CONTINUING MYSTERIES OF THE SPRING MIGRATION OF SIBERIAN KNOTS: A PROGRESS NOTE

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Since the discovery that the Knots *Calidris canutus* wintering in western Europe mainly belong to a short-billed population breeding in the Nearctic *C.c.islandica*, and that the Knots wintering in western and southern Africa belong to a longer-billed population *C.c.canutus* breeding in Siberia (Dick *et al.* 1976), a lot of fieldwork has been carried out on the migratory habits of both populations (see *e.g.* Figure 8 in Piersma *et al.* 1987). In an attempt to elucidate the spring movements of Siberian Knots from Africa through Europe, intensive fieldwork was undertaken co-operatively in the spring of 1979. This was organized by the Wader Study Group (Dick 1979, Dick, Piersma and Prokosch 1987). The results of this successful project indicated that Siberian Knots use only a few key sites during spring migration. After they leave West Africa, the great majority of the population was thought to stop over only in the Schleswig-Holstein and East-Niedersachsen part of the Wadden Sea. Other findings indicated that the much smaller numbers which additionally used the intertidal areas of the Tejo estuary in Portugal, west central France and the Dutch Delta, consisted mainly of birds that were unable, through shortage of energy resources, to cover the distance from west Africa to West Germany in one flight. The major gap in the knowledge that came from the 1979 project, was the lack of data from the Banc d'Arguin, Mauritania, where about 70% of all Siberian Knots winter.

In 1985 and 1986 intensive fieldwork was carried out on the spring departure of waders from the Banc d'Arguin (Ens 1985). This research was linked to investigations along the rest of the migration route of Siberian Knots, through the co-operative WSG project 'International Wader Migration Studies along the East Atlantic Flyway' (Piersma 1984). In addition to the activities on the Banc d'Arguin, catching and counting activities concentrating on Siberian Knots were carried out in South Africa (Waltner 1985), the west central coast of France (Bredin and Doumeret 1986), and the Schleswig-Holstein Wadden Sea.

As co-ordinators/organisors of the fieldwork in Mauritania, France and West Germany we met in Groningen, The Netherlands for three days in late February 1987, in order to analyse the data on *c.* 1200 adult Siberian Knots captured in 1985 and 1986, to discuss the findings, and to formulate the conclusions of the most recent work on the spring migration of Siberian Knots. We discovered that the picture is yet far from complete, not the least because of the considerable differences between years. This note gives our preliminary conclusions, lists the resulting further questions, and indicates the great gaps that remain. The note should also give the flavour of just how stimulating international co-operative research can be!

As a first check on the assumption that we were studying the same populations of Knots in Mauritania in February-April, as in France and West Germany in May, we compared average bill-lengths and wing-lengths of the adult Knots captured at the three sites (Table 1). Although four out of the six possible comparisons showed statistically significant differences this was due chiefly to the large sample sizes and possibly varying sex ratios also. The averages from the different sites are in absolute size remarkably similar. The bill-lengths clearly indicate a population consisting of Siberian Knots only (c.35mm compared with 33mm for Nearctic birds) (cf Dick *et al.* 1976). There is now additional evidence for a direct link between the Banc d'Arguin and the sites further north. Six of the 262 Knots, dye-marked on the Banc d'Arguin in March-April 1985, were resighted later in spring 1985 in west central France where 26 000 individuals were checked. No dye-marked birds were seen in Schleswig-Holstein, but observer density there was rather low.

On the Banc d'Arguin, Siberian Knots started to gain weight from the end of February onwards, though at a very low rate throughout spring (less than 1 g/day). No differences between the weight increases in the two seasons were detectable. In both years, departures occurred from 20 April onwards. Around this date there were also indications of the arrival of relatively light birds, probably from more southern wintering areas in Guinea-Bissau and S.Africa. Although the observations were stopped around 1 May, migratory activity had not ceased by that date and it is thought that departures continue well through the first week of May.

The weight patterns of Siberian Knots staging in west central France, in mainly the second and third wekk of May, showed the same pattern as documented for spring 1979 (Dick, Piersma and Prokosch 1987). Average weights were low (120-130 g), staging times obviously short, and weight increases in the order of 0.5 - 3 g/day.

