SEASONAL VARIATIONS IN WADER NUMBERS AND DISTRIBUTION AT THE RIA DE FARO

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The Ria de Faro in Portugal is of international importance for at least 8 species of waders. The importance of the area is described for waders during spring migration, as well as during winter. Regular counts of the area were made mostly in 1984 and 1985. Spring migration starts in February and continues in some species until May. In May, the area is especially important as a staging site for Siberian Knots. Colour-marking of Dunlins showed that there was no immigration between January and March, but suggested rapid passage in spring. Birds changed their roosting and feeding preferences between winter and spring, preferring saltmarshes in winter, and salines and sandy areas in spring.

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INTRODUCTION AND METHODS

The importance of the Ria de Faro for wintering waders have been stressed in previous works (Rufino *et al.* 1984a, 1984b). The wintering wader population in the area is estimated to be just over 20 000 birds.

This paper presents the results of counts undertaken here during a three year period, from late November to late May (Nov. to Feb. 1982/83, Jan. to Mar. 1984 and Mar. to May 1985), covering the end of the autumn migration, the wintering season and the spring passage.
The areas counted (Figure 1) were always the same and the counts were carried out monthly on spring tides, except in May 1985, when two complete and one extra partial count were done. Counts were made at high water roosts.

The roosts were grouped in four different substrate categories; salinas, salt-marshes, sand, and salt-marshes/sand; and in three geographical sectors: western, central and eastern (Figure 1). The western and central sectors have all the substrates represented in the roosts, and in similar proportions, but the eastern sector has very few sandy roosts. The larger salina complexes are in the western and eastern sectors.

In 1984 and 1985 several attempts were made to catch waders, and all the 500 Dunlins *Calidris alpina* caught were dye marked. The ringing sites were visited regularly to search the marked birds.

The aim of this paper is to give information on the numbers of waders using the Faro lagoon system from late autumn to late spring, and also to show how the birds' distribution within the area changes with the onset of spring migration. The numbers presented here give also some information about the timing of migration.

RESULTS AND DISCUSSION

Figure 2 shows the trends through the winter and spring in the numbers of waders, on total

