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THE BANC D'ARGUIN, MAURITANIA, AS A MEETING POINT FOR AVOCETS DURING SPRING MIGRATION

ANNE-MARIE BLOMERT¹, MEINTE ENGELMOER¹ & YAA NTIAMOA-BAIDU²

ABSTRACT About 35% of the W. European population of the Avocet winters south of the Sahara. At least 4% of these birds utilize the Banc d'Arguin as a stopover site for some hours. It is proposed that the area functions as a 'meeting point' where Avocets merge into larger flocks at departure. The timing of migration suggests that most birds wintering in Africa originate from NW. Europe, as was also confirmed by the resighting of three colour-marked individuals.

¹Foundation Working Group for International Wader and Waterfowl Research (WIWO), c/o Dribergseweg 16c, 3708 JB Zeist, The Netherlands;

²Department of Zoology, University of Ghana, Ghana.

INTRODUCTION

Although the Banc d'Arguin (Mauritania) is the most important wintering site for waders along the East Atlantic coast, Avocets *Recurvirostra avocetta* do not winter there (Engelmoer *et al.* 1984, Lamarche 1987). Portugal (especially the Tagus estuary) and France (the Vendée coast) harbour large numbers of Avocets, whereas Senegal to the south holds the majority of the birds wintering in Africa (Table 1). The population of the Avocet in NW. Europe has recently increased rapidly, at 5% per year: 10 200 pair in 1969 (Tjallingii 1971), 11 500 in the late 1970s (Scott 1980) and 16 000 in the early 1980s (Ruitenbeek 1985). The most recent estimate is 19 000 (Piersma 1986) but even this figure may be too low because that paper underestimates the W. German population by ca. 900 pairs (see Taux 1984). Part of the increase could be caused by better coverage of the breeding areas, but increases in the breeding population by 7-12% per year have been found in several main breeding areas in NW. Europe, such as the mainland coast of the Dutch Wadden Sea during the last 50 years (Engelmoer & Blomert 1985) and the mainland coast of Niedersachsen between 1950 and 1979 (Becker & Erdelen 1987).

The present winter population can be estimated at 50 000-62 000 birds. Given a breeding popu-

lation of 20 000 pairs, the non-breeding population is 10 000-22 000 birds. This is reasonable since the fledging success is 0.5-1.1 young/pair (Cadbury & Olney 1978, Engelmoer & Blomert 1985, pers. obs.). There is thus good agreement between the estimate of the breeding population and the wintering numbers counted during recent years (Table 1).

The numbers given in Table 1 show that perhaps 16 000-21 000 Avocets pass through the Banc d'Arguin in spring on their way to the northern breeding areas, assuming that second calendar year birds do not stay behind in Africa. This paper describes some observations on the passage of Avocets through the Baie d'Aouatif, Banc d'Arguin. It is concluded that the area does not function as a refuelling station, but may be a 'meeting point' for Avocets on passage, the function of which is discussed. The timing of the spring migration suggests that the birds breed in NW. Europe.

METHODS

Data on the departure of migrating flocks were collected systematically during ca. 2.5 h before sunset in the northern part of the Baie d'Aouatif, during periods March-May 1985, February-April 1986 and April-May 1988 (Piersma *et al.* 1990a). Further-

Table 1. Estimated numbers of birds wintering along the East Atlantic coast.

country	number	source
Denmark	-	1
W. Germany	200	2
The Netherlands	60-900	3
France	13 000	4
England	500	5
Spain	5300	6
Portugal	10 000-15 000	7,8,9
Morocco	3000	10
Senegal + S. Mauritania	10 000-15 000	11,12
Guinea-Bissau	90	13
Guinea	ca. 6000	14
Ghana	250	15
Total	49 000-59 000	

¹Laursen & Frikke (1984), ²Prokosch (1984), ³Boere & Smit (1981), ⁴Blanchon (1985), ⁵Reay (1988), ⁶Smit in press, ⁷Rufino (1984), ⁸Bijlsma *et al.* (1985), ⁹Rufino & Araújo (1987), ¹⁰Kersten & Smit (1984), ¹¹Meininger (1989), ¹²T.M. van Spanje (pers. comm.). Some thousands have been counted recently in S. Mauritania, but this concerns probably the same birds as are usually present in N. Senegal, ¹³L. Zwarts (pers. comm.), ¹⁴Altenburg & van der Kamp (1988) counted 2200, the numbers given being an extrapolation, ¹⁵Ntiemoa-Baidu & Grieve (1987).

more each member of the expeditions made notes on the arrival of flocks of Avocets (Smit *et al.* 1989).

