Second report on research on the Great Knot *Calidris tenuirostris* on the breeding grounds

Pavel Tomkovich

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P.S. Tomkovich, Curator of Birds, Department of Ornithology, Zoological Museum of Moscow State University, Moscow, Russia.

INTRODUCTION

Reproduced below is the edited report of Pavel Tomkovich on his continuing research on breeding Great Knots (for first report see *Stilt* 24). This study has again been funded by the Australian Nature Conservation Agency (ANCA).

PROJECT PARTICIPANTS

Pavel S. Tomkovich and Dmitry E. Te (Assistant), student of the Zoology Department, Moscow Pedalogical Museum.

STUDY AREA

Studies continued in the same are where the project was initiated in 1993; on the eastern spur of the Shchuchy Mountain Range, north-eastern Siberia (64° 55'N, 168° 35'E).

LOGISTICS

It was planned to reach the base camp at the mouth of the Balaganchick River, a tributary of the Anadyr River, on or about 20 May 1994 - before or at the time of arrival of Great Knots, in order to obtain data on the ecology of these birds before the commencement of breeding, as this has not previously been studied. However, because bad weather conditions prevented plane and helicopter flights, it was not possible to reach the base camp until 31 May. As a result it took a total of 20 days to travel from Moscow to the base camp, thus reducing the time available for studies during the pre-breeding period and restricting the general Great Knot studies to the period 1 June to 2 August. With travel time included the expedition lasted from 11 May to 8 August 1994.

It was necessary to use a helicopter to reach base camp from Markovo village as no other transport method was possible at the time. It was possible to travel up the river by motor boat (a much cheaper form of transport) just one week later, by that time the majority of Great Knots had begun breeding.

RESULTS

Site faithfulness and mate fidelity

The individual colour-marking of 12 adult breeding Great Knots (one known female and 11 supposed males) from the study area in 1993 made it possible to record a degree of their site faithfulness. Nine of these birds (75%) were found back in the study area; and individually within the same parts of the area, with a presumed relationship to defended pre-breeding areas. It is inferred from this that most, if not all, *surviving* adult males return annually to their former breeding sites.

Both adults of a colour-marked pair returned to their former territory, nesting some 125 metres from the nest site of the previous season. As only one known female was marked it is not possible to draw any definite conclusions about female site faithfulness from this. Additional birds, including females, were marked in 1994, thus it may be possible to obtain more reliable results in 1995.

As would be expected to a species which is presumed not to breed until at least the age two, none of the 29 Great Knot chicks banded in 1993 were seen in the natal area in 1994. However, one chick banded in 1993 was recovered on 3 June 1994 from Aniva Bay in Southern Sakhalin, therefore at least some one year old Great Knots undertake a northward migration and probably over-summer on the shores of the Sea of Okhotsk.

Breeding density

The same study area as that of 1993 of 9.5 - 10 km^2 of montane lichen tundra was used for density calculations. In 1993 the area was occupied by 13 broods and in 1994 twenty-four broods, and two unsuccessful nests were found. The most intensively studied area, a plateau of *circa* 1 km^2 near the base camp, was inhabited by three broods in 1993, and by six pairs and three unpaired territorial males in 1994. Flocks of feeding birds were also noted to be larger through-out the 1994 season.

Taking into account the known strong site-faithfulness of this species it is presumed that the dramatic increase in density of breeding birds was due to immigration of first-year breeders into the local population. Such an immigration cannot however by explained by a good chick production year two years previously, on the contrary 1992 was a poor breeding season, and therefore these numbers must be attributed to local conditions. High falls of snow in the upper and middle reaches of the Anadyr River in 1994 probably led to a lack of suitable breeding habitats in that area, however, by luck, the mountain range within the study area was uniquely free from large areas of snow in early June 1994 and therefore probably attractive to first-year breeders. It is of interest to note that one marked male which had raised a brood in 1993 was left unpaired in 1994.

It is presumed that the increased breeding density of Great Knots in 1994 will continue in 1995, thus making further studies in 1995 even more attractive.

