Chapter 7
Ecology and Conservation of Red-crowned Cranes in Russia

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Abstract The red-crowned crane (*Grus japonensis*) is a large, IUCN-listed endangered species found in East Asia. Within Russia, despite a century of records, the center of breeding habitat was not discovered until the 1970s. Since then, researchers and advocates have helped establish a network of protected areas to counter the threats of wetland reclamation, damming, wildfire, and poaching. Here, after briefly describing *G. japonensis* ecology, we detail these threats to the species and then describe mitigating actions, including creation of protected areas in Russia, working groups (both Russian and international), and conservation education initiatives throughout East Asia to benefit the conservation of this species and its habitat.

Keywords Conservation · Mainland population · Protected area · Red-crowned crane · Russia

7.1 Introduction

The red-crowned crane (*Grus japonensis*) is one of the largest of the Asian crane species. It is found in two disjointed populations: a nonmigratory population on Hokkaido Island, Japan, and a migratory population on the East Asian mainland, which breeds in northeast China and the Russian Far East, and winters on the Korean Peninsula and in China. In Russia, the majority of breeding grounds of this species are located in the middle reaches of the Amur River basin, a fact not known until as recently as the mid-1970s. In fact, despite being a species of considerable cultural

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interest, study of ecology and conservation of this endangered species is a relatively new concept. Here, after a brief description of crane ecology, we detail a history of conservation actions across the Russian Far East to conserve this species, expand the protected area network to protect it and its habitat, and conduct environmental education activities that broaden public support for crane conservation.

7.2 Ecology

7.2.1 Breeding Habitat

Breeding habitats in Russia are classified into two main types: (i) The first type is composed of habitats on floodplains where the water level is relatively high; shallow open water areas are mixed with lowland grass-covered areas in a complex network. A typical example is the Khanka lowlands that include drainage grooves near villages and occasionally an inferior riparian forest of shrubs. (ii) The second habitat type is composed of habitats where the water level is relatively low, consisting of three landscape components: (a) open water areas such as meandering rivers and scattered small ponds; (b) somewhat raised, low, dry plateau with tall trees, such as birch (*Betula*), oak (*Quercus*), aspen (*Populus*), and willow (*Salix*); and (c) other lowlands covered by various plants forming grasslands with tussocks of sedges, such as cotton grass (*Eriophorum*), and various *Carex* spp. accompanied by high-stem grasses, such as bluejoint grass (*Calamagrostis* spp.) and others. Here reeds (*Phragmites* spp.) often grow along the riverbanks, and riparian forests are sometimes present. This habitat is common in the branch watersheds of the Amur River, although it is recognized as being between the two habitats mentioned above.

The crane population density is generally higher in the first habitat, presumably because the surface area covered by water is larger, which makes it easier for foraging. In the Khingansky Nature Reserve along the middle Amur River, it is known that the crane population has increased through the years with increased precipitation (Parilov et al. 2015), apparently indicating a positive association between increased water presence and higher population density.

According to Winter (1977, 1981), who confirmed cranes nesting in the tussocky sedge marshes in the middle Amur River basin, the nest was constructed a few hundred meters from a patch of woodland, the distance between two adjacent nests being 3–4 km. The territory size was estimated to be approximately 4–12 km^2 ($N = 3$). Recently it has been calculated to be approximately 3.5 km^2 on the Khanka lowland by tracking of an individual with a platform transmitter terminal (PTT) in 2013 (Table 7.2, cf. 6.3.2.). Incidentally, in 1988, the mean inter-nest distance in Hokkaido, Japan, was found to be 3.1 km ($N = 90$) (Masatomi and Momose 1989), and in the 1970s, territory size was estimated to be 2–7 km^2 (Masatomi 1970).

7.2.2 Nesting and Brooding

In general, nests are made on a tussock of sedge-dominated grasslands with taller dead gramineous plants of the previous year, and sometimes they are built on flat peat grounds as high as 15–30 cm above the water surface. The nest materials are mainly various sedges and bluejoint grasses (Winter 1981). It seems to be very rare, however, that in a nest in the Khingansky Nature Reserve, 80% of the nest material consisted of small willow branches, and the rest was dead leaves of sedges (Masatomi et al. 2002). In Hokkaido, Japan, most nests are usually constructed from dead reeds. Nests consisting mainly of sedges are rarely found, and no examples in which tree branches are used as the major nest material have been documented so far (Masatomi 2010). In contrast, in Russia, because the grassland is dominated by sedges and fewer reeds are usually selected for the nest, it is the future of nests constructed not of *Phragmites*, as used in Hokkaido, Japan, and China, but of sedges principally and *Calamagrostis* or rarely tree branches.

In addition, there are egg color variations in Hokkaido, whereas the egg color variation is said to be low in Russia (Winter 1981). Among the breeding population in Hokkaido, white eggs with no speckles are laid at a high rate (Masatomi 2000). This is a clear difference between the two populations. Other aspects of parental behavior are also similar in the populations from Hokkaido and Russia, but it has been suggested that there is a difference in the unison call of the pairs between Russia and Hokkaido populations.