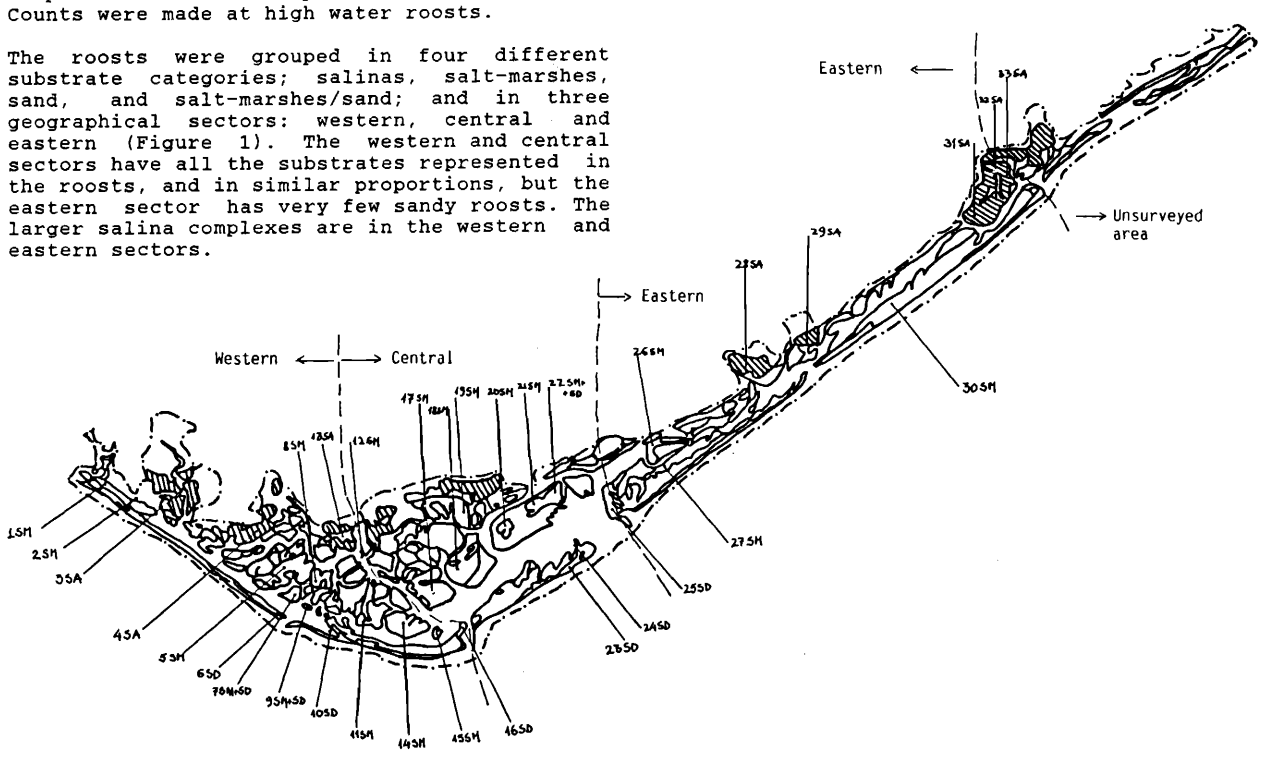
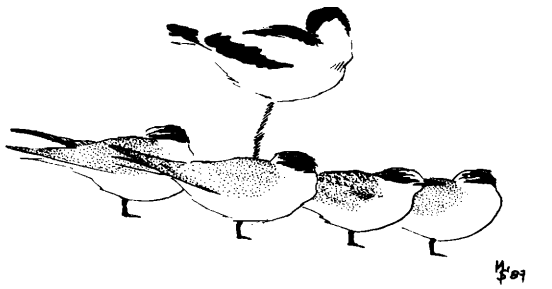


Figure 1. The study area of the Ria de Faro, showing the division into western, central and eastern sectors. The location of each roost site is numbered, and coded according to the substrate type: SA salinas, SM saltmarsh, SD sandy.

Table 1. Total number of waders counted in the Ria de Faro. The peak count for each species in underlined. Asterisks indicate species of international importance (1% of the European population).

DATE	29/30 Nov.82	27/31 Dec.82	16/20 Jan.84	28/30 Jan.83	15/19 Feb.84	5/9 Mar.85	17/20 Mar.84	3/6 Apr.85	3/6 May 85	18/21 May 85
Haematopus ostralegus	555	584	422	312	558	352	240	263	133	303
Charadrius hiaticula*	1 355	618	612	862	326	251	175	65	166	14
C. alexandrinus	285	543	722	733	502	416	377	257	272	232
Pluvialis squatarola*	1 525	1 468	1 425	1 568	2 154	1 407	1 538	1 805	758	303
Arenaria interpres*	249	99	53	143	227	738	354	488	444	174
Numenius arquata	808	1 453	1 429	1 239	1 912	555	204	247	309	95
N. phaeopus	60	26	46	39	37	41	101	135	66	10
Limosa limosa*	766	685	1 327	605	482	1 068	139	1	0	0
L. lapponica	1 516	1 768	3 008	3 353	2 742	2 563	1 001	1 263	247	330
Tringa totanus	1 636	1 246	1 231	1 462	1 344	1 379	1 034	190	28	11
T. erythropus	8	4	14	7	9	4	4	1	1	0
T. nebularia	12	23	36	56	35	87	35	166	4	2
Philomachus pugnax	0	1	1	5	3	0	1	0	0	0
Calidris canutus*	541	1 335	724	560	394	335	521	212	1 438	3 337
C. alpina	6 610	9 914	8 395	7 919	7 915	5 450	3 196	3 604	1 223	1 378
C. ferruginea	10	0	2	4	0	0	0	0	18	0
C. minuta*	480	209	225	157	170	25	86	124	0	0
C. alba*	275	197	244	205	134	507	66	109	184	203
Recurvirostra avosetta*	652	900	400	296	850	660	200	1	15	2
Himantopus himantopus	64	50	74	74	41	23	24	32	72	51
TOTAL	17 407	21 123	20 409	19 599	19 835	15 861	9 296	8 963	5 371	6 425



