

Population and ecology of the White-tailed Eagle (*Haliaeetus albicilla*) and its conservation status in Slovenia

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Abstract: In Slovenia, the White-tailed Eagle (*Haliaeetus albicilla*) reaches the south-western limit of its distribution in Europe. Its status in Slovenia changed significantly throughout the last 250 years, especially at the end of 20th century when the first breeding was confirmed. At the beginning of the 90ies, the size of the breeding population was estimated at 1–3 pairs, but after several new discoveries at the beginning of the 21st century, new estimates amount to 8–11 breeding pairs. The wintering population is still increasing with an annual increase of $9,7 \pm 4,9\%$ according to data obtained during the winter waterbird censuses. The species is more abundant in E than in W Slovenia. Characteristic for the country are mountainous breeding territories, which are situated in large forest complexes, but usually near large lakes or rivers. In winter, White-tailed Eagles are frequently present at large water bodies with high abundances of waterbirds, and the wintering areas of the species correspond well with its breeding grounds. In Slovenia, the White-tailed Eagle is officially protected since 1921, however, the main listed threats are illegal hunting, tourism, and intensive logging.

Key words: *Haliaeetus albicilla*, Slovenia, status, distribution, population size, breeding biology, seasonal dynamics, population dynamics, trend, foraging biology, conservation.

Introduction

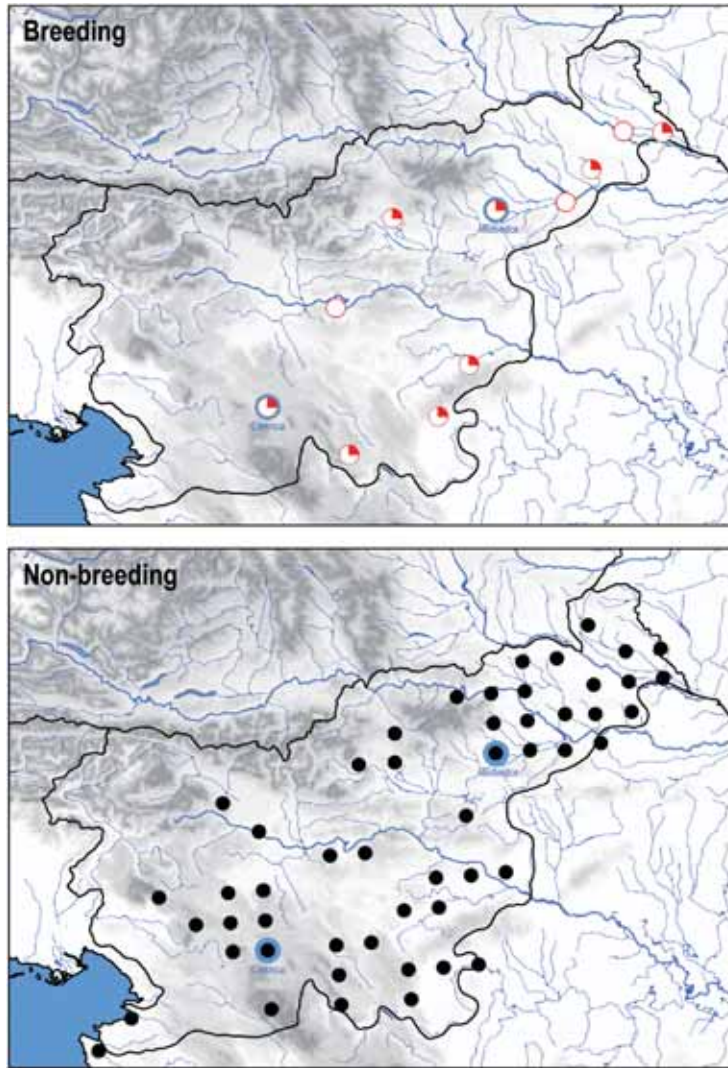
In Slovenia, the White-tailed Eagle (*Haliaeetus albicilla*) reaches the south-western limit of its distribution in Europe (MEBS & SCHMIDT 2006). Through historical times the species was always considered rare in Slovenia, confined mainly to the eastern part of the country (GEISTER 1995). For the territory of Slovenia, the species was firstly mentioned by SCOPOLI (1769) as *Falco pygargus* (GREGORI 2008). Although this name had been previously used by LINNAEUS (1758) for Montagu's Harrier (*Circus pygargus*), Scopoli's other national synonyms cited reveal that it refers to the White-tailed Eagle (cf. cited German names: Weiskopf, Gelbschnabel, Weisgeschwänzter Adler). According to available sources, the White-tailed Eagle was confined to the northern mountainous part of Slovenia both in the 18th and 19th century (SCOPOLI 1769, FREYER 1842). From those sources it is not clear if the species really bred in Slovenia at those times. However, it appears that it was rare since there are very few reports about shot birds mainly from the non-breeding period (ANONYMOUS 1838, DESCHMANN 1856).

From the beginning until the mid-20th century, the White-tailed Eagle was not mentioned among the breeding birds of Slovenia (PONEBŠEK & PONEBŠEK

1934, MATVEJEV & VASIĆ 1973) and was considered as a very rare migrant bird (SAJOVIC 1912, REISER 1925). At the end of the 20th century, the occurrence of the species became more regular during both the non-breeding and breeding period (SOVINC 1994, GEISTER 1995). Till the end of the 20th century, at least three potential breeding sites were recorded – two in southern montane forests and one in lowlands by the Drava River – but only one nest was found (GEISTER 1995, POLAK 2000). In that period, regular winter observations were known from Lake Cerknica (central Slovenia) and from large accumulations on the river Drava in NE Slovenia (KMECL & RIŽNER 1993, SOVINC 1994, BRAČKO 1997). From other areas, observations were recorded only occasionally (e.g. BRAČKO 1986, 1987, ERMAN 1987, PERUŠEK 1987, GREGORI 1992, BOŽIČ 1990, 1994, RUBINIČ 1995, KOČEVAR 1998, GREGORI & ŠERE 2005, VOGRIN 2005, TOME et al. 2005, SOVINC 2006). In the 21st century, several new nests were found (e.g. FIGELJ 2007) and also the awareness about species protection measures took place more seriously (HUDOKLIN 2008).

