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Citation	Mammal study, 45(2), 167-171 https://doi.org/10.3106/ms2020-0008
Issue Date	2020-04-15
Doc URL	http://hdl.handle.net/2115/80991
Type	article
File Information	Mammal study 45 (2)_167-171.pdf



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Source: Mammal Study, 45(2) : 167-171

Published By: Mammal Society of Japan

URL: <https://doi.org/10.3106/ms2020-0008>

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Records of sika deer *Cervus nippon* from the southern Kuril Islands in 1986–2019, with special reference to a continuous record of living deer on Kunashir Island since 2017

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Abstract. The sika deer (*Cervus nippon*) is native to eastern Asia and commonly occurs on Hokkaido Island, northern Japan. The nearby localities of the southern Kuril Islands, located east of Hokkaido, have not been regarded as part of the sika deer’s regular range, despite isolated observations and trace evidence described before 2017. Here we consolidate the information of the sika deer in the southern Kuril Islands since 1986 with new information that establishes a continuous record of living sika deer on Kunashir Island from 2017 to 2019.

Key words: *Cervus nippon*, Chishima Islands, Habomai Islands, Kunashiri Island.

The sika deer (*Cervus nippon* Temminck, 1838) was originally widespread throughout East Asia but today is now restricted to Japan (Hokkaido, Honshu, Kyushu, Shikoku, and some adjacent small islands) and some isolated regions of Far Eastern Russia, North Korea, China, and Vietnam. The species has also been introduced outside of its native range to Europe, North America, and New Zealand (Baryshnikov et al. 1981; McCullough et al. 2009; Harris 2015; Nagata 2015). Isolated reports of single individuals have been noted from Kunashir (Kunashiri), Tanfilieva (Suisho), and Zelenyi (Shibotsu) Islands of the southern Kuril Islands in 1970’s and 1980’s, respectively, but all of them were hunted or otherwise disappeared soon after their observation (Voronov and Voronov 1977; Voronov 2011; Pavlinov and Lisovsky 2012). Therefore, it has been thought that the southern Kuril Islands is not part of the regular range of the sika deer, although Voronov and Voronov (1977) suggested that sika deer might have inhabited the Lesser Kuril Chain in previous centuries. Recently, the sika deer have been often observed on Kunashir Island, which may affect the ecological condition of the island, but there have no offi-

cial records of deer since late 1980’s. Since 1986, State Nature Reserve “Kurilskiy” staff have documented the occurrence of deer on the southern Kuril Islands. Here, we build on these records and combined multiple types of evidence to confirm the presence of sika deer from Kunashir Island and the Lesser Kuril Chain from 1986 to 2019.

Usage of names for island groups in the “Kuril” or “Chishima” Islands is complicated, and there is no biunique names of the island groups between Russia and Japan. In this paper, “the southern Kuril Islands” includes Iturup (Etorofu) Island, Kunashir Island, and the Lesser Kuril Chain (= the Habomai Islands + Shikotan Island).

Methods

Information about the sika deer on Kunashir Island and the Lesser Kuril Chain was obtained accidentally by staff members of the State Nature Reserve “Kurilskiy” and other people (local residents and visitors) since 1986. The information was critically checked by researchers of the State Nature Reserve “Kurilskiy”, and suspected

