AN OVERVIEW OF THE LATHAM'S SNIPE POPULATION IN SAKHALIN, EASTERN RUSSIA

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Latham's Snipe (Японский бекас) *Gallinago hardwickii* was historically considered to breed mostly in Japan with a small proportion of breeding records in Russia. Since the 1950s, the species has been expanding its range northward and the current distribution of snipe encompasses most of the island of Sakhalin. At the same time, the species has experienced a breeding range contraction in Japan. During May 2019, opportunistic snipe surveys were conducted during a nine-day field trip of Sakhalin. Snipe were recorded either as incidental observations or during a 10' point count. The highest numbers of snipe were found on the south-west coast of Sakhalin in the Tomarinskiy and Korsakovsky regions. All records were made in mosaic meadow-forest and modified grassland habitats, and none were obtained from forest or intact woodland. Comparison of these snapshot data to breeding surveys conducted between 1993 and 2012 demonstrate the species to be relatively widespread across Sakhalin, and in most areas not dominated by continuous forest. However, the conditions under which snipe breed successfully are more restricted than would be expected based on these broad habitat associations and numbers of displaying males. Agricultural intensification, spring burning of meadowlands and illegal shooting of snipe all reduce breeding success. While a significant proportion of the Latham's Snipe global population appears to occur on Sakhalin (potentially as high as 18%), when considered in the broader context of species decline documented in Japan, it is likely that the global trend for this species is generally downward.

INTRODUCTION

Migratory shorebirds in the East Asian-Australasian Flyway are among the most threatened taxa globally, due largely to habitat loss and modification. Species utilising the Yellow Sea for staging on migration are particularly vulnerable due to "land reclamation", and a number of species migrating through this region are experiencing significant population declines (Amano *et al.* 2010, Murray *et al.* 2014, Studds *et al.* 2017).

The ecology of, and threats to predominantly coastal species are relatively better understood than for inland grassland and wetland species. Latham's Snipe *Gallinago hardwickii* is a good example of this, and is less well-known due to its cryptic habits, especially outside the breeding season. Latham's Snipe breeds in northern Japan and in parts of eastern Russia during the months April-July and migrates to Australia where it spends the non-breeding season predominantly in shallow, vegetated freshwater wetlands in south-eastern Australia (Higgins & Davies 1996). The population is declining in Japan (Ura *et al.* 2018), and the breeding range is now centred on the northern island of Hokkaido, with fewer breeding records from the main island of Honshu (Nakamura & Shigemori 1990, Iida 1995). The population trend in Australia is also considered to be declining. However, the difficulty of monitoring the species has precluded any trends analysis in the country.

In Russia, the species was historically found only in most southerly parts of the island of Sakhalin, and in small numbers on the lower Kuril Islands and on the coastal Russian mainland in Primorye (Nechaev 1994). The first record of the species in the Kuriles goes back to the end of the 19th century (Snow 1897). However, no details were provided. The southernmost part of Sakhalin was colonized in 1950-60 (Nechaev 1994), and during the 1970s to 1980s, records of snipe extended approximately 300 km north (Nechaev 1994). Latham's Snipe advanced to the southern coast of Nabilsky Bay, along the rivers Nabil and Vazi, where for the first time a displaying male was recorded on June 24, 1994 (Revyakina & Zykov 2012).

In 2000, during an environmental impact assessment of the north-south Sakhalin gas pipeline by Amur-Ussury Center for Biodiversity Latham snipe were recorded in the central part of the island, near Tymovskoe, 180 km to the north from the previously known distribution limit near Poronaysk and Uglegorsk (Valchuk *et al.* 2016). Five years later it was recorded breeding another 50 km to the north, near Nysh village (Valchuk *et al.* 2016). In 2008-2009, further records were obtained in the east near Nysh Vesnskoe village. In 2013, Latham's snipe were observed doing breeding display flights in nearby Val village, north of Nogliki on the north-east coast (Valchuk *et al.* 2016).

