

Breeding wader populations on the marine coasts of north-eastern Sakhalin

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North-eastern Sakhalin is important for waders on passage in spring and autumn. Breeding wader populations are rather small and in general only one or two species inhabit each biotope. Breeding has been recorded for six species and their numbers in different years depend on the availability of territories suitable for nesting, and on weather conditions. Little Ringed Plover *Charadrius dubius* nest on coastal dunes in similar numbers throughout (0.2-0.4 pairs.km⁻¹ of transect). Wood Sandpiper *Tringa glareola* is the most numerous wader species. It inhabits a wide range of landscapes at densities of 1-10 pairs.km⁻¹ but most frequently densities are usually 2-3 pairs.km⁻¹. Numbers in the dry breeding seasons of 1988 and 1989 were only half those in 1990 and 1991. Nordmann's Greenshank *Tringa guttifer* is found at the mouths of streams and on the Bay coast from May until October. Numbers breeding have increased each year to a maximum in 1991 of 0.1-0.2 pairs.km⁻¹. Redshank *Tringa totanus* nests locally in constant numbers (1.0-3.0 pairs.km⁻¹) on small wet grasslands, close to colonies of Aleutian Terns *Sterna aleutica*. Dunlin *Calidris alpina* nests on marshes of tundra-like appearance (0.5-2.0 pairs.km⁻¹). Early nesting in dry breeding seasons ensures the stability of the species population. Common Snipe *Gallinago gallinago* inhabits marshy areas, in 1990-91 its density was 1.0-3.0 pairs.km⁻¹, but in 1988-89 densities were much lower.

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Северо-восточный Сахалин играет большую роль в весеннем и осеннем пролетах куликов. Гнездящиеся популяции куликов относительно малочисленны, и в целом, в каждом биотопе обитает только один-два вида. Гнездование было доказано для шести видов, численность которых в отдельные годы зависит от наличия подходящих для гнездования участков и от погодных условий. Малый зуек *Charadrius dubius* гнездится везде в более или менее одинаковой численности на дюнах морского побережья (0,2-0,4 пар на 1 км маршрута). Фифи *Tringa glareola* - самый многочисленный вид куликов. Он обитает в широком диапазоне ландшафтов с плотностью 1-10 пар на 1 км, наиболее встречаемая плотность - 2-3 пары на 1 км. В сухие гнездовые сезоны 1988 и 1989 гг. численность была вдвое меньше, чем в 1990 и 1991 гг. Охотский улит *Tringa guttifer* встречается в устьях ручьев и на побережье заливов с мая по октябрь. Ежегодное увеличение численности гнездящихся улитов достигло максимума 0,1-0,2 пары на 1 км в 1991 году. Травник *Tringa totanus* гнездится местами в постоянном числе (1,0-3,0 пар/км) на небольших мокрых лугах вблизи колоний алеутских крачек *Sterna aleutica*. Чернозобик *Calidris alpina* населяет тундроподобные болота (0,5-2,0 пар/км). Раннее гнездование в сухие сезоны обеспечивает стабильность популяции этого вида. Бекас *Gallinago gallinago* придерживается заболоченных местностей; плотность гнездования в 1990-91 гг. насчитывала 1,0-3,0 пар/км, тогда как в 1988-89 гг. плотность была гораздо ниже.

Introduction

Ecological problems connected with the development by the oil and gas extraction industry of the Ockhotsk Sea shelf, near the Sakhalin islands, have recently become of critical importance. One of the main problems is the conservation of

waterbirds, particularly waders, which inhabit the marine coasts, bays, and lagoons. In spite of significant degradation caused by human activities, the north-eastern coast of the Sakhalin islands is still of great importance for breeding, and especially for migrating, waders of the Far East region.