Phenology

It is known that egg laying began in early June however data on hatching dates are more precise and allow for comparisons to be made with the previous season and for accurately defining the breeding season. Hatching took place from about 25 June to 9 July, with most broods hatched in very early July. This is similar to the timing of hatching in 1993. More precise hatching dates will be obtained by back calculations from measurements of chicks from 21 broods.

Three nests were found with incomplete clutches, allowing intervals between the laying of successive eggs to be determined about five days to complete a clutch of four eggs. Unfortunately only one of these nests survived to hatching, and this had an incubation period of 21 days for the last egg.

Repeated measurements of chicks revealed slower development in 1994 in comparison with 1993. In at least some broods fledging took 23 to 25 days in 1994, compared with 20 to 21 days in 1993.

Large scale movements of Great Knots began in late June 1994, however, the majority of the population departed on 1 and 2 July. The first wave of migration consisted of birds which were recognised failed-breeders, unmated males, and females which had deserted their mates at the time of hatching. Successful breeding males mainly departed in the last third of July, after accompanying their chicks for 24 to 30 days. It would appear that the slower growth rate of chicks in 1994 resulted in the departure of young both separately from parent males, and somewhat later than in 1993 (33 days was the maximum age of a young bird in 1994 compared with 30 days in 1993).

Breeding success

In 1994 chicks hatched in three of five nests under observation. One nest was deserted (the female may have perished, the colour marked male was observed later in pre-departing flocks), and one was predated. It would appear however that the majority of clutches hatched successfully but this was not the case with broods. Eight of the 20 broods under more or less regular observation disappeared, most probably these chicks died. At the same time mean brood size at fledging or a few days later did not differ much between years (2.5 young per brood (n=8) in 1993, and 2.3 (n=12) in 1994). In total at least 29 juveniles fledged of the 62 chicks banded in 1994. These results show a slightly higher mortality rate of chicks in 1994, nevertheless the overall breeding success was fairly good. The higher losses of eggs and chicks in 1994 can be at least partly explained by the greater number of mammalian predators (*Mustella erminea* and *Martes zibeilina*) following the increase in the rodent population in 1993 and 1994, however, this can not explain all brood losses.

Food and food resources

Several adult and fledged young Great Knot were collected (under permit from the Russian authorities) outside the study area from mid June to early August 1994. Preliminary analysis of the stomach contents of these birds and of casualties of downy young and collected droppings has given an unexpected result. It is apparent that to a large extent these birds were feeding on plants. Only small chicks feed exclusively on insects (Carabid beetles), while the food of chicks after one week of age and adults consisted of berries (*Arctous alpina, Empetrum nigrum, Vaccinium uliginosum*), old ones in June and new green ones in July/August. This appears to be unique among Calidrid species.

On the basis of this finding we can assume that (1) distribution and/or densities of Great Knots in alpine habitats can be directly related to the distribution of berry producing plants, and (2) fledging success of the species depends on the availability of surface-active insects and on the crop of berries.

If the latter supposition is correct, it provides an explanation for the reduced growth rate and increased chick mortality in 1994. It was hot in June and cool in July with rain periods for several days in 1994 in the study area, just the opposite to the situation there in 1993. As a result the pitfall traps set in 1994 revealed a peak in arthropod numbers, especially of beetles, in the second half of June and a marked decrease in early July. Therefore the hatching of the chicks in 1994 did not coincide with the peak numbers of beetles - the main

chick food. A lack of protein could result in the reduced growth rate of chicks. Measuring of arthropod abundance through the next season (1995) in the same place will help to check this hypothesis.

Crops of berries were not large in the alpine tundra of the study area in 1994, but this have been different on other mountains. We can only speculate that the disappearance of broods in the study area was due to the low numbers of berries there in addition to the low abundance of beetles. No surveys of berries were undertaken in other areas in 1994 but it would be useful to do so in 1995.

