Migration of waders in the Khabarovsk region of the Far East

V.V. Pronkevich

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In the area of the Lower Amur River two migration corridors for waders are known - along the sea coast and across the mainland. The overland route divides near the city of Komsomolsk and runs along the Evoron and Chukchagir lakes and the Nimelen and Tugur rivers, as well as along the Lower Amur valley. On the inland route, a total of 1,850-2,050 waders were counted along a 500 m strip at the Evoron lake during one and a half months (four hour observations each day) of spring migration in the period 1986-88. In the period 1988-90 at the sea coast, spring migration had low intensity: 50-80 waders per km^2 of the intertidal zone of Tugur Bay. Greenshank *Tringa nebularia* and Black-tailed Godwit *Limosa limosa* were the most numerous species. In contrast to spring, during autumn migration mean density at Tugur Bay was 600-700 waders per km^2 and a total of 3,000-6,000 waders were counted along the 10 km coastal route. Great Knot *Calidris tenuirostris* (46%) and Terek Sandpiper *Xenus cinereus* (30%) were the most numerous, while in some periods Black-tailed Godwit and Dunlin *Calidris alpina* prevailed.

V.V. Pronkevich, Institute of Water and Ecological Problems, Far Eastern Branch of Russian Academy of Sciences, Kim-Yu-Chen Str., 65, Khabarovsk, 680063, Russia.

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В Нижнем Приамурье известны два пролетных пути для куликов - вдоль морского побережья и над материком. Последний путь разветвляется у города Комсомольск и проходит по озерам Еворон и Чукчагир и по рекам Нимелен и Тугур, а также вдоль долины Нижнего Амура. На пути внутриматериковой миграции всего было учтено 1850-2050 пролетающих особей куликов; учеты проводились вдоль 500-метровой полосы на озере Еворон в течение полтора месяца весенней миграции 1986-88 гг. (ежедневно 4-х часовые наблюдения). На морском побережье в период 1988-90 гг. интенсивность весеннего пролета была низка: от 50 до 80 куликов на 1 кв. км приливно-отливной зоны в Тугурском заливе. Большой улит *Tringa nebularia* и большой веретенник *Limosa limosa* были самыми многочисленными видами. В отличие от весны средняя плотность во время осеннего пролета в Тугурском заливе была 600-700 куликов на 1 кв. км и общая численность вдоль 10-километрового маршрута на побережье моря насчитывала 3000-6000 особей куликов. Большой песочник *Calidris tenuirostris* (46%) и мородунка *Xenus cinereus* (30%) были самыми многочисленными, тогда как в отдельные периоды преобладали большой веретенник и чернозобик *Calidris alpina*.

Introduction

The seasonal migration of birds, particularly waders, is poorly studied in the whole of Far Eastern Russia, and in the Khabarovsk region in particular. The vast coastline and presence of longitudinally, or almost longitudinally oriented lowlands, as well as its large water courses make this area a very important part of a flyway where large movements of birds, including waterbirds and shorebirds, occur.

Studies of wader migration and the places where they stop during passage are becoming especially important in the light of the proposed construction of two large power stations - a tidal power station at Tugurskiy Bay, on the Sea of Okhotsk and a nuclear power station at Lake Evoron - areas with large concentrations of migrating birds. Information on wader migration has been collected in the past by Vtorov (1963), who carried out censuses on the Sea of Okhotsk coast near the Ayan settlement; by Dul'keit (1973) and Yakhontov (1977), who studied the wader fauna of the Shantary Islands; and by Babenko (1990), who carried out several wader counts at Ekaterina Bay and Schastya Bay in summer and autumn.

Two spring migration routes are known for waders of Khabarovsk region: along the Amur river valley and along the marine coast (Rakhilin 1972; our data).