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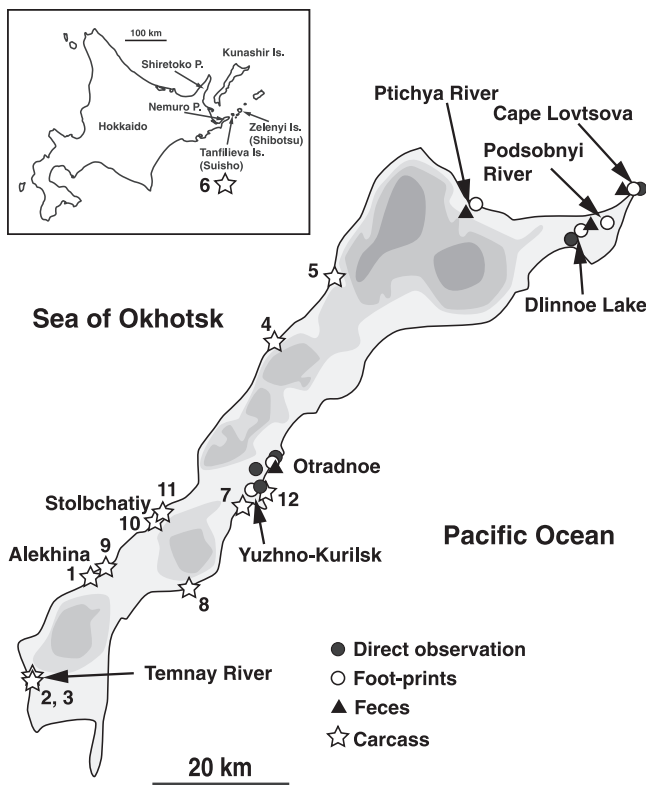


Fig. 1. Map of Kunashir (Kunashiri) Island highlighting the records of sika deer noted in this paper. Numbers associated with the stars correspond to the carcasses of Table 1.

information was excluded in the present paper. We developed a database to consolidate many different types of evidence and credible reports made by the researchers of the Nature Reserve since 1986, including carcasses, footprints, feces, and direct observations of sika deer on Kunashir Island and the Lesser Kuril Chain (Fig. 1).

Results

Carcasses

We report the occurrence of 12 carcasses in total: 11 carcasses from Kunashir Island and one from Tanfilieva (Suisho) Island (the Lesser Kuril Islands) (Table 1). Of these 12 carcasses, nine were female and three were male (Table 1). On Kunashir Island, eight carcasses were found near the Okhotsk Sea coast and three were near the Pacific Ocean coast (Fig. 1). We could not determine whether these deer died on the island or were instead the result of floatation from another location. Three carcasses were found after storm events (Table 1) and one of them had an injured leg (Fig. 2).

Footprints

Footprints of sika deer were first recorded on 11 March 2017 at a location 5.5 km north of Yuzhno-Kurilsk (Furukamappu) on Kunashir Island. Since 2017, footprints of deer (Fig. 3) have been recorded every year on Kunashir Island (Table 1). On 9 August 2019, footprints of two different sizes were observed near Dlinnoe (Nishi-Biroku) Lake (Table 1), indicating the existence of at least two individuals. The locations that footprints were found were northeastern part of the island and Otradnoe (Chikappunai) in the central part (Fig. 1).

Feces

On 11 March 2017, deer feces (Fig. 4) were recorded at a location 5.5 km north of Yuzhno-Kurilsk (Table 1). These feces were produced by the same individual as footprint #1 and direct observation #2. Since 2017, feces have been recorded every year on Kunashir Island (Table 1). Feces have been found on the northeastern and central part of the island (Fig. 1).

Direct observations

Since 2017, sika deer have been directly observed on Kunashir Island on the Pacific Ocean side of the island (Fig. 1). All observed individuals were female (Table 1).

The first deer was directly observed on 9 March 2017 on the coastline 6 km north of Yuzhno-Kurilsk (Table 1 and Fig. 1). Two days later, on 11 March 2017, probably the same individual was observed near the location of the first observation (Table 1). Further, probably the same individual was subsequently occasionally observed by local residents around the same area until June, 2017.

In February–March of 2018, two female deer regularly visited buildings in the area of Cape Lovtsova (Atoiya), where they were fed by lighthouse workers (Table 1).

From June to September of 2018, one female was periodically observed near a herd of domestic cows near the village of Otradnoe in the site 2 km north of the first direct observation site in 2017.

On 12 April 2019, a video of an adult female was taken on a coast of Otradnoe, 3 km north of Yuzhno-Kurilsk (Fig. 5). On 3 September 2019, a female deer was observed from a helicopter flying over Dlinnoe Lake (Table 1).

