

## DISPERSAL BY ACCIDENT – THE SPOONBILL *Platalea leucorodia* POPULATION IN CROATIA

### Razpršitev populacije žličark *Platalea leucorodia* na Hrvaškem

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The Croatian Spoonbill population is part of the Pannonian population, which may be understood as a meta-population shown by the recent breeding dispersal in Croatia. Kopački rit functions as a post-breeding gathering site with up to 1,000 roosting birds. The network of suitable wetland habitats is important for the survival of the species. The population had been rising until 1988, when 180 pairs bred in only one colony Krapje Đol in the Sava Wetlands, which has eventually been destroyed by the international melioration programme. This was the start of the dispersal of the population. Three new colonies were established along the Sava and Drava rivers. In the period 1999-2001, the largest colony at Jelas polje decreased rapidly due to the (too) high water level in the fishpond. Urgent measures are needed to preserve this important site. The restoration of the Spoonbill colony at Krapje Đol clearly shows that protection measures are successful and necessary. The capacity of the Croatian wetlands is at least 300 pairs of Spoonbills (sum of maxima per site between 1980 - 2000), but the breeding population was only 88 pairs in 2001 as the preservation of the breeding sites, which are all IBAs, was not effective. The last maximum was reached in 1997 with 218 pairs. The feeding sites in the fishponds and alluvial wetlands are also insufficiently preserved and an action plan for the species is needed urgently. Economic difficulties of the fish farms especially due to high water fees, and large scale water management schemes, such as the Danube-Sava-Adria Canal, endanger not only the Spoonbills but the unique natural heritage of Croatia's alluvial wetlands along the Sava, Drava and Danube rivers. As Croatia has signed the Rio, Bonn, Bern and Ramsar Conventions, the country has to change the old plans and to implement its new Biodiversity Strategy.

**Key words:** Spoonbill, *Platalea leucorodia*, population size, distribution, alluvial wetlands, fish farms, flood control, river restoration

**Ključne besede:** žličarka, *Platalea leucorodia*, velikost populacije, loke, ribogojnice, nadzor nad poplavami, obnova rek

## 1. Introduction

Croatia will surely maintain the country's great importance for the purposes of European nature conservation, in particular the protection of floodplains – the alluvial wetlands of the Danube, Sava, Drava rivers and their tributaries (RADOVIĆ 1999). The Croatian agriculture, forestry and water management are bearing particular responsibility in this context, since in no other European country alluvial forests and a mosaic of flooded grassland including traditional land-use in floodplains have been preserved to such extent (ERN 1990, BRUNDIĆ *et al.* 2000, DPRP 2000, HORVAT *et al.* 1974, PRPIĆ & RAUS 1991, SCHNEIDER-JACOBY 1994, 1999A, B).

Birds perfectly illustrate the outstanding role Croatia is playing in the preservation of the European natural heritage, but data collection and countrywide census techniques have to be improved (TUCKER & HEATH 1994, SCHNEIDER-JACOBY 2000). As we have good actual information on the status of the Spoonbill *Platalea leucorodia* in Croatia, which is a highly endangered species in Europe (SPEC category 2 - TUCKER AND HEATH 1994, European Threat Status E, EU Birds Directive/Appendix I (79/409/EEC), Bern Convention/Appendix II, Bonn Convention/Appendix II, compare HEATH & EVANS 2000, HUT 1992), we would like to use this species to point out various improvements and gaps in the country's nature conservation system and to monitor the implementation of its environmental policy.

With regard to the justification of the protection strategies and their implementation, birds as indicators are very valuable especially in nature conservation as used for example by the Ramsar Convention (1% criteria), the EU Natura 2000 Network or Emerald Network to cover the member states of the Council of Europe (compare HEATH AND EVANS 2000). Nature conservation indicators thus are: animal or plant species, which require the protection of a site, whose existence or absence is proving impacts on landscapes and whose requirements of habitat are throwing light upon the necessary protection measures (SCHNEIDER-JACOBY 1993). For many reasons birds are most suitable for the procedure as described above. Such bird species, like the Spoonbill with very special adaptations as its spoon-like bill (MÜLLER 1988), and distribution limited to very few sites in Europe (HAGEMEIJER & BLAIR 1997, SNOW & PERRINS 1998, TUCKER AND HEATH 1994), can be used as nature conservation indicators. It seems very important to distinguish these notions since bio-indication is mostly restricted to the field of

environmental protection (SCHNEIDER-JACOBY 1993, KUSHLAN 1993, 1997). MÜHLENBERG (1989), for instance, is using target species (Zielarten) in order to justify and estimate nature conservation measures.

