

# Status and breeding biology of the White-tailed Eagle *Haliaeetus albicilla* in former Yugoslavia and in Serbia

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**Abstract:** At the end of the first period of research on the White-tailed Eagle (1985–1991) in former Yugoslavia, 80 active and 30 potential breeding pairs (57 active and 17 potential pairs in Croatia, 23 active and 13 potential pairs in Serbia) were known. During that period, the White-tailed Eagle almost exclusively bred in the floodplain forests along the river valleys of the Danube, Sava, Drava, Kupa, Česma, Ilova, Bosut and Tisa Rivers. Nests were found on six tree species, the majority on Pedunculate Oak and native poplars. A total of 171 young White-tailed Eagle were marked by wing-tags. After 12 years, the population census was repeated in Serbia initiating a new period of research on the White-tailed Eagle. The population grew from 23–36 pairs in 1991 to 80–100 pairs in 2008. The population increase started at the beginning of 1990s is still in progress. Possible causes for this distinct increase are improved feeding conditions due to the construction of carp fishponds and increased breeding within hybrid poplar plantations as well as the higher degree of protection. The distribution pattern of White-tailed Eagles also changed. During the 1990s, the species inhabited floodplains in the Tisa and Tamiš river valleys. From 2000 on, eagles also bred south of the Sava River as well as far away from alluvial forests, in Deliblato Sands and in agricultural areas around Ruski Krstur, Lalić and Srpski Itebej. Most recent data suggest possible breeding in the Drina River canyon.

**Key words:** White-tailed Eagle, *Haliaeetus albicilla*, Serbia, former Yugoslavia, breeding biology, population size.

## 1. Former Yugoslavia (research period 1985–1991)

### Reasons for the initiation and methods of research on the White-tailed Eagle in former Yugoslavia

There are several main reasons for the initiation of research on the White-tailed Eagle in former Yugoslavia: (1) The lack of original data on the size of the breeding population; (2) the lack of data on dispersive movements of young eagles and the presumption that these movements could be monitored by using wing-tags, and (3) the starting of monitoring breeding pairs for their effective protection.

In Serbia, research was started in 1985 by István Hám and Slobodan Puzović. From 1986 on, Croatia was included and Jozef Mikuska and Darko Gec joined the team in Kopački Rit as well as Martin Schneider-Jacoby in the Sava valley. The unofficial coordinator for Croatia was Jasminka Fištrović (Institute of Nature Conservation, Zagreb). During the last year of research (1991), Mirko Šetina was a very important member of the project team. During individual and group surveys of known and potential territories, a total of ca. 500 excursions was made of which the collected data were only partly published (SCHNEIDER-JACOBY 1996).

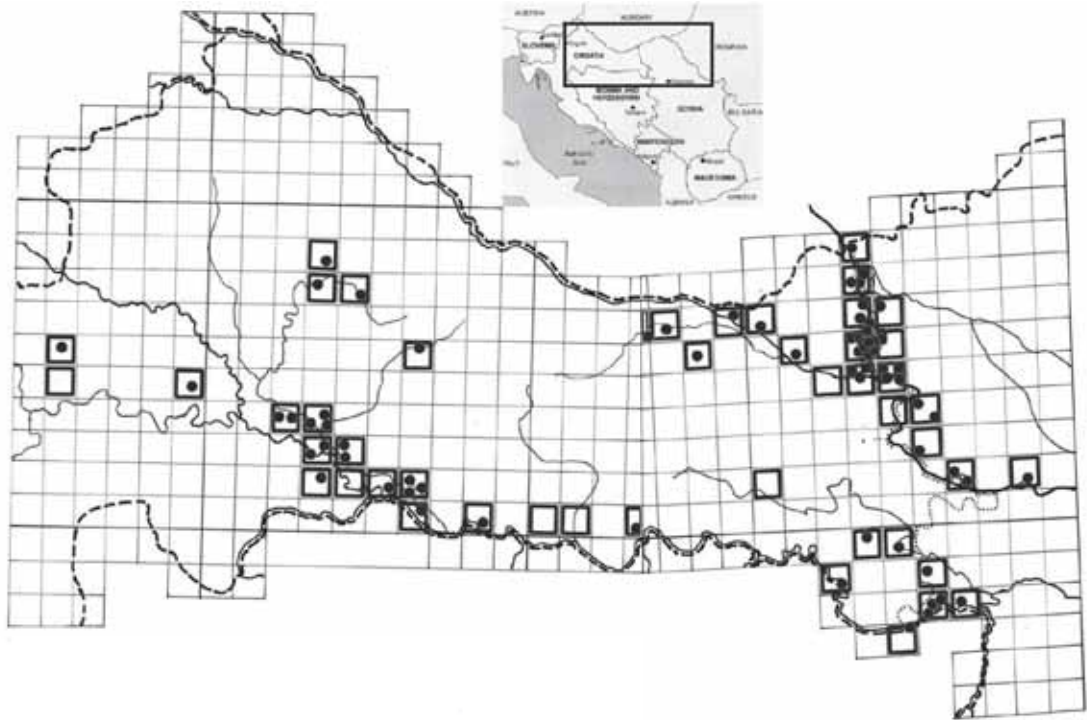
The project never had institutional sponsorship, but was financed by the researchers themselves and, indirectly, by the institutions at which they were employed: Faculty of Biology, Belgrade; Faculty of Pedagogy, Osijek; Jelen Hunting and Forest Estate, Bilje and Belgrade; Republic Institute of Nature Protection, Zagreb; Max-Planck Institut, Vogelwarte Radolfzell, Germany. The only funding for the partial project budget was granted from Guy Robbrecht, vice-president of the Belgian Raptor Conservation Fund (Fonds voor de Instandhouding van Roofvogels, FIR).

