Eurasian Migratory Water bird Agreement (AEWA).

Management of rice fields in Portugal and Spain

In the period December until the beginning of March presumably a very large part of the West-European population is staying in rice fields in Portugal and Spain. As a result, the conditions on these staging sites may have large effects on the entire population. Therefore, it is important to safeguard these staging sites and manage the rice fields to provide favourable conditions for the migrating godwits. A good management of the rice fields will also be beneficial for several other migratory species such as Common Snipes (*Gallinago gallinago*), Meadow Pipits (*Anthus pratensis*) and Skylarks (*Alauda arvensis*) which can be found here in large numbers.

Safe-guard staging sites in France

In France several habitat changes (planting of poplars, drainage) have taken place on important staging sites which are harmful for godwits. These changes seem to have caused a large decline in the number of spring staging Black-tailed Godwits in some areas. A good management of these areas to provide and safeguard alternative stop-over sites along the migration route is essential.

Ban of hunting along the migration route
It would be a major step in the complete protection of the species to stop hunting on the Black-tailed Godwit. Although the contribution of hunting in the mortality of godwits can not be quantified yet, such a step eliminates unnecessary risks. Besides a hunting-stop on spring staging sites of Black-tailed Godwits reduces disturbance. These regulations of hunting should fall under EU regulations in the framework of the European Action Plan for the Black-tailed Godwits Action (Jensen & Lutz 2006), and is about to be adopted by the State members.

Restoration of wetlands in Senegal delta
Large changes have occurred in the Senegal delta as a result of the construction of dams. Currently restoration projects are being carried out in part of the delta. These projects are essential to restore the natural flooding regimes of this river system to recreate the habitats which harbour large numbers of Palaearctic migrants. A good water management in combination with monitoring programs is essential to safeguard these areas.

Protection of wetlands in Morocco
Many large wetland areas in Morocco are currently under threat by the creation of dams which block the inflow of fresh water, and by the extraction of water for irrigation. Restoration projects to restore the inflow of fresh water and improved water management of these areas can safeguard these wetland areas.

Research

Although, in this survey a large amount of studies and data from different sources has been combined to give an overview of the current knowledge, it also indicated that there are big gaps in knowledge as to the migration of the Black-tailed Godwit.

Long-term monitoring of reproduction and mortality
Reliable data on annual reproduction and mortality are virtually absent as are reliable figures on hunting bags. A prime recommendation therefore is to set-up a monitoring system to gather long-term data on mortality and reproduction. These numbers are essential to take appropriate management measures to protect the species. An independent investigation is needed to estimate annual hunting bags.

Energetics of shifts in migration
The majority of Black-tailed Godwits is currently using staging sites in Portugal and Spain instead of the staging sites in France. This shift in staging sites may have energetic consequences which may influence arrival dates and condition during arrival in the breeding areas. As the energetic costs of migration are likely to be reflected in the breeding success of the birds, it is important to gather knowledge of the energetics of migration of this species.

Migration route of adults
Based on the diet switches it has been suggested that there may be two migration routes during spring migration: 1) flight form Senegal to Portugal/Spain and than to the Netherlands, 2) flight from Senegal to Morocco and than to the Netherlands. Studies on colour-ringed individuals or birds provided with transmitters should give insight in possible different migration strategies.

Conflict between Black-tailed Godwits and rice culture in West Africa
The suggested arrival of Black-tailed Godwits in July the Senegal delta and rice field further south coincides with the sowing of rice fields. At this time, godwits are reported foraging on

these newly sown rice fields which results in a potential conflict with local farmers. The order of magnitude of this conflict should be further established.

Providing good foraging conditions for migrating godwits in Portugal and Spain
The amount of suitable area which should be present to provide good feeding conditions for the entire godwit population staging in the rice fields of Portugal/Spain, should be determined. It should be investigated how the agricultural practises of farmers can best be combined with the demands of these migrating birds during the time godwits arrive.