From this short historical overview it is evident that the status of the White-tailed Eagle in Slovenia changed significantly throughout the last 250 years, especially at the end of the 20th century. Breeding was

Fig. 1: Breeding distribution of the White-tailed Eagle (*Haliaeetus albicilla*, above) and distribution during the non-breeding period (September–January, below) in Slovenia. — Brutverbreitung (oben) und außerbrutzeitliche Verbreitung (September–Januar, unten) des Seeadlers in Slowenien.



Base Map – Slovenia

Data: 1991–2009

White-tailed Eagle
(*Haliaeetus albicilla*)

- breeding possible
- 1 breeding pair
- non-breeding
- Lake / reservoir

Universal Transverse Mercator
Cell size: 10 x 10 km

confirmed in the 80ies of the 20th century (POLAK 2000) from which time on a gradual increase of the Slovenian population was noticed. The aim of this paper is to review the current knowledge of the species' status in Slovenia based on studies and observations from the last 30 years when the species was more regularly present. We analyse the species' breeding and non-breeding distribution, population and seasonal dynamics as well as nest and habitat features and foraging characteristics at its distribution limit in Slovenia.

Methods

No systematic survey of the White-tailed Eagle breeding population in Slovenia has been done yet, therefore only data of more or less occasional observations exist. For the present study we collected all available published and unpublished data on the White-tailed Eagle occurrence in Slovenia in order to determine (1) the breeding population size and distribution,

(2) the non-breeding distribution, (3) feeding biology, and (4) conservation status. More detailed data on breeding success, nest and breeding habitat characteristics were collected from some nests found. In order to assess the breeding distribution and to estimate the size of the Slovenian breeding population, a breeding territory was considered as confirmed if either a used nest was found or if a pair with juveniles was observed between May and November. If an adult pair was observed several times within the breeding period (February – June) or shortly before (January), we considered the area as possible breeding territory. The seasonal dynamics of occurrence were investigated at two feeding areas of the White-tailed Eagle in Slovenia, Cerknica lake (central Slovenia) and Medvedce accumulation (NE Slovenia) with systematic surveys all year around.

The only systematic monitoring of the White-tailed Eagle population is conducted within the scope of the International Waterbird Census (IWC). The wintering

population was thus regularly censused in January from 1997 to 2008 on all large waterbodies in Slovenia divided into seven count areas: (1) river Mura, (2) river Drava, (3) river Savinja, (4) Upper Sava River, (5) Lower Sava River, (6) Notranjska & Primorska area, and (7) the sea coast (ŠTUMBERGER 1997). IWC data were obtained from annual reports (ŠTUMBERGER 1997, 1998, 1999, 2000, 2001, 2002, 2005, BOŽIČ 2005, 2006, 2007, 2008). For the analysis of the IWC survey data and trend estimates of the White-tailed Eagle wintering population in Slovenia we used the statistical modelling program TRIM 3 (PANNEKOEK & VAN STRIEN 2005). The 'linear trend' modelling facility was selected using a stepwise selection of changepoints, and overdispersion and serial correlation were taken into account. To measure the correlation between White-tailed Eagle abundance and the abundance of waterbirds, its potential prey, we used the non-parametric Spearman correlation coefficient. We tested for correlations with regard to the abundance of all waterbird species counted in each count area each season as well as regarding some of the most abundant species, i.e. Great Cormorant (*Phalacrocorax carbo*), Mute Swan (*Cygnus olor*), Mallard (*Anas platyrhynchos*), Coot (*Fulica atra*), and Black-headed Gull (*Larus ridibundus*).

Results and Discussion

Breeding distribution and biology

The White-tailed Eagle was considered a non-breeding guest in Slovenia till the 1980ies (PONEBŠEK & PONEBŠEK 1934, MATVEJEV & VASIĆ 1973) when the first nest was found in the Kočevska region in S Slovenia (POLAK 2000). The nest was later destroyed, however, a new nest was established in the same breeding territory which was discovered in 1993. At the end of the 20th century, the Slovenian breeding population was estimated at 1–2 pairs (GEISTER 1995) or 1–3 pairs (BIRDLIFE INTERNATIONAL 2004). At the beginning of the 21st century, four new breeding sites (with nests) and two additional occupied territories (as indicated by observations of juvenile birds along with adults) were discovered (POLAK 2000, KERČEK 2005, FIGELJ 2007, BORDJAN in press, unpubl. data). According to the current breeding distribution of the White-tailed Eagle in Slovenia we estimate the breeding population size at 8–11 pairs (fig. 1). Although most confirmed breeding pairs originate from the period 2004 to 2009, we suspect that most pairs in known breeding localities had already begun to breed before, in the period from 1974 to 2000 (ERMAN 1987, GREGORI 1992, POLAK 1993, SOVINČ & ŠERE 1994, ŠTUMBERGER 1995, SENEGAČNIK et al. 1998, M. CERAR pers. comm.). Another pair breeds near the Slovenian-Hungarian border at Örség National Park in

