

## Breeding waders in Slovenia

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### Abstract

The paper presents the past and current status of breeding waders in Slovenia. In the 19th century, nine waders were breeding in Slovenia, whereas about 30 years ago about seven species were breeding. Today, thirteen species breed. However, only eight species are regular breeders. The most common species is Lapwing *Vanellus vanellus* with up to 2000 pairs, followed by Little Ringed Plover *Charadrius dubius* (up to 700 pairs) and Common Sandpiper *Actitis hypoleucos* (up to 400 pairs). For these species breeding

densities in various habitats are also presented. Most Lapwings in Slovenia breed on intensively cultivated fields (e.g. maize, sugar beet, potatoes). Only some pairs still nest on meadows, where a decline has been noticed. Kentish Plover *Charadrius alexandrinus* breeds exclusively on the coast, where the population increases.

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Received 22 March 2000, Accepted 4 May 2000, Editor: S. Svensson

### Introduction

The status, distribution and breeding biology of waders in Europe are well known (e.g. Glutz von Blotzheim et al. 1977, Cramp 1983, Hagemeyer & Blair 1997, and references therein). However, little information is available from Slovenia (Geister 1995a), although occurrence in the non-breeding season and migration patterns have received more attention (Štumberger 1991, Kmecl & Rizner 1992, 1993, Kmecl et al. 1997, Vogrin 1998a, 1998b, in print). In this paper I present an overview of the breeding status of waders in Slovenia.

### About landscape in Slovenia

Slovenia is situated in Central Europe between Italy, Austria and Hungary. Slovenia is not only one of the youngest, but also one of the smallest European countries (measuring 20,256 km<sup>2</sup> with about two million inhabitants). It is the meeting point of four European landscapes: Alpine, Dinaric, Pannonian and Mediterranean. Of the total surface area, more than 50% is covered by forest, and about 23% is used for agriculture (Statistical Office of Republic of Slovenia 1998). Land use is presented in Table 1.

Table 1. Use of farmland in Slovenia. Data come from Statistical Office of Republic of Slovenia (1998). *Användningen av jordbruksmark i Slovenien. Data from Slovenska statistikbyrå.*

Land use	ha
<i>Markanvändning</i>	
Fields and gardens <i>åkrar och trädgårdar</i>	176,938
Meadows and pastures <i>ängar och betesmarker</i>	265,485
Intensive orchards <i>intensiv trädgårdsodling</i>	4,234
Traditional orchards <i>traditionell trädgårdsodling</i>	6,812
Vineyards <i>vingårdar</i>	17,420
Abandonment <i>övergivna jordbruksmark</i>	59,882
Together	530,771
<i>Totalt</i>	

Agricultural intensification has taken place mostly after the Second World War, characterised by fertiliser inputs increasing from about 180 kg/ha/year in 1965

Table 2. Quantity of fertilisers (kg/ha) used in Slovenia and harvest of maize (kg/ha) in recent years. Data come from Statistični urad Republike Slovenije (1988, 1991, 1998). – = no data.

*Mängd konstgödsel (kg/ha) och majsskörd (kg/ha) under senare år. – = inga data.*

Year År	Fertilisers Konstgödsel	Maize Majs
1965	183	–
1970	185	–
1975	177	–
1980	214	3780
1981	–	4390
1982	–	4700
1983	265	4290
1984	274	4600
1985	267	4720
1986	278	4890
1987	317	4890
1988	287	4150
1989	264	4954
1990	229	5141
1991	196	5237
1992	175	3362
1993	376	4025
1994	403	6332
1995	388	6339
1996	397	6900

to 440 kg/ha/year in 1997 (Table 2;  $r = 0.71$ ,  $P < 0.005$ ,  $n = 19$ ). Consequently, harvest of e.g. maize/ha also increased (Table 2;  $r = 0.67$ ,  $P < 0.002$ ,  $n = 18$ ).