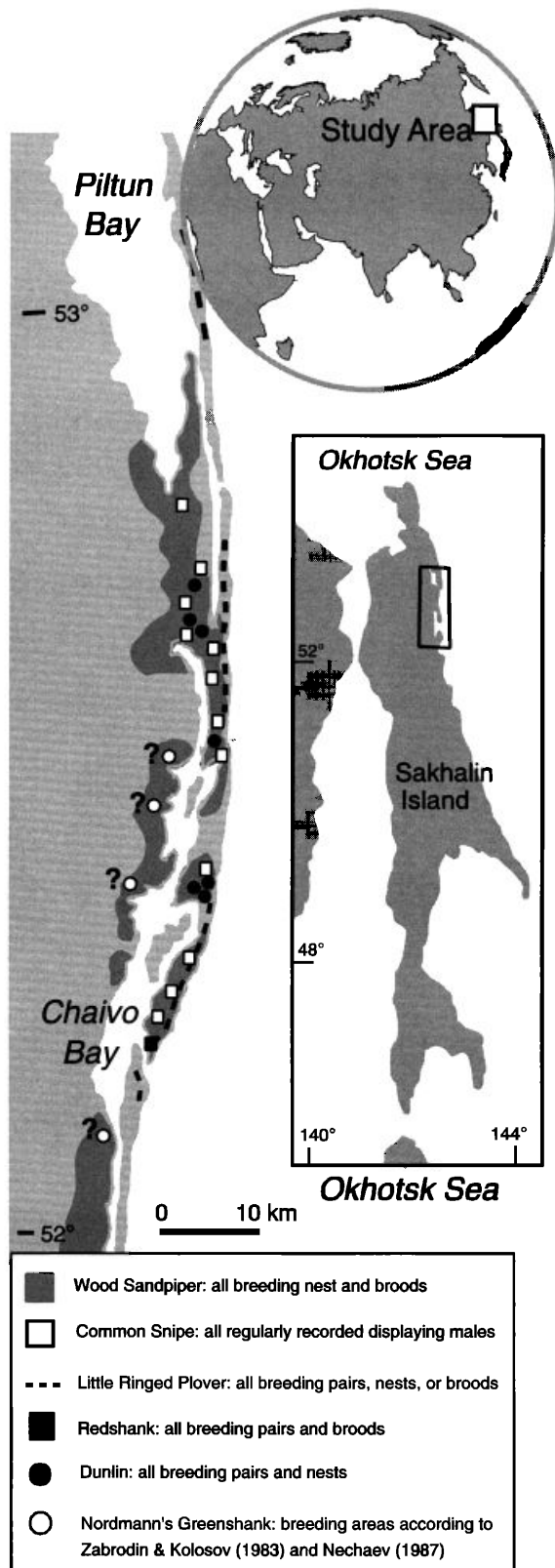


Figure 1. Study area and distribution of breeding waders.

Long-term ecological studies connected with the industrial development of the shelf zone (arrangement of ice-proof boring platforms, construction of pipe-lines etc.) were carried out in 1988-1991 on coasts near the Chaivo and the Piltun Bays (Figure 1) as part of the Far Eastern Marine Engineering and Geological Expedition. The main objectives of our study were to evaluate the current status of the animal populations and habitats of north-eastern Sakhalin, monitor coastal and marine ecosystems, and forecast the environmental risks arising from possible oil pollution in marine habitats. As part of this detailed zoological research, the population dynamics, distribution and status of waders in the region were studied and data collected on locally breeding waders are used in this paper.

Study Methods

Data were collected from May to October in the period 1988-1991. Only data concerning wader counts in the breeding period in suitable breeding habitats are included in this paper. The numbers of migrating waders were not analysed.

Wader counts were conducted on 1-25 km transects. All the birds observed at any distance were counted on the open coastal areas. In places which were difficult to survey, the birds were counted on 20-100 m wide transects. In addition to these transects, we made repeated counts on control plots, whose size (0.01-1.0 km²) was also determined by the characteristics of the area. Counts were made on 30 control plots in total and, on nine of them, regular censuses were conducted from spring until autumn. The period between counts varied from 1-10 days. Some of the control plots were surveyed only in the breeding season, which was considered to be from May to 10 July.

When the breeding habitats were explored, two observers would move parallel to each other, 10-25 m apart; time of observation, species, sex, number, distance of observation, and bird behaviour were recorded, together with a short description of the habitats and the breeding territories. All the routes were marked on blank 1:25,000 topographic maps.

Table 1. Densities (pairs.km route) of breeding waders in the protected (Olenyi Sanctuary) and unprotected areas in 1988-1991.

