

Knots' autumn migration in the western part of the Gulf of Gdansk, Poland: preliminary results

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The Knot *Calidris canutus* is a regular migrant through the Gulf of Gdansk in autumn. In spring Knots very seldom visit this region. Between 1983 - 1989, 588 Knots were ringed by WRG KULING at two ringing sites. Migration of adults occurs in two periods. The first one lasts from 15 July to 23 August and the second from 24 August to the end of migration period. Juveniles arrive about one month later than adults. The largest percentage of juveniles was found in 1985 (92% of captured and 88% of observed Knots) and the smallest in 1989 (41% and 17% respectively). The adults have head, bill and wing lengths that are significantly longer than those of juveniles. Only the wing length distribution shows evidence of two peaks. Published formulae for estimating lean weight and fat reserves indicated that Knots are arriving in the Gulf of Gdansk with very small fat reserves. Average recapture intervals were 1.8 days in adults and 4.0 days in juveniles. In the first day after capture average weight changed very little, but weights increased rapidly thereafter.

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INTRODUCTION

Studies on wader migration in the western part of the Gulf of Gdansk, Poland, have been carried out by the Waterbird Research Group (WRG) KULING since 1983. The autumn migration of waders has been studied at two places, at Reda and at Jastarnia (Figure 1). The Knot *Calidris canutus* is a regular migrant through the Gulf of Gdansk in autumn. Flocks of more than 150 - 200 birds are rare because the population turnover is high. During spring migration Knots very rarely visit the Gulf of Gdansk.

This paper provides a preliminary analysis of data on Knots collected in the western half of the Gulf of Gdansk, and supplements the report of Gromadzka (1992), which is based on studies at Vistula Mouth, in the southern part of the bay.

METHODS

The Knots were observed resting or feeding on the sandy beaches, but were never encountered on the adjacent meadows or in the nearby sewage farms.

Between 1983 and 1989, 588 Knots were ringed by WRG KULING at two ringing sites. In 1983 and 1987 only one ringing site was occupied (indeed, in 1987 only two Knots were ringed). Knots were caught on the coastline with 'walk-in' traps. The birds were weighed and the following measurements were taken: wing length (maximum cord), total head length and bill length (using stepped-ruler) and tarsus-plus-toe length (Piersma 1984). Ageing was according to Prater *et al.* (1977). No adults or juveniles showed primary feather moult.

At Jastarnia Point, where the studies started in 1984, all the areas in which waders were concen-



Figure 1. Location of study sites. J = Jastarnia Point, R = Reda, V = Vistula (study site of Gromadzka 1992).

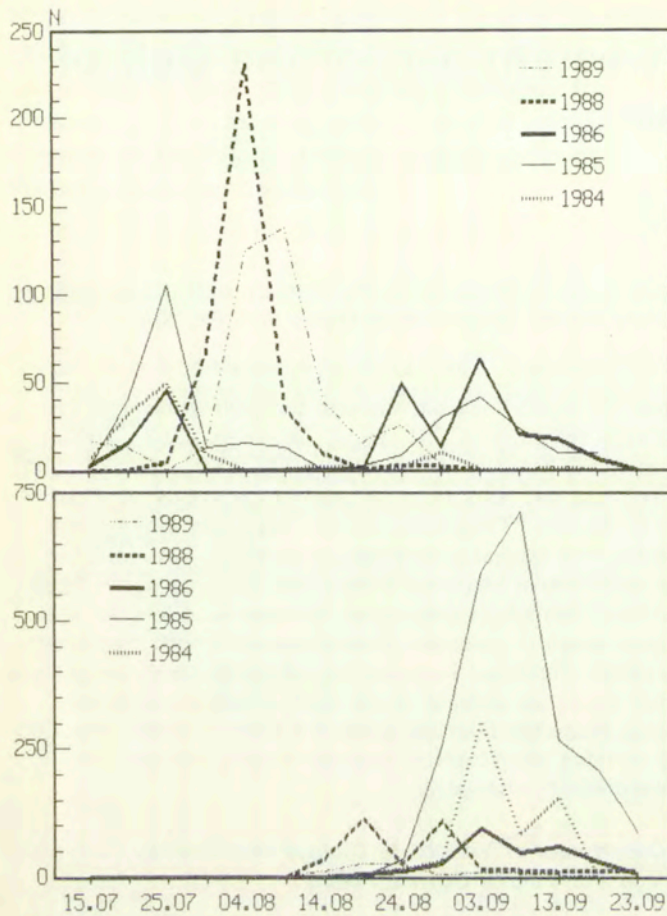


Figure 2. Timing of occurrence of adult (top panel) and juveniles (lower panel) Knots staging at Jastarnia during autumn migration in five different years. Counts are grouped in 5-day periods.