Eggs are incubated for 29–36 days, with both members of the pair taking turns for caring (Masatomi 1970; Ma 1981; Winter 1981). When the nest is threatened by predators, the female tends to stay near the nest, while the male confronts the threat (Johnsgard 1983). Chicks are precocial; hatchlings are covered with brown down feathers, and most feathers on the body shift to white contour feathers, according to the stages of growth from a chick to a juvenile crane. The neck eventually becomes black with a gradual shift to red at the crown. At the age of approximately 1.5 years, the plumage becomes almost the same color as that of an adult.

Juveniles stay with their parents for about 10 months after hatching. Whereas the majority of juveniles in the Hokkaido population are driven away from their parents in their wintering area, the juveniles in the Russian population are thought to be driven away after returning to the breeding ground. Thus, considering morphological, ecological, genetic, and other characteristics, it has been suggested that the populations of continental Russia and Hokkaido can be classified into separate subspecies (Winter and Kashentseva 2016).

7.2.3 Interactions with Other Species

Mammalian predators such as wolf (*Canis lupus*), red fox (*Vulpes vulpes*), raccoon dog (*Nyctereutes procyonoides*), and domestic dog are aggressively chased by nesting pairs, as are large, predatory birds such as steppe eagle (*Aquila nipalensis*),

white-tailed sea eagle (*Haliaeetus albicilla*), or even carrion crow (*Corvus corone*) (Masatomi and Kitagawa 1974; Winter 1981). Badgers (*Meles meles*), which are very common in red-crowned crane habitats and active during dusk and night, are the most dangerous terrestrial predators, especially during dry years when there is no water or a very narrow belt of surface water around the nest.

The cranes sometimes confront an opponent by spreading their large wings to appear intimidating, and they may use their sharp bills and claws to attack other individuals or predators. These behavior patterns performed by *G. japonensis* are described in detail in the ethogram (Masatomi and Kitagawa 1975). Most other bird species are ignored. *G. japonensis* and white-naped crane (*G. vipio*) are able to share the same wetlands without noticeable interspecies competition due to their different microhabitat and diet preferences (Smirenski 1980; Smirenski and Roslyakov 1982; Smirenski et al. 1986; Higuchi et al. 1994; Nosatchenko and Smirenski 2007; Kitagawa 2014; Heim and Smirenski 2017).

7.3 Research

7.3.1 Historical Initiatives

The first mentions of *G. japonensis* in Russia were by N. M. Przhevalsky and P. Maak at the end of the nineteenth century, with first records of breeding birds found in the early twentieth century in the works of Shulpin (1936) and Vorobiev (1954) for the areas around Lake Khanka. The first dedicated surveys to study ecology, nesting biology, and population size occurred in the 1960s–1980s (e.g.: Archibald 1976; Winter 1977; Shibaev 1982; Andronov 1988; Shibaev and Glushchenko 1988).

In Zabaikalsk Province, a gradual increase in population numbers (which began in the mid-1980s) accelerated noticeably by the early 2000s. A peak occurred in 2004 with 22–24 territorial pairs in the Russian part of the Argun River valley, after which the population trended downward to a catastrophic level by 2008, at which point the habitat area was reduced by 95% and the population size by 75% (Goroshko 2012). At present, barely one pair nests here (Goroshko 2015).

To the east, a similar dynamic was observed on the Zeya-Bureinskaya plain and the Arkhara lowlands, but not to the same degree. The population went from 170 individuals (24 pairs) in 1998 to 100–120 individuals (13–16 pairs) by 2004 (Darman and Andronov 2011). Subsequently, judging by monitoring results in some parts of this region, this negative trend continued. In the south of the Amur Province, the number of cranes fell from 24–33 territorial pairs in 2003 to 14 pairs in 2012 (Andronov et al. 2013). In Muraviovka Park, after a 10-year period of gradual growth (from 5 to 12 pairs), a decline was noticed in 2004, and since 2010, only three pairs continue to breed in the park. Further east, in the Jewish Autonomous Region, a significant population increase has been noted since the beginning of the 2000s, from 3–5 pairs in the 1980s–1990s to 20–22 pairs in 2004, with a subsequent stabilization at the level of 10 pairs (Averin 2011). Populations in the Khabarovsk

Table 7.1 Results of aerial surveys for red-crowned crane *Grus japonensis* in the Khanka lowlands, Primorsky Province, Russia, 2003–2016

Survey date	Families	Pairs	Singles	Birds in groups	Total adults	Total pairs
Nov. 05, 2003	25	13	13	18	96	38
Aug. 02–04, 2012	27	26	26	6	138	53
May 22–23, 2013	23	18	9	0	90	41
May 10–11, 2014	35	17	20	29	138	52
May 08–09, 2016	34	29	14	7	137	63

Province have seen a prolonged downward trend from 25 pairs in 1976 to 15 or fewer pairs by the end of the 1980s (Smirenski and Roslyakov 1982; Shibaev 1982). The population has not increased here, even during years of temporary population increases elsewhere within Russia (Nikitina et al. 2006).