RESULTS

The Banc d'Arguin as a stopover site

All Avocets came in from the south and headed off in a northerly direction. No birds were observed to pass the Baie d'Aouatif without staying for a while. A total of 1085 arriving and departing birds were counted on 84 observation days spread over three years. On average, 820 Avocets stopped annually in the Baie d'Aouatif during spring, as calculated from the numbers passing each day. This means that 4-5% of all the birds wintering further to the south landed in this bay. This figure increases

to 5-7% if it is assumed that all the birds in their second calendar stay behind in Africa. It is known, however, that this is not true, because Avocets are able to breed in their second calendar (Engelmoer & Blomert pers. obs.).

The Avocets always used the same most northern part of the intertidal flats of the Baie d'Aouatif to rest (one km NNE of counting site A, see Fig. 1 in Zwarts *et al.* 1990a). The site consisted of some tidal pools and creeks within an area of probably less than 1 ha. The Avocets coming in from the south landed before they encountered the abrupt change from intertidal zone to desert.

Flock formation

In all, 28 departing flocks were observed, of which 23 left during the systematic observation periods (i.e. before darkness) in northerly and north-westerly directions (see Piersma *et al.* 1990a). The chances are very high that the other five flocks left in darkness or in the early morning because they were not seen on the subsequent day.

The incoming flocks usually mixed with those already on the ground, although in one case, a huge flock (287 birds) did split up (Fig. 1). One flock was seen to arrive in the early morning and therefore outside the routine observation period. This flock arrived at 9.15 h local time and left at 19.45 h, just before darkness fell. Compared with the 630 min duration of this stay, the staging time of two other groups was extremely short. A flock came down and joined the Avocets already present. Just a few min later, a second flock came in, merged with the two flocks on the ground. Some min later, the whole combined flock took off.

The staging time of nine of the flocks was known exactly, the mean being 115 min ($SD = 195$; range 14-630). Arriving flocks were smaller than departing ones (Table 2). The observed difference is not significant ($p = 0.45$), perhaps because of the large variation in flock size. The differences are much larger, however, if a weighting procedure is used to take into account the fact that the arithmetic mean would not be the average flock size that is experienced by the individual bird (Table 2; see also Piersma *et al.* 1990b). Flocks passing the Moroccan coast

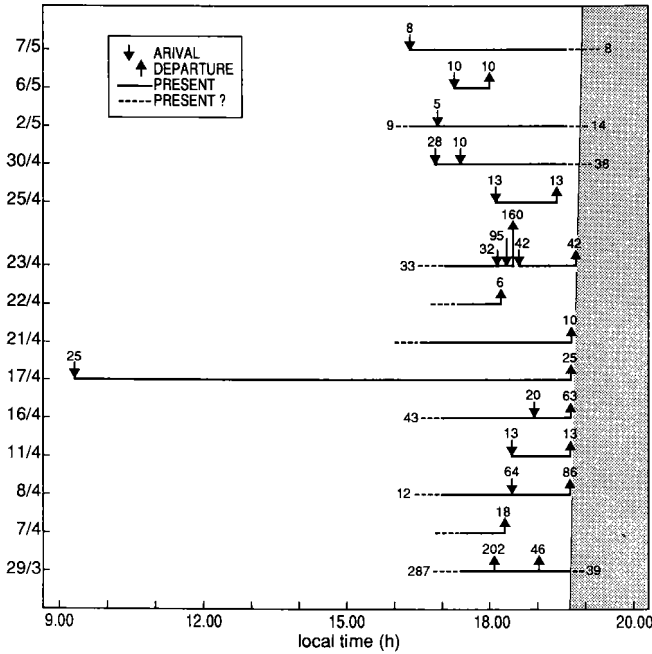


Fig. 1. The timing of the arrivals and departures of flocks of Avocets over 14 days. Most departing flocks were assemblages of flocks that had arrived before, except the flock of 29 March 1986 (287 birds) which split up into three flocks.

were smaller than those departing from the Baie d'Aouatif, and of equal size to the groups arriving there (Table 2). This suggests that flocks of Avocets usually split up into smaller units during flight.