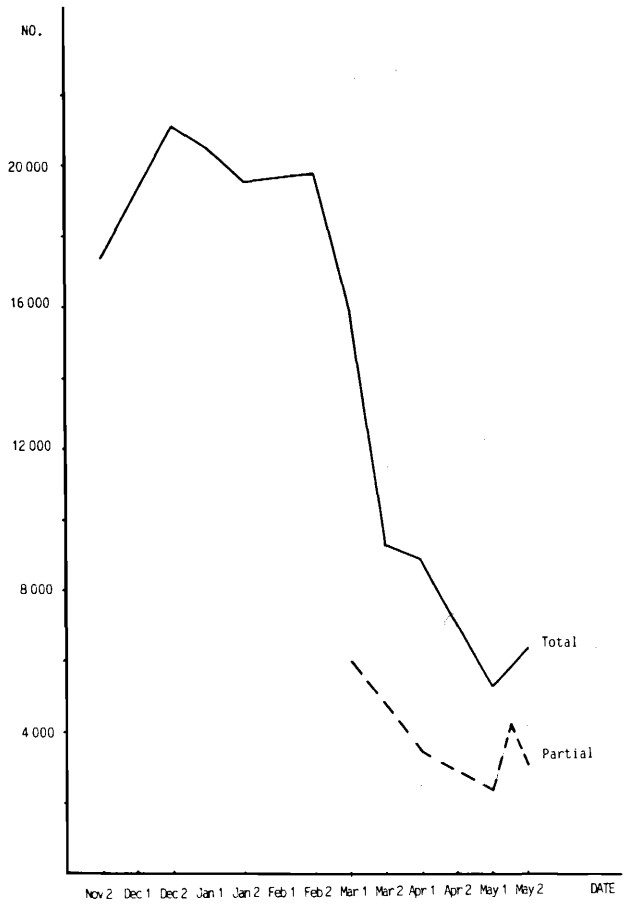


Figure 2. Total and partial counts of all wader species on the Ria de Faro in winter and spring. Each month is divided into two 15-day periods.

and partial counts. It is clear that from mid winter to May the wader population declines. In May, numbers increase again slightly, mainly as a result of Knot *Calidris canutus* migration. The partial count identifies better the exact time of peak passage, which corresponds to the second week of May.

Figure 3 shows the relative abundance of the thirteen commonest species of waders, those with at least 500 birds in one of the counts.

From the end of November to early March there is little variation for most of the species. Only the Bar-tailed Godwit *Limosa lapponica* increases in relative abundance and the Dunlin decreases. From March onwards, once spring migration begins, there are considerable changes in relative abundance. By the end of May, only two species, Knot and Dunlin, occur in major numbers. These two comprise over 70% of the birds present then. Dunlins are also the most abundant wader species from the end of November to the end of April.

The results of all complete counts carried out in the study area are shown in Table 1. Nine species have their peak numbers in mid-winter: Oystercatcher *Haematopus ostralegus*, Kentish Plover *Charadrius alexandrinus*, Black-tailed Godwit *Limosa limosa*, Bar-tailed Godwit, Spotted Redshank *Tringa erythropus*, Ruff *Philomachus pugnax*, Dunlin, Avocet *Recurvirostra avosetta* and Black-winged Stilt *Himantopus himantopus*. Ringed Plover *Charadrius hiaticula*, Redshank *Tringa totanus* and Little Stint *Calidris minuta* show a peak count in late autumn (late November). Grey Plover *Pluvialis squatarola* and Curlew *Numenius arquata* in late winter and Turnstone *Arenaria interpres*, Whimbrel *Numenius phaeopus*, Greenshank *Tringa nebularia*, Knot, Curlew Sandpiper *Calidris ferruginea* and Sanderling *Calidris alba* in spring. The last six species have also wintering populations in the area.

