Knots on the Polish Baltic coast

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The Polish coast is regularly visited by Knots *Calidris canutus* during autumn migration, but only sporadically in spring. Almost 2,000 Knots have been ringed and measured at the Gulf of Gdansk since 1960. Knots have been trapped during autumn (July-September) in almost every year. The number of birds observed and trapped varied greatly between years. Adult Knots appear in the study area in the middle of July. Juveniles arrive later, in mid August. Early passage adults have longer bills (females?) than those migrating later (males?). About 30% birds stop in the study area for two days or more. They increase their body mass but do not moult in Poland. Knots ringed in Poland spend the winter in western Europe as well as in West Africa. It is likely that mainly Siberian-breeding Knots use the Polish coast during autumn migration, but the present biometric and recovery data do not yet fully clarify the breeding origins of these birds.

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INTRODUCTION

The Polish coast is regularly visited by Knots *Calidris canutus* during autumn migration. They usually appear on the coast in small flocks, rarely exceeding 20 individuals. Sometimes flocks of 50-60 birds occur, and even a flock of 200 birds has been seen (W. Meissner pers. comm.). During spring, single Knots or flocks up to 20 birds have been observed, but they are uncommon. Larger flocks do occasionally pause in spring, notably a flock of *c.* 500 Knots seen on 18 May 1988 in north-eastern Poland (Vistula Lagoon, T. Mokwa pers. comm.).

The present article provides general information on the Knots ringed at Vistula Mouth (Gulf of Gdansk) during autumn migration, i.e. timing and intensity of migration, some morphometric data and details about wintering grounds and migration routes.

METHODS

Almost 2,000 Knots have been ringed in Poland up to 1988 (Gromadzka 1989). They have been trapped together with other wader species at the Vistula Mouth in 'walk-in' traps almost every year since 1960. In the 1980s regular trapping also started at other sites within the Gulf of Gdansk, notably Reda Mouth (WRG KULING 1985; Meissner 1992). Every year, the ringing at Vistula Mouth lasts for a 2-2.5 month period (mid-July - end of September). Traps have been checked every day, every two hours from sunrise to sunset. Most of birds were measured (wing length-maximum chord; bill length-exposed culmen; in the 1980s also head + bill length) and weighed (with Pesola spring balances). Birds were weighed as soon as possible after removal from the trap (usually within one h), but the time intervals between capture and weighing cannot be reconstructed.

This paper analyses the biometric data gathered in the 1970s and the 1980s only, and mainly from years when large numbers of Knots used the Vistula Mouth (Table 1). To analyse migration routes and wintering destinations, all the available recoveries

Table 1. The number of Knots ringed (*n*) and proportion of retraps (R%) in the years when Knots were most abundant at the Vistula Mouth during autumn migration.

	1972		1973		1976		1986		1988		Total	
	n	R%	*n*	R%	*n*	R%	*n*	R%	*n*	R%	*n*	R%
Adults	42	17	134	19	85	49	50	20	46	32	357	30
Juveniles	95	48	109	27	64	23	73	34	58	46	399	36

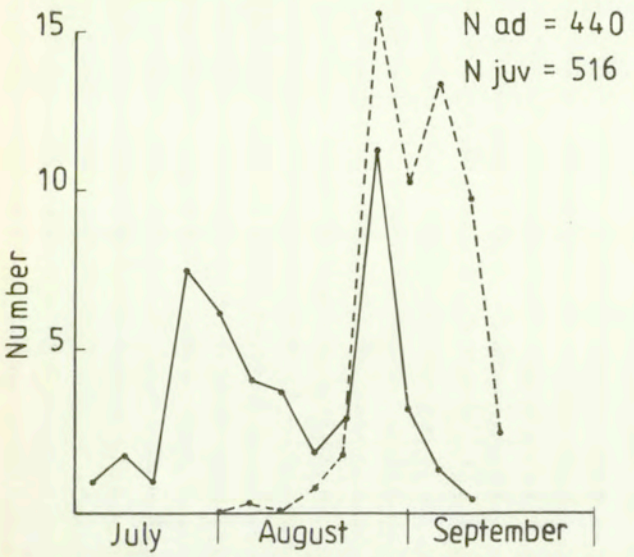

Figure 1. Timing of the autumn migration of the Knot at the Vistula Mouth (Gulf of Gdansk), 1971 - 1979; solid line: adults, dashed line: juveniles.

received from the Gdansk Ringing Centre by the end of 1989, were taken. Some of these refer to Knots ringed at other sites other than Vistula Mouth in the Gulf of Gdansk.