Summary

Since 1986, sika deer carcasses have been occasionally found on Kunashir Island and the Lesser Kuril Chain (Table 1), although it could not be determined whether

Table 1. Records of sika deer from Kunashir Island and Tanfilieva Island (the Lesser Kuril Islands) in 1986–2019

#	Location*	Sex	Date	Informant	Note
Carcass					
1	Cape Alekhina	female	Jan. 1986	Victor Zuev ¹	
2	The mouth of Temnaya (Sarukamappu) River	female	Feb. 1987	Victor Zuev ¹	
3	The mouth of Temnaya River	female	Mar. 1988	Victor Zuev ¹	
4	Cape Lesistiy	female	Jan. 1989	Victor Karpov ¹	
5	The mouth of Severyanka River	male	Feb. 1991	Victor Karpov ¹	
6	Tanfilieva (Suisho) Island of the Lesser Kuril Chain	female	Jul. 1994	Dmitriy Sokov ¹	
7	Yuzhno-Kurilsk (Furukamappu) Bay	male	Aug. 2000	Anatoliy Milichkin ¹	
8	The mouth of Tyurina River	female	18 May 2014	Aleksandr Kisleiko ¹	
9	Cape Znamenka (Nihon-Iwa)	male	28 Oct. 2016	Victor Varfolomeev ²	Found after a storm. Fig. 2
10	Cape Stolbchatiy (Shimanobori)	female	13 May 2017	Elena Linnlik ¹	Found after a storm
11	2 km east from Cape Stolbchatiy (Zaimoku-Iwa)	female	23 Sep. 2018	Victor Varfolomeev ²	Found after a storm
12	Golovnin Bay	female	9 Aug. 2019	Evgeniy Kozlovskiy ¹	
Footprints					
1	5.5 km north of Yuzhno-Kurilsk	female	11 Mar. 2017	Evgeniy Kozlovskiy ¹ , Aleksandr Kisleiko ¹	The same individual as in direct observation #2
2	Cape Lovtsova (Atoiya)	female	Feb.–Mar. 2018	Lidiya Fofanova ³	The same individual as in direct observation #4
3	Ptichya (Sokoboi) River	–	28 Aug. 2018	Evgeniy Kozlovskiy ¹ , Aleksandr Kisleiko ¹	1 individual
4	Otradnoe (Chikappunai)	female	12 Apr. 2019	Andrey Polyushkevich ⁴	The same individual as in direct observation #5
5	Podsobnyi River	–	8 Aug. 2019	Polina Volkova ⁵	1 individual
6	Dlinnoe (Nishi-Biroku) Lake	–	9 Aug. 2019	Polina Volkova ⁵	2 different sizes
Feces					
1	5.5 km north of Yuzhno-Kurilsk	–	11 Mar. 2017	Aleksandr Kisleiko ¹	One dung pat. The same individual as in direct observation #2
2	Cape Lovtsova	–	Feb.–Mar. 2018	Lidiya Fofanova ³	Several dung pats. The same individual as in direct observation #4
3	Ptichya River	–	2 Sep. 2018	Evgeniy Kozlovskiy ¹	One dung pat. Fig. 4
4	Dlinnoe Lake	–	9 Aug. 2019	Polina Volkova ⁵	One dung pat
Direct observation					
1	6 km north of Yuzhno-Kurilsk (Chikappunai)	female	9 Mar. 2017	Valeriy Kolesnik ⁶	
2	5.5 km north of Yuzhno-Kurilsk (Chikappunai)	female	11 Mar. 2017	Aleksandr Kisleiko ¹	Probably the same individual as #1. Hereafter occasionally observed until June, 2017
3	Otradnoe (Chikappunai)	female	Jun.–Sep. 2018	Dmitriy Sokov ¹ , Petr Pavlyukevich ⁷	With a cattle herd
4	Cape Lovtsova	female	Feb.–Mar. 2018	Lidiya Fofanova ³	Two individuals. Around the lighthouse
5	Otradnoe	female	12 Apr. 2019	Andrey Polyushkevich ⁴	Recorded in video. Fig. 5
6	Dlinnoe Lake	female	3 Sep. 2019	Nadejda Kudrevskay ⁸	Observed from a helicopter

* Records were from Kunashir Island except for carcass #6.