Most Avocets preened, bathed and slept during the staging period, although some individuals were observed to feed just after arrival.

Table 2. Mean flock size (\bar{x} , SD) of Avocets arriving in, and departing from, the Baie d'Aouatif or passing the Moroccan coast (Sidi Moussa, April 1982, N.E. van Brederode, M. Kersten, T. Piersma & P.M. Zegers pers. comm.). Since the variation is very large (see: range), the mean flock size does not differ significantly, according to a one-way analysis of variance ($R^2 = 0.027$, $p = 0.54$, $n = 49$). The difference is significant, however, if a weighting procedure is used (flock of x birds is taken as x measurements of x birds) ($R^2 = 0.099$, $p < 0.001$, $n = 1637$).

flocks	unweighted				weighted by \bar{x}		
	range	\bar{x}	SD	n	\bar{x}	SD	n
arriving	5- 95	28.1	26.0	13	50.3	31.3	365
departing	1-202	38.8	46.6	28	92.7	68.8	1085
passing	7- 97	23.4	28.3	8	53.3	38.4	187

Origin and timing

In total 483 Avocets were checked for colour rings in the Baie d'Aouatif. Two birds, colour-banded in the Dutch Wadden Sea, were observed on 29 March 1986, giving a ring density of 0.4%. The birds belonged to a population of 186 marked birds breeding in the salt marshes of Holwerd (53°22'N, 5°54'E), which represents 0.5% of the Palearctic population of 40 000 breeding birds. Another Avocet from Holwerd was seen in N. Senegal in December 1988 (H. Hötter pers. comm.).

One of the two birds which had been seen in the Baie d'Aouatif on 29 March 1986, was again noticed on the breeding area on 15 April, from where it had been definitely absent on 2 April. Its arrival time was also the same in other years (1983-1988). The other bird was found 30 km away from its previous breeding grounds on 19 April.

DISCUSSION

Origin and timing

Avocets ringed in the Netherlands have been recovered from all the major wintering areas (Table 1): France (Vendée), Portugal (Tagus estu-

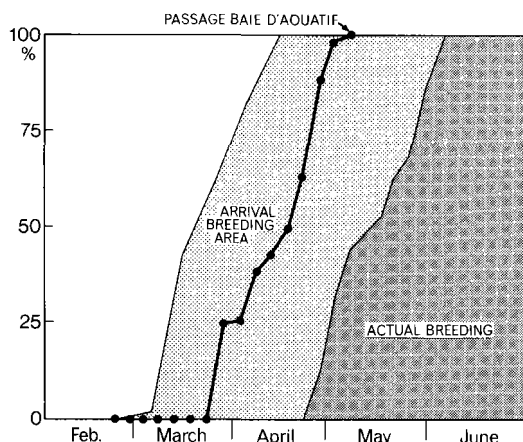


Fig. 2. Cumulative percentage of Avocets passing the Baie d'Aouatif during spring 1985, 1986 and 1988 (100% = 820), compared with the total numbers (1983-1988) and the cumulative percentage of new nests (100% = 99 first nests in 1986) along the Frisian mainland coast of the Dutch Wadden Sea. The wader counts were performed by the Wadvogelwerkgroep FFF.

ary), Spain (Coto de Doñana), Morocco and Senegal (Glutz von Blotzheim *et al.* 1977, Cramp & Simmons 1983, Engelmoer & Blomert pers. obs.).