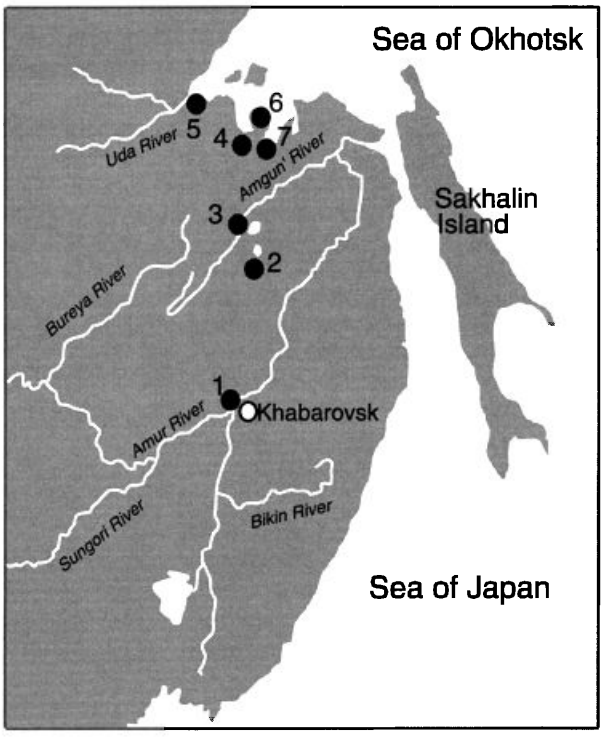

Figure 1. Study area and study locations: **1** - the Amur river flood-plain near the Khabarovsk; **2** - Lake Evoron; **3** - Amgun' river valley; **4** - Tugurskiy Bay; **5** - Gulf of Udskaya; **6** - Konstantina Bay; **7** - Ulbanskiy Bay.

The former divides into two branches in the northern part of the Middle Amur lowland, one to the Evoron-Chukchagir-Nimelen-Tugurskiy Bay, and the other to the lower Amur river valley. The marine migration route passes along the coast of the Tatarsky Strait and divides into several small branches at the Amur river mouth; one of these branches is directed towards Sakhalin Island, the others towards the mainland. In spring, the mainland and marine routes meet at the coastal area between the Amur river mouth and the Gulf of Udskaya; in autumn, a single migration route running from the north divides into two here.

Methods

Our data were mainly collected in four areas within Khabarovsk region: on the Amur river flood-plain near the Khabarovsk (1989), at Lake Evoron (1986, 1988, 1992), in the Amgun' river valley near the Polina Osipenko settlement (1991), and at Tugurskiy Bay on the Sea of Okhotsk (1989, 1990). Surveys of differing levels of detail were made. Waders were mostly counted on foot on transects with the exception of Lake Evoron, where observations were conducted from a stationary point. Single wader censuses were also conducted in some areas of the marine coast: at the Gulf of Udskaya, and at Konstantina Bay and Ulbanskiy Bays (Figure 1). At the Amur river flood-plain wader counts were carried out once every five days in April, May, July and September on a 20 km transect along the bank of the Amur river and in the flood-plain meadows, which have ox-bow lakes.

Results

The average number of waders per count on the Amur river flood-plain for each two-week period are shown in Table 1.

Migration usually starts in the first ten-day period of April; the earliest migrants are Lapwing *Vanellus vanellus*, then Eastern Curlew *Numenius madagascariensis* and Redshank *Tringa totanus*. In April, the intensity of migration is extremely low: on average 21-43 waders were counted on the 20 km transect, most of which were breeding Lapwings. In May, migration becomes more intense, reaching a peak during the third week of May. A record spring number of waders (168 per 20 km route) was counted on 20 May 1989. Common Snipe *Gallinago gallinago* (21%) and Spotted Redshank *Tringa erythropus* (18%) were the most numerous migrants. In June, wader densities are stable, and only breeding species such as Lapwing, Redshank, Common Sandpiper *Actitis hypoleucos*, Common Snipe and Little Ringed Plover *Charadrius dubius* remain there.