The present paper will use the Spoonbill to identify large-scale riverine landscapes in Croatia that offer very special habitats for this highly specialised large water bird.

## 2. Methodology

In order to define and delimit the important parts of the Central Sava Basin between Gradiška, Sisak, Ivanić Grad, Kutina and Novska that have to be protected, observations of all threatened bird species in Europe were carried out in 1986, 1987 and 1989 (compare SCHNEIDER-JACOBY 1993, 1999BC), including information on behaviour, vegetation, land-use and water level. The number of species per grid square (2x2 km, Gauß-Krüger-net) is offering a good overview for the large region. The area includes Lonjsko Polje Nature Park with its riverine forests, flooded pastures and meadow landscapes as well as the transition zone and the former floodplain with traditional agriculture. Outside this area, there are only some important concentrations of birds that have also been monitored: the fish-ponds of Lipovljani and Okučani, the Pakra water reservoir, which is the most important waterfowl roost, and the alluvial wetlands along the Sunja river. Since 1998, the new Nature Park is continuing the monitoring (D. KOVAČIĆ in lit.).

Since 1989, the situation changed considerably as Spoonbills have changed their distribution in Croatia. Thus a review of the Spoonbill population in Croatia has to summarise the old research and compare the information with the new situation and recently established breeding sites. In contrast to the situation in the sixties, when the colony in the Sava Wetlands was found by accident without steady monitoring before, Kopački rit has been researched for more than a 100 years. Although huge numbers of roosting Spoonbills have been recorded and other heron species are known to breed in large colonies, this site was seldom used by Spoonbills for breeding (MAJIĆ & MIKUSKA 1972, MIKUSKA & MIKUSKA 1994). Due to the regular observations and active preservation work of MIRKO ŠETINA (Jelas polje, Slavonski Brod) and ZDRAVKO TADIĆ (fish farm Donji Miholjac and relating Podravina), some reliable information on these two outstanding wetlands including their environment has been collected. JOZSEF MIKUSKA has regularly counted the Požega-Koška alluvial lowlands with the two large fish farms.

### 3. Results

#### 3.1. Population development and dispersal

Spoonbills were numerous in many wetlands but did decrease rapidly due to habitat loss all over Europe (TUCKER AND HEATH 1994). Recently some countries were recolonised (HAGEMEIJER & BLAIR 1997, SNOW & PERRINS 1998). In five Central European countries the decrease has reached a bottom line (BAUER & BERTHOLD 1996) and populations are slowly recovering: in the Netherlands (VOSLAMNBER 1994), Hungary (MÜLLER 1987 c), Austria (FESTETICS & LEISLER 2000), Yugoslavia (PUZOVIĆ *et al.* 1999) as well as in Croatia.

After the second World War, Spoonbills bred for the first time in 1954 at Kopački rit (MAJČIĆ & MIKUSKA 1972). During this time the alluvial wetland was still much larger and the transition zone had not been transferred into arable land. Pastoralism was also allowed in the wetlands. Although the habitat was ideal during that time, breeding could not be confirmed any more during the following thirty years.

In 1961, a small colony was found in the Sava Wetlands by ERN (1985, 1990) near the village of Krapje. RUCNER (1970) hypothesised that this colony had been established already as early as in 1949 (compare KRALJ 1997), but no detailed information has been obtained. At that time, the locality of Krapje Đol was an intact oxbow connected with the Strug river during high waters. It became the first Ornithological Reserve in Croatia, proclaimed in 1963. The population grew continuously (GELEŇČIR unpubl. for 1962-1984, RUCNER 1970) and became one of the largest colonies in Europe in 1989 (Figure 1, GRIMMET & JONES 1989, SCHNEIDER-JACOBY 1993).

Although the site was strictly protected, the internationally planned and financed water works (CONSORTIUM 1972, compare BRUNDIĆ *et al.* 2000) did create a polder around the oxbow and started to drain the former pastures and meadows adjacent to the reed beds. The hedgerow landscape named "greda" on the higher rarely flooded elevations was removed and only one row of bushes on the eastern side of the oxbows was maintained in the several hundred hectares large lowland area between the two large Sava bends and the Strug river. Although a drainage canal through the reserve was blocked in 1987, the overall lack of water led to a fast decrease of the water level. In 1987, the Spoonbills left their breeding site on willow bushes and moved to the reed beds in the northern part of the oxbow. This movement was caused by local people looking for firewood near the

village, and the colony moved to the deeper northern part of the oxbows in the reed beds.