The timing of the spring migration gives an indication that the Avocets wintering in W. Africa breed in NW. Europe. The series of observations carried out on the Banc d'Arguin clearly show that the majority of the birds wintering further south did not leave the wintering area before mid-April (Fig. 2). These Avocets cannot belong to the populations breeding in Spain, where breeding starts in early April (Glutz von Blotzheim *et al.* 1977), or in France (Vendée), where breeding starts ca. 10 April (Yésou 1985). On the other hand, the birds start late April in The Netherlands (Fig. 2; see also Engelmoer & Blomert 1985, Ruitenbeek 1985) and early May in Estonia (Glutz von Blotzheim *et al.* 1977), the most northeasterly breeding area.

It is of interest that the two colour-banded birds had been observed amongst the first Avocets passing through the Banc d'Arguin. Perhaps the Dutch Avocets wintering in the tropics leave the wintering areas earlier than those breeding further north and northeast. Such a trend within one species would

follow the interspecific difference in timing described by Piersma *et al.* (1990a).

The Avocets arrive in the Dutch Wadden Sea on average a month before they actually start breeding (Fig. 2). Some birds do arrive from early March onwards (Fig. 2; see also Cramp & Simmons 1983). All Avocets returning in March cannot winter in the tropics (Fig. 2). It is also obvious that the birds wintering in the tropics, compared to their conspecifics wintering more nearby, breed later and/or reduce the time between arrival and breeding.

Body mass

Two Avocets captured in the Baie d'Aouatif in 1985 (Duiven & Piersma 1989) were probably unrepresentative of the Avocets which temporally landed there: their masses (275 and 259 g) were very low compared with the average mass of Avocets during the winter in S. Africa. This is 319 g (range 270-390 g) (Summers & Waltner 1978), and is exactly the same as the mass of breeding birds (Engelmoer & Blomert 1985, pers. obs.). Assuming that Avocets seen on the Baie d'Aouatif had a body mass similar to those of other wader species at departure from the Banc d'Arguin, i.e. > 30% above winter mass, the mass of an average Avocet should be at least 400 g (Zwarts *et al.* 1990b).

According to the formula given by Davidson (1983):

$$LM = (0.029 \cdot W - 0.058)^3$$

where *LM* is lean mass and *W* is wing length, one of the two birds (wing length of 223 mm) should not have been able to leave the Banc d'Arguin, since the actual body mass was 1% below the expected lean mass of 261 g, so it would not have had the energy reserves required to migrate any distance. The other bird had a body mass 14% above its calculated lean mass of 242 g, and so should have been able to fly ca. 800 km according to the formula (Davidson 1984):

$$D = (DM^{0.302} - LM^{0.302}) \cdot 95.447 \cdot S$$

where *D* is distance, *DM* is departure mass, *LM* is

lean mass and S is speed, assuming that 60 % of the body reserve is fat (Piersma & van Brederode 1990, Zwarts *et al.* 1990b) and the flight speed of an Avocet is 60 km h^{-1} (T. Piersma & J.H. Bruggemann pers. comm.).

Function of a pause during spring migration

It is difficult to say why the Avocets interrupt their migration and land. Landing led to a 2 h loss on average. Moreover, the extra costs of ascending from the ground to an altitude of some km would exceed the gain from descending to the ground. Four possible advantages associated with a resting pause can be mentioned:

- 1) For physiological reasons, it may be preferable to interrupt migration at intervals, even though waders are able to fly long distances uninterrupted, for instance when they cross the Atlantic Ocean from E. Canada to northern S. America (e.g. Richardson 1979).
- 2) Perhaps the birds avoid flying during the day. Migrant passerines in good condition crossing the Sahara are known to seek shelter during the day (Biebach *et al.* 1986). But the majority of Avocets spent a few h in the area and not the whole day, which is contrary to this idea.
- 3) Since the Avocets which came to the ground hardly fed, it is unlikely that, as happens in passerines in poor condition crossing the Sahara (Biebach *et al.* 1986), the birds were stopping to regain mass. The two individuals that were caught were in poor condition and perhaps got stuck on the Banc d'Arguin.
- 4) A temporary pause allowed the Avocets to readjust flock size. Avocets departed in flocks which were larger than those in which they arrived (Table 2), which implies that flocks split up during flight. Flying in flocks may save time or energy. It has been shown that waders in larger flocks flew faster (Noer 1979), but saving energy, although likely, has not yet been quantified.