Autumn migration lasts from July until mid-October, although the earliest movements were recorded at the end of June. The beginning of these movements usually coincides with the arrival of Wood Sandpiper *Tringa glareola*. Intense migration occurs in July, August and the first half of September when Wood Sandpiper (42.9%), Common Snipe (17.9%) and Black-tailed Godwit *Limosa limosa* (11.4%) are recorded more often than the other waders. Sometimes, during intense migration, up to 190 waders a day were counted on the 20 km transect in the Amur river flood-plain. Observations of spring migration at Lake Evoron were conducted from a stationary point, located on the southern shore of the lake (Table 2). In 1986 and 1988 birds were counted during two hours in the morning and two hours in the evening for a month and a half. Censuses were also carried out on a four km transect once every five days from spring until autumn. The results of the counts from the stationary point indicated that waders form

Table 1. Average numbers of waders on the 20 km transect in the Amur river flood-plain near the Khabarovsk during half-month periods in the 1989 spring and autumn migrations.

Species	April		May		July		September	
	I	II	I	II	I	II	I	II
Pacific Golden Plover *Pluvialis fulva*	-	-	-	3	-	-	-	1
Lapwing *Vanellus vanellus*	37	17	24	26	15	50	-	-
Green Sandpiper *Tringa ochropus*	-	-	1	-	-	-	-	1
Wood Sandpiper *Tringa glareola*	-	-	1	3	84	61	24	1
Greenshank *Tringa nebularia*	-	-	-	1	2	5	1	2
Redshank *Tringa totanus*	3	3	1	3	4	11	1	1
Spotted Redshank *Tringa erythropus*	1	-	18	21	-	-	-	8
Marsh Sandpiper *Tringa stagnatilis*	-	-	1	1	-	-	-	-
Common Sandpiper *Actitis hypoleucos*	-	-	1	1	1	-	-	-
Calidris spp.	-	-	1	6	1	5	-	-
Common Snipe *Gallinago gallinago*	-	-	23	26	3	21	33	14
Swinhoe's Snipe *Gallinago megala*	-	1	2	-	-	-	-	-
Far Eastern Curlew *Numenius madagascariensis*	2	-	-	-	-	1	-	-
Black-tailed Godwit *Limosa limosa*	-	-	-	-	9	36	-	-
Total	**43**	**21**	**73**	**91**	**119**	**190**	**59**	**28**

approximately 13-17% of all birds migrating across the Evoron Lake.

Wood Sandpiper, Spotted Redshank and Black-tailed Godwit were most abundant on spring migration. The proportion of Common Snipe observed was under-estimated as the species is difficult to detect on migration. The main bulk of migrants passed the stationary point in the second half of May: peak migration was observed in different years from 17-18 May to 25-27 May, when 85-87% of all waders recorded during a spring passed through. In spite of pronounced differences in the weather conditions of the 1986 and 1988 springs, the dates of migration in different wader species were very similar.

The graph of seasonal changes in numbers of waders based on transect counts in 1986 (Figure 2) shows a sharp peak in spring and at least one, possibly two smaller ones in autumn, observed during the first half of August. The period when numbers are stable is rather short and is observed from the end of June to the beginning of July. In general, Common Snipe, Black-tailed Godwit and Wood Sandpiper were recorded most often on transects during summer-autumn migration on the shores of Lake Evoron. In order to estimate the approximate number of waders that simultaneously stop at Lake Evoron, we undertook censuses at the beginning of August in the most productive habitats which were at the mouths of the rivers running into Lake Evoron (Table 3). (The data for small wader

Table 2. Cumulative number of waders on spring migration recorded during daily four hour observation periods from a stationary point in the southern part of Lake Evoron in 1986 and 1988.