RESULTS

Timing of autumn migration

Knots appear at the Gulf of Gdansk in the first half of July. These are adult birds (Figure 1). There are generally two peaks in adult migration. A first wave comes through in the end of July and the beginning of August and a second in late August and early September. By early September all adult Knots have left the study area. Juveniles arrive in August and are present until early October.

Table 2. Durations of stay in autumn by Knots at the Vistula Mouth, Poland, as estimated from retrap-intervals.

Year	Adults				Juveniles			
	n	mean	range	SD	*n*	mean	range	SD
1972	7	2.7	1- 6	2.05	46	4.1	1-11	2.55
1973	29	3.4	1-13	3.05	30	7.2	1-17	4.36
1976	11	5.1	1-14	4.29	22	7.0	1-19	5.70
1986	10	4.2	1-12	3.88	25	5.1	1-11	3.25
1988	14	6.5	1-34	8.55	27	6.6	1-26	6.68
Total	71	4.37	1-34	5.04	150	5.89	1-26	4.62

The number of birds trapped varies from year to year. The variation seems to depend more on the number of birds visiting the study area than on the number of traps used. Juvenile percentages also vary from year to year (see Meissner 1992).

Passage patterns

Visual observations indicate that some Knots pass straight over the study area, and that others stop at the Vistula Mouth for only a very short time, often just a few hours. Our retrap data indicate that still other birds stop for a longer time, for one day or more. There are slightly more retraps among juveniles than among adults (Table 1). Juveniles also stay longer than adults (Table 2, Figure 2).

Moult

We found no indications that adult Knots started their autumn wing and body moult whilst migrating through the Polish coast.

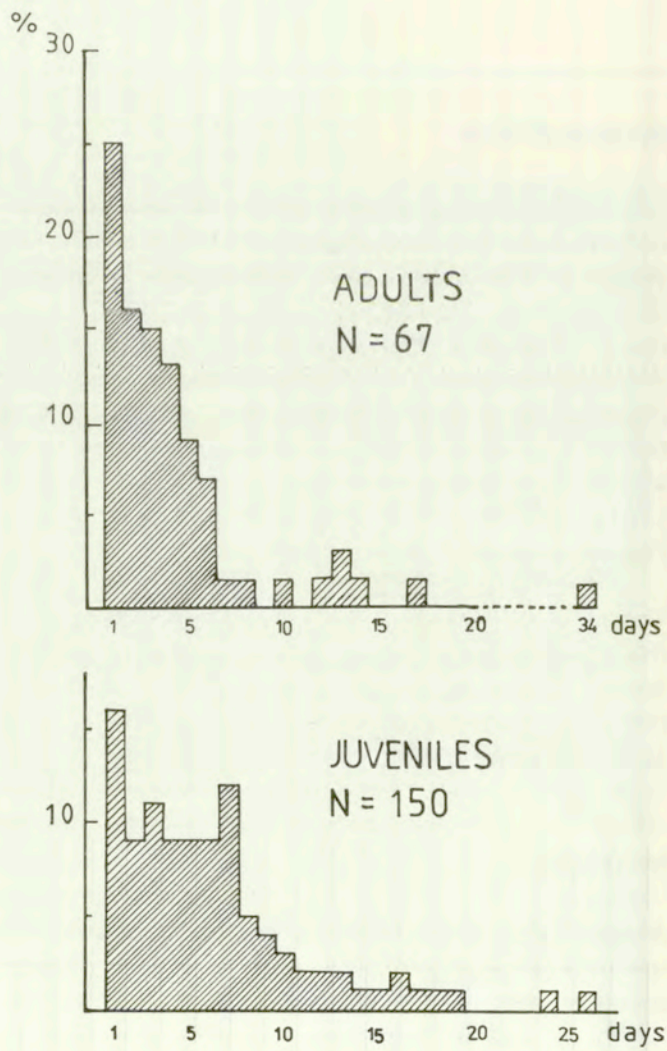

Figure 2. Frequency distribution of the duration of stay of adult and juvenile Knots as indicated by within-season trapping intervals at the Vistula Mouth.