Until relatively recently, the northernmost sightings of displaying snipe were known from Chayvo bay on the east coast of Sakhalin. During surveys of the nature reserve in May to June 2016 in the extreme north of Sakhalin, displaying birds were recorded both in the north and the south of Schmidt Peninsula (Fig. 1), which is separated from more southerly records by a 200 km gap of unsuitable habitat (mostly continuous larch and birch forest) (Ktitorov *et al.* 2019). In June 2018, Latham's Snipe were recorded nesting in the city of Okha in the far north of Sakhalin (Revyakina *unpubl. data*). It is worth noting that some areas in the north-west of the island are

still unoccupied, despite availability of suitable grassland habitat and warmer climate (Ktitorov & Zdorikov *unpubl. data*). During the same time period, Latham's snipe records had extended up the southern Kurile islands as far as Urup island (Zdorikov 2019) (Fig.1). On mainland Russia, the species has undergone a northward range shift such that numbers have decreased in the southern limit of its range (Primorye) while increasing northward and into the Amur River basin as far as Khabarovsk (Gluschenko *et al.* 2016, Nazarenko 2016, Valchuk *et al.* 2016).

The current distribution of Latham's Snipe encompasses fairly diverse biotopes, which includes river valleys, hillslopes and on the sea coasts. It is most often found in floodplains and coastal mixed meadows. It sporadically nests on the edges and clearings among larch woodlands, in thickets of undersized bamboo, and vegetated marshes (Revyakina & Zykov 2012).

Latham's snipe arrive on Sakhalin in the second half of April, and the males immediately begin to display (Nechaev 1994, P. Ktitorov *pers. obs.*). In the most optimal habitats, group displays are observed, in which between two to ten males take part. In between flights, snipe may also display on the ground, from treetops and on infrastructure such as power poles, fences, and building roofs. These behaviours make surveys during this period the most optimal time to get an estimate of relative abundance.

Information on current status and population trends of this species is patchy and opaque. While the population of Latham's Snipe is declining in Japan, and anecdotal evidence suggests it is also declining in Australia, it is expanding its range in Sakhalin and the Kuril Islands. In this study, we performed an opportunistic survey of the island of Sakhalin to capture a current snapshot of relative abundance and density of Latham's Snipe, based on observations and counts of displaying males, and to document apparent habitat associations. These snapshot data were compared to a previous study from 2012, commissioned by the Ministry of Forestry (Revyakina & Zykov 2012), to make inferences about the current population size and distribution, breeding habitat associations and potential threats to breeding snipe on Sakhalin.

METHODS

Study region

The island of Sakhalin is relatively under-populated and contains large areas that are undeveloped. It is 950 km in length and encompasses nearly 10 degrees of latitude from south to north (45°40' to 54°30'N). There are two main mountain ridges (600-1000 m high) with depressions in between that stretch along eastern and western sides in the southern and central parts of the island. The northern part is a hilly plateau with the mountains covered by sediments and only in the very northern tip (Schmidt Peninsula, 50 km long) the two mountain ridges emerge again showing the same structure with a depression in the middle. The climate is monsoon type with cold subarctic winters and relatively warm wet summers (average annual rainfall 500-

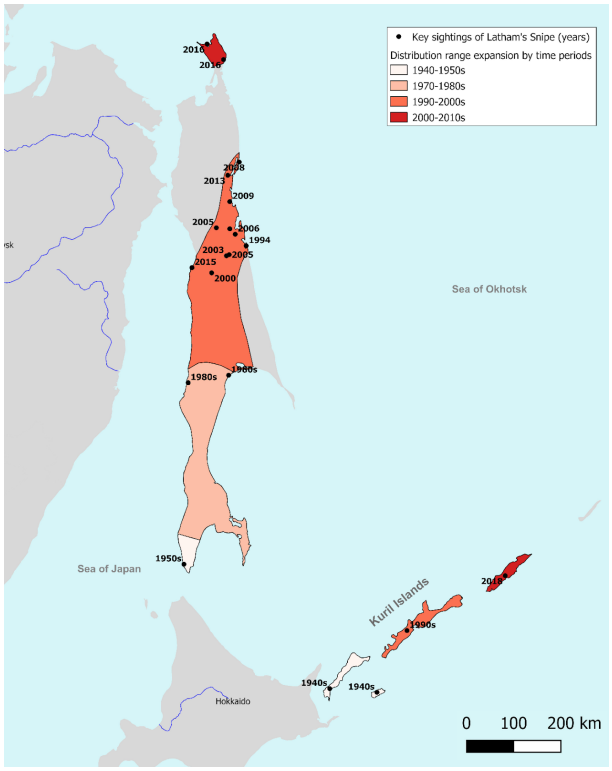

Figure 1. The key sightings locations and range expansion of Latham's snipe. Latham's Snipe absence is depicted by grey shading on Sakhalin Island and the Kuril Islands – no information is presented for the Russian mainland or Japan. Overall, the Latham's snipe was shifting the northern border of the breeding range by average of 15 km per year and colonised most of Sakhalin Island from 1950s until 2016.