The situation is stable in the Khanka lowlands, at the extreme south of breeding range in Russia. At the beginning of the 1960–1970s, the number was estimated at 30–40 breeding pairs (Leonovich 1965). The results of the first aerial surveys confirmed this estimate. In 1980, 92–106 individuals (39 pairs) were counted (not including chicks) (Shibaev and Glushchenko 1982). From 2003 to 2016, 5 full aerial surveys were conducted here (Surmach et al. 2013, unpublished data), which found 38 pairs in 2003, 53 pairs in 2012, 41 pairs in 2013, 52 pairs in 2014, and 63 pairs in 2016. The number of birds counted at the start of the nesting period varied from 96 to 138 individuals during these years, while the number of nesting pairs progressively increased from 23 to 35 and non-nesting territorial pairs from 38 to 63 (Table 7.1).

7.3.2 Recent Initiatives

In July 1993, collaboration between the Russian Academy of Sciences and the Wild Bird Society of Japan resulted in PTTs being attached to ten wild *G. japonensis* at Khingansky Nature Reserve, Ganukan Wildlife Refuge, and Lake Khanka for the first time anywhere in the world (Higuchi et al. 1998). In the continental population, it is extremely important for the conservation of the species to know locations and size of breeding areas and to know locations of staging sites for their migration. Therefore, by attaching PTTs to cranes, we were able to understand migration routes and home range size in the breeding grounds. Five of the tagged birds that survived at Lake Khanka migrated to the Korean Peninsula in winter and were successfully tracked. Data were subsequently made available for a doctoral dissertation by a Korean graduate student.

In August 2012, a single, adult *G. japonensis* was captured at its breeding site near Lake Khanka, Russia. This bird was marked with plastic color bands and outfitted with a satellite tracking transmitter (105 g LC4™ Battery Powered Argos/Global Positioning System (GPS) Transmitter, Microwave Telemetry, Inc.). The PPT was 94 mm in length, 33 mm in width, and 30 mm in height. Its undersurface was made up by epoxy resin to minimize feather damage. The transmitter was attached to the back of the crane using Teflon-treated ribbon. Including the harness, the tag weighed

Table 7.2 Area of home range and presumed status each period

Time span	Home range (km^2)	Presumed status
Aug. 3–Sep. 1, 2012	0.6	Chick was flightless
Sep. 2–Oct. 7, 2012	5.3	Chick began to fly
Oct. 8–Nov. 14, 2012	80.3	Preparation period for migration
Nov. 21, 2012–Mar. 13, 2013	43.0	Wintering period
Mar. 17–Mar. 25, 2013	2.1	Stopover for migration
Mar. 26–Apr. 26, 2013	58.1	Preparation period for breeding
Apr. 27–Jun. 9, 2013	3.5	Establishment of breeding territory

about 120 g (or about 1.5% of the body weight of an adult *G. japonensis*). GPS data (accuracy ±18 m) were acquired three times a day at 11:00, 14:00, and 23:00 in local time. The collected data were transmitted to a satellite every 10 days and then sent to a base station on the ground. From there, data were obtained over the Internet.

The crane fitted with the transmitter was an adult bird (probably female) with a chick. We collected GPS information from August 3, 2012, to June 9, 2013. Based on the resultant information, her home range was calculated via the 100% minimum convex polygon method. We then calculated home range for seven distinct time frames (Table 7.2).

The size of a crane's home range is probably a reflection of its familial status. For example, the pair with the banded crane likely established their territory or home range in the early breeding stage, which was about 3.5 km^2 (based on GPS data from April 27 to June 9, 2013). Because the home range of the banded crane suddenly enlarged widely at the beginning of September, it seems likely that the chick became able to fly around September 2, 2012. As chicks of *G. japonensis* are usually able to fly after about 100 days post hatching, it is possible to assume an incubation period from late April to late May and a rough hatching date of about May 25.

Starting November 14 and through November 21, 2012, the banded crane flew about 900 km southwest to the Demilitarized Zone (DMZ) of the Korean Peninsula (Fig. 7.1a). After winter, the bird flew 800 km northeast over a 4-day period (March 14–17, 2013 (Fig. 7.1b)) to an area about 30 km south of Lake Khanka. Despite only a sample size of one bird, the acquired data gave us new information about the location and size of a home range during winter and the spring migration route. Interestingly, the autumn migration route was quite similar to that observed by Higuchi et al. (1998). The migration routes we observed in both autumn 2012 and spring 2013 suggest that the wetlands surrounding the Tumen River mouth are a very important staging site for migration between breeding and wintering grounds (Fig. 7.1). In the near future, these results are expected to be useful for conservation of the migratory stopover sites.

