Report of the Dutch-Mauritanian project Banc d'Arguin 1985-1986

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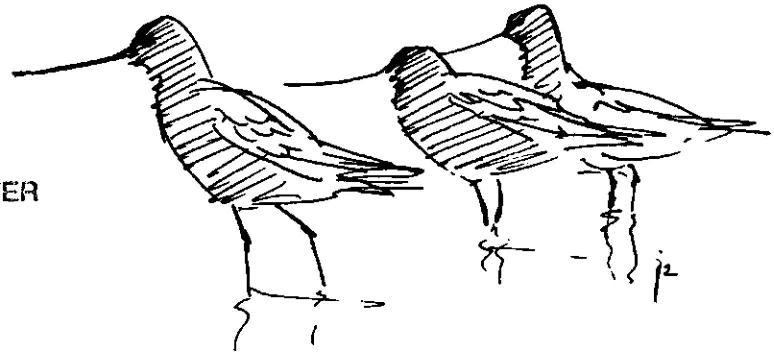


Parc National du Banc d'Arguin (PNBA)

Dutch Working Group for International Wader- and Waterfowl Research (WIWO)

Research Institute for Nature Management (RIN)

Netherlands Institute for Sea Research (NIOZ)

Texel 1989

R.I.N.-RAPPORT

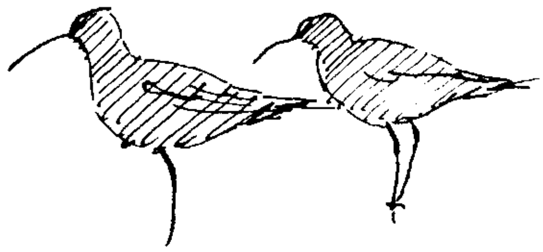
DEDICATED

to the memory of our respected friend

Ely ould Elemine

CONTENTS

1. INTRODUCTION



About 7 million coastal waders (Limicoles, Charadrii) migrate annually between vast arctic and subarctic breeding areas and temperate and tropical winter quarters scattered along the eastern shores of the Atlantic Ocean. After a short breeding season in the arctic tundras of NE Canada, Greenland, Iceland, Scandinavia and the northern parts of the USSR these birds arrive at the tidal flats of the Wadden Sea and the estuaries of Great Britain in late summer. After moulting their feathers, some waders stay there to winter but many others migrate further south to spend the winter in SW Europe, West-Africa, and even southern Africa. At least half of the coastal waders using the East Atlantic flyway spend the winter in these African winter quarters (Piersma et al. 1987).

About 1980 it became clear that the tidal flats of the Banc d'Arguin (Fig. 1) in Mauritania were one of the most important wintering areas along the East Atlantic flyway. Over 2 million waders were counted in that region in winter (Trotignon 1980, Altenburg et al. 1982). Remarkably enough food conditions on the Banc d'Arguin appeared to be marginal (Altenburg et al. 1982). Rough calculations based on data collected in February 1980 showed that the total amount of food present would be consumed within two months if no regrowth or resettlement of food organisms would occur. Although some regrowth is likely to occur, it remains to be seen how these birds are able to put on sufficient fat in early spring for their northward migration.

This question - how birds are able to start their spring migration from the Banc d'Arguin in good condition - formed the central theme of the Dutch-Mauritanian project "Banc d'Arguin 1985-86".

To answer this question we have to know how much food is available in spring and especially how much extra food is produced in this period. Secondly we need to know how much food is required by the birds and what is their extra need to put on sufficient fat for the spring migration. Finally we have to know when the birds put on this fat, when they leave and which staging areas they may or have to use.

This is very shortly the programme of the project "Banc d'Arguin 1985-86" developed by the Working Group for International Wader- and in 1985, as conceived originally. Because the international Wader Study Group had planned an international project to study the movements of waders during spring migration by means of birds with colour marks in the spring of 1985, it was decided to carry out only that part of the project "Banc d'Arguin 1985-86" which supported the international project and to postpone the remainder of the programme to 1986.

From the start of the project it was envisaged that Mauritanian counterparts would take part in the project. Consultation with the Mauritanian authorities resulted in a joint Dutch-Mauritanian project in which on the Mauritanian side the Parc National du Banc d'Arguin and the Directorate for Nature Protection of the Ministry of Rural Development took part.

The aims of the project "Banc d'Arguin 1985-86" were in more detail:

1. Studies on spring migration of waders in relation to feeding condition.

This part of the programme had to lead to a detailed analysis of the origin of waders at the Banc d'Arguin and the timing, patterning and extent of wader migrations from and through Banc d'Arguin in spring, and to an apraisal of the physical changes in the birds themselves which allow them these movements. Information on the fate of the birds after they have left the Banc d'Arguin, had to be gained as a result of these local studies. The research programme to reach these aims consisted of three parts, viz. description of arrival and departure of waders; description of the changes in physical condition of the birds before departure; and description of the routes taken by the waders to reach the breeding grounds and the location of these breeding areas.

2. Studies on the biomass and productivity of the benthic fauna of the tidal flats.

This involved in the first place a general survey of the benthic fauna of the Banc d'Arguin in order to obtain a reference value for the biomass of the entire area. Secondly, growth and production rates of selected invertebrates had to be measured in order to obtain an estimate of benthic productivity. This had to be compared with measurements on

The support of the Mauritanian authorities is gratefully acknowledged. We should like to mention Mr. Gabriel Hatti, Adviser of the Secretary General of the President, Mr. Hadya Amadou Kane, Director of the Directorate for Nature Protection of the Ministry of Rural Development in 1985 and Director of the Parc National du Banc d'Arguin in 1986, Mr. Dah ould Cheikh, Governor of Nouadhibou, Mr. Sy Zakarya dit Sy Kao, Vice-Governor of Nouadhibou, Mr. Mahmoud ould Merzoug, Director of the Directorate for Nature Protection in 1986, and Mr. Abderrahmane Touré, Director of the Parc National du Banc d'Arguin in 1985. We also like to thank José Luis de Torregrosa Garcià of the firm ICOD, the collaborators of the Parc National du Banc d'Arguin, the Campredon family, the Germain family, the "Cooperation de Timiris", and the inhabitants of Iouik and other villages at the Banc d'Arguin.

Material support was given by the Ringing Office of the CRBPO (Musée d'Histoire Naturelle) in Paris, the Bird Migration Centre ("Vogeltrekstation") in Heteren, the Wash Wader Ringing Group, the Royal Netherlands Meteorological Institute (KNMI), the Netherlands' Rijkswaterstaat, the Zoological Laboratory of the University of Groningen, the IJsselmeer Polder Development Authority (RIJP) and numerous relatives and friends.

A special word of thank must go to the many keen fieldworkers who happened to spot waders colour-marked during our expedition, elsewhere in the world. The resightings of these birds have contributed greatly to our knowledge of the migratory routes. The colour-marking registrations were ably administered by Chris Thomas and Dr. Hector Galbraith of the Wader Study Group - Colour-marking register.

During the analysis of the data collected at the Banc d'Arguin we were supported by Dr. Gesa Hartmann-Schröder (Hamburg), Dr. G.C. Cadée (Texel), Rinus Manuels (Texel), Michel Binsbergen (Texel), Drs. J.B. van Biezen (Arnhem), Nienke Bloksma (Groningen), Hew Prendergast (U.K.), Nick C. Davidson (Peterborough), Peter Prokosch (Husum), Denis Bredin (Rochefort), Joop Jukema (Oosterbierum) and many others ...

To all we owe the success of the project!

Roelof Hupkes: biologist at Groningen University (WIWO 1986)
Jan van de Kam: photographer (WIWO 1985, 1986);
Marcel Kersten: biologist at Groningen University (WIWO 1985);
Marcel Klaassen: graduate student at Groningen University (WIWO 1986);
André Meijboom: biological assistant at RIN (1986);
Gerard Moerland: graduate student at RIN (1986);
Theunis Piersma: biologist at Groningen University (WIWO 1985);
Cor Smit: biologist at RIN (1985, 1986);
Tom van Spanje: ornithologist and general coordinator of the project (WIWO 1985, 1986);
Kees Swennen: biologist at NIOZ (1986);
Jaap de Vlas: biologist at the Netherlands Ministry of Agriculture and Fisheries (RIN 1986);
Wim Wolff: biologist at RIN (1986);
Koos Zegers: biological assistent at RIN (1986);
Leo Zwarts: biologist at IJsselmeer Polders Development Authority (WIWO 1986).

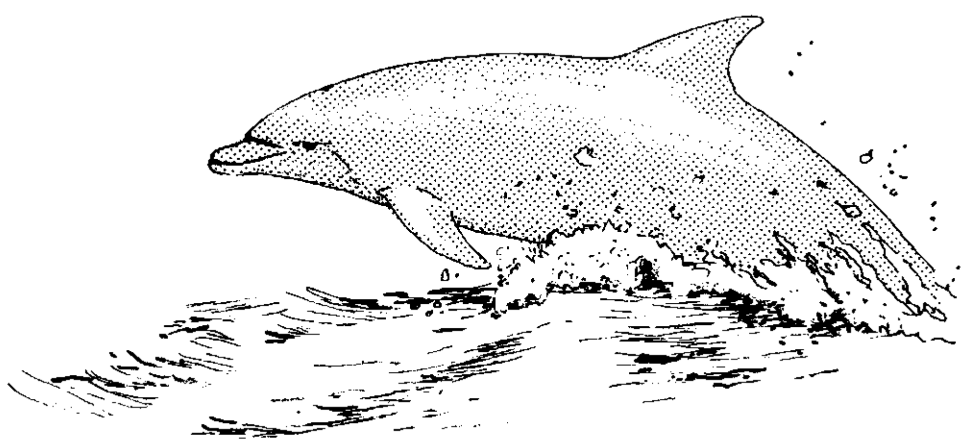
The expedition office and secretariat were held by RIN, where Mrs Veronica de Wit spent much time on preparation and coordination until 1986, whereafter Ms. Michaela Scholl was involved in remaining work. RIN also made the services of its workshop available.

Mr. Ekko Smith and Mr. Meinte Engelmoer (WIWO) handled all financial matters, whereas Dr. Gerard Boere (WIWO) acted as a general adviser.

Itinerary

9 - 23 December 1984 :	Tom van Spanje, general coordinator of the project pays a preparatory visit to Mauritania.
10 March 1985	: Arrival of Nelly van Brederode, Piet Duiven, Bruno Ens, Mark Fletcher, Jan van de Kam, Cheikhna ould M'Baré, Theunis Piersma, Cor Smit and Tom van Spanje in Nouadhibou.
11 - 19 March 1985	: Preparations for stay at Iouik in Nouadhibou.
20 - 21 March 1985	: Voyage to Iouik by two fishing boats and one Landrover; the night was spent at Ten Alloul.

30 - 31 March 1986	: Second change of personnel. Sjoerd Dirksen, André Meijboom and Jaap de Vlas leave and Cor Smit, Wim Wolff and Koos Zegers arrive.
9 April 1986	: Departure of Leo Zwarts.
21 - 23 April 1986	: Preparations for departure. Dismantling of the camp at Iouik.
24 - 25 April 1986	: Return voyage to Nouadhibou by two local fishing vessels. The night was spent at the Ile d'Arguin.
26 - 27 April 1986	: Loading of equipment into transport container. Final arrangements and courtesy visits in Nouadhibou.
28 April 1986	: Departure of all remaining Dutch participants except for Piet Duiven and Tom van Spanje.
1 May 1986	: Departure of Piet Duiven.
15 May 1986	: Conclusion of the project in Mauritania by Tom van Spanje.
9 September - 4 October 1986	: Visit of Abou Gueye and Mr. Mamadou Alassane Sall to RIN at Texel for training in data analysis.
22-26 September 1986	: Visit of Mr. Kane Hadya to the Netherlands.



- relative humidity;
- wind force and direction;
- precipitation.

3.2 Methods

The set-up of the Iouik weather station is shown in figure 3.1 Temperatures were measured under standard conditions at 10 and 150 cm, using a stand and weather box respectively. In both situations the equipment was protected against direct radiation from the sun. Temperature registrations at 10 cm were made using minimum and maximum thermometers allowing for an accuracy of 0.1°C. Temperatures at 150 cm were measured using comparable thermometers but were also registered continuously with a Fuess thermograph. Registrations of the latter instrument were read every hour, with an accuracy of full degrees Celsius.

Atmospheric pressure was measured continuously at 150 cm height in a standard weather box, using a Fuess barograph. Registrations were read every hour with an accuracy of full mbar.

Relative humidity was measured continuously at 150 cm height in a standard weather box, using a Fuess hygrograph. Registrations were read every hour with an accuracy of full %.

Windforce and direction were measured continuously at about 2 m height, using a Lambrecht wind meter at a site about 10 m from the camp. As a result of favourable wind directions, no turbulence could occur due to the presence of the camp. Wind direction was registered continuously too. Both types of registrations were read every hour. Wind direction was classified as one out of 8 categories (W, NW, N, NE, E, SE, S, SW).

Precipitation was measured using a standard precipitation meter on a stand. Due to sand and dust storms the meter had to be cleaned regularly.

All instruments sustained the harsh climatic situation at the Banc d'Arguin in a good way. Some slight and unimportant failures were due to inexperience in handling the equipment. After return in the Netherlands hourly measurements were stored into the VAX/VMS computer of the Research Institute for Nature Management. Results were calculated using Genstat statistical programmes. Most results were analyzed in two ways:

- a calculation of maximum, mean and minimum values over 24 hours, for the whole observation period at the Banc d'Arguin. Mean values were calculated using all 24 hourly data;

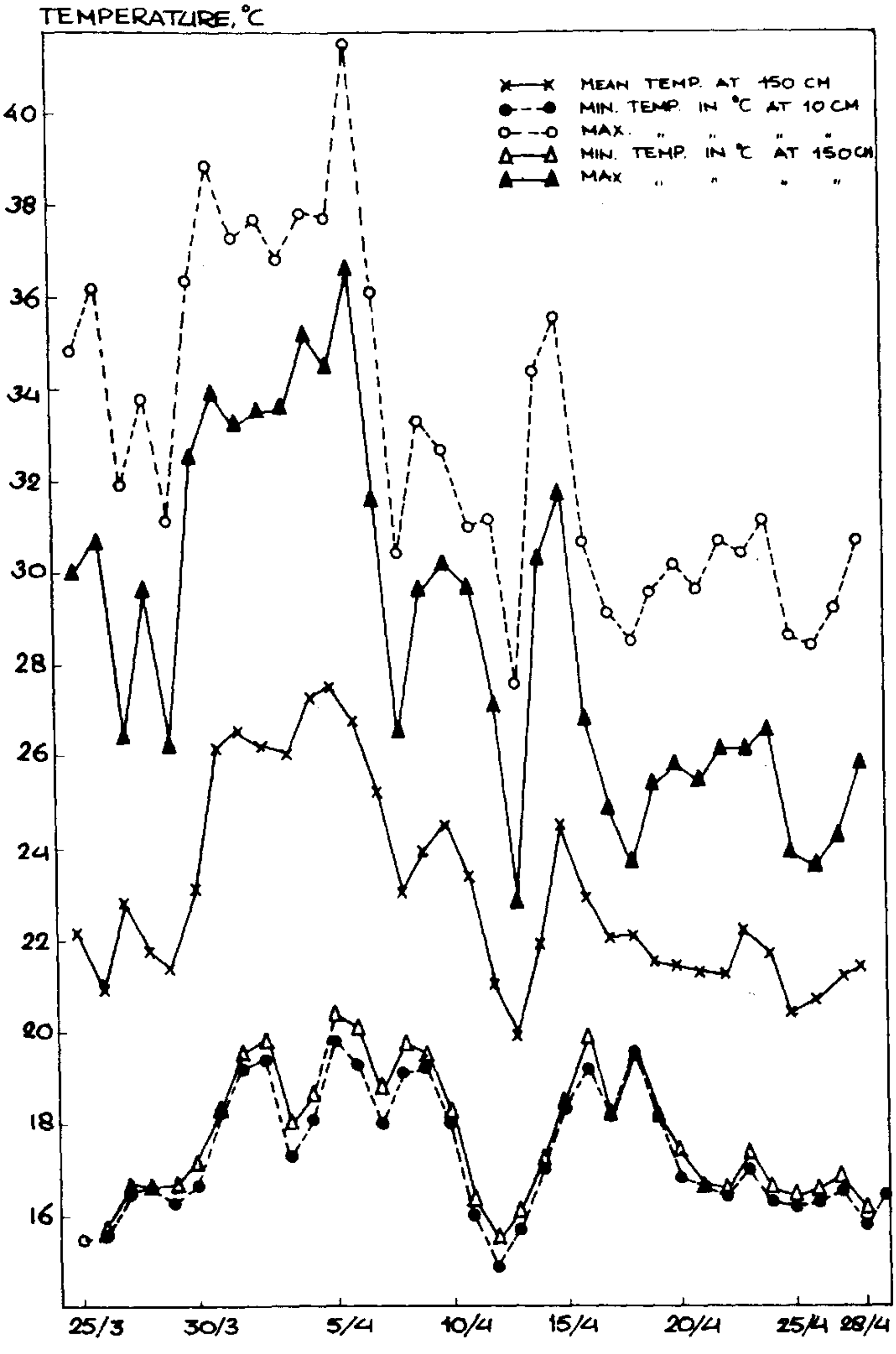


Figure 3.2. Minimum and maximum temperatures for each day at 10 and 150 cm height and mean temperatures calculated over 24 hourly registrations at 150 cm at the Iouik camp in 1985.

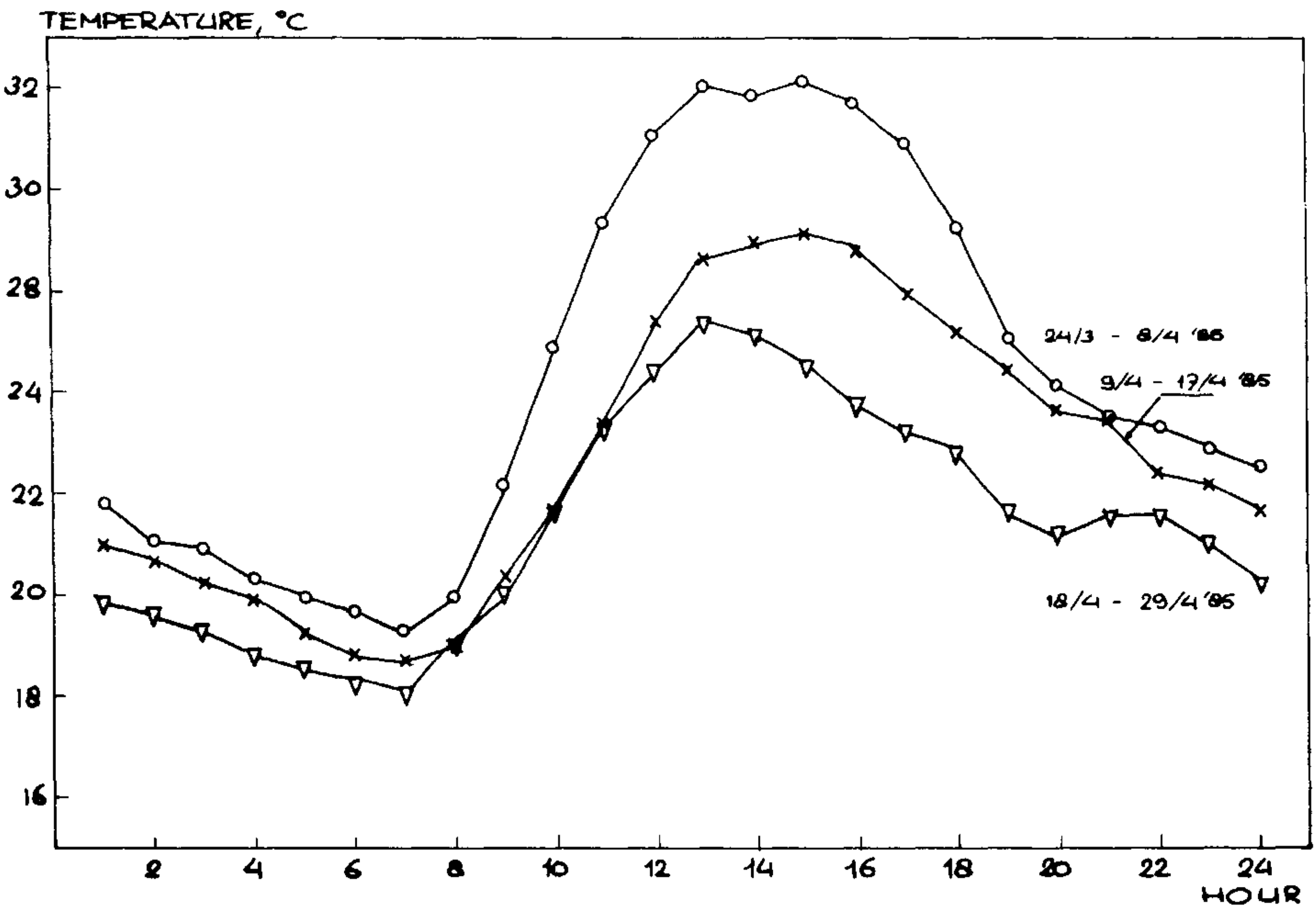


Figure 3.4. Mean temperatures (°C) per hour over three observation periods at 150 cm in 1985.

will be discussed later on in this chapter (3.5.1). Pressure levels in the course of the day show a highly identical pattern for all decades, with a high pressure level by the end of the morning and low pressure by the end of the afternoon. This diurnal pattern of atmospheric pressure is comparable for the situation met in Northwest Europe, through the difference in high and low pressure is somewhat larger, probably due to the more intense heating up of the atmosphere. This diurnal pattern has little in common with the weather situation itself. It is mainly caused by the attracting forces of sun and moon.

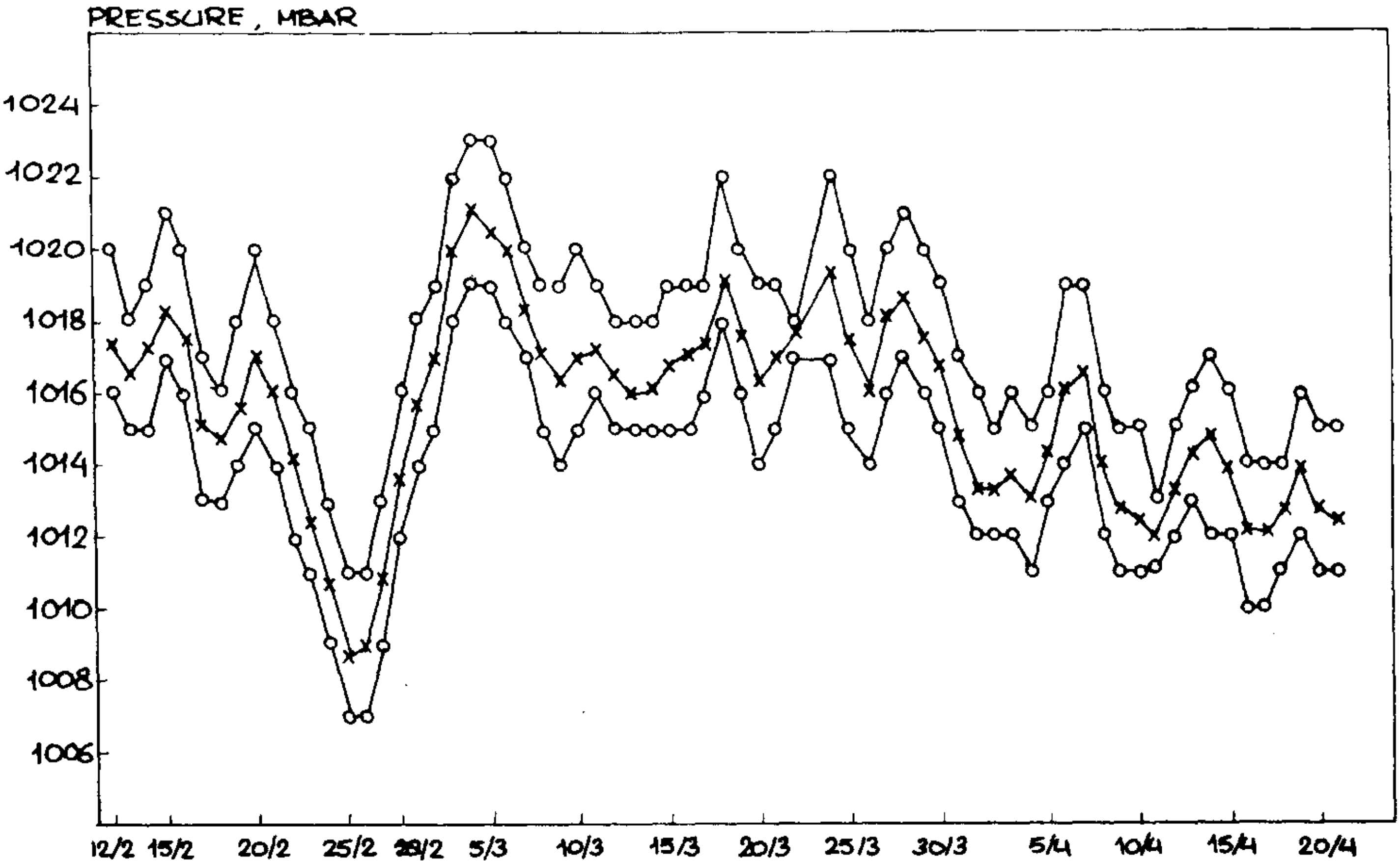


Figure 3.7. Minimum, mean and maximum data for atmospheric pressure (mbar) for each day in 1986. Mean data were calculated over 24 hourly registrations.

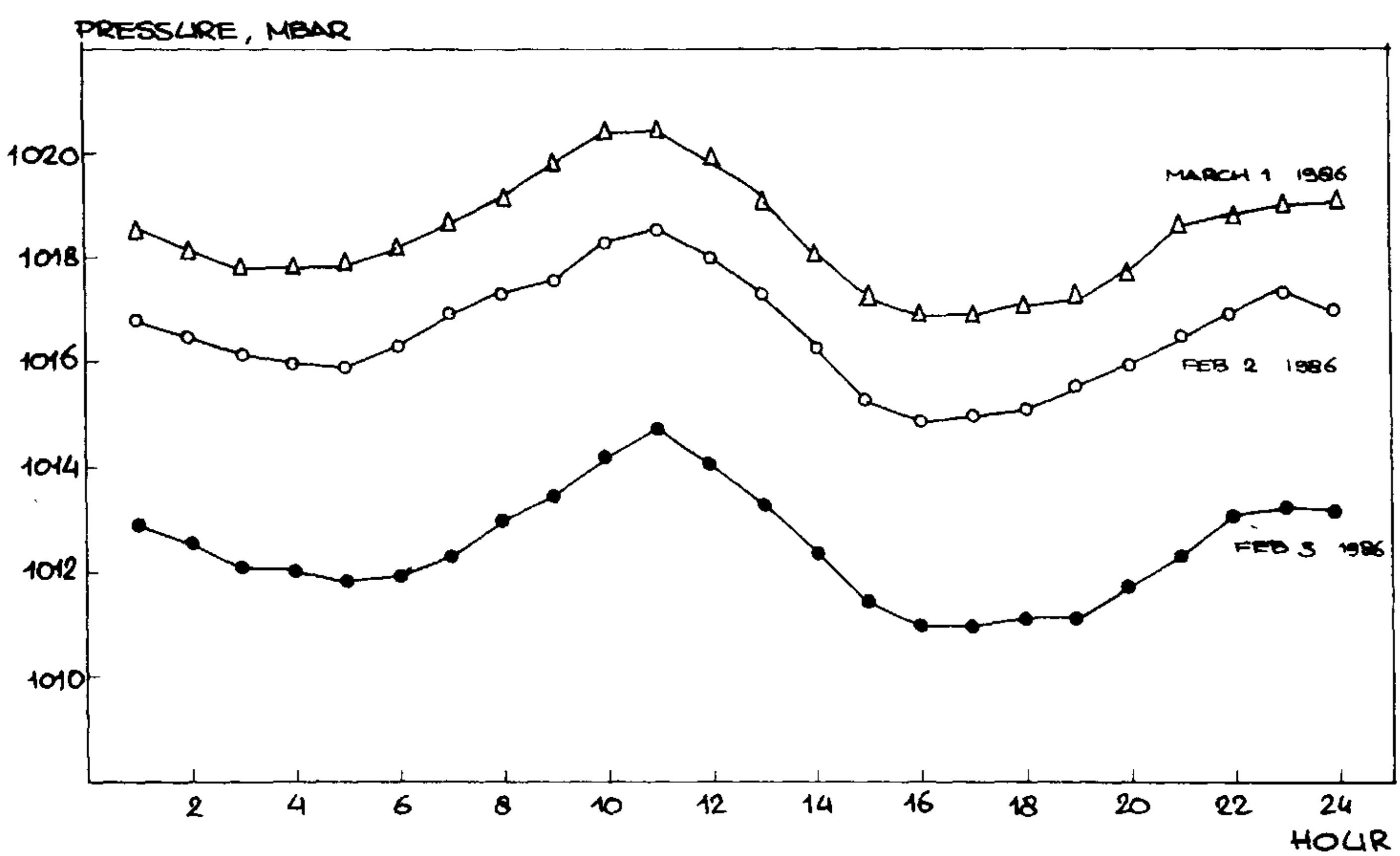


Figure 3.8. Mean data for atmospheric pressure (mbar) per hour over three decades (12 February-9 March) in 1986.

3.3.3 Relative humidity

Relative humidity in the course of the season is depicted in figures 3.10 and 3.11. In both years the maximum relative humidity values go up to 90 or 100%, and sometimes even exceed the latter value. The minimum humidity values vary greatly, on some days they even go up to 75%. As a result the

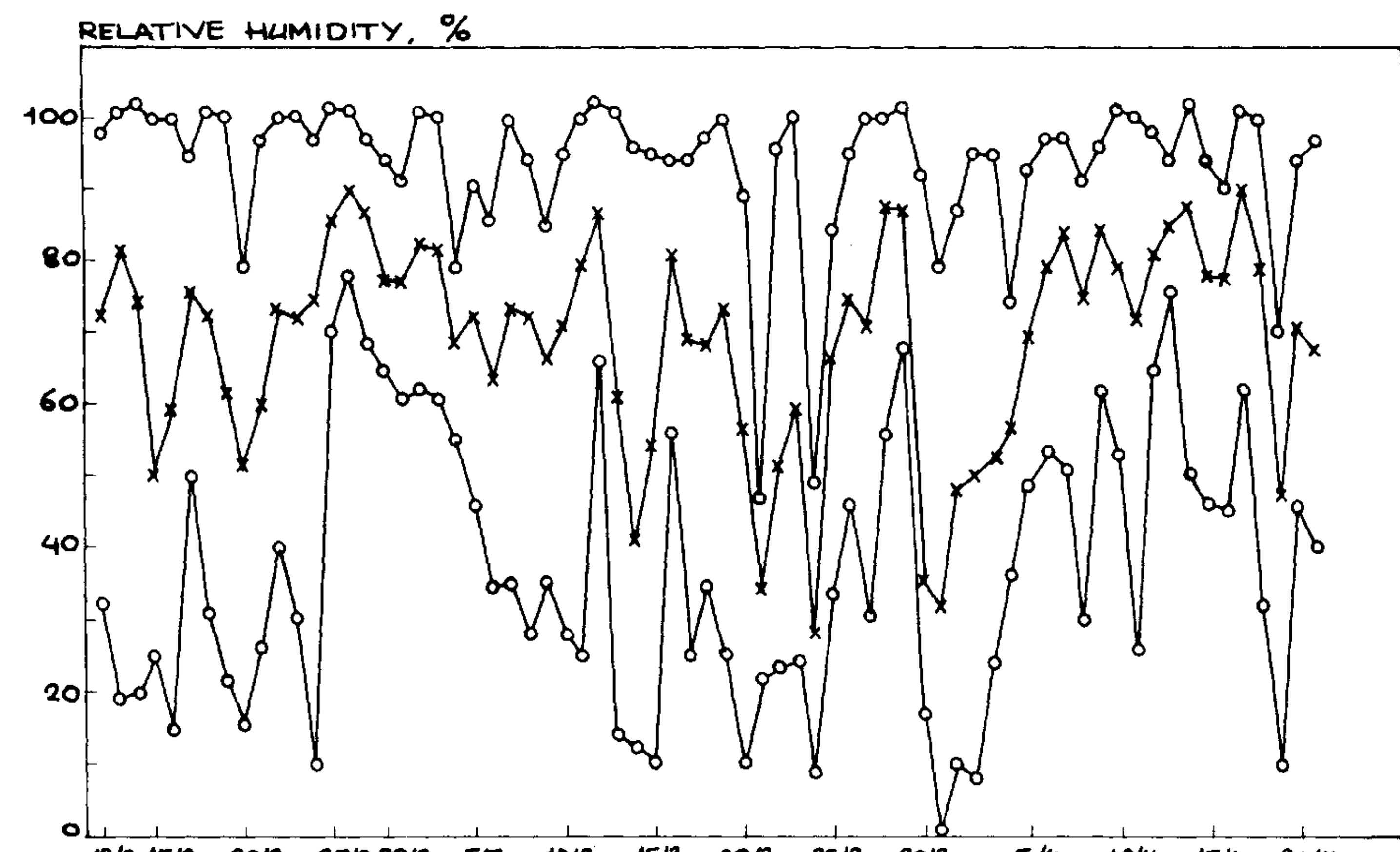


Figure 3.11. Minimum, mean and maximum data for relative humidity (in %) for each day in 1986. Mean data were calculated over 24 hourly registrations.

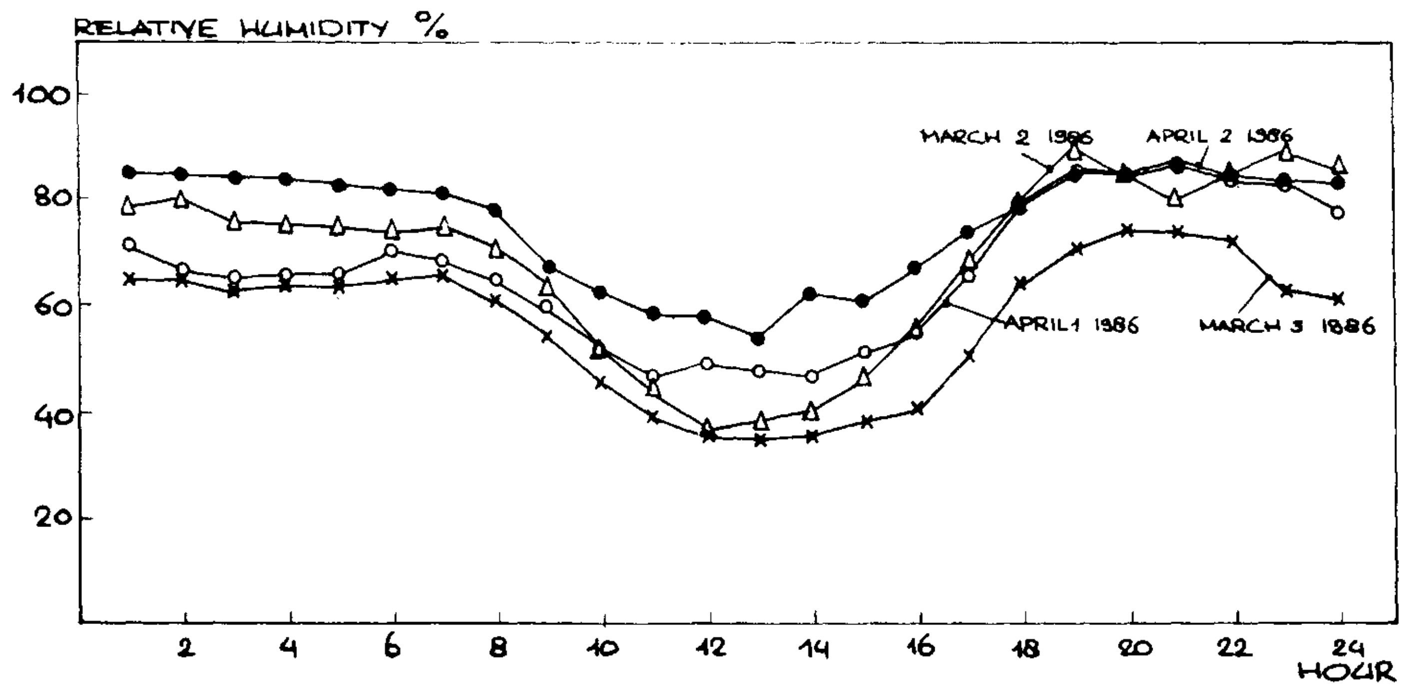


Figure 3.14. Mean data for relative humidity (in %) per hour over four decades (10 March-21 April) in 1985.

mean relative humidity values fluctuate rather strongly as well, generally being in the 40-80% range. No regular pattern is detectable, nor can obvious correlations be found with other meteorological parameters. There is, however, a very regular diurnal pattern, depicted in figures 3.12, 3.13 and 3.14. These graphs show relatively high humidity levels, especially at night. In some nights these high levels lead to dew formation. These 'wet' nights are those exceeding or coming close to 100% relative humidity, shown in figures 3.10 and 3.11. The total number of 'wet' nights, however, has been considerably higher than may appear from figures 3.12 and 3.13. The reason is that in the latter graphs we are dealing with mean values over 7-16 hourly values, less humid nights causing the hourly mean to drop to less than 100%.

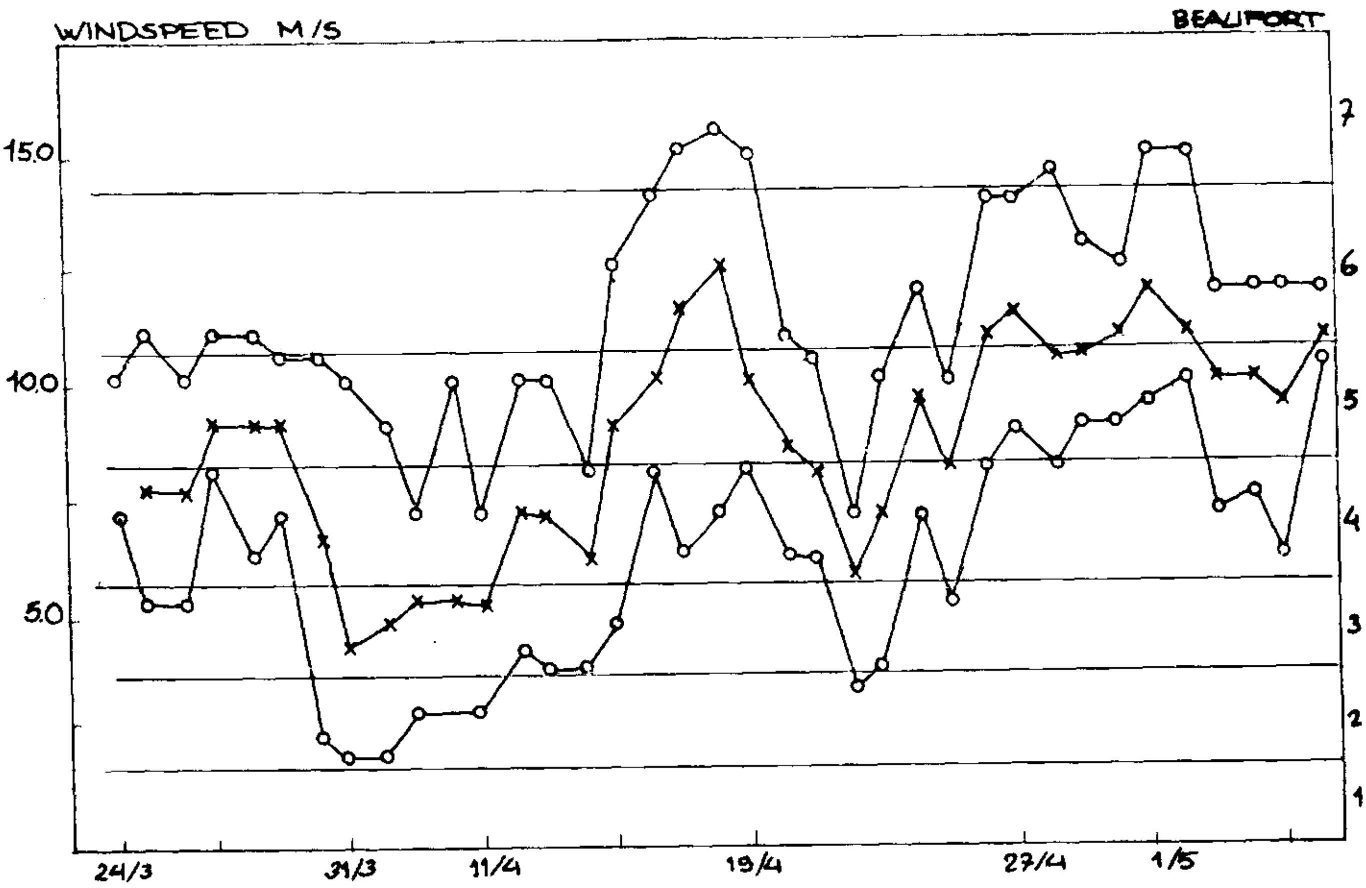


Figure 3.15. Minimum, mean and maximum wind speed (in m/s-left scale; Beaufort-right scale) for each day in 1985. Mean data were calculated over 24 hourly registrations.

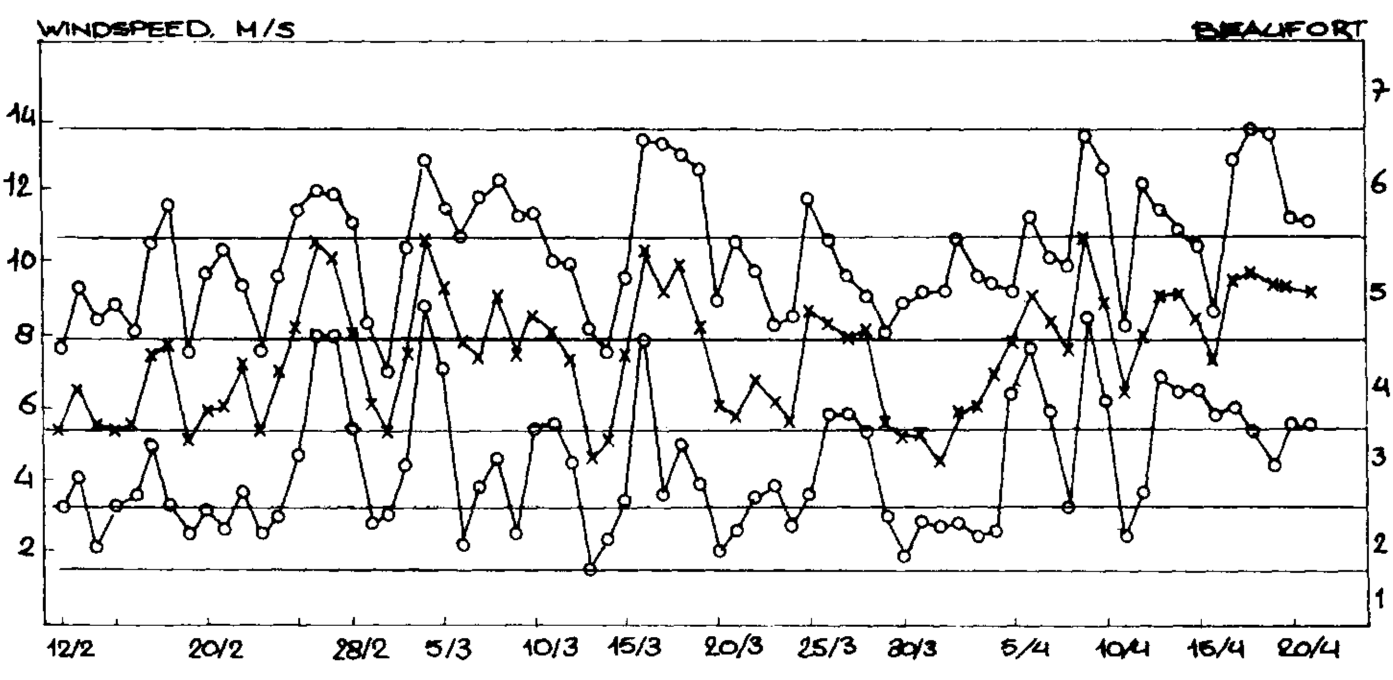


Figure 3.16. Minimum, mean and maximum wind speed (in m/s - left scale; Beaufort - right scale) for each day in 1986. Mean data were calculated over 24 hourly registrations.

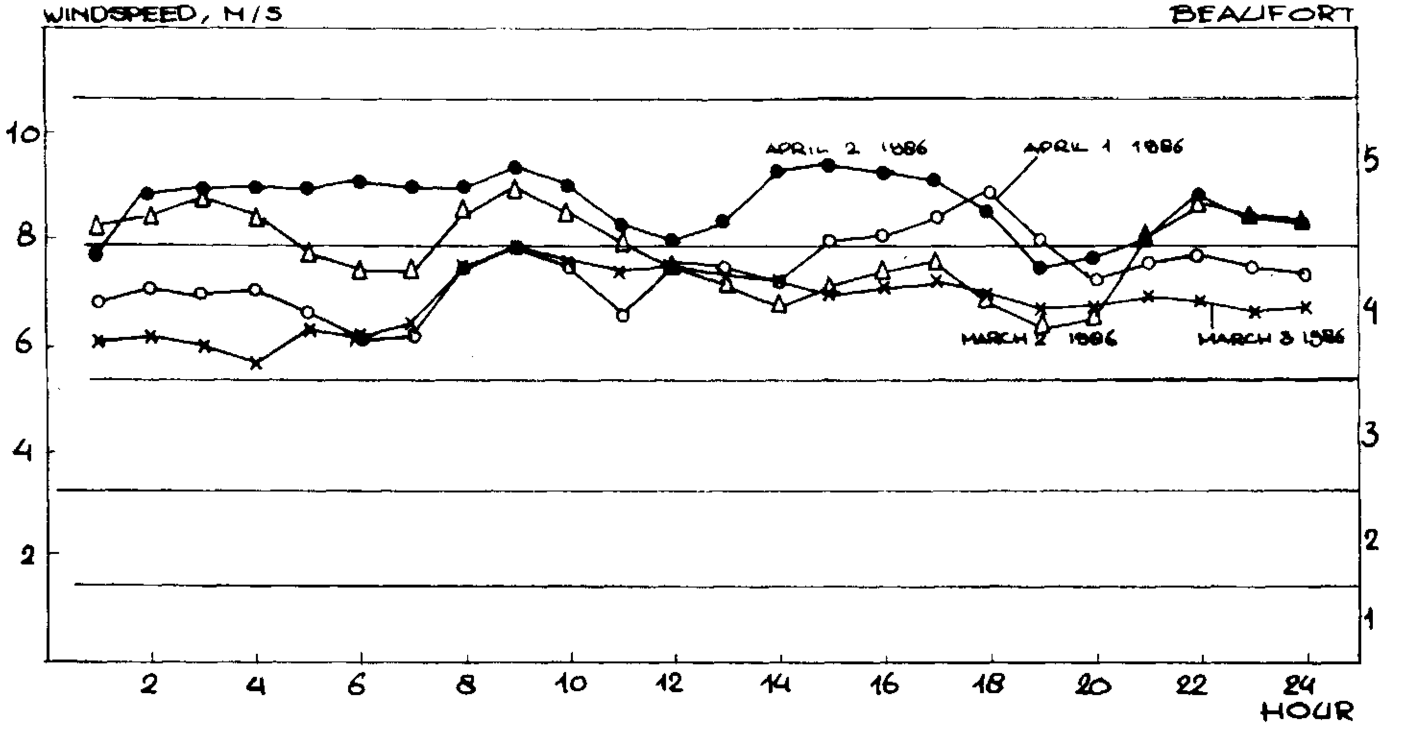


Figure 3.19. Mean wind speed (in m/s-left scale; Beaufort-right scale) per hour over four decades (10 March -21 April) in 1986.

