

Ecological features of Tundra Cranes in North-Eastern Siberia (Aves, Gruidae)

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ABSTRACT

In sub-arctic tundra of North-Eastern Siberia (Yakutia region) the breeding areas of Siberian Crane, *Grus leucogeranus* (Pallas, 1773) and Lesser Sandhill Crane, *Grus canadensis canadensis* (Linnaeus, 1758), overlap. In the present paper ecological interrelations between these two crane species are reported. Siberian Crane is the dominant species and occupies more productive ecological niche such as damp lowlands. Sandhill Cranes have to content themselves with less productive but more extensive habitats such as drier and higher levels of tundra. Generally speaking, Sandhill Cranes prefer to feed in damp lowlands, as can be observed in areas where Siberian Cranes are absent. Such a displacement toward another ecological niche has not a significant impact on Sandhill Crane thanks to the plasticity and tolerance of this species.

KEY WORDS

Siberian crane; Sandhill crane; breeding area; ecological niche; chick-raising period.

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INTRODUCTION

In tundra of North-Eastern Siberia (Yakutia region) Siberian Crane, *Grus leucogeranus* (Pallas, 1773) and Lesser Sandhill Crane, *Grus canadensis canadensis* (Linnaeus, 1758), share the same breeding area. Siberian Cranes inhabiting areas from Yana-Kolyma watershed to Kolyma River represent the eastern population of the species.

The welfare of Siberian Crane eastern population strongly influences the conservation of the species all around the world since western population now counts just a few pairs of specimens. By the present, Siberian Crane eastern population numbers up to 4004 individuals, as it was shown by the counts on the main wintering ground of the species in Poyang Lake Natural Reserve, South-Western China (Qian, 2003). For the western population, only one Siberian Crane was registered in the wintering ground in Iran during 2010-2011 (Tavakoli, 2011).

Sandhill Crane in Yakutia is represented by one from six subspecies. In the Old World, Lesser Sandhill

Crane is present in North-Eastern Russia from Kamchatka peninsula and North-Western Chukotka to subarctic tundra of north-eastern Yakutia. During the censuses of the 1980's, the number of Sandhill Cranes on breeding ground in Yakutia was estimated at 370 individuals (Labutin & Degtyarev, 1988).

Several authors reported a significant increase in Sandhill Cranes number along with the expansion of its breeding range westwards beginning from the second half of the 20th century (Portenko, 1972; Kischinski, 1988; Labutin & Degtyarev, 1988; Labutin et al., 1990; Poyarkov et al., 2000; Degtyarev, 2009).

Perhaps this phenomenon is associated with hunting on the Sandhill Crane in North America (Meine & Archibald, 1996). In particular, specimens number noticeably increased near-Kolyma tundra (Table 1). During this study, in 1998, a Sandhill Crane pair with two chicks was observed for the first time on the left bank of Indigirka River, 200 m west from the species breeding area limit; this finding seems to prove that Sandhill Cranes

breed near-Indigirka tundra and indicates the success of this species in its further expansion westwards (Vladimirtseva, 2002; Germogenov et al., 2003; Vladimirtseva et al., 2009).

In Indigirka basin, where their breeding ranges overlap, the two Tundra Crane species use different ecological niches (Watanabe, 2006). Siberian Cranes occupy damp lowlands near or between big lakes extending up to 15 km in length, whereas Sandhill Cranes can be often seen on higher and drier habitats. Over the last decade, in the studied area (1314 km² near-Indigirka tundra) the population of Siberian Cranes grew by four pairs and, in 2009, the population density was estimated as 0.71 ind/10 km².

In Indigirka basin, where Sandhill Cranes show a lower population density in the peripheral zone of the breeding area and share their breeding territory with Siberian Cranes, it was very difficult to carry out chronometrical observations, especially for pairs with chicks due to their constant movement resulting in short-term watching.