Species	Spring 1986 total	%	Spring 1988 total	%
Little Ringed Plover *Charadrius dubius*	-	-	5	0.6
Lapwing *Vanellus vanellus*	50	4.7	6	0.7
Green Sandpiper *Tringa ochropus*	9	0.8	7	0.8
Wood Sandpiper *Tringa glareola*	245	23.0	288	34.0
Greenshank *Tringa nebularia*	9	0.8	11	1.3
Redshank *Tringa totanus*	1	0.09	-	-
Spotted Redshank *Tringa erythropus*	311	29.2	166	19.6
Grey-tailed Tattler *Heteroscelus brevipes*	-	-	2	0.2
Common Sandpiper *Actitis hypoleucos*	73	6.9	115	13.6
Common Snipe *Gallinago gallinago*	73	6.9	37	4.3
Swinhoe's Snipe *Gallinago megala*	2	0.2	4	0.5
Far Eastern Curlew *Numenius madagascariensis*	32	3.0	78	9.2
Whimbrel *Numenius phaeopus*	-	-	1	0.1
Black-tailed Godwit *Limosa limosa*	148	13.9	121	14.3
Great Knot *Calidris tenuirostris*	91	8.5	5	0.6
Temminck's Stint *Calidris temminckii*	21	2.0	1	0.1
Totals	**1065**		**846**	

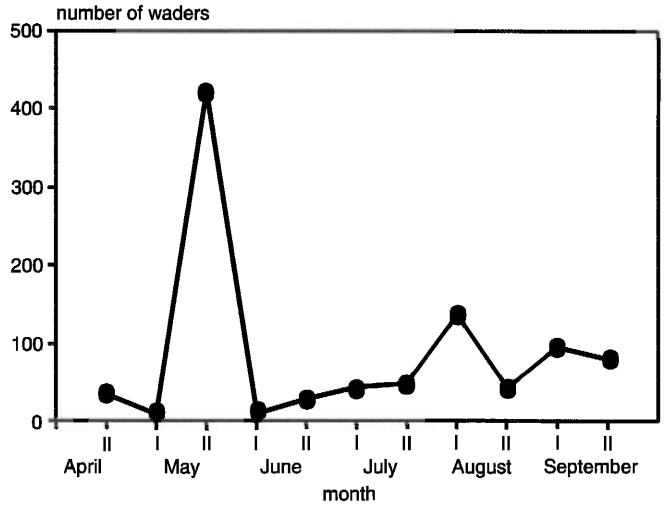

Figure 2. Seasonal variation in total wader numbers (for the first and second halves of each month) on the shore of Lake Evoron according to transect counts in 1986.

species in Table 3 are underestimates, because they were difficult to detect and thus under-counted.) Wood Sandpiper (36.3%) and Black-tailed Godwit (44.8%) were the commonest species during these counts. The latter species was breeding on the nearby mossy bogs and we believe that a rather large proportion of the Black-tailed Godwit counted were from the local breeding population.

At the Amgun' river valley, wader censuses were conducted on more or less constant routes at the flood-plain meadow and at the dwarf-shrub-mossy bog near the Polina Osipenko settlement. Total length of these routes was 12 km for every two weeks of the study. Up to 161 waders were counted there during the intense spring migration; Spotted Redshank, Common Snipe and Black-tailed Godwit prevailed. In summer and early autumn numbers of waders were rather low - from 12 to 17 birds, as the meadows were flooded twice during the summer. Wood Sandpiper, Common Snipe and Black-tailed Godwit were recorded the most often at that time.

Table 3. Wader numbers at the most productive areas of the Evoron Lake shores in the first half of August 1988.

Species	Total	%
Grey Plover *Pluvialis squatarola*	6	0.1
Pacific Golden Plover *Pluvialis fulva*	264	6.0
Little Ringed Plover *Charadrius dubius*	4	0.09
Mongolian Plover *Charadrius mongolus*	5	0.1
Lapwing *Vanellus vanellus*	18	0.4
Marsh Sandpiper *Tringa stagnatilis*	1	0.02
Greenshank *Tringa nebularia*	31	0.7
Wood Sandpiper *Tringa glareola*	1,578	36.3
Spotted Redshank *Tringa erythropus*	165	3.8
Common Sandpiper *Actitis hypoleucos*	23	0.5
Terek Sandpiper *Xenus cinereus*	20	0.5
Turnstone *Arenaria interpres*	5	0.1
Temminck's Stint *Calidris temminckii*	23	0.5
Great Knot *Calidris tenuirostris*	25	0.6
Knot *Calidris canutus*	1	0.02
Common Snipe *Gallinago gallinago*	178	4.1
Far Eastern Curlew *Numenius madagascariensis*	16	0.4
Black-tailed Godwit *Limosa limosa*	1,948	44.8
Bar-tailed Godwit *Limosa lapponica*	40	0.9
Totals	**4,351**	

