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Some breeding observations on the Siberian White Crane *Grus leucogeranus* in the Kolyma lowlands

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Summary

Some observations on a pair of Siberian White Cranes *Grus leucogeranus* were made during 1986–1991 in the Kolyma lowlands, former U.S.S.R. Their nesting habitat and behaviour are described. The diet and food distribution of both adult and chick are discussed. Observations in 1989 and the apparent starvation of a chick in 1991 suggested that narrow (10–20 m wide) strips of floating turf bordering permafrost-formed ponds and lakes may be essential for birds feeding a chick. In 1,050 km^2 of tundra there were only 25 km of suitable lakeshore and of this about 18 km were used by the family.

Introduction

The Siberian White Crane *Grus leucogeranus* is a threatened species which breeds only in the former U.S.S.R. (now only in the Russian Federation) and remains very poorly studied: Perfiliev (1963) and Flint (1987) describe behaviour during laying and incubation and give hatching dates, as well as migration routes and timing of movements. However, no observations have been made during the period between hatching and independence. It was known only that "families very soon leave the nest-area and roam the tundra until the chick is fledged" (Flint 1987).

In 1989 and 1990/1, I had an opportunity to study a pair of cranes feeding and tending their chick. The observations were made in the territory between two small tundra rivers, the Bolshaya (Big) and Malaya (Small) Konkovaya, not far from their confluence (69°N 158°E) west of the Kolyma river delta. The study area, ecologically classifiable as typical tundra subzone (Chernov 1985), covered 1,050 km^2 and was administratively a part of the Yakut (Sakha) Autonomous Republic (Nizhnekolymskiy district). A pair of Siberian White Cranes was observed at this site in the years 1986–1991, and the breeding records summarized in Table 1 presumably relate to the same pair. In addition, several visits by migrating cranes were recorded in the study area. My observations were made using a 30–60× telescope from a hide on the edge of a lake hollow and at a distance of not more than 800 m.

The nest found on 18 June 1989 contained two eggs measuring 101.2 × 60.8 and 103.2 × 64.3 mm and weighing 200 and 215 g respectively. It was situated in a very wet peaty lake hollow with permafrost polygons covered with moss-like vegetation (Figure 1). Each polygon in this hollow consisted of an elevated rim raised up to 30 cm above the centre covered with *Hypnum* moss and a puddle with floating, sparsely grass-covered turf and a bottom rust-coloured from the

Table 1. Breeding records of Siberian White Crane on Konkovaya river tundra

Year	Breeding records	Comments
1986	Probably 1 chick	A pair performed distraction display. Chick not found
1987	No chicks	A pair observed on territory
1988	No eggs or young	Spring very late – all bogs and lakes frozen until the end of June. No cranes observed in study area
1989	2 eggs, 1 chick	Family tracked during the first part of fledgling period
1990	? eggs, 1 chick	Family under observation twice. One bird flightless due to moult
1991	2 eggs, no chicks survived	One chick died shortly after hatching. One bird flightless due to moult

Figure 1. The nest-site in 1989 and 1991, showing the polygonal structure of the terrain and the associated lake hollows. The nest is arrowed. (Photo: E. Potapov)

silt of diatoms. The lake shore was marshy and formed by a floating layer of peaty turf composed of roots and rhizomes of sedge *Carex lugens*, cotton grass *Eriophorum polistachion*, kingcup *Caltha palustris*, and arctophila *Arctophila fulva*; this layer was sometimes pushed towards the shore by the spring ice-sheet movements, forming an ice-shove ridge.

During incubation, the adults foraged on the polygons and along the shoreline, pulling out roots from the floating turf or eating the juicy parts of the cotton grass stems. Failing sometimes to pull out a root, a feeding crane would attempt to get at it by hacking at the spot: moss would be scattered about and the

peat excavated. If one of the cranes pulled a root from the water under the floating turf, it would toss it onto a solid surface, usually a dry block of peat on the ice-shove ridge. Sometimes when feeding, a bird would submerge its neck to pick up a root, and the white feathers at the base of the neck then became conspicuously stained brown from the peaty ooze on the water surface. While feeding, the off-duty bird usually stayed within sight of its incubating mate.