Chronometrical observations were made near-Indigirka tundra during summer seasons from 1998 to 2009. The highest recorded duration of continuous observations of the Sandhill Crane brood in the Indigirka basin was of 11 hours and 3 min. These data were compared with those obtained during the pe-

riod 2010-2011 from a population with a high population density inhabiting near-Kolyma tundra (see Table 1).

Siberian Cranes are rare in Kolyma river basin and mostly do not breed there. The main objectives of this study were to provide data on Sandhill Crane population density, habitat conditions, breeding pair time budget and species behavior in the study area and to compare these results with those obtained for the population of Indigirka basin.

MATERIALS AND METHODS

Counts of the Crane pair numbers and observations were made from the highest points of local hills (called “edom”) using a telescope with sixty-fold magnification, as well by hiking and boating. Observations were recorded by the methods of continuous and regular (every 15 sec) recording (with mention of all details) (Dolnik, 1980; 1995).

Sandhill Crane social structure and population size were estimated within the study-area consisting of 402 km² near-Kolyma tundra, River Bolshaya Chukochya mouth (Table 2) by a total of 256.15 hours of chronometrical observations. A pair of Siberian Cranes between lakes Bolshoye Morskoye

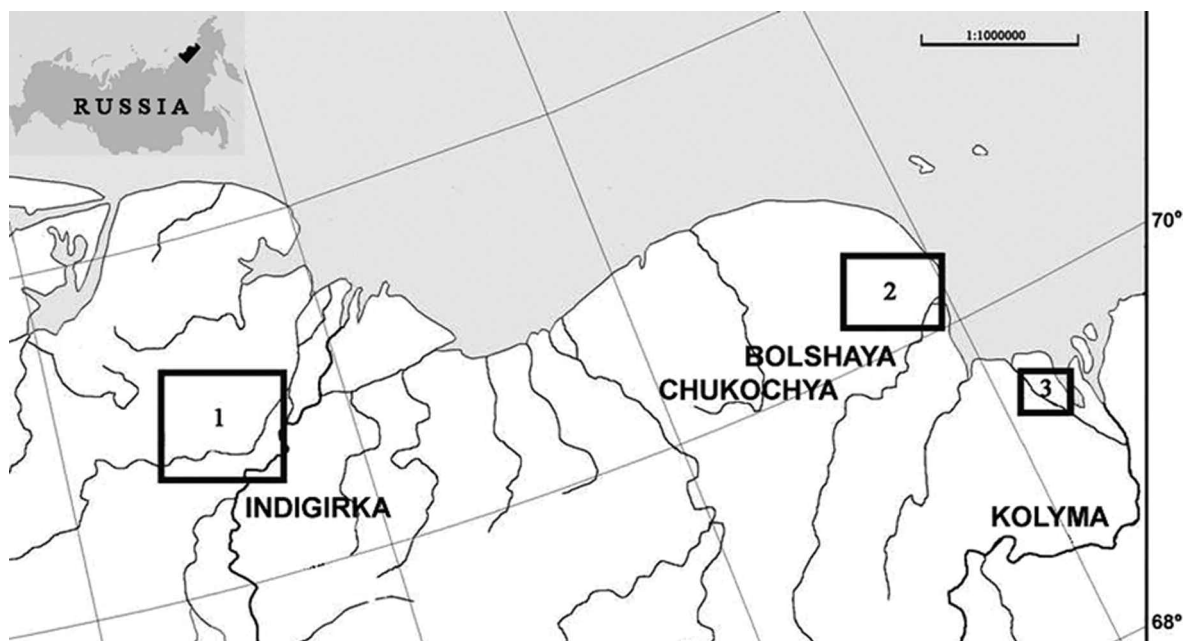


Figure 1. Research areas: 1, near-Indigirka tundra (from 1998 to 2009); 2, near-Kolyma tundra, Bolshaya Chukochya mouth (in 2010); and 3, Kolyma Delta, locality Pokhodskaya Edoma (in 2011).



Figure 2. Sandhill Crane chick, Bolshaya Chukochya River basin, and (in the small box on the right) an adult bird.