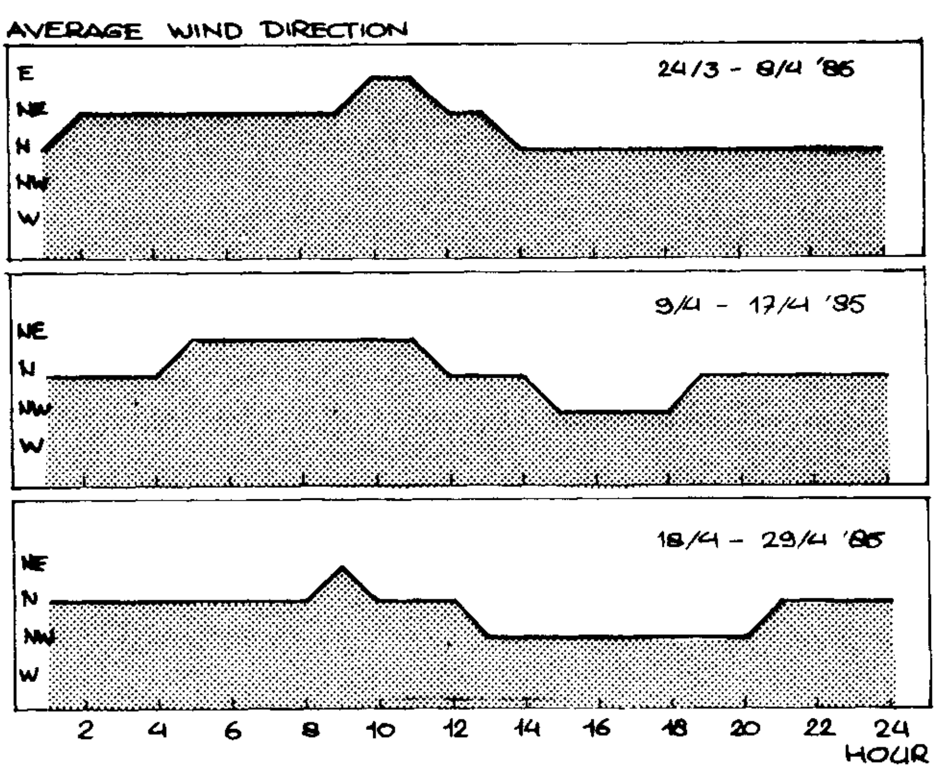


Figure 3.20. Average wind direction per hour over three registration period in 1985.

11 a.m.. No prevailing winds from the east were registered any more. A shift of wind direction at 3 p.m. towards the northwest resulted in an almost immediate drop of temperatures. During the third period in 1985 the wind changed towards the northwest already at 12 a.m., again resulting in a flow of relatively cool ocean air. For 1986 more or less comparable correlations can be found.

The diurnal pattern of changing humidity levels can often be correlated by the turning of the wind too. Wind from the northwest lead to the arrival of relatively wet air from the sea. However, not in all situations the turning of the wind alone can explain the humidity increase. Wind direction, wind speed and large scale meteorological patterns (the weather situation at the Atlantic Ocean) all play a part.

Chapter 3.5.1 describes the effects of the passage of high pressure areas, moving eastward north of Mauritania.

3.3.5 Precipitation

In 1985 one shower was recorded during the whole observation period. The phenomenon occurred on 14 March, from 0.30-0.45 a.m., and yielded 0.2 mm rain. In 1986 there were two showers on 10 February, lasting from 6.15-7.00 a.m. and 8.35-8.45 a.m., with some very light drizzle in the period in between. This extremely long lasting wet intermezzo, however, only yielded 0.1 mm of rain in total. Additionally there was rainfall in the night of 21-22 April from 10.20 p.m. until 2.30 a.m. and from 4.30-4.35 a.m. Though the drops were large, they were falling far apart. Therefore the shower yielded no registrable amount of rain.

3.3.6 Dust and sand storms

In this chapter a dust storm is defined as 'the air filled with light dust, allowing for a visibility of over 1 km'. During a sand storm larger particles are being transported on heavy winds, the visibility decreasing to less than 1 km. Dust and sand storms are difficult to record systematically, mainly because there is no obvious transition between clean air and dust storm. When sailing by ship along the Sahara, close to the coast, one can always see a yellowish brown foglike dustlayer over the Sahara. In the camp a severe dust or sand storm not only severely hampered the visibility and the normal daily routine but also solar radiation. On 11 April 1985 for instance, after a day with a severe sand storm, maximum temperatures were reached as late as around 4-5 p.m. by speeds over 8 m/s and a wind direction from either east or northeast. Days with dust storms and wind from north or northwest all had a maximum wind speed over 11 m/s.

3.4 Registrations at Iouik compared to those from Nouadhibou

Figure 3.22 shows maximum, mean and minimum temperatures for Nouadhibou Airport from 1952 to 1985. Maximum and minimum temperatures for February-April coincide rather well with those measured at Iouik. Mean temperatures in Nouadhibou, however, are somewhat lower. An explanation may be that the Atlantic Ocean and the Baie de Lévrier are almost completely encompassing the city, as a result of which the heating up of the area in the course of the day proceeds less rapidly. Especially in the second part of March and early April the morning winds in Iouik come from the northeast, i.e. parallel to the coast and partly from the Sahara. These winds contribute to a relatively quick heating up of the

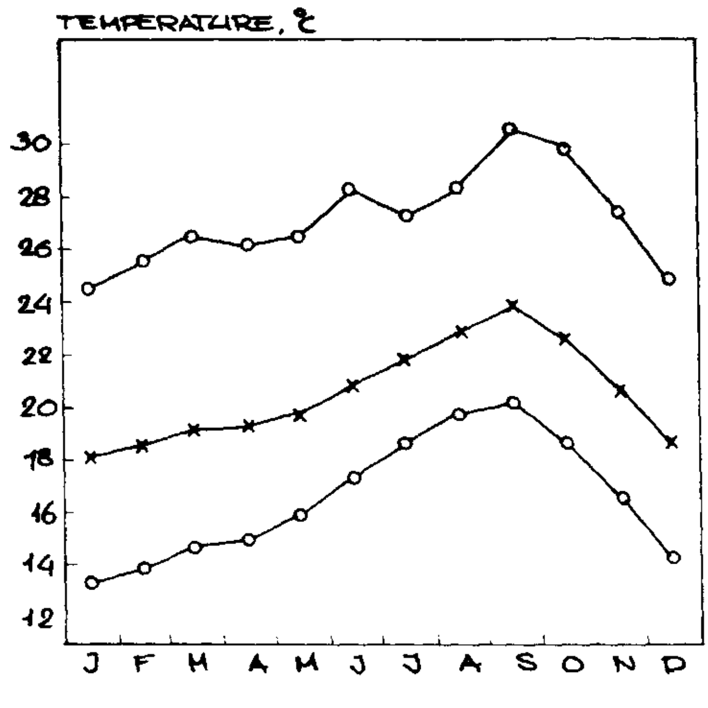


Figure 3.22. Mean minimum, mean maximum and mean temperatures (calculated over eight daily measurements) at Nouadhibou Airport in the course of the year. Minimum and maximum values were calculated for 1953-82, mean temperatures for 1961-85. Data: ASECNA, Exploitation Météorologique, Nouadhibou).

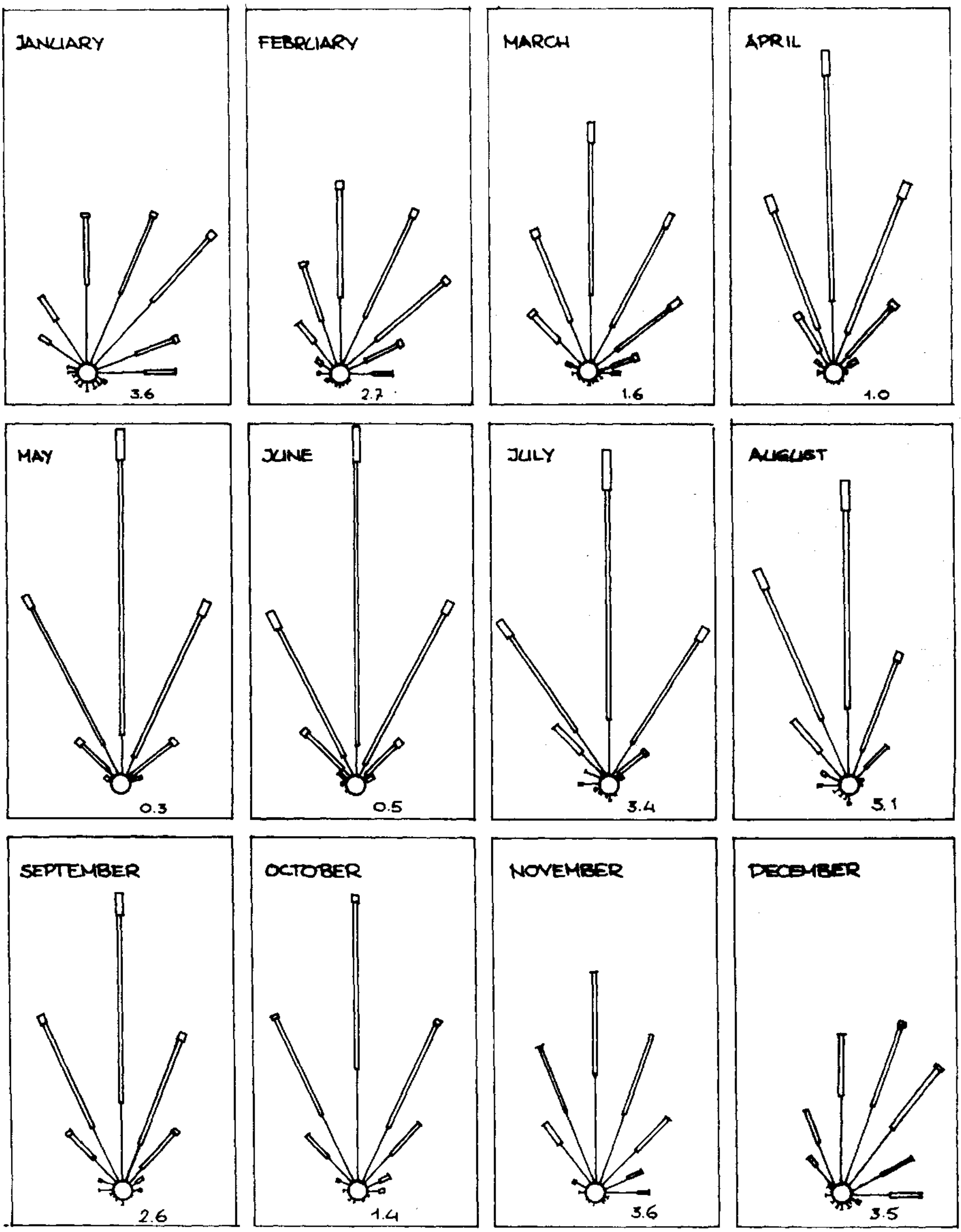


Figure 3.24. Frequency of wind directions throughout the year at Nouadhibou Airport. The length of the arms in the graphs depicts the percentage of time a certain wind direction has been measured, the width of the arms denotes wind speeds: narrow 1-6 m/s, moderate 7-13 m/s, wide $\geq$ 14 m/s. The figure in the centre denotes the percentage of time with wind silence. Data: ASECNA, Exploitation Météorologique, Nouadhibou.

Without the use of weather baloons it is almost impossible to gather data on wind direction and speed at higher altitude. For this reason such measurements have not been carried out at Iouik. In Nouadhibou however, such measurements have been done. Figure 3.25 shows frequency distributions of wind directions at 4 altitudes at 12 a.m. for the same period as our observations at Iouik. We can see a gradual shift in wind directions at higher altitudes. At a low level (100-150 m) winds from the north-northwest, north and north-northeast dominate highly. At 1800-2000 m, however, apart from winds from northerly directions, there are rather frequently winds from the southwest to the northwest. In April 1986 winds from this directions were even dominating! Unfortunately only very few registrations were carried out at 6 p.m.. The few data available only allow us to conclude that at low altitudes winds from the north-northwest

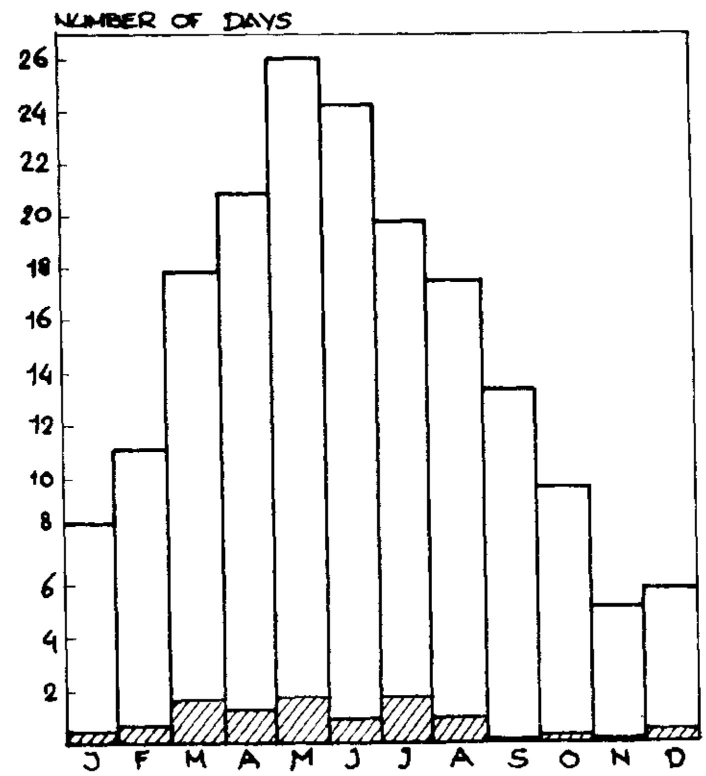


Figure 3.26. Mean number of days with light dust storms (visibility ≥ 1 km) and sand storms (visibility < 1 km, hatched) at Nouadhibou Airport from 1954-1985. Data: ASECNA, Exploitation Météorologique, Nouadhibou.

differences in weather from day to day along the Mauritanian coast.

Two examples, based on data from weather maps of the Deutscher Wattendienst, Offenbach, will be described:

On 8 April 1985 a high pressure area (1035 mbar) was found at the Atlantic Ocean, halfway between the American coast and the Canary Islands (35^{o} N, 50^{o} W). By that time the Banc d'Arguin was situated in a broad zone of relatively calm air with an atmospheric pressure of about 1013 mbar. During the following days the high pressure area slowly moved eastward, leading to a gradually increasing wind speed on the West African coast and increasing atmospheric pressure. On 11 and 12 April the centre of the high pressure area was situated over the Azores and even reached 1040 mbar, leading to north-northeast winds of 15 m/s on the Canary Islands and 25 m/s on the Cape Verdian Islands. On the Banc d'Arguin this weather situation led to dust and sand storms. On 13 April a low pressure area, coming from the Sahara, gradually spread out in northeast direction, leading to calmer weather conditions on the West African coast. On 14 April the Azores high pressure area only measured 1030 mbar, still slowly moving east. By 15 April it arrived in Northwest Spain, pushing the North African low pressure area towards the east too. From 17 April onwards another high pressure area at the centre of the Atlantic Ocean started going the same direction but appeared to follow a more southerly route in the following days. Because of its different route and lower maximal pressure (about 1030 mbar) the effects on the Banc d'Arguin were well notable (rather strong winds from the north) but not as intense as during the passage of the high pressure area the week before. By 22 April it had lost some pressure (1020 mbar) and was situated west of the Canary Islands, a day later it started to expand due to which wind speeds gradually dropped on the West African coast.

The extraordinary dip in atmospheric pressure from 21-28 February 1986 is explained by the rather northerly passage of a high pressure area. On 21 February a large high pressure area of over 1020 mbar was situated west of the Canary Islands. Two days later it had settled over Morocco and southern Spain, leading to rather low pressure at its southern range and easterly winds. At the same time a low pressure area of less than 1010 mbar over Central Africa was spreading northward. By this time on the whole Central Atlantic 1010-1015 mbar was measured. On 25 February the low pressure zone had moved even further north, the high pressure zone over North Africa losing much of its power and breaking up into

4. HYDROGRAPHICAL MEASUREMENTS

Cor J. Smit, Anne-Marie Blomert, André Meijboom, Wim J. Wolff
& Leo Zwarts

4.1 Introduction

Though information on the moments of high and low water and predictions on tide levels is permanently available for Dakar, Senegal (Admirality Tide Tables), only limited information on tidal parameters for the Banc d'Arguin was available. In the literature only the shape of one tidal curve, based upon measurements during 12 hours was available for Iouik, next to a map showing cotidal lines for part of the Banc d'Arguin

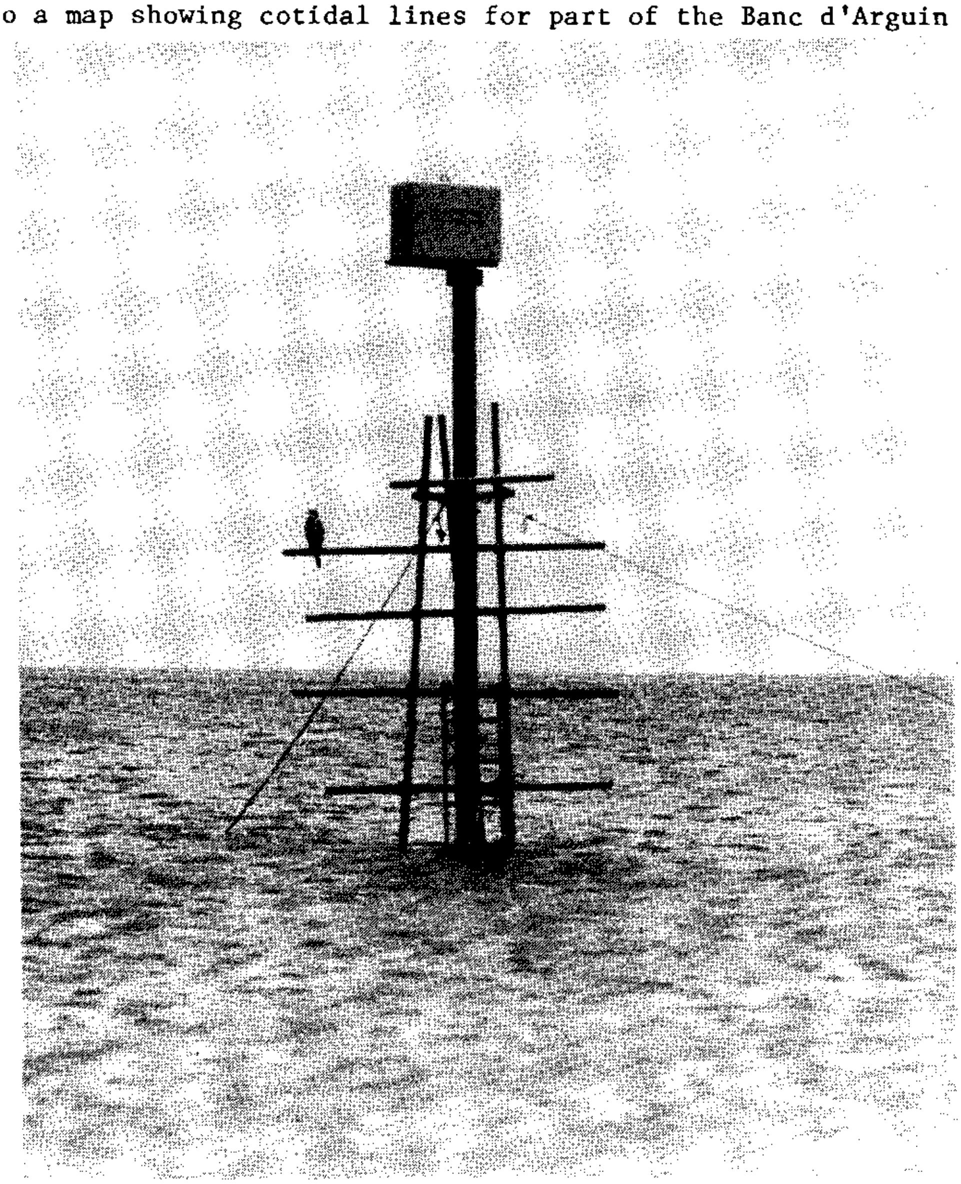


Figure 4.1. Ott tide registration device mounted on a hollow pipe on the edge of the channel close to the Iouik camp. The small ladder was often used by roosting Reed Cormorants Phalacrocorax africanus.

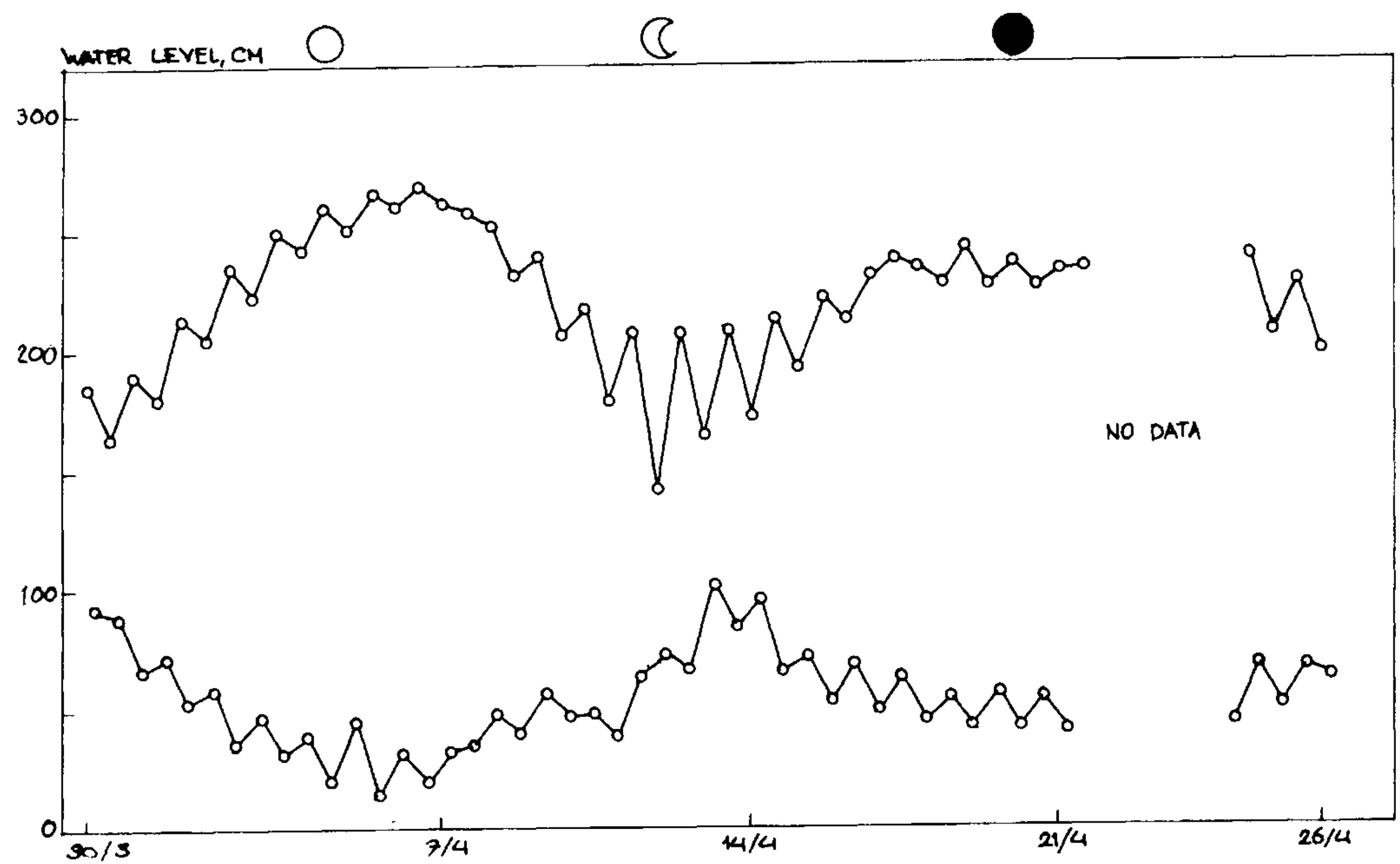


Figure 4.3. Successive registrations of tide levels during high tide (upper curve) and low tide (lower curve) in the course of time during the 1985 registration period. Symbols in the top part denote moon phases, indicating full moon and new moon.

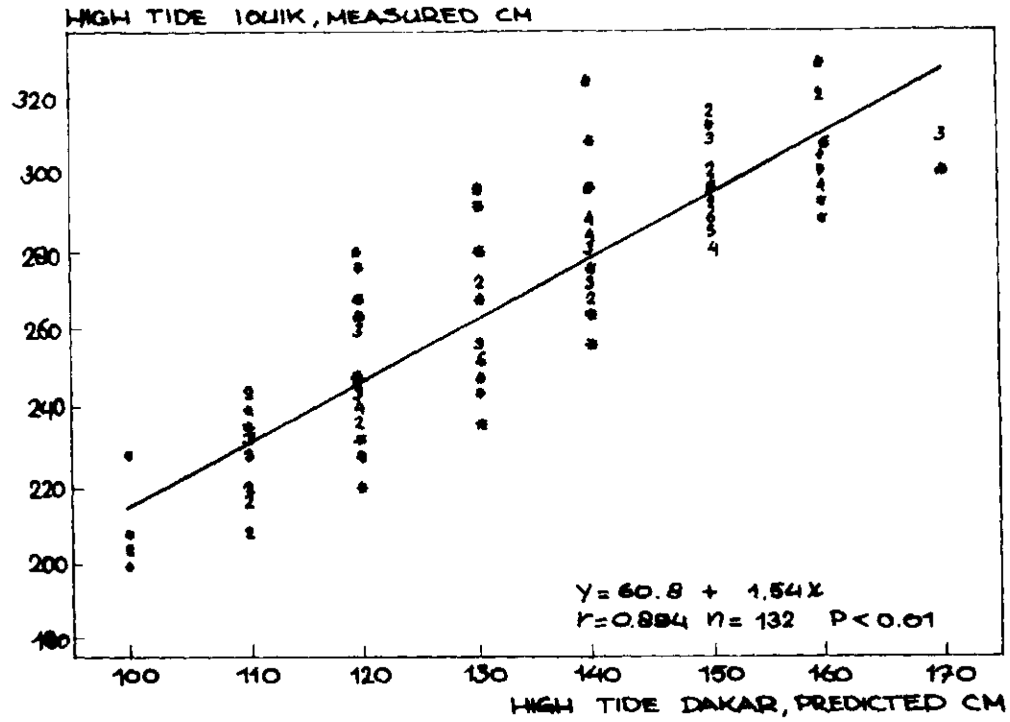


Figure 4.5. Measured water levels at high tide in Iouik (cm) in relation to the predicted water levels in Dakar, Senegal (cm) from 12 February - 21 April 1986.

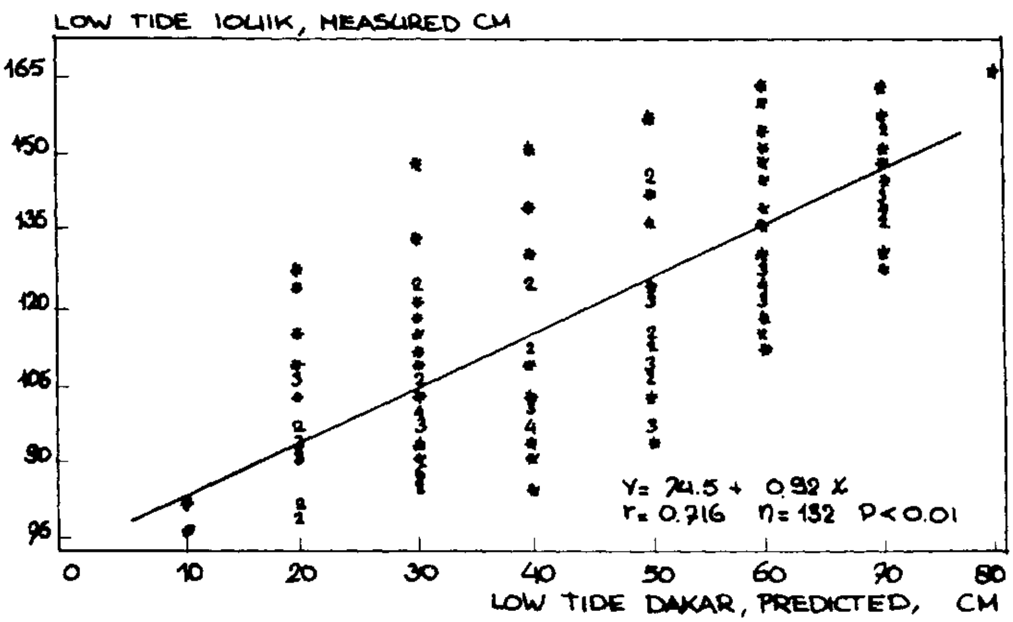


Figure 4.6. Measured water levels at low tide in Iouik (cm) in relation to the predicted water levels in Dakar, Senegal (cm) from 12 February - 21 April 1986.

pen. Registrations were made continuously on rotating sheets of paper, the running speed of which is steered by a clock. The final result of the measurements consists of a graph showing continuous registrations of water levels in the course of time.

Seawater temperature was measured with hydrographical thermometers with an accuracy of 0.1 ^{o}C. These were equipped with a small container to store a certain amount of sea water to allow for correct temperature reading. Temperatures at Iouik generally were taken 2-4 times daily, standing kneedeep in the water of the channel close to the Iouik camp. On some days temperatures were taken more frequently to analyse the influence of the tides and air temperature.

Observations at other stations were made from a small boat. Temperature measurements were made with an hydrographical thermometer which was moved through the water at about 0.4 m depth. Temperature readings were made after 1 min.

Sea water samples were collected in polyethylene,bottles thoroughly rinsed with sea water before collecting the samples. The bottles were closed very tightly and transported to the Netherlands where Mr. R. Manuels (Netherlands Institute for Sea Research) carried out the salinity determinations. To this end the samples were diluted with an equal quantity of distilled water (accuracy $\pm$ 0.01 g) after which salinity was determined by measurement of conductivity. The salinity thus determined was multiplied by a factor 2. All measurements were carried out at least in duplo.

4.3 **Results**

4.3.1 Tides

An example of two 24 hours graphs of tide levels is given in figure 4.2. The curve is a typical example of semi-diurnal ocean tidal curve. This is somewhat surprising, considering the fact that the tidal current, coming from the south is blocked by the island of Tidra and has to go about a long way to reach Iouik from the northwest. Apparently the tidal channels between Iouik and the open ocean are wide enough to allow the tidal water masses to flow in and out unhampered. There is an obvious difference in tide height between spring tide (open symbols) and neap tide (dots) as well as generally there is a difference in tide heights between two succeeding high and low tides. This difference, the dissimilarity of the diurnal tide, also appears from figures 4.3 and 4.4 showing the in the measured data, especially for low tides. Using figures 4.5 and 4.6 both high and low tides, the low water level at Iouik can be predicted with an accuracy of c. 30 cm (being the range of deviations from the mean), though in most cases with a higher accuracy. Evidently wind is a factor influencing the tide height at Iouik. An analysis of the difference between the prediction for Dakar and the measured value for Iouik, in relation to wind speed and wind direction shows that winds from western directions generally yield somewhat higher water levels in Iouik as predicted. On the other hand winds from easterly directions generally lead to somewhat lower water levels. Our analysis however also does not fully explain the differences we encountered.

The moment of high tide in Iouik on average lags 4 hours and 55 minutes behind Dakar (mean over 133 high tides from 12 February and 21 April 1986). For low tides the time lag amounts to 5 hours and 3 minutes (mean over 133 low tides in the same period). Figure 4.7 demonstrates that around full and new moon the time lag is somewhat larger, both for high water and for low water. For periods around half moon the time lag is relatively short. For high tides around spring the time lag amounts to 5.07 hours (mean over 40 high tides), for high tides around neap tide the time lag is 4.43 hours (n=51). For low tides the figures are 5.24 hours (n=45) and 4.49 hours (n=48) respectively.

4.3.2 Seawater temperatures

Water temperatures in the channel close to the Iouik camp show a gradual increase in the course of the season, starting from approximately 19°C by mid February to about 21°C by mid April. Figure 4.8 clearly shows this increase. At the same time this graph demonstrates that the increase in water temperature coincides to some extent with the air temperature increase. Because of the relatively slow heating up of the water, a sudden increase in air temperatures is not immediately reflected in water temperatures. The same applies for an air temperature decrease but the course of air temperatures is well reflected in water temperature changes.

Apart from changes in seawater temperature during the whole observation period there are notable differences in the course of the day. Figure 4.9 shows an increase in water temperatures as soon as morning sun heats up the water of the channel. The highest water temperatures are measured from 12 a.m. onwards. The best conditions for

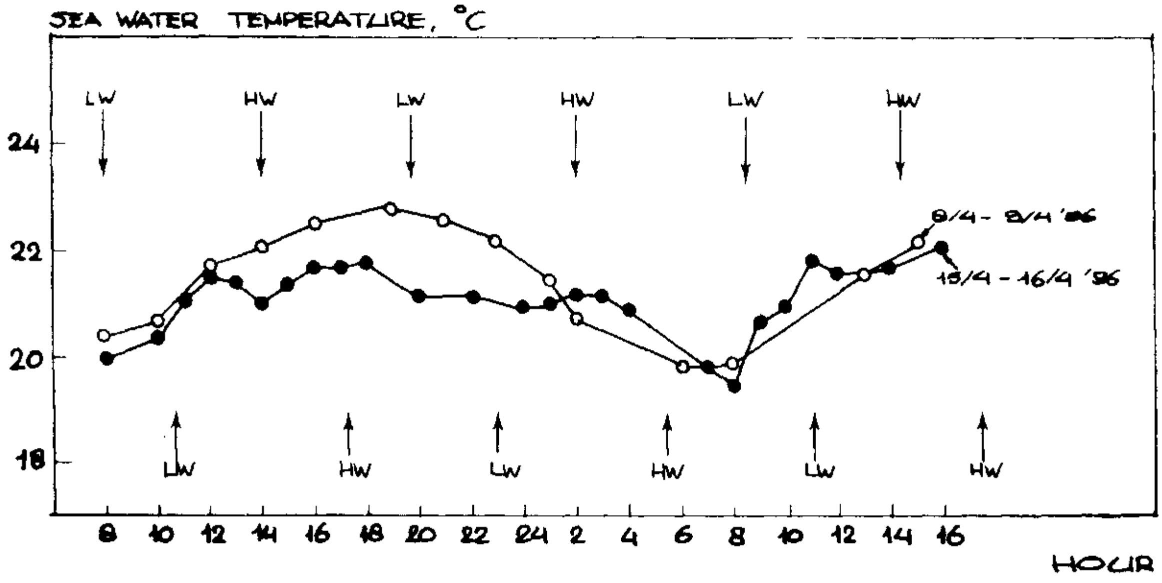


Figure 4.10. Sea water temperatures in the channel near the Iouik camp on 8/9 April 1986 (open circles) and 15/16 April 1986 (dots) in relation to high water (hw) and low water (lw).

taking a refreshing but not unpleasant bath are between 1 and 4 p.m. Somewhat later during the day declining air temperatures turn bathing to be less agreable. During the night seawater temperatures may drop considerably though figure 4.10 demonstrates this is not necessarily the case. Figure 4.10 shows successive seawater temperatures in two days in relation to high and low tide. On 15 April the temperature in the channel at 8 a.m. amounted to 20°C (lower graph). As a result of an increasing air temperature in the course of the day, the water temperature in the channel decreased as well, until about 1 hour after low water. By then somewhat colder water from the large tidal inlet west of Iouik came in, causing a temporary drop in water temperatures. Maximum air temperatures on this day were measured between 12 a.m. and 3 p.m. and amounted to 26.4°C. These temperatures resulted in a renewed warming up of the channel water. Due to the fact that air temperatures during the night only slightly dropped to 21°C, the water temperature did not decrease as well. On the contrary, the incoming high tide even allowed for a slight increase at 2 a.m. in the morning of 16 April. Minimum air temperature in the early morning was 18.3°C. These relatively low air temperatures in the early morning at the same time resulted in a gradual cooling off of the channel water on 16 April, from 8 a.m. onwards the course of the

4.3.3 Salinity

Table 4.1 summarizes all observations. Figure 4.11 presents a general picture of the distribution of salinity in the vicinity of Iouik in April 1986. Figure 4.12 gives the results of two series of observations in the main channel of the Baie d'Aouatif.

Earlier observations on temperature and salinity of the Banc d'Arguin have been published by Reyssac (1977) and Sevrin-Reyssac (1982, 1984). These may be summarized as follows. In the offshore areas salinities are about 35-36°/oo S. In the area around Arel values of about 38°/oo occur, whereas close to the shore (e.q. near Iouik and Teichot) values over 40°/o occur. In hydrographically isolated waters, such as the Baie de St.

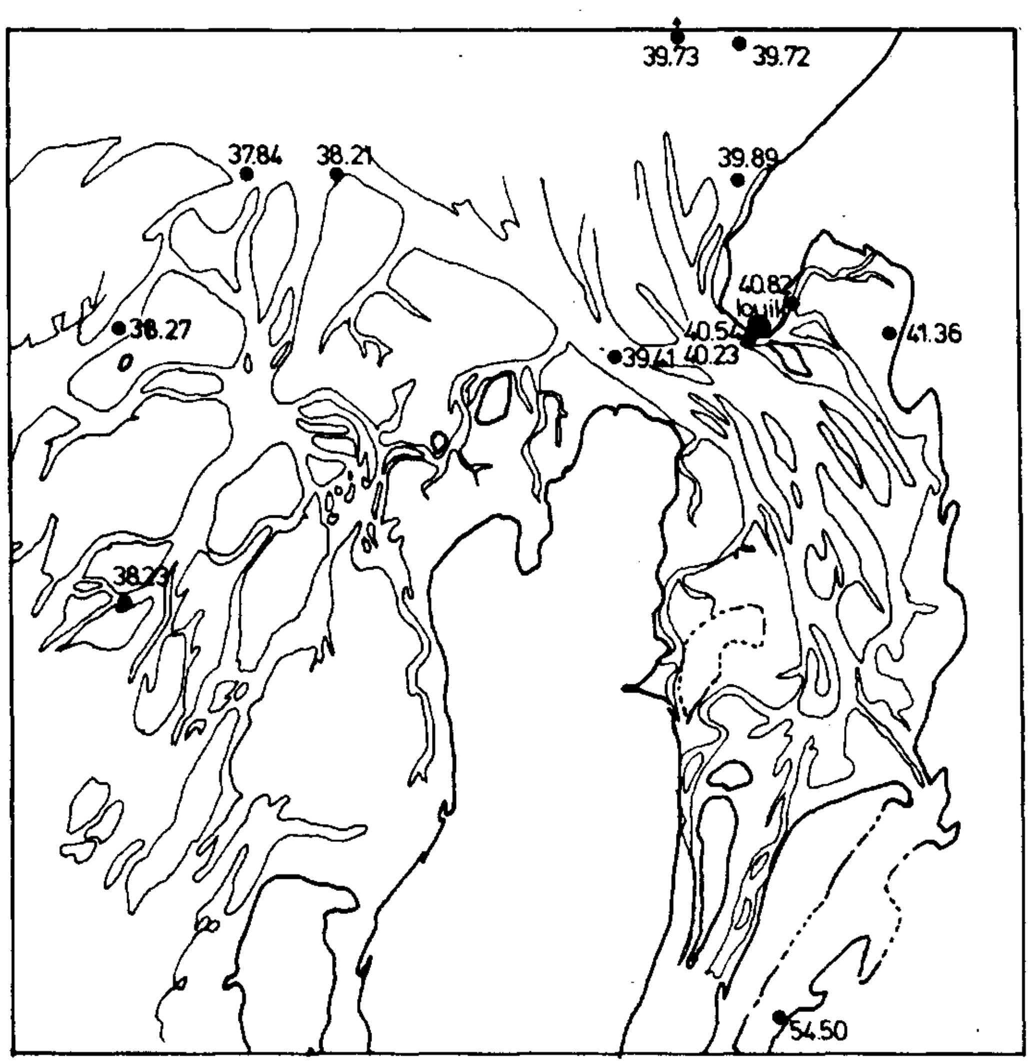


Figure 4.11. Salinity (o/oo) in tidal channels.

5. WADER AND WATERBIRD COUNTS 1985

Theunis Piersma, Abou Gueye & Cheikhna Mbaré

During the expedition several counts of the waders and waterbirds of certain areas were made. Both on the Presqu'ile de Cap Blanc near Nouadhibou and in the Baie d'Aouatif and surroundings near Iouik, counts were performed. Figure 5.1 shows the counting trajects in the Baie d'Aouatif and figure 5.2 the delineation of the counting trajects on Presqu'il de Cap Blanc. It should be clear that on Presqu'ile de Cap Blanc not all areas where waders could possibly occur, were covered. The northern part of the Baie de l'Etoile, and the beaches near La Guera on the west side of the peninsula, for example, were not visited during the counts. The results of the wader counts are presented in tables 5.1 to 5.8 and the results of the waterbird counts in tables 5.9 to 5.16.

Table 5.1 summerizes the results of the three counts in the Baie d'Aouatif and compares these with the results of an earlier count of the same area, in January 1980 (Altenburg et al 1982). It was encouraging to discover that the total number of 141,000 waders and also the breakdown in different species is comparable between the January 1980 and the March 1985 count. Encouraging, because this suggests both some constancy in wader populations, consistency between the counts and only limited departure of waders to the north before we (finally!!) arrived on the study site. In spring 1985, the total numbers of waders steadily declined. One of the counting trajects (VI, the Northwest Bay or Ebelk Aiznai in Hassania) was counted more frequently during the study period (Table 5.2; see also Table 5.17 for data from 1986), but wader numbers showed the same general trends there.

The counts on the Presqu'ile de Cap Blanc were made just before and just after the period of stay at Iouik, and therefore yield data on

Table 5.1. Results of the high tide counts of waders in the Baie d'Aouatif and surroundings in spring 1985. For comparison, the results of the high tide count of the same area by Altenburg et al. (1982) in January 1980 are also listed.

	19 January 1980	24 March 1985	17 April 1985	25 April 1985	Departed 24 March-25 April in %
Oystercatcher	4987	1065	275	393	- 63%
Avocet	0	0	4	0	-
Ringed Plover	11053	4522	3555	2928	- 35%
Kentish Plover	870	1383	850	456	- 67%
Grey Plover	2231	1253	1921	1702	+ 36%
Knot	40560	45513	40754	19028	- 58%
Sanderling	978	479	520	938	+ 96%
Little Stint	703	3122	5052	4345	+ 46%
Curlew Sandpiper	8385	4412	13633	5164	+ 17%
Dunlin	43427	56085	22163	31845	- 43%
Bar-tailed Godwit	32107	18518	14578	13312	- 28%
Whimbrel	612	245	476	244	0%
Curlew	358	320	52	0	-100%
Redshank	3552	2978	965	699	- 77%
Greenshank	486	54	148	237	+339%
Common Sandpiper	0	0	0	17	-
Turnstone	1539	640	1016	758	+ 18%
Total	151848	140589	105912	81983	- 42%

Table 5.2. Results of the high tide counts of waders in Ebelk Aiznai (the Northwest Bay, area VI) in spring 1985. On 14 April only the Bar-tailed Godwits were counted here: 2304 individuals. + = present, but not counted. The count of 7 May was kindly made available by Pierre Campredon.

	24 March	3 April	16 April	22 April	24 April	27 April	7 May
Oystercatcher	49	116	34	130	45	75	109
Ringed Plover	540	264	344	221	180	400	330
Kentish Plover	15	90	13	+	60	5	102
Grey Plover	325	127	400	646	385	232	321
Knot	10830	8383	9080	6326	6200	3500	3191
Sanderling	30	50	104	495	55	322	160
Little Stint	100	60	375	700	350	315	140
Curlew Sandpiper	300	195	3210	608	700	695	1082
Dunlin	3700	3220	2375	2560	2200	2422	1437
Bar-tailed Godwit	1282	2275	2507	1410	1525	822	760
Whimbrel	+	+	271	210	34	190	129
Curlew	70	3	1	3	0	0	0
Redshank	51	200	191	14	+	68	55
Greenshank	0	10	1	0	0	60	181
Common Sandpiper	0	0	0	0	0	0	3
Turnstone	21	24	193	201	?	158	63

Table 5.5. Results of the high wader counts on 25 April 1985 in the Baie d'Aouatif and surroundings. See figure 5.1 for delineation of the 7 counting trajects.

	Traject							
	I	II	III	IV	V	VI	VII	total
Oystercatcher	58	27	28	95	9	45	131	393
Ringed Plover	173	340	1410	546	99	180	180	2928
Kentish Plover	30	38	150	160	18	60	0	456
Grey Plover	174	173	626	285	9	385	50	1702
Knot	2800	250	6938	2290	0	6200	550	19028
Sanderling	46	10	510	192	45	55	80	938
Little Stint	850	580	850	1620	55	350	40	4345
Curlew Sandpiper	560	604	660	1980	10	700	650	5164
Dunlin	7400	4510	7700	8215	280	2200	1540	31845
Bar-tailed Godwit	1600	370	3480	4052	5	1525	2280	13312
Whimbrel	66	41	69	21	8	34	5	244
Curlew	0	0	0	0	0	0	0	0
Redshank	30	5	275	8	0	378	3	599
Greenshank	30	0	150	27	0	0	30	237
Common Sandpiper	0	1	16	0	0	0	0	17
Turnstone	22	33	190	43	263	140	67	750
Total								81983

Table 5.6. Results of the wader counts of part of the Presqu'île de Cap Blanc (see figure 5.2) on 15 March 1985.

	Ia	IIa	IIb	IIIa	IIIb	Total	Total
Hour	11-13	13-17	16-18	10-13	17-19		
Tide	low	after low	before high	low	high	a	b
Stone Curlew	0	0	0	20	35	20	35
Oystercatcher	32	16	27	35	54	94	81
Little Ringed Plover	0	0	0	2	5	2	5
Ringed Plover	76	6	51	279	320	351	371
Kentish Plover	52	5	103	8	10	65	113
Grey Plover	66	89	67	25	10	180	77
Knot	180	30	180	82	15	292	195
Sanderling	72	1357	1869	74	195	1503	2059
Little Stint	0	0	25	0	0	0	25
Curlew Sandpiper	0	0	2	0	0	0	2
Dunlin	597	0	50	64	28	661	78
Ruff	0	0	0	0	1	0	1
Black-tailed Godwit	0	0	0	1	1	1	1
Bar-tailed Godwit	341	35	124	99	110	475	234
Whimbrel	48	1	1	12	10	61	11
Curlew	14	1	2	2	12	17	14
Redshank	59	0	1	1	1	61	2
Greenshank	0	0	1	12	21	12	22
Wood Sandpiper	0	0	2	0	0	0	2
Common Sandpiper	4	0	1	6	6	10	7
Turnstone	88	21	19	112	104	221	123
Total						4026	3467

Table 5.9. Results of the high tide counts of waterbirds in the Baie d'Aouatif and surroundings in spring 1985. For comparison, the results of the count of the same area in January 1980 (Altenburg et al. 1982) are also listed.

	19 January 1980	24 March 1985	16/17 April 1985	24/25 April 1985
Cormorant	253	308	158	287
Long-tailed Cormorant	875	920	483	471
White Pelican	20	0	6	13
W. Reef Heron (blue)	101	53	75	217
Little Egret (white)	45	11	0	
Grey Heron	186	172	104	83
Spoonbill	191	1043	843	-
Greater Flamingo	360	480	424	491
Black-headed Gull	12	6	0	1
Grey-headed Gull	45	22	82	26
Slender-billed Gull	218	713	2435	1666
Lesser Black-backed Gull	814	25	8	4
Gull-billed Tern	8	0	107	191
Caspian Tern	391	10	5	234
Royal Tern	114	360	734	258
Sandwich Tern	4	0	8	1
Common Tern	0	30	162	129
Bridled Tern	0	0	0	2
Little Tern	14	0	43	62
Black Tern	0	0	2	0

Table 5.10. Results of the count of waterbirds in the Baie d'Aouatif and surroundings on 24 March 1985. See figure 5.1 for delineation of the 7 counting trajects. On traject II no birds were noticed.

	Traject						
	I	III	IV	V	VI	VII	total
Cormorant	0	0	18	0	90	200	308
Long-tailed Cormorant	0	0	0	0	320	600	920
W. Reef Heron (blue)	2	0	0	1	15	35	53
Little Egret (white)	1	0	0	0	7	3	11
Grey Heron	40	0	26	0	60	46	172
Spoonbill	95	0	48	0	200	700	1043
Greater Flamingo	260	122	13	0	65	20	480
Black-headed Gull	0	0	0	6	0	0	6
Grey-headed Gull	1	0	0	4	2	15	27
Slender-billed Gull	17	0	7	139	0	550	713
Lesser Black-backed Gull	0	0	25	0	0	0	25
Caspian Tern	0	0	0	0	10	0	10
Royal Tern	0	0	0	0	70	290	360
Common Tern	0	0	0	0	30	0	30

Table 5.13. Results of the high tide counts of waterbirds in Ebelk Aiznai (the Northwest Bay, area IV) in spring 1985.