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⁷ Local livestock breeder. ⁸ Local administration employee.



Fig. 2. Carcass of a male sika deer found on the coast near Cape Znamenka (Nihon-Iwa), Kunashir Island, on 28 October 2016. This individual was found after a storm and its left hind-leg was broken. Photo taken by Vladimir Varfolomeev.



Fig. 3. A footprint of a sika deer found on a sand bank of Ptichya (Sokoboi) River on 28 August 2018. The scale unit is cm. Photo taken by E. Kozlovskiy.

the carcasses floated to the islands as debris or the deer actually died on the islands themselves. However, since 2017, the continuous presence of the sika deer has been confirmed by footprints, feces, and direct observations on Kunashir Island (Table 1). It is concluded that at least three individuals (one in the center of the island and two in the north) have lived on Kunashir Island in 2018 and 2019. However, there is currently no direct evidence of newborn deer or reproduction on the island.



Fig. 4. Feces of sika deer found near the mouth of the Ptichya (Sokoboi) River on 2 September 2018. The scale is 15 cm. Photo taken by E. Kozlovskiy.



Fig. 5. A screen-captured image from a video of a female sika deer taken on the coast of Otradnoe (Chikappunai) on 12 April 2019. The video was taken by Andrey Polyushkevich.

Discussion

It has been thought that the occasional appearance of sika deer on the southern Kuril Islands is the result of accidental immigration from Hokkaido (Voronov 1974; Voronov 2011; Pavlinov and Lisovsky 2012), although there is no direct evidence to support this claim. The Shiretoko and Nemuro Peninsulas of Hokkaido are very close to Kunashir Island and the Lesser Kuril Chain, being separated by just 7–16 km at the closest points (Fig. 1). Recently, eastern Hokkaido has experienced a rapidly increasing sika deer population, resulting in

severe damage to forest vegetation and agricultural products (Kaji et al. 2004, 2010). Therefore, it is plausible that the deer on Kunashir immigrated from the now over-populated eastern Hokkaido by walking on floating ice in the winter/early spring or by swimming over the strait in spring–autumn. In the future, genetic analyses could be conducted to guide interpretation of these hypothesized origins.

The arrival of deer to Kunashir Island has potential conservation and management implications, as the island has fragile vegetation including endangered plant species (Barkalov 2000, 2009; Takahashi 2015) and has not experienced the high-level exposure of the deer herbivory. If a sika deer population should grow unsustainably on Kunashir Island in the absence of a native predator, there may be negative, irreversible consequences for the vegetation of Kunashir. Thus, we recommend intense monitoring of sika deer individuals in this region.

Acknowledgments: A special thanks to Vladimir Varfolomeev for offering a photo of a deer carcass and Andrey Polyushkevich for sharing his video. We thank staff members of State Nature Reserve “Kurilskiy”, Hikoki Mizumoto, and Toru Wakamatsu for field support. Mari Kobayashi provided financial support and Alexis Mychajliw polished the manuscript. Koichi Kaji assisted us in finding literature pertinent to sika deer. Note that Kunashir (Kunashiri) Island, Iturup (Etorofu) Island, and the Lesser Kuril Chain (the Habomai Islands and Shikotan Island) are claimed by both Japan and the Russian Federation. The names of places were indicated in Russian with Japanese names in parentheses just for convenience and this labeling does not represent the political views of the authors.

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Received 30 January 2020. Accepted 7 March 2020

Published online 15 April 2020.

Editor was Hayato Iijima.