### Breeding population and distribution

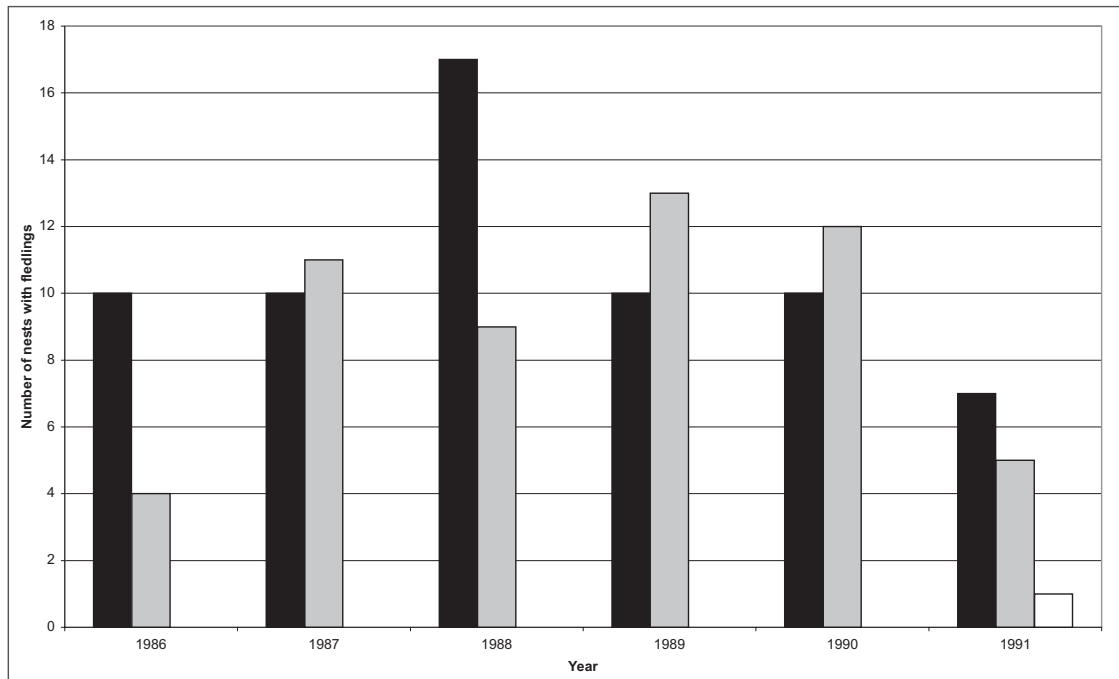
At the end of the 1985–1991 period, 80 active territories and another 30 potential breeding pairs (indications for existing territories were not checked and thus remained unconfirmed) in former Yugoslavia. Out of these, 57 active and 17 potential pairs were in Croatia and 23 active and 13 potential territories in Serbia.

The White-tailed Eagle was found to breed primarily in floodplain forests along the large Pannonian rivers Danube, Sava, Drava, Kupa, Česma, Ilova, Bosut and Tisa (fig. 1).

**Fig. 1:** Distribution of White-tailed Eagle *Haliaeetus albicilla* nests in former Yugoslavia in the period between 1985 and 1991 (UTM grid). Black dots – breeding pairs; squares – potential pairs. —  
Verteilung von Seeadlernestern im ehemaligen Jugoslawien 1985–1991 (UTM Raster). Schwarze Punkte – Brutpaare; Quadrate – potentielle Brutpaare.



**Fig. 2:** Number of White-tailed Eagle fledglings in former Yugoslavia in the period 1986–1991. Black bars – nests with one fledgling; grey bars – nests with two fledglings; white bars – nests with three fledglings. —  
Anzahl flügger Jungadler in Ex-Jugoslawien 1986–1991. Schwarze Balken – Horste mit einem Jungvogel; graue Balken – Horste mit zwei Jungvögeln; Weiss balken – Horste mit drei Jungvögeln.



### Nest trees

The frequency of nests found on particular tree species corresponds with the biogeographical and phytocoenological characteristics of the forest structure in the river valleys. The dominant and at the same time highest trees were Pedunculate Oak *Quercus robur* (Kupa, Česma, Ilova and Upper Vuka and Sava floodplains) and native poplars *Populus* sp. (Danube and Lower Drava floodplains, tab. 1).

Irrespective of tree species, all nests were found on very old trees. The average height of the nest above the ground was similar throughout all tree species (tab. 2).

The number of nests built on planted poplar clones increased, especially in the Serbian Danube valley (data for Serbia is presented in tab. 8). There are several possible reasons for this trend. Poplar plantations were established in areas of former native floodplain forests as well as on new, previously unplanted sites within the floodplains. The result was an increase of forested area

associated with a rising number of possibilities for nest building. From the nest protection point of view, the increased number of nests on poplar clones created a new conservation problem – bearing in mind that the rotation cycle of poplar plantations is very short while, at the same time, eagles favour breeding in the oldest plantations which are close to cutting age. This means permanent danger for many nests on those sites and threats tend to increase in line with the modernization of floodplain forest economy, the production of new clones with even shorter rotation cycles and the increasing White-tailed Eagle population. Hence, new ways to protect territorial pairs and their nests within non-native forest stands should be created.