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SAMENVATTING

Inleiding

In grote delen van zijn broedgebied laat de Grutto de afgelopen tientallen jaren een significante afname zien van de broedpopulatie. De soort staat daarom op de Rode Lijst van de IUCN vermeld als 'bijna bedreigd' (near threatened). Deze afname is niet beperkt tot de kernpopulatie in West-Europa. Ook de broedpopulatie in centraal Europa laat een afname zien. Deze alarmerende trends vragen om internationale bescherming langs de gehele migratieroute.

Voor een adequate bescherming is het van belang de verschillende sub-populaties van Grutto's in Europa te onderscheiden: de Oost-Atlantische, Centraal-Europese en de IJslandse populatie. Alleen de IJslandse populatie laat de afgelopen tientallen jaren een toename zien van 0-19 %. De andere populaties zijn in die periode sterk afgenomen.

Nederland speelt een belangrijke rol voor de Grutto aangezien 85 % van de Oost-Atlantische en 54 % van de totale continentale Gruttopopulatie in Nederland broedt. De afgelopen 40 jaar is de populatie in Nederland echter met 40 % afgenomen. Naast factoren die spelen in de broedgebieden (intensivering van landbouw, veranderingen in landschap) worden Grutto's geconfronteerd met veranderingen en bedreigingen in hun wintergebieden en pleisterplaatsen. Het doel van deze studie is om een actueel beeld te geven van de situatie in deze gebieden en aan te geven wat de bedreigingen zijn. De Oost-Atlantische populatie staat hierbij centraal in deze studie.

Actuele studie

Er is op verschillende manieren informatie verzameld over de status en bedreigingen van Grutto's in de verschillende landen:

1) Veldbezoeken en observaties
In samenwerking met lokale organisaties en partners (zie tabel 2.1) zijn alle belangrijke pleisterplaatsen bezocht. Hier zijn tellingen verricht en lokale deskundigen geïnterviewd.

2) Simultaantellingen tijdens voorjaarstrek
In samenwerking met een groot aantal partners uit verschillende landen (tabel 2.3) zijn op vaste momenten tellingen uitgevoerd. Deze gegevens geven een mooi beeld van de fenologie van de trek en het belang van elk gebied voor de Grutto tijdens de voorjaarstrek.

Overwinteringsgebieden

Aan het eind van het broedseizoen vertrekken Grutto's naar hun overwinteringsgebieden in West Afrika. Hier verblijven ze ongeveer 6-7 maanden, van augustus tot in januari. De overwinteringsgebieden kunnen onderverdeeld worden in drie gebieden: de Senegal delta, de kustzone van Senegal tot aan Guinee en de Niger-delta in Mali.

Senegal

De Senegal delta vormt een belangrijk overwinteringsgebied voor Grutto's. Ringterugmeldingen laten een duidelijk verband zien met Nederland. Gedurende de laatste decennia hebben er grote veranderingen plaatsgevonden in de delta door de aanleg van dijken, dammen en het inperken van de overstromingen. De overstromingsvlakten zijn tegenwoordig grotendeels getransformeerd in agrarische gebieden die gebruikt worden voor geïrigeerde rijstteelt. Alleen in een paar beschermde gebieden worden de oorspronkelijke overstromingshabitats nog aangetroffen. Grutto's zijn vooral te vinden in deze gebieden.

Voornamelijk het Diawling National Park (Mauritanië) en het Djoudj National Park (Senegal) zijn kerngebieden voor watervogels in de delta. Gebaseerd op tellingen van vrijwel alle geschikte gebieden in de Senegal delta is het aantal overwinterende Grutto's geschat op 2.000-5.000 vogels, terwijl in januari 2006 2.900 vogels geteld werden. Een analyse van alle beschikbare telgegevens van de Senegal delta laat zien dat het aantal Grutto's sterk is gedaald in de loop van 1990 en sindsdien laag is gebleven. Dit kan verband houden met de afname van de totale populatie-omvang. Daarnaast kunnen de grootschalige veranderingen in habitat geleid hebben tot veranderingen in de verspreiding van de soort.