Table 3. Body weights (g) of Knots captured only once at Vistula Mouth, Poland, in late summer and autumn. In 1986 and 1988 adults were significantly heavier than juveniles (Student's t-tests, $p<0.05$).

Year	Age	*n*	mean	range	SD
1972	Adult	34	104.65	93-124	8.42
	Juvenile	49	105.57	84-136	12.17
1973	Adult	104	103.12	90-122	7.08
	Juvenile	79	100.99	80-135	10.85
1976	Adult	11	101.72	89-113	8.66
	Juvenile	41	100.05	87-122	8.48
1986	Adult	40	106.92	90-120	8.26
	Juvenile	48	100.25	82-122	9.05
1988	Adult	31	102.32	92-112	6.61
	Juvenile	31	97.90	86-131	9.70

Table 5. Bill lengths (mm) of adult Knots at Vistula Mouth, Poland, in late summer and autumn. None of the differences between time periods within one year was statistically significant (Student's t-tests, $p>0.05$).

Time period	*n*	mean	range	SD
23 July - 8 Aug. '72	14	35.60	31.0-39.0	2.29
19 - 28 Aug. '72	14	34.21	32.0-37.0	1.47
4 - 13 Aug. '73	21	34.81	31.0-38.0	2.16
24 - 28 Aug. '73	87	33.10	29.0-38.0	2.09
25 July - 2 Aug. '74	53	35.34	29.0-39.0	2.03
20 July - 3 Aug. '76	60	34.28	30.0-38.0	2.04
29 Aug. - 7 Sept. '76	17	33.88	32.0-37.0	1.45
20 July - 8 Aug. '86	20	35.50	33.0-40.0	1.76
29 Aug. - 7 Sept. '86	14	32.64	30.0-35.0	1.45
20 July - 3 Aug. '88	7	35.71	32.0-39.0	2.28
14 - 23 Aug. '88	26	34.61	31.0-39.0	1.74

Biometrics

The weight of juveniles tended to be lower than that of adults in the same time periods (Tables 3 and 4). The weight of non-retrapped birds (both juvenile and adult, Table 3) was usually slightly higher compared to the weights of retrapped birds upon first capture (Table 4). Retrapped Knots increased their weight during their stay at the Vistula Mouth. Rates of weight increase in adults and in juveniles were rather similar, and varied around 2-5 g/d in different years (Table 4).

Bill length of adults was analysed separately for the two migrating waves. Birds from the first wave had,

Table 4. Body weights (g) and weight changes of Knots captured more than once at Vistula Mouth, Poland, in late summer and autumn.

Year	Age		First capture			Last capture			Weight increase (g/day)		
		n	mean	range	SD	mean	range	SD	mean	range	SD
1972	Adult	7	101.86	88-125	14.14	110.8	93-138	13.78	4.90	2.1-10.0	3.00
	Juvenile	46	100.15	88-131	11.39	116.4	84-152	16.72	4.01	0.6-10.0	2.31
1973	Adult	29	99.00	88-116	6.48	104.0	90-135	8.95	2.80	0.4-10.3	2.23
	Juvenile	30	97.67	85-115	8.21	106.9	80-137	14.83	1.98	0.2-5.2	1.26
1976	Adult	11	96.64	86-110	6.88	110.8	100-120	6.33	2.06	0.3-4.0	1.25
	Juvenile	22	93.68	85-112	8.17	105.5	85-132	11.34	2.42	1.0-4.0	0.93
1986	Adult	10	105.10	96-114	6.61	110.8	100-120	6.33	1.94	0.8-4.0	1.24
	Juvenile	25	100.60	87-120	8.67	108.7	92-128	9.02	2.24	0.3-7.0	1.98
1988	Adult	14	102.00	96-108	4.07	106.7	94-118	7.34	2.08	0.4-4.7	1.5
	Juvenile	27	95.81	82-119	9.29	108.2	80-144	18.87	2.32	1.3-4.5	1.0