Table 1. Comparison between the wing-lengths and bill-lengths of adult presumed Siberian Knots captured in the springs of 1985 and 1986 at three sites along the migration route. For wing-lengths, the differences between the measurements at Banc d'Arguin and in west-central France, and Banc d'Arguin and Schleswig-Holstein were significant (Student's t-test, $p<0.05$). For bill-lengths the differences between the measurements at Banc d'Arguin and in west-central France, and west-central France and Schleswig-Holstein were significant. The significant differences may be due to different sex ratios at the three sites, since males have smaller dimensions than females.

	Banc d'Arguin, Mauritania			west-central France			Schleswig-Holstein		
	average	SD	n	average	SD	n	average	SD	n
wing-length (mm)	169.71	3.90	278	171.62	4.39	583	170.93	4.30	289
bill-length (mm)	35.12	1.78	280	35.71	1.85	583	35.08	1.86	291

The majority of birds probably arrived with weights less than 110 g. However, since the catches were only made just before or after the dates with peak counts, the arrival weights could not be measured directly. There were great differences in the total number of Siberian Knots using the west central coast of France in 1985 and 1986. Using an average staging time of 8 days for individual Knots (estimate based on changing percentages of colour-marked birds in 1985), Bredin and Doumeret (in press) estimate that in 1985 100 000, but in 1986 only 35 000, Siberian Knots used west central France as a staging site.

Two successful cannon-netting catches were made at the same site in Schleswig-Holstein on 21 May, one in 1985 and one in 1986! The average weights of the birds captured then, showed a striking difference between years. On 21 May 1985 82 adult Siberian Knots weighed 173 g on average (corrected for weight loss after capture). On 21 May 1986 112 adult individuals weighed an average 197 g. This is a difference of 24 g or 14%.

The large numbers of Siberian Knots in west central France in 1985 and the low weights in Schleswig-Holstein in 1985, appear at first sight to corroborate the hypothesis formulated on the basis of the 1979 results: in a "difficult" year a lot of birds are unable to fly directly from the Banc d'Arguin to Schleswig-Holstein and are thus forced to stop over along the way, *e.g.* in west central France. In a "good" year, the majority of birds are able to make the flight directly, and do not stop over in west central France. In a difficult year the birds would be "behind on schedule" and therefore predicted to have low weights in the presumed last staging site (Schleswig-Holstein) before departure to the breeding grounds. Since we were unable to find differences between the weight increases on the Banc d'Arguin, and hence, in predicted departure weights in 1985 and 1986, the reason for 1985 being a difficult year must be due to factors playing a role elsewhere, *e.g.* more opposing winds during the migration period in 1985. We are currently investigating these possibilities.

In the paper on the results from the 1979 spring migration (Dick *et al.* 1987) it was concluded that at least 200 000 Siberian Knots stage in Schleswig-Holstein, and that birds arrive there around 10 May and leave in the first week of June. However, during a count on 19 May 1985 of the Knots present in the Schleswig-Holstein Wadden Sea, only 50 000 Knots were located (though an additional 50 000 birds may have been missed on one site which is known to sometimes harbour large numbers of roosting Knots). This must mean that in 1985 the majority of Siberian Knots had not yet arrived in Schleswig-Holstein by 19 May. This is corroborated by sightings of a heavy passage of Knots along the mainland coast of Friesland, The Netherlands, from 19-24 May 1985. From the data as yet available, it seems most probable that the Siberian Knots were scattered over many different sites in western Europe, at least during the first three weeks of May 1985 although we cannot yet rule out the possibility of later departures from Banc d'Arguin in 1985. No comparable data are yet available for spring 1986.

The data set analysed so far therefore shows more gaps than we had anticipated. The interpretation of the Siberian Knot migrations in 1985 and 1986 requires still a lot of data assembling, compiling and puzzling. Apart from the homework we nevertheless hope to continue fieldwork this spring. In west central France and Schleswig-Holstein we are aiming at catching Siberian Knots just after arrival and before departure, and also to collect detailed series of counts. Apart from this, we are looking forward to receiving any observations on Knots in the springs of 1985, 1986 and 1987, that may have escaped our notice. Thanks in advance!

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