De grote concentraties die voorkwamen in het verleden (1960-1970) zijn daarna niet meer waargenomen. Op dit moment zijn er geen duidelijke bedreigingen voor Grutto's binnen de Senegal delta. Op lange termijn zullen er klimaatsveranderingen optreden in de wetlands van de Sahel, met lagere regenval en droogte tot gevolg. Dit zal waarschijnlijk gevolgen hebben voor de geschiktheid van deze gebieden voor watervogels. Verstoring door mensen en jacht zijn geen knelpunten in de Senegal delta omdat vrijwel alle vogels in beschermde gebieden zitten. Ook buiten deze gebieden wordt er niet op Grutto's gejaagd. De grootschalige hydrologische veranderingen in de Senegal delta hebben geleid tot een degradatie van natuurlijke wetlands. Momenteel bieden de nog aanwezige natuurlijke wetlands genoeg mogelijkheden voor de relatief lage aantallen Grutto's die overwinteren in de Senegal delta. Habitatdegradatie vormt in de toekomst de grootste bedreiging voor de Grutto in de Senegal delta maar of het een direct knelpunt voor de Grutto is op dit moment is onduidelijk. Meer kennis omtrent de kwaliteit van aanwezige habitats, zoals de voedselbeschikbaarheid tijdens de start van de voorjaarsmigratie, is gewenst.

Rijst- en mangrovezone

De laagland-kustgebieden van de Sine Saloum tot Guinee vormen belangrijke overwinteringsgebieden voor Grutto's. In deze regio zijn de rijstvelden (bolanhas) van Guinee-Bissau veruit het belangrijkste overwinteringshabitat. In de maanden oktober tot januari is een inventarisatie uitgevoerd waarbij alle landen en gebieden werden bezocht (maar niet alle gebieden zijn in zijn geheel bekeken). Aan de hand van deze tellingen hebben we geschat dat 100.000 vogels, waarvan 40% in Guinee-Bissau, overwinteren in dit gebied. Het moet wel benadrukt worden dat deze schatting een lage betrouwbaarheid heeft, zoals ook het geval is bij schattingingen uit het verleden. In het algemeen hebben Grutto's een voorkeur voor rijstvelden boven mangroves, kale gebieden (tannes) en andere natuurlijke habitats. Deze habitats kunnen wel belangrijk zijn in de periode dat er geen rijst gegeten kan worden. In het noorden (Sine Saloum) werden grutto's gezien in zoetwatermoerassen en in Guinee vrijwel uitsluitend op moddervlakten, in tegenstelling tot de vogels in Guinee-Bissau die uitsluitend op rijstvelden werden waargenomen.

Binnen de rijstgebieden hebben Grutto's een sterke voorkeur voor geïnundeerde rijstvelden met ondiep water (0-20 cm), relatief lage planten (26-50 cm) en lage dichtheid van planten (< 20 cm). Een analyse van de trends in aantallen Grutto's in deze regio is beperkt doordat beschikbare gegevens uit het verleden schaars en incompleet zijn. Complete onderzoeken van de gehele regio bestaan niet. Niettemin, de beschikbare gegevens laten zien dat de verdeling van de Grutto in de regio hetzelfde is gebleven maar dat de aantallen sinds de jaren 80 minstens gehalveerd zijn. Ondanks lokale habitatveranderingen in het noorden van de regio door lage regenval of het verlaten van rijstvelden in Guinee Bissau, die de geschiktheid van deze gebieden voor Grutto's kunnen veranderen, hebben we in het algemeen geen duidelijke bedreigingen voor Grutto's aangetroffen. Jacht en verstoring spelen geen belangrijke rol. Een verandering in het verbouwen van andere typen rijst, die minder geschikt zijn voor Grutto's, kan een rol spelen in de toekomst. Dit is op het moment niet het geval.