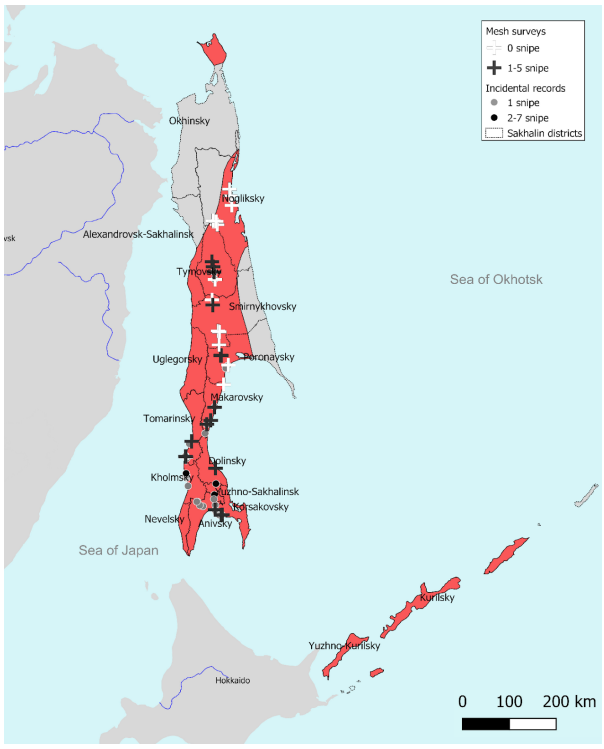

Figure 2. Map of Sakhalin showing the 15 mainland districts of Sakhalin and overlaid with the distribution of Latham's Snipe (in red). Mesh survey locations are shown in crosses and incidental records made outside mesh surveys are shown in circles.

1200mm). Snow cover occurs from December until the end of April in the south and from October until the end of May in the north. It is locally strongly affected by the cold wind streams of the Sea of Okhotsk in the east and the sheltering effect of the mountains making it more continental inside the depressions. The vegetation of Sakhalin is diverse. The southern part is dominated by mixed broadleaf-coniferous forest and its flora is common to northern Hokkaido. The central part is dark coniferous taiga, gradually replaced by larch taiga in the north and again with spruce taiga in the Schmidt peninsula. At the time of this visit (May 2019), there were still large patches of snow in low lying areas. Despite a long preceding period of snow cover and overall high humidity, the island was experiencing dry and warm conditions, and several forest fires were burning, particularly in the northern part of the island (which is common at this time of year: Kharuk *et al.* 2007).

Snipe surveys 2019

Between May 1 and 10, a north-south distance of approximately 600 km was traversed in a vehicle along the main routes from the capital Yuzhno-Sakhalinsk to the west coast at Kholmsk and through the island centre to Nogliki in the north-east (total bounding area 46° – 52° N, 142° - 144° E). Snipe were recorded using two approaches, (1) incidental records made while either moving or stationary usually of displaying males, and (2) using 10' point counts within a 1km grid ("mesh" method used in Japan by the Wild Bird Society of Japan: Ura *et al.* 2018). Due to the nature of the visit, it was not possible to pre-determine the locations of mesh surveys and thus, they were also conducted opportunistically. Exact point locations for conducting meshes were chosen at random and every mesh centroid was located ≥1 km apart.

During mesh surveys, snipe were recorded as the maximum number of displaying males either heard, perching or in display flights. Snipe flushed by the observer were excluded from the mesh total. Great care was taken to ensure that displaying males were not double counted by watching where birds were flying at the same time as noting the approximate location of males calling from the ground or a perch. Mesh counts were expressed as the number of displaying males per square kilometre.