The Tancho (red-crowned crane) Protection Unit (based in Kushiro, Japan) has also conducted aerial surveys to study the breeding status of *G. japonensis* in Russia since 1997, in cooperation with the Amur-Ussuri Centre for Avian Biodiversity, the Russian Academy of Sciences, WWF Russia, Khingansky Nature Reserve, and Muraviovka Park. In China, the Crane Working Group and Waterbird Monitoring Network have been conducting a census along flyways both in breeding and migratory seasons since 2010. This project was the very first synchronized and systematic census in China organized by Dr. Liying Su of ICF. Other organizations (viz., Red-

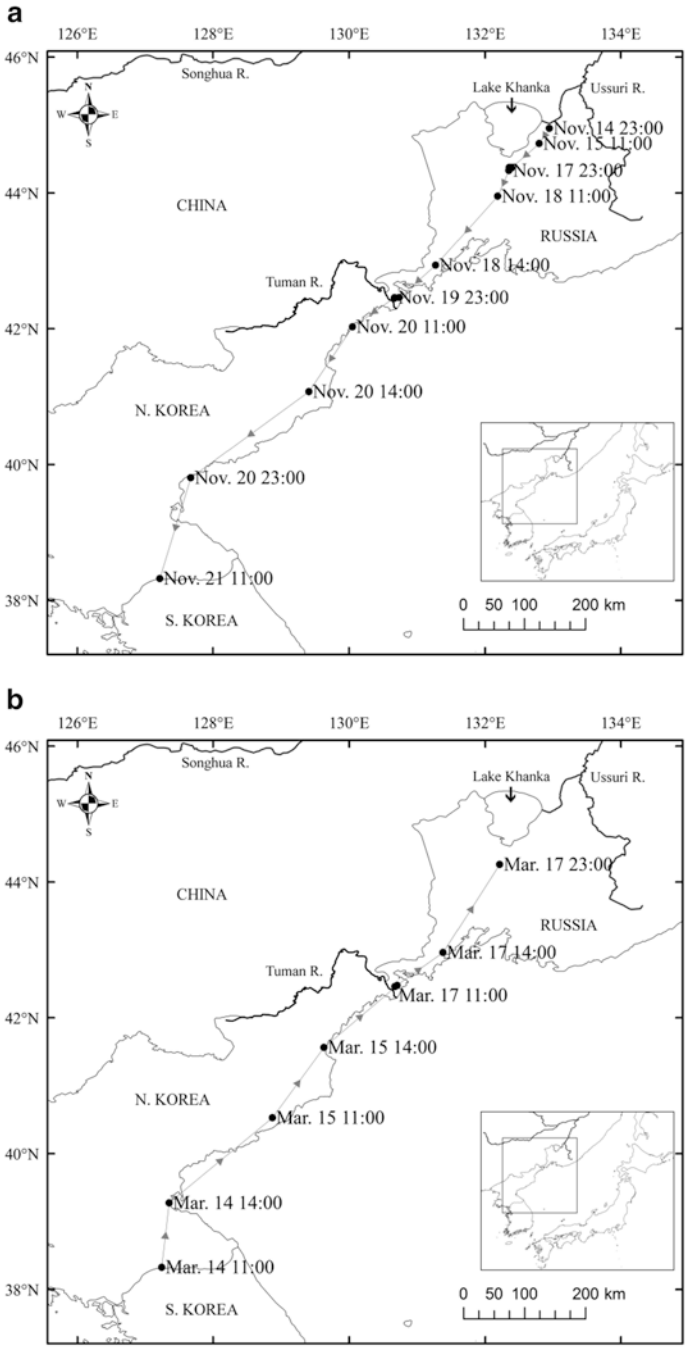

Fig. 7.1 The route of *Grus japonensis* migration: (**a**) autumn (2012), (**b**) spring (2013)

crowned Crane Conservancy, International Red-crowned Crane Network, and the International Hooded and White-naped Crane Network) have been supporting the project both via funding and active participation. The Korean Crane Network has been conducting winter census since 2003, and members of Red-crowned Crane Conservancy participated in 2009, 2010, and 2012. More recently, international collaboration has been halted due to outbreaks of avian influenza. Red-crowned Crane Conservancy cooperated with Korea Crane Network to capture a wintering *G. japonensis* in Yeongcheon-gun in 2014. This bird was outfitted with a GPS transmitter. In the same year, the Red-crowned Crane Conservancy and Korean Crane Network launched a joint project to conduct a comparative study of the continental population and the island population of *G. japonensis* using mitochondrial DNA.

7.4 Threats

7.4.1 Wetland Reclamation

Precipitation, fires, and other factors are unevenly spread in space and time, so in some years, breeding conditions for *G. japonensis* are better inside protected areas in Russia, while in other years they are more favorable in unprotected areas. Because of this, overall breeding conditions and success of birds in the Giltchin River watershed in the Amur River basin have remained relatively stable. Unfortunately, untreated sewage waters pour into the Giltchin River in Russia, and heavy water pollution also enters the Amur River from Chinese factories located along the Hailar River (Goroshko 2012). Reclamation of wetland patches in the Giltchin River watershed that had intensified in recent years leads to losses of important bird breeding habitats and creates unsustainable conditions for survival of waterbirds, including *G. japonensis*. A meeting held at Muraviovka Park in 2010, with the participation of 32 experts from 13 countries, addressed this threat, and further study clearly demonstrated the critical role of wetlands as key habitats for endangered species and natural filters that maintain good water quality in spite of high level of pollutants in the area (Harris 2012; Smirenski 2016).