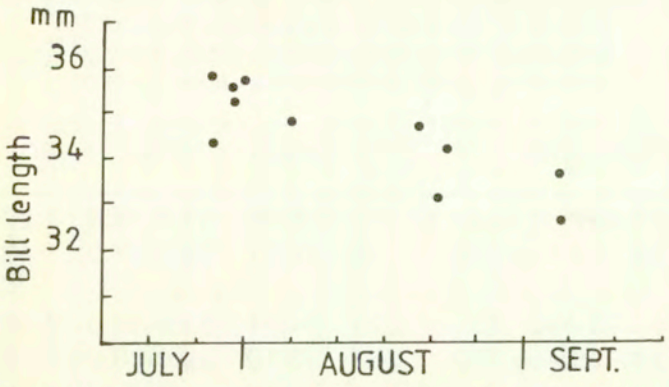

Figure 3. The average bill length of adult Knots at Vistula Mouth decreases significantly during the autumn (Spearman rank correlation coefficient r_s = -0.82, p = 0.0098). Average bill lengths for different time periods in different years (from Table 5) are plotted against the mid-date of each time period.

on average, longer bills than those from the second wave (Table 5). This means that when overall average bill length for adult Knots is plotted against date, bill length decreases significantly with time of the year (Figure 3). Juvenile Knots generally have shorter bills than adults (compare Tables 5 & 6). If two separate waves of juveniles occurred within one season, birds from both groups had similar bill length (Table 6).

Table 6. Bill lengths (mm) of juvenile Knots at Vistula Mouth, Poland in late summer and autumn. None of the differences between time periods within years was statistically significant (Student's t-tests, $p>0.05$).

Time period	*n*	mean	range	SD
1972	92	33.36	30.0-36.0	1.65
23-29 August	26	33.34	30.0-36.0	1.83
2-13 September	55	33.22	30.0-36.0	1.64
1973	100	32.52	28.0-37.0	2.03
1976	59	32.64	28.0-36.0	1.90
1985	82	33.71	30.0-37.0	1.70
23 Aug. - 8 Sept.	49	33.85	31.0-37.0	1.54
17 Sept. - 4 Oct.	21	33.09	30.0-37.0	1.98
1986	72	32.03	28.0-36.0	1.70
1988	57	31.89	29.0-35.0	1.42
8-29 August	32	31.87	30.0-35.0	1.34
12-29 September	15	32.00	30.0-35.0	1.41

Table 7. Wing lengths (mm) of Knots at Vistula Mouth, Poland, in late summer and autumn. None of the differences between time periods within years was statistically significant (Student's t-tests, $p>0.05$).

Time period	*n*	mean	range	SD
Adults				
1986				
20 July - 8 Aug.	20	172.00	166-183	3.77
29 Aug. - 7 Sept.	14	169.79	165-174	2.61
1988				
20 July - 3 Aug.	7	171.43	167-176	3.41
14 - 23 Aug.	26	169.11	162-175	2.98
Juveniles				
1985	82	164.06	157-177	3.67
23 Aug. - 8 Sept.	49	164.22	157-177	3.87
17 Sept. - 4 Oct.	21	163.19	157-171	3.17
1986	72	164.56	151-174	4.35
1988	57	163.61	158-174	3.35
8 - 29 Aug.	32	163.59	159-170	2.83
12 - 29 Sept.	15	163.33	158-174	3.87

There is no clear difference of wing length between adult Knots from different waves, but adults do have longer wings than juveniles (Table 7).

Ringing recoveries

Reports in autumn of Knots ringed in Poland (July-November) come mainly from the coasts of the Baltic, the North Sea and the eastern Atlantic. The most southern recoveries are, however, from Namibia (Figure 4). Only nine winter recoveries from Knots present in autumn on the Polish coast are presently available (Figure 5). Spring recoveries (March-June) are distributed along the same route as the autumn recoveries (Figure 5). The most southern recovery is from South Africa. There is one further spring recovery, outside the area shown in Figure 5, from northern Russia (67°25'N, 64°00'E), relatively close to possible breeding grounds on the Taymyr Peninsula. This adult Knot, ringed at the Vistula on 2 August 1967, was shot near Vorkuta on 2 June 1972.