(18.2 km in length) and Maloye Morskoye (11.1 km) was registered from the watching point on the lake Vankhmat. Considerable distance from the object (15 km) did not let to see if they had any chicks. Local people registered this pair of birds for over 10 years.

RESULTS

As revealed during the chick-raising period, Sandhill cranes do not show pronounced intra-specific territorialism. Although pairs had individual breeding territories, their boundaries could easily be violated. Representatives of all social groups, pairs with chicks, pairs without chicks and single birds moved freely over a wide area and could meet and connect in groups of up to seven birds for a short time.

A comparison of time budgets between the two crane species showed that Sandhill Crane chicks are more independent than Siberian Cranes at the same age: i.e. they can feed almost without the help of their parents (Table 3). In addition, the Siberian Crane chick is given more time to rest during daylight hours.

A distinctive feature of Sandhill Cranes occurring near-Indigirka tundra was the constant move-

ment associated with gathering food items, such as sedge shoots, small invertebrates, mammals (lemmings and voles) and small bird chicks, from the ground surface never showing feeding connected with digging. On the contrary, Sandhill Cranes near-Kolyma tundra spent 68% of their feeding time at the lowest elevation areas, so-called "pits", where they dig out roots of sedge using their beaks, which is typical of Siberian Cranes.

Moreover, Sandhill Cranes near-Indigirka area spent significantly more time in a state of alertness and anxiety than Sandhill Cranes inhabiting near-Kolyma tundra (where there are no Siberian cranes) and than Siberian Cranes (Table 4).

In general, time dedicated to brood care indicates that the rate of activities of Sandhill Cranes is a little more accelerated than that of Siberian Cranes. When considering the results reported in Table 4 it should be taken into account that some activities (alertness, movement and feeding) overlap in time, so that the sum of all activities during the day is over 100%.

DISCUSSION

Siberian Crane and Sandhill Crane share the same breeding area near-Indigirka tundra. Nevertheless, these species have the possibility to realize

Near-Indigirka tundra	Near-Kolyma tundra			Banks island, 1965, Yukon-Kuskokwim Delta, 1976	Ust-Chaun lowland, Chukotka, 2002
Left bank of Indigirka, 2009	Bolshaya Chukochya mouth, 2010	Pokhods-kaya Edoma, 2011	Pokhods-kaya Edoma, 2007		
0.85 ind./10 km ²	2.7 pairs /10 km ² , 5.9 ind./10 km ²	4.8 ind./10 km ²	4.5 ind./ km ² (Degtyarev, 2009)	5.4-17.8 pairs /10 km ² (Boise, 1976; Walkinshaw, 1965)	6.5-7.4 pairs /10 km ² (Winter, 2002)

Table 1. Sandhill Crane population density in different years and in different parts of its range.

Ind.	Adult cranes number			Breeding success	Chicks number		
	Including				Broods number	%	In 17 broods
	Singles	Pairs	Groups of 3-7				
239	7	216	16	38	35.2	9	9

Table 2. Sandhill Crane population structure and reproduction in the study-area during 2010.

Activities	Sandhill Cranes			Siberian Cranes (n=5)
	Indigirka basin (n=2)	Kolyma basin (n=12)		
Absolute rest	116.09±0.02 (16.00-16.19)	16.64±0.85		14.96±0.30
Incomplete rest	8.32±0.12 (8.11-8.53)	13.71±0.08		30.46±0.51
Self feeding	1.71±0.01 (1.70-1.72)	2.05±0.92		0.71±0.82
Alarm	3.59±0.71 (3.09-4.10)	0		0

Table 3. Time (expressed in %) dedicated to daily activities by crane chicks in the study areas.