My next visit to the nest was made on 3 July 1989; it was empty except for pieces of eggshell and fresh arctic fox *Alopex lagopus* droppings. Both adult cranes were nearby, but they flew off across the lake and landed on the opposite shore about 1.5 km away. It seemed at first that the pair had no chick, but the young bird was eventually found hiding in the middle of a small polygonal puddle. It was noteworthy that from above the bird was completely invisible against the red-coloured background, but when viewed from an angle it could be detected as a bright reddish-brown patch on the water surface.

With their chick in close attendance, the adults walked along the lakeshore, excavating roots from the floating turf and chopping them up for the chick or for themselves. Both parents maintained a very high foraging rate: they spent 53.1 $\pm$ 30.2 seconds ($n = 8$) between feeding events walking along the shoreline and searching for a suitable plant and then, having extracted the root, ate it with intervals between pecks of 3.2 $\pm$ 2.91 s ($n = 40$). These feeding bouts appeared to alternate with periods of rest of about two hours during which the adults brooded the chick or slept.

The cranes fed mainly on the roots and rhizomes of kingcup, arctophila, cotton grass and sedge. All available roots of these plants were eaten by the crane family as they moved along the lakeshore. An adult once managed to catch a small fish c.20 cm long, but found it difficult to cut into pieces, only succeeding finally in a very clumsy manner on a tussock. During my first visit, the chick fed with obvious relish on large craneflies Tipulidae and ignored my presence.

All the other observations of the family were in different places, but in the same habitat as the nest: very wet peaty marsh in a lake hollow – the same kind of lake with a gently shelving shore, soft floating turf of sedge and cotton grass, and the same rust-coloured diatom silt in the polygon puddles.

Everywhere the family had been there were signs of crane activity: uprooted moss, remains of plant rhizomes extracted from the floating turf, stalks with the more succulent parts missing, and huge crane footprints in the peaty mud washed out from the floating turf which lay on the shoreline.

Observations and examination of the signs of crane activity suggested that the family never used any part of the shoreline more than once during the summer. The birds made their way methodically along the shoreline and through all evidently suitable marshy habitats in the lake hollows. From a distance, such marshes appear bright yellow against the otherwise green tundra. As the cranes made their way along the shore of one lake, one of the adults would fly off to reconnoitre other hollows in the vicinity. It was sometimes possible to relocate the family by their flights.

Lake hollows vary from 0.5 km in diameter to tens of kilometres. They are separated from one another by an expanse of dry tundra which could be from 30 m to tens of kilometres. The cranes were forced to walk across this unsuitable

intervening habitat. In this situation the chick is very vulnerable to predators like wolves and arctic foxes, having no chance to escape by swimming out into the lake or hiding in a puddle. Moreover, on this dried tundra there are no suitable plants for a chick to eat. The family thus covers the distance between lakes at the greatest possible speed. Unlike smaller predators, the human observer is highly conspicuous on the open tundra and will always find it very difficult, if not impossible, to find a chick. If a man appears, the chick immediately hides itself in the grass or a frost crack, while the adults fly off and settle on the tundra, keeping their distance (not less than 800 m) from the observer. With nothing to orient by on the flat tundra, and especially if the observer has no previous experience, there is little chance of finding the chick's hiding place.

Progress of the 1989 chick

In 1989 the bogs in the cranes' habitat were thawed out by 28 May. The incubation period of the species is 28 days (Flint 1987). The chick was thus considered to be not more than seven days old on 3 July, and this is taken as the basis for the estimates of age shown in Table 2.

Table 2. Parameters of Siberian Crane chick growth, 1989

Date	Age (estimated)	Body weight	Wing length	Bill length	Tarsus	Skull length
03.07	7 days	205 g	36 mm	39 mm	51.2 mm	–
10.07	14	530 g	56 mm	48 mm	78.0 mm	–
15.07	19	730 g	–	53 mm	87.5 mm	–
27.07	31	1,800 g	138 mm	73 mm	135 mm	126 mm

As regards weight, the wild chick under observation grew slightly faster than artificially fed individuals in the nursery of the International Crane Foundation (Archibald and Viess 1979) (Figure 2).