In 1989, the mixed colony abandoned the famous and protected site, destroyed by internationally financed programme for the Sava Basin, as there was not enough water to guarantee protection of nests from predators. While the herons species did breed along the Sava river (e.g. JASENOVAC) or in oxbows inside villages (e.g. PUSKA), the Spoonbills did not settle down during the whole year of 1989. Thus a restoration project was immediately initiated (DEZELIĆ & SCHNEIDER-JACOBY 1999). In autumn 1990, it was possible to reflood the site for the first time through pipes, planned and constructed by the water management in Novska, the Croatian Institute for Nature Preservation and Euronatur. The Zoological Society of Frankfurt sponsored the works.

But already in 1990 the majority of the Sava population had moved 100 km downwards the Sava to the large fish farm called Jelas polje (Jelas Field) covering 20,000 ha and began to breed there (ŠETINA 1996). Other new small groups of Spoonbills attempted to form colonies also in Slavonia near the famous roosting site at Kopački rit. (Figures 1, 2a-b & Table 4, see Appendix) (MIKUSKA & MIKUSKA 1994). During 1991, after the successful restoration of the colony at Krapje Đol, some pairs that had remained in the area for two years began to breed again and herons came back to the reserve. But in two years no young were raised in the most important Spoonbill site in Croatia because the large wetland complex of more the 100,000 ha did not offer a second suitable breeding site for the species.

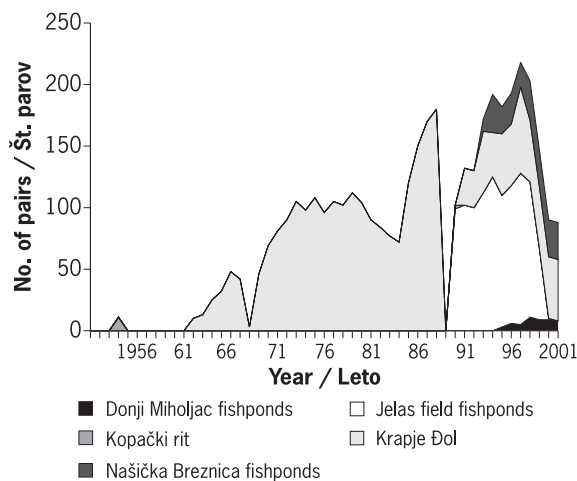


Figure 1: Population development of the Spoonbill in Croatia

Slika 1: Razvoj populacije žličark na Hrvaskem

### 3.2. Breeding sites

The Croatian Spoonbill colonies breed both in reed beds and on willow bushes. The Krapje Đol colony was for over 25 years situated inside a dense group of willow bushes, because within the floodplain nests could not be built just above the water level like on sites where the water level was relatively stable or even controlled (MÜLLER 1987A). Only during 1987 and 1988, when the water level decreased and floods could no longer reach the oxbow, nest where built in reed beds. After re-flooding the oxbow, the birds moved back to the old place on the willows. The Krapje Đol oxbow is very special as it is the only large one without houses, since natural levees of the Sava and the old meanders are the only elevations suitable for house building. As water levels are unpredictable in the alluvial wetlands, Cormorants *Phalacrocorax carbo* and Grey Herons *Ardea cinerea* are the only large water birds forming colonies inside the Sava Wetlands in trees.