7.4.2 Dams

In the past, high floods occurred every 8–12 years in the middle Amur River basin, which flushed accumulated bottom sediment from lakes, and increased species diversity and population links of fish and other aquatic organisms that represent important components of *G. japonensis* diets. After the launch of the Zeya (1975–1980) and Bureya (2003–2007) hydroelectric dams and construction of numerous small dams on the Hailar River in China (upper reaches of the Amur River) and on

minor Amur tributaries in China and Russia, these major floods became extremely rare. After a major flood in 1984, the Amur River floodplain experienced a 20-year drought until it was flooded by nonstop heavy rains in 2013. Current construction of the Lower Bureya hydroelectric dam and pending plans to build more dams on the Amur tributaries and even on the Amur River itself will completely terminate high floods in the Middle Amur Basin.

Without good scientific data, it is impossible to forecast how fast the wetlands will degrade and identify priority measures to preserve habitats of *G. japonensis* and other waterbirds. This problem, however, still had not concerned governmental agencies in Russia or China. In 2016, staff of Muraviovka Park in the Amur Province organized the first hydrological surveys of lakes located in the Amur floodplain. These surveys demonstrated that the majority of lakes within Muraviovka Park are shallow (150 cm or less), and the accumulated layer of bottom sediments is already greater that the layer of water above sediments. Without periodical flushing by high floods, these lakes may fill up with sediment in only a few years.

7.4.3 Wildfires

Anthropogenic grassfires that devastate wetlands every spring and fall are a major threat to *G. japonensis* breeding success (Goroshko 2012; Smirenski and Barzen 2017). Across the southern Russian Far East, local farmers typically burn old dry grass in pastures and hayfield to facilitate new growth, hunters and herders leave their smoldering campfires, and some villagers may ignite grassfires out of boredom. Intentional burning of straw in harvested crop fields has been the main source of wildfire in the Amur Province since the early 1990s and until recently, where fires annually destroy hundred thousand hectares of forests and buildings and kill animals and even people. Combined with climatic conditions of the region – frequent, strong, often gusty and long-lasting winds and high insolation – every grassfire in this region can be devastating for breeding birds. Annually 40–70% and in some years 90% of crane nests are destroyed by fires. Goroshko (2012) noted that 60%–70% of the wetlands on the Russian side of the Argun River valley (Transbaikal Province) burns every spring, and 30% of pairs of *G. japonensis* annually lose clutches or cannot establish nests in the Argun River valley because of this threat. At Muraviovka Park in the Amur Province, deaths of a molting *G. japonensis* and of an incubating *G. vipio* from grassfires were documented.

Due to a shortage of resources, equipment, staff, and training, local authorities have no capacity to enact proactive preventive measures in Amur Province near Muraviovka Park. To combat this, the park donated equipment to the Amur Province Forestry Department in 2011, 2016, and 2017 and conducted a field school on controlled burns for local firefighters and the park staff. In the fall of 2015, local officials finally took notice of growing damage to crop fields and buildings and loss of lives of firefighters due to wildfires in grasslands and wetlands in the province.

In 2016, the Amur Province Ministry of Forestry and Fire Safety organized and conducted controlled burns in Muraviovka Park, creating important firebreaks which stopped fires spreading from neighboring areas. In April 2016, the Ministry sent a team of 30 professional firefighters who, together with Muraviovka staff, conducted a wide (170–340 foot) controlled burn along 6 miles of the Park's southern border. In the fall 2016, a team of 30 firefighters worked for 3 days to create a firebreak 20 miles long and 200 feet wide. The Deputy Minister of Forestry and the Head of Tambovka District Branch of the Ministry for Emergencies joined the firefighters in these controlled burns.

Creation of firebreaks only along the borders of protected areas leads to the accumulation of huge masses of dry vegetation, which will serve as excellent fuel for the next fire and can be devastating for the habitat. That is why mosaic prescribed burns of areas around nesting sites are extremely important to prevent devastating fires from happening. It is important to educate local stakeholders about the importance of prescribed mosaic burns and restoration of trees and bushes (natural fire barriers).

7.4.4 Illegal Hunting and Disturbance

Legal spring hunting is also a threat (Goroshko 2012). Although cases of crane shooting are rare, shotgun blasts and the presence of people and dogs create high disturbance for cranes during the most sensitive time of the year. Further reduction of poaching and disturbance at Muraviovka is only possible if the protected status of this area was elevated to the level of federal wildlife refuge. In recent years, photographers and videographers have become a growing source of disturbance for *G. japonensis*, especially during incubation period, at roosting, and at feeding sites.

7.5 Conservation

7.5.1 History of Protected Area Creation for Red-crowned Cranes

In 1975, Nikolai Pankin, Zoology Professor from the Blagoveshchensk Teachers' University, discovered previously unknown breeding site of *G. japonensis* in Arkhara District of the Amur Province ~50 km west from Khingansky Nature Reserve. A proposal was prepared to establish a new protected area there, which received support from leading Soviet bird experts and the international conservation community, including the International Crane Foundation and the International Union for Conservation of Nature. However, given that this site was largely under agricultural use, local villagers, leaders of collective and state farms, and the local

administration were against the creation of a new protected area, and the proposal was not accepted. Only after meeting prof. Vladimir Flint, who was co-host of the very popular TV show about, wildlife that the local leaders had approved the expansion of the existing Khingansky Nature Reserve to include a new section, called the Antonovsky site.