### Nests

Characteristics of White-tailed Eagle nests in former Yugoslavia are summarized in tab. 3. Nest dimensions do not seem to be influenced by tree species. Local differences may be caused by the structure of individual trees and the age of the nest itself. The size of the nest does not increase with time, but may even decrease as a result of dropping nest material, especially during the winter.

### Start of hatching

White-tailed Eagles may start to breed as soon as January, however, most lay eggs in the first two decades of February (tab. 4).

### Breeding success

Data on the breeding performance of White-tailed Eagles in former Yugoslavia are presented in tab. 5 and fig. 2. Eagle nests were taken by Saker Falcons *Falco cherrug* in 1986 (1 case), in 1987 (3), in 1988 (6), in 1989 (3) and in 1990 (2). Persistent mobbing and nest predation by Pine Marten *Martes martes* was noted in four cases in 1989 and in three nests in 1990. Breeding failure due to Saker Falcons occurred only in Kopački Rit and Gornje Podunavlje, while martens preyed on chicks only in oak forest regions.

### Wing-tagging and dispersion of nestlings

An important part of the research project in former Yugoslavia was the marking of White-tailed Eagle nestlings. A total of 175 chicks were ringed out of which 171 birds were marked with wing-tags with one digit consisting of a single number or letter. Details on the number of marked birds and the applied wing tags in the period 1985–1991 are listed in tab. 6. Data on ringed and wing-tagged birds are stored at the Institute of Ornithology in Zagreb.

Between 1985 and 1989, five wing-tags were found and wing-tagged eagles could be observed in 330 cases.

**Tab. 1:** Share of particular tree species (%) in the total number of White-tailed Eagle nest trees in former Yugoslavia. — *Prozentualer Anteil einzelner Baumarten in Seeadler-Brutbäumen im ehemaligen Jugoslawien.*

Tree species	Kupa, Česma, Ilova and Upper Vuka and Sava floodplains (n = 33)	Danube and Lower Drava floodplains (n = 81)
<i>Quercus robur</i>	64	3
<i>Fraxinus angustifolia</i>	15	1
<i>Populus nigra</i>	6	30
<i>Populus alba</i>	15	46
<i>Salix alba</i>	0	15
<i>Populus x euramericana</i>	0	5

**Tab. 2:** Dimensions of White-tailed Eagle nest trees and nest height from the ground in former Yugoslavia. — *Stammumfang von Seeadler-Brutbäumen und Nesthöhe über dem Boden im ehemaligen Jugoslawien.*

Tree species	n	Trunk circumference at breast height (m)	Average nest height from the ground (m)
<i>Quercus robur</i> + <i>Fraxinus angustifolia</i>	29	2,5	26,7
<i>Populus nigra</i>	26	5,0	26,3
<i>Populus alba</i>	42	3,9	25,2
<i>Salix alba</i>	12	2,9	24,2
<i>Populus x euramericana</i>	5	2,9	22,0

**Tab. 3:** White-tailed Eagle nest dimensions in former Yugoslavia. — *Maße von Seeadlerhorsten im ehemaligen Jugoslawien.*

Tree species	n	Nest dimensions length x width x height
<i>Quercus robur</i>	23	150x123x127 cm
<i>Fraxinus angustifolia</i>	5	160x122x124 cm
<i>Populus nigra</i>	15	155x142x130 cm
<i>Populus alba</i>	21	154x136x118 cm
<i>Salix alba</i>	4	175x145x140 cm
<b>Mean</b>		<b>159x134x128 cm</b>

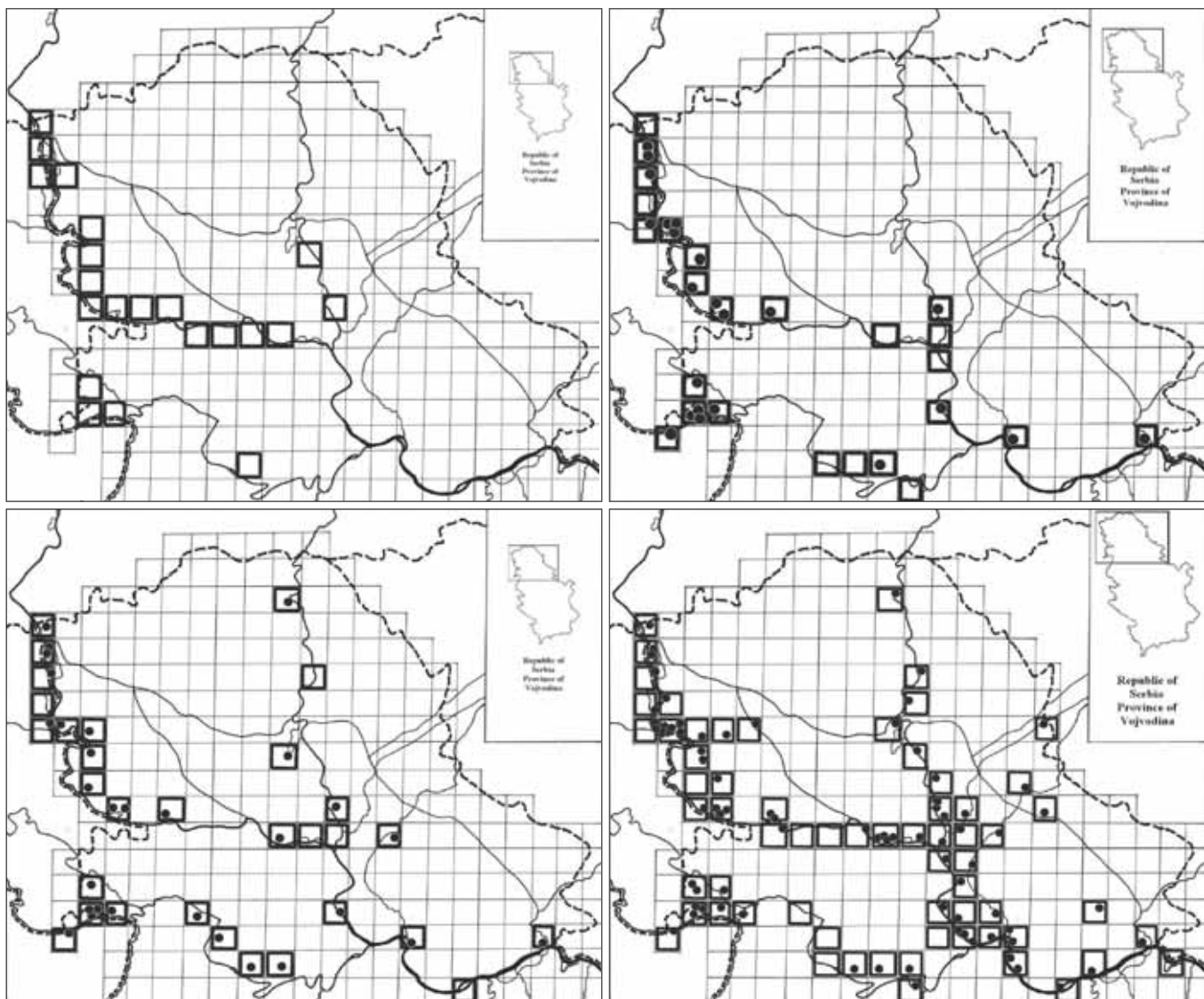
**Tab. 4:** Periods of egg-laying in White-tailed Eagles (n = 62) in former Yugoslavia 1986–1988 calculated from chick size (i.e. wing length; HELANDER 1981). — *Eiablagezeiten von Seeadlern im ehemaligen Jugoslawien 1986–1988 berechnet anhand der Flügellänge von Nestlingen.*