trated were close to each other and formed a clearly defined complex. In 1987, however, the counts were incomplete and these data have been excluded from the analyses below. Near the Reda there are so many places where waders can rest and feed, not only along the shoreline but also on an ash dump of the local electric power plant (Brewka *et al.* 1987),

Table 1. Measurements of juvenile and adult Knots caught at WRG KULING ringing sites at the Gulf of Gdansk, Poland. Data for all years are combined.

Measurement (mm)	Juveniles			Adults			Student's t-test
	n	mean	range	n	mean	range	
Total head length	298	61.4	56-68	200	63.4	58-72	$p < 0.001$
Bill length	297	32.9	27-39	214	34.6	29-44	$p < 0.001$
Wing length	291	164.4	154-175	135	169.0	160-181	$p < 0.001$

that it is difficult to count the birds accurately. Only results of counts from Jastarnia will therefore be presented in this paper.

RESULTS AND DISCUSSION

Timing of autumn migration

Autumn migration of adult Knots usually starts in mid July. Migration occurs in two distinct periods (Figure 2 top). The first period lasts from 15 July to 23 August, and the second from 24 August to the end of migration period. A similar pattern was observed at Vistula Mouth, about 50 km to the east (Gromadzka 1987, 1992). The timing of the first peak was similar in years 1984 - 1986 (25-29 July), but in 1988 and 1989 that peak appeared later (4-8 August and 9-13 August, respectively). In these years, although there were mild winters in Europe, the spring on the Siberian breeding grounds was probably late (W. Kania pers. comm.). This might account for the delayed migration timing in those years. The peak of the second wave was found in the period 24 August - 7 September, when the adults migrated together with the juveniles. At Wismar Bay, Germany, only one peak of adults has been found (Nehls 1987).

Juveniles arrive about one month later than adults. In 1984 - 1986 their peak occurred between 3-12 September, but in 1988 and 1989 the peak was earlier (19-23 August). In 1984, 1986 and 1988 there is some evidence of two waves of juveniles passing through about 10 days apart (Figure 2 bottom). However, in 1985 when juveniles were most numerous, and in 1989 when juveniles were least numerous, there was only a single peak (Figure 2 bottom).

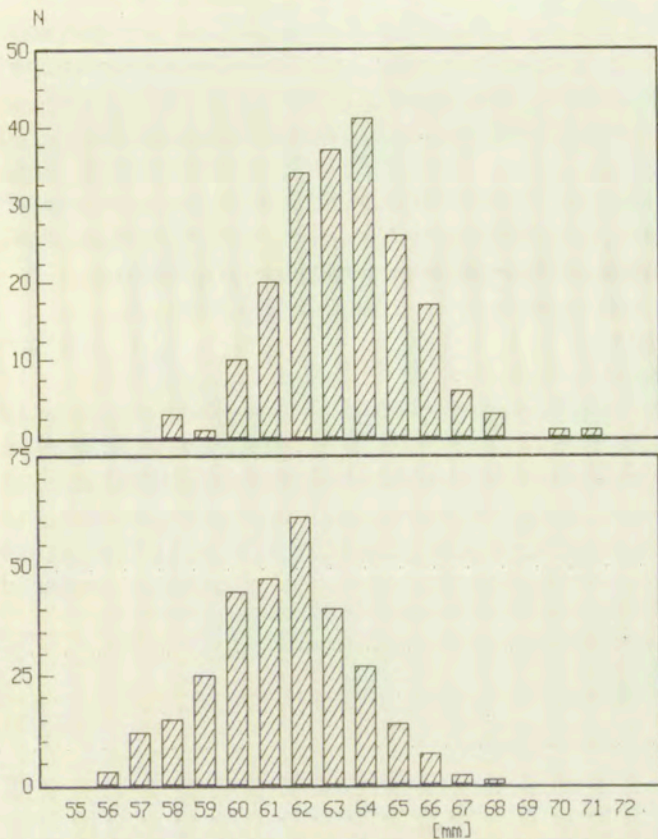


Figure 3. Distribution of total head lengths of adult (top panel) and juvenile (lower panel) Knots measured at Reda and Jastarnia.