Although these species can be roughly classified as either mainly winter visitors or spring migrants in the area, there are considerable differences in their patterns of variation in population size.

Seasonal variation in numbers of each species

Oystercatcher. More abundant in winter than spring. Numbers decreased up to mid May, when a second peak count was observed. The Oystercatcher is mainly a winter visitor and birds present in May are mostly immatures. These should not be considered as true passage migrants as we believe that they are not moving further north, but instead stay in the area during the breeding season.

Ringed Plover. Autumn migration ends in late November or early December. The wintering population steadily decreases, from March onwards, with a small increase in numbers in May. There is certainly a spring passage but the numbers involved are small.

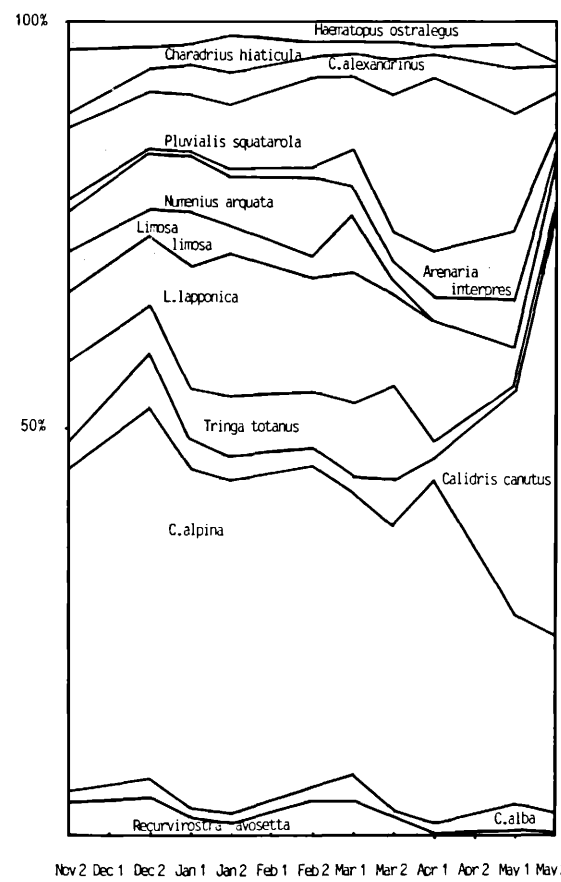


Figure 3. The relative abundance in winter and spring of the commonest waders (those with at least one count exceeding 500 birds) in the Ria de Faro. Each month is divided into two 15-day periods.

Kentish Plover. The breeding population is thought to be mainly resident. During the winter there is an influx of birds that breed further north. Counts show these to arrive up to December and to leave the area in February and March.

Grey Plover. The Grey Plover shows two peaks in numbers, one in mid February and another in early April. Both of them are probably due to an influx of birds coming from wintering grounds further south.

Counts carried out in Morocco during the winter and spring show that there the local wintering population begin leaving the area in late January and by the end of March and the beginning of April there is an influx of migrants (Thevenot *et al.* 1982). Hence the first arrival in south Portugal of birds wintering in Morocco would be expected during February. Eventually those wintering in Mauritania also arrive in Europe during this month, and Portugal, France (Maheo 1979) and Britain (Prater 1981) have February peaks of numbers. Grey Plovers wintering further south from Guinea-Bissau to South Africa, probably migrate later and pass through Morocco by late March and south Portugal by early April, as shown by our counts.

This 1.5 month interval between the two peaks would seem to reflect different migration strategies within the Grey Plover population using the East Atlantic Flyway.