Area	<i>Tringa glareola</i>	<i>Gallinago gallinago</i>	<i>Charadrius dubius</i>	<i>Tringa totanus</i>	<i>Calidris alpina</i>	<i>Tringa guttifer</i>
"Olenyi" Sanctuary	0.5-10.0	0.1-3.0	0.2-0.4	1.0-3.0	0.5-2.0	0.1-0.2
Outside the Sanctuary	0.5-10.0	0.1-3.0	0.2-0.4	-	-	-

"-" = none recorded breeding

Results

Only six wader species were found breeding in the study area (40% of the Sakhalin list of breeding waders). Their numbers in different years depended on the presence and availability of sites suitable for breeding, and on the weather conditions. Overall, the breeding density was rather low, and in summer the coastal habitats were inhabited mostly by only one or two wader species. The majority of surveyed areas were within the "Olenyi" Sanctuary, in the temperate region, where economic activities were limited for several years; nevertheless, no significant differences were found between the wader populations in this protected area and the unprotected area outside the sanctuary (Table 1). In both areas the densities of breeding waders were similar in similar habitats.

The suitability of sites for breeding waders seemed to be connected to the amount of water and the presence of fresh-water bodies, which determine the abundance and diversity of wetland vegetation at potential nest-sites. The driest habitats were inhabited by Little Ringed Plover *Charadrius dubius* and Redshank *Tringa totanus*, moister areas by Wood Sandpiper *Tringa glareola* and Nordmann's Greenshank *Tringa guttifer* and wet, marshy ones by Dunlin *Calidris alpina* and Common Snipe *Gallinago gallinago*. Below, we describe the characteristics of the breeding populations for each of these wader species.

Little Ringed Plover *Charadrius hiaticula*

Little Ringed Plover were found breeding in the narrow coastal zone habitats adjacent to intertidal areas, as well as in supratidal areas dominated by intrazonal plant vegetation. Nests were found in the sand-dunes in areas of mixed herbs and grass with an abundance of xerophytic plants. These dunes stretch along the coast and, in areas where the dune are between 150-500 m wide, Little Ringed Plover density exceeded 0.3-0.4 pairs.km⁻¹. Very occasionally, Little Ringed Plovers were found nesting in dunes which were less than 150 m wide, on the bay coasts and on flat, open, sandy areas where their density varies from 0.2-0.3 pairs.km⁻¹. No Little Ringed Plovers were found in dunes overgrown with shrubs *Alnus hirsuta*, *Salix* spp., *Betula* spp., or with the Siberian Dwarf Pine *Pinus pumila*. Although dunes with xerophytic vegetation were widespread along the coast, this species was not numerous there.

Wood Sandpiper *Tringa glareola*

Wood Sandpiper was the most abundant breeding wader on the north-eastern coast of Sakhalin, inhabiting a wide spectrum of habitats. Sand-dunes with herb-grass vegetation held lowest densities (0.5-1.0 pairs.km⁻¹). In dune complexes with shrubs and dwarf pine associations, the density was highly variable (2.0-7.0 pairs.km⁻¹), due to local variation in the amount of water present. The density was also highly variable in sandy complexes containing lakes

and ponds, with shrub and dwarf pine vegetation (3.0-4.0 pairs.km⁻¹) (the maximum density observed in a control plot in these areas was 3.0 pairs.ha⁻¹). The most diverse and suitable habitats for Wood Sandpiper were the marshy plains with larch peat-mosses and coastal plains covered with mosses (*Sphagnum* spp.), Siberian Dwarf Pines, shrubs and sparse woodland (*Alnus hirsuta*, *Larix dahurica*) with lakes. The maximum density in a control plot in these mosaic habitats, exceeded 5.0 pairs.ha⁻¹ with, on average, 2-3 pairs per kilometre of transect. Sites suitable for breeding were located on both the coastal and inner parts of the study area.

Fluctuations in numbers of this species depended on the level of precipitation. Numbers were two to

Table 2. Comparison of the densities of Wood Sandpipers in different habitats in dry and wet seasons 1988-1991 (pairs.km⁻¹).

Breeding habitat	Dry seasons 1988 & 1989	Wet seasons 1990 & 1991
Dunes	0	0.5-1.0
Dunes with shrubs	0	2.0-7.0
Lakes with shrubs	1.0-2.0	3.0-4.0
Marshes, peatmosses etc.	4.0-6.0	5.0-10.0
Average (range)	1.6 (1.2-2.0)	4.0 (2.6-5.5)

three times higher in the wet breeding seasons in 1990 and 1991, than in the dry seasons of 1988 and 1989. The scale of these fluctuations also differed locally: in marshy habitats, numbers were only reduced by half in dry years, whereas in dry habitats, virtually no Wood Sandpipers bred (Table 2).