Month	Time span (days)	Share in total number of nests in which egg-laying started
January	11–20	1,6%
January	21–31	9,7%
February	1–10	33,9%
February	11–20	32,9%
February	21–28	16,1%
March	1–10	6,5%

72.4% of all tagged individuals were observed at least once. 20% of live sightings or recoveries of wing-tags were recorded at distances of 0 to 5 km, 40% between 5 and 20 km, 25% between 20 and 100 km and 15% were recorded at distances between 100 and 200 km from their place of birth. All resightings of tagged birds were recorded within the Pannonian parts of Croatia, Serbia and Hungary during the first year of life, mostly during autumn and winter.

**Tab. 5:** Breeding performance data of White-tailed Eagles in former Yugoslavia in the period 1985–1991. — *Bruterfolg von Seeadlern im ehemaligen Jugoslawien 1985–1991.*

Parameter	1985	1986	1987	1988	1989	1990	1991	Total / mean
(1) Number of surveyed territories	10	31	54	77	73	51	34	330
(2) Number of occupied nests	7	24	42	53	52	41	26	245
(3) Number of nests with fledged young	4	14	21	26	23	22	13	19,8
(4) Number of fledged young	7	18	32	35	36	34	20	182
(5) Average number of fledged young per successful nest	1,75	1,29	1,52	1,35	1,57	1,55	1,54	1,47
(6) Number of unsuccessful breeding attempts <sup>3</sup>		10	21	27	29	21	13	20,2
(7) Nest success (3:2) in %	57	58	50	49	44	51	50	50
(8) Productivity (4:2)	1,00	0,75	0,76	0,66	0,63	0,79	0,77	0,73



**Fig. 3:** Changes in the breeding population of the White-tailed Eagle *Haliaeetus albicilla* in the Serbian Province of Vojvodina: Distribution in 1956 (top left; MARČEVIĆ 1957), 1985–1991 (top right; I. Hám, pers. data), in 1996 (bottom left; HÁM & PUZOVIĆ 2000) and in 2008 (bottom right; I. Hám & S. Skorić, pers. data). — *Entwicklung der Brutpopulation des Seeadlers in der serbischen Provinz Vojvodina: Verbreitung in den Jahren 1956 (links oben; MARČEVIĆ 1957), 1985–1991 (rechts oben; I. Hám, eig. Daten), 1996 (links unten; HÁM & PUZOVIĆ 2000) und 2008 (rechts unten; I. Hám & S. Skorić, eig. Daten).*



**Plate 1:** **a:** In the Danube floodplains in former Yugoslavia, White-tailed Eagles bred most frequently on Black and White Poplars. Photo: D. Gec. — *Im ehemaligen Jugoslawien brüteten Seeadler in den Donauauen meist in Schwarz- und Silberpappel.* **b:** White-tailed Eagle pair on the nest in a hybrid poplar plantation. Photo: I. Hám. — *Seeadlerpaar am Horst in einer Hybridpappel-Plantage.* **c:** In recent times, the majority of nests are situated in plantations of hybrid poplars. Photo: I. Hám. — *Neuerdings brüten Seeadler mehrheitlich in Hybridpappel-Pflanzungen.* **d:** In dry years instead of boats carriages were used to reach nests in Kopacki Rit. Photo: I. Hám. — *In trockenen Jahren wurden Seeadlerhorste mit einer Kutsche statt mit einem Boot kontrolliert.* **e:** White-tailed Eagle chicks predated by a marten. Photo: I. Hám. — *Von einem Marder erbeutete Jungvögel.* **f:** Sakers (*Falco cherrug*) can sometimes overtake even active White-tailed Eagle nests. Photo: I. Hám. — *Sakerfalken können Seeadler manchmal sogar noch nach deren Eiablage vom Nest vertreiben.* **g:** Damaged wing-tag taken off the wing by the eagle. Photo: I. Hám. — *Eine beschädigte, vom Seeadler abgenommene Flügelmarke.* **h:** Juvenile bird with the wing-tag. Photo: I. Hám. — *Jungvogel mit Flügelmarkierung.*