The function of the Baie d'Aoutif as a meeting point can be argued in the case of the Avocet because there are no suitable feeding grounds available. But some observations indicate that two other species Greenshank *Tringa nebularia* and Oyster-

catcher *Haematopus ostralegus* came to the ground for some h and for the same reason as Avocets. These birds also preened and rested in a flock, even at low tide when all the other waders present were feeding. This phenomenon was conspicuous in both species because Greenshank and Oystercatcher were uncommon and the transients were gathered in relatively large flocks. It may also occur in other wader species, but that would be more difficult to show.

The idea that waders use a meeting point during migration raises many questions. Is it a phenomenon unique to the Baie d'Aoutif, or does it occur unnoticed in other areas? How does a meeting point come into being? Are these spots located at sites where waders cross over deserts and seas? Do Avocets see a resting flock on the ground from the air and then alight?

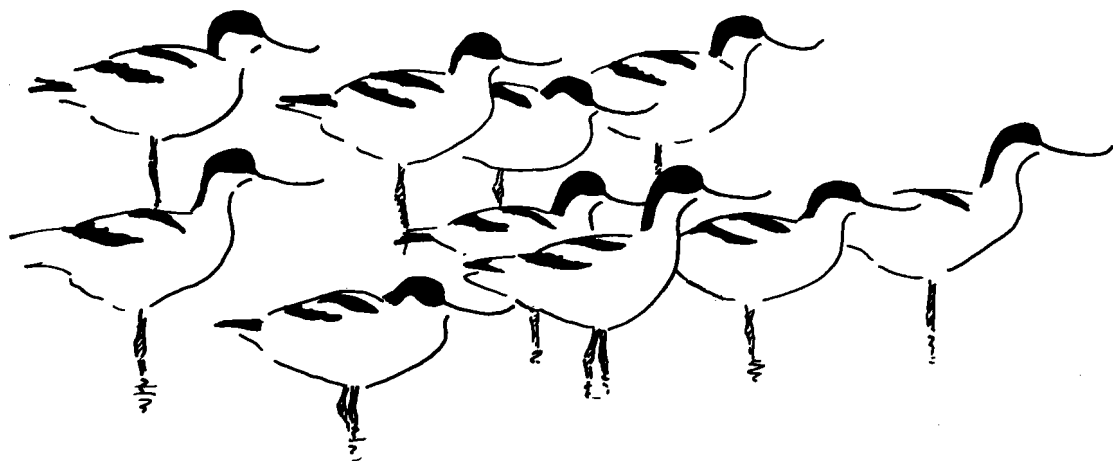
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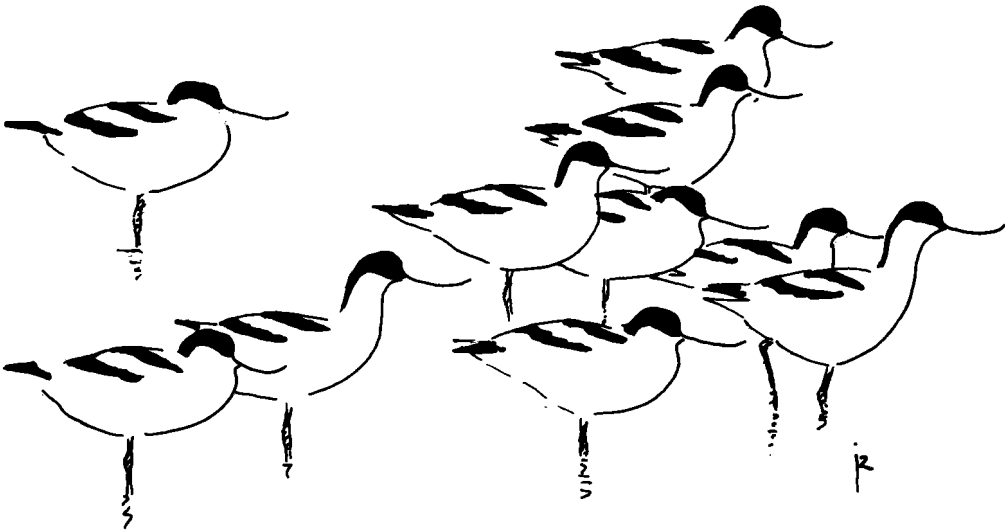
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Avocets (drawing Jos Zwarts).