Nordmann's Greenshank *Tringa guttifer*

Nordmann's Greenshank was found at the mouths of streams and rivers from May until October. These birds are most noticeable when they are foraging, since the breeding territories are usually situated some distance from the coast. These breeding habitats, which are overgrown with Larches *Larix dahurica* and have a moss-rosemary *Ledum* spp. ground-cover, are situated in the inner areas of the bay coasts, and at both dry and marshy river mouths. The number of birds recorded during the counts increased every year and a maximum of 0.1-0.2 pairs.km⁻¹ was observed in 1991. We believe that this increase was mainly due to redistribution after the disappearance of colonies in neighbouring areas (Zabrodin & Kolosov 1983; Nechaev 1987). During fires in the summers of 1988 and 1989, large areas of forest were burned. However, the forests within the two sanctuaries, which were the most suitable breeding areas for this species, were not damaged.

Redshank *Tringa totanus*

Redshank nest locally in wet meadows near Aleutian Tern *Sterna aleutica* colonies. These wet meadows are extremely rare within the study area. The local population is stable and present in suitable habitat at densities that vary in different years between 1.0-3.0 pairs.ha⁻¹.

Dunlin *Calidris alpina*

Within the study area, Dunlin breed in the tundra-like peat-bog, either singly, or in groups of 5-12 pairs. Average densities varied from 0.5-2.0 pairs.km⁻¹ and the minimum distance between nests was 50 m. Small areas of peat-bog (0.01-0.02 km²) were usually only occupied by a single pair; on areas larger than 1 km², several pairs were found and the average density was 1.0-2.0 pairs.km⁻². Because these birds begin to breed early, they do not depend on spring and summer precipitation, but are able to use wet areas fed by melting snow. Their population is therefore fairly stable even in dry breeding seasons and the birds were able to raise chicks before the period of summer heat and fires. The clutches in which eggs were about three-quarters of the way through incubation by 10 June, were found in the Aleutian Tern colony, when few of the terns themselves had started egg-laying and most of them were only at the stage of preparing their nest-scrapes. The Dunlin colony was located within a colony of 300 pairs of Aleutian Terns.

Common Snipe *Gallinago gallinago*

Common Snipe inhabits marshy areas, peat-mosses and the boggy shores of water bodies which can be either open or covered with dwarf pines, shrubs or sparse woodland (*Salix* spp., *Alnus* spp., *Sorbus* spp., *Larix dahurica*). The population density of this species is determined by the water supply in the area and by changes in the water table in drought periods; the numbers breeding vary considerably. In 1990 and 1991, an average of 1.0-3.0 pairs.km⁻¹ occurred, while in 1988 and 1989 only 0.1- 0.5 pairs.km⁻¹ (five to ten times less) occurred as the water bodies dried out and the water table dropped.

Discussion

The north-eastern Sakhalin has a specific ecological community of which coastal waders are an important element. The changes in their numbers and distribution are determined by two main factors: the availability of suitable breeding habitats, and food resources. Both factors are probably influenced by the amount of precipitation. Waders inhabiting sandy coastal areas close to the littoral zone forage mostly on the intertidal sand flats, feeding on various species of small, littoral invertebrates. Here, Little Ringed Plover are found foraging, and on rare occasions, Redshank and Nordmann's Greenshank, and even more infrequently, Wood Sandpiper and Dunlin can be found. Dunlin, Nordmann's Greenshank and Redshank forage more often on the intertidal mudflats and peatflats of the bays, and in the mouths of streams and rivers. As the latter habitats

are not widespread, their size appears to limit the breeding populations of these waders. Wood Sandpiper, Dunlin and Common Snipe usually breed some way from the marine shoreline and use areas with oligotrophic water bodies for breeding and foraging. Breeding populations of Dunlin, Nordmann's Greenshank and Redshank are also limited by the lack of suitable breeding habitat.

Waders with the highest population densities, such as Common Snipe and Wood Sandpiper, showed the greatest fluctuations in numbers, with the less numerous Dunlin, and very rare Nordmann's Greenshank showing the least pronounced fluctuation. Populations of Redshank and Little Ringed Plover, found at low densities within the study area, were stable.

In view of the intensification of human activities on the shelf, the natural environment together with the populations of breeding waders in the north-western Sakhalin, are under threat of heavy degradation. This will push the rare wader species, such as Nordmann's Greenshank and the Sakhalin subspecies of Dunlin, to the edge of total extinction.

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