	24 March	16 April	22 April	24 April	27 April	7 May
Cormorant	90	16	95	20	40	72
Long-tailed Cormorant	320	138	260	60	30	198
W. Reef Heron (blue)	15	4	4	0	0	2
Little Egret (white)	7	0	0	0	0	0
Grey Heron	60	23	4	5	14	4
Spoonbill	200	28	8	17	34	25
Greater Flamingo	65	51	60	70	73	167
Grey-headed Gull	2	0	1	0	0	0
Slender-billed Gull	0	21	31	?	0	20
L. Black-backed Gull	0	0	0	?	1	0
Gull-billed Tern	0	0	4	?	+	21
Caspian Tern	10	0	1	?	0	6
Royal Tern	70	204	28	?	40	32
Sandwich Tern	0	6	0	?	3	17
Common Tern	30	130	120	?	6	70
Little Tern	0	39	52	?	49	51
Black Tern	0	2	0	?	0	31

Table 5.14. Results of the counts of of waterbirds of part of the Presqu'île de Cap Blanc (see figure 5.2) on 15 March 1985.

	Ia	IIa	IIb	IIIa	IIIb	Total	Total
Hour	11-13	13-17	16-18	10-13	17-19		
Tide	low	after low	before high	low	high	a	b
Cormorant	0	23	11	7	6	30	17
Cattle Egret	0	0	0	6	0	6	0
W. Reef Heron (blue)	0	0	0	1	1	1	1
Little Egret (white)	10	1	1	2	1	13	2
Grey Heron	10	9	6	33	36	52	42
Spoonbill	16	1	0	12	12	29	12
White Stork	0	6	6	0	0	6	6
Greater Flamingo	12	0	0	31	31	43	31
Black-headed Gull	0	0	0	42	120	42	120
Slender billed Gull	0	0	61	20	254	20	315
L.Black-backed Gull	0	362	270	178	420	540	690
Caspian Tern	2	63	52	74	39	139	91
Royal Tern	0	16	1	8	0	24	1
Sandwich Tern	0	8	91	12	10	20	101
Common Tern	0	2	0	8	0	10	0

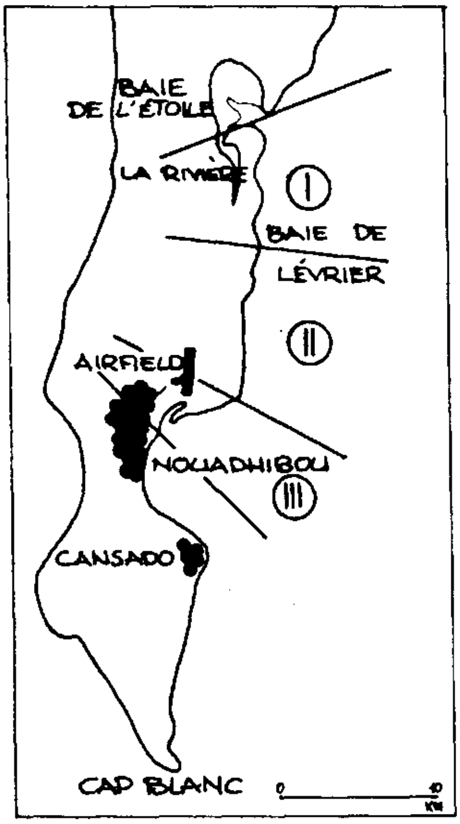


Figure 5.2. Map of Presqu'île de Cap Blanc indicating the counting transects I, II, and III.

Table 5.17. Results of some incidental high tide counts in the Northwest Bay in February 1986.

Species	8 February	13 February	22 February
Oystercatcher	220	210	287
Ringed Plover	485	700	649
Kentish Plover	?	21	30
Grey Plover	269	642	115
Knot	5600	2750	3500
Sanderling	289	295	189
Little Stint	?	300	164
Curlew Sandpiper	520	440	500
Dunlin	4025	1950	4600
Bar-tailed Godwit	4100	2190	?
Whimbrel	400	8	511
Curlew	42	80	73
Redshank	490	67	41
Greenshank	7	13	1
Turnstone	148 (12 Feb.)	69	57

the wind had dropped below 8 m/sec and visibility was good, strong migration was observed again. Also on the following three out of four days with windforce below 8 m/sec migration was seen. From 19 April onwards the wind speed was 10-12 m/sec for seven days. During this period however only a slight drop of the wind, especially in the afternoon gave rise to migration activities. On 21 and 22 April the wind dropped to 8-9 m/sec for three, respectively five hours. On 25 April the wind dropped to 10 m/sec from 6.00 h to 19.00 h. This slight improvement gave rise to massive departure.

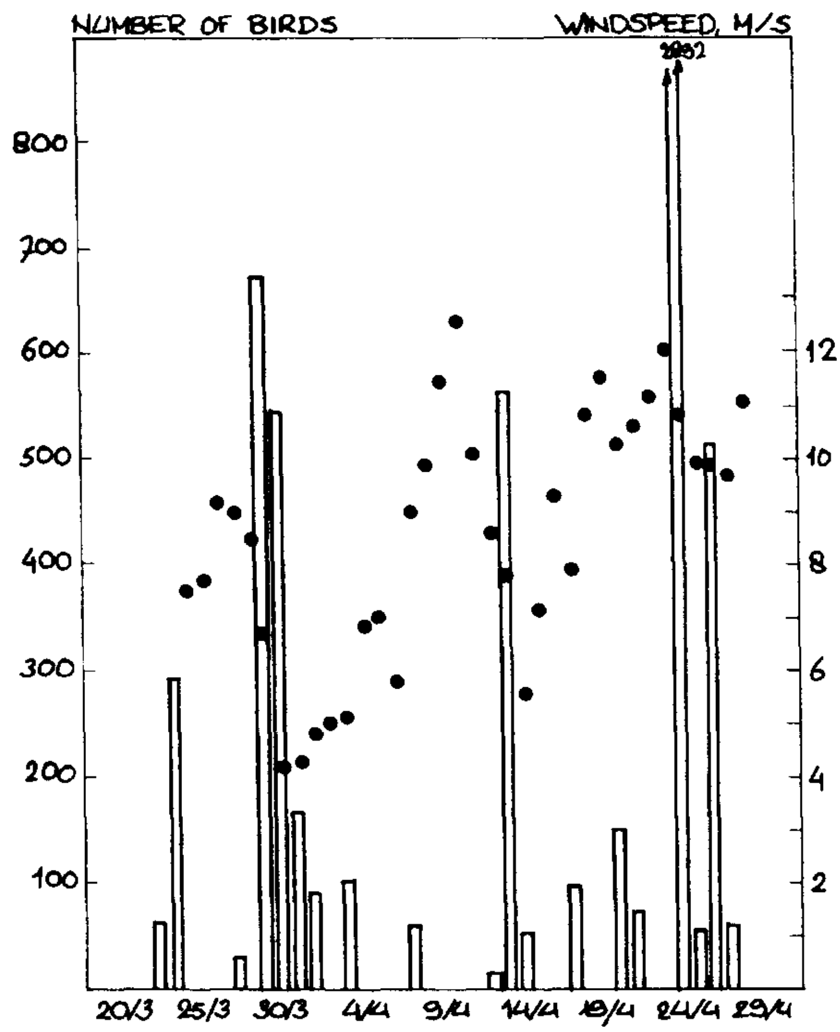


Figure 6.1. Number of birds leaving in northerly direction from Baie d'Aouatif and Northwest Bay (columns) and strength of the wind (m/sec) on these days (dots).

The impression is that not so much the windforce by itself kept birds from migrating. Usually a few days with increasing windspeed and especially impaired visibility by sandstorms like on 10, 11, 12 and 24 April, followed by better weather conditions in comparison would give rise to strong migration, especially the first day after the weather leaving is related well to the number of flocks. This is in contrast with the situation between 15.00 h and 17.00 h when birds left in large numbers in only a few flocks or only a few left in several flocks (Fig. 6.2).

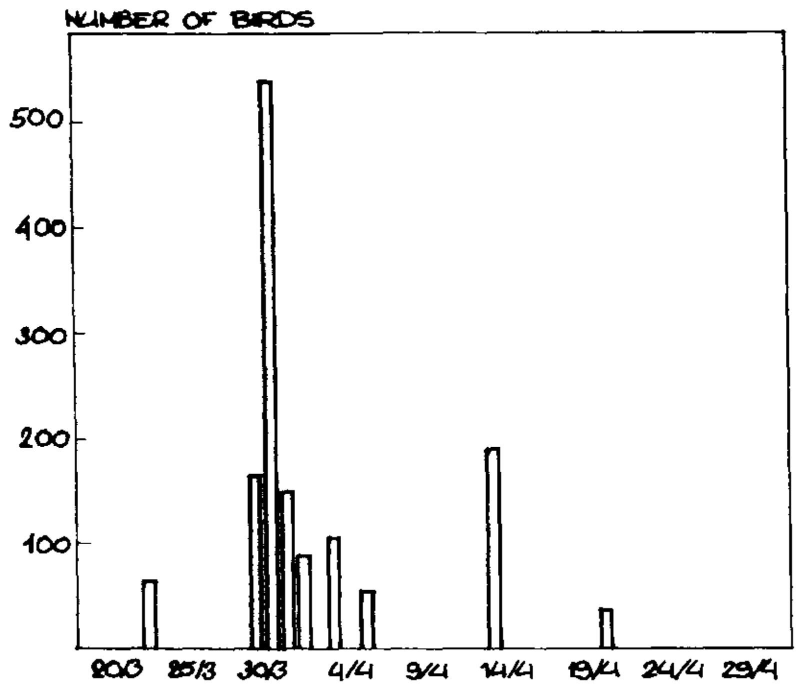


Figure 6.3. Numbers of Oystercatchers leaving in northerly direction from the Baie d'Aouatif and the Northwest Bay.

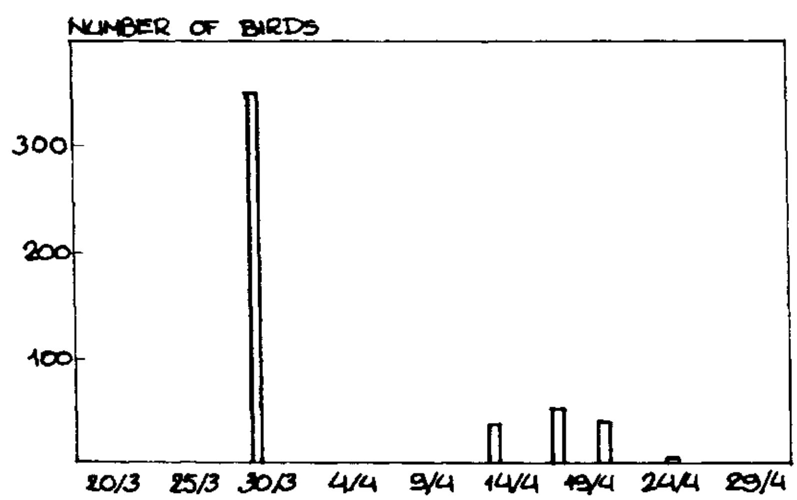


Figure 6.4. Numbers of Redshank leaving in northerly direction from the Baie d'Aouatif and the Northwest Bay.

Table 6.1. Data of waders leaving Mauritania from other sites than the Northwest Bay or the Baie d'Aouatif.

Date	Place	Time	Species	Number	Direction
4 April	Nouadhibou	11.00	Redshank	20	N
6 April	Nair	17.30	Oystercatcher	55	N
		17.45	Curlew	12	N
20 April	Nair	17.50	Turnstone	242	N
21 April	Nair	16.30	Bar-tailed Godwit	20	N-NE
		16.45	Bar-tailed Godwit	30	N-NE
		17.10	Bar-tailed Godwit	40	N-NE
		17.45	Bar-tailed Godwit	26	N-NE
		17.45	Whimbrel	60	N-NE
1 May	Ile d'Arguin	16.30	Bar-tailed Godwit	160	N-NW
		17.25	Dunlin	405	N-NW
			Knot	100	N-NW
			Bar-tailed Godwit	170	N-NW
		17.35	Dunlin	20	N-NW
10 May	Nouadhibou	15.00	Knot	30	N
		17.05	Ringed Plover	12	N

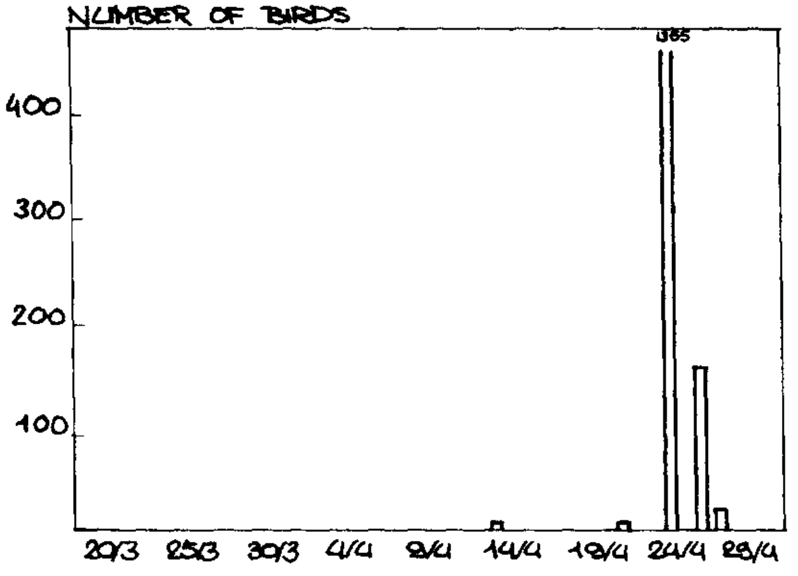


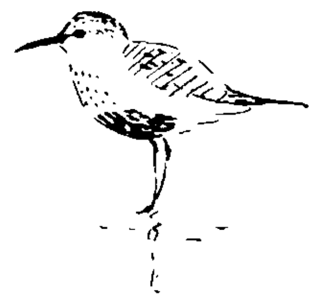
Figure 6.7. Numbers of Bar-tailed Godwits leaving in northerly direction from the Baie d'Aouatif and the Northwest Bay.

relation between the decrease in numbers and the intensity of the visible migration was very clear (Table 6.2, Fig. 6.3 and 6.4). The numbers of Redshank for example decreased rapidly between the end of March and mid April. During this period the numbers of birds which were noted to be leaving were higher than between the middle and the end of April when numbers decreased only a little. The same probably is true for Grey Plovers. However we did not perform a high tide count after 25 April to show the probable decrease in numbers after the strong migration on this date (Fig. 6.5).

In some species the decrease in numbers is rarely or not always accompanied by visible migration. In Kentish Plovers, Little Stints, Curlew Sandpipers and Turnstones only one migration observation was noted for each of them (Table 6.2). In Kentish Plovers and Curlew Sandpipers numbers decreased by two thirds between two or three high tide counts. Numbers dropped significantly in Whimbrels and especially Knots and Bar-tailed Godwits at a time with only very few visible signs of migration, while this could be very obvious at other times: on 25 April 319 Knots, 1355 Bar-tailed Godwits and 105 Whimbrels were seen to leave. In the preceeding month only 189, 5 and 35 (Fig. 6.6 and 6.7).

In Ringed Plovers and Dunlins (Fig. 6.8) a strong decrease in numbers was not accompanied by strong visible migration. Especially for these two species this is in contrast with experiences in Morocco, where they gave most frequent notes on migration (Van Brederode et al., in prep.). Especially in Dunlins the different situation at night might have been important, because at Sidi Moussa 72% (n=95) of the migrating flocks were heard at night, for Ringed Plovers this was 31% (n=39) (Van Brederode et al., in prep.). The high tide counts show that migration was present as well (Table 6.2). In some species like Oystercatcher, Grey Plover, Dunlin, Bar-tailed Godwit and Greenshank (Fig. 6.9) in which visible migration can be very obvious, very few or no birds were seen leaving while their numbers increased, so the influx of birds could exceed the numbers of birds leaving. In Oystercatchers, at the time in which immigration occurred, visible migration was clearly less than at the time between the first and the second high tide count when numbers decreased.

Other species in which numbers increased like in Curlew Sandpipers, Little Stints, Sanderling and Turnstones visible migration was infrequent anyway. Birds leaving from the Baie d'Aouatif and the Northwest Bay were heading north or northwest, so at least when starting off they were



7. WADER CATCHES

Piet Duiven & Theunis Piersma

7.1 Methodology

Normally speaking this should be a continuous story of cannon net catches of huge numbers of waders. As had been described in the project proposal 'large catches should be attempted in March, early April and the end of April'. Enthusiastic informations by observers with good acquaintance with the local situation made that we had good hope to realise catches of large numbers indeed. For this aim we had taken four cannon nets with us. Two sets of the type that is being used by the Wash Wader Ringing Group and another two sets of the Vogeltrekstation-type (Bub 1969) in use by

Table 7.1. Numbers of waders captured near Iouik on the Banc d'Arguin, Mauritania in March and April 1985.

Species	Newly ringed	Controls (foreign)	Recaptures (own rings)	Total
Oystercatcher	2			2
Avocet	2			2
Ringed Plover	55		2	57
Kentish Plover	10			10
Grey Plover	13			13
Knot	284	1	2	287
Sanderling	34			34
Little Stint	169	1	5	175
Curlew Sandpiper	42		1	43
Dunlin	430	1	11	442
Bar-tailed Godwit	85			85
Whimbrel	27			27
Redshank	29		1	30
Turnstone	214	2	10	226
Total	1396	5	32	1433

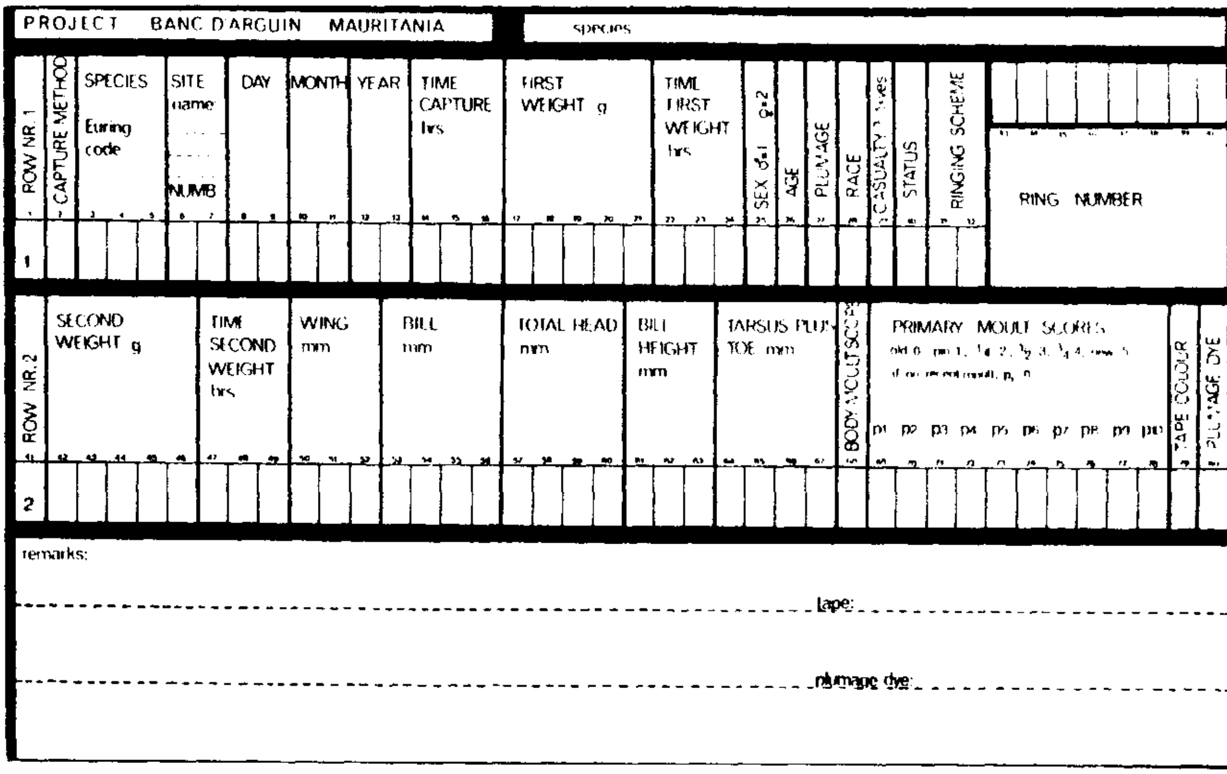
was so frustrating to see all the birds without any possibility to catch them. By observing frequently where they were grouping we saw they flew and walked to the same area, but they never used exactly the same spot. The birds were not shy at all and could be approached easily. However, if they did not go to the right place (our nets!) directly, we did not succeed in getting them in front of the nets within the catching distance. We failed notwithstanding well executed driving by the team members, and the subtle crawling actions by Mark and Cor like skilful infantry men.

The only place where we could be fairly sure to catch birds was the beach of the fishing village of Iouik. Turnstones and Sanderlings were foraging here close to the huts on drying fish and further along the beach on carrion and were used to regular disturbance by people walking around. With fish remains and kitchen leavings we could lure these species to our nets.

A problem not yet mentioned was a more technical one. When we wanted to fill the cartridges for the first time, Mark detected that the powder

Table 7.2. Numbers of waders (recaptures excluded) captured with different type of net near Iouik in March/April 1985.

Species	Type of net			
	Mist	Clap	Cannon	Total
Oystercatcher	1	1		2
Avocet	2			2
Ringed Plover	46		9	55
Kentish Plover	10			10
Grey Plover	11	1	1	13
Knot	268	1	16	285
Sanderling	22	11	1	34
Little Stint	170			170
Curlew Sandpiper	33		9	42
Dunlin	397		34	431
Bar-tailed Godwit	71		14	85
Whimbrel	6		21	27
Redshank	29			29
Turnstone	60	156		216
Total	1126	170	105	1401
Total in %	80	12	8	100



LEGEND BIOMETRY/RINGING DATA SHEET

CAPTURE METHOD: 1 = cannon-net
2 = mist-net
3 = dazzling
4 = cage-trap
5 = clap-net

SPECIES (Euring):

450	Oystercatcher	WE, WI, BI, BIWI
470	Ringed Plover	WE, WI, BI, TOHE, TATO
486	Grey Plover	WE, WI, BIHE, BI, TOHE, TATO
496	Knot	WE, BI, WI, TOHE, TATO
497	Sanderling	WE, WI, BI, TOHE, TATO
501	Little Stint	WE, WI, BI, TOHE, TATO
509	Curlwe Sandpiper	WE, WI, BI, TOHE, TATO
512	Dunlin	WE, WI, BI, TOHE, TATO, race
534	Bar-tailed Godwit	WE, WI, BI, TATO
538	Whimbrel	WE, WI, BI, TATO
539	Curlew	WE, WI, BI, TATO
546	Redshank	WE, WI, BI, TOHE, TATO
548	Greenshank	WE, WI, BI, TATO
561	Turnstone	WE, WI, BI, TATO

SITE NUMBER: see local-reference list

TIME(S): in 24 hrs, 1/10 hr (e.g. 5.1)

AGE: 2 = full-grown
4 = 1st year
5 = 2nd year
6 = >2nd year
7= 3rd year
8 = >3rd year

PLUMAGE: Blank = no record
1 = full winter plumage
2 = trace of summer plumage
3 = ¼ of summer plumage
4 = ½ of summer plumage
5 = ¾ of summer plumage
6 = trace of winter plumage
7 = full summer plumage

RACE: Blank = not recorded or indistinguishable
1 = C. a. alpina
2 = schinzii
3 = arctica
4 = schinzii/arctica (where identity not certain but the bird is one of these two).

STATUS: Blank = newly ringed
1 = control, no ring added or replaced
2 = control, ring added or replaced
3 = 1st recapture
4 = 2nd recapture
5 = 3rd recapture
6 = 4th recapture
7 = 5th recapture
8 = 6th recapture
9 = ≥ 7th recapture

RINGING SCHEME: 01 London, UK
02 Washington, USA
03 Reykjavik, Iceland
04 Stavanger, Norway
05 As, Norway
06 Oslo, Norway
07 Stockholm, Sweden
08 Göteborg, Sweden
09 Helsinki, Finland
10 Copenhagen, Denmark
11 Viborg, Denmark
12 Kalø, Denmark
13 Arnhem, Holland
14 Leiden, Holland
15 Helgoland, Germany
16 Radolfzell, Germany
17 Rossiten, Germany
18 Hiddensee, Germany
19 Sempach, Switzerland
20 Bruxelles, Belgium
21 Jersey
22 Paris, France
23 Aranzadi, Spain
24 Donana, Spain
25 Madrid, Spain
26 San Sebastian, Spain
27 Oporto, Portugal
28 Warsaw, Poland
29 Gdanks, Poland
30 Matsalu, Estonian SSR
31 Tartu, Estonian SSR
32 Riga, Latvian SSR
33 Moscow, USSR
34 Praha, Czechoslovakia
35 Budapest, Hungary
36 Sofia, Bulgaria
37 Bucarest, Romania
38 Zagreb, Yugoslavia
39 Bologna, Italy
40 Valetta, Malta
41 Cyprus
42 Tunis, Tunisia
43 Jos, Nigeria
44 Nairobi, Kenya
45 Livingstone, Zambia
46 Pretoria, S.Africa

BODY MOULT SCORE: Blank = not recorded
0 = no moult
1 = light moult
2 = medium
3 = heavy moult

TAPE COLOUR: 0 = no tape
1 = white
2 = yellow
3 = blue
4 = green
5 = red
6 = green/yellow striped

PLUMAGE DYE: 0 = no dye applied
1 = picric underwing only) Knot
2 = picric on tail and/or wing bar) Sanderling
3 = picric both under and upper-side) Bar-tailed Godwit
) Grey Plover
) Redshank
) Curlew Sandp.

4 = rhodamine underwing only)
5 = rhodamine on tail and/or wing bar) Ringed Plover &
6 = rhodamine both under and upper-side) Dunlin

Figure 7.2. Lay out of the biometric and ringing data form used on the Banc d'Arguin in 1985 and 1986. The form is based on an earlier one developed by the Wader Study Group (cf. Pienkowski 1980).

Turnstones caught with clap nets in the village) were eventually caught with mist nets. We used 15 m long three shelf 'wader nets' and 9 m long four shelf 'songbird nets'. Lines of nets totalling between 150 and 400 m, mostly set perpendicular to the wind, were used during the catching nights (when the wind allowed us to employ the nets). Figure 7.1 gives an overview of the catching localities used in 1985 and 1986. The nets became quickly very heavy and polluted with salt and dust. In 1985 this lead us to wash the nets halfway through the study period with some (non-potable!) fresh water.

We checked the nets 3-4 times per night, carrying the birds from the nets to the boat or shore in bags. The birds were transported in plastic cages (often in the Landrover) back to camp for ringing, measuring and, in 1985, colour-dye-marking.

Captured birds were ringed and weighed. In addition lengths of wing (maximum chord; Evans 1986), bill, total head (Green 1980) and tarsus + toe (cf. Piersma 1984) were measured. Body moult was scored as absent, light, medium or heavy. The extent of summer plumage was indicated in a seven point scale ranging from 1 = full winter plumage to 7 = full summer plumage. Sexing was only possible when the birds had attained summer plumage to a sufficient degree. Ageing was according to Prater et al. (1977). All data were immediately written down on green 'computer-ready' forms, on the back side of which all administrative details were given (Fig. 7.2). The data were entered into the computer directly from the cards (kindly organised by Staatsbosbeheer, Utrecht). Most of the analyses reported on in chapter 9, were performed using the SPSS-statistical package (Nie et al. 1975).

All the biometric information on waders is presented in Appendix 1.

7.2 Capture totals

In 1985 when we concentrated on catching waders, we managed to capture 1433 birds (Table 7.1). In 1986 wader catching had a low priority, but still 947 waders were caught (Table 7.5). Amongst those caught in 1986 were 30 recaptures from the year before. Dunlins, Turnstones, Knots and Little Stint contributed most to the catching totals. A breakdown of numbers caught with the different types of catching gear in 1985 is presented in table 7.2. The numbers caught per day in 1985 are listed in table 7.3. In 1985 we colour-dyed the birds and also put coloured plastic tape around the ring. These activities were carried out in the context of the Wader Study Group programme on 'wader migration studies along the East Atlantic Flyway' (Piersma 1984). Table 7.4 presents the species and numbers colour-marked in different ways in different periods. No dye-marking took place in 1986, but the majority of waders received green-yellow tape around the ring.

Table 7.5. Numbers of waders captured near Iouik on the Banc d'Arguin in February-April 1986.

Species	Newly ringed	Recaptures within 1986	Recaptures of birds ringed in 1985	Controls	Total
Oystercatcher	10	1			11
Ringed Plover	19				19
Kentish Plover	14				14
Grey Plover	8				8
Knot	114	2			116
Sanderling	20				20
Little Stint	104				104
Curlew Sandpiper	48	1			49
Dunlin	348	5	9	3	365
Bar-tailed Godwit	30				30
Whimbrel	4				4
Redshank	16	1			17
Greenshank	1				1
Turnstone	161	5	21	2	189
Total	897	15	30	5	947

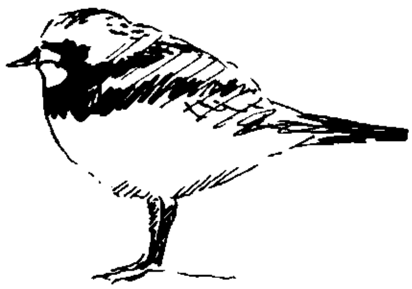
Theunis Piersma

7.3 Resightings and recoveries

The colour-marking programme in 1985 proved to be a great success: no less than 22 of the 1256 (1.8%) colour-marked birds were sighted later in the year (Table 7.7), thereby extensively increasing our present knowledge about migration routes and breeding destinations of waders wintering on the Banc d'Arguin (cf. Engelmoer 1982). The resightings and recoveries (Table 7.8) of Knots confirmed the existence of a stopover site in west-central France for Knots wintering in West and South Africa and breeding in Siberia (Dick et al. 1987). The resightings of Sanderlings in the Wadden Sea suggest a Siberian breeding origin. The resightings of Dunlins are consistent with the view that most Dunlins wintering on the Banc d'Arguin are of the schinzii subspecies. Apparently both birds from the main breeding population on Iceland and a smaller population on the Hebrides, Scotland, and possibly also from the very small Baltic population are involved. One Curlew Sandpiper was resighted later in spring on Malta, in the Mediterranean. This resightings suggest a trans-Saharan migration via Tunisia to the Siberian breeding grounds. One Bar-tailed Godwit was resighted only a week after capture in Denmark: this bird was certainly a very early migrant! Two other birds were resighted on a major site in the Dutch Wadden Sea (one of them only just escaped the net!). The resightings of Redshanks suggest a West European breeding origin. The three sightings of Turnstones in 1985 are remarkable since these birds were only marked with green-yellow tape (indeed, the unique colour combination made it possible to positively identify the birds as coming from Mauritania in the first place). It is striking that no Turnstones marked with green-yellow tape were sighted during the 1986 season. The recovery of a Turnstone from Greenland goes against all preconceptions: Mauritanian birds were thought to come from Northern European and Siberian breeding areas only. The recapture of a Ringed Plover during the same spring (1985) nicely illustrates the use of stop-over sites, and points to a Greenland or Canadian breeding origin.

Redshank	Yellow underwings	22 March-23 April 1985	June 1985	Pellworm, Schlesw.-Holstein, W. Germany	Breeding bird!
Redshank	Yellow underwings + tail	22 March-23 April 1985	28 June 1985	Marais d'Olonne sur Mer, Vendée France, (46°32'N, 1°47'W)	
Turnstone	Yellow-green tape	24-29 April 1985	21 May 1985	South Gare Sand, Teesmouth, U.K. (54°38'N, 01°08'W)	Tape around right leg=adult, vis. sexed as female at Teesm.
Turnstone	Yellow-green tape	24-29 April 1985	28 May 1985	Ile de Ré, Vendée, France	
Turnstone	Yellow-green tape	24-29 April 1985	3 August 1985	Loix en Ré, Charente, Maritime France (46°14'N, 1°24'W)	Seen in flock of 80 Turnstones of which 12 carried metal rings
Dunlin	Pink underwing	22 March-23 April 1985	20 April 1985	Süderhafen, Nordstrand, Schlesw.-Holstein, W. Germany	Seen in flight
Dunlin	Pink tail + underwing	22 March -23 April 1985	16 July 1985	Skjotjörn, Kjosasysla, Iceland (64°05'N, 22°01'W)	No flag
Curlew Sand-piper	Yellow underwings	22 March-23 April 1985	19 May 1985	Ghadira, Malta (35°58'N, 14°21'E)	
Bar-tailed Godwit	Yellow underwings	22 March-23 April 1985	9 May 1985	Paesenser Polder, Friesland The Netherlands	Identified in flight as a male
Bar-tailed Godwit	Yellow underwings	22 March-23 April 1985	18 May 1985	Paesenser Polder, Friesland, The Netherlands	

Little Stint	Stavanger 9 288 300	1st c.y.	12 Aug. 1974	Makkevikka, Gikse M. og Romsdal, Norway (62°30'N, 6°02'E)	11 April 1985	Iouik, Banc d'Arg. Mauritania	Control, but accidently killed
Dunlin	London NS 05 982	> 2nd	8 May 1982	Waterfoot, Annan, Dumfries & Gallway U.K. (54°58'N,3°16'W)	1 April 1985	Iouik, Banc d'Arg. Mauritania	Control
Dunlin	Paris SA 747 448	> 2nd	16 Apr. 1985	Iouik, Banc d'Arg. Mauritania	20 July 1985	Fort Mahon, Baie d'Authie, Sud Somme France (50°21'N, 1°34'E)	Killed by hunter
Dunlin	Paris SA 747 545	> 2nd	18 Apr. 1985	Iouik, Banc d'Arg. Mauritania	19 May 1987	Shannon Airport Lagoon, Clare, Ireland (52°42'N, 8°55'W)	Controlled and ring replaced by London NS 96 461
Dunlin	Paris SA 747 785	2nd?	4 Apr. 1986	Iouik, Banc d'Arg. Mauritania	23 July 1986	Farlington Marsh, Portsmouth, Hampsh. U.K. (50°50'N, 1°02'N)	Control; recaptured again at same site (Farlington Marsh, on 12 July 1987
Dunlin	Paris SA 747 473	> 2nd	15 Apr. 1985	Iouik, Banc d'Arg. Mauritania	9 Aug. 1987	Terrington Kings Lynn, Norfolk, U.K. (52°48'N, 0°18'E)	Control; ring repaced by London NS 47 170
Dunlin	London BX 64 712	> 1st	11 Aug. 1975	Terrington, Kings Lynn, Norfolk, U.K. (52°48'N, 0°18'E)	4 April 1986	Iouik, Banc d'Arg. Mauritania	Control
Dunlin	London NS 17 195	> 2nd?	5 May 1985	Biggar, Walney Isl. Umbrica, U.K. (54°05'N, 3°15'W)	6 March 1986	Iouik, Banc d'Arg. Mauritania	Control



8. BODY COMPOSITION ANALYSIS

Nelly E. van Brederode

8.1 Introduction

Of 85 waders, the unavoidable casualties of our mist-netting and cannon-netting activities in 1985, it was possible to make a body composition analysis. Twelve species were involved (Table 8.1).

Table 8.1. Species and numbers of waders caught at Iouik, Mauritania, and used for body composition analysis.

Species	Number
Ringed Plover	4
Kentish Plover	1
Grey Plover	1
Knot	23
Sanderling	1
Little Stint	13
Curlew Sandpiper	2
Dunlin	29
Bar-tailed Godwit	4
Whimbrel	3
Redshank	1
Turnstone	3

8.2 Methods

Fresh weights (in grams) were recorded as well as wing-, bill-, total head- and tarsus + toe lengths (in mm). The pectoral muscles of the right side were completely removed and their fresh weight was taken. Sternum this variation among birds in Mauritania is not known. It might have something to do with the procedures (e.g. the time it took between death of the bird and analyses; dehydration).

One way of telling whether dehydration after capture is of importance, is by looking at the relation between water percentage and the time between capture and taking the weight (Figs. 8.1, 8.2 and 8.3). The correlations are low (Table 8.3), but in two cases significant, so it is

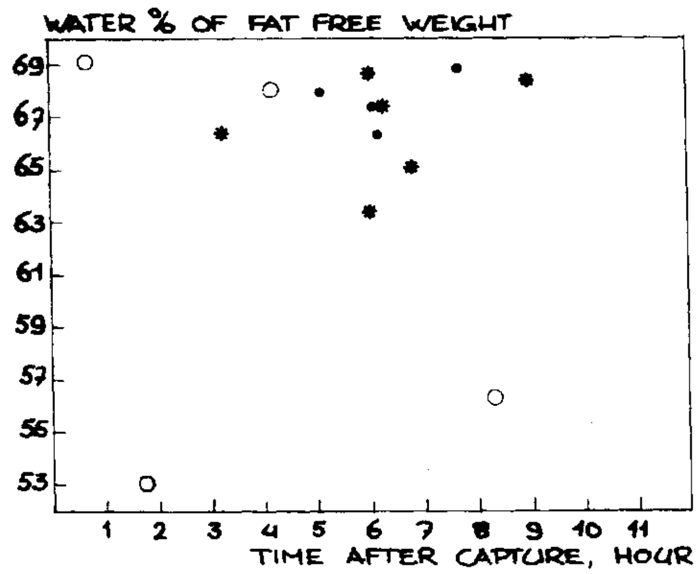


Figure 8.1. The water percentage of fat-free weight of 2nd c.y. (●), adult male (*) and adult female (o) Little Stints in March and April in Mauritania.

possible to estimate the mean water percentage at time of capture and make a correction for birds with a low water percentage.
A way of telling whether migration influences the water percentage is by looking at the relation between the water percentage and the amount of

Table 8.3. Linear regressions of water percentage of lean fresh weight (y, ing) on time between capture and taking the weight (x, also ing) for Little Stints, Dunlins and Knots. For Little Stints r is not significantly different from zero, for Dunlins and Knots r=0.05.

Species		Intercept	Slope	r	r^2
Little Stint	(n=13)	64.1	0.228	0.11	0.01
Dunlin	(n=29)	70.0	-0.613	-0.36	0.13
Knot	(n=21)	70.3	-0.405	-0.35	0.12

fat. Recently arrived birds, birds in a bad condition, as well as birds which are about to leave (premigratory dehydration) might have a low water percentage. Although birds with a low water percentage are among those with a high amount of fat, there is no trend (Figs. 8.4, 8.5 and 8.6). To get around the possible complication of dehydration the water percentages were assumed to be 65% for Little Stints, 66% for Dunlins and 67% for Knots.

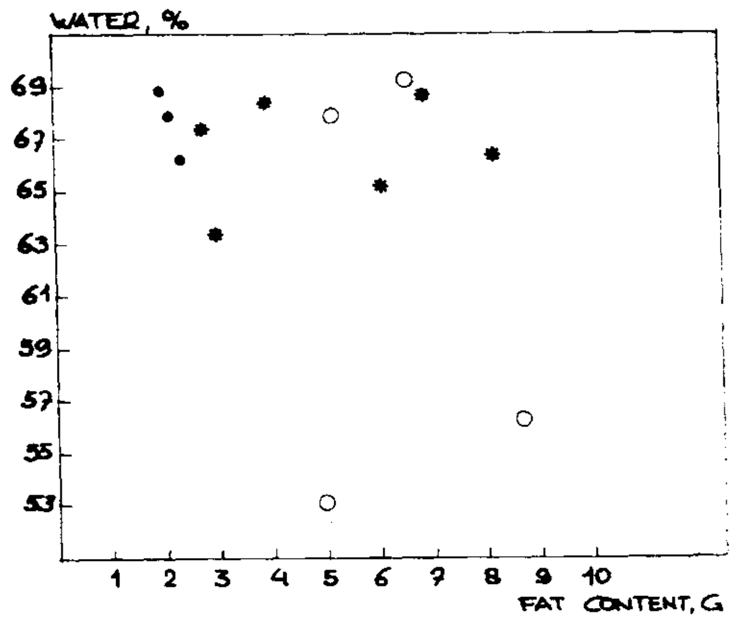


Figure 8.4. The relationship between the water percentage of fat-free weight and the fat content in 2nd c.y. (●), adult male (*) and adult female (o) Little Stints.

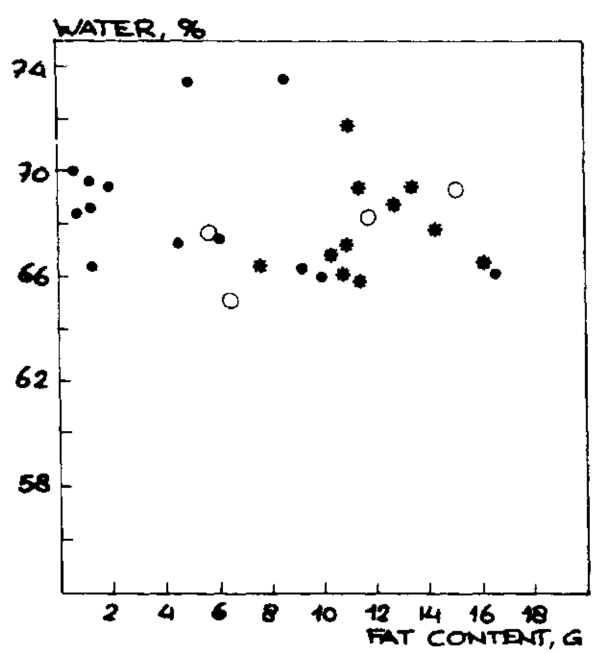


Figure 8.5. The relationship between the water percentage of fat-free weight and the fat content in 2nd c.y. (●), adult male (*) and adult female (o) Dunlins.

Table 8.6. Coefficient of variation (CV) of wing, bill, total head and tarsus + toe length for Dunlins and Knots (CV=S.D./mean).

Species		CV Wing l.	CV Bill l.	CV Total head l.	CV Tarsus + toe l.
Dunlin	all birds	0.029	0.087	0.051	0.035
	adults	0.030	0.089	0.050	0.039
	2nd c.y.	0.026	0.078	0.050	0.032
Knot	all birds	0.027	0.047	0.041	0.022
	adults	0.019	0.037	0.046	0.022
	2nd c.y.	0.043	0.040	0.030	0.026

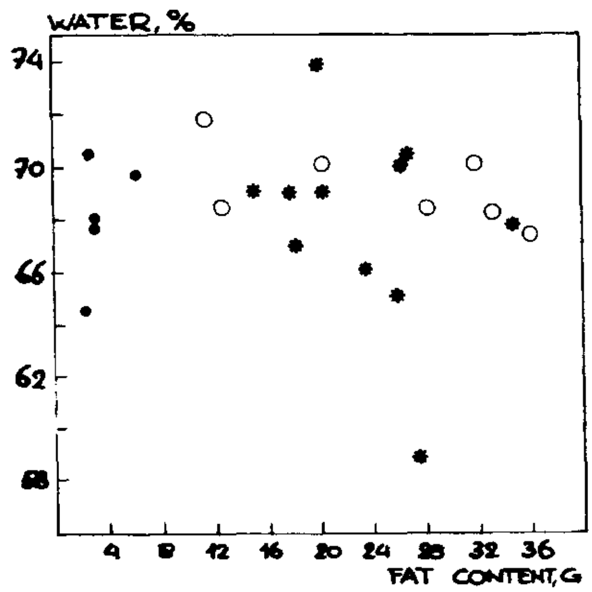


Figure 8.6. The relationship between the water percentage of fat-free weight and the fat content in 2nd c.y. (●), adult male (*) and adult female (o) Knots.

little fat (Fig. 8.7). In Knots and Dunlins this correlation is much lower, especially for the adults. For Dunlins this can be explained by the variation in size between the sexes (Table 8.5). In Knots however there is not such a big difference in measurements between the sexes and the coefficient of variation for bill length is much lower than in Dunlins (Table 8.6). Second year Knots like second year Little Stints have very little fat. The regression is again not very useful. In second

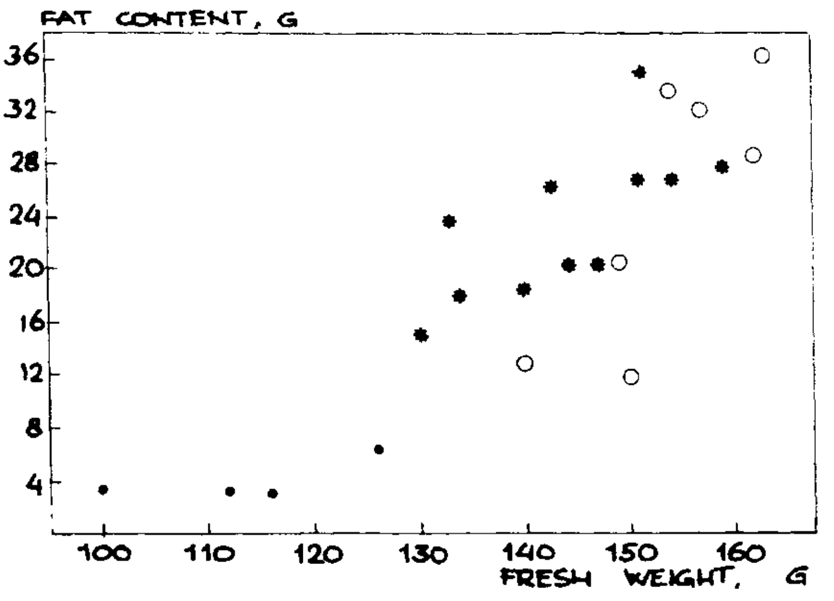


Figure 8.8. The relationship between the fat content and the fresh weight in 2nd c.y. ( ), adult male (*) and adult female (o) Knots in March and April in Mauritania.

Table 8.8. Lean fresh weight of individual birds and species in which no regression was performed.

Species	Age	Sex	Weight
Charadrius hiaticula	adult	male	43.8
	adult	male	50.9
	adult	male	43.4
	2nd c.y.	female	43.4
Pluvialis squatarola	adult	male	175.1
Calidris alba	adult	female	49.7
Calidris ferruginea	2nd c.y.	male	46.3
	adult	male	52.6
Limosa lapponica	adult	male	211.9
	adult	male	265.1
	adult	male	248.7
	adult	male	227.7
Tringa totanus	adult	female	111.1
Arenaria interpres	adult	male	96.8
	unknown	female	95.3
	adult	female	103.1

calendar year Dunlins the increase in fat and weight has the same pattern as in adults.

Table 8.9. The mean lean fresh weight of Little Stints, Dunlins and Knots. For Dunlins and Knots the lean fresh weights corrected for weight loss after capture (cf. Table 8.3) are used.

Species		Mean lean fresh weight (g)
Little Stint	(13)	19.7 ± 1.8
Dunlin	(29)	39.9 ± 5.3
Knot	(23)	119.7 ± 11.5

Both for Knots and for Little Stints it is not possible to improve the estimation of lean fresh weight by using other body measurements (Table 8.7). As could be expected this can be done for adult Dunlins, especially using bill- or total head length (Table 8.7, Fig. 8.10).

Table 8.8 shows the lean fresh weight of individual birds of those species of which sample sizes are small. Table 8.9 shows the mean lean fresh weight of Little Stints, Dunlins and Knots.

8.4 Conclusions

For all three species, Little Stint, Dunlin and Knot, for which regressions were possible, the best estimates of the amount of fat in living birds can be calculated from the fresh weight. For Dunlins a better estimation is possible for adults using bill length or total head length.

anaethetus) (Trotignon 1976). On several occasions mixed flocks of terns were observed feeding on fish shoals either out on the open sea or in pools at or near Iouik which were flooded at high tide.

9.3.1 Gull-billed Tern (Gelochelidon nilotica)
Individuals and parties of this species were to be seen at several locations over the mud flats often feeding on Fiddler Crabs (Uca tangeri). The maximum number counted at high tide in the Baie d'Aouatif was 191 in late April 1985. This reflected a steady build up from none counted in late March. Altenburg et al. (1982) counted eight birds in this area. Several birds were observed courting.

One bird was caught (18 April 1985) and was not aged. No moult was observed. The tip of the upper mandible of this bird was distinctly yellow in colour contrasting with the black of the rest of the bill. No broad patches were present.

Measurements made were wing (334 mm) and weight (238 g). From the biometrics given by Cramp & Simmons (1983) it would seem that this bird was probably an adult male.

9.3.2 Caspian Tern (Sterna caspia)
This species was observed migrating northwards during the duration of the study. However there is a local breeding colony on Kiaone (Altenburg et al. 1982). The numbers recorded in 1980 at this colony was 100-150 pairs. The maximum count for this species was 234 in late April in the Baie d'Aouatif area. Altenburg et al. (1982) had a count of 391 in January 1980. Dick (1975) suggested an exodus in late October and the late April count may indicate birds returning. No individuals of this species were caught.