Moreover, drainage and other farming melioration, mainly in the sixties and seventies, destroyed many thousands ha of swampy areas (e.g. Bračić 1975, Kert 1979). Natural wetland is one of the most endangered bird habitats in Slovenia. To a certain degree its function in some parts of the country has been taken over by numerous reservoirs and also some fishponds. Some fishponds have become important sanctuaries for biodiversity in areas of modern intensive farming, especially in north-eastern Slovenia. The Rački ribniki fishponds (protected as a Landscape Park with neighbour area) and Vrbje pond are important both for breeding and migrating bird species (see e.g. Vogrin 1996a, 1999b, Vogrin & Vogrin 1997, 1999).

Other very valuable wetlands important for breeding waders in Slovenia include Secovlje salina

(Škornik et al. 1995, Makovec et al. 1998), the Drava (Bračko 1997), Ljubljansko barje (marshes) (Trontelj 1994) and Lake Cerknica (Polak 1993). Among these, only Sečovlje salina are fully protected as Landscape Park and as Ramsar site. These localities are important as breeding as well as wintering sites also for other wetland birds.

## Methods

The analysis is based on literature data (see references) and my own unpublished data.

All statistical tests were performed with the SPSS 6.0/Windows statistical package. Data not normally distributed (tested by Kolmogorov-Smirnov test; e.g. Fowler & Cohen (1988)) were analysed using Spearman rank correlation coefficient ( $r_s$ ), otherwise Pearson coefficient ( $r$ ) was used. An error probability of  $P < 0.05$  was considered significant.

## Results and discussion

In 19th century at least nine waders were breeding in Slovenia (Table 3). In the 20th century, the breeding status of waders, among other species, in Slovenia has been described by Krešič & Šošteršič (1963) and Matvejev & Vasic (1973). According to the first two authors 13 wader species were breeding (Table 3). However, it is unlikely that some of them really could have bred here at that time (Geister 1990). Such examples are Greenshank *Tringa nebularia* and Great Snipe *Gallinago media* which only breed much more to the north (e.g. Kalas et al. 1997, Thompson & Thompson 1997). Ten years later Matvejev & Vasic (1973) published a catalogue of birds in former Yugoslavia. They noted six breeding waders for Slovenia.

Today, according to the atlas of breeding birds (Geister 1995a), 219 species breed in Slovenia, and 13 (6%) of them are waders. The breeding waders are listed in Table 3. Seven of them are regular breeders (breed every year), three are exceptional breeders (breeds only irregularly in single years), one breeds only occasionally, and one species was already extinct. More details of each species are discussed below.

Waders in Slovenia are almost exclusively found in lowlands, the only exceptions are Woodcock *Scolopax rusticola*, Wood Sandpiper *Tringa glareola* and to some extent Little Ringed Plover *Charadrius hiaticula* and Common Sandpiper *Actitis hypoleuca* which breed also in the river valleys in the Alps.

Intensification of farming practices (see above) is

Table 3. Breeding waders in Slovenia. Data from 19th century come from Seidensacher (1864), Reiser (1925), Geister (1995a) and references therein, data from before 1963 come from Krešič & Šušteršič (1963), and data from before 1973 are taken from Matvejev & Vasic (1973). Present data of status and breeding pairs come from literature (mainly Geister 1995a) and my own data.

*Häckande vadare i Slovenien*. Breeder = *Häckare*, Probably breeder = *Troligen häckare*, Extinct = *Utdöd*, Regular = *Regelbunden*, Passage migrant = *genomflyttare*, Exceptional = *tillfällig*