Broad habitat types and land use at each mesh location were recorded. As most opportunistic incidental records were made from roadsides, habitat types were determined from site photos and satellite imagery in GIS.

Snipe surveys 1993-2012

Methods used in the previous study are briefly described here (Revyakina & Zykov 2012). Surveys to determine distribution and abundance of Latham's Snipe were conducted in April to August between 1993 and 2012, as part of an environmental impact assessment for the north-south gas pipeline. Survey transects of (usually) 400m in width and varying length were undertaken in most Sakhalin districts: Anivsky, Korsakov, Dolinsky, Nevelsky, Kholmsky, Tomarinsky, Uglegorsky, Makarovsky, Poronaysky, Smyrnykhovsky, Tymovsky, Nogliksky.

The area of the species' habitat was estimated based on the analysis of publicly available Landsat satellite images. As the objective of these surveys was to obtain maximum survey coverage (by surveying different locations in different years), the data were pooled prior to estimating breeding population size. An expert assessment approach was used to estimate the total number of breeding snipe per square kilometre based on four variables: the area of potential nesting habitat (determined from analysis of satellite images), the area of nesting habitat where breeding males were recorded, and the minimum density of nesting sites in any given survey area, and the average density of nesting sites in any given survey area (Revyakina & Zykov 2012).

The density of snipe recorded during the 2019 survey was used to estimate the total number of breeding males for any matching district, using a similar extrapolation approach and the same breeding habitat area values as in the Revyakina & Zykov (2012) study.

RESULTS

Snipe surveys 2019

A maximum of 89 snipe were recorded during the May 2019 visit, either as incidental records (n=55) or during mesh surveys (n=34). This excludes any potential double-counts between nearby incidentals records and / or mesh counts. As all but one bird was displaying when recorded, then it is reasonable to assume counted birds were males and that this represents an actual count of 177 snipe. The density of displaying males from mesh surveys was equivalent to 1.9 snipe per square km (from 35 × 1 km^2 mesh grids).

The highest numbers of snipe in individual mesh surveys occurred in the regions of Makarov-sky (n=4), Poronaysky (n=3), Dolinsky (n=3) and Korsakovsky (n=3 & 5). The Nogliksky region in the north was the only region that had all zero count mesh surveys (eight mesh surveys) (Fig. 2). The highest numbers of snipe from incidental records were obtained in the south-west regions of Kholmsky and Tomarinsky, and numbers decreased moving northward such that no snipe were recorded north of Tymovsky (Fig. 2).

The most common habitats that snipe were recorded in during mesh surveys were coastal and modified grasslands, grassland / woodland mix (with or without low-intensity agriculture) and urban areas (both sparse and medium density settlements) (Fig. 3). No snipe were recorded in Taiga forest, regardless of whether it was open, partly cleared, continuous, near or distant from floodplains. Similarly, a single visit (two meshes) to the extensive estuarine flats north of Nogliki did not produce any snipe records.

Snipe surveys 1993-2012

A total of 277.2 km of transects, and a survey area of 93 km^2, was surveyed between 1993 and 2012 (Revyakina & Zykov 2012). Individual survey dates in each district are spread across multiple years. For example, Dolinsky, which had the highest estimate overall, was surveyed in

the years 2003, 2004, 2009, 2011 and 2012. Similarly, Anivsky, which had the second highest estimate, was surveyed in 2002, 2004 and 2007. This survey effort produced a cumulative total of 407 displaying males (7.25 snipe per square km). The highest counts of males, corrected by total transect distance were in the southern Sakhalin regions of Anivsky, Korsakovsky, Yuzhno-Sakhalinsk and Dolinsky (3.6-1.8 males / km of transect).

A total of 5469 breeding males were estimated across the 12 districts, based on survey data compiled from multiple survey years (Fig. 4). This population estimate is mainly based on surveys conducted over the five years prior to 2012 within previously known habitats, as well as in the northern parts of the island that have been colonised by snipe only in recent years.

The highest densities of displaying males occurred in the more southerly districts of Korsakovsky (1.8–14.6 males/km^2), Aniva (4.4–12.5 males/km^2), Dolinsky (2.3-11.3 males/km^2) and Yuzhno-Sakhalinsk city (4.3–6.3 males/km^2). More northerly districts, as well as areas on the west coast, were characterised by lower densities and in general, there was a decreasing trend in the number of nesting snipe from south to north. As estimates were based on transect counts performed in the same districts in different years and many cases, in different places, no comparison between years was possible.