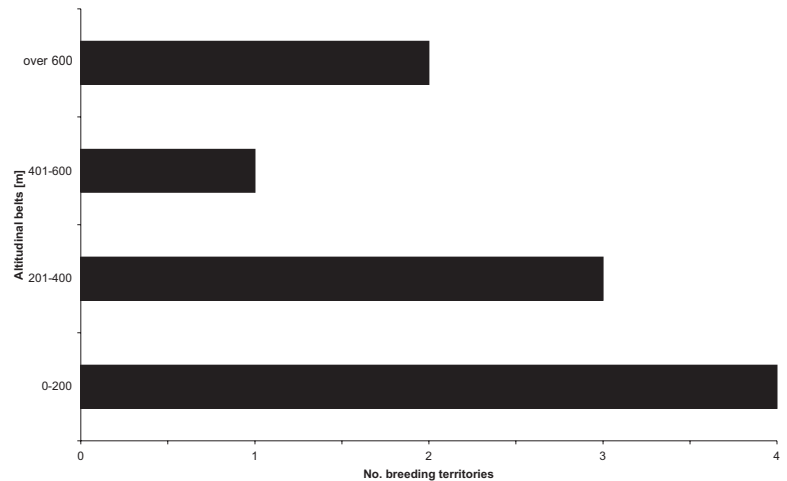


Fig. 2: Altitudinal distribution of White-tailed Eagle (*Haliaeetus albicilla*) breeding territories in Slovenia (N = 10). — *Altitudinale Verbreitung von Brutrevieren des Seeadlers in Slowenien (N = 10).*



Fig. 3: A special characteristic of the Slovenian White-tailed Eagle (*Haliaeetus albicilla*) population are breeding territories in montane forests, e.g. in a Dinaric Beech forest with Fir (*Omphalodo-Fagetum* s.lat.) above 600 m a.s.l. (Photo: Mirko Perušek) — *Ein spezielles Charakteristikum der slowenischen Seeadlerpopulation sind in Bergwäldern gelegene Brutreviere, z.B. in einem Buchenwald mit Tanne in den Dinariden, mehr als 600 m über dem Meeresspiegel.*

Hungary (SAMWALD & GRUBER in this volume), but the nest is around 6 km away from the border and the breeding territory is established more or less only on the Hungarian side (O. SAMWALD pers. comm.). Although White-tailed Eagles occur at the nearby Goričko area in Slovenia, especially on Ledavsko jezero (BRAČKO 1986, SAMWALD & GRUBER in this volume), these sightings are rare and therefore, that pair is not considered part of the Slovenian breeding population. Nevertheless, the Slovenian breeding population of the White-tailed Eagle is apparently increasing as also indicated by the in-



Fig. 4: Beech (*Fagus sylvatica*) is the most frequent nest tree of White-tailed Eagles (*Haliaeetus albicilla*) in Slovenia, especially in montane breeding eagles, e.g. in the southern Dinaric region. (Photo: Mirko Perušek) — Die Buche ist der häufigste Brutbaum von Seeadlern in Slowenien, vor allem unter montan brütenden Adlern, wie z.B. in den südlichen Dinariden.

creasing number of birds observed in winter (see chapter 'seasonal and population dynamics'). Before the recent large increase in the breeding population White-tailed Eagles were rare also during winter time (SOVINČ 1994) despite the relatively large breeding population in nearby Croatia (RADOVIĆ et al. 2003).

Whereas the first confirmed nest was found in the Dinaric region in the southern part of the country, the majority of breeding territories today are situated in NE and E Slovenia, where there are probably four to seven territories (fig. 1). Territories of those pairs are situated below 250 m a.s.l. which is considerably lower than those in the rest of the country, which are located at elevations above 400 m a.s.l. (fig. 2). In Europe White-tailed Eagles generally avoid mountainous regions and areas with extensive forest cover (CRAMP 1987). On the contrary, at least three to four territories in Slovenia are confined to mountainous forested areas, and both territories (nests) in the southern Dinaric region are situated above 600 m a.s.l. Only one nest was so far found in a montane forest situated at 650 m a.s.l. (S Slovenia). However, in the 18th and 19th century the White-tailed Eagle was known only as a bird of mountainous areas although at that time in N Slovenia (SCOPOLI 1769, FREYER 1842). These data show that at the limit of its distribution the White-tailed Eagle is able to expand its range also to mountain forest areas if there are good foraging areas present, e.g. large lakes or rivers (fig. 3).

All of the six nests found in Slovenia were built between 20 and 35 m above the ground. Three are places on Beech (*Fagus sylvatica*; fig. 4), two on Pedunculate Oak (*Quercus robur*; fig. 5), and one on Norway Spruce (*Picea abies*). According to the altitude the forest structure of the breeding habitat differs greatly among territories, but most of the nests were found in montane Dinaric Beech forest with Fir (*Omphalodo-Fagetum* s.lat.) and lowland Oak forest (*Quercetum*). All breeding territories are more or less near larger water bodies; three near lakes, water reservoirs and fish ponds, six near larger rivers and two breeding territories contain both, larger rivers and lakes.

Breeding success was monitored only at two nests. In the mountainous southern Dinaric region at Kočevsko one to three young were in the nest annually



Fig. 5: A White-tailed Eagle (*Haliaeetus albicilla*) nest with one young discovered in 2005 in a lowland forest of Pedunculate Oak (*Quercus robur*) in the Subpannonian region in eastern Slovenia. (Photo: Tomaž Mihelič) — Ein 2005 entdecktes Seeadlernest mit einem Jungvogel in einem Stieleichenwald in der subpannonischen Region Ostsloweniens.

between 1993 and 2000, on average $1,25 \pm 0,97$ (in 1993 2 young, in 1994 3 young and 2 fledged, in 1995 1 young, in 1996 2 young, in 1997 1 young, in 1998 no young, in 1999 1 young, in 2000 nest deserted due to disturbance, for details see chapter 'conservation'). In the lowland nest in the Subpanonian region so far only one young was observed annually in the period 2005 to 2008 (fig. 5). The collected data corresponds to the general breeding success across the species' European range (e.g. CRAMP 1987, MEBS & SCHMIDT 2006).