Weak points of this unique marking project in Croatia and Serbia were the lack of feeding sites where tagged birds can be easily spotted, the low number of observers and the poor quality of the tags (HÁM et al. 1998, 1990; MIKUSKA et al. 1989).

## 2. Serbia (research period 2003–2008)

### Methods of research on the White-tailed Eagle in Serbia

After 12 years, the survey of the White-tailed Eagle population was initiated again in Serbia in 2003. The methods were the same as those used previously in for-

mer Yugoslavia. In order to survey the breeding population and study breeding biology, information on nest occurrences were collected from known areas of distribution, mainly along the large rivers in Vojvodina: Danube, Tisa, Sava, Bosut, Tamiš and Begej. Information on other areas was gained from infrequent visits or from other researchers.

In 2008 the whole territory of Vojvodina was covered completely, with very detailed mapping of breeding pairs. Many potential sites were visited and information was gained from many contributors, with generous assistance of Provincial Secretariat for Environmental Pro-

**Tab. 6:** Number of wing-tagged White-tailed Eagle chicks in former Yugoslavia in the period 1985–1991 and description of wing-tags. — *Anzahl markierter Seeadlernestlinge im ehemaligen Jugoslawien 1985–1991 und Beschreibung der verwendeten Flügelmarken.*

Year	Number of wing-tagged chicks	Tagged wing	Color of tag	Color of inscription
1985	7	Left	Yellow	Black
1986	17	Right	Yellow	Black
1987	29	Right	White	Black
1988	34	Left	White	Black
1989	33	Left	Green	White
1990	31	Right	Red	White
1991	20	Left	Yellow	Black

**Tab. 7:** Development of the White-tailed Eagle population in Serbia since World War II. — *Entwicklung der serbischen Seeadlerpopulation seit dem 2. Weltkrieg.*

Year	Number of breeding pairs	Source
1952–1957	57 (breedings)	MARČEVIĆ 1957
1964–1967	12–14	SUETENS & VAN GROENENDEAL 1968
1968	10–15	BULEVELD 1974
Mid-1970s	min. 10	HÁM 1977
1977–1979	14–18	HÁM & PUZOVIĆ 2000
1986–1988	20–22	HÁM & PUZOVIĆ 2000
1991	23–36	I. Hám, pers. data
1994–1996	28–33	HÁM & PUZOVIĆ 2000
1995	26–29	SNOW & PERRINS 1998
1996–2000	35–40	PUZOVIĆ 2001
2002–2003	52–58	PUZOVIĆ ET AL. 2003
2008	80–100	I. Hám & S. Skorić, pers. data

**Tab. 8:** Share of particular tree species (%) in the total number of White-tailed Eagle nest trees in Serbia. — *Prozentualer Anteil einzelner Baumarten in Seeadler-Brutbäumen in Serbien.*

Tree species	2003–2007 (n = 36)	2008 (n = 72)
<i>Populus x euramericana</i>	36,1	37,5
<i>Populus alba</i>	19,4	20,8
<i>Populus nigra</i>	16,7	16,7
<i>Quercus robur</i>	16,7	18,0
<i>Fraxinus angustifolia</i>	2,8	4,2
<i>Salix alba</i>	5,6	2,8
<i>Pinus sylvestris</i>	2,8	0

tection and Sustainable Development and Institute of nature Conservation of Serbia.

### Breeding population and distribution

Many attempts were made to assess the size of the Serbian White-tailed Eagle population, based on different methods. The resulting estimates are summarized in tab. 7. It is clear that the population increased during the last 40 years and is now probably 1.000% bigger than in 1970s. However, this phenomenon is quite new. HÁM et al. (1988) stated that there was no considerable increase in the population size during the 1970s and ear-

ly 1980s. Apparently, the onset of population growth was only in the early 1990s and is still in progress.

Several reasons have been proposed to explain this development which is also obvious in the two neighboring countries Croatia and Hungary (BIRDLIFE INTERNATIONAL 2004). The general increase of breeding pairs is largely a consequence of the continually growing number of feeding places due to the construction of new fishponds. Feeding possibilities for young White-tailed Eagles improved with the construction of additional fishponds outside the previous feeding sites. There are 28 large fishponds in Vojvodina, of which almost all are managed semi-intensively comprising large areas of shallow water rich in aquatic animals in autumn, early winter and spring (TUČAKOV 2005). Persecution of White-tailed Eagles at fishponds has been low in recent times even though maximum eagle numbers on some of the ponds in autumn are very high. The most important ones are on the edge of Gornje Podunavlje Reserve: Sviložjevo (max 90 ind.; N. Spremo, pers. comm.), Bač (max. 36 ind.) and Kolut (max. 18 ind.).

On the other hand, White-tailed Eagles adapted to breeding on non-native trees, which was obviously not a population feature prior to the 1990s (cf. tab. 1). The majority of pairs in Serbia breed in poplar clone plantations representing the dominant type of forest stand in all breeding sites (tab. 8). Moreover, the area of poplar plantations within the floodplains is planned to be expanded.