While there were no systematic searches for nests during this study, nesting was occasionally discovered during surveys. This included in modified landscapes like in the capital Yuzhno-Sakhalinsk, where nests were found on the outskirts of petrol stations, on the sidelines of roads and railways, and within the liquefied natural gas plant in the Korsakovsky district (Fig. 5).

Comparative snipe survey data

The survey data collected during the two different studies used different survey methods in different districts, and the time scale for data collection varied greatly. The population estimate derived from the 2019 data, using the extrapolation approach of Revyakina & Zykov (2012) produced numbers of breeding males ranging from 810 in Dolinsky (*c.f.* 1385 from 2012) to 60 in Tymovsky (*c.f.* 248 from 2012). A total of 1724 breeding males was estimated in 2019 using this method (Fig. 4), extrapolated from a survey area of 35 km^2. This is comparable to the estimate of 5469 in the 2012 study, which was over a much greater area (93 km^2) but was split over multiple years so may therefore represent some repeated counts of individuals between years.

DISCUSSION

Latham's Snipe occupied almost all habitat types in surveyed regions with the exception of moderately to heavily forested areas (taiga). While snapshot surveys conducted in May 2019 did not locate any snipe north of Tymovsky in the north-central part of Sakhalin, the earlier 2012 surveys found snipe in the three northern regions of Sakhalin: Noglikisky, Okhinsky and Alexandrovsk-Sakhalinsky. Collectively, the two

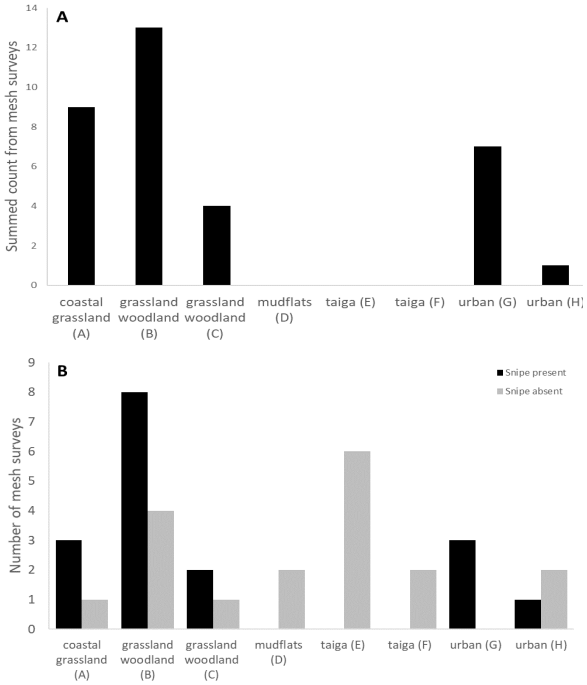

Figure 3. Broad habitat associations of snipe recorded during mesh surveys in 2019. A = total count of snipe across all meshes in different habitats. B = presence and absence of snipe across mesh surveys in different habitats. Details of habitat types: A = coastal grasslands; B = mosaic meadow-forest complexes (hay/grazing); C = grassland, marshland &/or riparian / floodplain woodland; D = estuarine mudflats; E = open, partly cleared or continuous taiga; F = open, partly cleared or continuous taiga, floodplain woodland; G = sparse settlement / nearby infrastructure; H = urban areas.

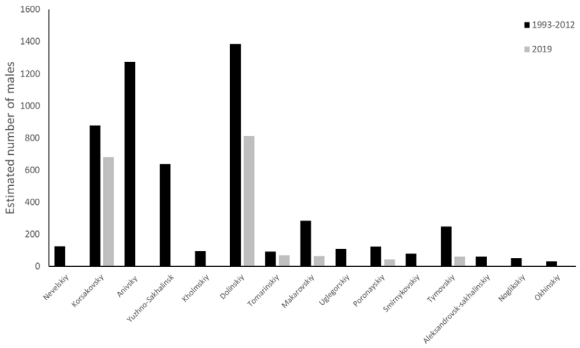

Figure 4. Estimated number of breeding Latham's Snipe on Sakhalin (by region), based on survey data from 1993-2012 (with most records obtained between 2007-2012) and 2019.