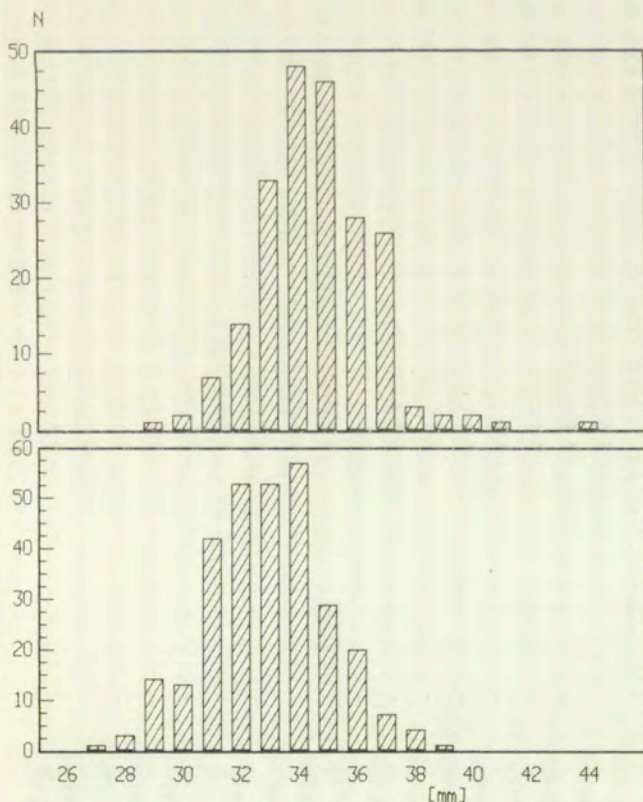


Figure 4. Distribution of bill lengths of adult (top panel) and juvenile (lower panel) Knots measured at Reda and Jastarnia.

Morphometrics

The adults have head, bill and wing lengths that are significantly longer than those of juveniles (Table 1). The adults that migrated in the first wave appeared to be larger than those in the second wave, but the sample size for the second wave is small and the differences are not significant. The distributions of total head length, bill length and wing length are shown in Figures 3, 4 and 5. Only in wing length is there evidence of two peaks. Bill lengths of adult Knots measured in the southwest Baltic at Langenwerder (data from Figure 5 in Nehls 1987) are significantly shorter than those of adults caught at the Gulf of Gdansk (Student's t-test, $p < 0.05$). This, together with the similarity of the mean bill length (Table 1) to those of Afro-Siberian birds of the *canutus* subspecies (Dick *et al.* 1976; Piersma *et al.* 1992), suggests that although Nearctic Knots migrate through the southwestern Baltic (Nehls 1987), at most very few birds of this subspecies pass through the Gulf of Gdansk.

Age structure

The largest percentage of juveniles caught (92%) was in 1985, and the smallest percentage of juveniles (41%) was in 1989 (Figure 6). The results from observations showed a similar pattern.