Species Art	19th century 1900-talet	Before 1963 Före 1963	Before 1973 Före 1973	Today I dag	No. of pairs Antal par
<i>Himantopus himantopus</i>	–	–	–	Regular breeder from 1990	up to 32
<i>Burhinus oedicnemus</i>	Breeder	Extinct	–	Extinct	–
<i>Charadrius dubius</i>	Breeder	Breeder	breeder	Regular	500–700
<i>Charadrius alexandrinus</i>	Probably breeder	Breeder	–	Regular	up to 40
<i>Vanellus vanellus</i>	Breeder	Breeder	breeder	Regular	1500–2000
<i>Gallinago gallinago</i>	?	probably breeder	–	Regular	30
<i>Gallinago media</i>	–	probably breeder	–	– (passage migrant)	–
<i>Scolopax rusticola</i>	Breeder	Breeder	probably breeder	Regular	80 – 100
<i>Limosa limosa</i>	–	–	–	Exceptional	1
<i>Numenius arquata</i>	Breeder	Breeder	breeder	Regular	10–20
<i>Tringa nebularia</i>	–	probably breeder	–	– (passage migrant)	–
<i>Tringa totanus</i>	Breeder	probably breeder	–	Irregular breeder from 1985 up to 3	
<i>Tringa ochropus</i>	Probably breeder	probably breeder	–	Exceptional (1980)	1
<i>Tringa glareola</i>	–	probably breeder	probably breeder	Exceptional (1997)	1
<i>Actitis hypoleucos</i>	Breeder	Breeder	breeder	Regular	200–400

not the only threat. We must take into account also threats caused by abandonment of farmland (Table 1). However, abandonment is not a serious problem in lowlands and it rarely concerns wet grasslands.

#### *Himantopus himantopus*

The first data about breeding of the Black-winged Stilt come from 1990 from Sečovlje salina (Makovec & Škornik 1990) where two pairs bred. After that the number of pairs increased up to 32 pairs in 1995 and then declined to 8 pairs in 1997 (Makovec et al. 1998, Škornik et al. 1995). However, since eight years the number of breeding pairs of Black-winged Stilt in Sečovlje salina is more or less stable ( $r=0.18$ ,  $n=8$ ,  $P > 0.05$ ). The first breeding data from the interior of the country was recorded in 1996 in waste water basins (Štumberger & Bračko 1996) of the local sugar refinery close to river Drava, near the town Ormoz in NE Slovenia.

#### *Burhinus oedicnemus*

Stone Curlew is not considered a breeding species any more (Geister 1995a). It was breeding on rivers

like Drava, Mura, Sava and Savinja probably until the 1930s. Due to regulations and construction of reservoirs on river Drava, Stone Curlew became extinct as a breeding bird in Slovenia in the 1980s.

#### *Charadrius dubius*

Little Ringed Plover is distributed mainly in NE and central parts of Slovenia (Geister 1995a). Here it breeds on the shingles along rivers, in gravel pits (Vogrin 1994), on building sites in suburban areas (Trontelj 1992), on different intensive fields, e.g. covered with maize and sugar-beet (Bracko 1997, Vogrin & Vogrin 1998) and also in emptied fishponds (Vogrin 1997a). Today, the Little Ringed Plover prefers man-made sites which account for more than half the total population. According to my estimation about 20% breeds on fields. Data about densities found in different habitats are presented in Table 4. It seems that densities in secondary habitats (gravel pits, fields, ponds, industrial and suburban areas) do not differ from those in the original habitat (rivers) ( $F = 1.09$ ,  $P > 0.05$ ). In spite of great plasticity, the number of breeding pairs still declines, almost exclusively in its natural habitat (rivers).

Table 4. Little Ringed Plover *Charadrius dubius* densities in different habitats in Slovenia.  
Tätheter för mindre strandpipare i olika biotoper.

Habitat <i>Biotop</i>	Research area (ha)	Density (no of pairs/10 ha)	Source
Gravel pit <i>sandtag</i>	4	10	Trontelj 1991
Suburban area <i>förorter</i>	1	10	Trontelj 1991
Industrial area <i>industriområde</i>	0.5	100	Trontelj 1991
Rivers Sava and Trzaška Bistrica	250	0.2	Geister 1995b
Field with maize <i>majsält</i>	69	0.14	Vogrin 1999b
Field with sugar beet <i>sockerbetor</i>	4.7	4.2	original
Shingle at river Savinja	0.9	22.2	original
Gravel pit <i>sandtag</i>	14	4.3	original
Empty pond <i>tömd damm</i>	13.5	Up to 3	original

### *Charadrius alexandrinus*

The Kentish Plover in Slovenia exclusively breeds on the coast. Inland populations, as in neighbour countries, i.e. Austria and Hungary (e.g. Dvorak et al. 1993, Szekely 1997), do not exist. According to Makovec (1994) the most important breeding site for this species is Sečovlje salina where up to 25 pairs breed. In the last 15 years the number of breeding pairs in Sečovlje salina increased ( $r_s = 0.57$ ,  $n = 15$ ,  $P < 0.05$ ; Figure 1).