Figure 5. Satellite imagery of southern Sakhalin. The inset shows nesting sites of Latham's Snipe (white dots) near the borders of the plant for the production of liquefied natural gas in the Korsakovsky district (source Zykov & Revyakina 2009). The highest densities of snipe were recorded here in 2019.

datasets demonstrated that the greatest numbers of snipe occur in the southern regions of Sakhalin.

Current breeding distribution and abundance

The current EAAF population estimate for Latham's Snipe is 30,000 (Hansen *et al.* 2016), although recent breeding grounds surveys in Japan have estimated the population size to be 35,000 (Ura *et al.* 2018). The number of nesting snipe on Sakhalin island was estimated at 5400 breeding males in the 2012 study, based on surveys from the previous five years (Revyakina & Zykov 2012). This is equivalent to 5400 pairs if a 1:1 sex ratio assumed, although studies from Honshu breeding areas suggests the species is not monogamous (Nakamura & Shigemori 1990). Given that surveys were conducted in multiple years, the true population size is potentially less as it is possible some surveys double-counted birds between years. Using a similar extrapolation approach to that used in 2012, we estimated around 1700 breeding males based on a much smaller survey area but from a single time period in 2019. While these values from the two studies cannot strictly be compared, as they were derived from different survey types over different time periods, they nevertheless clearly indicate that a substantial population of snipe occurs on Sakhalin. Over the past 30 years, the breeding range of the Latham's snipe on Sakhalin has continued to expand north. Since completion of the 2012 study, breeding Latham's Snipe have been recorded in new locations at the extreme north of Sakhalin on Schmidt Peninsula (54ºN). Therefore, it seems highly probable that Sakhalin supports internationally significant numbers of Latham's Snipe, and that this could represent anything between 6 and 18% of the global population (based on the Hansen *et al.* 2016 population estimate).

In the southern regions of Anivsky, Korsakovsky, Dolinsky and in the territory of the Yuzhno-Sakhalinsk city, the highest average and maximum values of the abundance (individuals / km) and density (number of males per 1 km^2) were recorded. More northern areas, as well as areas of the west coast, had lower abundances and densities. In general, the number of birds decreases from south to north. In the Makarovsky and Poronaysky districts, in some areas most favourable for nesting, relatively high abundances and densities have been recorded previously (up to 5.7 individuals/km and up to 7.2 snipe/km^2, respectively) in the mosaic meadow-forest complexes of the lower reaches of the Gastellovka river (Gluschenko *et al.* 2010).

Factors affecting population size

Latham's Snipe actively populates anthropogenic landscapes, for example, agricultural land (pastures, crops of perennial grasses), outskirts of settlements, clearings under power lines, man-made disturbed territories reclaimed and overgrown with grassy vegetation, military training grounds, road and railroad lanes. In these areas, they forage in meadows, often using sparse vegetation along river banks, streams, small lakes, and roadside ditches (Revyakina & Zykov 2012). This apparent flexibility in habitat choice means that it has a higher probability of resettlement following the cessation of disturbance or restoration.

Egg laying begins in mid-May and chicks start hatching in late May to the first half of June, with fledglings recorded as late as the second half of September (Revyakina & Zykov 2012). One of the main anthropogenic causes of nest failure and fledgling death is spring burning of dry grass in open spaces, which are arranged by local residents for no obvious purpose (Revyakina & Zykov 2012). Usually, such fires occur in May, after the establishment of warm weather, when Latham's Snipe females are incubating. Livestock grazing also causes nest failure and death of chicks. For example, in one of the coastal meadows of the Korsakovsky district, which is a permanent nesting site, the introduction of grazing resulted in 100% mortality (Revyakina & Zykov 2012).