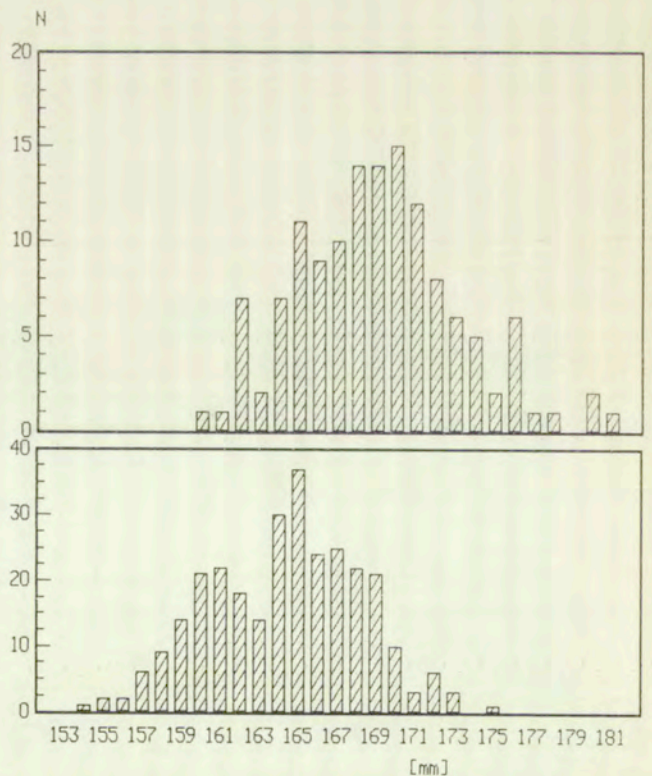


Figure 5. Distribution of wing lengths of adult (top panel) and juvenile (lower panel) Knots measured at Reda and Jastarnia.

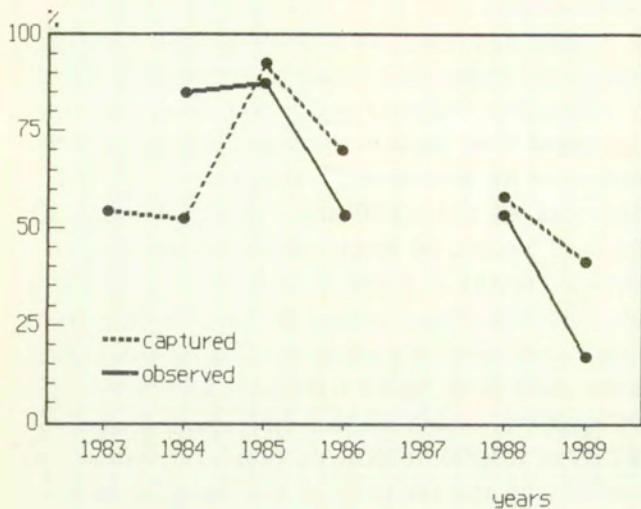


Figure 6. The percentage of juvenile Knots in the western Gulf of Gdansk in different years according to captures in walk-in traps and visual observations. No visual observations were collected in 1983 and no data at all in 1987.

Body weight and length of stay

Body weights are shown in Figure 7. There was no significant difference between mean body weights of juveniles and adults, but Figure 7 suggests that the distributions of weights is different between age-classes. This possibility is the subject of further study. Some juveniles were surprisingly heavy, with some birds exceeding 150 g. Application of published

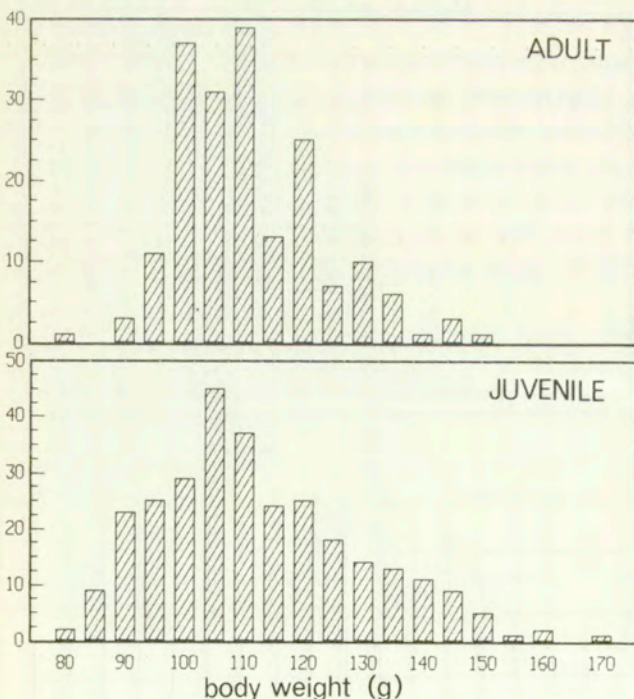


Figure 7. Distribution of the body weights of adult and juvenile Knots captured at Reda and Jastarnia. Data for all birds captured in the autumns of 1983 - 1989 are included (total $n = 482$).