Activities	Sandhill Cranes			Siberian Cranes (n=5)
	Indigirka basin (n=2)	Kolyma basin (n=12)		
Feeding	49.86±0.59 (50.80-50.92)	50.05±0.6		32.66±0.21
Movement (no feeding)	8.41±0.4 (9.00-9.82)	2.8±0.31		2.6±0.12
Alert	6.0±0.19 (5.8-6.2)	0.9±0.55		0.1±0.60
Anxiety	14.0±0.39 (14.6-15.4)	1.0±0.09		7.5±0.21
Cleaning of feathers	0.8±0.01 (0.09-0.12)	1.2±0.41		3.8±0.32
Night's sleep	14.99±0.08 (15.90-16.08)	15.6±0.26		14.9±0.52
Feeding the chicks	32.8±0.2 (34.7-34.9)	34.9±0.14		38.4±0.19

Table 4. Time (expressed in %) dedicated to daily activities by adult cranes within the study areas.

their potential in population growth because they use two different ecological niches; Siberian Cranes occupy damp lowlands near or between big lakes, whereas Sandhill Cranes can be often seen on higher and drier habitats.

Siberian Cranes are absent in Kolyma River basin, probably because of lack of big lakes which constitute an optimal habitat for their breeding. Observations near-Kolyma River tundra showed that Sandhill Cranes with chicks spent most of their feeding time in damp and low wetlands. In the area at the mouth of Bolshaya Chukochya River, Sandhill Cranes do not compete for territories in chick-raising periods, as in Chukotka (Winter, 2002) or Alaska (Boise, 1976), thus suggesting that their food resources should be abundant enough.

Near Kolyma River tundra Sandhill Cranes feed in the Siberian Crane way: during the day, they periodically dig out parts of sedges staying in the same place. On the contrary, near-Indigirka River tundra Sandhill Cranes gather food (i.e. sedge sprouts, insects, small animals and small bird clutches or chicks) mostly from the surface, which makes them covering great distances during feeding activities.

Near Indigirka River (= the co-habitation area of the two species) Siberian Crane appears to be dominant and is replaced by Sandhill Crane in the less productive ecological niche, that is, the higher and drier areas of the tundra; while in northern-eastern tundra of Yakutia (where Siberian crane is absent) Sandhill Crane broods clearly prefer damp and low wetlands.

Sandhill Cranes are capable to use a wide range of habitats, since they are not so highly specialized and hence result more adaptable to environmental conditions than Siberian Crane. Using a less productive but more extensive habitat, Sandhill Cranes occurring in Indigirka tundra continue to expand their breeding range westwards increasing in density and number (Vladimirtseva et al., 2009).

Taking into account both growth of Sandhill Cranes number and the extension of their breeding range in Yakutia, in order to examine inter- and intra-specific relationships between Siberian Cranes and Sandhill Cranes within the co-habitation area as well as in Kolyma tundra, further studies are certainly needed. Global warming, one of the most serious threats to Siberian Crane, may lead to reduction and loss of nesting habitat for this vulnerable crane species breeding in wet lowlands close to big lakes.

At the present time, Siberian Crane and Sandhill Crane can coexist by using different ecological niches but, on the other hand, in the next decade ecological and ethological observations regarding these species will probably show the degree of danger of emerging and evolving threats menacing their existence.

CONCLUSION

1. In the tundra near Indigirka River Siberian Crane and Sandhill Crane occupy different ecological niches which strongly reduces the competitive relationship between these species and allows them to realize, at best, potential growth in their respective populations.

2. In Kolyma basin, where Siberian Cranes are absent, Sandhill Crane broods prefer to feed in wet habitats. On the contrary, in Indigirka River basin, where breeding ranges of these two crane species overlap, the dominant Siberian Crane is replaced by Sandhill Crane in the higher and dryer zones of the tundra. Such a displacement toward another ecological niche has not a significant impact on Sandhill Crane thanks to the plasticity and tolerance of this species.

3. Large-scale movement of Sandhill Crane broods in Indigirka River tundra may be due firstly to the tolerance of these organisms which, unlike Siberian Crane, are not strongly dependent on wetlands; and, secondly, to their habit of gathering food items from terrain surface which allows them to exploit more elevated terrains and explore much larger areas.

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