9.3.3 Royal Tern (Sterna maxima)
With breeding colonies around the area of Baie d'Aouatif fairly large numbers of this species were observed. The highest count was in mid April with 734 individuals counted at high tide. Dick (1975) suggested that birds may winter to the south and the number counted by Altenburg et al. (1982) in mid January 1980 gave a number of 114 for the area much lower than the 360 counted some two months later.

Two birds were caught together (11 April 1985) in mist nets. Both were aged as adults and neither were showing wing or body moult. Dick (1975)

9.3.6. Little Tern (Sterna albifrons)
These birds were observed apparantly migrating northwards often in association with Common and Sandwich Terns. The largest numbers recorded at high tide in the Baie d'Aouatif was 62 in late April. One bird was caught and it was aged as an adult. No moult was recorded. The biometrics were wing 172 mm, bill 29.4 mm and weight 45.4 g.

9.3.7 Other terns
Black Terns (Chlidonias niger) and to a lesser extent Bridled Terns (Sterna anaethetus) were observed flying through the area in ones or twos. No larger number were recorded during the high tide counts. The Black Terns were caught in 1986, all were aged as adults. Biometrics were taken and were as follows, all were males:

wing (mm)	216	221	223
bill (mm)	27.3	28.0	27.3
tarsus (mm)	16.7	18.4	17.5
total head (mm)	60.3	61.2	58.8
weight (g)	61	61	72

No moult was recorded. All of these biometrics were similar to those reported by Cramp & Simmons (1983).

9.4 Gulls
Principally four species of gulls were observed and counted in the area of Baie d'Aouatif and Iouik. The majority of the gulls were found in the region of the village attracted by the fish offal and rubbish found at the water's edge and nearby. As in Europe the gulls readily consumed offal and rubbish when it became available and waited around feeding only for short times rather than continuously. However some active fishing was observed and also piracy of other species of gull and of waders was recorded. Some of the species of gull are obviously migrants and colonies of other species were found in the area.

9.4.1 Black-headed Gull (Larus ridibundus)
Very small numbers of this species were observed in the area of the study as were found by Dick (1975) and Altenburg et al. (1983). This area is much at the southern limit of the range of this species. In 1986 two

the Lesser Black-backed Gulls observed were not full adult, many being juveniles. None of this species were caught.

9.4.4 Slender-billed Gull (*Larus genei*)

This species is resident and comparatively large numbers were observed either feeding on shoals of fish or roosting, and feeding near the village of Iouik. The highest count made for this species was in mid April with nearly two and a half thousand counted (2435). This was more than the total count for all the Banc d'Arguin made by Altenburg et al.

Table 9.4.4.1. Mean values, standard deviations and ranges of measurements and weights of Slender-billed Gulls.

		Length in mm	S.D.	Range
Wing	(n=122)	293	12.5	256 -322
Bill	(n=118)	41.6	2.6	35.9- 48.3
Tarsus	(n= 99)	50.0	2.8	42.7- 57.2
Total head	(n= 98)	91.9	4.5	83.6-101.9
Weight in g	(n=135)	286.6	38.5	205-404

(1982) in 1980. In the area of Baie d'Aouatif and Iouik in January 1980 they counted 218. It would seem that birds probably come into the area to breed during the spring and although the count fell to 1,666 in late April this may represent breeding being under way with one of the pair being absent. The majority of the birds were counted on Zira.

A total of 51 Slender-billed Gulls were caught and measured in 1985 and a further 75 were caught in 1986 which included three birds retrapped from these caught in 1985. The majority of birds were adults. In 1985 one first year birds was caught, 1986, 14 were first year birds.

The overall mean measurements and ranges are given in table 9.4.4.1. The higher ends of the weight range are well over the published weights for the species, 350 g (Dement'ev & Gladkov 1951) but one or two of these birds were found to have brood patches and the higher weights may well have been females which were about to lay eggs.

Some observations were made on the feeding on shoals of fish by this

10. AVIFAUNA

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10.1 Introduction

This chapter summarizes all observations of birds and mammals in Mauritania during the stay of the expedition members from 10 March-5 May 1985 and from 3 February-28 April 1986. Some additional and more occasional observations of the project co-ordinator outside these periods are added as well. The location of the sites mentioned in the text can be found in appendix 2 of this report. Apart from occasional observations of the expedition members, the results of counts of the Baie d'Aouatif, Ebelk Aiznai and La Cherka, Nouadhibou for each species are added. Results for the Baie d'Aouatif include bird numbers found in Ebelk Aiznai and the area around the village of Iouik. This chapter additionally includes the biometrics of passerines captured in the expedition camp as well as biometrics of some non-passerine species captured occasionally. Fat in passerines was scored 0-5, according to the standard method described by Busse & Kania (1970). This method yields well reproduceable information on the actual fat load of passerines (Pettersson & Hasselquist 1985). More detailed accounts on the results of catches of waders, gulls and terns can be found in chapter 10 and appendix 1 of this report.

Abbreviations used in this chapter stand for:

ad. = adult(s)

camp = base camp of the expeditions, approximately 500 m east of the Biological Station near Iouik

c.y. = calendar year

imm. = immature(s)

juv. = juvenile(s)

N = North(ern)

E = East(ern)

S = South(ern)

W = West(ern)

Table 10.1 Weight (g) and biometrical data (mm) of Storm Petrels captured in mistnets in the Baie d'Aouatif

date	weight	age	wing	bill	tarsus
23/3/85	230	2nd c.y.	119	12.6	22.5
1/4/85	222	2nd c.y.	123		
3/4/85	255	2nd c.y.	119	12.0	22.9
15/4/85	274	2nd c.y.	121	12.4	24.6
16/4/85	239	2nd c.y.	120	11.8	22.0

Sula bassana Gannet Fou de bassan

Common visitor to Mauritanian coastal waters, locally in large flocks, most numerous from December-February. Juvenile percentage generally 50-80% (Lamarche 1987). Altenburg et al. (1982) observed 30 Gannets in the Baie de Lévrier on 8 March 1980.

10/3/85 3 over sea near Cansado

20/3/85 ++ Baie de Lévrier, approx. 25% adults

13/3/85 about 50 near Cap Blanc, nearly all imm.

2/5/85 2 Baie de Lévrier

5/2/86 200-300 during crossing of Baie de Lévrier. In the N part mainly adults, in the S part mainly 2nd c.y. and imm. In a sample of 21 birds 6 ad., 1 4-5th c.y., 3 4th c.y., 5 3rd c.y. and 6 2nd c.y..

25/4/86 ++ between Ile d'Arguin and Nouadhibou, especially in the W part of the Baie de Lévrier, 80-90% imm.

Phalacrocorax carbo lucidus Cormorant Grand cormoran

The W African subspecies of the Cormorant is a common visitor and breeding bird in Mauritanian coastal waters and the Sénégal delta (Lamarche 1987). Altenburg et al. (1982) counted 9395 Cormorants at the Banc d'Arguin during the 1980 expedition. It is breeding at the Banc d'Arguin in 3 colonies (4260 pairs in 1984-85) from September-March (Campredon 1987).

11-13/3/85 2-5 La Cherka, Nouadhibou

15/3/85 7 La Cherka, Nouadhibou and 23 along beach N of Nouadhibou

20/3/85 ++ area around Cap Tafarit

24/3/85 308 Baie d'Aouatif

13/2/86 203 Ebelk Aiznai
22/2/86 372 Ebelk Aiznai

Pelecanus onocrotalus White Pelican Pélican blanc

Common visitor and breeding bird in Mauritanian coastal waters and inland habitats along the Sénégal river (Lamarche 1987). Altenburg et al. (1982) counted 611 adult White Pelicans and 300 fledglings at the Banc d'Arguin during the 1980 expedition. Breeding at the Banc d'Arguin in 1 large colony at Arel (3080 pairs in 1984-85) from September-March (Campredon 1987).

24-25/3/85 1 Baie d'Aouatif
3/4/85 1 ad. Iouik
4/4/85 1 ad. Ebelk Aiznai
5/4/85 3 Baie d'Aouatif, S of catching site 5
8/4/85 15 flying S over Ebelk Aiznai
11/4/85 48 (out of which 5 imm.) passing Iouik
14/4/85 1 swimming under mistnets Baie d'Aouatif, site 5
15/4/85 1 feeding on the emerged mudflats and seagrass beds in the N part of the Baie d'Aouatif, eating large preys
16/4/85 6 Baie d'Aouatif; 1 under the mistnets by night, Baie d'Aouatif site 5
18/4/85 2 near camp
20/3-22/3/85 up to 5 resting during high tide at Nair
24/5/85 13 Baie d'Aouatif
30/4/85 1 near camp

February-April 1986 frequently 1-3 near the camp and elsewhere in the Baie d'Aouatif. Additional observations:

16/2/86 5 SE corner Baie d'Aouatif, 2 in the central part
18/2/86 10 S of Zira
19/2/86 ++ near camp, migrating S
22/2/86 ++ Serini; +++ SE part Tidra
24/2/86 5 Serini
25/2/86 100 S tip Tila penisula
2/3/86 10 near camp, flying S
20/3/86 50 circling high over Iouik, descending into the Baie d'Aouatif
23-25/3/86 20-30 between Iouik and Rgueïba
1/4/86 4 Zira; 3 Serini
2/4/86 1 N part Tidra

West-African coasts. Brown et al. (1982) again separate E. gularis and E. garzetta as separate species, both of these occurring along the Mauritanian coast. In the field a distinction between the two 'species' is very difficult to make. For practical reasons all dark coloured egrets were considered to be E. gularis, all white birds to be E. garzetta. This may have lead to a underestimation of the numbers of E. gularis. The 'species' is breeding at the Banc d'Arguin in 8 colonies (745 pairs in 1984-85, 55 of these at Zira) from April-November (Campredon 1987). Altenburg et al. (1982) counted 2899 dark herons at the Banc d'Arguin during the 1980 expedition.

11/3/85 about 10 La Cherka, Nouadhibou
15/3/85 1 La Cherka, Nouadhibou
24/3/85 53 Baie d'Aouatif
4/4/85 20 Ebelk Aiznai
7-8/4/85 1-2 Ebelk Aiznai
12/4/85 6 flying N and 3 foraging Iouik
13/4/85 22 flying N and 3 foraging Iouik
14/4/85 20 in mixed flock with E. garzetta passing camp flying N; in the evening 31 flying S towards communal nocturnal roost
16/4/85 75 Baie d'Aouatif
20-22/4/85 about 20 at high tide roost, Nair
22/4/85 ++ Iouik
23/4/85 ++ Niroumi
24/4/85 217 Baie d'Aouatif
1/5/85 + Ile d'Arguin
3/5/85 1 Presqu'Ile de Cap Blanc
5/5/85 1 La Cherka, Nouadhibou
7/5/85 2 Ebelk Aiznai
10/5/85 2 La Cherka, Nouadhibou
22/1-3/2/86 2-4 La Cherka, Nouadhibou
8-22/2/86 9-21 Ebelk Aiznai
3/3/86 15-20 La Cherka, Nouadhibou
24/3/86 ++ between Iouik and Kiji
25/3/86 5-10 between Rgueïba and Serini
5/4/86 7 in a flock, possibly migrants, N part Baie d'Aouatif
24/4/86 2 La Cherka, Nouadhibou

Ardea cinerea Grey Heron Héron cendrée

At the Banc d'Arguin 2 subspecies are observed. The N subspecies 'cinerea' is a rather common winter visitor from September-April in coastal and freshwater habitats all over Mauritania, the endemic subspecies 'monicae' is restricted as a breeding bird to the Banc d'Arguin but may also be seen as a migrant in the Sénégal delta (Lamarche 1987). The latter subspecies is breeding at the Banc d'Arguin in colonies at Kiaone and Arel (2400 pairs in 1984-85) from April-January (Campredon 1987). Most observations concern the subspecies "monicae", though locally (and more often than indicated here) also the subspecies "cinerea" was observed. Altenburg et al. (1982) counted 3076 Grey Herons at the Banc d'Arguin during the 1980 expedition.

11/3/85 ++ La Cherka, Nouadhibou
15/3/85 42 S part Presqu'Ile de Cap Blanc
24/3/85 172 Baie d'Aouatif
14/4/85 12 Ebelk Aiznai
16/4/85 104 Baie d'Aouatif
20/4-22/4/85 about 10 Nair
22/4/85 ++ Ebelk Aiznai
23/4/85 +++ Niroumi, among which also A.c. cinerea
24/4/86 83 Baie d'Aouatif
27/4/85 14 Ebelk Aiznai
1/5/85 ++ Ile d'Arguin
3/5/85 28 S part Presqu'Ile de Cap Blanc
7/5/85 4 Ebelk Aiznai
10/5/85 12 La Cherka, Nouadhibou
22/1/86 3 La Cherka, Nouadhibou
3/2/86 20 La Cherka, Nouadhibou
8/2/86 7 N part Baie d'Aouatif; 20 Ebelk Aiznai
10-22/2/86 24-25 Ebelk Aiznai
23/2/86 120 S tip Tidra
25/2/86 50 at high tide roost S tip Tila peninsula
3/3/86 10 La Cherka, Nouadhibou
18/3/86 1 Ebelk Aiznai, positively A.c. cinerea
21/3/86 18 Baie d'Aouatif, site 1 migrating S
23/3/86 2 "cinerea" Baie d'Aouatif
24/3/86 2 "cinerea" between Iouik and Kiji
25/3/86 tens between Rgueïba and Serini

10/3/85 1 La Cherka, Nouadhibou

13/3/85 1 circling over Nouadhibou, 2 in lagoon N of Nouadhibou

14/3/85 6 La Cherka, Nouadhibou

15/3/85 29 S part Presqu'Ile de Cap Blanc

21/3/85 5 Ten Alloul

23/3/85 1 found dead 100 m E of Iouik

24/3/85 1043 Baie d'Aouatif, two of these carrying Dutch rings but not identifiable

1/4/85 24 N part Baie d'Aouatif, migrating NNW (7.10 p.m.)

4/4/85 46 Ebelk Aiznai

5/4/85 40-50 Ebelk Aiznai

7/4/85 36 flying towards the emerging mudflats, Zira

16/4/85 843 Baie d'Aouatif

20-22/4/85 colony settling down on NW part Nair. On 21/4 930 sitting, fighting, copulating and nesting birds and about 600 spectators. Among the latter birds 1 or 2 carrying Dutch rings.

22/4/85 9 flying N and leaving the Baie d'Aouatif around 19.30 h, site 1; 7 foraging there already; no larger flocks present any more in the Baie d'Aouatif

23/4/85 +++ Niroumi

24/4/85 9 N part Baie d'Aouatif, migrating NNW (7.30 p.m.)

27/4/85 34 Ebelk Aiznai

3/5/85 16 Presqu'Ile de Cap Blanc

7/5/85 25 Ebelk Aiznai

10/5/85 8 La Cherka, Nouadhibou

22/1-3/2/86 1 La Cherka, Nouadhibou

February and March 1986 frequent observations of small flocks (up to 35) in many places in the Baie d'Aouatif.

8/2-13/2/86 5-7 Ebelk Aiznai

9/2/86 20 on high tide roost Ebelk Aiznai

10/2/86 9 migrating N in NW part Baie d'Aouatif

14-19/2/86 200 Zira

16/2/86 150 SE part Baie d'Aouatif

19/2/86 200 on Zira; another 100 Iouik

21/2/86 200 S Foum Al Trique

23/2/86 150 S tip Tidra

24/2/86 50 S tip Ajoueïr

25/2/86 200-300 SE part Baie d'Aouatif; 250 at roost S tip Tila penisula in Cadiz, Spain on 31 October 1982 and in S France from May 1986 onwards (Alan Johnson, in litt.).

16/4/85 843 Baie d'Aouatif

20-23/4/85 up to 100 foraging around Nair

23/4/85 ++ Niroumi

24/4/85 491 Baie d'Aouatif

27/4/85 73 Ebelk Aiznai

1/5/85 1700 in NE part Ile d'Arguin

3/5/85 66 Presqu'Ile de Cap Blanc

5/5/85 ++ La Cherka, Nouadhibou one of these colour-ringed as a pullus in the Camargue in 1984 (Alan Johnsson in litt.)

7/5/85 167 Ebelk Aiznai

8-20/2/86 13 Baie d'Aouatif

11/2/86 250 counted from plane between Iouik and Ile d'Arguin

14-21/2/86 5-7 Zira

22/2/86 1 Ebelk Aiznai

23/2/86 40 Ebelk Aiznai, migrating N; 19 Baie d'Aouatif

24/2-17/3/86 about 10 N part Baie d'Aouatif

13-14/3/86 6-7 Zira

18/3/86 3 Ebelk Aiznai

21/2/86 320 SW part Serini

22/2/86 +++ between Tidra and Ajoueïr; 100 E Ajoueïr

23/3/86 100 Baie d'Aouatif; 150 S tip Tidra

24/3/86 many thousands between Iouik and Kiji

25/3/86 ++ between Rgueïba and Serini

27/3-3/4/86 3-19 in Baie d'Aouatif and around Zira

4/4/86 200 between Arel and Niroumi

5/4/86 26 NW part Baie d'Aouatif

6/4/86 40 Tivide

7/4/86 2000 NW Arel

9/4/86 20 NW part Tidra

10/4/86 60 Baie d'Aouatif, 46 migrating N (5.00 p.m.)

11/4/86 11 Ebelk Aiznai; 15 Baie d'Aouatif; +++ Arel

12/4/86 38 NW part Baie d'Aouatif

13/4/86 200 Niroumi; 500 W part of Tidra

14/4/86 50 Baie d'Aouatif

16/4/86 11 Ebelk Aiznai; 47 Baie d'Aouatif; 11 Iouik migrating N

17-18/4/86 39-47 NW part Baie d'Aouatif

Table 10.4 Weight (g) and biometrical data (mm) of a male Teal captured in a mistnet in the W part of the Baie d'Aouatif.

date	weight	wing
17/3/86	395	189

Anas querquedula Garganey Sarcelle d'été

Wintering in large numbers in the Sénégal delta (on average 100,000). Migration along the coast noted from September-November and in February and March (Lamarche 1987). Altenburg et al. (1982) observed up to 23 Gargeneys in several places at the Banc d'Arguin during the 1980 expedition.

24/3/85 3 males and 3 females Baie d'Aouatif, flying SW

13/3/86 14 flying SW near camp

Anas clypeata Shoveler Canard souchet

Wintering in rather small numbers in the Sénégal delta and inland wetlands in S Mauritania. Migration noted from October-December and in January and February (Lamarche 1987). Altenburg et al. (1982) observed up to 60 Shovelers in several places at the Banc d'Arguin during the 1980 expedition.

22/3/85 2 males and 6 females flying NE over camp

24/3/85 1 male N of Iouik

26/3/85 26 (about 50% males, 50% females) leaving the Baie d'Aouatif in N direction

13/4/85 2 females Baie d'Aouatif, site 2

25/2/86 2 males and 2 females N part Baie d'Aouatif

7/4/86 corpse of female found Tidra

Milvus migrans Black Kite Milan noir

Two subspecies may be observed in Mauritania. M.m. migrans probably is the only subspecies the expedition encountered, M.m. parasiticus, an Afro-tropical subspecies, has its N range around the 17th degree of latitude. "Migrans" is an rather common migrant in August and September and February and March (Lamarche 1987). Altenburg et al. (1982) observed 16 Black Kites at the Banc d'Arguin on 7 March 1980.

31/3/85 1 Iouik flying S; 1 ad. male Ebelk Aiznai
2/4/85 1 W part Baie d'Aouatif; 1 female Nair; 1 ad. male Ebelk Aiznai
3-4/4/85 1 female Ebelk Aiznai
5/4/85 1 ad. male Iouik; 2 Ebelk Aiznai
6/4/85 8 Ebelk Aiznai
7-14/4/85 1-2 Ebelk Aiznai
9/4/85 1 male and 1 female Ebelk Aiznai; 1 male near camp; 1 female flying N over camp
12-21/4/85 1 W part Baie d'Aouatif
25/4/85 1 female Ebelk Aiznai
8-22/2/86 1 Ebelk Aiznai
8/2-18/3/86 1-2 W part Baie d'Aouatif
20/2/86 3 Ebelk Aiznai
21/2/86 1 female E coast Tidra
24/2/86 1 Serini
20-22/3/86 3-6 W part Baie d'Aouatif
23-24/3/86 1-3 Baie d'Aouatif, site 3
24/3/86 3 between Iouik and Kiji
25/3/86 1 Ajoueïr
25/3/-11/4/86 frequently 1-2 Baie d'Aouatif
9/4/86 1 NW part Baie d'Aouatif
20/4/86 1 Tivide
25/4/86 1 Ile d'Arguin

Circus cyaneus Hen Harrier Busard Saint-Martin

Occasional visitor to Mauritania, most frequently observed in September, October and March (Lamarche 1987).
15/3/86 1 ad. male Baie d'Aouatif, site 1
21/3/86 1 ad. male W part Baie d'Aouatif
22/23/3/86 1 imm. male W part Baie d'Aouatif
24/3/86 1 female Nair
31/3/86 1 female Baie d'Aouatif, site 1

Circus pygargus Montagu's Harrier Busard cendré

Rather small numbers are recorded as a wintering guest in the S part of the country as well as during migration, especially in September and in March-April (Lamarche 1987).
4/4/85 1 male near camp

4/4/86 1 N of Nair
5-6/4/86 1-2 NW part Baie d'Aouatif
7/4/86 1 Arel
20/4/86 2 between Tivide and Serini
21/4/86 1 NW part Baie d'Aouatif

Falco tinnunculus Kestrel Faucon crécerelle
Two subspecies are found in Mauritania, only the nominate occuring in the W part of the country. Common winter visitor to the S part of the country. On migration most frequently found along the coast in October-November and March-May (Lamarche 1987).
13/3/85 2 corpses found Cap Blanc
18/3/85 1 in garden Nouadhibou
1/4/85 1 corpse found Nair
2/4/85 1 Baie d'Aouatif, site 5
3/4/85 1 flying N over camp; 1 Iouik
4/4/85 1 near camp; 2 in the desert between Ebelk Aiznai and camp
5/4/85 1 male Ebelk Aiznai; 1 female camp catching a Phylloscopus
6/4/85 4 W part Baie d'Aouatif
7-9/4/85 1 near camp
11/4/85 1 Iouik
4/5/85 1 city centre Nouadhibou
19/1-2/2-86 1 female Sabah hotel, Nouadhibou
19/3/86 1 female Baie d'Aouatif, site 1, showing active wing moult
21/3/86 1 male near camp
22/3/86 4 Baie d'Aouatif, site 1; 1 camp
23/3/86 5-10 W part Baie d'Aouatif
24/3/86 5 Baie d'Aouatif, site 1; 5 Niroumi; 10 Kiji
25/3/86 3 between Rgueïba and Zira; 1 Baie d'Aouatif, site 1; 1 camp
27/2/86 1 between Teïchot and Rgueïba
31/3/86 7 W part Baie d'Aouatif
1/4/86 1 Baie d'Aouatif, site 1; 5 Nouadhibou
2-4/4/86 1-2 camp
5/4/86 1 N NW part Baie d'Aouatif
16/6/86 1 camp
26/4/86 1 La Cherka, Nouadhibou
27/4/86 1 Cansado

displaying.
8/2/86 1 near airstrip Baie d'Aouatif, chasing a Redshank into the water; 1 Ebelk Aiznai catching a Ringed Plover
11/2/86 1 chasing waders, giving special notice to a Redshank
22-24/2/86 1 Ebelk Aiznai. It is uncertain whether this bird was one of the two frequently observed in the Baie d'Aouatif
18/3/86 1 Ebelk Aiznai
20/3/86 2 mangroves W of Tidra
24/3/86 pair eating a Knot, Baie d'Aouatif, site 1
11/4/86 1 male W part Baie d'Aouatif, eating a Knot
12/4/86 1 Ebelk Aiznai
20/4/86 3 Tivide
24/4/86 1 Kiaone

Fulica atra Coot Foulque macroule

Irregular winter visitor to Mauritania, the presence of which quite often is only noted through the finding of corpses (Lamarche 1987).
15/3/85 1 dead bird found in lagoon N airport Nouadhibou

Coturnix coturnix Common Quail Caille des blés

Rather small numbers are present in Mauritania as a winter vistor. Small numbers are seen during migration, mainly along the coast, from September-November and in February-March (Lamarche 1987).
16/2/86 1 female captured near the camp; weight 112 g
27/4/86 1 corpse, dead for several months, Biological Station Iouik

Porphyrio porphyrio Purple Coot Poule sultane

The subspecies "madagascariensis" is found throughout the year in the S part of the country though numbers are highly variable (Lamarche 1987).

Table 10.6 Biometrical data (mm) of 2 corpses of Purple Coots found at the N part of Tidra, both "madagascariensis", dead for approx. 2-3 months

date	wing	bill	tarsus	age
14/4/86	240	37.2	85.2	3rd c.y.
14/4/86	246	36.6	88.2	2nd c.y.

(Lamarche 1987). Altenburg et al. (1982) did not observe the species at the Banc d'Arguin during the 1980 expedition.

7/4/85 35 Ebelk Aiznai

25/2/86 1 in mangroves N Timiris

30/3/86 40 NW part Baie d'Aouatif

Recurvirostra avosetta Avocet Avocette

Some hundreds are wintering in the S part of Mauritania (Lamarche 1987), some thousands winter further S in Sénégambia and Guinea Bissau (Smit & Piersma in prep.). Passage in Mauritania is noted from August-October and in March, especially along the coast (Lamarche 1987). Altenburg et al. (1982) did not observe the species at the Banc d'Arguin during the 1980 expedition. For further details see Appendix 1.

13/3/85 + roosting N part Baie d'Aouatif

28-29/3/85 9 Baie d'Aouatif, site 3

30/3/85 42 roosting Baie d'Aouatif, site 3

31/3/85 4 Baie d'Aouatif, site 5

14/4/85 15 departing from N part Baie d'Aouatif

17/4/85 4 N part Baie d'Aouatif

18/4/85 4 on high tide roost Ebelk Aiznai

14/3/86 4 Baie d'Aouatif, site 1

28/3/86 11 Baie d'Aouatif, site 1

29/3/86 287 departing from N part Baie d'Aouatif, 2 colour-ringed

4/4/86 7 N of Niroumi

8/4/86 86 NW part Baie d'Aouatif

11-18/4/86 13 NW part Baie d'Aouatif

16/4/86 62 N part Baie d'Aouatif

21/4/86 65 NW part Baie d'Aouatif, none of these being colour-ringed

22/4/86 34 NW part Baie d'Aouatif, 6 leaving in N direction; 28 Ebelk Aiznai

Burhinus oedicnemus Stone Curlew Oedicnème criard

Mainly seen in small flocks (some individuals) on migration, inland as well as along the coast, from September-December and from January-March (Lamarche 1987).

11-12/3/85 38-45 La Cherka, Nouadhibou

15/3/85 20 La Cherka, Nouadhibou

22/1/86 10 La Cherka, Nouadhibou

are estimated to winter on the Mauritanian coast and in the Sénégal delta. Passage in Mauritania is mainly noted in August-October and March-June (Lamarche 1987). For further details see Appendix 1.

14/3/85 300 La Cherka, Nouadhibou and on nearby rubbish tip
15/5/85 371 S part Presqu'Ile de Cap Blanc
24/3/85 4522 Baie d'Aouatif
3-16/4/85 264-344 Ebelk Aiznai
17/4/85 3555 Baie d'Aouatif
20-22/4/85 about 100 S part Niroumi
24/4/85 180 Ebelk Aiznai
25/4/85 2928 Baie d'Aouatif
27/4/85 400 Ebelk Aiznai
3/5/85 110 S part Presqu'Ile de Cap Blanc
7/5/85 330 Ebelk Aiznai
10/5/85 75 La Cherka, Nouadhibou
22/1-3/2/86 +++ La Cherka, Nouadhibou
8-22/2/86 485-700 Ebelk Aiznai

Charadrius alexandrinus Kentish Plover Gravelot à collier interrompu

Numbers counted in winter at the Banc d'Arguin vary from 6500 (Trotignon et al. 1980) to 18,000 (Altenburg et al. 1982). Some 20,000 winter further S in Sénégambia and Guinea Bissau (Smit & Piersma in prep.). Breeding along the coast from the Banc d'Arguin to S Mauritania. Passage noted from September-October and March-April (Lamarche 1987). For further details see Appendix 1.

15/3/85 113 S part Presqu'Ile de Cap Blanc
24/3/85 1383 Baie d'Aouatif
3-16/4/85 264-344 Ebelk Aiznai
17/4/85 850 Baie d'Aouatif
21/4/85 2 Nair
24/4/85 60 Ebelk Aiznai
25/4/85 456 Baie d'Aouatif
27/4/85 5 Ebelk Aiznai
3/5/85 128 S part Presqu'Ile de Cap Blanc
7/5/85 102 Ebelk Aiznai
10/5/85 17 La Cherka, Nouadhibou
22/1/86 50-100 La Cherka, Nouadhibou
13-22/2/86 21-30 Ebelk Aiznai

14/3/85 70 La Cherka, Nouadhibou

15/3/85 292 S part Presqu'Ile de Cap Blanc

24/3/85 45513 Baie d'Aouatif

3-16/4/85 8383-9080 Ebelk Aiznai

17/4/85 40754 Baie d'Aouatif

20-22/4/85 ++++ Nair

22/4/85 6326 Ebelk Aiznai

25/4/85 19028 Baie d'Aouatif

27/4/85 3500 Ebelk Aiznai

1/5/85 10000 NE part Ile d'Arguin; 17.25 100 leaving in N direction

3/5/85 251 S part Presqu'Ile de Cap Blanc

7/5/85 3191 Ebelk Aiznai

10/5/85 142 La Cherka, Nouadhibou

22/1/86 50-100 La Cherka, Nouadhibou

3/2/86 50 La Cherka, Nouadhibou

8-22/2/86 2750-5600 Ebelk Aiznai

26/4/86 + La Cherka, Nouadhibou

Calidris alba Sanderling Bécasseau sanderling

Numbers counted in winter at the Banc d'Arguin vary from 6600 (Trotignon et al. 1980) to 34,000 (Altenburg et al. 1982), 7000 are estimated to winter on the Mauritanian coast itself (Lamarche 1987). Many thousands are known to winter further S along the W African coast, even S to the Rep. S Africa (Smit & Piersma in prep.). Passage in Mauritania is noted from September-November and in March-April (Lamarche 1987). For further details see Appendix 1.

11-12/3/85 + La Cherka, Nouadhibou and nearby rubbish tip

13/3/85 100 Cap Blanc

15/3/85 2059 S part Presqu'Ile de Cap Blanc

24/3/85 479 Baie d'Aouatif

3/4/85 50 Ebelk Aiznai

16/4/85 104 Ebelk Aiznai

17/3/85 520 Baie d'Aouatif

20-22/4/85 max. 20 Nair

22/4/85 495 Ebelk Aiznai

25/4/85 938 Baie d'Aouatif

27/4/85 322 Baie d'Aouatif

3/5/85 1257 S part Presqu'Ile de Cap Blanc details see Appendix 1.

14/3/85 1 rubbish tip near La Cherka, Nouadhibou

15/3/85 2 S part Presqu'Ile de Cap Blanc

24/3/85 4412 Baie d'Aouatif

3/4/85 195 Ebelk Aiznai

16/4/85 3210 Ebelk Aiznai

17/4/85 13633 Baie d'Aouatif

20-22/4/85 at least 80 on high tide roost Nair

22-27/4/85 608-700 Ebelk Aiznai

25/4/85 5164 Baie d'Aouatif

3/5/85 1 S part Presqu'Ile de Cap Blanc

7/5/85 1082 Ebelk Aiznai

3/2/86 3 La Cherka, Nouadhibou

8-22/2/86 440-520 Ebelk Aiznai

Calidris maritima Purple Sandpiper Bécasseau violet

A straggler to Mauritania, not included in the list by Lamarche 1987.

5/4/85 1 Ebelk Aiznai

Calidris alpina Dunlin Bécasseau variable

Numbers counted in winter at the Banc d'Arguin vary from 705,000 (Trotignon et al. 1980) to 818,000 (Altenburg et al. 1982). Some thousands winter further S in Sénégambia and Guinea Bissau (Smit & Piersma in prep.). Up to 30,000 are estimated to winter in S Mauritania and the Sénégal delta. Passage in Mauritania is noted in October-November and March-April (Lamarche 1987). For further details see Appendix 1.

11/3/85 100 La Cherka, Nouadhibou

15/3/85 661 S part Presqu'Ile de Cap Blanc

24/3/85 56,085 Baie d'Aouatif

3/4/85 3220 Ebelk Aiznai

16-27/4/85 2200-2560 Ebelk Aiznai

17/4/85 22,163 Baie d'Aouatif

20-22/4/85 +++ on high tide roost Nair

25/4/85 31,845 Baie d'Aouatif

1/5/85 25 leaving Ile d'Arguin in N direction (5.25 p.m.); 380 (5.30 p.m.)

3/5/85 128 S part Presqu'Ile de Cap Blanc

7/5/85 1437 Ebelk Aiznai

(Trotignon et al. 1980) to 543,000 (Altenburg et al. 1982). Over 150,000 are known to winter in Guinea Bissau (Zwarts 1988), 30,000-40,000 are estimated to winter on the Mauritanian coast itself. Passage in Mauritania is noted in September-October and March-April (Lamarche 1987). For further details see Appendix 1.

14/3/85 100 La Cherka, Nouadhibou
15/3/85 475 S part Presqu'Ile de Cap Blanc
24/3/85 18,518 Baie d'Aouatif
3-16/4/85 2275-2507 Ebelk Aiznai
17/4/85 14,578 Baie d'Aouatif
20-22/4/85 12,000 at high tide roost Nair
22-24/4/85 1410-1525 Ebelk Aiznai
25/4/85 13,312 Baie d'Aouatif
27/4/85 822 Ebelk Aiznai
3/5/85 222 S part Presqu'Ile de Cap Blanc
7/5/85 760 Ebelk Aiznai
10/5/85 83 La Cherka, Nouadhibou
22/1/86 50-100 La Cherka, Nouadhibou
3/2/86 100 La Cherka, Nouadhibou
8/2/86 4100 Ebelk Aiznai
13/2/86 2190 Ebelk Aiznai
24/4/86 100 Zira migrating in N direction (12.45 a.m.)
26/4/86 ++ La Cherka, Nouadhibou

Numenius phaeopus Whimbrel Courlis corlieu

Numbers counted in winter at the Banc d'Arguin vary from 10,500 (Trotignon et al. 1980) to 15,600 (Altenburg et al. 1982). Over 40,000 winter further S in Guinea Bissau (Zwarts 1988), 2000-6000 are thought to winter on the Mauritanian coast itself. Passage in Mauritania is noted in September-October and March-April (Lamarche 1987). For further details see Appendix 1.

10/3/85 + La Cherka, Nouadhibou
15/3/85 61 S part Presqu'Ile de Cap Blanc
24/3/85 245 Baie d'Aouatif
16/4/85 271 Ebelk Aiznai
17/4/85 476 Baie d'Aouatif
20-22/4/85 1500 on high tide roost Nair
22/4/85 210 Ebelk Aiznai

Tringa erythropus Spotted Redshank Chevalier arlequin

Wintering throughout W Africa, mainly in freshwater wetlands. Small numbers are wintering in Mauritania, especially in the S part of the country. Passage is noted in September-October and February-March (Lamarche 1987). Altenburg et al. (1982) did not observe the species at the Banc d'Arguin during the 1980 expedition.

21/3/85 1 La Cherka, Nouadhibou
30/3/85 1 Baie d'Aouatif, site 3
7/4/85 1 near camp
12/4/85 1 Baie d'Aouatif, site 1
20/4/85 1 Baie d'Aouatif, site 1
21/4/85 1 along the coast N of Iouik
11/3/86 1 Baie d'Aouatif, site 5
17/3/86 1 near camp
22/3/86 1 Baie d'Aouatif, site 1
25/3/86 5 Baie d'Aouatif, site 5
30/3/86 3 near camp
31/3/86 2 near camp; 1 NW part Baie d'Aouatif
1/4/86 1 Baie d'Aouatif, site 1; 2 La Cherka, Nouadhibou
4/4/86 1 Baie d'Aouatif, site 1

Tringa totanus Redshank Chevalier gambette

Numbers counted in winter at the Banc d'Arguin vary from 31,000 (Trotignon et al. 1980) to 70,000 (Altenburg et al. 1982). Over 80,000 are known to winter in Guinea Bissau (Zwarts 1988). A variable number is wintering in S Mauritania, especially in the Sénégal delta (Lamarche 1987). Passage in Mauritania is noted in September-October and in March-April (Lamarche 1987). For further details see Appendix 1.

10-14/3/85 1-3 La Cherka, Nouadhibou
15/3/85 61 S part Presqu'Ile de Cap Blanc
24/3/85 2978 Baie d'Aouatif
3-16/4/85 191-200 Ebelk Aiznai
17/4/85 965 Baie d'Aouatif
20-22/4/85 ++ on high tide roost Nair
22/4/85 14 Ebelk Aiznai
23/4/85 +++ in mangroves S part Niroumi
25/4/85 699 Baie d'Aouatif
27/4/85 68 Ebelk Aiznai

Table 10.7. Weight (g) and biometrical data (mm) of a Greenshank captured in a mistnet W part Baie d'Aouatif

date	weight	wing	bill	tarsus+toe	age
6/3/86	163	198	49.4	99	>2nd c.y.

Tringa ochropus Green Sandpiper Chevalier cul-blanc

A common wintering guest in S Mauritania, mainly in the W part of the country, but rare on the Banc d'Arguin. Passage is noted in August-October and in February-April (Lamarche 1987).

20/3/86 1 W part Baie d'Aouatif

15/4/86 1 near camp

Tringa glareola Wood Sandpiper Chevalier sylvain

Small numbers are wintering in Mauritania, more frequently observed during migration. Main passage is noted in August-September and March-April (Lamarche 1987). Altenburg et al. (1982) did not observe the species at the Banc d'Arguin during the 1980 expedition.

15/3/85 2 lagoon N of airport Nouadhibou

3/4/85 1 tidal flats opposite camp

5/4/85 1 near camp

Actitis hypoleucos Common Sandpiper Chevalier guignette

Small numbers are wintering in Mauritania, more frequently observed during migration. Main passage is noted in August-September and in February-April (Lamarche 1987). Altenburg et al. (1982) observed 5-10 Common Sandpipers in La Cherka, Nouadhibou in January and March 1980 and 5 at Kiaone during the 1980 expedition.

10/3/85 2 La Cherka, Nouadhibou; 1 Cansado

15/3/85 10 S part Presqu'Ile de Cap Blanc

30/3/85 1 Iouik

5/4/85 1 near camp

6/4/85 1 near camp; 1 Ebelk Aiznai

7-14/4/85 1 Ebelk Aiznai

23/4/85 5 S part Niroumi

25/4/85 17 Baie d'Aouatif

11/3/86 500-600 roosting Iouik, probably coming from tidal flats W Iouik
15/3/86 at least 400 roosting Iouik
17/3/86 740 Iouik
26/4/86 ++ La Cherka, Nouadhibou

Stercorarius parasiticus Arctic Skua Labbe parasite
Small numbers are wintering in Mauritanian coastal waters, generally 50-70 are wintering at the Banc d'Arguin. Present from September-April (Lamarche 1987).
13/3/85 10-15 Cap Blanc

Stercorarius skua Great Skua Grand Labbe
Small numbers are wintering in Mauritanian coastal waters, about 50 are wintering at the Banc d'Arguin. Present from September-March (Lamarche 1987). Altenburg et al. (1982) observed 1 Great Skua in the Baie de Lévrier during the 1980 expedition.
5/2/86 20-30 Baie de Lévrier

Larus minutus Little Gull Mouette pygmée
Frequently observed at the Banc d'Arguin from November-March, though always in small numbers (Lamarche 1987). Altenburg et al. (1982) observed one juvenile Little Gull in Nouadhibou during the 1980 expedition.
11/3/85 1 juv. La Cherka, Nouadhibou
25/3/85 1 Iouik
5/5/85 2 second c.y. and 1 third c.y. La Cherka, Nouadhibou

Larus melonocephalus Mediterranean Gull Mouette mélanocéphale
Small numbers, mainly immature individuals, are wintering in Mauritanian coastal waters. Present from September-April (Lamarche 1987). Altenburg et al. (1982) observed up to 5 Mediterranean Gulls in Nouadhibou during the 1980 expedition.
22/1/86 1 imm. La Cherka, Nouadhibou
18/3/86 2 third c.y. and 1 second c.y. NW part Baie d'Aouatif
1/4/86 3 La Cherka, Nouadhibou
9/4/86 2 imm. NW part Baie d'Aouatif

Larus ridibundus Black-headed Gull Mouette rieuse
About 400-500 are wintering at the Banc d'Arguin, another 300-400 are

26/4/86 4 La Cherka, Nouadhibou

Larus cirrocephalus Grey-headed Gull Goéland à tête grise

Present throughout the year, wintering as well as breeding in Mauritania. Rarely found inland (Lamarche 1987). Altenburg et al. (1982) counted 81 Grey-headed Gulls at the Banc d'Arguin during the 1980 expedition. Breeding at the Banc d'Arguin in 2 small colonies at Zira and Kiaone (15 pairs in 1984-85) from May-July (Campredon 1987). Surprisingly few sightings from Nouadhibou and surroundings. For further details see chapter 9.4.2.

21/3/85 4 Ten Alloul
22/3/85 21 along the water's edge near the camp to S
24/3/85 22 Baie d'Aouatif
26-30/3/85 10 Iouik
31/3/85 4 Ebelk Aiznai; 1 Iouik
8-9/4/85 2 Ebelk Aiznai
9/4/85 6 Iouik
17/4/85 82 Baie d'Aouatif
22/4/85 1 Ebelk Aiznai
25/4/85 26 Baie d'Aouatif
1986: Numbers appear to increase slightly in the course of February.
7/2/86 2 ad. and 1 imm. Ebelk Aiznai
8/2/86 1 Ebelk Aiznai
9-14/2/86 1-5 around Zira and Iouik
15/2/86 10 Iouik
22/2/86 8 Ebelk Aiznai; 2 near camp
24/2-3/3/86 5-10 Iouik
3/3/86 1 ad. La Cherka, Nouadhibou
10-13/3/86 10-20 Iouik
18/3/86 1 Ebelk Aiznai
22/3/86 1 ad. and 1 imm. in wing moult near the camp
24/3/86 5-10 between Nair and Rgueïba
25/3/86 5-10 between Rgueïba and Serini
1-3/4/86 about 20 Iouik
7/4/86 ++ Arel
13/4/86 5 Niroumi; 1 Tidra

25/3/86 ++ between Rgueïba and Zira

1/4/86 150 Iouik

9-14/4/86 25-100 frequently feeding socially near camp

26/4/86 + La Cherka, Nouadhibou

Larus audouinii Audouin's Gull Goéland d'Audouin

Small numbers of individual birds and some occasional small flocks are found along the coast as a wintering guest from November-May (Lamarche 1987).

20/3/85 1 ad. Baie de Lévrier

3/2/86 2 La Cherka, Nouadhibou

31/-1/43/86 5 ad. and 10 imm. La Cherka, Nouadhibou, one of these colour-ringed, possibly in Spain.

Larus fuscus Lesser Black-backed Gull Goéland brun

In theory we may expect both L.f. fuscus and L.f. graellsii in Mauritania but also Larus argentatus michahellis (Urban et al 1986). Especially L.f. graellsii and L.a. michahellis are difficult to distinguish in the field. During the 1985 and 1986 expeditions no serious attempts were made to do so. For this reason all observations of Lesser Black-backed Gull-like birds have been lumped to L. fuscus. Our observations suggest a decrease in numbers in the course of March and April. For further details see chapter 9.4.3. Altenburg et al. (1982) counted 7468 "Lesser Black-backed Gulls" at the Banc d'Arguin during the 1980 expedition.

10/3/85 +++ La Cherka, Nouadhibou

13/3/85 +++ Cap Blanc

15/3/85 120 S part Presqu'Ile de Cap Blanc

24/3/85 2 ad. and 23 imm. Baie d'Aouatif

26/3/85 30 Iouik

31/3/85 1 ad. and 6 imm. Iouik

8/4/85 30 Ebelk Aiznai

12/4/85 5 ad. and 1 imm. Iouik

13/4/85 1 ad. and 4 imm. Iouik

17/4/86 8 Baie d'Aouatif

18/4/85 2 ad. and 3 imm. Iouik

22/4/85 1 imm. Iouik

25/4/85 4 Baie d'Aouatif

27/4/85 1 Ebelk Aiznai; 1 imm. Iouik

18/4/85 roost of 10 during high tide Baie d'Aouatif, site 1
20-22/4/85 40 Nair, frequently displaying
22/4/85 4 Ebelk Aiznai; 9 Baie d'Aouatif, site 1 feeding on Fiddler Crabs
23/4/85 small numbers everywhere between Iouik and Niroumi
25/4/85 191 Baie d'Aouatif
1/5/85 ++ NE part Ile d'Arguin; + between Iouik and Ile d'Arguin
7/5/85 21 Ebelk Aiznai
10/5/85 1 La Cherka, Nouadhibou
6/2-1/4/86 about 10 along the whole W shoreline of Baie d'Aouatif
8/2/86 10 Tivide
18-22/2/86 2-3 Ebelk Aiznai
7/4/86 17 Arel
8/4/86 8 NW part Baie d'Aouatif; 5 NE Arel
9/4/86 20 NW Tidra; 10 NW part Baie d'Aouatif
11/4/86 4 Ebelk Aiznai; 5 Arel; 5 Baie d'Aouatif, site 1; 5 near camp
12/4/86 12 Ebelk Aiznai
13/4/86 ++ between Tidra and Niroumi; + surroundings of Nair
20/4/86 20-30 between Serini and Tivide
21-22/4/86 15-20 NW part Baie d'Aouatif

Sterna caspia Caspian Tern Sterne caspienne

Present as a wintering guest, as a breeding bird and as a migrant, mainly from August-April. About 1500-2000 are estimated to winter at the Banc d'Arguin, another 400-500 along the Mauritanian coast. Rarely found inland (Lamarche 1987). Altenburg et al. (1982) counted 2435 Caspian Terns at the Banc d'Arguin during the 1980 expedition. Breeding at the Banc d'Arguin in 5 colonies (2575 pairs in 1984-85, 230 of these at Zira) from February-November (Campredon 1987). Counts and occasional observations show that part of the birds at the Banc d'Arguin is resident, part is leaving the area in the course of March-April. For further details see chapter 9.3.2.
10/3/85 3 Cansado
11/3/85 60 La Cherka, Nouadhibou
13/3/85 ++ Cap Blanc
15/3/85 139 S part Presqu'Ile de Cap Blanc
20/3/85 ++ between Nouadhibou and Ten Alloul
22-30/3/85 1-2 Ebelk Aiznai
24/3/85 10 Baie d'Aouatif

1987). For further details see chapter 9.3.3.

12/3/85 7 La Cherka, Nouadhibou

13/3/85 15 Cap Blanc

15/3/85 24 S part Presqu'Ile de Cap Blanc

16/3/85 10 Iouik

20/3/85 ++ between Nouadhibou and Ten Alloul

24/3/85 360 Baie d'Aouatif

29/3/85 20 Iouik

30/3/85 100 ad. Ebelk Aiznai, all displaying

7/4/85 300 Cap Tafarit

16/4/85 204 Ebelk Aiznai

17/4/85 734 Baie d'Aouatif

21/4/85 2 Nair

22/4/85 28 Ebelk Aiznai; ++ Iouik

25/4/85 258 Baie d'Aouatif

27/4-7/5/85 32-40 Ebelk Aiznai

1/5/85 ++ between Iouik and Ile d'Arguin; + NE part Ile d'Arguin

2/5/85 ++ Baie de Lévrier

3/5/85 28 S part Presqu'Ile de Cap Blanc

5/5/85 1 La Cherka, Nouadhibou

10/5/85 23 La Cherka, Nouadhibou

8-22/2/86 10-30 Ebelk Aiznai

14/2/86 1 Zira

24/2/86 1 Serini

3/3/86 1 La Cherka, Nouadhibou

24/3/86 ++ between Iouik and Rgueïba

25/3/86 ++ between Rgueïba and Zira

2/4/86 ++ Zira; 10 La Cherka, Nouadhibou

7/4/86 +++ Arel

24/4/86 ++ Baie de Lévrier, more numerous than Caspian Tern

25/4/86 ++ between Ile d'Arguin and Nouadhibou

26/4/86 1 imm. La Cherka, Nouadhibou

Sterna sandvicensis Sandwich Tern Sterne caugek

Wintering at the Banc d'Arguin in large numbers (29,000) as well as along the coast (5000). Migration observed from August-October and in March-April (Lamarche 1987). Altenburg et al. (1982) counted 250 Sandwich Terns at the Banc d'Arguin during the 1980 expedition. Numbers obviously roost at Cap Blanc. The species is breeding at the Banc d'Arguin in 5 small colonies (98 pairs in 1984-85, 50 of these at Zira) from May-July (Campredon 1987). Locally numerous as early as February and March but at the Banc d'Arguin increasing in numbers in the course of March-April. Frequently seen migrating N in March-April. For further details see chapter 9.3.5.