In summer and early autumn numbers of waders were rather low - from 12 to 17 birds, as the meadows were flooded twice during the summer. Wood Sandpiper, Common Snipe and Black-tailed Godwit were recorded the most often at that time.

In the southern part of Tugurskiy Bay (Sea of Okhotsk) wader counts were carried out on a transect in an intertidal area with a tidal range of up to 6 m (Table 4). Spring migration at Tugurskiy Bay, as in the whole region, starts with the arrival of Lapwing; in 1990 this species was first recorded on 15 April. In spring, wader numbers on the intertidal area are not large, probably because the intensity of migration along the coast westwards from the Amur river is in general rather low. Only two wader species, Nordmann's Greenshank *Tringa guttifer* and Terek Sandpiper *Xenus cinereus*, seemed to reach that area using the marine migration route. All the other waders, judging by their densities and species composition (Tables 1 & 2), used the mainland migration route. The largest number of waders recorded on a 10 km transect was 83 birds; Black-tailed Godwit and Greenshank *Tringa nebularia* prevailed. Wader numbers on the intertidal area increase noticeably in July (in 1990 from 3 July), when Terek Sandpiper and Great Knot *Calidris tenuirostris* arrive from the north in large flocks. The numbers of Greenshank, Spotted Redshank, Dunlin Calidris alpina and Red-necked Stint *Calidris ruficollis* also increase. The total abundance of waders in autumn is 40-70 times higher than in spring and reaches 6,000 individuals per 10 km transect. Migration continues at this high intensity until mid-September. The majority of birds recorded at Tugurskiy Bay during the main period of summer-autumn migration were Great Knot and Terek Sandpiper, although sometimes large numbers of Black-tailed Godwit (July) and Dunlin (September) were also recorded.

Because of the absence of any published data on wader numbers at the Gulf of Udskaya,

Table 4. Numbers of waders on a 10 km transect through the intertidal area in the southern part of Tugurskiy Bay in 1990.