Seasonal and population dynamics

In the non-breeding period (September–January) the White-tailed Eagle is distributed over the whole territory of Slovenia, missing only in alpine NW Slovenia (fig. 1), despite the species being recorded in the nearby alpine regions of Italy and Austria on migration (GENERO 2006, Probst in FELDNER et al. 2008). Also during the non-breeding period the birds were mostly observed in known breeding territories (92% of observations) and rarely elsewhere (8% of observations; $N = 390$). This proportion is expected since in southern regions, breeding adults are mostly sedentary and leave their breeding ground only when their main hunting water bodies freeze, in which case they move to the nearest larger water body that is not frozen (CRAMP 1987), and this also applies to young birds. The species has been observed also at the sea coast, but very rarely with only two known records so far (RUBINIČ 1995, T. MIHELIČ unpubl.). In general the eagles are much more common in the eastern than in the western part of Slovenia (fig. 1, see also fig. 9), except for lake Cerknica (central Slovenia), which is located within the territory of a breeding pair (fig. 6). At foraging sites inside of breeding territories, White-tailed Eagles are present more or less continuously all year round both in the western (e.g. Cerknica lake; fig. 7) as well as in the eastern part of Slovenia (e.g. accumulation Medvedce; fig. 8).

Tab. 1: Prey species of the White-tailed Eagle (*Haliaeetus albicilla*) compiled from occasional field observations in the breeding (B) and non-breeding season (N). — *Beutetiere des Seeadlers nach Zufallsbeobachtungen in (B) und außerhalb (N) der Brutsaison.*

Prey group	Prey species	Season
Pisces		B, N
Aves	<i>Phalacrocorax carbo</i>	N
Aves	Ardeidae	N
Aves	Anatidae	B, N
Aves	<i>Fulica atra</i>	B
Mammalia	<i>Lepus europaeus</i>	B, N
Mammalia	<i>Erinaceus concolor</i>	B
Mammalia	<i>Vulpes vulpes</i>	B
Carrion		N

In the winter period, December to January, adult birds (59,7%) predominate over immatures (40,3%) in the population in Slovenia ($n = 72$). In winter, the eagles were mostly observed near larger water bodies, most frequently at the rivers Drava, Mura and Lower Sava, and at Lake Cerknica. Over the 12-year period from 1997 to 2008, the wintering population of the White-tailed Eagle fluctuated greatly according to the IWC data (fig. 9). Previously, the wintering population was estimated at 5–8 birds (SOVINC 1994). According to recent IWC surveys the number of wintering eagles oscillates between 0 and 11 birds (tab. 2). Using the linear trend model (goodness of fit: $\chi^2 = 59,5$, $df = 49$, $p = 0,20$), we estimate that the winter population is moderately increasing by $+9,7 \pm 4,9\%$ annually (overall slope model: $p < 0,05$). The recorded trend and its extent corresponds to the overall positive trend of the species in Europe (BIRDLIFE INTERNATIONAL 2004, SAUROLA 2008). Since White-tailed Eagles are supposed to be mostly sedentary in southern regions, we speculate that mainly birds from breeding pairs are counted in winter surveys (see also tab. 3). Therefore, the estimated trend may provide a good estimation also for the Slovenian breeding population.

Tab. 2: Estimates of the Slovenian winter population numbers of the White-tailed Eagle (*Haliaeetus albicilla*) and some waterbird species – potential eagle prey – for the period 1997–2008, and their abundance in correlation with White-tailed Eagle abundance (r – Spearman correlation coefficient). — *Geschätzte Größe der slowenischen Winterpopulation der Seeadlers und einiger Wasservogelarten, der potentiellen Beute des Seeadlers, 1997–2008, und deren Dichte in Korrelation mit der Dichte des Seeadlers (r – Korrelationskoeffizient nach Spearman).*

Species	Slovenia	Abundance per count area per year		Correlation with White-tailed Eagle abundance	
	Population size	Median	Q1 – Q3	r	p
<i>Haliaeetus albicilla</i>	$5 \pm 3,6$	0	0–1	–	–
<i>Phalacrocorax carbo</i>	3.286 ± 544	345	175–622	0,32	<0,01
<i>Cygnus olor</i>	991 ± 511	61	12–202	0,47	<0,0001
<i>Anas platyrhynchos</i>	21.500 ± 5.189	1.935	1.014–3.299	0,46	<0,0001
<i>Fulica atra</i>	5.988 ± 1.734	522	256–1.092	0,08	ns
<i>Larus ridibundus</i>	4.454 ± 1.556	39	6–1.041	0,21	ns
All waterbirds	50.644 ± 8.020	4.598	2.991–7.716	0,28	<0,05

Tab. 3: Percentage of observed White-tailed Eagles (*H. albicilla* (W)) and waterbird species that showed a significant positive correlation with White-tailed Eagle abundance counted during the International Waterbird Census (1997–2008) at seven count areas in Slovenia. For comparison, the percentage of White-tailed Eagle breeding territories (*H. albicilla* (B)) in those areas is given. — *Prozentualer Anteil von im Zuge der Internationalen Wasservogelzählung (1997–2008) beobachteten Seeadlern (*H. albicilla* (W)) und von Wasservogelarten, die einen signifikanten Zusammenhang mit der Seeadlerdichte aufwiesen, an sieben Zählpunkten in Slowenien. Zum Vergleich ist der Prozentsatz von Brutrevieren des Seeadlers (*H. albicilla* (B)) in diesen Gebieten angeführt.*