Wetlands in Mali

De Binnendelta van de Niger in Mali vormt een belangrijk overwinteringsgebied voor Grutto's, vooral voor vogels die behoren tot de Centraal-Europese populatie. Ringterugmeldingen laten zien dat een gedeelte van de Nederlandse broedvogels overwintert in de Niger delta. In totaal werden hier c. 27,000 Grutto's geteld in februari 2006 in het centrale gedeelte van de delta. Op het moment van deze tellingen was de delta vrijwel droog. Maximum aantallen voor de gehele delta lagen in dezelfde orde van grootte als geteld in andere jaren in de periode 1985 tot en met 2004 (circa 40.000). Grutto's komen in de delta in natuurlijke habitats voor. Bij afnemende overstroming foerageren ze vooral op tijdelijke modder- en zandbanken. In de periode januari-maart concentreren ze zich in het centrale merengebied waar ze foerageren op kleine bivalven. Een trend-analyse van de aantallen Grutto's in de Niger delta laat relatief constante aantallen zien, in tegenstelling tot de situatie in de kustgebieden van West Afrika. In de Niger delta in Mali worden op grote schaal vogels gevangen. Duizenden steltlopers worden jaarlijks gevangen, waaronder kleine aantallen Grutto's. Andere bedreigingen zoals habitatveranderingen spelen geen rol op dit moment. Plannen voor het bouwen van dammen in de bovenloop van de rivier kunnen de voedselbeschikbaarheid voor Grutto's die zich voorbereiden op de voorjaarstrek beïnvloeden. Aanbevolen wordt om dit verder uit te zoeken.

Voorjaarstrek

Vanaf december trekken Grutto's vanuit hun overwinteringsgebieden noordwaarts naar de broedgebieden. Ze gebruiken tijdens de voorjaarstrek verschillende pleisterplaatsen. Van elke belangrijke pleisterplaats is een overzicht gegeven van de actuele situatie, bedreigingen en veranderingen die de afgelopen decennia hebben plaatsgevonden.

Marokko

Belangrijkste pleisterplaats is de Merja Zerga met 4.500 Grutto's in januari 2006. Ze foerageren hier voornamelijk op brakke natte graslanden. De belangrijkste bedreiging in Marokko is het gebrek aan zoet water. De neerslag variëert sterk per jaar. Daarnaast vindt er veel extractie van zoet water plaats voor irrigatie en worden dammen gebouwd. Doordat minder zoet water via de rivieren wordt afgevoerd ontstaan zandbanken in de riviermonden. Hierdoor verdwijnt veel dynamiek in de riviermonding, met verlies van geschikt foerageerhabitat als uiteindelijk gevolg.

Portugal en Spanje

Veruit de hoogste concentraties Grutto's worden aaangetroffen in de rijstvelden van Portugal en Spanje. In Portugal zijn de belangrijkste pleisterplaatsen gelegen in de rijstvelden in de Tejo en Sado estuaria. Gedurende simultaantellingen in beide gebieden zijn in februari 44.700 Grutto's geteld, wat neer komt op meer dan een kwart van de totale geschatte broedvogel populatie van West Europa. In Spanje liggen de belangrijkste pleisterplaatsen in de rijstvelden van de Extremadura en de wetlands en rijstvelden in de Cota Doñana. Er is weinig bekend van de aantallen Grutto's in de andere rijstgebieden in het land. De vogels foerageren in Portugal en Spanje vrijwel uitsluitend op rijst. Belangrijkste bedreigingen zijn gekoppeld aan de omstandigheden in de rijstgebieden. Vooral in natte en geploegde velden is volop voedsel aanwezig. Alhoewel er op het moment voldoende geschikt foerageergebied aanwezig is, zijn deze pleisterplaatsen gevoelig voor veranderingen in de rijstteelt.

Frankrijk

Belangrijkste plesiterplaatsen zijn de Basses Vallées Angevines, Moëze-Oléron en Marais Poitevin. Hier zijn in het voorjaar van 2006 (begin maart) respectievelijk 10.000, 6.000 en

1-2.000 Grutto's geteld. De getelde aantallen in de Marais Poitevin laten een duidelijke afname zien van 40-50.000 in de jaren 80 tot 1-2.000 nu. Belangrijke bedreigingen hangen samen met verminderde beschikbaarheid van geschikte foerageergebieden door veranderend grondgebruik (aanplant populieren in de Basses Vallées Angevines, aanleg maïsakkers en ontwatering in de Marais Poitevin). De afname in aantallen in de Marais Poitevin kan ook voor een deel samenhangen met de opkomst van de pleisterplaatsen in Spanje en Portugal.