Turnstone. For Turnstones the autumn migration is still in progress in November while the spring passage goes from mid February to May with a maximum in early March. In Morocco the peak numbers are also reached in mid March (Thevenot *et al.* 1982). The Faro wintering population is small.

Curlew. Curlew numbers show a peak in mid February. This may be due to an early return of birds wintering further south. However, the counts published for Morocco (Thevenot *et al.* 1982) and Mauritania (Altenburg *et al.* 1983) cannot confirm this. The migration continues until early May, when there is a slight increase in numbers.

Whimbrel. There is a small wintering population of about 50 birds. The species shows a peak passage period in early April. A maximum of only 135 birds were counted.

Black-tailed Godwit. This species is mainly a winter visitor but the high numbers counted in March show that Black-tailed Godwits also pass through the area, although in a very short period. These birds might winter in Morocco as, according to Thevenot *et al.* (1982), the departures have already started during February on the Atlantic coast of Morocco.

Bar-tailed Godwit. Bar-tailed Godwits are particularly abundant during the winter, and are present up to May. As it does not show a spring peak count it is difficult to establish any migration timing.

Redshank. In late November there are still Redshanks passing through the area. The wintering population stays up to March with almost all birds leaving the Faro lagoon during this month. Apparently there is no later passage of birds wintering further south.

Spotted Redshank. Present in winter and spring in small numbers.

Greenshank. There is a small wintering population. The species shows a peak passage in early April.

Ruff. Present during the winter in small numbers.

Knot. The wintering population of Knot, presumably of Nearctic origin, peaks in late December and numbers decrease from January to April, although not steadily, as there is a rise in numbers in March. This population starts it's northward migration very early if we consider that arrival on the breeding grounds occurs only by early June (Uttley *et al.* 1987). The birds passing in May, which are of Siberian origin, have their peak numbers during the second week of May (as revealed by the partial counts) which is almost simultaneous with the one of the vendee in France (Dick *et al.* 1987).

Dunlin. Dunlins are the most numerous wintering wader at the study area. Although the numbers do not show a clear migratory influx, this does occur and is confirmed by colour marking and biometric data collected both at the site and elsewhere in Portugal (Rufino 1981). The passage takes place during April and May.

Little Stint. This species is also a late autumn migrant and has a small wintering population. The numbers counted in March and April seem to indicate a small spring passage.

Sanderling. There is a small wintering population in the area. The peak count in early March is probably due to migratory passage. The numbers in April and May suggest a second passage period, particularly during May.

Avocet. The Avocet numbers show a first peak in late December and a second in mid February. This could mean that the species winters in the area but also that there is an early spring passage in February.

Black-winged Stilt. Usually the numbers in May are higher than the winter numbers as the species is mainly a local breeder. This was not the situation in 1985, as this was a bad breeding year. Between-year fluctuations seem to be normal with this species (Cramp and Simmons 1983). The numbers seem to indicate that at least part of the wintering population leave the area in March/April, meaning that the Stilts are only partial residents in the area and that there is an influx of northerly breeders during the winter.

Colour marking of Dunlins

In 1984, 16 *C. alpina* were dye marked yellow with picric acid. The marking took part during a short period of time, 19 to 23 January, and the ringing area, a salina complex, was visited regularly up to 18 March. The sightings are grouped by fortnight periods in Table 2.

Table 2. The percentage of colour-marked Dunlins in flocks in the salina complex in which they were ringed in late January 1984. Population size at ringing date was 1600 birds.

Period	% colour-marked
16-31 Jan	.93
1-15 Feb	.95
16-28 Feb	1.17
1-15 Mar	.92

Table 2 reveals a reasonable stability in the proportion of marked birds through the survey period. During this period the number of Dunlin in the ringing area and in the whole Faro lagoon was decreasing (Table 1). Hence at least up to mid March there was no immigration into the area, but only emigration.