Species	Eastern Slovenia					Western Slovenia				N
	Drava	Mura	Savinja	Lower Sava	Total	Upper Sava	Notranjska & Primorska region	Sea Coast	Total	
<i>H. albicilla</i> (B)	30,0	20,0	10,0	30,0	90,0	0,0	10,0	0,0	10,0	10
<i>H. albicilla</i> (W)	50,0	20,0	0,0	13,3	83,3	3,4	13,3	0,0	16,7	60
<i>Phalacrocorax carbo</i>	38,2	8,7	8,6	22,6	78,1	11,6	2,9	7,4	21,9	39.973
<i>Cygnus olor</i>	49,8	16,6	3,7	19,1	89,2	9,5	1,2	0,1	10,8	12.123
<i>Anas platyrhynchos</i>	45,2	11,4	6,9	9,4	72,9	16,2	7,5	3,4	27,1	258.006
All waterbirds	45,6	7,2	5,2	8,7	66,7	11,2	5,4	16,7	33,3	607.731

Foraging and remarks on feeding biology

Prey intakes by White-tailed Eagles in Slovenia have so far been recorded only by occasional observations of hunting birds or by analysing prey remains found under nest trees (tab. 1). The most commonly recorded prey are fish and waterbirds, e.g. Great Cormorant, Garganey (*Anas querquedula*) and Coot, which are usually taken on large lakes or rivers (e.g. POLAK 1993, RUBINIČ 1993, this study). Mammal prey up to the size of Red Fox (*Vulpes vulpes*) has been recorded only in the breeding period especially among prey remains under nest trees. Montane breeding birds have been observed feeding on carrion provided at feeding sites for Brown Bear (*Ursus arctos*) in the winter. In large montane forest areas with relatively small water bodies,

which are mostly frozen in winter, carrion and mammal prey are probably the most important food sources for sedentary territorial birds.

In winter, White-tailed Eagles are frequently present at large water bodies (fig. 10). They select areas with significantly higher abundances of waterbirds, especially areas with large numbers of Anatidae species (e.g. Mute Swan, Mallard) and Great Cormorants (tab. 2). We connect that to the species' optimal foraging strategy to select areas rich in prey (PYKE 1984). Therefore, waterbird numbers can be used as direct or indirect indicator of White-tailed Eagle foraging site quality. Anatidae species generally are very important prey and thus represent potential prey of the White-tailed Eagle (see e.g. MEBS & SCHMIDT 2006). The presence of large

Fig. 6: The westernmost breeding territory of the White-tailed Eagle (*Haliaeetus albicilla*) in Slovenia contains the large and food-rich foraging area of Lake Cerknica. (Photo: Dejan Bordjan) — *Das westlichste Brutrevier des Seeadlers in Slowenien umfasst die ausgedehnten, nahrungsreichen Flächen des Cerknica Sees.*



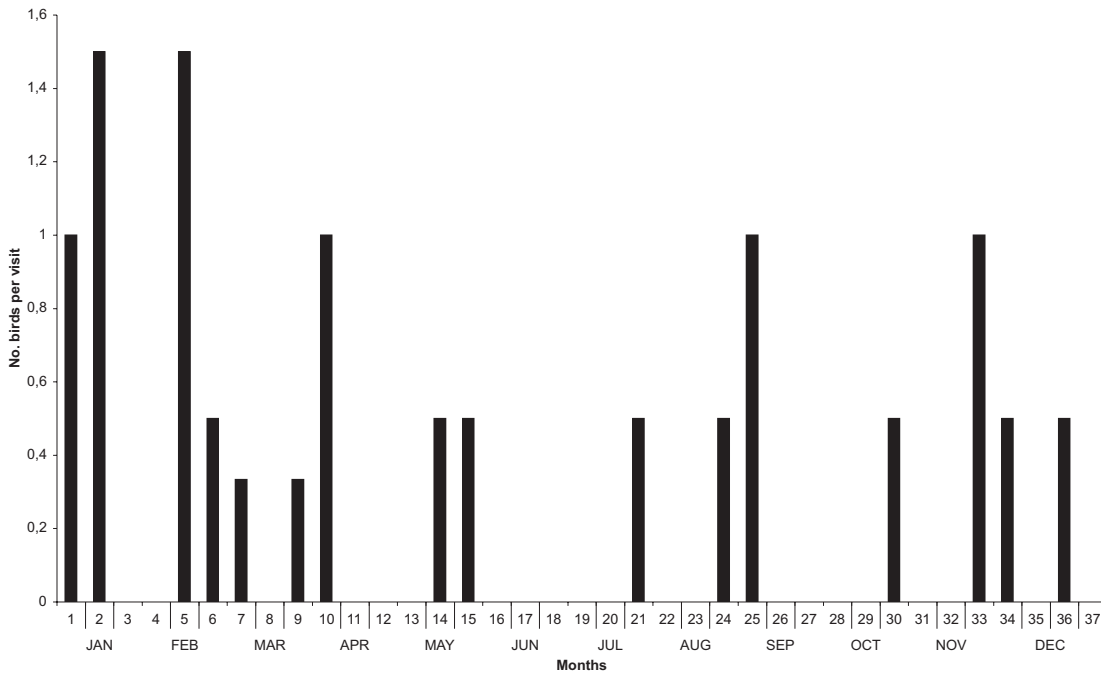


Fig. 7: Seasonal dynamic of the White-tailed Eagle (*Haliaeetus albicilla*) at Cerknica Lake (C Slovenia) in decades in 2007. — Saisonale Dynamik des Seeadlers am Cerknica-See (Z Slowenien) in Dekaden im Jahr 2007.