Along with the population growth, there was a change in the distribution pattern. It is evident that in the 1990s (1991–1996), White-tailed Eagles moved eastwards to breed in the Tisa and Tamiš river valleys (fig. 3). This trend was even more pronounced from 2000 on, when the first pair was confirmed to breed south of the Sava River, near Dokmir, 18 km north of Valjevo (RAKOVIĆ 2003), as well as far outside the floodplains in Deliblato Sands, in agricultural areas near Ruski Krstur, Lalić and Srpski Itebej (fig. 3). Data on adults and immatures observed in the Drina River canyon in Tara National Park (SKORIĆ et al. 2007) suggests possible breeding in that region, which is situated far south of the known breeding range in Serbia and represents a very isolated possible breeding site in the Balkans. Breeding in that area as well as on the Danube near Golubac (E Serbia) was confirmed in 2009 (B. Grubač, pers. comm.). There are indications for a breeding territory close to Srbovo, in the Timok River's mouth (S. Skorić, pers. comm.). These data together with the most recently discovered breeding sites outside Vojvodina, in Mačva (ŠČIBAN 2008), suggest that the White-tailed Eagle spread towards the south in recent years, but also that it sticks to river valleys or large stagnant waterbodies.

**Tab. 9:** Number of color-ringed White-tailed Eagle chicks in Serbia in the period 2007–2008 and characteristics of rings. — *Anzahl farbberingter Jungadler in Serbien 2007–2008 und Beschreibung der verwendeten Ringe.*

Year of ringing	No. of color-ringed chicks	Ringed leg	Color of ring	Color of inscription	No. of digits (first digit)
2007	7	left	white	black	2 (2)
2008	17	left	white	black	2 (2)

### Nests

Recent surveys confirm our hypothesis that the species frequently uses planted poplar clones for breeding which are sometimes not even very old. Another new tendency is the breeding on solitary trees in agricultural land.

### Breeding success

The breeding performance of the White-tailed Eagle in Serbia is summarized in tabs 10 and 11. Out of all unsuccessful breeding attempts, 7 pairs did not lay eggs for unknown reasons and 10 clutches failed to hatch for unknown reasons out of which 6 belonged to the eagles which laid eggs as soon as January and hatching failure was caused by bad weather (low temperatures and strong wind). 4 clutches failed to hatch due to direct disturbance by man (logging or land cultivation in the vicinity of nests or other, accidental disturbances). In all three of the latter cases, all chicks died.

The mortality of young commonly occurred also at older ages: another 8 nestlings were found dead below the nest, even though they were well-feathered or just prior to fledging. Possible causes were the worsening feeding conditions and lack of food because of low water levels on the rivers.

### Color-ringing

Color-ringing of White-tailed Eagle nestlings in Serbia started in 2007. Altogether, 24 eaglets were ringed in 2007 and 2008 (tab. 9). However, there are no clear results on movements yet due to the lack of ring-ringing in Serbia.

### Birds in captivity

Overall, 10 White-tailed Eagles are currently kept in Serbia (9 adults and one immature). This figure is close to the figure in 2003 when 11 eagles were noted to live in captivity (HELANDER & STJENBERG 2003). However, in the period between 2004 and 2008, three adults died as a result of inadequate keeping conditions.

The Wildlife Rescue Center which was established in the Palić Zoo in 2004 accommodates 3 birds at the moment. During 2008, two juveniles were released while one was euthanised due to bad injuries and the lack of possibilities for medical treatment. The other birds are kept in zoos in Belgrade (2 adults), Palić (3 adults, 1 immature) and Kolut (1 adult).

**Tab. 10:** Breeding success of White-tailed Eagles in Serbia – partial research 2003–2007. — *Bruterfolg des Seeadlers in Serbien 2003–2007.*

Parameter	2003	2004	2005	2006	2007
Number of successful breeding pairs	7	10	12	3	11
Number of fledged young	11	14	14	5	17
Average number of young per successful pair	1,57	1,40	1,17	1,70	1,55

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### Sažetak

U Srbiji istraživanja belorepana (u okviru intenzivnih istraživanja ove vrste u bivšoj Jugoslaviji) započeta su 1985. od strane Istvána Háma i Slobodana Puzovića. Od 1986. u istraživanja bila je uključena i teritorija Hrvatske, a u tim su se uključili Jozsef Mikuska i Darko Gec u Kopačkom ritu, a Martin Schneider-Jacoby u Posavini. Nezvanični koordinator bila je Jasminka Fištrović. Tokom poslednje godine istraživanja važan član tima bio je i Mirko Šetina. Na kraju perioda istraživanja, koje je trajalo od 1985. do 1991. u bivšoj Jugoslaviji bilo je poznato 80 aktivnih i 30 potencijalnih parova, od toga 57 aktivnih i 17 potencijalnih parova na teritoriji Hrvatske i 23 aktivna i 13 potencijalnih parova u Srbiji. Belorepan se u tom periodu gnezdio prvenstveno u ritskim šumama u dolinama Dunava, Save, Drave, Kupe, Česme, Ilove, Bosuta i Tise. Gnezda su