In 1989 the chick was found and measured four times. On 3 July, when it was estimated to be seven days old, it was covered by soft rust-coloured down feathers. If an observer approached it tried to hide in the middle of a puddle

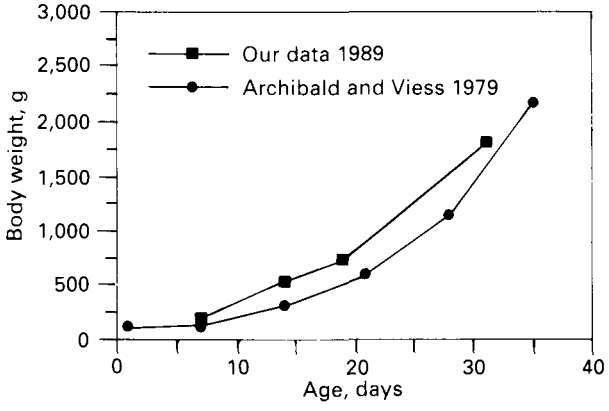

Figure 2. Growth of Siberian Crane chicks. (Adapted from Archibald and Viess 1979.)

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where it lay still on the water surface; it was able to swim. In spite of the cold and the close presence of the observer, it caught large crane-flies. However, when it showed signs of shivering it was left alone to be brooded. When it was relocated on 10 July, at an estimated age of 14 days, the down feathers on the wing had been replaced by primaries in pin. Second generation down of rusty-grey had appeared on wings, scapulars, back and neck, and the general colour of its plumage was rusty. It hid after the first anxious call from its parents, lying immobile despite my presence. It was fitted with a small back-packed radio-transmitter (5 g in weight) in order to facilitate finding it again. On 15 July, when thought to be 19 days old, its wings were now grey following growth of the second generation down feathers. Primaries, secondaries and greater upper wing-coverts appeared in pin. The radio-tag was removed in order to prevent damage to the body from the tag's harnesses, and also because it was no longer useful in locating the chick: instead of hiding, the young crane now tried to escape by running or swimming, although when the observer approached to c.3–5 m, it stood its ground in an erect threat posture, wings spread. It was in the same but more developed plumage on 27 July (31 days) and it exhibited the same (but improved) escape behaviour.

Observations in 1990

In 1990 the nest was located in very similar habitat to that in 1989, in a different lake hollow 6.3 km to the north-east. I did not find the pair until 3 July after the chick had hatched and when the nest was empty. I saw the chick from the edge of the hollow, but was unable to capture it. One of the parents had started to moult; I saw it shed some small feathers.

Another visit to the family was made on 2 August 1990. The adults were extremely wary and alert. One adult was flightless and attempted to hide rather than to escape. On seeing me, the other would fly over me giving alarm calls and then land on the opposite side of the lake hollow.

The crane family was in different habitat from that occupied on my earlier visit, namely raised dry peat polygons separated one from another by a network of frost cracks 1–1.5 m deep connecting to the lake. Vegetation in these cracks was the same as in typical crane habitat. Moulted white secondary and dark brown primary feathers were scattered along the lakeshore.

Such habitat gives the cranes excellent protection. A crane can crouch and became practically invisible, but will run off if an observer approaches to within c.15 m.

The chick weighed approximately 4 kg. It fed alone, about 1.2–1.3 km from its parents. On sighting an observer, it would swim out to the middle of the lake or hide near the shoreline on the edge of adjoining dry polygons.

Observations in 1991

In 1991 birds reoccupied and restored the 1989 nest. The platform was 10 cm high and measured 110 × 90 cm. Two eggs with dimensions 101.5 × 60.8 and 99.4 × 63.3 mm weighed 210 and 216 g respectively. Their behaviour was the same except that during incubation one of the birds was away from the lake

hollow very often. When the first chick hatched, the family left the nest with one egg in it. The egg was eventually eaten by an arctic fox.