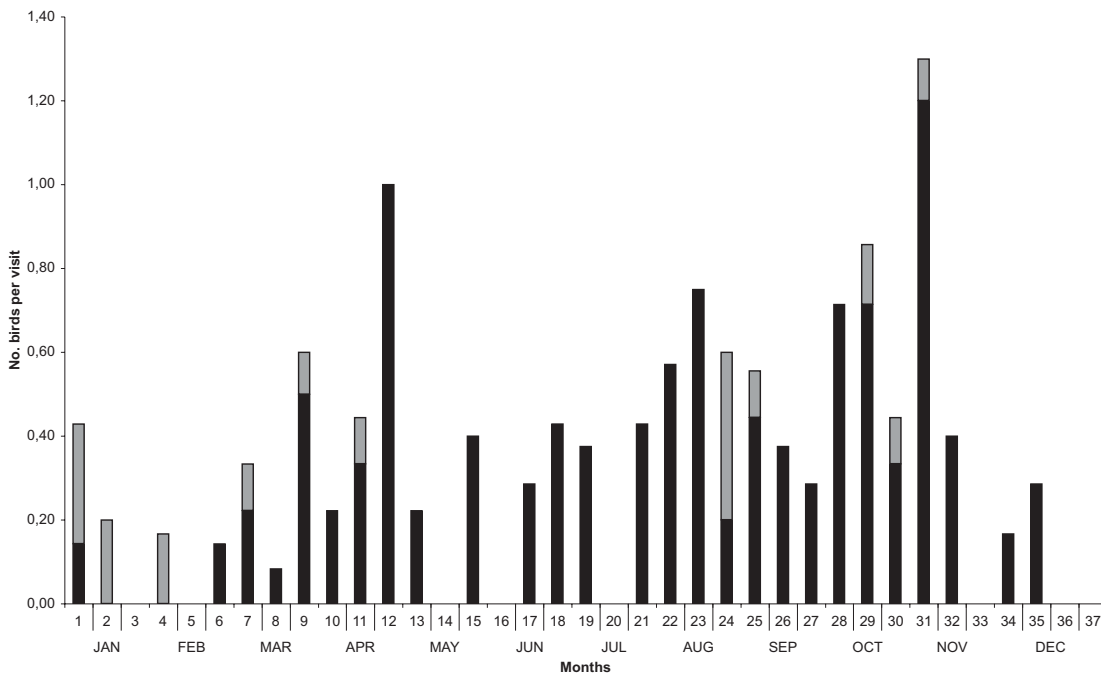


Fig. 8: Seasonal dynamic of the White-tailed Eagle (*Haliaeetus albicilla*) at Medvedce reservoir (E Slovenia) in decades for the period 2002–2007. Black columns for adults, grey columns for immature birds. — Saisonale Dynamik des Seeadlers am Medvedce-Stausee (O Slowenien) in Dekaden für die Periode 2002–2007. Schwarze Balken – Adultvögel, helle Balken – immature Vögel.

numbers of Great Cormorants, however, could indirectly indicate areas rich in fish – although Cormorants themselves can also be preyed upon or at least kleptoparasitised by the White-tailed Eagle (tab. 1; see also PROBST in this volume).

The winter abundance of White-tailed Eagles in different regions of Slovenia corresponds well to the actual distribution of breeding territories ($\chi^2=4,52$, $p>0,05$; tab. 3). Winter feeding conditions thus seem to be very important for the species' breeding habitat selection and also for areal expansion. The best breeding conditions

for the White-tailed Eagle in Slovenia are given in the eastern part of the country in the basins of the rivers Drava (fig. 11) and Lower Sava, but in the western part of Slovenia only the Notranjska region is important due to the large and food-rich Lake Cerknica.

Conservation

Already at the beginning of the 20th century (1921), the White-tailed Eagle became fully protected in Slovenia, although the species was not considered a breeding bird at that time (BEUK 1920, PONEBŠEK & PONEBŠEK

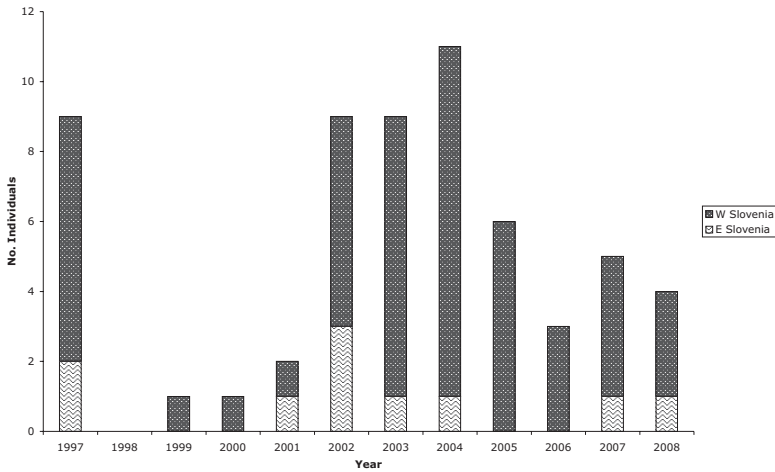


Fig. 9: Population dynamics of wintering White-tailed Eagles (*Haliaeetus albicilla*) in eastern and western Slovenia according to International Waterbird Census data (IWC; 1997–2008). — *Populationsdynamik des Seeadlers im Winter in Ost- und Westslowenien beruhend auf Ergebnissen der Internationalen Wasservogelzählung (1997–2008).*