11/3/85 ++ La Cherka, Nouadhibou

13/3/85 ++++ Cap Blanc

15/3/85 10 S part Presqu'Ile de Cap Blanc

17/3/85 1 La Cherka, Nouadhibou

24/4/85 30 Baie d'Aouatif

30/3/85 30 Ebelk Aiznai

3/4/85 200 Ebelk Aiznai, half of these in summer plumage, some displaying; 2 Iouik

15/4/85 40 Ebelk Aiznai

16/4/85 130 Ebelk Aiznai

18/4/85 20 Iouik

20/4/85 ++ migrating N along the camp

20-22/4/85 30 Nair, among which displaying couples

21/4/85 10 ad. and 10 imm. Iouik; 1 imm. moulting 9th primary

22/4/85 120 Ebelk Aiznai; 10 ad. and 15 imm. Iouik

27/4/85 6 Ebelk Aiznai; ++ Iouik

1/5/85 ++ between Iouik and Ile d'Arguin

2/5/85 ++ between Ile d'Arguin and Nouadhibou

3/5/85 425 S part Presqu'Ile de Cap Blanc

7/5/85 70 Ebelk Aiznai

10/5/85 53 La Cherka, Nouadhibou

8-13/2/86 1 Ebelk Aiznai

16/2/86 1 Baie d'Aouatif

22/2/86 2 Ebelk Aiznai

6-23/2/86 1 W part Baie d'Aouatif

24/3/86 20 Nair; 10 Kiji

25/3/86 5-10 between Rgueïba and Zira

28/3/86 10 near camp

29/3-22/4/86 approx. 10-20 W part Baie d'Aouatif

1/4/86 30 La Cherka, Nouadhibou

12/4/86 25 Ebelk Aiznai

13/4/86 20 Nair

small numbers in early February, getting more numerous from mid-February onwards. For further details see chapter 9.3.6.

26/3/85 1 Iouik

27/3/85 3 near camp

29/3/85 4 over the tidal flats opposite camp

30/3/85 2 ad. Ebelk Aiznai; 3 ad. near camp

31/3/85 4 ad. Iouik; 4 ad. near camp

2/4/85 14 Ebelk Aiznai

3/4/85 50 on high tide roost Ebelk Aiznai; + Iouik; 2 near camp

5-6/4/85 52-53 Baie d'Aouatif, site 6

9/4/85 8 Ebelk Aiznai

14/4/85 at least 22 Ebelk Aiznai

16/4-17/5/85 39-52 Ebelk Aiznai

17/4/85 43 Baie d'Aouatif

20-22/4/85 6 Nair

22/4/85 10 Iouik

25/4/85 62 Baie d'Aouatif

27/4/85 + Iouik

1/5/85 ++ surroundings of Iouik

3/5/85 48 Presqu'Ile de Cap Blanc

10/5/85 7 La Cherka, Nouadhibou

7/2/86 at least 2 Ebelk Aiznai

8/2/86 2 Ebelk Aiznai; 1 between Iouik and Ebelk Aiznai

10-15/2/86 + W part Baie d'Aouatif

13/2/86 2 Ebelk Aiznai

15-28/2/86 10-20 W part Baie d'Aouatif

19/2/86 6 Ebelk Aiznai

28/2/86 10 Iouik

1-30/3/86 10-20 W part Baie d'Aouatif, frequently 1-5 near the camp

18/3/86 1 Ebelk Aiznai

24/3/86 ++ between Iouik and Kiji

25/3/86 ++ between Rgueïba and Zira

1-24/4/86 ++ Baie d'Aouatif

3/4/86 20 Gibene

7/4/86 + Arel

12/4/86 15 Ebelk Aiznai

13/4/86 at least 100 Nair

16/4/86 20 Ebelk Aiznai

26/4/86 2 ad. La Cherka, Nouadhibou

Streptopelia turtur Turtle Dove Tourterelle des bois

Two subspecies occur in Mauritania, the nominate being the only one to be observed in the W part of the country. Ten thousands of S.t. turtur are wintering in the S part of the country. Passage noted in August-October and in April-May (Lamarche 1987).

5/4/85 2 Nair
8/4/85 1 Ebelk Aiznai
3/5/85 1 near Sabah hotel, Nouadhibou, Nouadhibou
4/5/85 2 in garden Nouadhibou
5/5/85 2 near Sabah hotel, Nouadhibou, Nouadhibou
2/3/86 1 corpse found Tanoudert, wing 172 mm.
22/3/86 1 near camp
27/3/86 1 dead bird beached near camp
1/4/86 1 garden Nouadhibou
17/4/86 1 Biological Station

Otus scops Scops Owl Hibou petit duc

Two subspecies occur in Mauritania, the nominate being the only one occurring as far N as Nouadhibou. O.s. scops is a wintering guest in small numbers, along the coast as well as inland. Passage is noted mainly from September-December and in April and May (Lamarche 1987).

28/4/85 1 corpse found Cap Blanc

Asio flammeus Short-eared Owl Hibou brachyote

Rather small numbers are wintering along the coast as well as in the S part of Mauritania. Passage is noted in October-November and in March (Lamarche 1987). Altenburg et al. (1982) observed 1 individual near Ten Alloul and 3 at the Banc d'Arguin during the 1980 expedition.

28-29/3/85 1 along the shoreline near Iouik, flying up with prey
7/4/85 2 Cap Tafarit

Apus apus Swift Martinet noir

Small numbers are found wintering, mainly in the S part of the country. Passage is noted in August-September and February-June (Lamarche 1987). Altenburg et al. (1982) did not observe the species at the Banc d'Arguin during the 1980 expedition.

hundreds in Iouik on 3 March 1980 and some tens elsewhere in the same period during the 1980 expedition.
24/3/85 1 N part Baie d'Aouatif flying NW
18/4/85 1 Baie d'Aouatif, site 3 flying N
28/2/86 1 Ebelk Aiznai, flying N
23/3/86 1 Baie d'Aouatif, site 1
24/3/86 4 Baie d'Aouatif, site 1

Merops apiaster Bee-eater Guêpier d'Europe
Numerous as a wintering guest in the Casamanche (Sénégal). Migrating individuals are seen from August-December and in March-June, though spring migration is rather inconspicuous (Lamarche 1987).
29/3/85 1 Iouik
6/4/85 10 Baie d'Aouatif, site 5; 8 site 6
12/4/85 call heard when unknown number was flying over camp
18/4/85 8 Baie d'Aouatif, site 3
23/3/86 41 on the sebka, Baie d'Aouatif, site 1 (10.45 a.m.); 20 males and 16 females migrating E near camp (6.15 p.m.)
24/3/86 32 Baie d'Aouatif, site 1, migrating N
25/3/86 call heard and 1 seen near camp
31/3-1/4/86 ++ Nouadhibou
23/4/86 call heard when unknown number was flying over camp
27/4/86 call heard Nouadhibou

Coracias garrulus Roller Rollier d'Europe
In the W part of Mauritania only autumn passage is observed (August-September) (Lamarche 1987). Altenburg et al. (1982) observed 1 individual in Nouadhibou during the 1980 expedition.
6/4/86 old corpse, probably dating from 1985, found NE part Tidra

Upupa epops Hoopoe Huppe fasciée
Two subspecies are present in the country, which cannot be separated in the field. In the NW part of the country probably only the nominate subspecies is present. It is only seen as a rather common migrant from August-October and January-May (Lamarche 1987). Altenburg et al. (1982) observed 1-3 individuals in the first part of February during the 1980 expedition.
10/3/85 + Nouadhibou

12/4/86 3 Ebelk Aiznai
13/4/86 6 Tidra

Aleamon alaudipes Hoopoe Lark Sirli du dèsert
Occuring as a common breeding bird all over the country, but rare or absent in the SE (Lamarche 1987). Altenburg et al. (1982) observed 1-2 in the Baie d'Aouatif area in January 1980 and 1 near Cap Tafarit in March 1980. Frequently 1-2 in Ebelk Aiznai and in the dunes in the NE part of the Baie d'Aouatif. According to our occasional observations relatively numerous around the Baie d'Aouatif but less so further away from the coast.
25/3/85 2 N Iouik
30/3/85 2 N Iouik; 1 near camp
31/3/85 1 in desert near camp
17/4/85 2 between camp and Ebelk Aiznai; 1 in SE part Baie d'Aouatif
28/4/85 1 Iouik
8/2/86 2 Tivide
17/2/86 1 near camp
24/2/86 1 Foum Al Trique
25/2/86 4 displaying Tivide
2/3/86 1 between Tanoudert and Nouadhibou
6/3/86 1 near camp
9/4/86 1 N part Tidra
13/4/86 1 Tidra

Calandrella cinerea Red-capped Lark Alouette calandrelle
Found as a breeding bird in the N part of the country. Noted on passage in September-Ocober and March-April, locally in large flocks. Wintering in the N as well as in the S part of the country. Premigratory flocks may hold thousands of birds (Lamarche 1987). Altenburg et al. (1982) observed 1 individual near Cap Timirist during the 1980 expedition.
14/3/85 1 on rubbish tip near La Cherka, Nouadhibou
1/4/85 1 Niroumi
14/4/85 1 Ebelk Aiznai
24/2/86 3 Foum Al Trique
21/3/86 5 near camp migrating N
22/3/86 2 NW part Baie d'Aouatif
30/3/86 2 near camp

30/3/86 ++ along W shoreline Baie d'Aouatif
31/3-3/4/86 + near camp
7/4/86 1 Iouik
20/4/86 3 between Serini and Tivide
21-23/4/86 2-5 near camp
26/4/86 + La Cherka, Nouadhibou
27/4/86 + Nouadhibou

Table 10.8. Weight (g) and biometrical data (mm) of a Sand Martin captured in mistnets in the Baie d'Aouatif, site 5.

date	weight	wing	age
3/4/85	220	102	ad

Hirundo rustica Swallow Hirondelle de cheminée
Only wintering in small numbers in the S part of the country. Large numbers are seen on migration, mainly from August-November and January-July, sometimes assembling in very large flocks (Lamarche 1987). Altenburg et al. (1982) observed an increased Swallow migration at the Banc d'Arguin in the course of February and March 1980.
10/3/85 + Cansado
11/3/85 + Nouadhibou
14/3/85 32 Nouadhibou
15/3/85 2 in lagoon N airport Nouadhibou
20/3/85 2 near Cap Tafarit
21/3/85 2 Ten Alloul
24/3/85 3 near camp; 60 in the Baie d'Aouatif; in the afternoon 15 Baie d'Aouatif migrating N; 1 Ebelk Aiznai
25/3/85 3 near camp; 11 Iouik
28/3/85 10 Baie d'Aouatif
29/3/85 18 Ebelk Aiznai
30/3/85 30 migrating N Iouik; +++ Baie d'Aouatif
31/3/85 400 foraging Baie d'Aouatif, site 3, gradually migrating N
1/4/85 ++ near camp
2/4/85 300 Baie d'Aouatif, site 1
3-4/4/85 + Iouik; ++ near camp; everywhere in the Sahara between

Table 10.9. Weight (g) and biometrical data (mm) of Swallows captured in mistnets near the camp or by hand in the camp itself

date	weight	wing	sex	age	fat score
31/3/85	130	121	male	ad.	0
31/3/85	180	122	male	ad.	0
1/4/85	205	117	female	ad.	0
1/4/85	173	117	female	ad.	0
2/4/85	150	120	female	ad.	0
3/4/85	193	125	male	ad.	4
8/4/85	138	119	female	2nd c.y.	0
14/3/86	157	121	male		2
14/3/86	157	120	female	ad.	3
14/3/86	130	122	male	ad.	0
18/3/86	139	120	female	ad.	0
21/3/86	150	119		ad.	0
21/3/86	163	123	male	ad.	0
21/3/86	159	122		ad.	0
21/3/86	162	124	male	ad.	0
21/3/86	161	123	female	ad.	0
22/3/86	164	119	female	ad.	3
22/3/86	148	122	female		0
31/3/86	116	117	female	ad.	0

24/3/86 1 near camp
31/3/86 1 near camp
2-3/4/86 2 near camp
12/4/86 1 Ebelk Aiznai
21/4/86 1 corpse found near Biological Station, dead for about 2 weeks, wing 119 mm

Table 10.11. Weight (g) and biometrical data (mm) of a Red-rumped Swallow captured in a mistnet near the camp

date	weight	wing	age	fat score
22/3/86	182	119	2nd c.y.	2

Delichon urbica House Martin Hirondelle de fenêtre

Wintering in very small numbers in the S part of the country. Autumn passage (October) is not very conspicuous. Numbers seen during spring passage (February-June) are somewhat larger. Most birds seem to use a route through the interior part of the country (Lamarche 1987). Altenburg et al. (1982) only observed 2 individuals at the Banc d'Arguin during the 1980 expedition.

10/3/85 + Cansado
13/3/85 1 Cap Blanc
29/3/85 1 Iouik
31/3/85 7 near camp; 3 Iouik
1/4/85 2 near camp
2/4/85 10 Baie d'Aouatif, site 1
3/4/85 + Iouik; + near camp; at least 10 Nouadhibou
5-6/4/85 ++ camp; ++ Iouik
7/4/85 + near camp
11/4/85 1 near Biological Station Iouik
14-18/4/85 up to 5 migrating N near camp
4/5/85 1 Nouadhibou
3/2/86 1 Nouadhibou
7/2/86 1 Ebelk Aiznai
15/2/86 3 near camp, migrating N
14/15/3/86 1-2 near camp

1/4/85 1 Niroumi
2-5/4/85 1-2 near camp
3/4/85 2 Iouik
11-13/4/85 1 Iouik
17/4/85 2 W part Baie d'Aouatif
14/3/86 1 near camp; 2 Baie d'Aouatif, site 1
25/3/86 2 Rgueïba, migrating N
1/4/86 1 near camp
2/4/86 3 near camp; 2 NW part Baie d'Aouatif
5/4/86 1 near camp
9/4/86 2 N part Tidra
26/4/86 + La Cherka, Nouadhibou

Table 10.12. Weight (g) and biometrical data (mm) of Tree Pipits captured in mistnets near the camp

date	weight	wing	age	fat score
16/3/85	26.5	90		4
28/3/86	15.0	87	ad.	0

Anthus pratensis Meadow Pipit Pipit farlouse

Small numbers are wintering in Mauritania, rarely in the E part of the country. Passage is noted from September-November and in February-March (Lamarche 1987).

31/1/86 1 La Cherka, Nouadhibou
9/4/86 1 N part Tidra

Anthus cervinus Red-throated Pipit Pipit à gorge rousse

Wintering in vegetated parts of the country, mainly S of the 21st degree of latitude. Passage from September-November and March-May, in autumn mainly in the E part of the country, in spring mainly in the W part (Lamarche 1987). Altenburg et al. (1982) once (7/3/80) observed 5 Red-throated Pipits near Cansado during the 1980 expedition.

11/3/85 20 La Cherka, Nouadhibou
14/3/85 15 on rubbish tip near La Cherka, Nouadhibou
30/3/85 1 Ebelk Aiznai

5/4/85 ++ near camp, among which "flava"
6/4/85 at least 6 "flavissima" Baie d'Aouatif, site 6; 1 M. flava sp. near camp
7/4/85 ++ near camp
8/4/85 5 Ebelk Aiznai; 4 near camp
9-22/4/85 at least 2 Ebelk Aiznai
12/4/85 1 male "flavissima" Iouik
13/4/85 3 near camp; + Iouik
14/4/85 4 Ebelk Aiznai; 1 "flava" W part Baie d'Aouatif
18-22/4/85 2 near camp; 1 Iouik
19-23/4/85 3 Nair
23/4/85 ++ Niroumi, all males "flava"
25/3/85 + E part Baie d'Aouatif
27/4/85 1 Ebelk Aiznai
1/5/85 + NE part Ile d'Arguin
15-19/2/86 1 near camp
22/2/86 1 male "iberiae" Ebelk Aiznai; 1 flava sp. near camp
25/2/86 1 near camp
28/2/86 3 "iberiae" Ebelk Aiznai
8-12/3/86 1-2 near camp
14/3/86 10 "iberiae", 10 "flava" and 1 "flavissima" near camp
15/3/86 3 near camp; 2 Iouik
20/3/86 1 near camp; 1 along W part Baie d'Aouatif
22/2/86 2 Ajoueïr
22-23/3/86 10-20 near camp, among which 1 "iberiae"
24/3/86 25-50 between Iouik and Kiji, among which "flavissima"
25/3/86 10-50 between Rgueïba and Zira
26-29/3/86 1-3 near camp; 1 "thunbergi" Iouik
30/3/86 15 "iberiae" and "thunbergi" near Biological Station
31/3/86 about 100 Baie d'Aouatif, site 1
1/4/86 10-20 migrating along camp, among which 1 "flava" and 2 "thunbergi"
2/4/86 2 "flavissima" along W part Baie d'Aouatif
3/4/86 4 near camp; 2 Iouik; 1 Tidra
4-27/4/86 up to 5 near camp
6/4/86 1 "thunbergi" Iouik
9/4/86 20 N part Tidra
20/4/86 1 between Serini and Tivide

2-4/2/86 ++ Nouadhibou, several places
6-7/2/86 1 near camp
8/2-7/3/86 2-5 near camp; + Ebelk Aiznai; 0-1 Iouik
16/2/86 ++ near camp
24-25/2/86 1 Teïchot
3/3/86 10 La Cherka, Nouadhibou
8-9/3/86 1 near camp
10/3-2/4/86 generally 2, occasionally up to 5 near camp; 0-4 Iouik
24-25/3/86 5-10 between Iouik and Kiji
2/4/86 6 La Cherka, Nouadhibou
2-14/4/86 1-2 near camp
3/4/86 2 very dark Wagtails near camp, possibly M.a. subpersonata; 1 M.a. alba Iouik
9/4/86 10 N part Tidra
16/4/86 1 Iouik
20/4/86 1 Tivide
21/4/86 1 Iouik

Table 10.14. Weight (g) and biometrical data (mm) of a White Wagtail captured in a mistnet near the camp

date	weight	wing	sex	age	fat score
15/4/86	15.6	83	male	2nd c.y.	0

Luscinia megarhynchos Nightingale Rossignol philomèle
Probably not present as a wintering guest. Passage, mainly in the W part of the country, from August-October and February-April (Lamarche 1987).
31/3/85 2 in camp Iouik
1/4/85 1 in camp (in tent)
17/4/85 1 near camp
9/4/86 1 N part Tidra
17/4/86 1 corpse, dead for several weeks, Biological Station

Luscinia svecica Bluethroat Gorge bleue
Small numbers are wintering in the Sénégal delta and elsewhere in wetlands in the S part of the country. Passage from September-November

26/4/86 1 male La Cherka, Nouadhibou

Table 10.16. Weight (g) and biometrical data (mm) of a Whinchat captured in a mistnet near the camp

date	weight	wing	age	fat score
4/4/85	14.0	73	ad.	2

Saxicola torquata Stonechat Traquet patre

Rare as a wintering guest as well as during migration, numbers varying strongly from year to year (Lamarche 1987).

5/4/85 1 male Baie d'Aouatif, site 6

23/1/86 1 male Sabah hotel, Nouadhibou

Oenanthe oenanthe Wheatear Traquet motteux

Four subspecies may be encountered in Mauritania, O.o. oenanthe being the most numerous. Birds wintering in the country probably mostly are O.o. seebohmi and possibly O.o. libanotica. O.o. oenanthe is observed as a migrant from September-November and February-March, "leucorhoa" is relatively scarce from September-November and in March. "Seebohmi" is noted on passage in November and in February-March, "libanotica" is mostly seen in October and November and possibly in February (Lamarche 1987). Altenburg et al. (1982) observed 1 Wheatear in Cansado in March during the 1980 expedition.

11/3/85 3 Nouadhibou

12-15/3/85 1-2 La Cherka, Nouadhibou

21/3/85 1 Ten Alloul

30/3/85 2 males Iouik; 1 male near camp; 1 male Ebelk Aiznai; 1 female (probably O.o leucorrhoa) Baie d'Aouatif; 1 male Baie d'Aouatif, site 3

31/3/85 2 Ebelk Aiznai

3/4/85 1 male and 1 female Iouik; 1 male near camp

5/4/85 at least 5, out of which 3 males, Baie d'Aouatif, site 6

6/4/85 1 male Baie d'Aouatif, site 6; 10 near camp

7/4/85 1 female Ebelk Aiznai; 1 female near camp

8/4/85 2 males Ebelk Aiznai

14/4/85 3 Ebelk Aiznai out of which 2 males O.o. seebohmi d'Aouatif

14/2-13/3/86 1 male Iouik

18/2/86 1 Tivide

22/2/86 1 female Ebelk Aiznai

3/3/86 1 male La Cherka, Nouadhibou

8/3/86 1 male near camp

Oenanthe leucopyga White-crowned Black Wheatear Traquet à tête blanche

Occurring throughout the Sahel and Sahara, generally N of the 18th degree of latitude (Lamarche 1987).

23/2/86 1 S tip Tidra

Monticola saxatilis Rock Thrush Merle de roche

A rare guest to Mauritania, mainly from September-April (Lamarche 1987).

5/4/85 1 ad. male sebka near Iouik

Turdus philomelos Song Thrush Grive musicienne

A rare guest to Mauritania, mainly from November-February (Lamarche 1987).

14/3/85 1 in bushes near Sabah hotel, Nouadhibou

30-31/1/86 1 in garden Sabah hotel, Nouadhibou

Locustella naevia Grasshopper Warbler Locustelle tachetée

Locally common as a wintering guest, mainly between Nouakchott and the Chott'Boul and along the coast. Passage from August-October and in February-March. Spring migration is very inconspicuous (Lamarche 1987).

4/4/85 1 garden Nouadhibou

5/4/85 + near camp; 1 Ebelk Aiznai

7/4/85 feather remains of eaten bird Ten Alloul

10/4/85 1 in house Iouik

14/4/85 1 near camp

23/1/86 1 garden Sabah hotel, Nouadhibou

Acrocephalus schoenobaenus Sedge Warbler Phragmite des joncs

Wintering in small numbers in the Sénégal delta and wetlands elsewhere in the S part of the country. Passage in September-October and from February-June (Lamarche 1987).

22/1/86 1 in garden Sabah hotel, Nouadhibou

Passage in September-October and in March (Lamarche 1987). Altenburg et al. (1982) observed single individuals at the Banc d'Arguin on two days in February during the 1980 expedition.

6/4/85 1 near camp

4/5/85 1 in garden Nouadhibou

20/2/86 1 near camp

Table 10.19. Weight (g) and biometrical data (mm) of a Subalpine Warbler captured in mistnets near the camp

date	weight	wing	age	fat score
4/4/85	8.8	56	2nd c.y.	3

Sylvia melanocephala Sardinian Warbler Fauvette mélanocéphale

Wintering in rather small numbers, mainly in the S part of the country. Rare in the E. Passage in September-November and from February-April (Lamarche 1987).

22/1/86 1 male and 2 females Nouadhibou

2/3/86 pair in Acacia forest N Tanoudert

Sylvia communis Common Whitethroat Fauvette grisette

A rather common wintering guest, mainly in the S part of the country. Passage in August-October and in April-May (Lamarche 1987).

8/4/86 1 Baie d'Aouatif, site 1

Table 10.20. Weight (g) and biometrical data (mm) of a Common Whitethroat captured in mistnets near the camp

date	weight	wing	sex	age	fat score
3/4/85	11.4	74	female?	ad.	0

Sylvia borin Garden Warbler Fauvette des jardins

Wintering in rather small numbers, mainly in the central part of the country, absent in the S part. Passage in August-November and from

Table 10.22. Weight (g) and biometrical data (mm) of a Blackcap captured in mistnets near the camp

date	weight	wing	sex	age	fat score
3/4/85	24.5	73	male	ad.	5

Phylloscopus bonelli Bonelli's Warbler Pouillot de Bonelli

Small numbers are wintering S of the 17th degree of latitude. Passage from August-October and February-April (Lamarche 1987).

5-6/4/85 1 near camp

18/4/85 1 near camp

14-15/3/86 1 near camp

26/4/86 1 La Cherka, Nouadhibou

Table 10.23. Weight (g) and biometrical data (mm) of a Bonelli's Warbler captured in mistnets near the camp

date	weight	wing	age	fat score
14/3/86	8.1	66	ad.	3

Phylloscopus collybita Chiffchaff Pouillot véloce

Common winter visitor in areas more or less close to the water. Passage in October-November and January-June (Lamarche 1987). Altenburg et al. (1982) observed 1 singing Chiffchaff in Nouadhibou in March 1980.

10/3/85 1 in garden Nouadhibou

11/3/85 ++ on several places Nouadhibou

13/3/85 1 in garden Nouadhibou

29/3/85 2 Iouik

30/3/85 1 Ebelk Aiznai

2-5/4/85 ++ near camp

18/1/86 5 in garden Sabah hotel, Nouadhibou

3/2/86 ++ in gardens Nouadhibou

8/2/86 1 Tivide

10/2-19/3/86 + near camp

Phylloscopus trochilus Willow Warbler Pouillot fitis

Rather common winter visitor near wetlands all over the country. Passage from August-November and in January-February (Lamarche 1987).

13-15/3/85 ++ gardens and La Cherka, Nouadhibou

30/3/85 1 Iouik; 1 Ebelk Aiznai

31/3/85 1 captured, ringed 21/4/84 Bardsey Isl., Wales; 3 Iouik

1/4/85 at least 4 around camp

5-6/4/85 +++ everywhere around the camp, frequently feeding in tents

7/4/85 4 near camp; 1 Ebelk Aiznai

18/4/85 1 Baie d'Aouatif, site 5

23/4/85 2 Niroumi

1/5/85 1 Ile d'Arguin

22/1/86 10 garden Sabah hotel, Nouadhibou

14-20/3/86 + near camp

22-23/3/86 50-100 near camp

24/3/86 30 S part Kiji

24-26/3/86 3-5 near camp

29/3-3/4/86 1-3 near camp

13/4/86 2 N part Tidra

20/4/86 3 between Serini and Tivide, foraging along the shoreline

21-22/4/86 1 near camp

Table 10.25. Weight (g) and biometrical data (mm) of Willow Warblers captured in mistnets near the camp

date	weight	wing	sex	age	fat score
12/3/85	10.3	66			4
31/3/85	7.2	63			0
1/4/85	6.2	62		ad.	0
1/4/85	6.8	62		ad.	1
3/4/85	7.3	64		ad.	1
3/4/85	8.1	71		ad.	3
3/4/85	8.7	63		ad.	4
3/4/85	7.2	68		ad.	0
3/4/85	9.5	70		ad.	3
4/4/85	8.3	64		2nd c.y.	3
4/4/85	7.6	63		ad.	2

Ficedula hypoleuca Pied Flycatcher Gobe-mouches noir

Wintering in rather small numbers in the S part of the country. Much more numerous during passage, mainly from August-November and in April (Lamarche 1987).

6/4/85 1 male Baie d'Aouatif, site 6

Table 10.26. Weight (g) and biometrical data (mm) of a Pied Flycatcher captured in mistnets near the camp

date	weight	wing	sex	age	fat score
15/4/85	8.2	80	male	2nd c.y.?	0

Lanius excubitor Great Grey Shrike Pie grièche grise

Three subspecies may be encountered in Mauritania, L.e. elegans and L.e. leucopygos being the most numerous. All subspecies are breeding in the country as well. "Elegans" is mainly to be found in the N part, thoughout the year, and may be seen on passage from August-November and February-April. "Leucopygos" is a rather common resident breeding bird from the S part of the country, though some N-S movements have been recorded. The status of "dodsoni" still is somewhat obscure. Possibly it is a rare breeding bird from the Adrar region in the central part of the country (Lamarche 1987). Observations of the 1985/86 expeditions probably refer to "elegans". Altenburg et al. (1982) observed 1 Great Grey Shrike in Nouadhibou in January 1980.

4/4/85 1 in garden Nouadhibou

22/1/86 1 singing garden Nouadhibou; 1 La Cherka, Nouadhibou

4/2/86 1 city centre Nouadhibou

20/4/86 1 between Serini and Tivide

Lanius senator Woodchat Shrike Pie grièche à tête rousse

A rather common wintering guest, occurring near wetlands in the S part of the country. Passage from July-October and March-June (Lamarche 1987).

31/3/85 1 Ebelk Aiznai; 1 near camp

1/4/85 1 ad. male Niroumi

2/4/85 2 Ebelk Aiznai

3/4/85 1 Iouik

14/4/85 5 Chami

28/4/85 1 near camp

1/5/85 4 NE part Ile d'Arguin

3-4/5/85 2-4 La Cherka, Nouadhibou

5/5/85 2 near Sabah hotel, Nouadhibou; 2 La Cherka, Nouadhibou

20/2/86 1 near camp

25/2/86 1 Aouguît

2/3/86 6 between Tanoudert and Baie de Lévrier

13-14/3/86 2 Baie d'Aouatif, site 1, watching Fiddler Crab burrows

25/4/86 3 Ile d'Arguin

Passer simplex Desert Sparrow Moineau blanc

Small numbers are found as a breeding bird in the N part of the country (Lamarche 1987).

14/4/85 12 Chami

2/3/86 10-15 Acacia woods N Tanoudert

7/3/86 8 among which 3 males, near camp

13/3/86 1 in camp

21/3/86 pair near camp

23/4/896 12 near camp

Passer luteus Sudan Golden Sparrow Moineau doré

Common breeding bird, mainly between the Sénégal river and the 18th degree of latitude, getting rarer N of this latitude (Lamarche 1987). Altenburg et al. (1982) observed hundreds in Cansado in March 1980.

18/3/85 ++ Cansado

Carduelis chloris Greenfinch Verdier

Rare visitor to Mauritania, only few sightings from Nouadhibou and Nouakchott (Lamarche 1987).

22-25/1/86 4 garden Sabah hotel, Nouadhibou

2/3/86 5 garden Sabah hotel, Nouadhibou

Rhodopechys githagenea Sahara Trumpeter Bullfinch Bouvreil githagine

Rather common and widespread as a breeding bird throughout the country, but only occurring in places where fresh water is available (Lamarche 1987).

22/3/86 1 imm. male near camp

6/4/85 1 Ebelk Aiznai

7/4/85 1 Cap Tafarit

17/4/85 2 Ebelk Aiznai

25/4/85 1 Ebelk Aiznai

12/2-24/4/86 seen or heard very frequently in or close to the camp

12/2/86 2 on tidal flats NW part Baie d'Arguin

24/2/86 traces found at Foum Al Trique

25/2/86 2 NW part Baie d'Arguin

5/3/86 1 feeding along the edge of the tidal flats NW part Baie d'Arguin

20/3/86 1 piste Teichot-Iouik, close to Serini

23-26/3/86 1 feeding at night Baie d'Arguin, site 1

25/3/86 den found Ebelk Aiznai with small and large traces nearby

1/4/86 traces found Serini

2/4/86 traces found Gibene

3/4/86 many traces found Tidra

6/4/86 1 at 12 m distance from observer, NW part Baie d'Aouatif

9/4/86 many traces as well as dens found Tidra

12/4/86 1 W part Baie d'Arguin; 1 Ebelk Aiznai

13/4/86 traces found at Tidra and Niroumi

16/4/86 1 following the waters edge near the camp; 1 Ebelk Aiznai

17/4/86 1 Baie d'Arguin, site 3 walking in direction Ebelk Aiznai

20/4/86 1 sleeping Tivide

21/4/86 1 NW part Baie d'Arguin

24/4/86 1 Ebelk Aiznai

Felis sylvestris sarda African wild cat Chat sauvage d'Afrique

19/4/85 1 close to the mist nets Ebelk Aiznai

1/5/85 1 Ile d'Arguin

Gazella dorcas Dorcas Gazelle Gazelle dorcas

25/2/86 traces found Tivide

13/4/86 1 male and 1 female Tivide

20/4/86 2 males found dead S of Tivide

Tursiops truncatus Bottlenose Dolphin Grand Dauphin

20/3/85 20-30 during crossing Baie de Lévrier

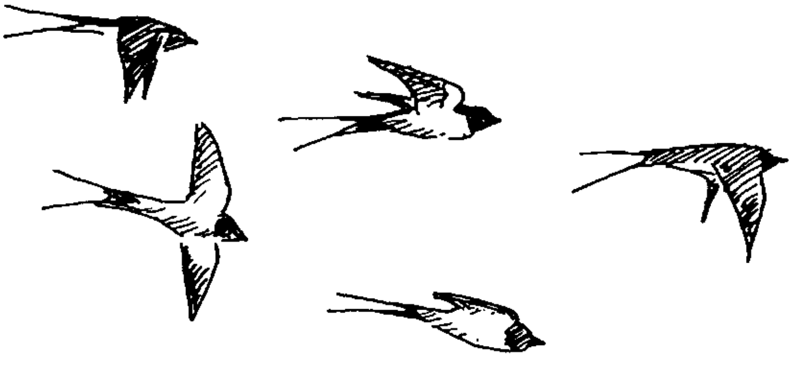
2/5/85 10-20 during crossing Baie de Lévrier

5/2/86 some tens during crossing Baie de Lévrier

17/4/86 2 W Nair

17/4/86 10 near Nair swimming in direction Arel

19/4/86 1 in channel next to the camp



summer plumage it was noted how far body moult had progressed.

In 1986 two hides were erected to the north of the camp site. The first overlooked a marked area of 5 ha. From 14 February to 21 April observations took place almost daily, following the same methodology as in 1985. The other hide was occupied once a week during two consecutive low-tide periods. One week a complete daytime low-water period was followed by a complete nighttime low-water period, while the other week a half light, half dark period was followed by a half dark, half light period. In daytime an area of 6.7 ha was covered, compared to an area of 2.5 ha during the night, due to the limited visual range of the infrared night-scope.

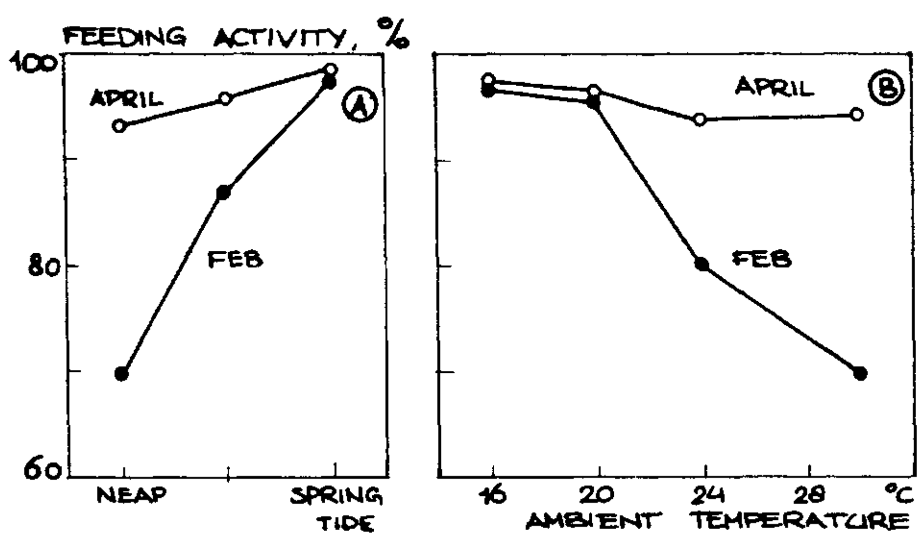
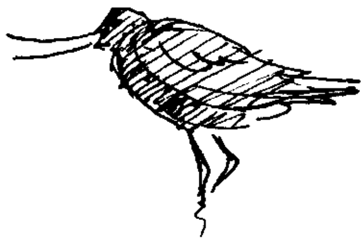


Figure 11.1. a Average feeding activity of Dunlin during neap and spring tides and intermediate tides in February and April 1986; b Average feeding activity of Dunlin at different temperatures given apart for February and April.

11.3 Results and conclusions

Daytime feeding activities were high in 1985 and 1986 and comparable to January 1980 (Altenburg et al. 1982). Waders in moult spent more time on feeding than individuals in winter plumage. This could be due to the fact that many juveniles neither moult to summer plumage nor build up large fat reserves for migration, or do so rather late in the season (chapter 9). Large flocks of preening and sleeping birds were seen outside the counting areas during neap tides in February and March: hence the feeding activity was much lower on neap tides compared to other tides in the same period, the absence of such flocks in April suggests an increase in

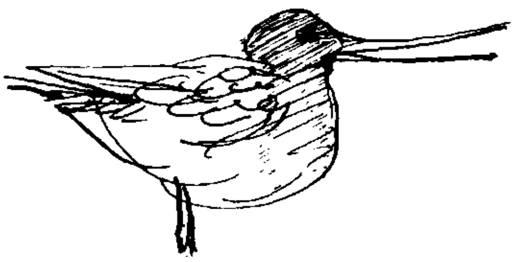


12. WADER ENERGETICS

Marcel Klaassen

12.1 Heat stress on the roost

During the 1986-expedition the possible load of heat stress on roosting waders was investigated. Experiments with a Bar-tailed Godwit mount and behavioural observations on Bar-tailed Godwits, Dunlins and Kentish Plovers, were conducted at the high water roosts. The mount experiments showed that laying birds encounter higher environmental temperatures than standing birds. Heat stress cannot be an acute problem on the high water roosts as many birds were found laying, or standing on one leg with tucked bills. The finding that roosting birds are not suffering from heat stress, cannot implicitly be extrapolated to foraging waders.



12.3 **Energetic cost of weight gain**

To evaluate the extent to which the premigratory weight gain forms a heavy burden for the waders preparing to migrate from the Banc d'Arguin in spring, cage experiments were conducted to measure the extra food needed to gain weight. In 1985 seven Turnstones were kept in captivity from 30 March to 30 April. In 1986 twelve Knots and five Sanderlings were kept in captivity from 7 March to 22 April. All birds were provided with fresh water ad libitum and a commercial feeder. At regular intervals (varying from 2 to 5 days depending on the species) all birds were weighed and food consumption over the interval was measured. These data allowed a plot relating daily food consumption to daily weight change. As

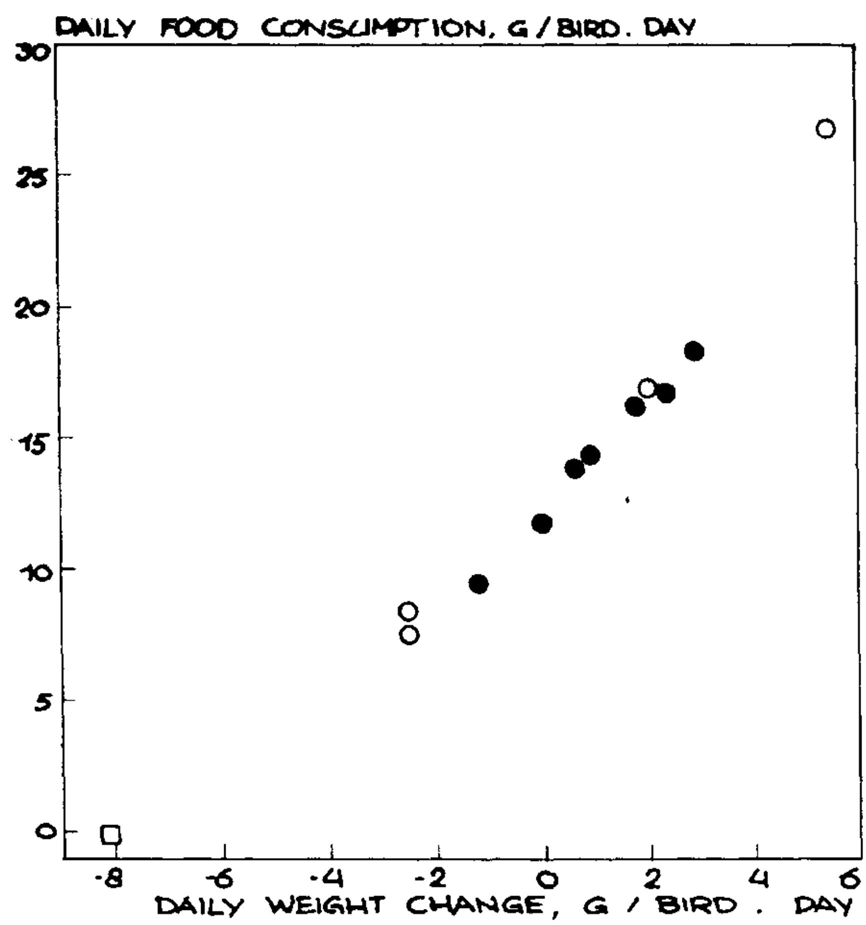
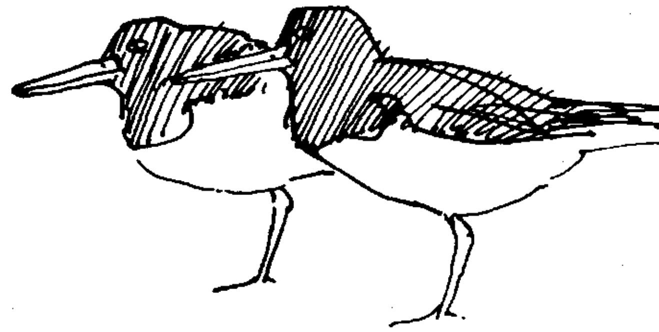


Figure 12.3.1 Daily food consumption (gram pelsifood per Turnstone per day) as a function of daily weight change (gram body weight per Turnstone per day). Closed dots refer to group means, and the open dots to data points for individuals when food was provided ad libitum. The open square reports the average weight loss when the food was taken away for a day.



13. FORAGING OYSTERCATCHERS ON THE BANC D'ARGUIN

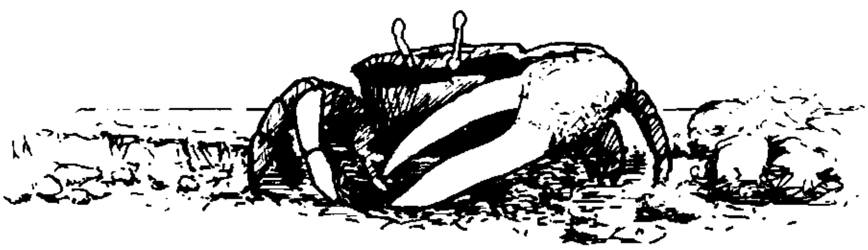
C. Swennen

All data for this study were collected from 7 to 28 February 1986. Flocks of Oystercatchers Haematopus o. ostralegus were only seen foraging on beds of the Bloody Cockle Anadara senilis that were present on intertidal flats in and around the Baie d'Aouatif (Banc d'Arguin). A few single birds, that were probably ill, were observed at other sites (beach of Iouik, harbour of Nouadhibou).

Although some Oystercatchers flew from their high water roosts to the emerging tidal flats at the same time as the other waders, the majority departed later in the tidal cycle. In contrast with what was observed in most other waders present, the Oystercatcher show no intensified feeding in the beginning and at the end of the low tide period.

Detailed feeding observations were conducted from an elevated hide on an intertidal flat at the Baie d'Aouatif. It could be established that adults fed on A. senilis. Juveniles appeared to be less specialized and took other prey species as well.

Oystercatchers obviously located most of their prey by eye while walking slowly. They always opened the bivalve by stabbing. Stabbing movements seemed to be directed to the frontal-ventral side, which is rather deep in the sediment. Undisturbed handling times were about 3.5 min on average. The first part of a handling episode from having located the prey to swallowing the first parcel of flesh, took on average 69 sec, and the last part 143 sec. The maximum undisturbed handling time lasted 570 sec (9.5 min). It did not become clear how the birds were able to open shells without damaging their bill. The handling could not be imitated by the author with living individuals of A. senilis. The metal



14. FEEDING BEHAVIOUR OF WHIMBREL AND ANTI-PREDATOR BEHAVIOUR OF ITS MAIN PREY, THE FIDDLER CRAB UCA TANGERI

Leo Zwarts and Sjoerd Dirksen

14.1 Introduction

The primary aim of this part of the project was to arrive at an estimate of the daily gross energy intake of at least one wader species under the tropical conditions of the Banc d'Arguin. Through extrapolation the result could then be used to estimate the food consumption of other wader species. A pilot study in 1985 revealed that Whimbrel preying on fiddler crabs are not only well suited to make field estimates of food intake, but also extremely well suited to make a much more fundamental investigation of the relationship between predator and prey.

14.2 Methods

A continuous record of the feeding behaviour of one Whimbrel was made (when possible throughout the whole tidal cycle) from a hide on top of 5 m of scaffolding located in the NW-corner of the Baie d'Aouatif. A total of 200 hours of observations were collected on three individuals defending a territory on the beach and adjacent muddy Zostera flats.

The surface activity of Uca was measured in three ways:

- regular counts with a telescope of Uca present in 13 plots of 4 m^2.
- counts of burrows in 76 plots of 1 or 4 m^2; the burrow diameters were measured to estimate the size frequency distribution (Zwarts 1985).
- recording the activity of Uca with a film and photo camera mounted on a tripod; pictures were made at regular intervals during the entire low water period.

obtain little food. Despite a large variation in the food intake from one low water period to the next, a gradual increase from February to April was apparent. This was due to temperatures of 17°C and less, occurring less often late in the season. The premigratory weight increase of the Whimbrel may thus be attributed to the effect of temperature on the availability of its main prey.

14.5 Prey availability

It would be too simple to equate 'prey availability' to 'density of Uca on the surface'. Special attention was paid therefore to the way Uca minimize the risk of being taken by a bird:

- how far do foraging Uca move from their safe burrows?
- what is its burst speed when taking flight to its burrows? The positive correlation between burst speed and temperature may explain why Uca do not leave their burrows at low temperature.
- at what distances from an approaching predator start the escape?
- how long do Uca remain in their burrows following a disturbance?

When the escape behaviour of Uca is compared to the feeding capabilities of Whimbrel (like its maximal running speed) it is clear that Whimbrel have to work hard to find enough prey if the Uca remain in their burrowing zone. The situation is completely different if the crabs leave their burrowing zone in very large herds to feed elsewhere. This occurred during 1 to 4 low water periods per fortnight.

Thus to understand the availability of Uca we must understand their willingness to take risks. It remains to be shown that Uca only accept high risks when potential benefits are high too.

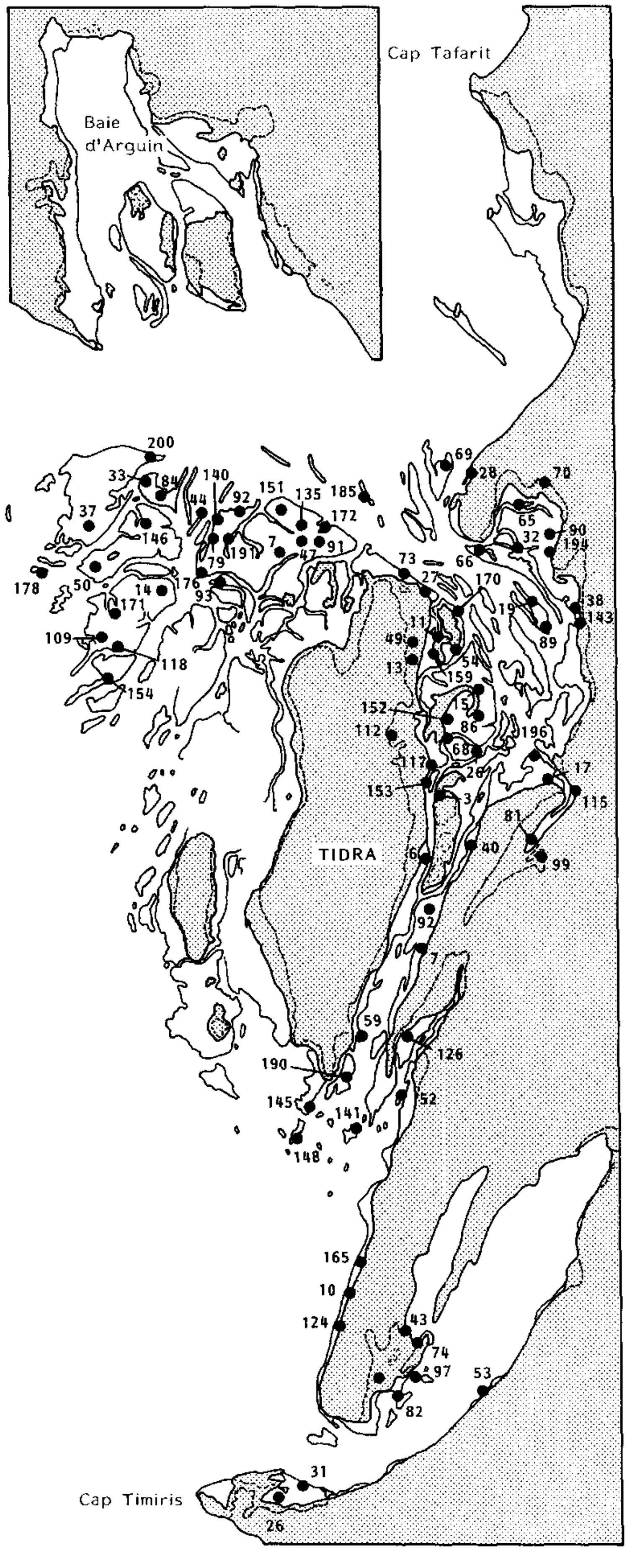


Fig. 21.1. Localities at the tidal flats where bentic fauna sampels were taken in 1986.