In 1989, Chinese and Soviets had a chance to discuss shared concerns about the wetlands along Lake Khanka, a border region just south of the Amur River and a critical nesting habitat for *G. japonensis*. At the end of the 4-day meeting, a resolution was sent to both governments to suggest that Khanka's wetlands be protected. As a result, in 1990, the Khankaisky Nature Reserve was established on the Russian shore of the lake (Harris 1990; Archibald 1992), and in 1996, the governments of China and Russia signed an agreement on international cooperation in scientific research and wildlife conservation at a transboundary nature reserve called Lake Khanka that includes the Russian nature reserve and Xingkai-hu, a wildlife reservation on the Chinese side of the lake. Both these sites are very important nesting grounds of the eastern flock of *G. japonensis* mainland population.

In 1996 Muraviovka Park was established in the Amur Province following decades of field study showing the importance of the region (Smirenski 1986). Whereas most protected areas in Russia preclude use by local communities, this is not the case at Muraviovka, where this 65 km^2 acts as a working example of sustainable land use implementation, with a goal to benefit wildlife conservation while increasing living standards and education levels of local populations. Muraviovka Park is the first nongovernmentally managed territory of sustainable land use in Russia's history and it operates under a land lease that expires in 2058 (Harris 1993; Smirenski 1998; Smirenski et al. 2017). The Park and the adjacent area (total 390 km2) are listed as a wetland of international importance under Ramsar Convention.

The Amur Branch of the World Wildlife Fund (WWF), under Director Dr. Yuri Darman, played a large role in the creation and expansion of the protected area network for *G. japonensis*. From 1997 to 2004, this 4 2 1 organization initiated the creation of two nature reserves and four game refuges and expanded existing nature reserve, with an end result of 5699 km^2 of newly protected lands. Later, the area of seven game refuges and nature reserves increased by another 4900 km^2. This was accomplished by successfully arguing that lands "temporarily orphaned" within the Russia-China border zone (i.e., where commercial agricultural activities were prohibited) should be given protected status. By 2004, protected areas in the Russian part of the Amur River basin covered about 60% of all *G. japonensis* habitats in Russia, with 16 reserves of varying degrees of protection totaling 14,200 km^2 (Darman and Andronov 2011). One of these reserves is in the Transbaikal Province, nine are in the Amur Province, three are in the Jewish Autonomous Region, two are in Primorsky Province, and one is in Khabarovsk Province. At present, the possibilities for further expansion of the reserve network in the Amur River basin are essentially exhausted.

7.5.2 National and International Crane Working Groups

In 1980 a meeting was organized at Moscow State University (MSU) focused on the situation of *G. japonensis* at Khingansky Nature Reserve, and on the status of cranes in the USSR in general, as a threatened group of birds. On the initiative of Sergei M. and Elena M. Smirenski and Sergei V. Winter, the Crane Working Group of the USSR was established. This group was unique in the history of the conservation movement in the USSR, and it made an invaluable contribution to the research and protection of all seven species of cranes of the USSR, creation of protected areas, information exchange and dissemination, and training of crane experts. During the first 10 years of its existence, more information about cranes was gathered and published than during the entire history of ornithological studies in Russia. The group met annually between 1980 and 1991, publishing seven collections of papers on cranes. The group's activities and results were so impressive that soon working groups on other groups of animals began to emerge in the Soviet Union. In 2000, after a 10-year dormancy caused by the collapse of the Soviet Union, it was reinstated as the Crane Working Group of Eurasia (CWGE) with Elena Ilyashenko as its Executive Secretary. CWGE continues to be very active today, uniting efforts of all crane experts and lovers not only in Russia but in all former Soviet Union republics.

From 2007 to 2009, the Red-crowned Crane Conservancy (Tancho Protection Group at the time) held a series of three international workshops called "Establishment of a Feasible International Project for Protection of the Tancho, *Grus japonensis*." These workshops were attended by key individuals actively involved in conservation activities of *G. japonensis* in Russia, China, Korea, and Japan. The purpose of these workshops was (1) to understand the current status of *G. japonensis* in each range state, (2) to agree on the serious conservation problems shared by all range states, and (3) to discuss opportunities for conservationists in range states to collaborate and cooperate.

As a result of this series of workshops, the International Red-crowned Crane Network was established in 2009 and officially launched on January 1, 2010 (Koga 2009; Archibald and Harris 2010). International Red-crowned Crane Network (IRCN) is an umbrella organization for regional red-crowned crane networks, collectively referred to as "IRCN Regionals," i.e., IRCN China, IRCN Japan, IRCN Korea, and IRCN Russia, based on the concept of geographic regions rather than countries due to political sensitivities. Red-crowned Crane Conservancy has been supporting the activities of the International Red-crowned Crane Network secretariat since its inception. The council meets annually to share the current status of the species, to discuss any questions, and to implement any feasible solutions for the conservation with international cooperation.