OTHER ACTIVITIES

a. At least 270 adult waders of 18 species, mostly Great Knot, Common Sandpiper *Actitis hypoleucos,* Terek Sandpiper *Xenus cinereus* and Pacific Golden Plover *Pluvialis fulva*, were checked for colour-flags or bands near Anadyr airport; in Markovo; and in the vicinity of the base camp. One Great Knot wearing a foreign band (probably an Australian one) on the right tarsus was detected. The bird was an unmated male, holding a territory on the study area plateau. Observations of this bird revealed information on the local movements and behaviour of an unmated male Great Knot. It was last observed on 1 July, in a large flock before departure to the south.

b. A total of 224 birds of 26 species, mainly waders (122 birds of nine species) and passerines was banded. The waders banded were: 82 Great Knot (20 adults, 62 chicks), 12 Pacific Golden Plover, eight Ringed Plover *Charadrius hiaticula*, five Terek Sandpiper, four Temminck's Stint *Calidris temminckii*, four Red-necked Stint *C. ruficollis*, three Common Sandpiper, three Solitary Snipe *Gallinago solitaria*, and one Wood Sandpiper *Tringa glareola*. Most of these birds were fitted with red and white "Darvic" flags or colour pendants attached to the metal bands.

c. The study of the poorly known local bird fauna was continued; 77 species were recorded in 1994, including 11 previously unrecorded. Breeding by three new species was also recorded. Of particular interest was the breeding record of a Red-necked Stint, on the edge of its known breeding range. Records of the Western Sandpiper *Calidris mauri* in May and August near the Anadyr airport are new for that area, and are outside the known breeding range of this nearctic species.

d. Data on the distribution, numbers, and some aspects of the breeding biology of the Pacific Golden Plover and Solitary Snipe were obtained in the alpine tundra and adjacent habitats.

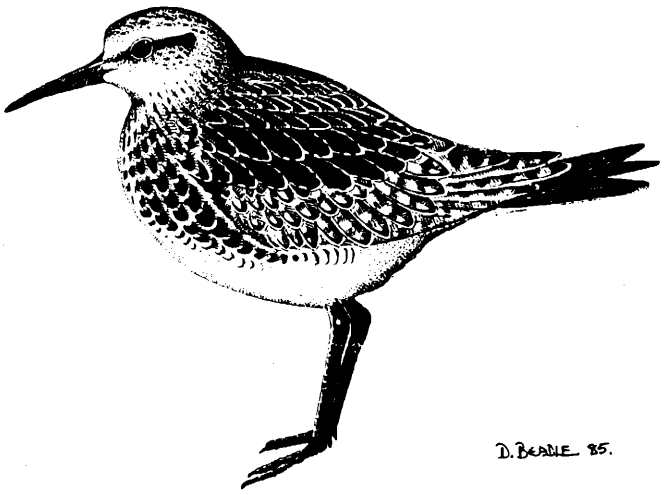
e. A note on the breeding record of Solitary Snipe in north-eastern Siberia was published in 'Information Materials of the Working Group on Waders of the CIS. Two papers on the breeding range and migration of Great Knot in Russia are in preparation for possible publication in an international ornithological journal and a set of slides with a note about breeding distribution and biology of the Great Knot was submitted to *Dutch Birding.*

FURTHER PLANS FOR STUDIES

A unique knowledge of various aspects of the distribution and breeding biology of the Great Knot has been built up over the last two years of the project. It has become clear that the mountains of the upper Anadyr River are ideal as an area for studies of the Great Knot at the breeding grounds. The species is a difficult one to study, primarily because the birds are scattered across many mountain tops or plateaux. Therefore it is necessary to undertake studies over several seasons in order to obtain meaningful results.

Some aspects of the breeding biology of the species are now fairly well understood (breeding and departure phonology, mating and parental care systems, growth of chicks, *etc.*), but others need further study. The main gap concerns the arrival dates and pre-breeding period, although other aspects of missing information have been raised in this report. Data on year to year variations in breeding phonology, distribution, density, and breeding success are such aspects which are of interest and importance.

Because of the above it is considered important that at least a third year of these studies be undertaken. Knowledge of the area and of the species requirements will lead to a greater understanding of what is necessary to ensure its continued survival.



Great Knot