Species	May		June		July		August		September		Oct.	Total	
	I	II	I	II	I	II	I	II	I	II	I	No.	%
Little Ringed Plover *Charadrius dubius*	-	4	-	-	1	-	-	-	-	-	-	5	0.03
Mongolian Plover *Charadrius mongolus*	-	-	-	-	-	-	-	2	-	-	-	2	0.01
Lapwing *Vanellus vanellus*	3	-	-	-	-	-	-	-	-	-	-	3	0.02
Oystercatcher *Haematopus ostralegus*	-	-	-	1	1	-	-	-	1	-	-	3	0.02
Wood Sandpiper *Tringa glareola*	-	-	-	-	-	6	12	1	-	-	-	19	0.1
Greenshank *Tringa nebularia*	-	28	23	11	78	26	133	110	46	-	-	455	2.3
Redshank *Tringa totanus*	-	-	17	1	-	3	3	17	-	-	-	41	0.2
Spotted Redshank *Tringa erythropus*	-	-	-	19	290	40	81	12	250	121	70	883	4.4
Nordmann's Greenshank *Tringa guttifer*	-	-	1	-	-	-	3	-	-	-	-	4	0.02
Grey-tailed Tattler *Heteroscelus brevipes*	-	5	5	-	-	-	7	3	9	-	-	29	0.1
Common Sandpiper *Actitis hypoleucos*	-	8	-	-	-	1	6	4	-	-	-	19	0.1
Terek Sandpiper *Xenus cinereus*	-	-	1	14	2,334	2,350	898	280	65	-	-	5,942	29.8
Turnstone *Arenaria interpres*	-	-	-	-	-	4	15	4	1	4	-	28	0.1
Dunlin *Calidris alpina*	-	-	-	-	17	22	5	120	850	300	2	1,316	6.6
Sanderling *Calidris alba*	-	-	-	-	-	-	-	-	1	-	-	1	<0.01
Great Knot *Calidris tenuirostris*	-	-	-	-	2,670	747	2,242	3,135	305	-	-	9,099	45.7
Knot *Calidris canutus*	-	-	-	-	-	-	5	1	-	-	-	6	0.03
Red-necked Stint *Calidris ruficollis*	-	-	-	-	-	80	5	13	3	-	-	101	0.5
Far Eastern Curlew *Numenius madagascariensis*	-	-	3	3	-	-	-	-	-	-	-	6	0.03
Black-tailed Godwit *Limosa limosa*	-	38	300	163	680	475	115	150	20	-	-	1,941	9.7
Bar-tailed Godwit *Limosa lapponica*	-	-	-	-	-	-	5	-	2	-	-	7	0.04
Grand Total	**3**	**83**	**350**	**212**	**6,071**	**3,754**	**3,535**	**3,852**	**1,553**	**425**	**72**	**19,910**	

Konstantina, Ulbanskiy and Tugurskiy Bays, we present here our fragmentary data from these areas. In the southern part of Konstantina Bay, 5,500 waders were counted on a 5 km transect on 3 August 1989; 70% of them were Terek Sandpiper and 15% were Great Knot. In the southern part of Ulbanskiy Bay censuses were made from 4 - 15 August 1989. The maximum number of waders recorded on a single occasion was about 5,000 individuals. Besides the numerous Terek Sandpiper, Great Knot and Wood Sandpiper, unusually large numbers of Redshank were recorded there: 221 Redshank were counted on a 5 km transect in the coastal meadow close to the Syran river mouth. On 28 August 1990, 15,000 to 17,000 waders were counted on a 20 km transect in the southern part of Tugurskiy Bay; Great Knot (65%) and Terek Sandpiper (30%) were by far the most abundant. About 13,000 waders were counted there on 17 September 1990, when 97% of the birds present were Dunlin.

Conclusions

In the Khabarovsk region, passage waders follow two main migration routes, either travelling across the mainland or along the marine coast. In spring, the birds flying along the marine coast of Tatarsky Strait cross the Sea of Okhotsk directly and only in small numbers, moving westwards from the Amur river mouth. The main bulk of migrants flying over the mainland pass through within a rather short time period of about 10 days. In autumn, a proportion of the birds that in spring use the marine migration route, return by the mainland route. This was observed in Grey Plover *Pluvialis squatarola*, Mongolian Plover *Charadrius mongolus* and Broad-billed Sandpiper *Limicola falcinellus*. Intense summer-autumn migration lasts for two and a half months. Wood Sandpiper, Common Snipe and sometimes also Black-tailed Godwit and Spotted Redshank are the most abundant species using the mainland route, both during spring and summer-autumn passage. At Tugurskiy Bay on the Sea of Okhotsk the most abundant species in summer-autumn are Great Knot and Terek Sandpiper although, during parts of this period, Black-tailed Godwit and Dunlin are also very abundant. Fragmentary census data from the Gulf of Udskaya, Konstantina, Ulbanskiy and Tugurskiy Bays, as well as published material from earlier studies, suggest that these areas west of the Amur river mouth are of

special importance for birds using the coastal route. These coastal bays serve as roosting and foraging areas for a very large number of birds migrating from the whole of north-east Asia to their wintering grounds, including such rare species as Nordmann's Greenshank, Spoon-billed Sandpiper *Eurynorhynchus pygmeus* and Swan Goose *Anser cygnoides*.

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