formulae for estimating lean weight and fat reserves of waders in autumn indicated that large proportions of birds had live weights below the predicted lean weights. Such 'negative weights' occurred for 54.9% of juveniles and 62.9% of adults when using Davidson's (1983) formulae, and 51.8% of adults when using McNeil & Cadieux's (1972) formula. This suggests that Knots are arriving in the Gulf of Gdansk with very low weights and small fat reserves.

The length of stay in the study area is short. Only 6.9% adults and 19.3% of juveniles were recaptured in the same autumn. Average recapture intervals were 1.8 days in adults and 4.0 days in juveniles. Figure 8 shows average weight changes of retrapped birds. In the first day after capture, average weight

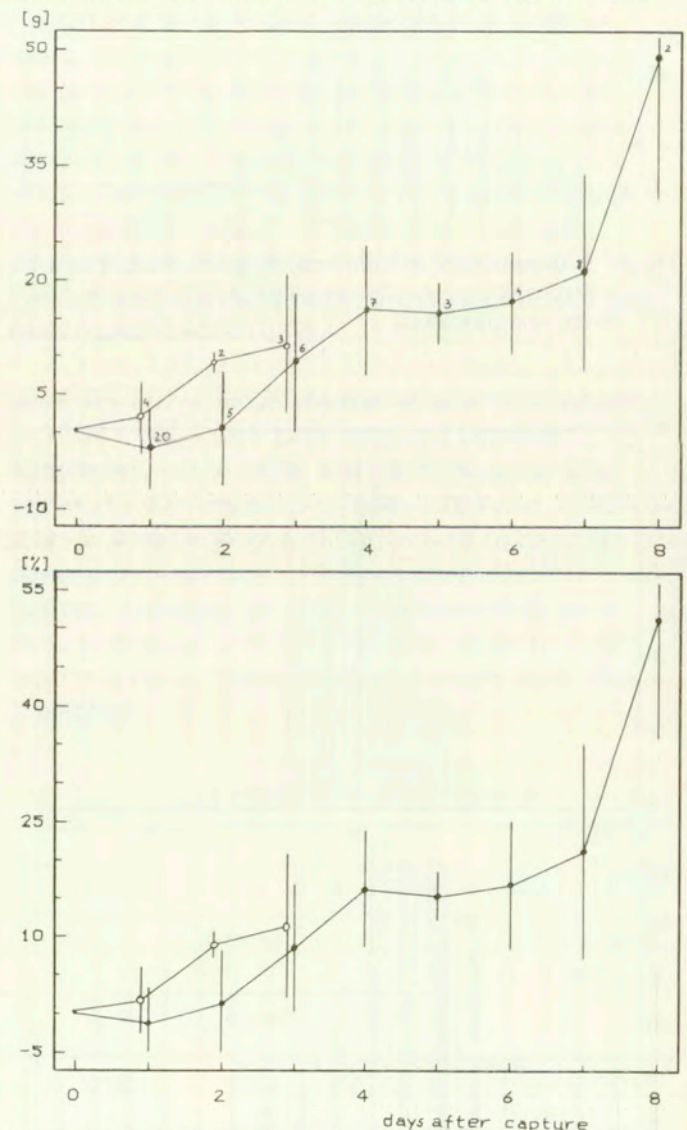


Figure 8. Changes with staging time in mean weight (top) and weight-percentage (bottom) of adult and juvenile Knots retrapped in the western Gulf of Gdansk in autumn. Vertical lines represent standard deviations and the numbers given are sample sizes.

changes very little, but weights then increased rapidly, such that juveniles recaptured after eight days had increased their weight by almost 50%. These patterns are very similar to those of Dunlins *Calidris alpina* from the Gulf of Gdansk (Meissner in prep.). Studies on Knot migration in the western Gulf of Gdansk are continuing.

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