International Red-crowned Crane Network has engaged in outreach by publishing *The Red-crowned Crane*, *Red-crowned Cranes at Risk*, and a series of booklets on *G. japonensis*, *God of the Wetland I, II, and III*. These publications are printed in the five languages spoken in the range states as a joint project with Red-crowned Crane Conservancy (Fig. 7.2). The International Red-crowned Crane Network has

Fig. 7.2 Publications of the International Red-crowned Crane Network as a joint project with RCC: The Red-crowned Crane, Red-crowned Cranes at risk, God of the Wetland I, II, and III, in five languages spoken in the range countries

also printed and distributed posters to promote anti-crane poaching efforts in Russia, which brought the first successful court case against a crane poacher in the country (Fig. 7.3). The International Red-crowned Crane Network also submitted a letter of request to Vladimir Putin in 2010, who was the Prime Minister of the Russian Federation at the time, to establish a nature reserve in the Argun River estuary, a newly discovered breeding area for *G. japonensis*. Some recent, international collaborative activities include a banding project on Kunashir Island and an exchange program for young researchers. The International Red-crowned Crane Network has also been cooperating and supporting the Crane Specialist Group of IUCN/WI Species Survival Commission.

Following the success and effectiveness of the International Red-crowned Crane Network, two other crane networks were also established: the International Black-necked Crane Network and the International Hooded and White-naped Crane Network, in 2012 and 2015, respectively.

7.5.3 Captive Breeding and Release

Staff of Khingansky Nature Reserve developed a project to captive-rear chicks from crane eggs received from breeding centers and zoos, raise them under semi-wild conditions, and then release year-old birds into the wild. This program has been

Fig. 7.3 Poster to promote anti-crane poaching in Russia. It brought the first successful court case against a crane poacher in the country

successful, but only at bolstering crane populations within that reserve (Andronova and Andronov 2015).

In 2005, a captive breeding facility was constructed at Muraviovka Park and populated by two *G. japonensis*: a male named Kivili and a female named Oka. These birds bonded well and in 2011 produced their first two chicks. They have raised one or two young annually since. Raised in captivity, cranes were released at Khingansky Nature Reserve and shipped to Crane breeding Center at Oka Biosphere Nature Reserve and to the Zoo Gallery in Irkutsk. In May 2017, two red-crowned cranes raised in captivity in 2016 were released into Muraviovka Park wetlands.

7.5.4 Supplemental Feedings

During the breeding season, *G. japonensis* practically do not leave the Amur floodplain where they forage in wetlands on fish, mollusks, insects, and other animals, as well on the succulent plant parts. In spring and autumn, however, crop fields become a major feeding habitat for *G. japonensis*. Corn is the most favorite and energetically valuable crop for cranes. At Muraviovka, staff try to plant 30–35 hectares of corn every spring as supplemental food source for cranes and other wildlife.

Some years have unfavorable weather conditions, when late snow melt and low air temperatures in spring cause cranes that arrive from the wintering grounds to suffer acute lack of food. This may lead to high mortality of starving and exhausted

birds right before the breeding season. In such years Muraviovka staff make appeals to the public and receive help from residents of the Amur Province and other parts of Russia to purchase fish and grain and spread it on special feeding stations. This artificial feeding helps save the birds in distress, as it happened in the spring of 2013.

7.5.5 Environmental Education and Awareness Programs

Lack of awareness among local communities of the critical threats to cranes and lack of respect of federal laws concerning nature protection on the part of developers and farmers are typical for Amur Province and elsewhere in the breeding range of *G. japonensis*. Environmental education of local stakeholders is essential if we want to preserve *G. japonensis* (or any other rare species of bird). Therefore, education is the key activity.

7.5.5.1 Muraviovka Park, Russia

Here, environmental education has been an important component of all programs since the first days of land lease even before the Park was established. There have been international summer field schools taking place at Muraviovka Park annually since 1994, where residents of nearby communities learn firsthand about wetlands and their inhabitants, their importance, and existing threats. Participants also learn about sustainable agriculture and participate in nature art classes, and workshops are available for teachers. Local students and teachers have the opportunity to assist in field research by visiting scientists, talk with renowned environmentalists and professors, and mingle with university and school students from the United States, Europe, and East Asia. In total more than 3000 teachers, researchers, and students from Russia, China, Germany, Hungary, India, Japan, Kazakhstan, Republic of Korea, and the United States have participated in this annual 10-day environmental education event since 1994. Due to their participation in these summer programs, some students were subsequently awarded prizes in art or language contests, and four teachers have received higher professional certifications and "Best Teacher of the Year" nominations and prizes. Most importantly, many teachers have begun using new teaching techniques that integrate environmental education into their curricula. In 1999 the first group of students and teachers from China participated in summer camp in the Park. In 2001 the Park helped to organize and conduct first outdoor environmental camp in Heilongjiang Province of China and developed exchange program for students and educators between the park and crane sites in three provinces of China. The park also holds annual public festivals that attract hundreds of visitors every year and attract more than a thousand tourists (mostly Russian) annually. Thousands of children participated in "Crane-Bird of Peace" art contests organized by Igor Sakovitch in 1995 in the Amur Province. This project initiated similar contests in many cranes' countries around the word.