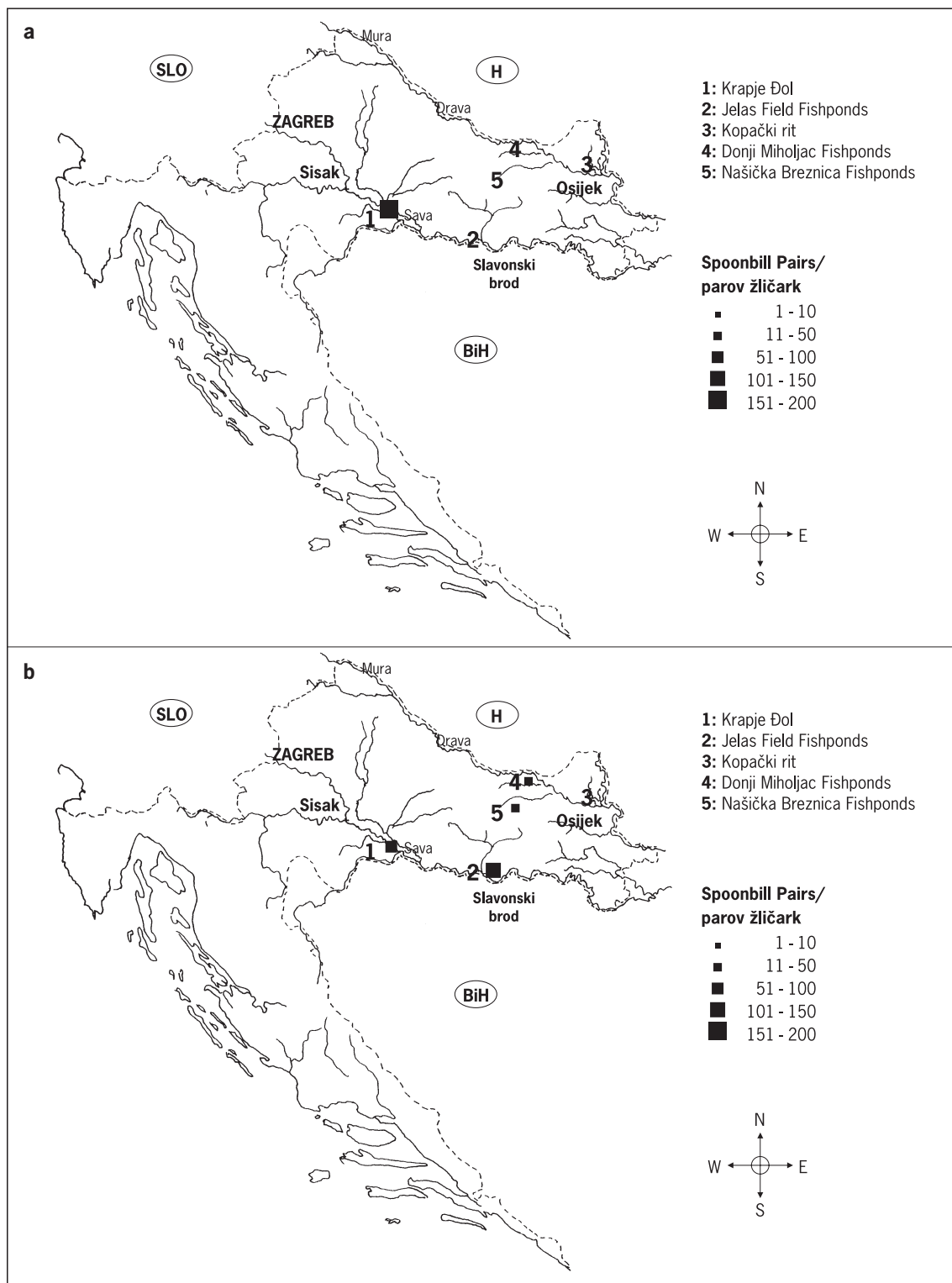
At Jelas Field, the Spoonbill colony was built in the middle of a fishpond on dense emerging vegetation consisting mainly of *Typha latifolia* and *T. angustifolia*. Until 1998, the colony used this site and remained protected. But for the purpose of fish production, the water level within the pond has been artificially increased from 1.20 – 1.30 m up to 1.60 m, which has caused deterioration of the emerging vegetation. During the 1999-2001 these stands died out and as a result the Spoonbills abandoned the colony and no longer bred there in 2001 (ŠETINA unpubl.). While the heron species have moved to another fishpond, the spoonbills have been much more sensitive to the changing conditions, as in the Sava Wetlands ten years earlier.

At Našička Breznica fishponds, Spoonbills breed in reeds (*Phragmites australis*, *Typha latifolia*) along with other heron species that breed in willow trees. The colony is situated along the border of a pond and it is prone to disturbance by fishermen and guards.