Een andere belangrijke bedreiging wordt gevormd door de jacht. Er zijn weinig gegevens beschikbaar over jaarlijkse afschotcijfers maar schattingen lopen uiteen van 2-5,000 geschoten vogels per jaar. Die worden vooral geschoten in de nazomer en bestaan dan vooral uit juvenielen. Als er inderdaad 2-5,000 vogels (juvenielen) worden geschoten in Frankrijk, is dit 4- 15 % van de benodigde jaarlijkse jongenproductie. Als er rekening mee wordt gehouden dat de jaarlijkse reproductie vaak ver beneden de benodigde reproductie is, kunnen de aantallen afgeschoten vogels in Frankrijk niet verwaarloosd worden. Vanaf 1 februari mag er niet gejaagd worden op Grutto's zodat adulte vogels vrijwel niet geschoten worden tijdens de voorjaarstrek.

Tunesië
Gebieden waar in het verleden grotere aantallen Grutto's zijn gezien zoals Lac Kelbia, Lac Tunis - Radès en Lac Ichkeul lijken tegenwoordig veel minder van belang te zijn voor Grutto's. Deze gebieden zijn minder geschikt geworden als pleisterplaats voor Grutto's door habitatveranderingen als gevolg van ondermeer de aanleg van dammen. De belangrijkste pleisterplaats is momenteel de Salines van Thyna. Hier zijn 691 Grutto's geteld in februari 2006. Gezien de aantallen Grutto's spelen de pleisterplaatsen in Tunesië kwantitatief geen grote rol tijdens de voorjaarstrek van Grutto's.

Italië
De Po-delta vormt een belangrijke pleisterplaats tijdens de voorjaarstrek van Grutto's. In totaal zijn in Italië 8.143 Grutto's geteld in maart 2006. Belangrijke bedreigingen bestaan vooral uit het verdwijnen van natuurlijke habitats. Jacht lijkt geen grote bedreiging te vormen. De jacht op de Grutto is verboden en er wordt nauwelijks illegaal op Grutto's gejaagd. Verstoring door jacht kan echter wel een bedreiging zijn. Gebaseerd op de fenologie van de trek in de verschillende voorjaarspleisterplaatsen is aangetoond dat het merendeel van de Italiaanse Grutto's uit overwinteringsgebieden in Mali behoort tot de broedvogelpopulatie van centraal Europa. Slechts een klein gedeelte van de Nederlandse broedvogels gebruikt Italië als voorjaarspleisterplaats.

Gezien de dieetkeuze en de aantallen die geteld worden op de verschillende pleisterplaatsen zijn er aanwijzingen gevonden voor het bestaan van verschillende trekstrategieën. Een groep vogels zou voornamelijk foerageren op dierlijke kost en trekt van de overwinteringsgebieden in West-Afrika naar Marokko en vervolgens naar Frankrijk waarna naar Nederland wordt doorgevlogen. Een tweede groep vogels zou voornamelijk foerageren op rijst. Deze vliegt vanuit West-Afrika naar Portugal en Spanje en vertrekt daarna zonder tussenstop in Frankrijk naar Nederland. Gezien de aantallen die geteld worden in Spanje en Portugal in vergelijking tot de aantallen in Frankrijk, blijkt het merendeel van de Grutto's in Spanje/Portugal te pleisteren en daarna in één keer door te vliegen naar Nederland. Het is de vraag of deze langere trekweg consequenties heeft voor de vogels. Het zou een mogelijke verklaring kunnen zijn voor een latere aankomstdatum of een verminderde conditie bij aankomst in de broedgebieden. Gezien de mogelijk consequenties van veranderingen in trekroutes verdienen deze vragen volop aandacht in de nabije toekomst.