In spring 1985 nearly 500 Dunlin were colour marked with green dye. However, the number of sightings was too small for detailed analysis for several reasons; including disturbance at the ringing site and difficulty in actually seeing the colour. It proved impossible to gather enough information to allow any conclusions. However, we had the impression that birds were passing through fast since we did not recapture birds on even consecutive days.

Distribution of waders

Figures 4 and 5 show the distribution of waders by roost substrate and region. Saltmarshes are important especially in winter. However, saltmarshes loose their importance with the onset of spring migration, while both salinas and the sandy substrates become more important. The use of salinas has several advantages for the birds especially the availability of foraging areas during high tide.

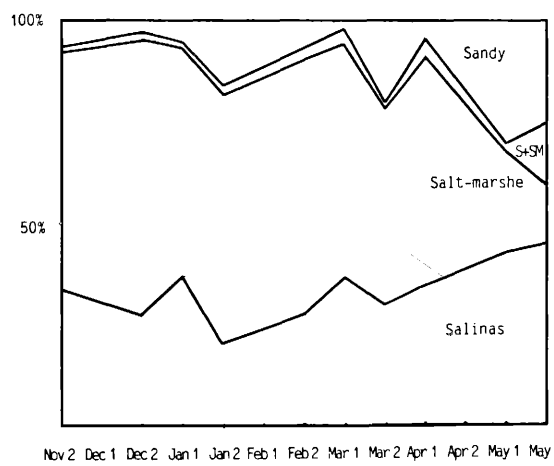


Figure 4. The proportional distribution of waders in the Ria de Faro in winter and spring according to roost substrate. Each month is divided into two 15-day periods.

The increase in the use of sandy roosts is a consequence of the influx of species like the Knot and Sanderling, which do not usually roost in salt-marshes.

The wader distribution along the lagoon system also shows some variation, particularly during spring migration. The eastern area shows little change, but the central area decreases in relative importance and the western area increases.

According to information collected at the site, the settlement of Cockles *Cerastoderma edule*, is very variable. In 1985 most of it occurred in the western part of the 'Ria'. This certainly affected the wader distribution as several species depend upon this resource, particularly the most abundant at the time, the Knot.

The non-uniform distribution of waders shown in

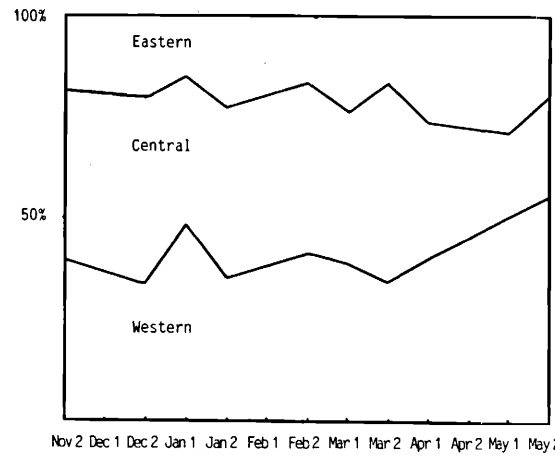


Figure 5. The proportional distribution of waders in the Ria de Faro in winter and spring according to geographical sector. Each month is divided into two 15-day periods.

Figures 4 and 5 has implications for how such areas are counted. In using control areas, or when spreading single counts over a large period, such limitation could lead to important errors. This is why the partial counts carried out at salinas, a habitat whose relative importance decreased during migration, could not be used to estimate the total wader population of the area, but only to identify the timing of migration more precisely.

CONCLUSIONS

The international importance of the Ria de Faro for wintering waders is already known. This paper emphasises the international importance of the site for the migration of some wader species: Grey Plover, Turnstone, Black-tailed Godwit, Knot, Little Stint, Sanderling and Avocet. All these species use this lagoon system during their spring migration, but there are considerable differences in timings between them.

Spring migration starts in February and it goes at least until May. Some species show only one peak passage period (Turnstone, Curlew, Whimbrel, Black-tailed Godwit, Knot, Little Stint and Avocet) while others show two peaks (Grey Plover and Sanderling).