### *Vanellus vanellus*

The Lapwing is with 2000–3000 pairs (Geister 1995a) the most numerous breeding wader (Table 3) and one of the most studied species. However, I think that the number of pairs is overestimated. On the basis of my own observations and research (e.g. Vogrin 1998c, Vogrin & Vogrin 1998), I estimate that the breeding population is about 1500–2000 pairs.

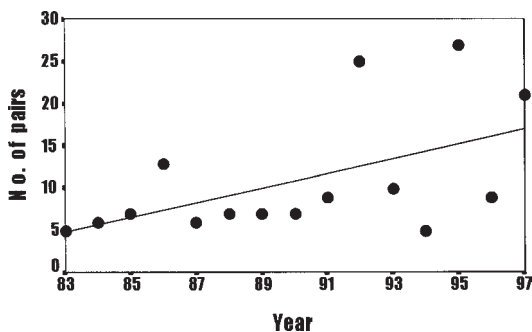


Figure 1. Number of pairs of *Charadrius alexandrinus* breeding in Sečovlje salina different years.  
*Antalet häckade par av svartbent strandpipare i Secovlje salina olika år.*

In the past this species was not so common as today. Reiser (1925) estimated about 20 breeding pairs on meadows (probably wet) in 1921 in Dravsko polje (NE Slovenia). Seventy-five years later Vogrin (1998c), in the same area, estimated 250–300 pairs which exclusively bred on intensive fields. The last known breeding on meadows in Dravsko polje was in 1987 and the first breeding on intensive fields occurred in the eighties (pers. obs.) as in the Gorenjska region (Trilar 1981). Lapwings, as elsewhere (e.g. Hudson et al. 1994 and references therein), prefer to nest in fields cultivated in the spring. In the north-eastern part of the country, Lapwings prefer to breed on fields covered with maize and sugar beet (Vogrin 1998c, Vogrin & Vogrin 1998), whereas in the Gorenjska region they prefer fields with potatoes (Trilar 1981, 1983).

In Slovenia Lapwings still breed on meadows at Ljubljansko barje (Sovinc et al. 1993, Tome 1998) and Cerknica lake (Polak 1993, pers. obs.) in the central part, and in some parts of the Prekmurje region, NE Slovenia (pers. obs.). In some of these areas, e.g. at Ljubljansko barje (Tome 1998) and in Prekmurje (pers. obs.), a decline was observed, mainly due to changing agriculture practice, i.e. transformation of meadows into fields. During a study (1988–1998) in a research area of 25 ha on Ljubljansko barje, Tome (1998) found up to 18 breeding pairs and over the years a strong declining trend was confirmed ( $r = -0.82$ ,  $P < 0.01$ ,  $n = 10$ ).

Today over 80% of the pairs breed on intensive fields (pers. obs.). Hence, fields is the most important habitat for this species in Slovenia. However, since pesticides are used in high quantity which is harmful for invertebrates (food for Lapwings; e.g. Hudson et al. 1994 and references therein) breeding success is questionable. Moreover, farming activities is another risk. In line with this I must mention the adaptation

of Lapwings which put the nest in the line of cereals and not between them (Vogrin 1998c). In such a way the Lapwing prevents damage to the eggs from different machines.

Breeding on the improved meadows (intensive manure meadows, grass mostly used for silage) was not detected. This is certainly because tall grass reduces feeding efficiency (e.g. Baines 1990, Hudson et al. 1994). Densities of Lapwing on various habitats is presented in Table 5. It seems that there is no difference between natural and secondary habitats, whereas some other authors (e.g. Baines 1988) found higher densities on unimproved grasslands.