Amyclina pfeifferi Philippi
Samples: 13, 27, 93, 126, 226.
Beach of Iouik
Altenburg et al. (1982) found A. pfeifferi near Chikchitt, Cheddid and South Tidra

Cymbium cymbium (Linné)
Altenburg et al. (1982) record Cymbium cymbium (Linné) near Iouik and Nair.
We observed it at several places in the vicinity of Iouik and in the Baie d'Aouatif.

Persicula cingulata (Dillwyn)
Samples: 37, 90
Beach of Iouik

Persicula chudeaui Bavay
Samples: 28, 109

Prunum amygdalum (Kiener) (Marginella amygdala)
Samples: 14, 27, 28, 31, 79, 146, 151, 159, 170, 185, 192.
Beach of Iouik.
Altenburg et al. (1982) found Prunum amygdalum near Chikchitt and Cheddid

Clavatula bimarginata (Lamarck)
Samples: 37, 52, 57, 79, 82, 90, 93, 109, 118, 146, 151, 166, 171, 172, 176.
Beach of Iouik
Altenburg et al. (1982): near Chikchitt and South Tidra.

Conus papilionaceus Bruguière (Conus papilionaceus Hwass)
Near samples 84, 93, 175, 176, 185.
Altenburg et al. (1982) record Conus pulcher papilionaceus Hwass from the mudflats near Arel, Iouik, Kiji and S. Tidra

Conus genuanus Hwass
Samples: 26, 52, 118, 135, 146, 170
Altenburg et al. (1982) record apparently the same species as Conus

Altenburg et al. (1982) found Linga adansoni (d'Orbigny) alive near Arel.

Loripes lacteus (Linné)
Samples: 3, 14, 17, 19, 26, 27, 28, 31, 33, 36, 37, 40, 47, 50, 52, 53, 57, 59, 69, 79, 81, 82, 89, 90, 93, 109, 118, 135, 141, 143, 145, 146, 147, 148, 151, 154, 166, 170, 171, 172, 176, 178, 190, 191, 192.
Very common in all tidal flats. Also Altenburg et al. (1982) found this species living at all sites apart from Chikchitt.

Pythina mactroides Hanley
Samples: 6

Cerastoderma edule (Linné)
Samples: 31, 53, 126.

Dosinia lupinus (Poli)
Samples: 126
Beach of Iouik?

Venus verrucosa Linné
Near samples: 44, 200

Tagelus angulatus (Sowerby)
Baie d'Aouatif; Beach of Iouik.
Altenburg et al. (1982) mention T. angulatus from the Baie d'Aouatif; freshly dead specimens near Iouik.

Abra tenuis (Montagu)
Samples: 13, 17, 19, 27, 53, 57, 68, 79, 81, 82, 84, 92, 126, 135, 140, 148, 152, 154, 166, 171, 176, 178, 190, 192, 196, 226.
Common at all sites according to Altenburg et al. (1982)

Gastrana matadoa (Gmelin)
Baie d'Aouatif; recently dead.

Solen marginatus (Pennant)
Beach d'Iouik

Nereis spec.
Samples: 13, 14, 26, 27, 36, 37, 90, 140, 146, 151, 154, 159, 170, 175

Nephtys spec.
Samples: 32

Glycera alba (O.F. Müller)
Samples: 28, 185

Glycera rouxi (Audouin & Milne-Edwards)
Samples: 28, 69, 151

Glycinde nordmanni (Malmgren)
Beach of Iouik

Onuphis eremita
Samples: 28

Diopatra neapolitana
Samples: 3, 6, 11, 17, 31, 36, 73, 79, 90, 135, 143, 145, 150, 153, 159, 175, 191, 192, 194, 200, 226

Marphysa sanguinea (Montagu)
Samples: 6, 11, 14, 17, 19, 26, 28, 32, 33, 36, 50, 59, 90, 93, 118, 140, 141, 143, 145, 146, 151, 166, 170, 176, 190, 192, 194, 196

Nematonereis unicornis
Samples: 6, 73

Lumbrineris spec.
Samples: 33, 40, 73, 140, 143, 151, 172, 178, 191, 192, 194

Arabella mutans
Samples: 6, 31, 32, 44, 146, 175, 178, 191, 192, 200

Driloneris filum (Claparède)
Samples: 3

Capitellidae spec.
Samples: 17

Capitella capitata (Fabricius)
Samples: 3, 6, 13, 26, 27, 31, 32, 49, 53, 68, 79, 81, 90, 109, 115, 118, 124, 126, 143, 145, 147, 152, 154, 159, 165, 171, 175, 178, 190, 226

Heteromastus filiformis (Claparède)
Samples: 6, 11, 19, 27, 47, 49, 68, 69, 79, 90, 92, 93, 135, 140, 141, 145, 146, 148, 153, 154, 159, 166, 172, 185, 191, 192

Arenicolidae spec.
Samples: 109

Euclymene oerstedi (Claparède)
Samples: 3, 6, 11, 13, 14, 17, 26, 28, 31, 32, 36, 37, 40, 47, 49, 50, 52, 53, 54, 65, 69, 73, 82, 90, 93, 109, 118, 135, 140, 141, 145, 147, 148, 151, 153, 154, 159, 166, 170, 171, 175, 176, 185, 192, 194, 196, 200, 226

Petaloproctus terricola
Samples: 6, 11, 13, 14, 17, 32, 36, 40, 47, 65, 73, 82, 90, 140, 143, 145, 146, 159, 191, 192, 194, 196, 200

Isolda whydahaensis
Samples: 28

Pista spec. cf. cristata (O.F. Müller)
Samples: 90, 140, 151, 200

Terebella lapidaria
11, 36, 59, 65, 82, 90, 153, 154, 194, 196, 200

Polycirrus aurantiacus (Grube)
Samples: 3, 11, 59, 69, 82, 89, 118, 145, 192

Hypsicomus spec.
Samples: 11, 36, 143

Other species recorded by Altenburg et al. (1982) are:

Ehlersia cornuta	)	
Spionidae spec.	)	found in samples from muddy *Zostera*
Clymeninae spec.	)	
Perinereis oliveira	)	
Scolaricia typica	)	found in samples from sandy biotopes like
Scoloplos madagascariensis	)	beaches

biomass for the entire area of tidal flats was estimated at 5.5 $g.m^{-2}$ ash-free dry weight. The *A. senilis* population appeared to consist mainly of 10 to 20-year-old individuals, showing a very slow growth and a production : biomass ratio of about 0.02 y^{-1}. Recruitment appeared negligible and mortality was estimated to be about 10% per year. Oystercatchers (*Haematopus ostralegus*), the gastropod (*Cymbium cymbium*) and unknown fish species were reponsible for a large share of this. The distinction of annual growth marks permitted the assessment of year-class strength, which appeared to be correlated with the average discharge of the river Senegal. This may be explained by assuming that year-class strength and river discharge both are correlated with rainfall at the Banc d'Arguin.

A detailed account of this study is given in the Netherlands Journal of Sea Research 21: 243-253.

Table 17.1. List of species of fish, prawns and crabs caught.

Pisces (fishes)

Gynglymostoma cirratum (Bonnaterre 1788)
Atherina cf. loperiana Rossignol & Blache 1961 [1)]
Syngnathus typhle Linnaeus 1758
Syngnathus cf. abaster Risso 1826
Ephinephelus aenaeus (Geoffroy Saint Hilaire 1817)
Ephinephelus guaza (Linnaeus 1758)
Dicentrarchus punctatus (Bloch 1792)
Tilapia guineensis (Bleeker 1862) - identification not certain
Diplodus sargus Linnaeus 1758
Pomadasys incisus (Bowdich 1825)
Sparus caeruleostictus (Valenciennes 1830)
Crenilabrus bailloni Valenciennes 1839
Labrisomus nuchipinnis (Quoy & Gaimard 1824)
Pomatoschistus marmoratus / microps [2)]
Gobius niger Linnaeus 1758
Gobius paganellus Linnaeus 1758
Bathygobius casamancus
Citharichthys stampflii (Steindachter 1894)
Dicologlossa azevia Capello 1867
Dicologlossa cuneata (Moreau 1881)
Stephanolepis hispidus (Linnaeus 1766)
Ephippion guttiferum (Bennett 1831)
Sphaeroides spengleri (Bloch 1782)
Lagocephalus laevigatus (Linnaeus 1766)

Crustacea Decapoda

Penaeaidea (prawns)

Gennadas spec.
Penaeus notialis Perez Farfante 1967
Penaeus kerathurus (Forskal 1775)
Sicyonia carinata (Brünnich 1768)

Caridea (prawns)

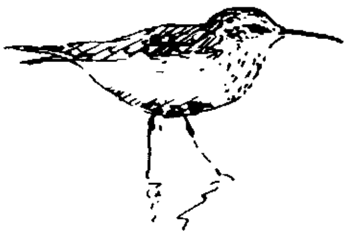
Leander tenuicornis (Say 1818)
Palaemon adspersus Rathke
Palaemon elegans Rathke
Hippolyte longirostris (Czerniavsky)
Latreutes fucorum Fabricius 1798
Pontophilus fasciatus (Risso 1816)

Table 17.2. Numbers of specimens of fish and crustaceans obtained in trawl hauls over sandy bottoms.

Year	1984		1985							1986				
Date	12/8	12/8	5/5	5/5	10/22	10/22	11/22	11/22	12/8	3/15	3/17	3/17	3/17	3/25
Atherina sp.	-	-	1	-	-	-	1	-	-	-	-	-	-	-
S. typhle	-	-	2	-	-	-	-	-	1	1	-	-	-	-
Carangidae	-	-	-	18	-	-	2	2	-	-	-	-	-	-
E. aenaus	-	-	-	-	-	-	-	-	-	-	-	-	-	1
D. sargus	-	-	-	-	23	1	-	-	50	-	2	1	-	3
L. nuchipinnis	-	-	-	-	-	-	-	-	-	-	-	-	-	1
P. marmoratus/microps	34	35	110	30	95	51	21	23	7	-	-	+	+	-
G. niger	5	2	-	4	1	-	-	-	1	-	-	-	-	-
C. stampflii	-	-	-	-	-	-	1	-	-	-	-	-	-	-
D. azevia	1	-	3	6	-	1	1	-	1	-	-	-	-	-
D. cuneata	-	-	-	-	-	-	-	-	-	-	-	1	-	-
S. hispidus	-	-	-	-	1	1	-	1	1	-	-	-	-	1
S. spengleri	-	-	-	-	-	-	-	-	-	-	1	-	-	-
P. kerathurus	8	14	-	-	) 35	) 14	30	) 19	) 4	-	-	-	-	-
P. nothialis	-	-	-	-	)	)	-	)	)	1	-	-	-	-
P. adspersus	-	-	-	-	-	-	-	-	-	1	-	-	-	-
P. elegans	-	-	24	9	46	1	2	36	2	-	-	-	-	-
other shrimps	-	-	4	-	+	-	-	-	2	-	-	-	-	-
C. marginatus	-	-	-	-	-	-	1	-	-	-	-	1	-	-
M. minor	-	-	-	-	-	-	-	-	-	-	1	1	-	-

Table 17.4. Numerical densities of fish and shrimps over the tidal flats of the Baie d'Aouatif at high tide.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Sand												
No hauls					2	-				2	2	3
Total length hauls					392	-				420	413	770
No fish/m^2					0.43	-				0.43	0.12	0.17
No gobies/m^2					0.35	-				0.34	0.10	0.10
No shrimps/m^2					0.09	-				0.22	0.21	0.00
No P. elegans/m^2					0.08	-				0.11	0.09	0.00
Seagrass												
No hauls					-	2				2	3	4
Total length hauls					-	483				420	658	1022
No fish/m^2					-	1.58				0.62	0.68	0.24
No gobies/m^2					-	0.80				0.02	0.35	0.07
No shrimps/m^2					-	4.54				7.78	5.31	1.88
No P. elegans/m^2					-	4.36				6.58	5.28	0.89



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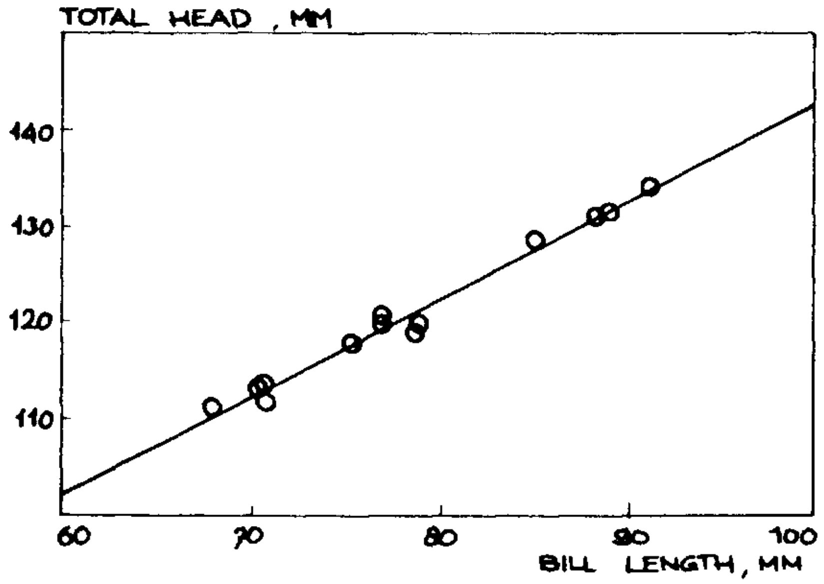


Figure 1.1. The relationship between bill length and total head of Oystercatchers at the Banc d'Arguin, Mauritania. Y = 41.3766 + 1.01383 x, r=0.992039.

plumage. The after third calendar year bird, weighing 480 g, was in full winter plumage too. Another after third calendar year bird only weighed 384 g. One of the legs of this bird was missing from the intertarsal joint and besides that, it was still in winter plumage and two of the primaries were not moulted. It was found earlier that the enumerated aberrations are indications for a poor physical condition (Swennen 1984).

Though the available sample is small (n=10) a close relationship has been found between bill length and total head (Fig. 1.1).

Table 1.1. Weights (in gram) of Oystercatchers at the Banc d'Arguin, Mauritania.

	February		March		April	
	1-14	15-28	1-15	16-31	1-15	16-30
2nd c.y.					364	
					372	
					370	
> 2nd c.y.			503			
3rd c.y.			513			423
			375			
> 3rd c.y.	480	384	592			550

Theunis Piersma

2 Avocet (Recurvirosta avosetta)

Much to our surprise we found Avocets in our mist nets on the evening of 25 March 1985 (more individuals than we had seen up till then!). The measurements made on these birds (both > second calendar year birds) are listed in table 2.1. Two Avocets with colour rings were sighted on 29 March 1986. Both were ringed in May 1984 near Holwerd, Friesland, The Netherlands, as breeding adults. One was sighted later in spring (on 19 April 1986) in the Lauwersmeer, The Netherlands, and the second was resighted on 15 April 1986 near Holwerd (M. Engelmoer, pers. comm.). It took them therefore a maximum of two weeks to fly from the Banc d'Arguin to the Dutch Wadden Sea.

Tabel 2.1. Measurements of two adult Avocets on 15 March 1985 near Iouik on the Banc d'Arguin.

	Bird 1 (ring FT 92008)	Bird 2 (ring FT 92009)
Wing length (mm)	223	217
Bill length (mm)	84.2	70.9
Total head length (mm)	127.2	119.1
Tarsus + toe length (mm)	133	125
Body weight (g)	261	275
Colour of iris	brown (female?)	reddish brown (male?)

the season, being 31 and 30% in March and April, respectively. Juveniles could not be sexed successfully. Among the adults 23 could be sexed as male, 3 as female. Another 27 could not be sexed successfully. It should be kept in mind, however, that males can more easily be sexed (Prater et al. 1977). There were 4 retraps, the biometrical data of these are given in table 3.1.

Table 3.1. Biometrical data of 4 Ringed Plovers captured twice.

Ring	Date	Age	Corrected weight	Wing	Bill	Total head	Tarsus + toe
SA 747096	25/3/85	6	51	136	14.1	41.8	47
	10/4/85	6	53	137	14.3	41.5	48
SA 747334	10/4/85	6	56	136	15.0	40.6	46
	9/3/86	6	51	134	13.9	40.5	46
SA 747336	11/4/85	6	52	131	15.0	42.0	46
	9/3/86	6	49	132	14.9	41.9	46
SA 747554	19/4/85	6	62	130	13.8	39.7	44
	22/4/85	6	57	131	14.2	40.2	44

3.3 Biometrics

Body measurements of Ringed Plovers captured in 1985 and 1986 are given in table 3.2. There are significant differences in wing length ($t = 5.44$, $p < 0.001$), bill length ($t = 2.99$, $P < 0.01$) and total head length ($t = 2.08$, $P < 0.05$) between second calendar year and adult birds. Juvenile bill lengths are somewhat smaller as compared to measures taken in 1973 ($t = 2.49$, $P < 0.05$). Adult bill lengths are exactly the same. Juvenile wing lengths in autumn 1973 were significantly larger ($t = 3.08$, $P < 0.01$) as compared to winter 1985/1986. This may be a result of feather abrasion in the course of autumn and winter, though it may also be due to the fact that different populations are involved. Adult wing lengths do not differ significantly.

A frequency distribution of bill, wing and tarsus plus toe lengths (Fig. 3.1) demonstrates two distinct and one minor peaks in bill lengths, suggesting that within the catches two or three populations can be distinguished. This may partly be explained by differences between sexes, but also indicates that at least two populations of different origin are present. Table 3.3 shows that, as in Kentish Plover, few biometrical parameters are significantly correlated.

Table 3.2. Body measurements (in mm) of Ringed Plovers at the Banc d'Arguin in February-April 1985 and 1986.

	2nd c.y. average ± S.D. range, number	Adult average ± S.D. range, number	All birds average ± S.D. range, number
Wing length	128.2 ± 2.8 123-134; n=24	132.2 ± 3.0 124-138; n=52	130.9 ± 3.4 123-138; n=77
Bill length	14.1 ± 0.6 12.7-15.3; n=24	14.6 ± 0.7 12.7-15.9; n=53	14.5 ± 7.0 12.7-15.9; n=28
Total head length	40.7 ± 0.7 38.8-42.0; n=24	41.1 ± 0.8 38.9-42.6; n=53	41.0 ± 0.8 38.8-42.6; n=28
Tarsus + toe	45.3 ± 1.5 43-48; n=23	46.0 ± 1.6 43-51; n=53	45.8 ± 1.6 43-51; n=77

Table 3.3. Correlation coefficients of corrected weight and biometrics of Ringed Plovers (all age classes), n=78. Coefficients significant at the 0.05 level are marked with *, those at the 0.01 level with ** and those at the 0.001 level with ***.

	Weight	Wing length	Bill length	Total head length
Wing length	0.3007*			
Bill length	0.0189	0.1448		
Total head length	0.0550	0.1459	0.5602***	
Tarsus + toe	0.1911	0.0371	- 0.1641	- 0.0667

Table 3.4. Corrected mean weights (grams) of second calendar year and adult Ringed Plovers captured at the Banc d'Arguin in February-April 1985/1986.

Month	2nd c.y. average ± S.D. range, number	Adult average ± S.D. range, number
February	43 (n=1)	54 (n=1)
March	47.1 ± 2.2 43-50; n=9	49.4 ± 4.2 43-57; n=20
April	49.8 ± 4.1 42-56; n=15	56.9 ± 5.1 46-70; n=31

(Johnson 1985). Figure 3.2 shows that weight increase of Ringed Plovers at the Banc d'Arguin starts from mid-March onwards. The same figure suggests a separation in two groups of birds, according to the dotted line. A comparison of wing- and bill lengths of those two groups does not show any differences. We may therefore not conclude that different populations are involved. Neither there is any indication that this separation is the result of differences between sexes.

The fact that Ringed Plover numbers on 24 March already were half of those counted in January indicates that a considerable proportion of these birds which are leaving the Banc d'Arguin do so at relatively low weights. Assuming that the population of birds captured in our mist nets is a representative sample of the population present at the Banc d'Arguin, the birds leaving the area do so at weights of approximately 50 g! The lean weight of a Ringed Plover may be estimated at 45.4 g (McNeil & Cadieux 1972). Birds leaving in March therefore would only carry about 5 g of fat, allowing them to fly somewhat over 500 kilometers (calculated from equations in Davidson 1984). This would only bring them as far as the Bay of Dakhla or coastal areas elsewhere in the Republic of Western Sahara. The heaviest birds in mid-April are approximately 10 g heavier as compared to those in March. This fat load allows them to fly about 1500 km, as a result of which they would be able to reach central Morocco.

There are two possible explanations for the extremely low fat loads found in March. Firstly we may not have captured relatively heavy birds in March. This is well possible since the number of Ringed Plover catches from the first part of March, is extremely limited. The second explanation may be that Ringed Plovers leaving in March do not prepare for long distance flights but are capable of foraging along sandy or rocky coasts along the West African coast north of the Banc d'Arguin. Quite considerable numbers have been found on rocky coasts in Morocco indeed (Kersten et al. 1983) where they appeared to be the most numerous wader species. On 13 March 1984 75 Ringed Plovers were counted on a stretch of 10 km between Cap Blanc and El Jadida.

3.5 Plumage

From early March onwards Ringed Plovers start coming into summer plumage (Fig. 3.3). Especially adult birds appear to do so. The number of second calendar year birds in intermediate or summer plumage is extremely small.

Only one bird was found to be in intermediate plumage. Adult birds come into full summer plumage by the end of March. By the end of April adult Ringed Plovers display a blend of intermediate and full summer plumages. Relatively few birds have been found to be in heavy body moult (Fig. 3.4). Most adult birds are in intermediate or light body moult and the number of birds not moulting at all is relatively large, even in the second part of March and in April. The number of juveniles found moulting amounted to 5, which equals about 20% of the total number captured. For the adults no relation could be found between moulting stage and weight. This finding is in contrast to data from Morocco 1981, where moulting birds tended to be heavier as compared to non-moulting individuals (Kersten et al. 1983). Two birds, both juveniles, were in active wing moult. One, captured on 15 April 1985, weighing 42 g showed following characteristics: 5555530000. The second bird, captured 9 March 1986 weighing 46 g showed 5550000000. None of the birds showed signs of tail feather moult.

3.6 Geographical variation and migration

Ringed Plovers have often been regarded as one of the typical species showing leap-frog migration (Salomonsen 1955, Parey et al. 1971). This means that the northernmost breeding populations are wintering farthest south, those breeding further south progressively migrating over shorter distances. As a result the southernmost breeding population (Britain) is almost resident and is wintering farthest north. Breeding populations from elsewhere in Northwest Europe have been found wintering south to North Africa. Those breeding in Iceland and Greenland 'probably' winter in West Africa whereas birds from northern Scandinavia and northern USSR winter in West Africa (Pienkowski & Evans 1984). West Europe is situated on a crossroad of migration routes from Nearctic and Palearctic breeding grounds, probably ending up in the Gulf of Guinea and possibly even further south. There are recoveries of Ringed Plovers, captured in the Wash on the English east coast, from Morocco, Sénégal and Bénin (Branson 1987). Nearctic and North Palearctic populations do mix in African winter quarters whereas considerable numbers (mainly the North Palearctic 'tundrae' population) winter inland in Africa, south of the 15th degree of latitude, along large rivers and lakes (Pienkowski in Cramp and Simmons 1983). A recent analysis of ring recoveries (Taylor 1980) shows that the leap-frog concept does exist but is less distinct than assumed

Obviously part of the Mauritanian measures coincides with the measures of the four populations from figure 3.5. However, quite a lot of measures do not fit well into these four populations. These remaining birds are especially charcterized by relatively long bills and shorter wings. The same relatively long bills and short wings have been found by the Oxford and Cambridge expedition in autumn 1973 (Dick 1975). In fact their adult bill and wing lengths did not differ significantly from values found in 1985/1986. There are two recoveries of birds ringed at the Banc d'Arguin in 1985/1986. The first, an adult ringed on 8 April 1985, was controlled in Wales (52°31'N, 04°03'W) on 5 May in the same year. The second, an adult ringed on 8 February 1986, was found dead on the French channel coast (50°59'N, 01°56'E) on 10 August 1986. The 1973 expedition yielded recoveries from Iceland, the Baltic and Morocco (Altenburg et al. 1982). These recoveries strongly suggest (cf. Ferns 1980) that at least part of the birds wintering in or passing through the Banc d'Arguin, is of Icelandic or Nearctic origin. The Baltic recovery suggests that also populations from northern Scandinavia or the USSR are involved. The origin of the long billed birds, however, for the moment remains obscure. Even more is uncertain regarding the juvenile birds. Autumn catches at Cap Timiris (Dick 1975) suggest an exodus of Ringed Plovers, particularly juveniles, to wintering quarters further south.

4.2 Catches

All but one bird were captured in mist nets on various catching sites. The total number of Kentish Plovers captured in 1985 and 1986 amounts to 24 birds, 59% of these being second calendar year birds. This figure is quite close to the 65% found by Dick (1975) at the Banc d'Arguin in 1973 and by Van Dijk et al. (1986) in the Gulf of Gabès, Tunisia. Nine birds were sexed as males, one as a female but it should be kept in mind that males can be more easily sexed (Prater et al. 1977). Two birds could not be aged successfully. All birds were newly ringed. No retraps (own birds) or controls (foreign birds) were obtained.

4.3 Biometrics

Body measurements of Kentish Plover captured in 1985 and 1986 are given

Table 4.2. Biometrics (x ± S.D.) of juvenile and second calendar year and adult Kentish Plovers along the north and west African coast. Data were taken from Dick (1975) (5), Pienkowski (1975) (1), Moser (1981) (2), Kersten et al. (1983) (3), Van Dijk et al. (1986) (4) and this study (6).

Origin	Wing length (mm)		Bill length (mm)	
	juveniles + 2nd c.y.	adults	juveniles + 2nd c.y.	adults
1 Morocco autumn 1972	110.7 ± 3.1 (n=15)	109.3 ± 2.9 (n=34)	14.9 ± 0.8 (n=17)	14.9 ± 3.3 (n=69)
2 Sidi Moussa, Morocco autumn 1980	109.9 ± 3.8 (n=29)	110.4 ± 3.0 (n=14)	14.7 ± 0.6 (n=35)	15.1 ± 1.1 (n=29)
3 Sidi Moussa, Morocco spring 1981	112.0 ± 2.5 (n=6)	114.8 ± 1.6 (n=7)	15.5 ± 0.5 (n=6)	15.4 ± 0.7 (n=7)
4 Gulf of Gabès, Tunisia winter 1984	113.8 ± 2.8 (n=33)	113.8 ± 2.5 (n=11)	16.0 ± 0.8 (n=33)	15.7 ± 0.6 (n=11)
5 Banc d'Arguin autumn 1973	110.8 ± 2.7 (n=11)	110.8 ± 0.6 (n=6)	15.5 ± 0.8 (n=11)	15.3 ± 1.2 (n=6)
6 Banc d'Arguin spring 1985, 1986	112.5 ± 3.7 (n=13)	111.9 ± 3.4 (n=9)	15.7 ± 1.0 (n=13)	15.6 ± 0.4 (n=9)

Kentish Plovers amounted to 0.3 g/h. The results presented here have been corrected accordingly. On average Kentish Plovers were kept 3.22 h ± S.D. 1.82 (n=23) between catching and weighing. The results of our measurements are shown in table 4.4. Adult weights tend to increase very slightly in the course of the season but this does not apply for young birds. The limited amount of data, however, does not allow any further analyses. Both second calendar year and adult weights are slightly exceeding the levels found by Dick (1975). The latter data (September-November 1973) show a mean juvenile weight of 36.5 g ± S.E. 1.2 (n=11) and a mean adult weight of 38.7 g ± S.E. 1.8 (n=6). Second calendar year and adult Tunisian captured birds (January-March 1984) weighed 41.3 g on average (Van Dijk et al. 1986), Moroccan birds (March 1981) were lighter (36.5 g and 37.3 g resp.) (Kersten et al. 1983). This indicates that although own Mauritanian spring weights were low, there is a certain tendency to fatten up. Figure 9.4.1, however, shows that no obvious weight increase in the course of the spring can be detected. This applies both for young and for adult birds. Only two birds out of 22 used for data analysis, weighing 51 g and 58 g respectively, were obviously heavier as compared to the rest. Assuming a lean weight of 40 g the heaviest bird carried 18 g fat. Applying the equation given by Davidson (1983) this bird would be capable of covering a non-stop flight of somewhat less than 2000 km.

Kentish Plovers leave their wintering quarters rather early in the season. Breeding sites in southern Morocco are reoccupied from the end of February onwards (Robin in Glutz von Blotzheim et. al 1975). Further north (Bretagne) Kentish Plovers arrive relatively early as well, i.e. from early March on. The majority of the population in this area arrives in the second part of March and in the course of April. Territories in countries bordering the North Sea are reoccupied from the end of March until mid-April (Glutz von Blotzheim et al. 1975). Numbers along the Moroccan coast (Sidi Moussa) decreased in the early part of March and were rather stable in the following weeks (Kersten et al. 1983). Considering these data and keeping in mind that only few adult Kentish Plovers were relatively heavy we must conclude that most of the captured birds probably were not preparing a long distance flight towards breeding areas in Europe or northern Africa. Unfortunately only very few Kentish Plovers were captured in the course of February and March. The few data available for this period do not allow any speculations on departure weights and migration strategies.

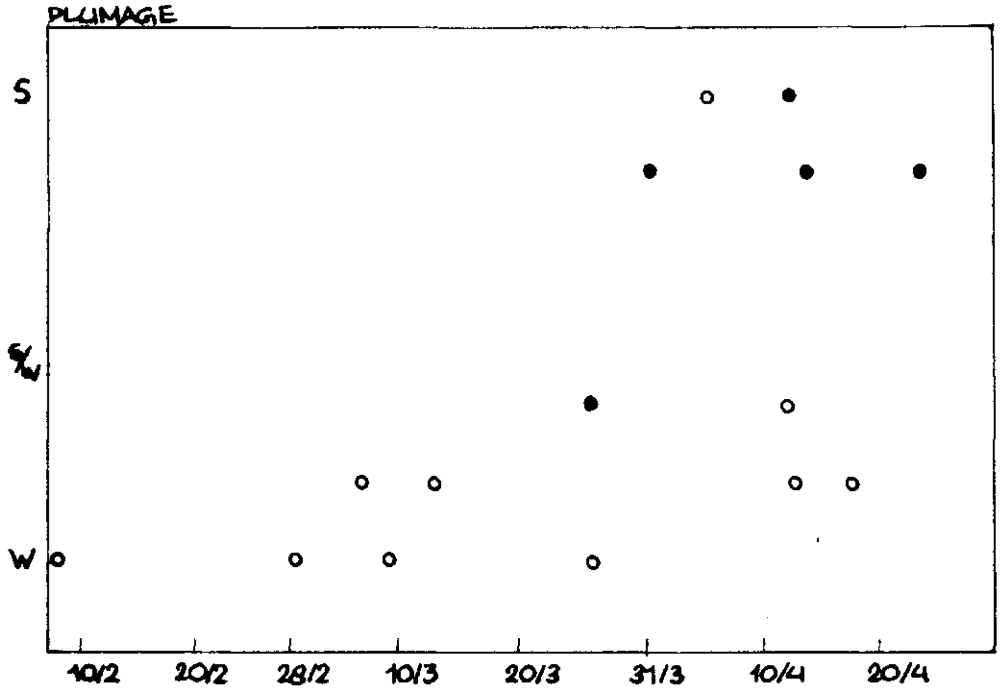
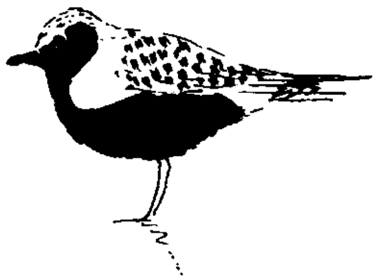


Figure . 4.2. Plumage of Kentish Plover at the Banc d'Arguin in February-April 1985/86. Open circles refer to second calendar year birds, dots to adults.

4.6 Geographical origin and migration

Though rather few data are available, the frequency distribution of bill lengths of Mauritanian captured Kentish Plovers has a single peaked shape. Most bills measured between 15-16 mm. This is in contrast with data from Tunisia. Van Dijk et al. (1986) found a bimodal distribution with peaks in the 15-16 mm and 17-18 mm range. Wing lengths at the Banc d'Arguin showed a tendency towards two peaks, one between 105-110 cm, and one between 112-117 cm. In Tunisia more or less the same distribution was found. Using the PCF-method outlined by Griffiths (1968), 60% of the Tunisian birds appeared to be small-winged (mean 111.7 mm $\pm$ 1.7), 40% was larger-winged (mean 116.3 mm $\pm$ 0.9). Part of the Tunisian population is thought to be residental, another part is believed to originate from southern France and possibly from Italy and the central part of Europe. According to Cramp & Simmons (1983) northwest European Kentish Plovers have wings of 113 mm (males) to 114 mm (females) (mean data corrected for shrinkage, Engelmoer et al. 1983), those of the Canary Islands and Maghreb countries being approximately 1 mm smaller. Measurements of wing, tail and toe apparently decrease gradually from western to southern Europe whereas males of southern breeding populations more often tend to have a bright cinnamon coloured crown. The latter phenomenon definitely



5 Grey Plover

Cor J. Smit

5.1 Introduction

As compared to some other wader species Grey Plovers are rather scarce at the Banc d'Arguin. Altenburg et al. (1982) arrived at 23,500 birds for the whole area, about 10% of these wintering in the Baie d'Aouatif. The number of Grey Plovers in the whole area corresponds to about 1% of the total number of waders. Grey Plovers can be found in several habitat types feeding in densities ranging from less than 1 up to 3 birds/ha (Altenburg et al. 1982). Numbers in the Baie d'Aouatif in 1985 varied between 1253 and 1921 birds, showing no obvious trend to decrease or to increase. The same applied for numbers counted in Ebelk Aiznai.

5.2 Catches

The total number of Grey Plovers captured in 1985 and 1986 amounts to 22 birds; five birds were captured using a clap net, one using a cannon net, the remaining 16 in mist nets at various places in the Baie d'Aouatif. All birds could be aged successfully. Exactly half the number were second calendar year birds. This is considerably more than the 19% found by Dick (1975). It should be kept in mind, however, that the number of birds captured in 1973 was small too and amounted to only 21 birds. All but one bird, captured in 1985/86, were newly ringed. One second calendar year bird, captured on 22 March 1985, was retrapped as an adult on 1 March 1986. Biometrics of the latter bird are shown in table 5.1.

Table 5.1. Biometrical data of a Grey Plover (FT 92002) captured both in 1985 and 1986.

Date	Age	Corrected weight	Wing	Bill	Total head	Tarsus + toe
22 March 1985	2nd c.y.	203	203	319	691	83
1 March 1986	adult	201	209	323	705	82

5.4 Weights

No information was collected on weight loss between catching and weighing. Based on the results of the 1981 Sidi Moussa expedition (Kersten et al. 1983) weight loss was assumed to amount to be 1.5 g/h. The results presented here have been corrected for accordingly. Grey Plovers were kept 2.77 h ± S.D. 2.20 (n=22) on average between catching

Table 5.4. Corrected mean weights (grams) of second calendar year and adult Grey Plovers captured at the Banc d'Arguin in February-April 1985 and 1986.

Month	2nd c.y. Average ± S.D. range, number	Adult Average ± S.D. range, number
February	187 (n=1)	
March	184.7 ± 16.2 164-207, n=7	202.2 ± 12.0 188-221, n=5
April	185.3 ± 12.9 176-200, n=3	209.8 ± 29.3 163-238, n=6

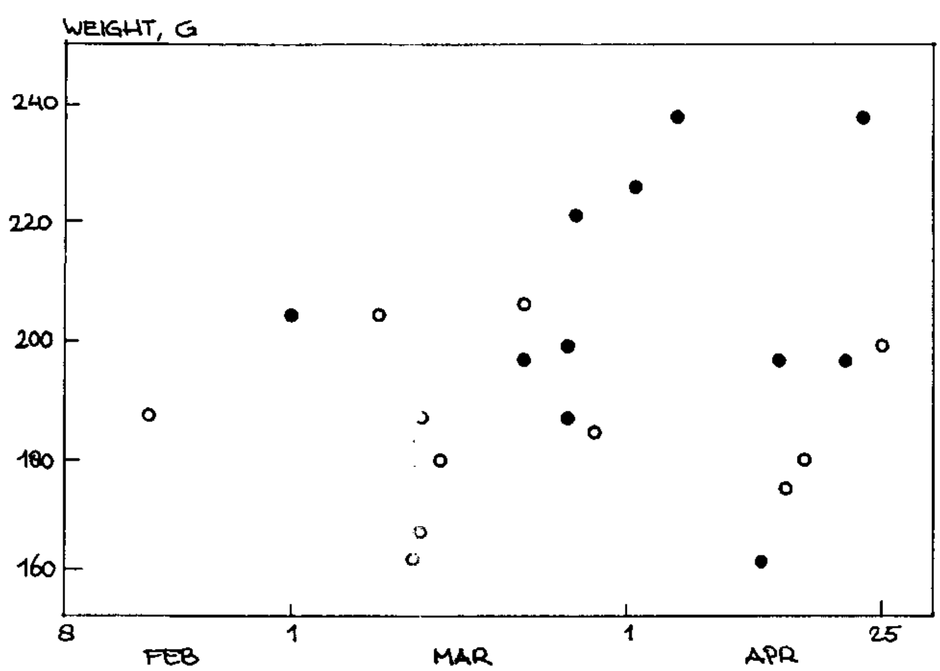


Figure 5.1. Weights (grams) of Grey Plovers captured at the Banc d'Arguin in February-April 1985/86. Open circles refer to second calendar year birds, dots to adults. Weights have been corrected for weight loss between catching and weighing.

have been no captures of birds in plumage stages 5-7, i.e. close to complete summer plumage. Field observations, however, showed that some birds apparently do come into full summer plumage at the Banc d'Arguin. By mid-April most Grey Plovers, both adult and second calendar year birds, have been found in intermediate or heavy body moult. This finding suggest that most Grey Plovers continue their body moult while on migration towards the breeding areas.

Grey Plovers at the Banc d'Arguin showed no signs of primary or secondary moult. This finding is in strong contrast with observations in Tunesia where in March 1984 9 out of 40 Grey Plovers showed primary moult and 22 out of 40 showed secondary moult (Van Dijk et al. 1986).

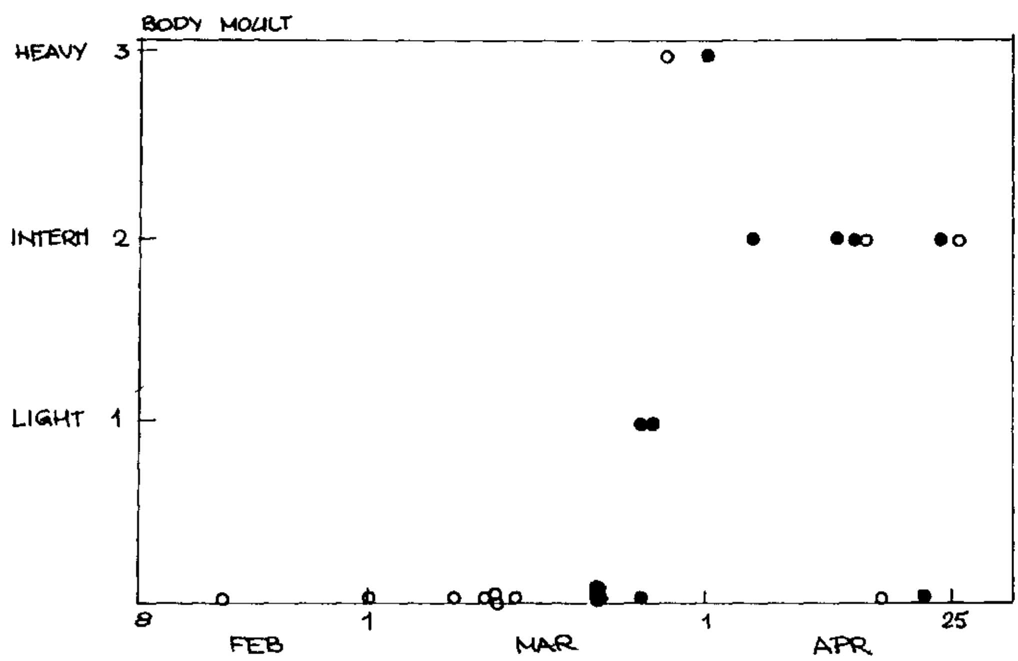


Figure 5.3. Body moult of Grey Plovers in the course of spring at the Banc d'Arguin. Open circles refer to second calendar year birds, dots to adults.

5.6 Geographical origin and migration

Grey Plovers migrating through Northwest-Europe are believed to originate from the West-Siberian population, though a recovery from the Taymyr peninsula indicates that also Central-Siberian birds are present (Cramp & Simmons 1983). Recoveries from Great Britain show that the winter quarters of birds passing through Northwest-Europe are situated as far south as Ghana (Spencer & Hudson 1978). Figure 5.4 shows the results of the wing length-bill length relation of Grey Plovers captured at the Banc d'Arguin in 1985-86. This graph also shows the means and standard what has been measured on Westsiberian birds. The latter measurements, especially some very long-winged and long-billed birds, suggest that at least some birds from eastern Palearctic populations are present at the Banc d'Arguin and possibly also birds from the Nearctic population (the presence of the latter population, however, has not yet been confirmed through ring recoveries in western Europe or western Africa). The fact that autumn catches (Dick 1975) yielded even longer-billed birds (chapter 5.3) suggests that these birds are even more numerous in this season. A possible explanation may be that the relatively high number of Grey Plovers which has been found to winter in Guinea Bissau (57,000; Zwarts 1988) and further south along the Gulf of Guinea consists of a relatively high proportion of eastern Palearctic birds. An analyses of biometrics of Grey Plovers captured in Guinea Bissau shows that a high proportion actually does consist of large billed Eastern Palearctic birds (Altenburg et al., in prep.).

Table 6.2. Body measurements of Knots captured on the Banc d'Arguin in February-April 1985/86. Body mass was corrected for loss after capture. The number of juveniles in the sample is 116, the number of adults 278 (wing, tarsus + toe), or 281 (rest).

Measurements		Juveniles		Adults	
		Average	S.D.	Average	S.D.
Wing length	(mm)	163.89	4.13	169.71	3.90
Bill length	(mm)	35.62	1.82	35.12	1.78
Total head length	(mm)	64.32	2.04	64.00	1.96
Tarsus + toe length	(mm)	59.36	1.86	58.95	1.81
Body mass	(g)	119.20	10.03	144.2	15.42

(Dick et al. 1976, 1987). The linear body measurements of Knots correlate strongly (Table 6.3). It comes as no surprise that total head length and bill length show the strongest correlation with each other.

6.3 Body mass changes

Body mass is a complicated measure because it is so variable. It depends on water and food intake and excretion, so that birds loose mass after capture. We therefore have to transform body masses taken at various intervals after capture to the time of capture, taking into account the post-capture loss in body mass (Goede & Nieboer 1983, Davidson 1984a). Figure 6.1 shows that Knots lost on average 0.8 g/h between first and second weighing, i.e. after the period of rapid mass loss in the first few hours after capture. Figure 6.1 also shows that 'our' Knots were weighed between 1 and 8 hours after capture. In this study all body mass

Table 6.3. Pearson correlation coefficients between different body measurements of adult Knots on the Banc d'Arguin in 1985 and 1986. All correlation coefficients are significantly different from zero at the 0.1% level.

	Bill	Total head	Tarsus + toe
Wing	0.334	0.356	0.390
Bill		0.821	0.334
Total head			0.337

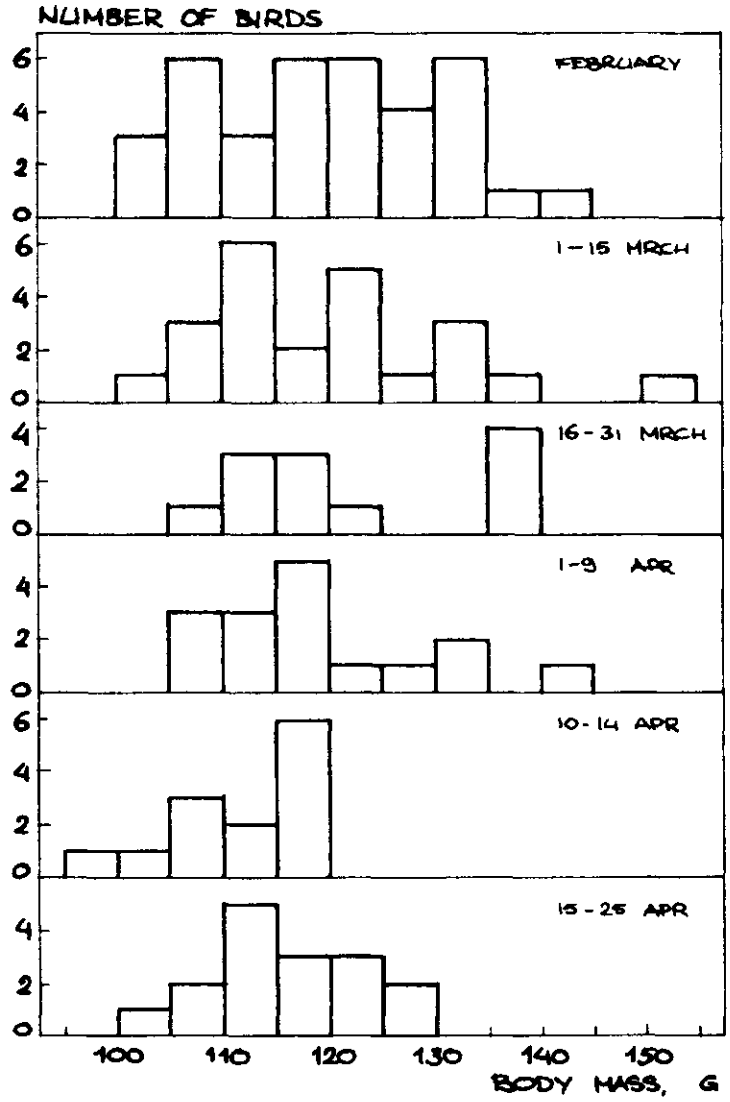


Figure 6.2. Variation in body mass of juvenile Knots on the Banc d'Arguin in February-April 1985/86.

juveniles heavier than 130 g after 10 April may indicate an early departure of Knots from the Banc d'Arguin. Since it is clear that second calendar year birds do not put on fat in April to depart with the adults to the north in late April/early May, it is possible that there are early leaving juveniles who go southwards e.g. to possible summering areas in Guinea-Bissau. This hypothesis clearly needs testing.