**Tab. 11:** Breeding success of the White-tailed Eagle in Serbia in 2008. — *Bruterfolg des Seeadlers in Serbien 2008.*

Parameter	N / %
(1) Number of occupied nests	41
(2) Unsuccessful breeding attempts	20
(3) Nests with fledged young	21
(4) Fledged young	33
(5) Fledged young per successful nest	1,57
(6) Nest success (3:1) in %	51
(7) Productivity (4:1)	0,8

pronađena na šest vrsta drveća, najviše na hrastu lužnjaku i autohtonim vrstama topola. Dimenzije gnezda nisu bile uslovljene vrstama drveća. Važan deo istraživanja bilo je obeležavanje mladih belorepana krilnim markerima (ukupno 171). Posle 12 godina, popis populacije nastavljen je u Srbiji. Od 23–36 parova 1991. populacija je narasla na 80–100 parova 2008. Porast brojnosti je počeo početkom 1990-ih i još uvek traje. Moguće je da je porast brojnosti rezultat boljih uslova za ishranu koji su nastali konstrukcijom šaranskih ribnjaka, naseljavanjem plantaža evroameričkih topola od strane belorepana (to je preovlađujuće drvo na kome se belorepan gnezdi u Srbiji danas), kao i većeg stepena zaštite. Došlo je i do promena u rasprostranjenju belorepana u Srbiji. Tokom 1990-ih ova vrsta počela je da naseljava ritove u Potisju i Potamišju, a počevši od 2000. gnezdi se i južno od Save, kao i daleko od aluvijalnih šuma: u Deliblatskoj peščari i na njivama u okolini Ruskog Krstura, Lalića i Srpskog Itebeja. Najnovijim podaci sugerišu i moguće gnežđenje u kanjonu Drine. U periodu 2007–2008. 24 belorepana prstenovano je prstenovima u boji. U periodu 2003–2007. prosečan broj mladunaca po uspešnom gnezdu kretao se od 1,17 do 1,57. Tokom 2008. kontrolisano je 41 zauzeto gnezdo, od kojih je 21 bilo uspešno gnežđenje, a 20 neuspešnih pokušaja. Ukupno je othranjeno 33 mladunaca (1,57 mladunaca po uspešnom gnežđenju). Od neuspešnih pokušaja gnežđenja, 7 parova nije položilo jaja iz nepoznatih razloga, jaja se nisu izlegla u 10 pologa iz nepoznatih razloga, od čega 6 pripadaju parovima koji su jaja položili još u januaru a ona se nisu izlegla zbog lošeg vremena (niske temperature i jakog vetra), dok je 4 legla propalo zbog uznemiravanja od strane čoveka. U ostala 3 slučaja mladunci su uginuli. Uginjavanje mladunaca je bilo učestalo i u narednih 8 slučajeva, čaki i kada su mladunci bili dobro operjali, pa čak i pre izletanja iz gnezda.

## Zusammenfassung

Am Ende der ersten Untersuchungsperiode zum Seeadler (1985–1991) im ehemaligen Jugoslawien waren 80 aktive und 30 potentielle Brutreviere (57 sichere und 17 potentielle in Kroatien, 23 sichere und 13 potentielle in Serbien) bekannt. In diesem Zeitraum brütete der Seeadler fast ausschließlich in den Auegebieten entlang den Flusstäler von Donau, Save, Drau, Kupa, Česma, Ilova, Bosut und Theiß. Horste wurden auf sechs Baumarten gefunden, mehrheitlich auf Stieleichen und heimischen Pappeln. Insgesamt wurden 171 Nestlinge mit Flügelmarken versehen. Nach 12 Jahren wurde die Bestandserfassung des Seeadlers wiederholt und damit eine neue Untersuchungsperiode eingeleitet. Die Population stieg von 23–36 Paaren im Jahr 1991 auf 80–100 Paare im Jahr 2008 an. Diese Zunahme begann Anfang

der 90er Jahre und ist noch im Gange. Mögliche Ursachen für diesen markanten Populationsanstieg sind verbesserte Nahrungsbedingungen durch die Anlage neuer Fischteiche, das zunehmende Brüten in Hybridpappel-Pflanzungen sowie ein höheres Schutzausmaß. Mit dem Populationsanstieg veränderte sich das Verbreitungsmuster von Seeadlern. In den 1990ern bewohnte die Art Auwälder in den Flusstälern von Theiß und Temesch. Beginnend mit dem Jahr 2000 brüteten Seeadler auch südlich der Save und, weit abseits von Auwäldern, in der Region Deliblato Sands und in der Kulturlandschaft rund um die Siedlungsgebiete von Ruski Krstur, Lalić und Srpski Itebej. Neueste Daten legen ein mögliches Brüten in der Drina-Schlucht nahe.

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**Appendix 1:** Active and potential territories of the White-tailed Eagle in former Yugoslavia in the period 1985–1991. Names of localities and forest sections (in parentheses) are given. — *Sichere und potentielle Brutreviere des Seeadlers im ehemaligen Jugoslawien 1985–1991.*