There was a significant decrease in agricultural production in Sakhalin in the 1990s and since that time, overgrowing fields and pastures have served as the favourite habitat of the species. Revyakina & Zykov (2012) found during surveys in the Korsakovsky district a rapid increase in the number of nesting snipe within 3-4 years after natural regeneration of disturbed lands overgrown with low-growing meadow vegetation. In areas like these, snipe breeding success tends to be high (Revyakina & Zykov 2012). However, when meadows are overgrown with tall grass, the success of snipe breeding was found to decline, and with the beginning of the formation of forest communities in such areas, the nesting of snipe eventually ceased. Intensification of agricultural production (e.g. intensive grazing, haymaking, plowing) can also lead to a decrease in habitat area and population decline.

Latham's Snipe are reasonably tolerant of certain levels of disturbance, which has allowed the species to populate residential areas and industrial zones. However, the prolonged presence of people and companion animals close to breeding territories can lead to the mortality of clutches and nestlings, or displacement of breeding birds (Revyakina & Zykov 2012). This is especially true for habitats located on coastal meadows, in river valleys and in open areas around cities, in places of traditional recreation for the population. Thus, weekends are periods when snipe experience greater disturbance due to large crowds of people and cars, dog walking, trampling and littering of the territory, as well as the lighting of fires. Crows also pose a threat to nesting snipe, especially for snipe nesting in the outskirts of settlements. Near the majority of settlements there are open dumps of household waste type, which contribute to an increase in the number of Jungle Crow (*Corvus macrorhynchos*) and Carrion Crow (*Corvus corone*).

While Latham's Snipe is listed in the Red Data Book of Sakhalin (Red Data Book of Sakhalin Oblast 2016), it was delisted from the Federal (Russian) Red Data Book in March 2020. Occasional shooting by hunters poses threats to Latham's Snipe, despite being protected in Sakhalin. Misidentification during hunting leads to the shooting of Latham's Snipe in the spring. Based on surveys of hunters, Revyakina & Zykov (2012) found that some hunters consider Latham's Snipe as

woodcocks, some do not know that snipe are waders, and most do not know about the conservation status of this species. Cases of the shooting of Latham's Snipe are observed not only in the southern regions of Sakhalin, but also in the Aleksandrovsk-Sakhalinsk region, where this species has been recorded nesting (Revyakina & Zykov 2012).

To reduce Latham's snipe mortality from shooting, engagement activities that explain the importance of snipe conservation and focus on improving identification skills should be conducted before the hunting season commences. Displaying woodcock is the only wader species permitted to be hunted in Russia during spring. While autumn hunting for snipe are popular in the Russian mainland, it is much less common on Sakhalin due to relatively small gun dog culture, small size of game species and difficulties of shooting small and fast targets (P. Ktitorov *pers. obs.*).

Nest failure and death of chicks can occur for natural reasons, in the case of late cooling and prolonged rains (Revyakina & Zykov 2012). Adverse conditions and threats that birds encounter during migrations and wintering can also lead to a decrease in the population of Latham's snipe. Hunting for Latham's Snipe is prohibited in Japan (since 1974) and there is a moratorium on hunting in Australia. However, there are no restrictions on hunting of snipe in south-east Asian countries through which they migrate, nor on the island of Papua New Guinea, where they are known to stage (Latham's Snipe Project *unpubl. data*). Furthermore, habitat loss, associated with the drainage of wetlands, their removal for urban construction, agriculture and other purposes, and the replacement of meadow vegetation with trees and shrubs are significant threats to the species across its global range.

CONCLUSION

Latham's snipe are widely distributed across the island of Sakhalin, and likely to breed in most areas where there is low intensity land use and low disturbance from human activities. The species appears to have benefitted from some human activities, such as deforestation, which have opened up otherwise continuous forest. Current agricultural practices are relatively low in intensity and there is a tendency for human settlements to become abandoned rather than expand, and thus, the human "impact footprint" is fairly small on Sakhalin. In addition, the northward and eastward shift of Latham's Snipe breeding range might be facilitated by climatic factors, as similar patterns observed in many bird species globally (Hitch & Leberg 2007, Virkkala & Lehikoinen 2014). Collectively, these factors have probably contributed to the expansion of this population. However, the opposite pattern in land use is occurring on both Japanese breeding and Australian non-breeding grounds. Given the declining trends in the global population of the species, regular (once every 5 years) monitoring using standardised methods should be conducted in both the Japanese and Russian parts of the breeding range. Without coordinated monitoring, it will be difficult to determine whether the species is decreasing, increasing or stable but shifting its distributional range.

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