6.3.2 Adults. Body masses of adult Knots show a large variation, even within periods and especially from April onwards (Fig. 6.3). Part of this variation may be due to variations in structural size, as is indicated by the positive correlations between mass and various body dimensions, especially bill and total head length (Table 6.5). There were no

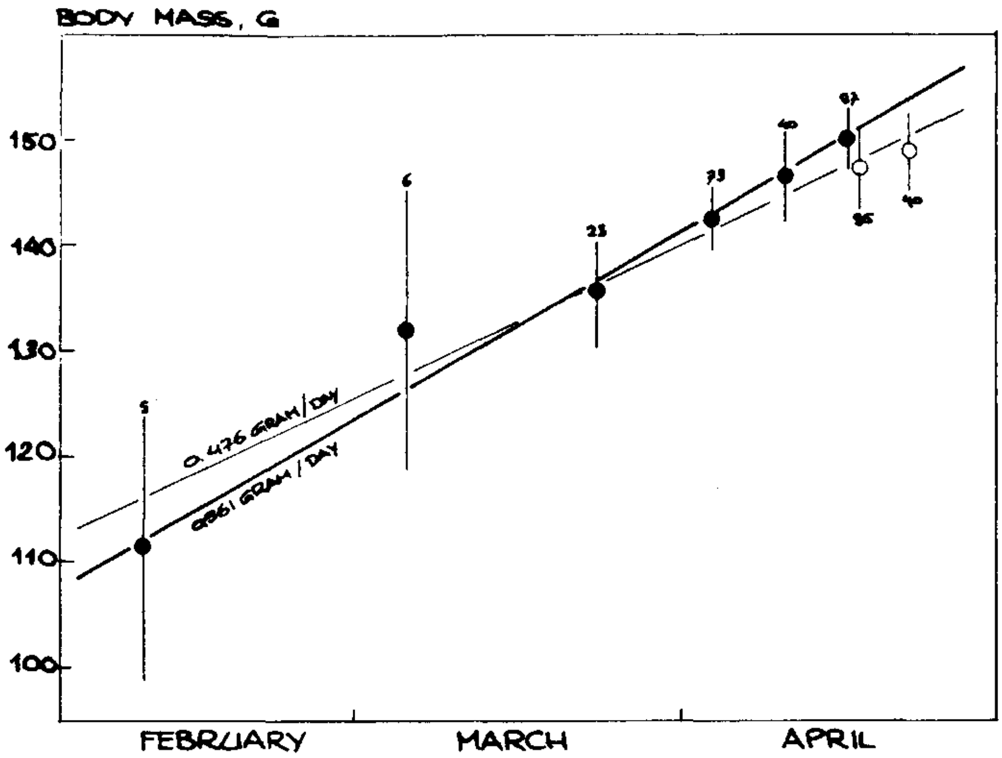


Figure 6.4. Average increase in body mass of adult Knots on the Banc d'Arguin in the springs of 1985/86. The thin line describes the linear regression through all data points (r^2=0.43) and the thick line (r^2=0.21) excludes the data from the last period and the birds with low body masses from the period 15-19 April (white area in figure 9.6.3). The dots give averages ± 95% confidence intervals.

Table 6.5. Pearson correlation coefficients between different structural size variables and body mass of adult Knots on the Banc d'Arguin in different periods in the springs of 1985 and 1986. Single underlined values are significant at the 5% level and bold typed values at the 0.5% level. The remaining correlation coefficients are not statistically significantly different from zero.

	8-28 Feb (n=5)	1-15 Mar (n=6)	16 Mar-9 Apr (n=94-96)	10-19 Apr (n=131-132)	20-25 Apr (n=40)
Wing	0.378	0.281	**0.303**	**0.457**	**0.594**
Bill	-0.491	<u>0.776</u>	**0.372**	**0.512**	**0.406**
Total head	-0.525	0.700	**0.350**	**0.519**	**0.427**
Tarsus + toe	0.557	0.537	<u>0.251</u>	**0.375**	<u>0.323</u>

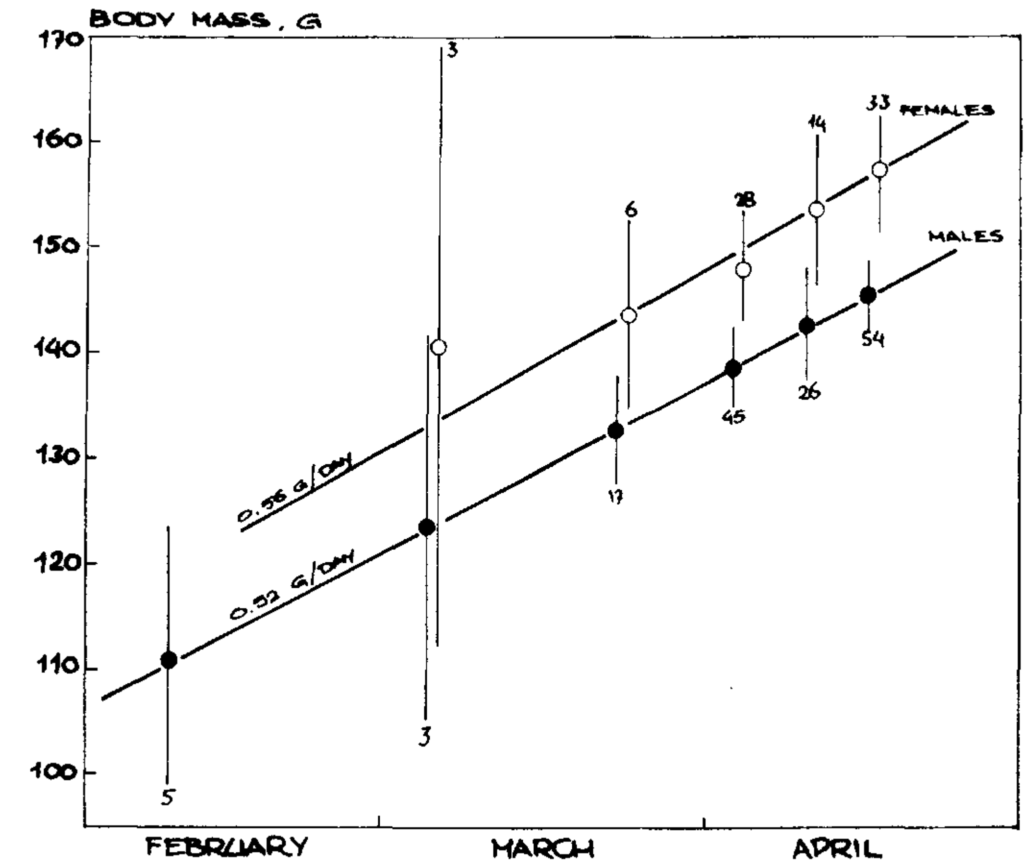


Figure 6.6. Body mass increases of adult female and male Siberian Knots caught on the Banc d'Arguin in 1985/86, excluding the light birds and those from the last catching period (cf. Fig. 9.6.3). The birds were sexed according to the discriminant function presented in figure 9.6.5. The dots give averages ± 95% confidence intervals.

or larger than 0.8), the results are the same, although the explained variances are somewhat lower.

Arrival times in West Europe (Piersma, Bredin & Prokosch in prep.) indicate that the Knots should be leaving the Banc d'Arguin during the first few days of May. An extrapolation of the average body mass increase (Fig. 6.4), suggests that the average departure mass would be about 160 g. This is 20 g less than the predicted departure mass on the Banc d'Arguin, as estimated by Dick et al. (1987: Fig. 9) from arrival masses in Schleswig-Holstein (the inferred next stopover site) and the flight range formula of Davidson (1984a). Note, however, that the 'disappearance' of birds weighing 170-190 g between 15-19 and 20-25 April (Fig. 6.3) indicates that some birds may leave with predicted body masses. The average mass increase of 0.56 g/day on the Banc d'Arguin is far less than the average mass increase of 3/day measured at Langebaan Lagoon in South Africa and 4 g/day in the Wadden Sea (Dick et al. 1987).

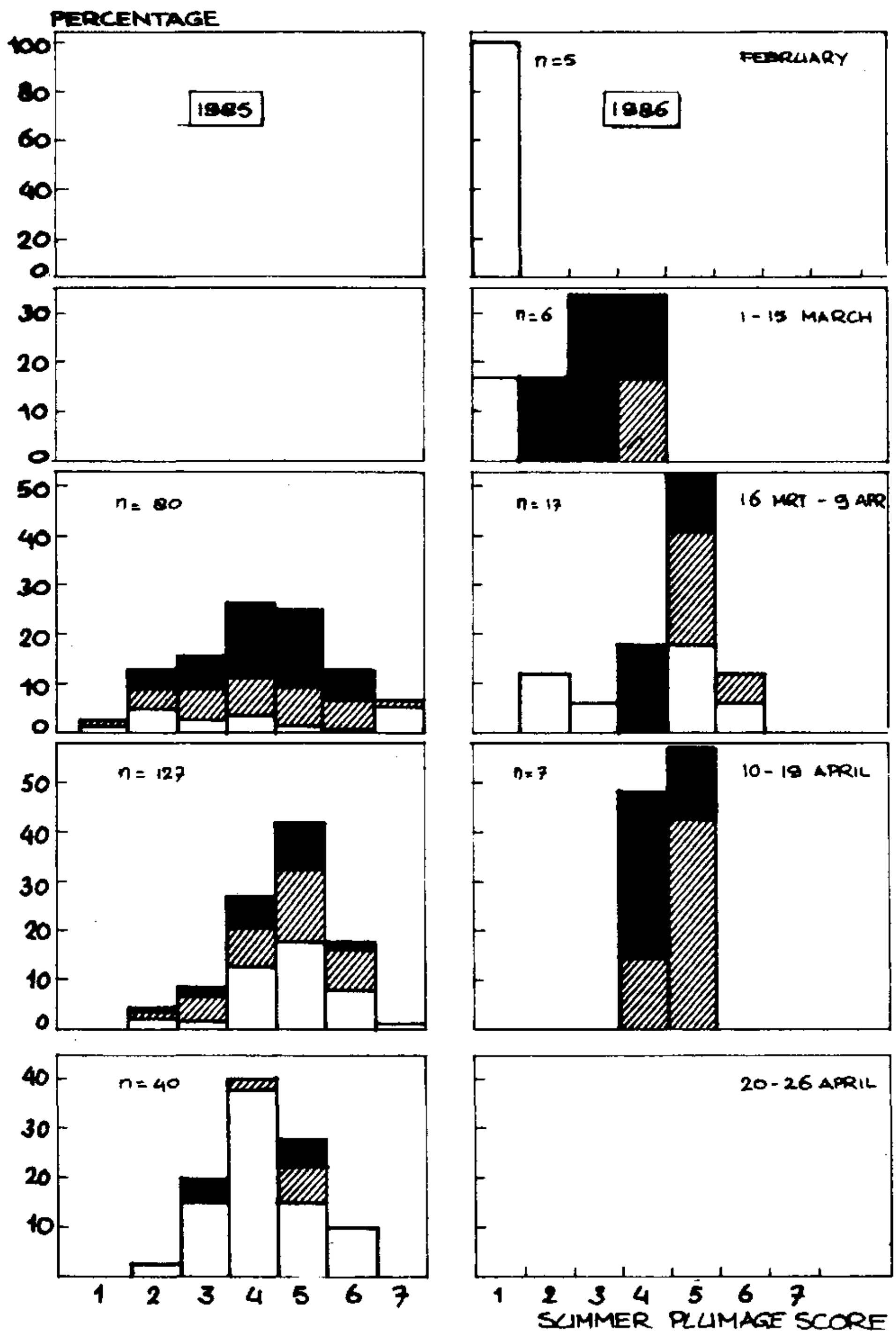


Figure 6.8. Development of the summer plumage of adult Knots on the Banc d'Arguin in the period February-April in 1985 and 1986, in relation to body moult. Heavy shading refers to birds in medium or heavy body moult, light shading to birds in light body moult and no shading to birds without body moult. A summer plumage score of 4 stands for half summer plumage, 5 for 3/4 summer plumage, 6 for trace of winter plumage and 7 for full summer plumage.

plumage show smaller body moult intensities, and: later in spring birds with a more, but also with a less advanced summer plumage, show little or no body moult. This strongly suggest that before departing to the north birds stop body moult. This is even the case when the summer plumage is not yet fully completed: the 'decision rule' whether to finish summer plumage, or to stop body moult and leave summer plumage incomplete as to be able to migrate, appears to change in the course of the spring season.

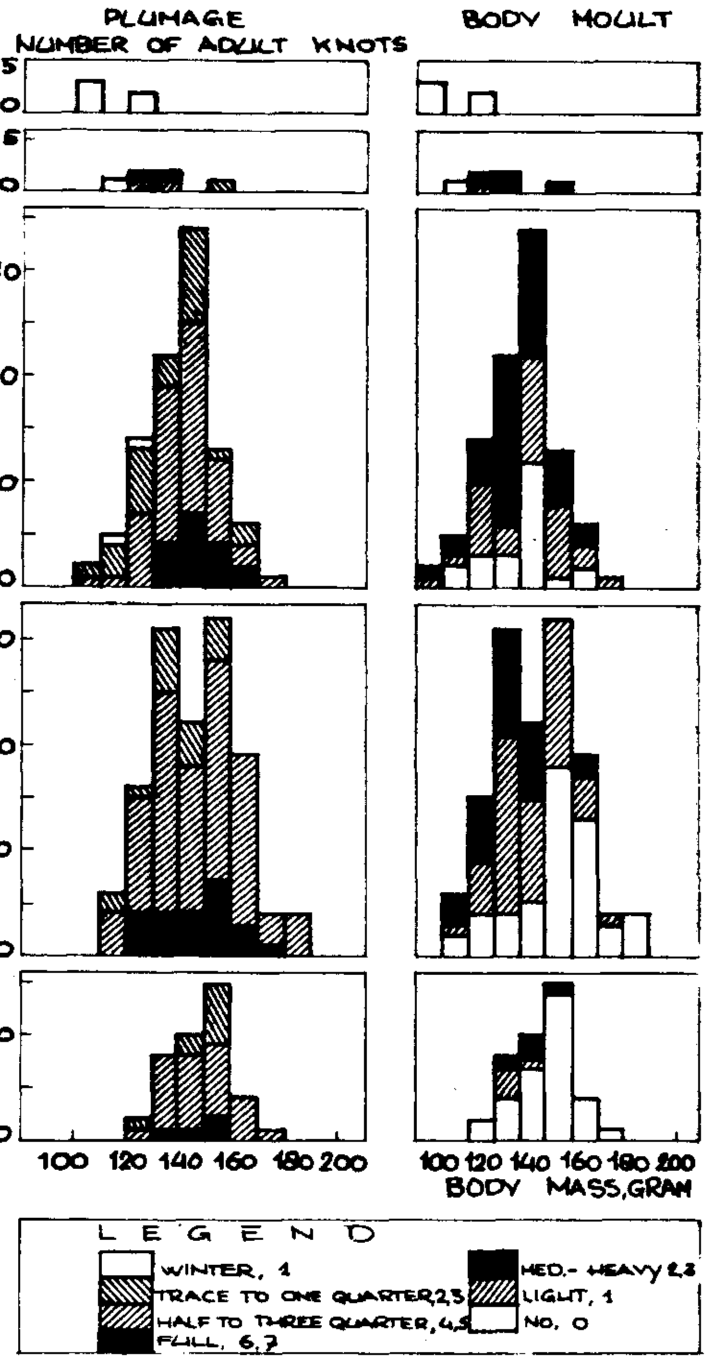


Figure 6.11. The development of summer plumage and the intensity of body moult in relation to body mass and the time of the year in adult Knots on the Banc d'Arguin (1985/86).

composition between catches, the number of second calendar year birds dominating in February (10 second calendar year birds and 2 adults in February 1986), the number of adults dominating in April (5 second calendar year birds and 26 adults in April 1985). During the Oxford and Cambridge Mauritanian expedition in September-November 1973 (Dick 1985) 110 Sanderlings were caught, 29% of these being juvenile birds. For the moment sample sizes still are too small to speculate on the background of these differences.

Table 7.1. Body measurements (in mm) of Sanderlings captured at the Banc d'Arguin in February-April 1985 and 1986.

	2nd c.y. average ± S.D. range, number	Adult average ± S.D. range, number	All birds average ± S.D. range, number
Wing length	123.3 ± 2.9 117-131; n=21	126.8 ± 3.7 118-133; n=31	125.4 ± 3.8 117-133; n=54
Bill length	24.8 ± 1.3 21.7-27.6; n=22	24.6 ± 1.9 20.9-27.9; n=31	24.7 ± 1.6 20.9-27.9; n=55
Total head length	50.0 ± 2.0 46.8-57.3; n=22	50.0 ± 1.8 45.5-53.1; n=31	50.0 ± 1.9 45.5-57.3; n=55
Tarsus plus toe	44.1 ± 1.4 41-47; n-21	45.0 ± 1.3 43-47; n=31	44.6 ± 1.4 41-47; n=54

All 1985/86 captured birds were newly ringed. No retraps (own birds) or controls (foreign birds) were obtained. Eight birds out of the 1986 catch were used for cage experiments.

7.3 Biometrics

Body measurements of Sanderlings captured in 1985 and 1986 are given in Table 7.1. Adult wing lengths are very similar to values found by Dick in 1973 (mean 126.6 ± S.E. 0.31 for new primaries). Wing lengths of juvenile birds caught by the 1973 expedition were somewhat longer (mean 124.8 ± S.E. 0.35), but this difference is not significant ($p>0.05$, t-test). The same has been found in other species, e.g. for Little Stint, and could be a result of feather abrasion in autumn and winter. There is no difference in bill lengths between second calendar year birds and adult birds. This

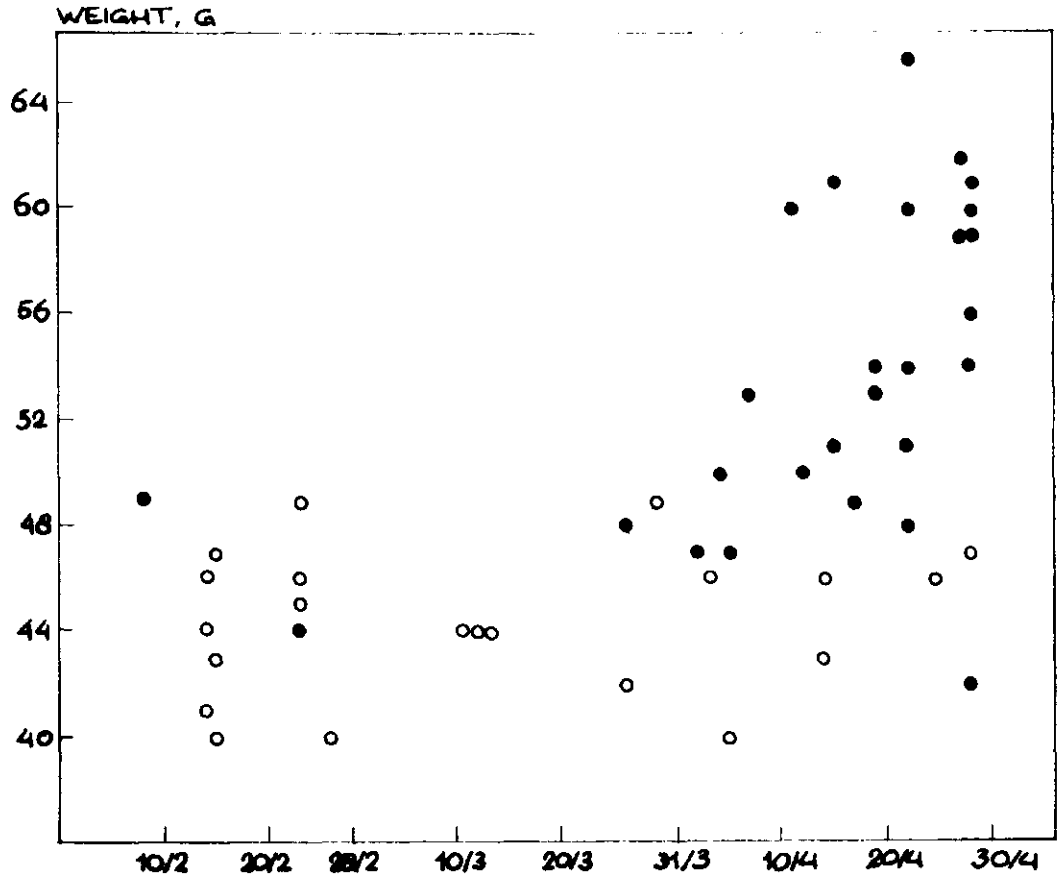


Figure 7.1. Weights (grams) of Sanderlings, captured at the Banc d'Arguin in February-April 1985/86. OPen circles refer to second calendar year birds, dots to adults. Weights have been corrected for weight loss between catching and weighing.

± S.E. 0.39 for adults in September-November 1973. Though the sample size of our February catches is small, weights may be considered comparable to those found in 1973. Once again (following Dick 1975) we may conclude that Sanderling weights in Mauritania in winter are the lowest found anywhere.

Three birds, died during capture or during their stay in the cages, were analysed on fat content afterwards. Results of this analysis and biometric data are given in table 7.4. Lean weight figures are considerably below the 55 g we arrive at when applying the lean weight equation given by McNeil & Cadieux (1972).

Weights, especially of adult birds, increase in the course of time. Figure 7.1 demonstrates that adult weight increase probably starts around mid March. Because very little information is available for February and March it is impossible to be more explicit about the start of the fattening up. More or less the same applies for the fattening up of potential flight range if 1,500-2,300 km (Davidson 1984). This fat load will bring them to the Moroccan coast, and it means that their flight range is only half the size, or less, as compared to Sanderlings from Britain and South Africa. This may implicate that Sanderlings captured at the Banc d'Arguin either were still in the process of fattening up, or that flight ranges of birds leaving the Banc d'Arguin simply are rather small. According to Dick (1975) Sanderlings are numerous along the Mauritanian mainland coast between Cap Timiris and Nouakchott. The same applies for the Sénégalese coast where De Smet & Van Gompel (1979)

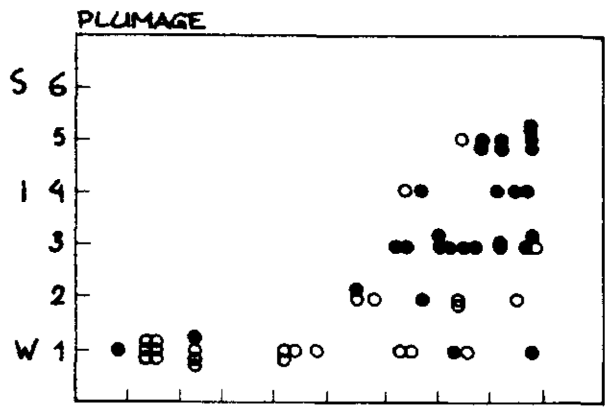


Figure 7.2. Plumage of Sanderlings at the Banc d'Arguin in February-April 1985/86. Open circles refer to second calendar year birds, dots to adults.

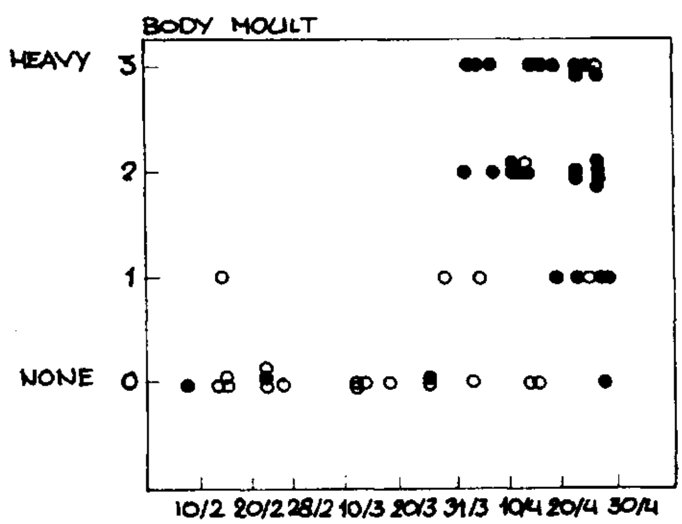


Figure 7.3. Body moult of Sanderlings in the course of spring at the Banc d'Arguin. Open circles refer to second calendar year birds, dots to adults.

counted over 6,000, being the most numerous wader species. The same may apply for sand beaches further north along the African coast. A possible explanation for the rather low weights at the Banc d'Arguin therefore may information. According to Cramp & Simmons (1983) adult Sanderlings moult part of their body feathers in the second part of April and in May, some feathers even being replaced as late as mid-July. Some second calendar year birds also show body moult and also attain some summer plumage. They do, however, lag behind the adults. Again this is in agreement with literature. According to Cramp & Simmons (1983) spring body moult in juveniles is highly variable and mainly takes place in May-June. One bird of unknown age, weighing 47 grams, captured on 28 April 1985 was in active wing moult in its outer two primaries (5555555543).

7.6 Geographical origin and migration

An analysis of the wing length-bill length relation of birds caught in Mauritania in 1985/86, together with biometric data from breeding areas in the nearctic and some stop-over and wintering sites in the Palearctic (Fig. 7.4) yields no information on the possible origin of the Mauritanian birds. There is a considerable overlap in sizes between Nearctic and Palearctic breeding populations and the pattern is even more obscured by the size difference between sexes. Birds caught in Mauritania much variation, both in wing length and in bill length. It is striking that some relativly small-winged and small-billed birds have been caught, both second year birds and adults. These measurements point towards West Siberian birds. Uspenski (1969) gives wing lengths of 115-124 mm (mean 118.6) for 30 females from Siberia (exact location unknown) and 115-126.5 mm (mean 121.9) for 30 females. Bill lengths of this population are 20.8-26.0 for males and 20.2-27.6 for females. The lower part of the range of measurements of birds encountered in Mauritania is below the one found in Nearctic birds (Cramp & Simmons 1983, Engelmoer 1984). These measurements however do coincide with small-winged and small-billed birds captured in South Africa (Summers et al. 1987). of the latter population have been recorded in Siberian breeding sites and stop-over areas along the Black Sea, Caspian Sea and Mediterranean, the latter areas also pointing to migration towards Siberian breeding areas. Additionally there is one May-resighting of a 1985 dyed Sanderling from the Schleswig-Holstein west coast, also pointing towards migration to Siberia. On the other hand there are three spring recoveries of Mauritanian ringed Sanderlings from the English west coast, birds probably belonging to the Greenland breeding population (Dick 1975). These data clearly suggest that Sanderlings of both Nearctic and Palearctic origin are wintering at the Banc d'Arguin.

suggested that both female and male birds were present at all times. The wing lengths however were on average longer than those found by Etheridge (1971) in the Trucial States in late December (mean 95.5 mm, range 93-99 (n=7)). The adult wing lengths were very similar to those found by Dick (1975) mean 98.4 mm but the juvenile wing lengths found by Dick were on average longer 99.7 mm (n=46). Wing lengths at the lower end of the range in the study were smaller than those published in 'The Birds of the Western Palearctic' (Cramp & Simmons 1983).

The mean bill length of all birds (n=244) was 18.7 mm (S.E. ± 0.06) with a range of 15.1-21.1 mm. For juvenile birds, mean bill length was similar to those of adults. The distribution of wing length is shown in figure 9.8.1.

Cramp & Simmons (1982) give a range for bill length of 16.7-19.9 mm for museum specimens. Seven birds were found to have bill lengths shorter than this range, with one bird very much shorter 15.1 mm. In addition

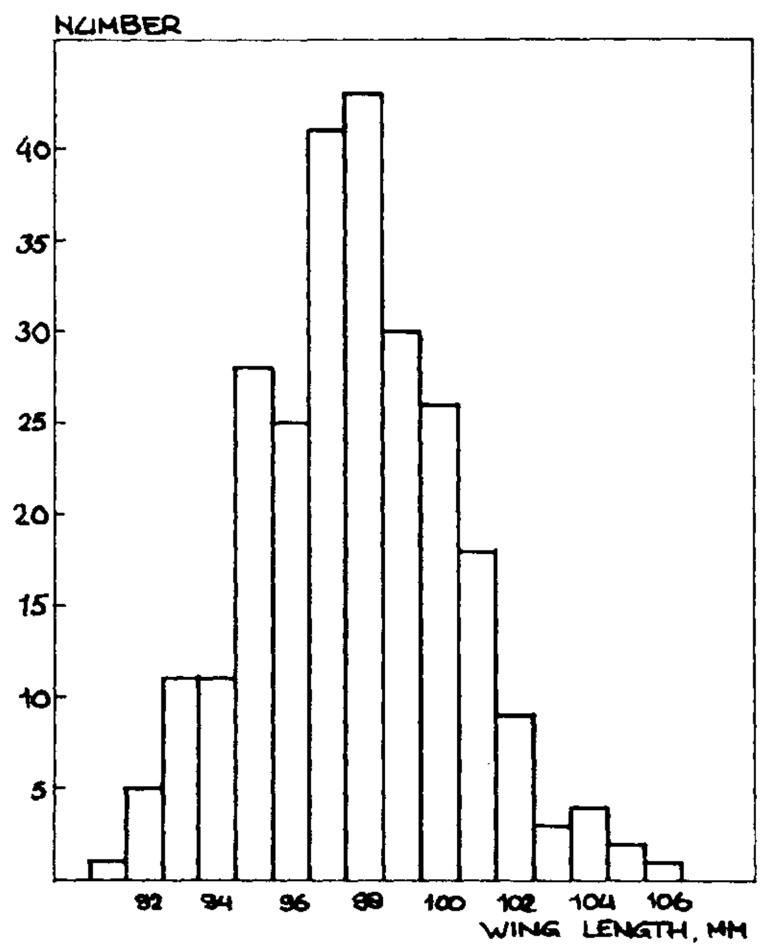


Figure 8.1. Distribution of wing lengths of Little Stints caught on the Banc d'Arguin in 1985/86.

However, often weights were recorded some time after the bird was captured and weight losses are known to occur with time. In several cases a second weight was taken after a known period of time in an attempt to assess this weight loss with time.

If it is assumed that this weight loss is linear, the following equation can be applied:

$$WDif = -0.249 + 0.341\ TDif\ (r^2=0.54)$$

where WDif = difference in grams between first and second weight, and TDif = time in hours between the two weights.

This gives a weight loss of 0.3 g/h. It is probable that the weight loss in the first hour is greater than this, with a lower decrease in weight as time progresses. Because the time of capture was approximately known and the time of weighing was recorded, it is possible to correct the weights of the birds using the above equation. This was then used to give a mean corrected weight for all birds of 25.3 g and a range of 17.9-36.5 g. Juvenile mean weight was 25.5 g, range 17.9-36.5 g. Corrected mean weights over the the period of the study are shown in table 8.2.

Table 8.2. Corrected mean weights of Little Stints in time periods between 8 February and 22 April (1985 and 1986).

	8-13 Feb	1-9 Mar	13-16 Mar
All birds	21.4 g	21.6 g	21.8 g
Juveniles	23.7 g	20.7 g	19.1 g
Adults	20.7 g	22.5 g	22.9 g
	22 Mar-5 Apr	10-16 Apr	17-22 Apr
All birds	23.4 g	26.9 g	27.1 g
Juveniles	22.0 g	23.5 g	24.1 g
Adults	23.9 g	26.4 g	27.3 g

The weight increase with time is still present with the adult birds and this may show a pre-migratory increase at the Banc d'Arguin prior to departure northwards. Because this increase is not so apparent in moulted varied considerably from very few to nearly all. There was one bird (juvenile) which showed arrested moult with a moult configuration of N^7O^3. Arrested moult in Little Stints has been recorded by Dowsett & Fry (1971) at Lake Chad, and Pienkowski et al. (1976) on the Atlantic coast of Morocco. In both these cases arrested moult was recorded in September.

Body moult was recorded in the majority of birds and there were birds caught showing full winter plumage right through various stages to full summer plumage.

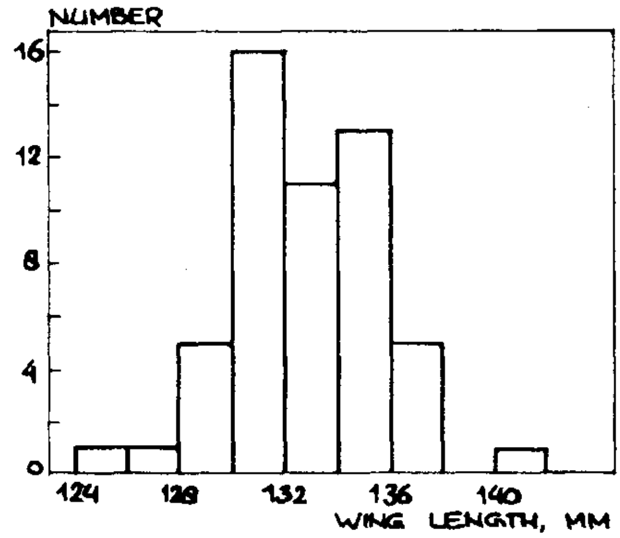


Figure 9.2. Frequency distribution of wing length of adult Curlew Sandpipers (n=53) caught at Iouik, Mauritania in 1985 and 1986.

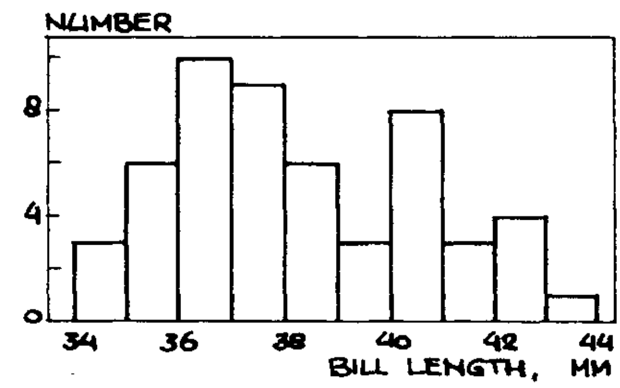


Figure 9.3. Frequency distribution of of bill length of adult Curlew Sandpipers (n=53) caught at Iouik, Mauritania in 1985 and 1986.

al., in prep., T-test, df=70, t=0.67), but does significantly differ from mean bill lengths measured during a winter expedition to Mauritania (Dick et al. 1975, T-test, df=402, t=2.35) and two autumn expeditions to Morocco (Pienkowski et al. 1972, T-test, df=63, t=5.10; Moser et al. 1980, T-test, df=87, t=2.00). The difference with the autumn figures is probably caused by the differential timing of autumn migration by males and females, the males migrating earlier and leaving to incubate and tend the young (Portenko 1959). In spring there is simultaneous northward migration (Elliott et al. 1976) and simultaneous arrival on the breeding grounds (Portenko 1959). The autumn figures from Morocco also illustrate this point: the mean bill length for adult birds caught in July and August is significantly lower than that for adult birds caught in September (Pienkowski et al. 1972; Moser et al. 1980; T-test, df=44,

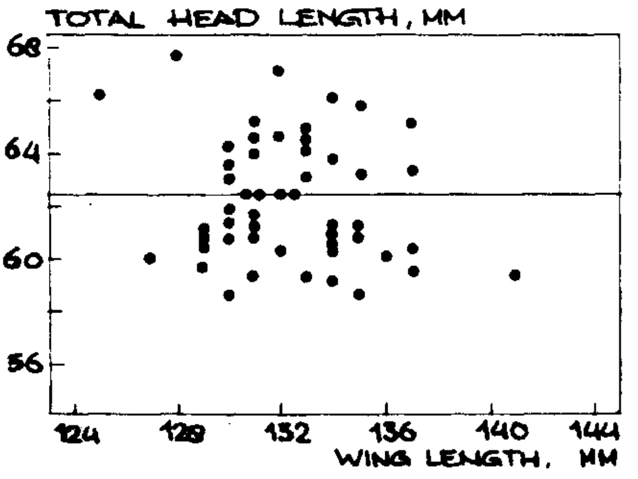


Figure 9.6. The relationship between total head and wing length in adult Curlew Sandpipers (n=51), y = 82.55 - 0.15x (r=-0.18). The horizontal line divides the females (top) and males (bottom) according to the discriminant function (see text).

In our data neither bill length (r=-0.08) nor wing length (r=-0.04) correlates well with weight during the spring period when there is no increase in weight yet (before 15 March), so these measures cannot be used as an indication for structural size.

In order to see how much weight birds might loose between time of capture and time of measurement, we measured rates of weight loss in a small sample of birds. One bird reweighed after one hour had lost 1.7 g, three birds reweighed after 4-5 hours lost on average 0.8 ± 0.4 g/h, eight birds reweighed after 10-12 hours lost on average 0.6 ± 0.06 g/h. The greatest rates of weight loss therefore occur in the first hours of captivity. The average weight loss of all 12 birds is 0.7 ± 0.4 g/h. In practice the time between capture and first weight is on average 4.4 ± 1.7 h (n=87). So our correction with 0.7 g/h is considered a minimum.

Table 9.1. The fresh and fat-free fresh weights and the sexing data (see text) of three Curlew Sandpipers caught and dissected at Iouik, Mauritania, in spring 1985 and 1986.

Age	Fresh weight (in gram)	fff-Weight (in gram)	Sexing by dissection	Sexing by discriminant function
Adult	67.8	52.6	male	male
Adult	60.1	51.1	unknown	male
2nd c.y.	56.8	48.1	male	-

The weights of second calendar year birds vary between 42.8 g and 57.1 g in February and the first half of March (Fig. 9.7). In the second half of March and in April the weight increases but not as much as for the adults. The maximum is 63.2 g. This might indicate they either migrate later in the season or that they do not migrate at all. For the birds caught before 15 March there is no significant difference in weight between adults and juveniles (T-test, df=36, t=1.81), for the birds caught after 15 March there is a significant difference (T-test, df=48, t=4.92).

Table 9.2. Measurements of Curlew Sandpiper caught at Iouik, Mauritania, in spring 1985 and 1986. There is no bird of unknown age and one adult which could not be sexed by discriminant function (see text).

	2nd c.y. (35)	Adult males (30)	Adult females (23)
Wing length (mm)	128.5 ± 3.5	132.6 ± 3.1	132.1 ± 2.8 (22)
Bill length (mm)	37.0 ± 2.2	36.5 ± 1.0	40.6 ± 1.3
Total head l. (mm)	60.6 ± 2.1	60.4 ± 1.0 (29)	64.6 ± 1.4
Tarsus + toe (mm)	53.7 ± 2.0	53.5 ± 1.4	54.7 ± 1.8
Weight (g), uncorr.	49.7 ± 4.1 (34)	58.4 ± 6.8	55.8 ± 7.7
Weight (g), corr.	51.8 ± 4.7 (34)	61.7 ± 6.8	58.3 ± 7.6

	All adults (54)	All birds (90)
Wing length (mm)	132.4 ± 2.9 (53)	130.8 ± 3.7 (89)
Bill length	38.3 ± 2.3 (53)	37.8 ± 2.4 (89)
Total head l. (mm)	62.3 ± 2.4 (52)	61.6 ± 2.4 (88)
Tarsus + toe (mm)	54.0 ± 1.7	53.9 ± 1.8
Weight (g), uncorr.	57.2 ± 7.2	54.3 ± 7.2 (89)
Weight (g), corr.	60.2 ± 7.2 (53)	56.9 ± 7.5 (88)

Two birds were recaptured, one adult caught on 2 April 1985 (57.5 g) and recaptured on 3 April 1985 had lost 3.0 g. One second calendar year bird caught on 8 February 1986 (52.0 g) and recaptured on 6 March 1986 had, even after this long period lost 1.6 g.

9.2 Flight range estimates

To estimate flight range we have used the formula of Davidson (1984): $R = 95.447 * S * (T^{0.302} - M^{0.302})$, where S = speed km/h, T = total weight at departure, M = fff-weight or total weight at arrival. M (fff-weight) was colour-marked bird caught in March or April 1985 at Iouik was seen on 19 May 1985 in Malta. The departure weight for a non-stop flight, 3800 km, would predict to be 81.7 g. It should be mentioned that Van Brederode et al. (1982) counted 4000 Curlew Sandpipers in the Merja Zerga, Morocco, on 30 April 1982, while none were present on 18 March 1982. If birds first fly to the Merja Zerga (2000 km) and then further north (to the Mediterranean) the departure weights would be 65.8 g. Several birds have a weight well above this figure and will probably not go there. It is also unknown if birds from the Banc d'Arguin go to the Merja Zerga at all, they may come from further south than the Banc d'Arguin.

9.3 Plumage and moult

Up to 20 March most birds are still in full winter plumage and very few birds show body moult (Fig. 9.8). From the end of March onwards, and with

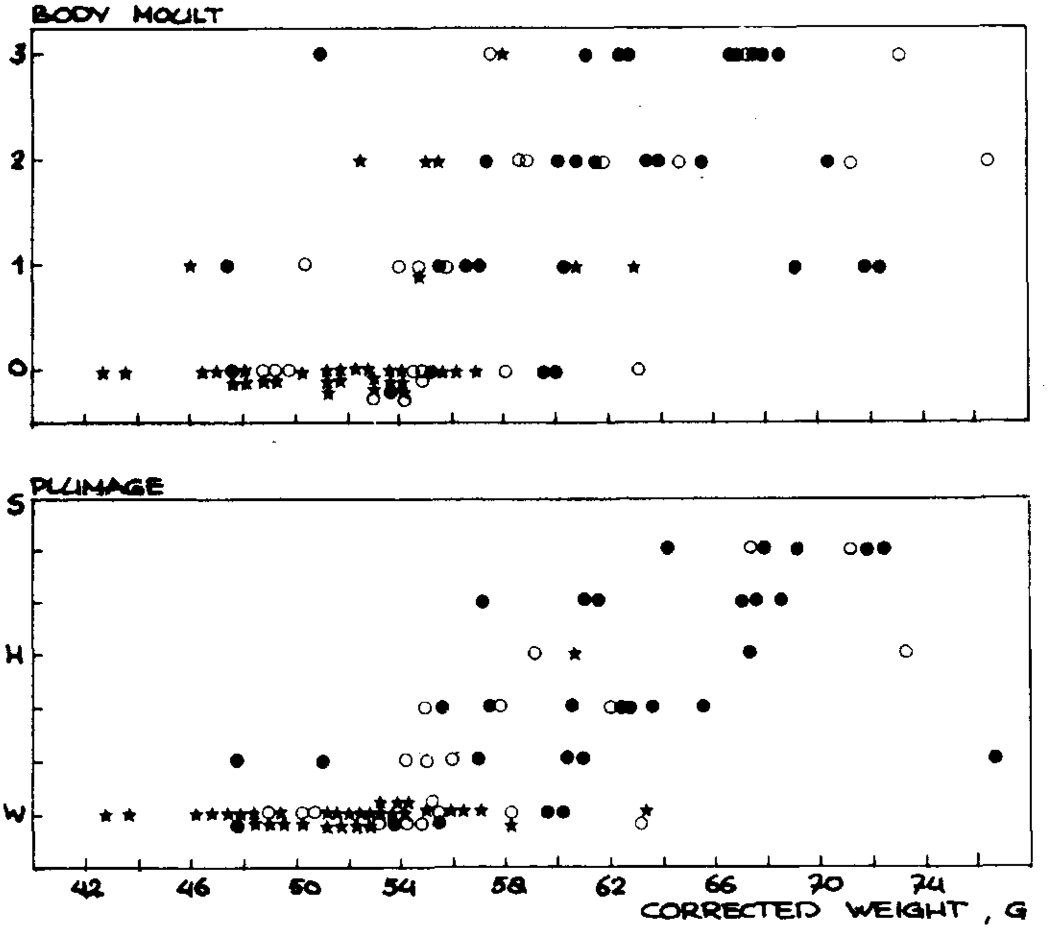


Figure 9.9. The relationship between plumage resp. body moult and corrected weight in Curlew Sandpipers caught at Iouik, Mauritania in 1985 and 1986 (n=89, o adult female, . adult male, * 2nd c.y.). The birds are provisionally sexed with discriminant function (see text).

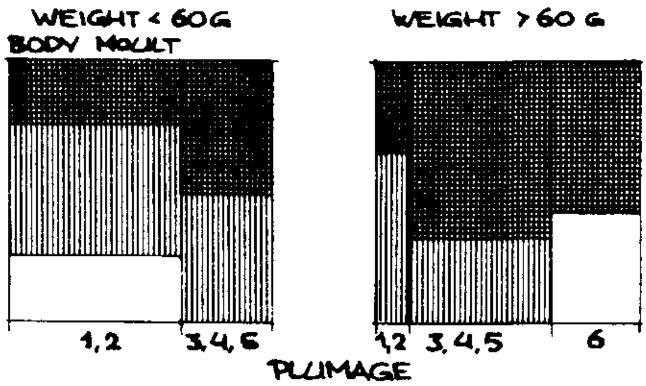


Figure 9.10. The relationship between plumage and body moult in April for adult Curlew Sandpipers with a low weight, < 60 g, (n=6) and a high weight, > 60 g, (n=22), expressed as relative surface over a body moult vs. plumage plot (BM 1 = blank, BM 2 = vertical stripes, BM 3 = vertical plus horizontal stripes).

which are halfway into summer plumage (scores 3, 4 and 5). Some of the birds in almost full summer plumage (score 6) also have a body moult score of one, indicating that they are finishing their moult. This again suggests that adult Curlew Sandpipers complete their moult into full summer plumage further north. There is no apparent difference between adult males and adult females in the timing of the acquisition of summer plumage (Fig. 9.8).

With one exception all second calendar year birds stayed in full winter plumage (Table 9.4). Of the six birds which showed light, moderate or heavy body moult (scores 1, 2 and 3) five were still in full winter plumage. It is possible, therefore, that second calendar year birds in Mauritania do not change into summer plumage until at least the end of April (Fig. 9.8).

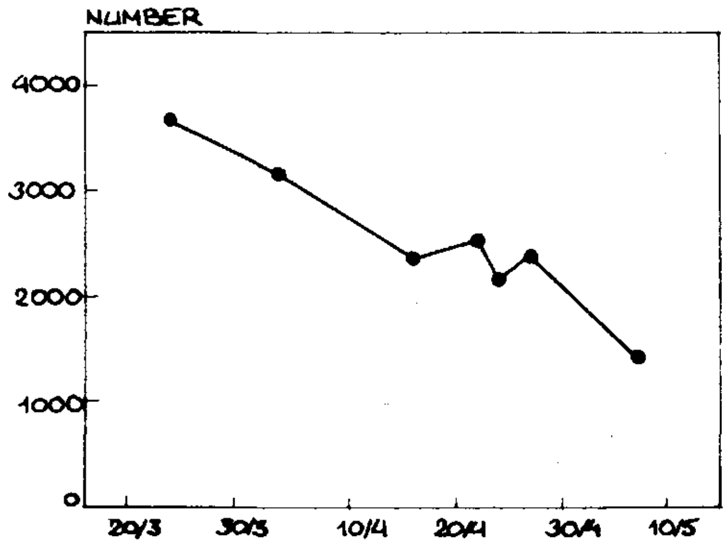


Figure 10.2. Numbers of Dunlins during high tide in the Northwest Bay in spring 1985.

(Fig. 10.1). A series of regular counts in the Northwest Bay gives a better picture of the timing of spring migration departure (Fig. 10.2). The results suggest that numbers declined steadily over the study period

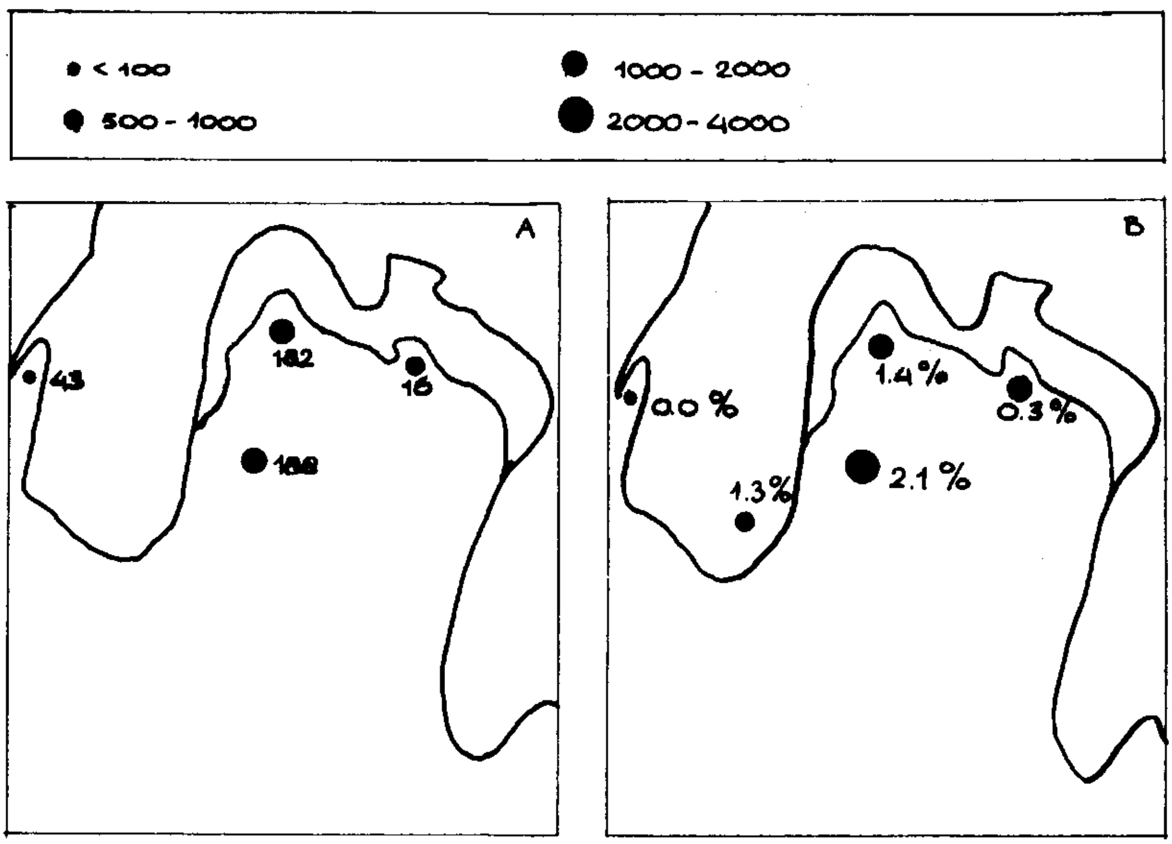


Figure 10.3. a. Numbers of Dunlins marked at different locations in the Baie d'Aouatif. b. Proportion of marked Dunlin in the population at different sites.