SAMENVATTING

Ongeveer 35% van de NW. Europese broedpopulatie van de Kluut overwintert ten zuiden van de Sahara (tabel 1). In maart-mei 1985, februari-april 1986 en april-mei 1988 werden in de Baie d'Aouatif, Banc d'Arguin, Mauretanië systematisch gegevens verzameld over de wegtrek van overwinterende steltlopers. Hoewel Kluten niet overwinterden op de Banc d'Arguin, werden wel groepen doortrekkende Kluten waargenomen. Het ging hierbij om vogels die ten zuiden van Mauretanië overwinterden en die gedurende een korte periode, variërend van 15-630 minuten, aan de grond kwamen. De vogels foeraerden zelden tijdens laag water, maar poetsten, baadden en sliepen. Het is niet aannemelijk dat de vogels uit voedselgebrek aan de grond kwamen.

Volgens berekeningen passeerden per jaar 820 Kluten de Baie d'Aouatif in de periode februari-mei. In totaal werden 1085 Kluten waargenomen, verdeeld over 28 groepen; 23 groepen vertrokken voor of juist in de schemering, 5 groepen vertrokken in het donker. De groepen die van de Banc d'Arguin vertrokken, waren bijna twee maal zo groot als de groepen die aankwamen. Het vermoeden bestaat dat de Banc d'Arguin voor de Kluut de functie vervult van een trefpunt, waar kleine groepen zich kunnen hergroeperen tot één grote groep.

Op grond van gegevens uit de literatuur blijkt dat Kluten in N. en NW. Europa iets later broeden dan Iberische en Franse vogels. De Kluten die na 25 maart langs de Banc d'Arguin trokken, waren op weg naar broedgebieden in N. en NW. Europa. Deze veronderstelling werd bevestigd door drie waarnemingen in Mauretanië en Senegal van Kluten die enkele jaren eerder als broedvogel waren geringd in Nederland (Waddengebied).

RÉSUMÉ

Environ 35% des Avocettes se reproduisant en Europe de l'Ouest hivernent au sud du Sahara (Tableau 1). De mars à mai 1985, de février à avril 1986 et d'avril à mai 1988 les départs des limicoles hivernant dans ces zones furent l'objet d'une étude systématique dans la Baie d'Aouatif, -située sur le Banc d'Arguin en Mauritanie. Bien que les Avocettes n'hivernent pas sur le Banc d'Arguin, on a pu observer au passage des vols d'Avocettes. Il s'agit là d'oiseaux hivernant au sud de la Mauritanie touchant terre pendant une brève période, variant de 15 à 630 minutes. Ils allaient rarement se nourrir à marée basse, mais lissaient leurs plumes, prenaient un bain et se reposaient, ce qui fait supposer qu'ils n'atterrissaient pas pour se nourrir.

Sur la base de calculs, 820 Avocettes passent annuellement dans la Baie d'Aouatif de février à mai, ce qui représente 4% à peu près des oiseaux qui hivernent au sud de la Mauritanie. Au total, 1085 Avocettes furent observées, réparties en 28 vols, dont 23 partirent, avant, ou juste au crépuscule. Cinq vols partirent dans la nuit. Les vols quittant le Banc d'Arguin avaient presque deux fois la taille des vols à l'arrivée. Nous supposons que le Banc d'Arguin sert de 'rendez-vous', à de petites vols d'Avocettes qui s'y rassemblent en vols plus importants.

Les données dans la littérature font ressortir que les Avocettes de l'Europe du Nord et de l'Ouest se reproduisent un peu plus tard que leurs congénères méditerranéens. Par conséquent, on suppose que les Avocettes de passage sur le Banc d'Arguin -après le 25 mars- sont d'origine nord- et ouest-européenne. Cette supposition s'avère soutenue par trois observations d'Avocettes baguées dans les zones de reproduction du nord des Pays-Bas.