<b>CROATIA</b>		
<b>Region</b>	<b>Active pairs</b>	<b>Potential pairs</b>
Pokupsko Basin	Crna Mlaka Malinje (54)	Crna mlaka (32, 15)
Turopolje	Lekenik	
Česma and Ilova valleys	Česma (67/72) Gudovac (25) Drljež (79) Zdenački gaj (10)	Garešnica
Sava valley from Lonjsko Polje to Slavonski Brod	Svinjičko Šuma Zelenik Košutarica Kutina (16) Ilovsko Polje (21) Opeke (34) Opeke (82) Opeke (98) Žutica (192) Sunjsko Polje (15) Puska (76) Poganovo Polje (77) Mlaka (93) Međustrugovi (12) Vrbovljani Mokro Polje Sičice (67) Migalovci (35)	Dubica Radinje Strmac Slavonski Kobaš
Sava floodplains from Slavonski Brod to Spačva	Gunja (12) Otok (117) Lipovac (2)	Stari Mikanovci Zvezdangrad
Drava floodplains from Donji Miholjac to Osijek	Rešetina (83, 84) Visoko Brešće (74) Đurđenovac (94) Drava Medrović (17) Drava Budvaj (15) Drava Bezdan (51)	Koška
Danube floodplains from Batina to Ilok	Mačkaluk (Šarkanj) Blaževica Siga Erdutska Ada	Sotin
Kopački Rit	Kazuk-Ašvanj Dud (17) Mančošleg (19) Menteš Crveni Krst Menteš – Ulnaci Benčić greda (57/58) Popovica Centralna greda (68) Velika Popovica-Bara Saudar Greda Jelen Greda (72) Kolonca Oršoš (53/54) Nadhat Buda Dunav (1349) Buda Centar Buda Ribari Kifla Dombofok Mali Bajar (29) Mali Bajar (23) Mali Menteš (29)	Zlatna greda (6) Kormanj-Mali Ludaš Menteš Greda (37) Bengovac Greda Mala Popovica Bara Remeta Renovo
<b>SERBIA – Vojvodina</b>		
Gornje Podunavlje (from Bački Breg to Bogojevo)	Šmaguc Dunav Kalandoš Kazuk (7) Srebrenica (47) Staklara (73) Marin Prud Bakulja	Karapandža Šmaguc Nepoplavno Zverinjak Adler Bakšam
Danube floodplains from Bogojevo to Slankamen Plavna	Bukinski rit Karađorđevo–Vila Ribnjak Bač Poloj	Kamarište Koviljski Rit

Region	Active pairs	Potential pairs
Danube floodplains from Slankamen to Ram	Dunav Kivilovo Dunav Štefanac Dunav Dubovac (Deliblatska Peščara)	Dunav Čenta
Tisa floodplains	Tisa Mužljanski Rit	Tisa Joca Tisa Knićanin
Sava floodplains from Jamena to Belgrade	Jamena Novi Rađenovci Domuskela (27) Morović Velika Vinična (11) Morović Vinična (8) Morović Naprečava (37) Višnjicevo Varadin (29) Obedska Bara (4)	Karakuša Grabovačko- Vitojevačko ostrvo Crni Lug

**Appendix 2:** Active and potential territories of the White-tailed Eagle in Serbia in the period 2008–2009. Names of localities and forest sections (in parentheses) are given. — *Sichere und potentielle Brutreviere des Seeadlers in Serbien 2008.*

Area	Active pairs	Potential pairs
Gornje Podunavlje (from Bački Breg to Bogojevo)	Karapandža Šmaguc Dunav Kalandoš Kazuk Zverinjak Adler (1386) Adler (1385) Srebrenica (47) Srebrenica (49) Bakšam (51) Staklara (73) Bakulje (83) Košare (48) Junaković	Šmaguc Nepoplavno Srebrenica (36)
Danube floodplains from Bogojevo to Bačka	Bukinski rit Palanka Isino Ostrvo (1313) Šaregradska Ada Karađorđevo Vila	Kamarište Plavna-Bačko Novo Selo Šaregradska Ada-Hagla
Danube floodplains from Bačka Palanka to Novi Sad	Neštinska Ada (6) Susek–Donji Rit (1282) Poloj	Čerevička Ada Fruška Gora Fruška Gora Jezero
Danube floodplains from Novi Sad to Slankamen	Petrovaradinski Rit (1246) Koviljski Rit-Topolova Greda Koviljski Rit-Savin Put Bara Koviljski Rit-Mala Tonja Koviljski Rit-Rljak Ločka Ada	
Danube floodplains from Novi Sad to nera River mouth	Čenčanska Ada (1209) Belegiš I.o. (1202) Vrbovski-Dunav (1189) Kovilovo-Centar (1180) Kovilovo-Čuvarnica (1179) Kovilovo-Crvenka (1177) Jojkić-Krnjača (1170) Krnjača-Višnjica (1161) Štefanac (1152) Dunav-Vinča Leva Obala Omoljička Ada Smederevska Ada (1118) Kovinska Ada (1106) Palanački Špic D. P. (1082)	Knićanin-Dunav
Mostonga valley	Srpski Miletić Deronje Branjevina Deronje Ribnjak Ristovača Lalić Ruski Krstur	

<b>Area</b>	<b>Active pairs</b>	<b>Potential pairs</b>
Tisa floodplains from Martonoš to Slankamen	Adorjan Molska Šuma Bečej Nadret Ljutova (25) Čurug Elemir-Jegmeč Mužljanski Rit-Komonj Mošorinska Okuka Mužljanski Rit-Joca Tisa 2. km Novi Kneževac	Aradac-Greda
Begej River valley	Srpski Itebej-Hetin Carska Bara Perleska Bara	
Tamiš floodplains	Neuzina Uzdin Baranda Glogonjski Rit Jabučki Rit Idvor Sefkerin	
DTD Canal from Botoš to Banatska Palanka	Konak D. P. Čoka	
Sava floodplains from Jamena to Belgrade	Jamena-Novi Rađenovci Blata (4) Studva Blata (14) Domuskela (38 [27]) Vinična (8) Velika Vinična (12) Kućine (22) Varadin (34) Banov Brod (11) Grabovačko-Vitojevačko Ostrvo Obedska Bara (4) Crni Lug Žeravinac Neprečava Malovanci Vratična Crna Bara Senajske Bare Karkuša Mačva Leget Dobanovci	

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