10.1.2 Catches 1985

There were strong indications that more adults than juveniles left the area during the study period. First, the proportion of juveniles in the catches increased from 33% at the end of March to 60% by the end of April (Table 10.1). Further, the proportion of juveniles in resightings of Dunlins marked with plastic tape between 22 March and 4 April increased during the season (Table 10.2). This indicates that the majority of Dunlins that stayed on the Banc d'Arguin until late in the season are

Table 10.3. Numbers of adults and juveniles that left the Baie d'Aouatif between 24 March and 25 April in 1985. * average of two estimates (18985 and 22152), see text.

	Adults	Juveniles	Total
1) N present 24 March	35334	20751	56085
2) N present 25 April	11076	20569 *	31645
3) N departed (1-2)	24258	182	24440
4) % departed (3/1)	69%	1%	44%

Table 10.4. Concentration of birds marked between 22 March and 4 April within the population close to the catching areas throughout April.

Period	sample size	number marked	% marked
8-13 April	1822	26	1.4
15-20 April	448	9	2.0
22-27 April	1043	12	1.2

Table 10.5a. Biometric data for Dunlins, 1985.

	Adults (n=273)		Juveniles (n=159)	
	mean	S.D.	mean	S.D.
Wing length (mm)	114.6	3.2	114.3	3.3
Bill length (mm)	30.9	2.7	30.4	2.6
Total head (mm)	53.2	2.8	53.4	2.7
Tarsus + toe (mm)	46.3	2.0	46.3	1.8

Table 10.5b. Biometric data for Dunlins, 1986.

	Adults (n=215)		Juveniles (n=151)	
	mean	S.D.	mean	S.D.
Wing length (mm)	114.4	3.2	113.9	3.7
Bill length (mm)	29.9	2.5	30.6	2.7
Total head (mm)	52.5	2.6	53.1	2.9
Tarsus + toe (mm)	46.6	2.0	46.6	1.8

= 18985 and 0.7 x 31645 = 22152 birds. Based on this information, the proportion of adult Dunlins that left the study area until 25 April can be estimated at 69% (Table 10.3).

There was probably no immigration of Dunlins into the study area. Arrival of new birds would have resulted in a decrease of the proportion of marked birds of the population. There is no sign of such a drop, but the situation is a little complicated since the marked Dunlins did not disperse freely over the study area. Instead, the marked birds were concentrated close to the sites where they were captured (Fig. 10.3). When we use the resightings close to the catching sites of the 200 Dunlins marked between 22 March and 4 April it can be shown that their concentration remained more or less constant throughout the study period (Table 10.4).

10.1.3 Catches 1986

No Dunlins were marked in 1986, but the data on the proportion of juveniles among the captured birds showed the same increase as in 1985. The situation was, however, a little more complicated since the proportion of juveniles differed considerably between the two sites where Dunlins were captured in 1986 (Table 10.1).

10.2 Biometrics

Tables 10.5a and b provide a summary of the biometric data. In all measurements the Mauritanian Dunlins were appreciable smaller than those caught in Morocco in March 1981 (Kersten et al. 1983). This is not surprising since the Moroccan Dunlins belonged for about 50% to the biggest subspecies C. a. alpina, whereas the vast majority of Dunlins in Mauritania were from the much smaller subspecies C. a. schinzii (Table 10.6).

population of <u>C. a. schinzii</u> (Table 10.7). It is very convenient that there is little overlap between the bill-lengths of males and females. By allocating bill-lengths ≤ 30.5 mm to males and bill-lengths ≥ 31.5 mm to females, more than 80% of the birds captured could be assigned a sex, with only a few errors (Table 10.8).

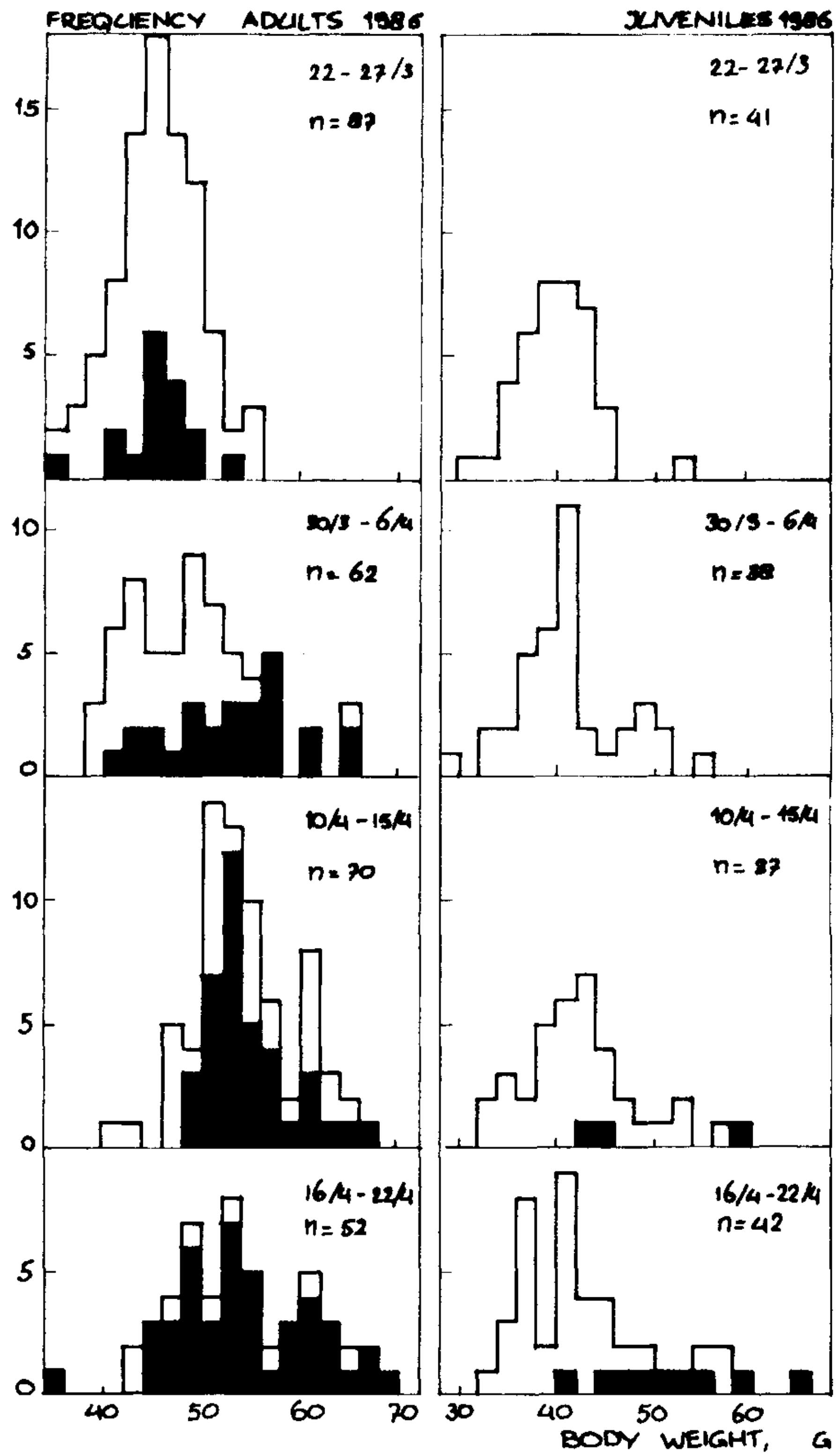
Females do not only have longer bills than males; they are generally bigger in all measurements taken (Table 10.9).

Table 10.8. Proportion of male and female Dunlins with 'short' and 'long' bills.

Age and sex	1985 bill length (mm) ≤ 30.5	1985 bill length (mm) ≥ 31.5	1986 bill length (mm) ≤ 30.5	1986 bill length (mm) ≥ 31.5
Adults				
males	89%	3%	85%	5%
females	5%	85%	5%	83%
Juveniles				
males	90%	3%	84%	5%
females	3%	86%	0.5%	97%

Table 10.9. Average measurements of male (bill length < 30.5 mm) and female (bill length ≥ 31.5 mm) Dunlins.

	Adults				Juveniles			
	males		females		males		females	
	mean	S.D.	mean	S.D.	mean	S.D.	mean	S.D.
1985 (n)	(165)		(90)		(87)		(64)	
Wing length	113.1	2.8	117.0	2.6	112.7	2.5	116.4	3.0
Total head l.	51.3	1.5	56.4	1.5	51.4	1.4	56.1	1.3
Tarsus + toe	45.4	1.6	47.8	1.6	45.4	1.2	47.5	
1986 (n)	(142)		(57)		(87)		(48)	
Wing length	113.2	2.7	117.2	2.7	112.6	3.2	116.6	3.2
Total head l.	51.0	1.4	56.0	1.8	51.1	1.3	56.6	1.9
Tarsus + toe	46.0	1.9	47.9	1.6	45.8	1.5	48.0	1.6



between adult males and females. Among the adults captured between 22 and 27 March, females dominated the birds that were still in winter plumage, whereas they were underrepresented among the birds that were already in full summer plumage (Table 10.10). This indicates that females started to moult later than males.

Table 10.11. Average body weights of adult and juvenile Dunlins in the course of spring.

	Body weight (g)						
	adults			juveniles			
	mean	± S.D.	(n)	mean	± S.D.	(n)
1985						
22-27 March	44.8	4.3	(87)	39.3	4.2	(41)
30 March- 6 April	48.8	6.7	(62)	40.8	5.4	(38)
10-15 April	53.9	5.3	(70)	42.3	6.2	(37)
16-22 April	53.8	7.1	(52)	43.1	7.2	(42)
1986						
8-13 Feb.	38.9	3.4	(34)	36.7	6.3	(49)
6-14 March	42.3	3.9	(99)	39.1	3.7	(44)
4-12 April	47.4	5.3	(82)	38.6	4.6	(58)

mainly due to fat deposition (see chapter 8) and illustrates that these birds are preparing themselves for a long migratory flight. The difference between adults and juveniles must be related to the fact that the juveniles did not leave the study area before the end of April, whereas many of the adults departed (Table 10.3).

10.3.3 Adults

Adults which have completed their moult are generally heavier than those which were still moulting (Table 10.12), but this does not mean that each bird delayed premigratory fattening until moult was finished. The body weight of birds with moult still in progress increased as well over the study period.

Dunlins have a very low weight before the onset of moult and there is a strong positive correlation between body weight and bill-length (Table 10.13). A rough estimate for the amount of fat that is deposited before the start of the spring migration might be derived from the difference in body weight between summer and winter plumage birds. This weight difference is in order of 10-14 grams, and there is a tendency for big birds to accumulate more reserves than small birds.

One important point remains to be made. It is not only the average body weight of adult Dunlins that increases in the course of the season,

Table 10.13. Linear regression equations for the relation between body weight (g) and bill length (mm) in adult Dunlins. In summer plumage birds the slope of the regression equation is significantly steeper than in winter plumage birds (p<0.5, Student t-test). Only one adult with winter plumage was captured in 1985.

Plumage	year	Body weight = a (bill length) + b	r^2	n	S.E. of a
Winter	1986	1.05 BL + 7.84	0.62	55	0.11
Summer	1986	1.51 BL + 5.76	0.60	28	0.24
	1985	1.61 BL + 4.19	0.39	122	0.18

Table 10.14. Proportions of male and female juvenile Dunlins captured between 10 and 22 April at different stages of moult. 3 birds could not be sexed according to their bill length.

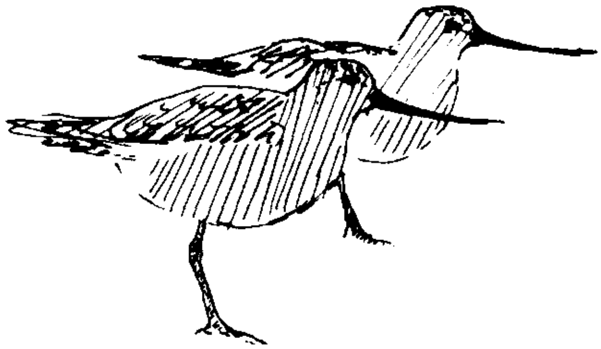
Plumage	Males		Females	
	n	%	n	%
Winter plumage	22	51	7	21
Intermediate	15	35	20	58
Summer plumage	6	14	7	21
Total	43		34	

Table 10.15. Body weights of adult and juvenile Dunlins that had completed their body moult.

a) Juveniles captured between 10 and 22 April.

b) Adults captured between 16 and 22 April.

	Males	Females
	mean ± S.D. (n)	mean ± S.D. (n)
Juveniles a)	45.9 ± 4.8 (6)	54.8 ± 7.6 (6)
Adults b)	49.7 ± 5.3 (25)	59.6 ± 5.1 (18)



Theunis Piersma

11 **Bar-tailed Godwit (Limosa lapponica)**

11.1 Biometry

Bar-tailed Godwits are a sexually very dimorphic wader species with females being larger than males (Green 1973). This is also apparent in our data on bill lengths for birds captured on the Banc d'Arguin (Fig. 11.1). We captured far less females than male Bar-tailed Godwits (27% vs. 73%), which is in accordance with an unequal sex ratio of 1:2 recorded in January/February 1980 by visual observations (Piersma 1982). Table 11.1 shows that also in other measurements males are smaller than females. Juvenile males are somewhat smaller than adult males and much lighter. The latter indicates that juvenile birds do not generally deposit fat reserves for spring migration and may therefore be expected to spend their second calendar year's summer on the Banc d'Arguin. As is apparent from table 11.2, all measurements are strongly and positively correlated

Table 11.1. Body measurements of Bar-tailed Godwits on the Bnac d'Arguin in February-April 1985/86. Males are birds with bills smaller than 89 mm. Body mass values were corrected for mass loss after capture. Linear measurements in mm, masses in gram.

	Males Juveniles (n=23) average ± S.D.		Males Adults (n=61) average ± S.D.		Females Adults (n=22) average ±S.D.	
Wing length	205.0	5.2	214.2	6.3	230.7	4.0
Bill length	78.2	3.9	78.1	3.6	99.8	4.1
Total head length	114.1	3.7	115.2	5.0	137.9	4.7
Tarsus plus toe	87.3	2.6	87.2	3.0	95.0	2.6
Body mass	204.9	22.8	294.4	41.6	355.4	45.6

Table 11.2. Pearson correlation coefficients between different body measurements of Bar-tailed Godwits captured in March and April 1985 (sex and age classes combined) n=85. All coefficients are significant at the 0.001 level.

	Wing	Bill	Total head	Tarsus + toe
Weight	0.748	0.599	0.362	0.339
Wing		0.753	0.493	0.560
Bill			0.520	0.645
Total head				0.350

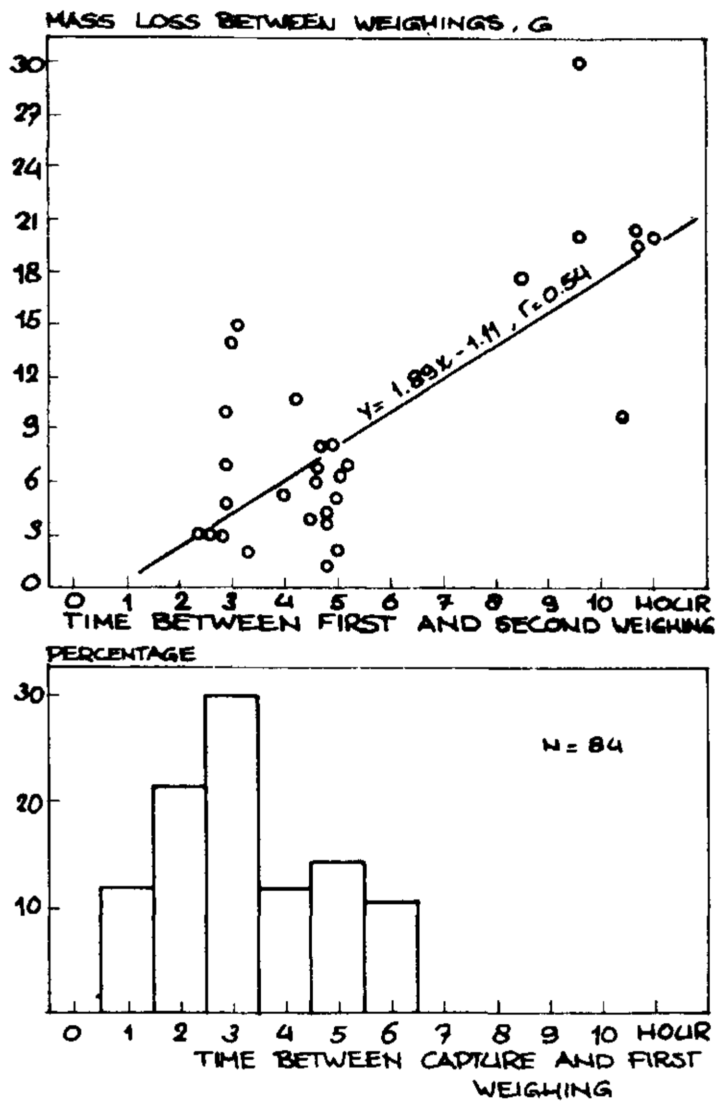


Figure 11.4. Mass loss after capture (top) and the time between capture and first weighing (bottom) of Bar-tailed Godwits on the Banc d'Arguin. Sex and age classes combined.

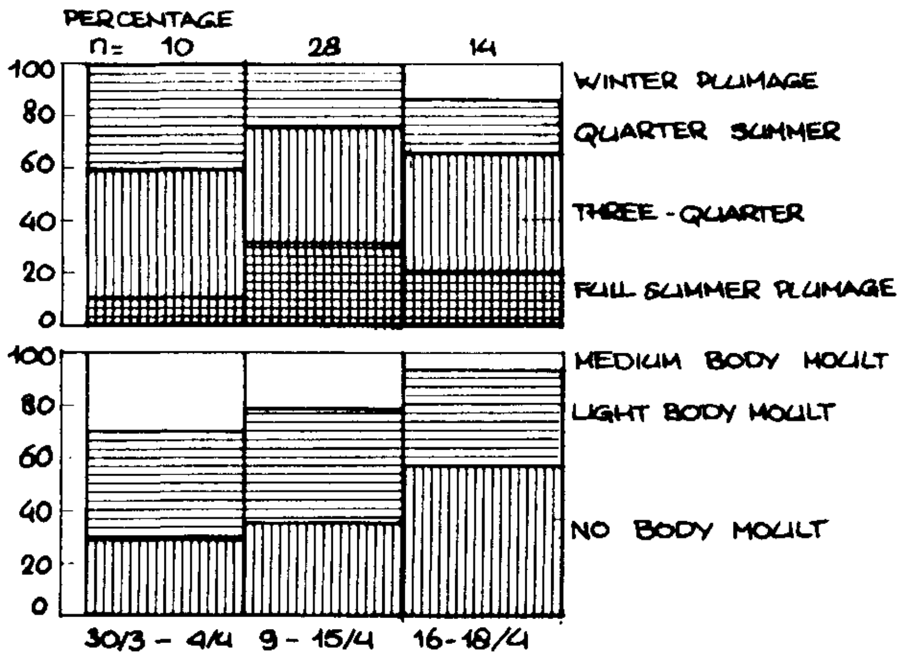


Figure 11.6. Development of summer plumage and body moult of male Bar-tailed Godwits on the Banc d'Arguin in the course of April 1985.

for females, but both values must be underestimates. If we exclude the data for the light and possibly immigrant birds (see below), males increased body mass by 2.5 g/day and females by 2.6 g/day (as indicated by the fitted linear regressions in figure 11.5). Both values are much smaller than the rate of body mass increase of 6-8 g/day in the same godwit population in Friesland, The Netherlands in May 1985-86 (Piersma & Jukema, in prep.).

11.3 Plumage and moult

Figure 11.6 shows the temporal changes in the extent of summer plumage and the intensity of body moult in male Bar-tailed Godwits in spring 1985. In the third period the proportion of birds in full summer plumage has declined and the proportion of birds in winter plumage increased. This supports the suggestion that some unmoulted birds arrived and/or that birds in full summer plumage departed from the area. The percentage of Bar-tailed Godwits without body moult steadily increased over the spring season. The data suggest that (male) Bar-tailed Godwits leave the Banc d'Arguin with a three-quarter or fully completed summer plumage and no body moult.

For comparing the weights of the two age classes only the catches of 1985 were used. Birds after their second calendar year had significantly higher weights than the second calendar year birds (Analysis of variance, F=43.78, P<0.001). The weights of the Whimbrels caught in 1986 were 369, 406, 459 and 630 g. For comparison only few data on weights from winter quarters are available. In South Africa in late March/early April two adults weighed 627

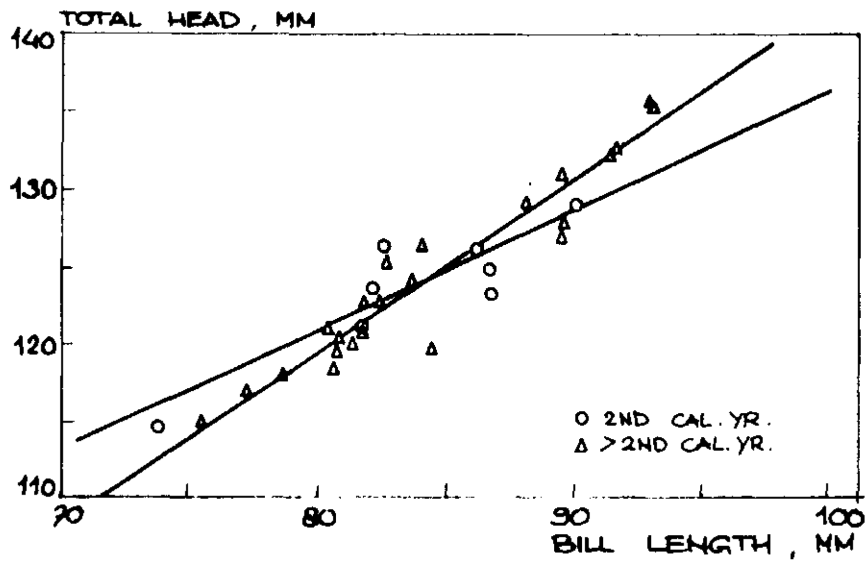
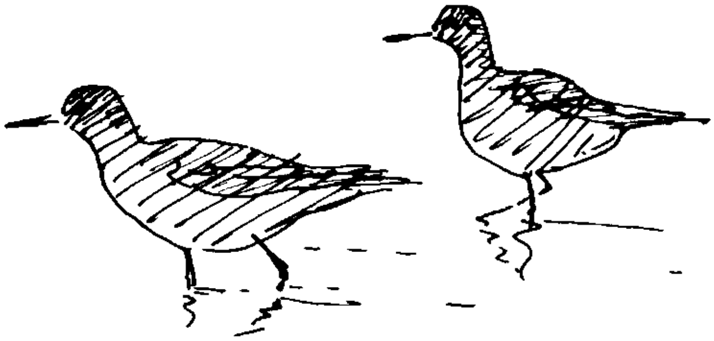


Figure 12.1. Relationship between bill length and total head of Whimbrels at the Banc d'Arguin (Mauritania). For Whimrel 2nd c.y.: y = 58.5879 + 0.779964 x, r=0.898683; for Whimbrel > 2nd c.y.: y = 29.2278 + 1.12869 x, r=0.960326.

and 600+ g and a juvenile 370 g (Glutz von Blotzheim et al. 1977). Four adults birds after completion of wing moult weighed between 480 and 600 g at the Banc d'Arguin in November (Dick 1975).

The mean wing length of the birds after second calendar year is larger than that of second calendar year birds. The difference is significant (Analysis of variance, F=8.58, P<0.001). Birds in both age classes have longer wings than has been described in literature (Glutz von Blotzheim et al. 1977, Prater et al. 1977, Cramp & Simmons 1983). However measurements in these references are mostly obtained from museum specimens, and because of post-mortum shrinkage wing length in dried museum skins is significantly shorter than in freshly killed or living birds (Prater et al. 1977, Engelmoer et al. 1983). After transformation the data for shrinkage, the estimated wing lengths in our Whimbrels are still longer. The wing lengths of adults caught at the Banc d'Arguin in November were also smaller than in



Theunis Piersma

13 **Redshank (Tringa totanus)**

The spring migration (departure) of Redshanks was already in full swing by the time we started our catching activities on the Banc d'Arguin in 1985. From 24 March to 17 April 1985 Redshank numbers around Iouik dropped with 68 % from 2878 to 965 birds. Their relatively early departure may have been one of the reasons that we captured only few (29) Redshanks during this expedition. In 1986 catching activities already started in early February and so a small sample of birds was obtained from before the time of mass departure. The average measurements of Redshanks are presented in table 13.1. Apart from body mass, the biometric values (both averages and standard deviations) closely resemble those of birds caught in Morocco during spring migration (Table 13.2), suggesting that we are dealing with the same population. This is probably the population breeding in Northwest Europe (The Netherlands, West Germany, Denmark), as is supported by the sighting of a colour marked

Table 13.1. Body measurements of Redshank on the Banc d'Arguin in February-April 1985 and 1986. Body mass values are not corrected for loss after capture. Linear measurements in mm, body mass in g.

	Juveniles (n=12) average ± S.D. (min.-max.)		Adults (n=32) average ± S.D. (min.-max.)		All birds (n=45) average ± S.D.	
Wing length	157.1 (150-164)	3.9	161.3 (154-168)	3.5	160.2	4.0
Bill length	43.2 (40.1-45.7)	1.8	43.7 (40.2-47.5)	1.5	43.5	1.6
Total head length	74.9 (71.0-79.2)	2.5	75.6 (71.9-79.4)	1.7	75.4	1.9
Tarsus + toe	84.8 (80-89)	2.8	85.1 (79-92)	2.7	85.0	2.7
Body mass	100.8 (86-150)	18.4	129.7 (95-174)	18.3	122.0	22.1

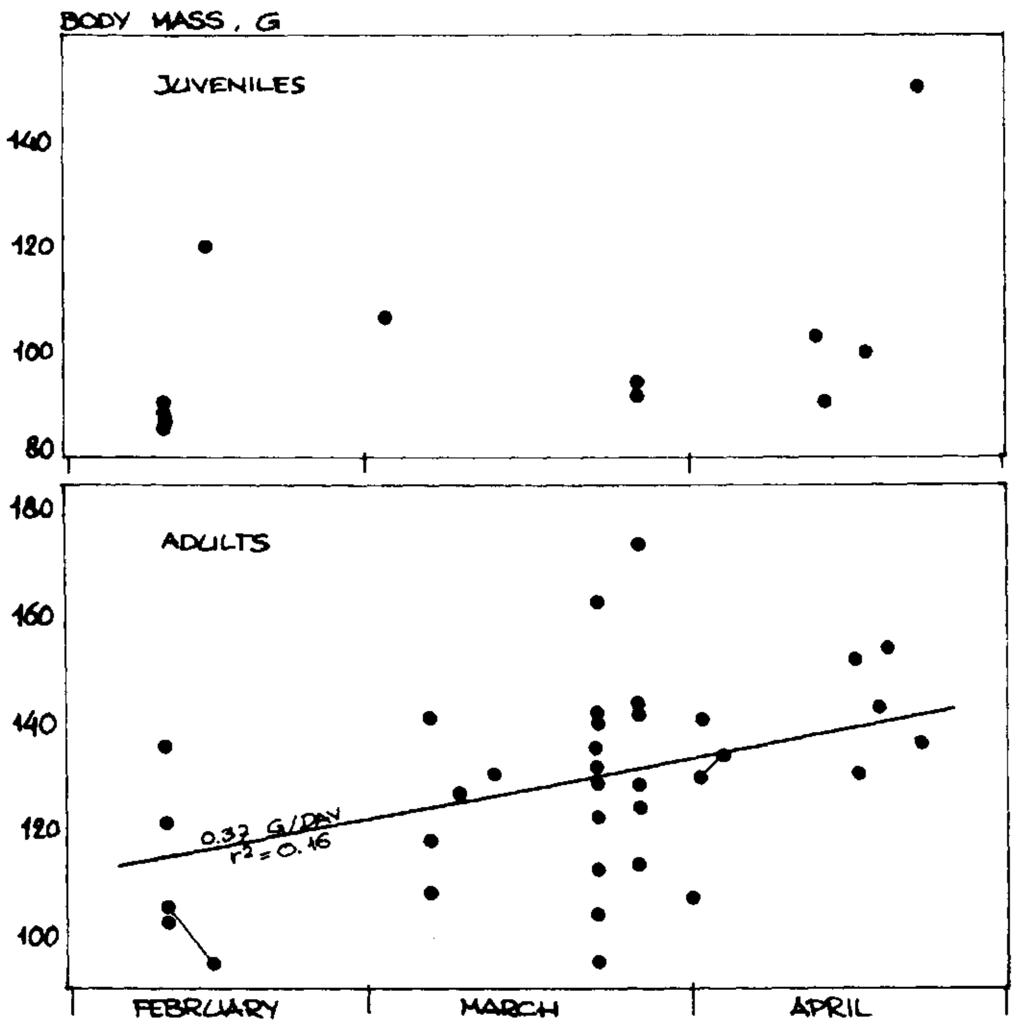
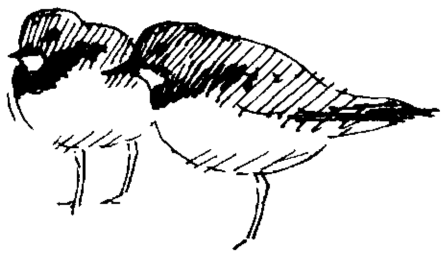


Figure 13.1. Changes in body mass of juvenile and adult Redshanks on the Banc d'Arguin in 1985 and 1986. Thin lines connect successive weighings of individual birds. The linear regression of first taken body masses against data is given for adult birds. For juveniles the positive slope (0.25 g/day) was significantly different from zero.

Redshank on the island of Pellworm (Wadden Sea of Schleswig-Holstein), where it was spotted as a breeding bird!

Body mass correlated best with wing length, but hardly so with the other linear dimensions (Table 13.3). Bill, total head and tarsus + toe length are strongly correlated with each other, but much less so with wing length and body mass. This may indicate that only wing length is a measure of structural size, the other dimensions probably being expressions of race, sex and age.

We made only a few measurements of mass loss after capture, and for this reason body mass was not corrected for the time between capture and first weighing. The average time between capture and first weighing was



Bruno J. Ens

14 Turnstone (Arenaria interpres)

14.1 Materials and methods

The large majority of Turnstones were caught at high water with clap nets in the little village of Iouik, while they were feeding on drying fish and litter left on the beach. Some were caught with a cannon net in Iouik and a few into mist nets placed on the mudflat nearby.

Separating the Turnstones in adults and juveniles, using the criteria of Prater et al. (1977), was generally easy except for a few individuals. In some measurements these individuals tended more to adults, in others more to juveniles (Table 14.1), indicating they might well be immatures in their third calendar year. It was decided to restrict the analysis to the adults and juveniles.

A few times birds were reweighed after a certain time lag to estimate the weight loss incurred. Despite a large scatter (after 8 hours individuals lost from 1 to 5 g in weight), a significant non-linear

Table 14.1. Comparison of biometric data on birds of three different age classes. Means and standard deviations (in brackets) are provided, except for body moult and summer plumage score where the median value and the range (in brackets) are presented. Data for 1985 and 1986 are combined.

	Juvenile (n=113)		Age uncertain (n=13)		Adult (n=287)	
Wing length (mm)	150.9	(4.4)	156.1	(5.2)	157.6	(5.0)
Bill length (mm)	23.2	(0.9)	23.5	(1.5)	23.4	(2.0)
Total head length (mm)	51.2	(1.1)	51.5	(1.0)	51.4	(2.0)
Tarsus + toe (mm)	52.5	(1.6)	52.9	(1.5)	52.8	(1.9)
Body weight (g)	89.3	(7.0)	96.5	(9.0)	109.4	(14.5)
Body moult	0	(0-3)	0	(0-2)	1	(0-3)
Summer plumage	1.5	(1-3)	2	(1-5)	4	(1-7)

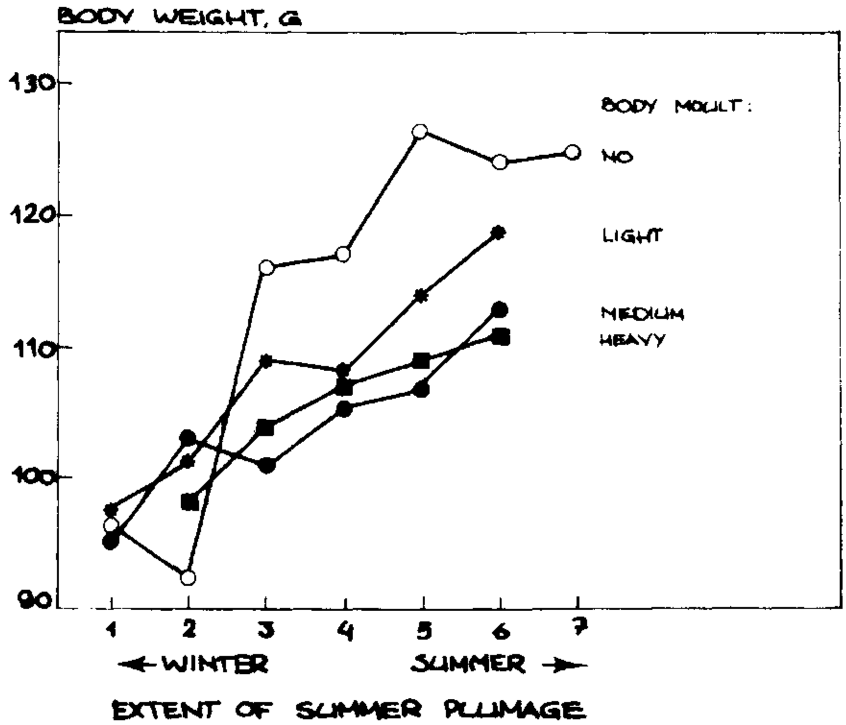


Figure 14.3. Body weight of adults in relation to the extent of summer plumage, separated for different body moult scores (data of 1985 and 1986 combined).

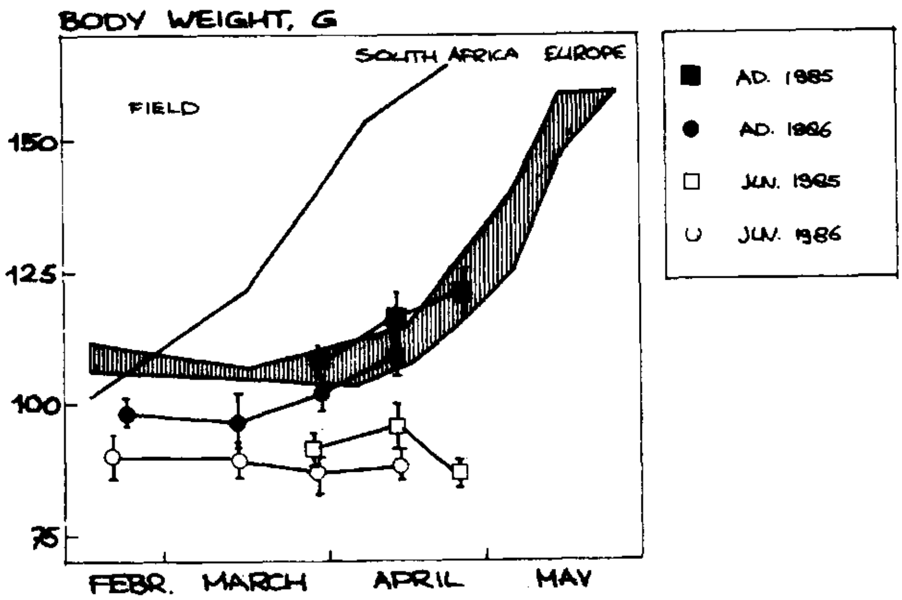


Figure 14.4. Average weight of adult and juvenile Turnstones caught in five different periods in 1985 and 1986. Bars represent 95% confidence limits. For comparison average weights of adults in South Africa (Summers & Waltner 1979). Morecambe Bay (Clapham 1979) and the Wadden Sea (Engelmoer in prep.) are also presented.

plumage (Fig. 14.2). In addition the weight of juveniles showed no tendency to increase in time (Fig. 14.4). In every period the weights of juveniles and adults were higher in 1985 than in 1986 (Fig. 14.4).

Several lines of evidence indicate that departure commences at the end of April. The pattern of the average weight gain depicted in figure 14.4 may well correspond to the pattern for individuals up to that period. Surprisingly only 5 out of 14 adults recaptured within the same year showed a positive weight change (Fig. 14.5). It is possible that due to the extreme environmental conditions the effects of catching and handling birds are more detrimental than they appear to be in temperate zones (Davidson 1984). Large weight decreases were associated with short time intervals, suggesting that the birds needed some time to recover from the negative effects of being caught (Fig. 14.5).

Assuming that individuals follow more or less the same migration program from one year to the next (Metcalfe & Furness 1985), we can meaningfully analyse the weight differences of individuals caught in different years. If the difference in weight gain between 1985 and 1986 is real, we expect that birds caught early in 1986 and late in 1985 show larger weight gains than birds caught early in 1985 and late in 1986. This may be true, but there is too much scatter in the data to make the differences significant (Fig. 14.5). By lumping the data we hope that under- and overestimates are cancelled out. The fact that weights 'gained' between years were much larger than weights gained within a year is additional evidence of a negative effect of handling. The fact that the curve levels off at long intervals may be caused by long intervals being due to birds caught in February. Fig. 14.4 shows that weights start to increase from March onwards. The rate of weight gain can be meaningfully calculated only when the time interval is sufficiently long, so intervals of less than a week were rejected.

Table 14.2 suggests that birds gained weight at a faster rate at the end of April, but it is not significant. Even so, the calculated average rate of 0.91 g/day for individual birds is much higher than the average rate of 0.5 for the population (Fig. 14.4). This indicates that some heavy individuals departed, thereby depressing the weight gain of the population. The same conclusion follows from figure 14.6: the weight distribution of the individuals 'ready to go' (no body moult and three quarters summer plumage or more) did not change from the middle of April towards the end of April.

Table 14.3 shows that there is only one period in which the catching method had a significant effect on body weight. However, this is due to mist net birds being extremely light. Birds caught with the clap net did

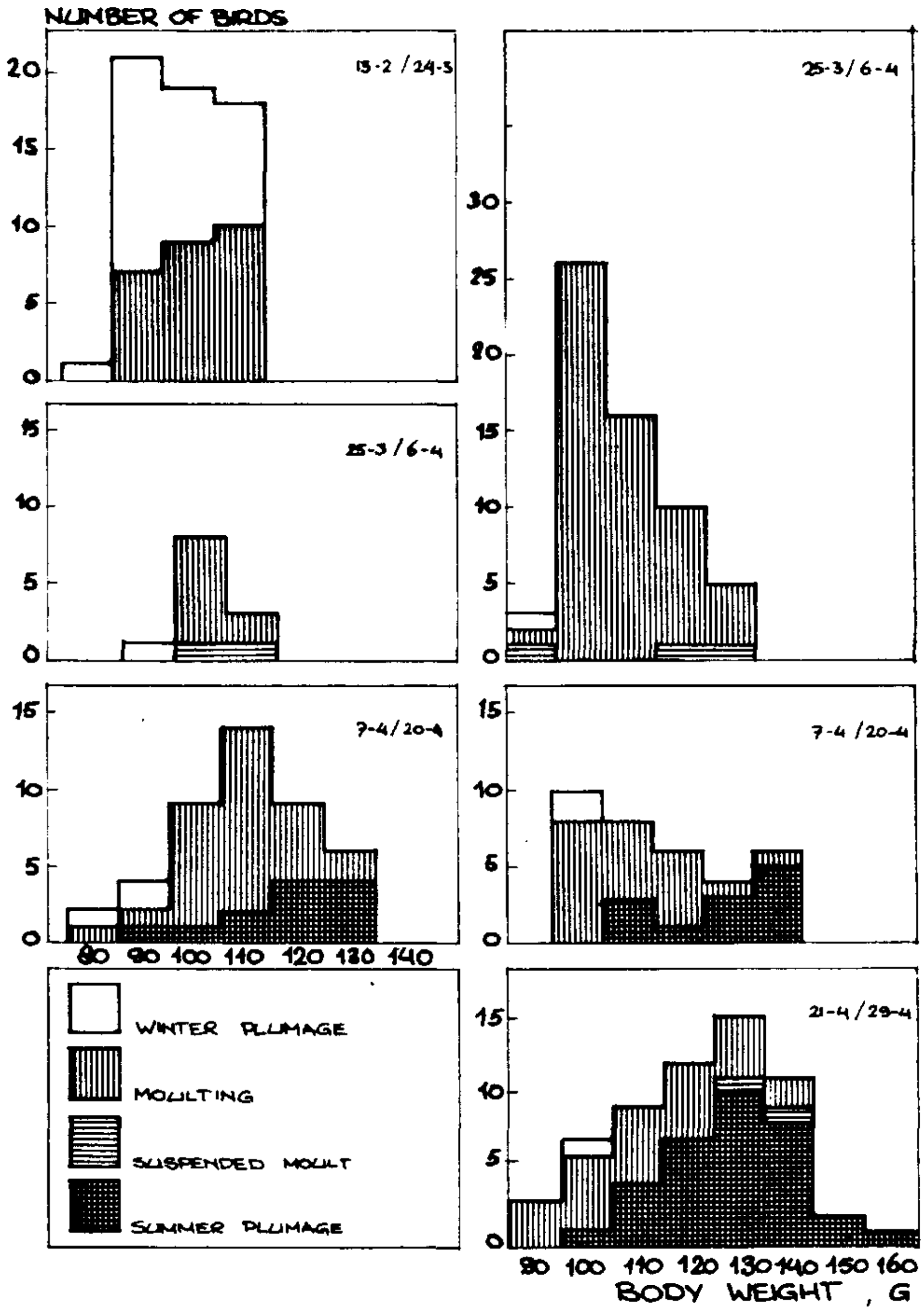
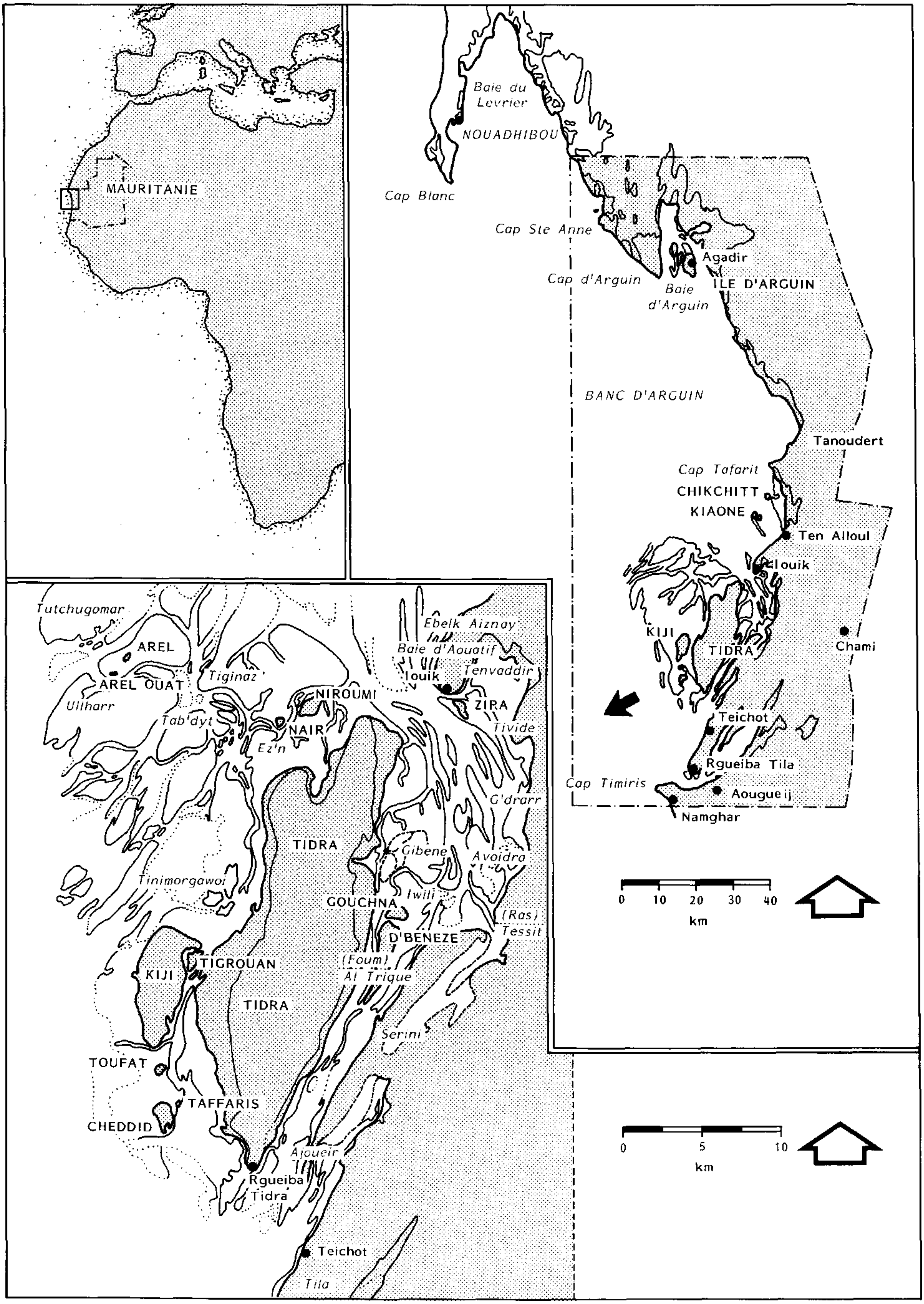


Figure 14.6. Frequency distribution of weights of adult Turnstones in four different periods in 1985 and 1986. Differences in hatching indicate: birds in winter plumage (plumage score 1 or 2), showing no body moult, all birds showing body moult, birds in summer plumage (score 5, 6 or 7) showing no body moult.

APPENDIX II



MAURITANIE
Baie du Levrier
NOUADHIBOU
Cap Blanc
Cap Ste Anne
Agadir
Cap d'Arguin
Baie d'Arguin
ILE D'ARGUIN
BANC D'ARGUIN
Tanoudert
Cap Tafarit
CHIKCHITT
KIAONE
Ten Alloul
Iouik
KIJI
TIDRA
Chami
Teichot
Rgueiba Tila
Cap Timiris
Aougueij
Namghar
0 10 20 30 40
km
Tutchugomar
AREL
AREL OUAT
Ullharr
Tiginaz
Tab'dyt
Ez'n
NIROUMI
NAIR
Ebelk Aiznay
Baie d'Aouatif
Iouik
Tenvaddir
ZIRA
Tivide
G'drarr
TIDRA
Gibene
Avoidra
Tinimorgawoi
GOUCHNA
Iwili
(Ras) Tessit
D'BENEZE
(Foum) Al Trique
KIJI
TIGROUAN
TIDRA
Serini
TOUFAT
TAFFARIS
CHEDDID
Ajoueir
Rgueiba Tidra
Teichot
Tila
0 5 10
km

WIWO-reports available:

Altenburg,W., M.Engelmoer, R.Mes & T.Piersma 1982. Wintering waders on the Banc d'Arguin-Mauritania. Report of the Netherlands Ornithological Mauritanian Expedition 1980. Communication No. 6 Wadden Sea Working Group, Stichting Veth tot Steun aan Waddenonderzoek, Texel. 284 pp. (WIWO-report 1) Sold out.

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Bennet,C.A., R.G.Bijlsma & R.Stouthamer 1982. Survey of waterbirds on Egyptian wetlands, autumn 1981. WIWO-report 16, Zeist, The Netherlands. Dfl. 7,50.

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