**Table 1:** An overview of the Spoonbill colonies in Croatia

**Tabela 1:** Pregled žličarkinih kolonij na Hrvaskem

Colony and site/ Kolonija in lokaliteta	Maximum (year / leto)	Vegetation / Vegetacija Reedbeds / Trstičevje	Willow bushes / Vrbovje
<b>Krapje Đol</b> (IBA Sava Wetlands / savska mokrišća) Type / Tip: oxbow / mandevska mrtvica	180 pairs/ parov (1989)	Only in 1987 and 1988 (little water) / Samo v letih 1987 in 1988 / malo vode)	During all other years a mixed colony with 4 heron species on dense bushes growing in water / V preostalih letih mešana kolonija 4 vrst čapelj na gostem grmičevju, rastočem v vodi
<b>Jelas polje</b> / Jelas Field Type / Tip: fish farm/ ribogojnica	125 pairs/ parov (1994)	<i>Typha</i> spec., mixed colony with 4 heron species and <i>Plegadis falcinellus</i> <i>Typha</i> spec., mešana kolonija 4 vrst čapelj in <i>Plegadis falcinellus</i>	
<b>Donji Miholjac</b> (IBA) Type / Tip: fish farm / ribogojnica	11 pairs/ parov (1998)	Reed, mixed heron colony with 3 heron species / Trstiče, mešana kolonija 3 vrst čapelj	
<b>Kopački rit</b> (IBA) Type / Tip: natural wetland / naravno mokrišće (1954) Abandoned fish pond/ opuščen ribnik (1990)	11 pairs/ parov  3 pairs/ pari	In 1990 mixed heron colony with 3 heron species / V letu 1990 mešana kolonija 3 vrst čapelj	In 1954 mixed colony with 5 heron species / V letu 1954 mešana kolonija 5 vrst čapelj
<b>Našička Breznica</b> (IBA) Type / Tip: fish farm / ribogojnica	31 pairs/ parov (1994)	Mixed colony with 4 heron species/ Mešana kolonija 4 vrst čapelj	



**Figure 2a-b:** Distribution map of Spoonbills in Croatia in 1988 (a) and after 1990 (b) with maximum colony size

**Slika 2a-b:** Karta žličarkine razširjenosti na Hrvaškem v letu 1988 (a) in po letu 1990 (b) z največjo velikostjo kolonij

At Donji Miholjac fishponds, Spoonbills breed in the Purple Heron *Ardea purpurea* colony situated in a large reed bed in the middle of the fishpond. Small numbers of Great Egrets *Egretta alba* and Grey Herons are also using the same nest site. The reed stand is surrounded by water that prevents predator intrusion. During the low water levels, however, wild boars *Sus scrofa* enter the colony causing egg and young loss to the nesting birds (TADIĆ, unpubl.).

In the Kopački rit wetland, Spoonbills bred during 1954 in willow trees in a mixed species colony at Lake Kopačevo. This colony, however, was destroyed by fishermen. During 1990, three pairs of Spoonbills attempted to nest in the reeds inside the mixed heron species colony on one of the abandoned ponds at Podunavlje fishponds. For unknown reason, this breeding attempt failed and no young were raised despite the fact that other herons raised their young with no trouble at all. In 1999, the water level in the pond was too low for herons to breed and they relocated their colony back to the willow trees of Lake Kopačko.

### 3.3. Feeding habitats

Spoonbills need shallow water (up to 30 cm) to search for prey (Table 2), a habitat which is limited even in alluvial wetlands. They prefer muddy, clay or fine-sand substrates for foraging, moving their bills from side to side (HANCOCK *et al.* 1992, MÜLLER 1988). This is why flooded pastures – especially when they are rooted up by pigs – in the depressions along the Sava tributaries of Lonja, Strug and Sunja as well as temporarily drained fishponds are the most important feeding grounds (Table 3, SCHNEIDER-JACOBY 1993).

It is very interesting that these optimal feeding conditions are found at each place only periodically and that a prolonged monitoring is required to find out all these foraging bottleneck sites for the population (Figure 3). During 1987, the Krapje Đol colony left, as firewood cutting caused a severe disturbance there. The number of Spoonbills increased to 400 on feeding sites as adults and non-breeders stayed together all day. 1988 was a typical year to illustrate the use of different sites during the

**Table 2:** Preferred water level at Spoonbill's feeding sites in the Sava Wetlands (25 controls in 31 test areas, SCHNEIDER-JACOBY 1993)

**Tabela 2:** Preferenčna višina vode v žličarkinih prehranjevališčih na savskih mokriščih (25 pregledov v 31 testnih območjih, SCHNEIDER-JACOBY 1993)

Water depth/ Globina vode	% of observed area/ % pregledanega območja	Observed birds/ Št. opaženih žličark	Birds per 100 ha/ Ptica na 100 ha
Dry soil / Suha tla	53.0	0	0
Wet soil / Mokra tla	16.0	0	0
Shallow water / Nizka voda (< 10 cm)	4.3	466	4.6
10 – 30 cm water / vode	5.6	1765	15.5
> 30 cm water / vode	5.6	123	0.7
100 cm water / vode	14.2	0	0