The late November counts show that there is then still some migration further southwards for a few species (Ringed Plover, Turnstone, Redshank, Little Stint and Sanderling): these occur in greater numbers in November than in December. Other species (Kentish Plover, Curlew, Knot, Dunlin and Avocet) have larger populations in December than November. Hence birds will still be arriving by this time.

The colour marking of Dunlin indicate that at least up to mid March there is no immigration. The spring passage possibly happens with a fast turnover but more data is needed to confirm this.

The wader populations of the area show different preferences for roosting substrates through the period, as well as regional preferences within the area. These might be determined by the proximity of food supplies, which are abundant but with strong seasonality in salinas, and in the sandy areas were the first-year Cockles have settled.

When using partial counts, or counts undertaken over a long period of time, in a large area, the dynamic behaviour of the wader populations needs to be taken into account.

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DOES THE NEARCTIC KNOT CALIDRIS CANUTUS ISLANDICA MIGRATE THROUGH THE SOUTH-WESTERN BALTIC?

H.W. Nehls

The Knot *Calidris canutus* is a regular migrant along the Baltic coast in the German Democratic Republic (GDR) in autumn, but more than 100-200 are seldom seen at the resting grounds at any one time. However, observations of their migration indicate that more birds occur in this part of the Baltic than the number of resting birds suggests. It seems probable that most of them pass through the area on their way to the North Sea without resting.

Autumn migration starts with the adults in mid-July, reaches its peak during the last 10 days of July and the first 5 days of August, and continues until late September. The first juveniles appear around mid-August. Their migration reaches a peak between the last 5 days of August and the first three weeks of September. The last Knots leave the region in late October (Figure 1). Adults have been observed to rest here for only a short time, but juveniles often stay for a considerable period.

It is extremely rare for Knots to rest on our coastline during the spring migration. Usually only single birds, or groups of less than 10, are observed. Occasional birds appear towards the end of March, and there are scarcely perceptible peaks in the first half of May and mid-June. Birds have not been observed overwintering in this region, but in mild winters, individual Knots sometimes appear between December and February, probably flying in from the North Sea.

Since only a few Knots rest on our coastline, trapping and ringing are possible to only a very restricted extent. The total number of Knots ringed in the GDR during the autumn migration up to and including 1986 is only

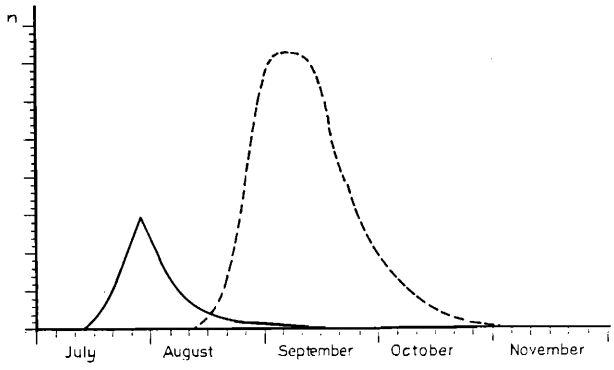

Figure 1. Timing of occurrence of adult (solid line) and juvenile (dotted line) Knots resting on Langenwerder, Wismar Bay, during their autumn migration.

about 2 200. Of these, 1 700 were ringed on the island of Langenwerder in Wismar Bay, where Knots have been ringed since 1959, although on a large scale only since 1976. The birds are caught mainly with wader traps, although mist nets are sometimes used.

Knots caught on Langenwerder are weighed and the following measurements taken: wing length, bill length (culmen to tip, sometimes also from front margin to nostrils to tip), and tarsus length. Only about 17% of the birds caught have been adults. These birds had not yet started moulting their primaries when they migrated along our coast.

So far 36 of the birds ringed in the GDR have been recovered in other countries, a recovery rate of about 1.6%. Of the birds caught in the