#### *Gallinago gallinago*

The Snipe is a rare breeding species concentrated mainly in three areas: Ljubljansko barje, Cerknica lake and Jovsi meadows near river Sotla where up to 15 (Trontelj 1994), up to 7 (Polak 1993) and up to 6 (Trontelj & Vogrin 1993) pairs were estimated. Recently, one of the last wet meadows in NE Slovenia (155 ha), the last Snipe breeding site in this part of the country, was flooded and changed into reservoir (Vogrin 1996b).

#### *Scolopax rusticola*

The Woodcock is one of the less known waders. Quantitative data exist only in Trontelj (1994) for Ljubljansko barje (160km<sup>2</sup>) with about 80 "pairs".

#### *Limosa limosa*

The Black-tailed Godwit is an extremely rare breeder.

It was found only in 1990 at Cerknica lake where one pair was found (Geister 1995), but the data is questionable.

#### *Numenius arquata*

The Curlew is the rarest wader which breeds regularly. The only regular site is Ljubljansko barje, where 60 years ago up to 21 pairs were breeding (Geister 1995a). Today, this most southern population in Europe counts only seven pairs (Trontelj 1994).

#### *Tringa totanus*

The first confirmed breeding of the Redshank comes from Cerknica lake in 1985 (Šere 1985). According to Schiavuzzi (1882, 1883) in Geister (1995a) this species was breeding also in Secovlje salina in the 19th century.

#### *Tringa ochropus*

First confirmed breeding of the Green Sandpiper was in 1980. That year adults with fledglings were observed in gravel pit near Ptuj in NE Slovenia (Štumberger 1980).

#### *Tringa glareola*

Breeding of Wood Sandpiper was first confirmed in 1997 when an adult bird with two young was observed on a peat bog at 1510 m above sea level (approximately 46°29'N, 15°19'E) on Mt. Pohorje (Vogrin in print). According to Väisänen (1997) this was the most southern breeding place in Europe.

Table 5. Lapwing *Vanellus vanellus* densities on different habitats in Slovenia. *Tätheter av tofsvipa i olika biotoper.*

Habitat <i>Biotop</i>	Area (ha) <i>Areal (ha)</i>	Density (pairs/10 ha) <i>Täthet (par/10 ha)</i>	Source <i>Källa</i>
Meadows <i>ängsmark</i>	25	up to 7.2	Tome 1998
Fields with maize <i>majsfällt</i>	5	4	Vogrin 1998c
Field with maize <i>majsfällt</i>	7.4	2.7	Vogrin 1998c
Field with maize separated with grass strips <i>majsfällt skilda av gräszon</i>	24	3.8	Vogrin 1998c
Field with sugar beet <i>sockerbetor</i>	15	9.3	Vogrin 1998c
Field with sugar beet <i>sockerbetor</i>	4.7	6.4	original
Field with sugar beet <i>sockerbetor</i>	30	5.3	original
Empty pond <i>tömd damm</i>	13.5	up to 5.2	original

## *Actitis hypoleucos*

The main habitat of the Common Sandpiper in Slovenia is rivers and streams with exposed shingle and various vegetation cover. However, it nests also in gravel pits (Vogrin 1994, Bracko 1997) and at reservoirs (Geister 1995a). Little data is available about densities. On the confluence of the rivers Sava and Trziška Bistrica (about 250 ha), Geister (1995b) found up to seven pairs (0.3 pairs/10 ha) and along 3 km of river Savinja near Zalec in Lower Savinja valley I found 2 pairs (0.7 pairs/km). As elsewhere (e.g. Yalden 1992), the species shows a great sensitivity to habitat alteration and environmental change and especially, as in Slovenia, to human disturbance e.g. recreation, fishing activities and gravel excavations.

## Acknowledgements

Thanks to all who send me the literature.

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## Sammanfattning

### Häckande vadare i Slovenien

I Slovenien har vadarnas förekomst utanför häckningstiden fått mest uppmärksamhet, medan deras förekomst under häckningstiden är dåligt dokumenterad. I denna uppsats ger jag en översikt baserad främst på en litteraturgenomgång.