CONCLUSIONS

The following points emerge from the data on Knots collected during wader studies in Poland:

- Knots occur on the Polish Baltic coast mainly

Figure 4. Autumn (July-November) recoveries of Knots ringed or controlled during autumn migration at the Gulf of Gdansk, indicated by an asterisk. Open symbols show locations of birds ringed as juveniles and recovered within the same autumn. Solid circles show all recoveries of adults (includes adults ringed and recovered in the same autumn or successive autumns and birds ringed as juveniles and recovered after more than a year). Circles with a small dot alongside indicate autumn ringing locations of Knots subsequently controlled in Poland in a later autumn.

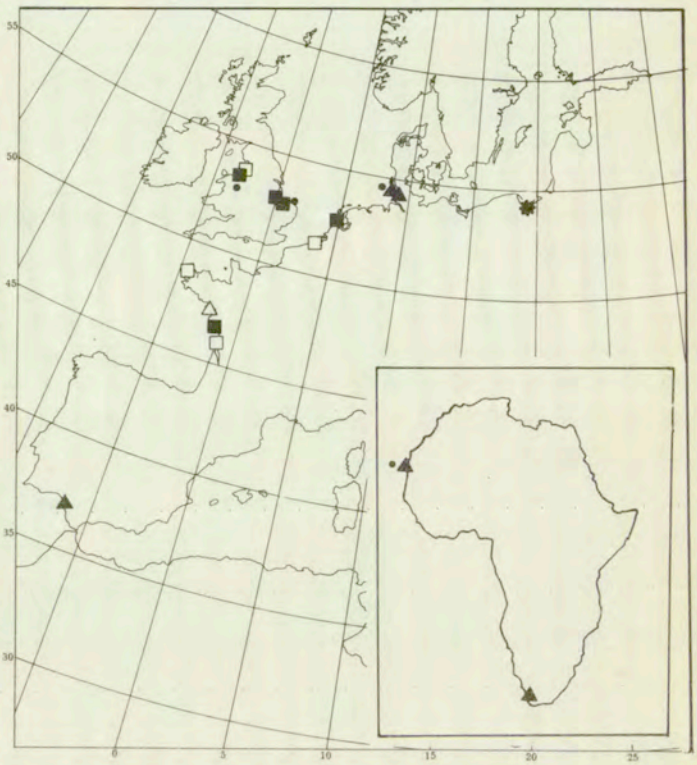

Figure 5. Winter (December-February) and spring (March-May) recoveries of Knots ringed and controlled in Poland in autumn. Open symbols are birds ringed as juveniles and solid symbols are birds ringed as adults (see Figure 4). Squares are winter recoveries and triangles are spring recoveries. Symbols with a small dot alongside indicate ringing locations of Knots subsequently controlled in Poland in a later autumn.

during autumn migration;

- the intensity of migration differs through the autumn and between years in both age groups (juveniles and adults);
- about 30% of ringed birds stay longer than one day at Vistula Mouth, and these put on weight during their stay;
- juveniles have generally shorter bills and wings than adults;
- in a single year the bill length of successive waves of juveniles is similar, but between-year differences occur;
- bill length of adults shows greater seasonal variability, with earlier migrants having longer bills than later birds;
- some Knots ringed at the Polish Baltic coast seem to overwinter in Europe (Great Britain, The Netherlands, France) and others in western and southern Africa.

The geographical location of our study site in Poland in relation to the known breeding grounds of the two subspecies occurring in Europe (*islandica* and *canutus*) implies that most birds migrating through Poland should be of Siberian (*canutus*) origin. The longer-billed and shorter-billed birds seem to belong to different sexes of *canutus* rather than to different subspecies. A similar interpretation has been suggested for *islandica* Knots migrating in autumn through southeast Norway (Lifjeld 1988). The timing of Knots appearing on migration through Poland corresponds well with the timing of departures of Knots from their breeding grounds in northern Siberia and females start migration first (Cramp & Simmons 1983). The range of bill lengths of Polish Knots overlap, however, with published bill lengths for European-wintering *islandica* as well as the *canutus* subspecies (Roselaar 1983; Tomkovich 1987). The available recoveries of Polish-ringed Knots provide more questions than answers about the origin of the

birds. If Poland is visited mainly by Siberian-breeding birds, birds should overwinter in Africa (Dick *et al.* 1976, 1987). Most of the winter recoveries are, however, in Europe, suggesting Nearctic origins. The question of the origin of Knots migrating through Poland remains to be clarified.

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