Fig. 10: White-tailed Eagles frequently forage at large water bodies as for example Cerknica Lake in central Slovenia. (Photo: Dejan Bordjan) — *Seeadler suchen regelmäßig große Gewässer – in der Abbildung der See von Cerknica in Zentralslowenien – zur Nahrungssuche auf.*

1934, VIDIC 1992). The species and its breeding habitat remain protected up to recent times (UR. LIST RS 46/2004). In the Red Data List the species was first considered as endangered (GREGORI & MATVEJEV 1987), later as rare (GREGORI & MATVEJEV 1992) or threatened with extinction (BRAČKO et al. 1994), and nowadays as endangered (UR. LIST RS 82/2002). Up to now the White-tailed Eagle has not been regarded as qualification species of any Natura 2000 site in Slovenia, but at least two known nests are within Natura 2000 sites or Special Protected Areas (SPAs, BOŽIČ 2003). However, at three Natura 2000 sites a special protection is declared for the species (UR. LIST RS 49/2004), and in 2008 the new Important Bird Area (IBA) Črete in NE

Slovenia was declared by DOPPS-BirdLife Slovenia with the White-tailed Eagle as qualification species.

The main threats for the White-tailed Eagle in Slovenia are illegal hunting, tourism, and intensive logging (BRAČKO et al. 1994). Hunting, however, seems to be less important recently since no White-tailed Eagles were found during inspections of taxidermists (LUSKOVEC 1991, LUSKOVEC & HUDOKLIN 1992). There are two recent official records of shot White-tailed Eagles of which both are preserved in the Slovenian Museum of Natural History. The first one from Ljubljansko barje (central Slovenia) was shot in 1976 (SOVINČ 1990), the second was found in 1997 in the vicinity of a breeding site in southern Slovenia. Of the later bird, an adult male, the beak was heavily damaged, blown off, and veterinary inspection revealed that it had died of starvation. Later it was confirmed that the dead bird was not the breeding male but an already wounded bird from somewhere else, perhaps not even from Slovenia. In spite of that illegal and officially not recorded shootings can not be ruled out even if the species has been fully protected for almost 100 years in Slovenia (REISER 1925, M. CERAR pers. comm., Ž. ŠALAMUN pers. comm.).

At least at two breeding sites tourism appeared to be a more serious problem (HUDOKLIN 2008). A nest site in a montane forests in southern Slovenia where White-tailed Eagles bred regularly from the mid-80ties on may serve as an example. In 2000, a photographer observed the nest from close up from February to May (LAVRIČ 2001). From that year on the eagles did not breed anymore in that nest. The adults can still be observed at the lake in the immediate vicinity of the nest every year, but no young birds have been recorded since. Therefore, several protection measures have been taken at recently found nests (HUDOKLIN 2008, M. PERUŠEK unpubl.): (1) the exact location of the nest has been concealed and remained published, (2) nests have been actively protected and regularly inspected during the breeding period, and (3) propaganda for the White-tailed Eagle and its protection has been promoted in order to increase public awareness. These measures were more or less based on voluntary work including people from several organisations and associations, i.e. DOPPS-BirdLife Slovenia, Slovenia Forest Service (ZGS), Institute for Nature Conservation (ZRSVN), local hunters' and foresters' associations and local inspectors for forestry and hunting.

The negative effects of logging on breeding White-tailed Eagle have been direct, by cutting down the nest tree, or indirect, by causing disturbances around the nest during the breeding season. Recently, logging activities in the close vicinity of known nests were time

restricted or prohibited (PERUŠEK 2006) which lowered the negative impact of logging. In the mountain forest region of Kočevsko (S Slovenia), the nest and its surrounding breeding habitat was even declared as a forest reserve by the Slovenia Forest Service. However, illegal logging caused nest desertion at least at one recently found nest in NE Slovenia. Despite the complete prohibition of logging in the near vicinity of the nest by the Slovenia Forest Service, the forest owner cut wood under the nest during the breeding season. Since nest controls were not regular, the disturbance caused the eagles to desert the nest. The owner, however, had to pay a penalty.

The great challenge of White-tailed Eagle conservation in Slovenia is going to be the protection of nest sites, which proved difficult in almost all known nests in the country. Although the breeding population is recently been increasing, it is still very small and highly vulnerable. Only the effective protection of nest-sites and breeding habitat of the species may provide long-term survival of the White-tailed Eagle breeding population in Slovenia. Therefore, future field studies should focus on the systematic search for new nest-sites, based on the regular occurring of adult birds, to provide suitable protection measures for the species. Furthermore, the monitoring of the breeding population should be established to follow the expected distribution expansion of the species at the limit of its areal especially in montane forests which are a less usual habitat of this predominantly lowland raptor in Europe (CRAMP 1987). By comparing the breeding success of lowland and montane breeders it would be possible to ascertain the optimality of the montane forest habitat as well as differences in vulnerability between lowland and montane breeding populations.

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Fig. 11: Large rivers and accumulations, e.g. Ormož accumulation lake on the river Drava (NE Slovenia), with high abundances of wintering waterbirds are very important foraging areas for the White-tailed Eagle (*Haliaeetus albicilla*) in Slovenia. (Photo: Al Vrezec) — *Große Flüsse und Stauseen mit hohen Dichten überwinternder Wasservögel, wie z.B. der Ormož-Stausee an der Drau (NO Slowenien), sind sehr wichtige Nahrungsgebiete für den Seeadler in Slowenien.*