7.5.5.2 International Ecological Camp, Japan

The Red-crowned Crane Conservancy held an International Ecological Camp in Kushiro, Japan, for three consecutive winters (from 2011 to 2013). This camp was modeled after the summer camp of Transbaikal State Pedagogical University and Daursky Nature Biosphere Reserve in Russia, which is held at the field station in the reserve, where students carry out research on plants, birds, mammals, and the ecosystem under the guidance of professional staff of the university and the reserve. It is also designed to contribute to the scientific database of the reserve.

The purpose of the camp in Kushiro was to establish cooperative and friendly relationships among college students from China, Korea, Russia, and Japan for the conservation of the natural environment, particularly wetlands, using *G. japonensis* as a focal species. In the Eurasian continent, *G. japonensis* migrate across borders, and the ecological status is closely linked to the natural environment of their habitats, specifically the environmental changes resulting from development and the climate changes in recent years.

Conversely, *G. japonensis* living in eastern Hokkaido do not migrate long distances and are directly affected by human activities such as agriculture and tourism. By understanding the serious problems facing crane habitat in these separate populations, we aim to encourage camp participants to focus on conservation of *G. japonensis* as a species, which can aid them in tackling conservation issues from various and extensive angles.

Students participate in the winter census of *G. japonensis* (Fig. 7.4), which has been carried out by Japanese researchers since the 1980s. Students also attend lectures and field trips and are encouraged to exchange information and ideas directly with experts from China, Korea, Russia, and Japan before giving oral presentations and written reports that are due upon completion of the program (Fig. 7.5).

7.5.5.3 International Nature School, China

The International Nature School has been held in China since 2011 to promote the conservation of cranes, waterbirds, and their habitat through environmental education activities. The International Nature School is organized annually by Dr. Liying Su of the International Crane Foundation (ICF), and both Red-crowned Crane Conservancy and International Red-crowned Crane Network have been supporting this program since the beginning by providing partial funding and sending experts and university students as instructors from Russia, Korea, Japan, and the United States.

Field research of the last decade demonstrated that the main causes of decline of the western part of *G. japonensis* mainland population are loss of habitats, unintentional mortality from feeding on poisoned grain spread in crane habitats to catch geese and ducks, and removal of crane eggs and chicks in China for private collections. At the same time, people in China, especially young people, are becoming more

Fig. 7.4 Students during the winter census in Kushiro

Fig. 7.5 Presentation by students upon completion

Fig. 7.6 A Russian student-instructor with local children

interested and are getting involved in conservation activities, making this collaboration in environmental education with partners in China even more important.

At International Nature School, the selected university students draft a curriculum for the wetland ecosystem, plants, birds, and art, respectively, under the guidance and support of professors and experts, and prepare to carry out environmental education activities as instructors of elementary and junior high school students. The International Nature School is held two to four times a year and has been carried out in nine locations, mainly in national nature reserves of Heilongjiang Province, Inner Mongolia Autonomous Region, Jilin Province, and Liaoning Province. Over 2000 children have been reached, and more than 120 university students have participated as of 2016 (Figs. 7.6 and 7.7).

One of the successful outcomes of this initiative is the suppression of illegal egg collection by local residents. In some areas, the number of chicks increased in the spring following a session of International Nature School. The school itself has attracted wide attention in educational and media circles, and International Nature School has kept growing steadily with many former students coming back later as organizing students or instructors.

7.5.5.4 International Crane School CCZ, Republic of Korea

On initiative and with financial support from a local farmer and the Korean Federation for Environmental Movement, an International Crane School is organized every year inside the CCZ key wintering ground of red-crowned cranes.

Fig. 7.7 Student-instructors from different countries

7.6 Conclusion

Despite the red-crowned crane's status as a cultural symbol in East Asia, little research and conservation action have been conducted in Russia to date. In recent years, grassroots conservation and education initiatives, as described in this chapter, have worked to address this deficit by promoting (1) better protection of *G. japonensis* and its habitat, (2) better public education and awareness about the decline of this species, and (3) growing international cooperation in monitoring and protection of *G. japonensis*. But, more needs to be done. For example, there were 5–11 nesting pairs of *G. japonensis* at Muraviovka Park for the first decade of its existence, a higher density than in any other part of Russia. But since 2004 the number of *G. japonensis* has fallen, and since 2010, only three pairs continue to breed there (Smirenski 1998; Masatomi et al. 2002; Nosatchenko and Smirenski 2007). In 2016, despite favorable weather conditions, only two pairs of *G. japonensis* laid eggs, and only one pair successfully fledged two chicks. There are suitable nesting sites, but most of them remain unoccupied. This reflects the decline and critical situation of the mainland population of this species in the western part of its range – loss and fragmentation of habitats (Su and Zou 2012) and collateral mortality from poisoned grain spread at wintering and staging sites targeting geese and ducks (Kong et al. 2007; Zhou et al. 2014, 2017). Conservation research and education need to be expanded if *G. japonensis* are to survive as a breeding species in Russia.

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