Slovenien ligger i Centraleuropa mellan Italien, Österrike och Ungern och är ett av de yngsta och minsta av Europas länder. Arealen är 20.256 kvadratkilometer och det finns två miljoner innevånare. Fyra landskapstyper möts, nämligen den alpina, dinariska, pannoniska och mediterrana. Landets halva areal utgörs av skog och 23% av jordbruksmark (Tabell 1). Efter andra världskriget har jordbruket intensifierats med ökande tillskott av konstgödsel och bl.a. ökande areal av majs (Tabell 2). Det har också skett dikning av tusentals hektar våtmarker, särskilt under sextio- och sjuttiototalen. Naturliga våtmarker är den mest hotade naturtypen i Slovenien. Blott till en ringa del har de naturliga våtmarkernas funktion övertagits av talrika vattenreservoarer och en del fiskdammar. En del av fiskdammarna är numera viktiga refugier för fågelfaunan. Ett våtmarksområde, Secovlje salina, är skyddat som "landskapspark" och Ramsarområde.

Under 1800-talet häckade minst nio vadare i Slovenien. Enligt en sammanställning (Krešič & Šošteršič 1963) häckade 13 arter i mitten av 1900-talet. Dock är det osannolikt att några av dem verkligen gjorde det, t.ex. gluttonäppa och dubbelbeckasin,

och en senare sammanställning tog bara upp sex arter som häckfåglar. En sammanställning för olika tidsperioder finns i Tabell 3. Sammanfattningsvis finns det i dag 13 vadare som häckat i Slovenien, varav 7 är regelbundna häckfåglar.

*Stytlöparen* häckade första gången 1990 vid kusten. Beståndet var maximalt 32 par 1995, men det sjönk till 8 par 1997. En häckning har noterats i inlandet vid ett sockerbruk.

*Tjockfoten* dog ut som häckfågel under 1980-talet, men fanns tidigare på flera lokaler längs floder fram till andra världskriget.

*Mindre strandpiparen* finns dels på naturliga grusstränder längs floder, dels i människoskapade miljöer, där mer än halva beståndet finns. Så mycket som 20% häckar på åkrar. Trots detta minskar beståndet, dock nästan uteslutande i de naturliga miljöerna.

*Svartbenta strandpiparen* häckar bara vid kusten. Den viktigaste lokalen är Seclovlje salina, där beståndet ökat (Figur 1).

*Tofsvipan* har uppskattats till 2000–3000 par, men mina egna undersökningar pekar på ett mindre bestånd, 1500–2000 par. Tofsvipan är i dag vanligare än förr. Exempelvis kunde jag notera 250–300 par på ett område där det för 75 år sedan bara fanns 20 par. Arten har börjat häcka på åkrar i relativt sen tid och som i andra länder föredrar den vårsådda fält men finns också på fält med sockerbetor, majs och pota-

tis. Beståndet på våtare ängsmarker har minskat i takt med att dessa omvandlats till åkrar. I dag häckar över 80% av beståndet på åkrar. Täthetsuppgifter i olika biotoper finns i Tabell 5.

*Enkelbeckasinen* är sällsynt och finns bara på ett fåtal lokaler. En av de sista våtmarkerna i nordöstra Slovenien, där arten fanns, har nyligen omvandlats till en vattenreservoar.

*Morkullans* bestånd är okänt. Endast en täthetsuppgift finns, nämligen 80 ”par” inom 160 kvadratkilometer.

*Rödspoven* har bara häckat en gång, 1990 vid Cerknicasjön.

*Storspoven* är den sällsyntaste vadaren som häckar regelbundet. Den enda säkra lokalen är Ljubljansko barje, där det fanns 21 par för 60 år sedan men där det nu bara finns 7 par. Detta är Europas sydligaste lokal för storspoven.

*Rödbenan* häckade för första gången 1985 och det finns också häckningsuppgifter från 1800-talet.

*Skogssnäppan* häckade första gången 1980.

*Grönbenan* häckade första gången 1997 på en torvmosse, och detta lär vara det sydligaste häckningsfyndet i Europa.

*Drillsnäppan* häckar längs vattendrag och i vattenfyllda grustag och reservoarer. Få täthetsuppgifter finns: 7 par på 3 km och 2 par på 3 km flodsträcka.