Conclusies

Alhoewel de belangrijkste oorzaken van de afname van de Gruttopopulatie in West Europa (en Centraal Europa) gezocht moeten worden in de broedgebieden, laat dit onderzoek zien dat er een groot aantal veranderingen hebben plaatsgevonden in de overwinteringsgebieden en voorjaarspleisterplaatsen. De belangrijkste conclusies uit dit onderzoek kunnen als volgt worden samengevat:

Overwinteringsgebieden

- De belangrijkste overwinteringsgebieden van Grutto's uit West Europa zijn gelegen in West Afrika, vooral in de rijst en mangrovezone van zuid Senegal tot in Guinee
- De rijstgebieden van Guinee Bissau zijn veruit het belangrijkste overwinteringsgebied, met naar schatting 40% van de totale winter populatie
- In vergelijking tot de jaren 80 is de verspreiding van Grutto's in de wintergebieden niet veel veranderd, maar de aantallen in de verschillende gebieden zijn gehalveerd. Deze afname houdt verband met de achteruitgang van de broedvogelpopulatie in West Europa. In Mali zijn de aantallen stabiel; deze vogels behoren voornamelijk tot de Centraal Europese broedvogelpopulatie
- Alhoewel er grootschalige habitatveranderingen hebben plaatsgevonden in de Senegal delta, naast grote droogtes, die beide de verspreiding van Grutto's hebben veranderd, hebben we in het algemeen geen significante knelpunten voor Grutto's in de overwinteringsgebieden aangetroffen
- Jacht en menselijke verstoring – die voorkomen in verschillende gebieden- lijken geen significante factoren te zijn die de overleving van Grutto's beïnvloeden. Het moet benadrukt worden dat deze waarneming onderbouwd zou moeten worden met een langdurige monitoring van de jaarlijkse mortaliteit van de soort.

Voorjaarspleisterplaaten

- Veruit de belangrijkste pleisterplaatsen tijdens de voorjaarstrek zijn het Tejo estuarium en Sado estuarium in Portugal en de Extremadura in Spanje. Hier kunnen respectievelijk 27 %, 16 % en 18 % van de totale populatie op een moment worden aangetroffen.
- Deze studie heeft laten zien dat er waarschijnlijk een belangrijke verschuiving heeft plaatsgevonden de afgelopen decennia tijdens de voorjaarstrek. De belangrijke pleisterplaats in de jaren 80 de Marais Poitevin in Frankrijk, lijkt zijn betekenis te hebben verloren ten koste van pleisterplaatsen in Portugal en Spanje. De gebieden in Marokko spelen een minder belangrijke rol, maar kunnen op andere momenten in het seizoen van belang zijn. Voorjaarspleisterplaatsen in Tunesië zijn kwantitatief van kleine betekenis voor Grutto's.
- Een klein deel van de vogels dat op de voorjaarstrek Italië aandoen, is broedvogel in Nederland omringende landen. Vergelijking van de fenelogie van de voorjaarstrek geeft aan dat het merendeel van de vogels in Italië tot de centraal Europese populatie behoort.
- Hoewel op het moment voldoende geschikte gebieden in Spanje en Portugal aanwezig lijken te zijn, zijn deze pleisterplaatsen kwetsbaar voor veranderingen in de rijstbouw. Het enorme belang van deze gebieden in zuid Europa biedt echter mogelijkheden voor beheer en bescherming.
- De belangrijkste bedreigingen langs de voorjaarstrekroute bestaan uit habitatveranderingen en en jacht. Habitatveranderingen hebben negatieve effecten in Marokko en Frankrijk, en kunnen hebben bijgedragen aan de verschuivingen van belangrijke pleisterplaatsen. Het effect van jacht in Frankrijk blijft een vraag vanwege het ontbreken van goede gegevens. Als er inderdaad, zoals recente cijfers

suggereren, een paar duizend juveniele Grutto's jaarlijks worden geschoten, kan het effect van jacht niet verwaarloosd worden.
- Jacht lijkt geen belangrijke bedreiging te zijn in andere landen langs de trekroute. Jacht kan echter wel leiden tot verstoring van pleisterplaatsen die gebruikt worden door grote aantallen Grutto's.

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