Zusammenfassung

Der Seeadler (*Haliaeetus albicilla*) erreicht in Slowenien die südwestliche Grenze seines europäischen Verbreitungsgebiets. Der Status der Art veränderte sich signifikant im Laufe der letzten 250 Jahre, vor allem am Ende des 20. Jahrhunderts als die erste Brut bestätigt wurde. Zu Beginn der 90er Jahre wurde die Brutpopulation auf 1–3 Paare geschätzt, doch nach mehreren Neuentdeckungen zu Beginn des 21. Jahrhunderts belaufen sich neue Schätzungen auf 7–11 Paare. Die Winterpopulation nimmt weiterhin zu mit – den Ergebnissen der Winter-Wasservogelzählungen folgend – einem jährlichen Zuwachs von $9,7 \pm 4,9\%$. Die Art ist häufiger in Ost- als in West-Slowenien. Charakteristisch für das Land sind Brutreviere in großen Bergwäldern, gewöhnlich in der Nähe von großen Seen oder Flüssen. Im Winter sind Seeadler regelmäßig an großen Wasserflächen mit hohen Wasservogeldichten vertreten, wobei die Überwinterungsgebiete der Art gut mit ihren Brutarealen übereinstimmen. Seit 1921 ist der Seeadler offiziell in Slowenien geschützt, dennoch sind die am häufigsten genannten Gefährdungen die illegale Jagd, Tourismus und intensiver Holzeinschlag.

Povzetek

Populacija belorepca (*Haliaeetus albicilla*) v Sloveniji dosega skrajno jugo-zahodno mejo evropskega areala. V obdobju zadnjih 250 let se je status vrste v Sloveniji drastično spreminjal. V 18. in 19. stoletju naj bi se ta orel pojavljal zgolj v goratih predelih severne Slovenije,

še v začetku 20. stoletja pa je vrsta veljala za izjemno redkega gosta. Šele v 80-tih letih je bilo najdeno prvo gnezdo na Kočevskem in konec 20. stoletja je bila slovenska gnezditvena populacija ocenjena na 1 do 3 pare. Glede na novejša terenske raziskave v začetku 21. stoletja, pa lahko danes ocenjujemo slovensko populacijo na kar 8 do 11 parov. Visok porast pa se poleg gnezditvene odraža tudi pri prezimujoči populaciji, ki glede na zimsko štetja vodnih ptic (IWC) v obdobju 1997–2008 narašča z značilnim trendom povečevanja $+9.7 \pm 4.9\%$ na leto. Ker se ptice tudi v negnezditvenem obdobju oziroma pozimi pojavljajo večji del na znanih gnezditvenih teritorijih, sklepamo da se podoben trend odraža tudi pri gnezdeči populaciji. Večina danes znanih teritorijev belorepca je omejenih na nižinske predele SV in V Slovenije na nižjih nadmorskih višinah pod 250 m. Ostali del populacije pa živi v gorskih gozdovih nad 400 m n.v., v južni dinarski regiji celo prek 600 m n.v., kar je posebnost slovenske populacije belorepca. Do sedaj je bilo najdenih šest gnezd, tri na bukvi (*Fagus sylvatica*), dve na dobu (*Quercus robur*) in eno na smreki (*Picea abies*), pretežno v gorskih dinarskih bukovih gozdovih z jelko (*Omphalodo-Fagetum* s.lat.) in v nižinskih hrastovih gozdovih (*Quercetum*). Vsi znani teritoriji so v bližini večjih vodnih teles, jezer ali rek. V negnezditvenem obdobju so bili belorepci opazovani bolj ali manj po vsej Sloveniji z izjemo skrajnega alpskega SZ dela. Večina opazovanj pa je iz vzhodnega dela Slovenije. Izjema v osrednji Sloveniji je Cerkniško jezero, ki je znotraj gnezditvenega teritorija. Na prehranjevališčih, kakršna sta Cerkniško jezero in vodni zbirnik Medvedce, so belorepci prisotni bolj ali manj prek celega leta. Pozimi so pogostejši na večjih vodnih površinah z velikimi jatami vodnih ptic, še posebej mlakaric (*Anas platyrhynchos*), labodov grbcev (*Cygnus olor*) in kormoranov (*Phalacrocorax carbo*), ki predstavljajo belorepčev potencialni plen. Takšne zgostitve so predvsem na Dravi, Muri, spodnji Savi in na Cerkniškem jezeru. V goratih predelih gnezdeči belorepci so bili pozimi opazovani tudi na mrhoviščih. Na ozemlju Slovenije je belorepec zavarovana vrsta že od začetka 20. stoletja (1921). Danes vrsta ni kvalifikacijska na nobenem Natura 2000 območju, čeprav v vsaj dveh gnezdi, v letu 2008 pa je DOPPS-BirdLife Slovenia razglasil novo IBA območje črete z belorepcem kot kvalifikacijsko vrsto. Glavni dejavniki ogrožanja vrste v Sloveniji so nelegalen lov, turizem in intenzivna sečnja. Za zaščito znanih gnezd je bilo sprejetih več ukrepov, ki so se izvajali bolj ali manj na prostovoljni ravni: (1) zakrite natančne lokacije gnezd, (2) aktivno varstvo gnezd z rednimi kontrolami med gnezditvenim obdobjem in (3) informiranje lokalne javnosti o pomenu in zaščiti gnezda. Veliko gnezd je namreč ogroženih zaradi neposrednih motenj človeka tekom gnezditvene sezone, na primer neprestano nadlegovanja

zaradi fotografiranja ali sečnja v neposredni bližini gnezda. Čeprav gnezditvena populacija belorepca v Sloveniji narašča, gre še vedno za majhno populacijo, pri čemer je učinkovita zaščita gnezd in gnezditvenega habitata ključna za dolgoročno preživetje vrste v Sloveniji. V bodoče bo potrebno zato napore terenskih raziskav usmeriti v odkrivanje novih gnezd ter vzpostaviti učinkovit monitoring populacije tako v nižinskih kot širše zanimivih gorskih predelih.

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