The hatched chick was kept in the vicinity of the nest for the first two days. My next visit to the lake hollow took place six days later. The chick was found dead a very short distance away from where it was last seen. One of the adults was still brooding the dead body. The vegetation around this place was severely damaged by the birds. All mosses in the area were uprooted, both in the polygons and along the edge of the lake. It seemed that the chick had died owing to shortage of food in the immediate surroundings. Unusually cold weather had evidently caused it to need constant extra heating, and perhaps it had not been able to cover the substantial distance (1.6 km) to the next lake hollow.

One of the adults showed first signs of moult immediately after leaving the nest. After losing the chick the adults stayed in the lake hollow for about a week, then moved into the lake hollow where the 1990 nest had been located, returning to the 1989/1991 lake hollow at the beginning of August. The moulted bird always tried to escape towards the middle of the lake, showing swan-like swimming skills.

The brownish, saddle-shaped stain on the lower neck of adult cranes, mentioned earlier as a result of immersion when foraging, occurred in both birds during incubation and the chick-rearing period (Figure 3). In 1991 the pair lost this "paint" just after losing their chick, presumably because they changed their

Figure 3. The pair at the nest in 1991 (Figure 1 was taken from the hill in the background). Both adults show the saddle-shaped stain on the lower neck, possibly a sign of a particular type of foraging associated with reproduction. (Photo: E. Potapov)

feeding methods. This may indicate a means for distinguishing breeding or successfully reproductive from non-breeding or failed birds in their summer quarters.

Chick-feeding habitat as a constraint

The view that Siberian White Crane numbers are limited by mortality during migration and in winter and that the tundra ecosystems provide food and habitat in abundance for them (Flint and Panchenko 1982) perhaps needs reassessment. It may be true that adults in summer have time to peck out roots from the marshy turf which is common on the tundra, but a pair with a chick apparently need to maintain a foraging rate of about five food items per adult per minute and this can be obtained only from the section of lakeshore with floating turf. It is this narrow (10–20 m wide) strip (Figure 4) which appears to be the key habitat for birds feeding a chick. I calculated that in 1989 on the 1,050 km^2 of my study area there were only 25 km of this type of lakeshore. Of this, the birds could use only about 18 km, as the other lakes were either too far from their normal routes or had steep banks without a zone of shallow water near the floating turf, so that a bird could not stand in water near the shore. In 1989 the monitored family of cranes used 13.5 km of such shoreline during one month. I therefore consider it likely that an important reason for the Siberian Crane's rarity and vulnerability is its dependence on a very restricted habitat during the chick-rearing period.

Figure 4. Trail of a crane and its young through the narrow strip of floating shoreline vegetation that is apparently needed for rearing offspring. (Photo: E. Potapov)

Only Whooper *Cygnus cygnus* and Bewick's Swans *C. bewickii* are potential competitors of the Siberian White Crane in this shoreline habitat, but neither of these is capable of extracting large rhizomes from the floating turf.

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References

Archibald, G. and Viess, L. (1979) Captive propagation at the International Crane Foundation 1973–8. Pp.1–73 in J. C. Lewis, ed. *Proc. 1978 Crane Workshop*. Colorado: Colorado State University.

Chernov, Yu. I. (1985) *The living tundra*. Cambridge: Cambridge University Press.

Flint, V. E. (1987) Pp.313–326 in R. L. Potapov and V. E. Flint, eds. [*Birds of the USSR. Gruiformes, Galliformes.*] Leningrad. (In Russian).

Flint V. E. and Panchenko V. G. (1982) ['The breeding farm of rare crane species: results of two-year investigations and prospects'.] Pp.75–85 in N. M. Litvinenko and I. Neufeldt, eds. [*Cranes of Eastern Asia.*] Vladivostok: Far East Centre of the Academy of Sciences of the USSR. (In Russian).

Perfiliev, V. I. (1963) [New data on the ecology of Siberian White Crane.] *Byull. Mosk. Obshch. Ispyt. Prir. Otd. Biol.* 68(1): 25–28. (In Russian).

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