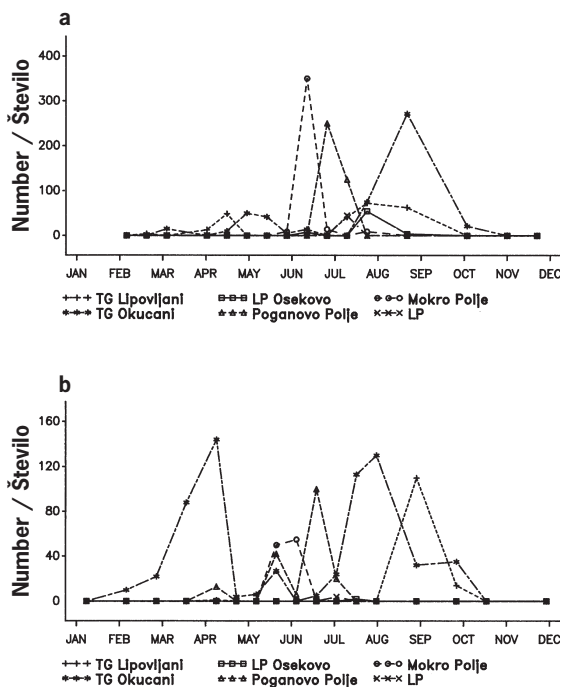
**Table 3:** Preferred land-use on Spoonbill's feeding sites in the Sava Wetlands (25 controls in 31 test areas, SCHNEIDER-JACOBY 1993)

**Tabela 3:** Preferenčna raba tal v žličarkinih prehranjevališčih na savskih mokriščih (25 pregledov v 31 testnih območjih, SCHNEIDER-JACOBY 1993)

Land-use / Raba tal	% of observed area/ % pregledanega območja	Observed birds/ Št. opaženih žličark	Birds per 100 ha/ Ptica na 100 ha
Fish pond (or unused) / Ribnik (ali pa ni v rabi)	29.8	1197	1.7
Meadows / Travniki	18.9	0	0
Arable land / Orna zemlja	27.6	0	0
Pastures / Pašniki (mixed cattle / različna živina)	19.4	575	1.3
Pastures / Pašniki (only pigs / samo prašiči)	4.2	582	5.9



breeding season. Nearly 50 % of the adults from the colony were found feeding together on one site during the two-week census (SCHNEIDER-JACOBY 1993).

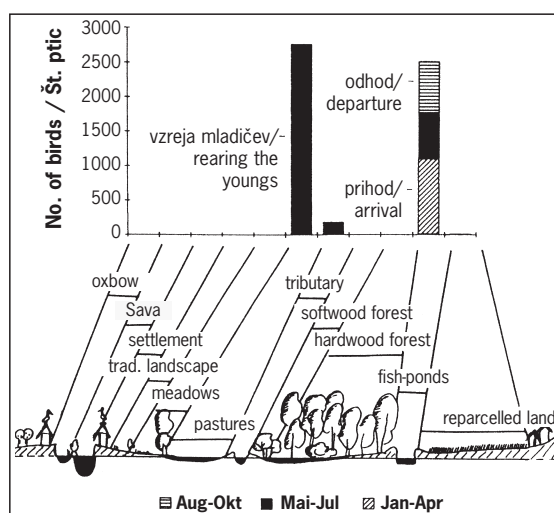


**Figure 3:** Preferred Spoonbill's feedings sites in the Sava Wetlands in 1987 (a) and 1988 (b) during the systematic monitoring (SCHNEIDER-JACOBY 1993). (TG = fish farm, LP = Lonjsko Polje, MP = Mokro Polje)

**Slika 3:** Preferenčna žličarkina prehranjevališča na savskih mokrišćih leta 1987 (a) in 1988 (b) med sistematičnim monitoringom (SCHNEIDER-JACOBY 1993). (TG = ribogojnica, LP = Lonjsko polje, MP = Mokro polje)

During the intensive reseach period in the Sava Wetlands, fishponds were mainly used as foraging habitats during spring and after the breeding season before leaving the area. During the important chick-rearing period, the pastures - including the tributaries during low water levels - offer ideal feeding places, since the decreasing water concentrates the food items inside the remaining water pools (Figure 4). During this time of the year, fishponds are usually filled with water and therefore lose their importance as foraging sites.

As shown in Figure 3, there are only very short periods during which each feeding site in the alluvial wetlands is preferred. Smaller and larger flocks of up to 40 birds leave the colony together to visit these



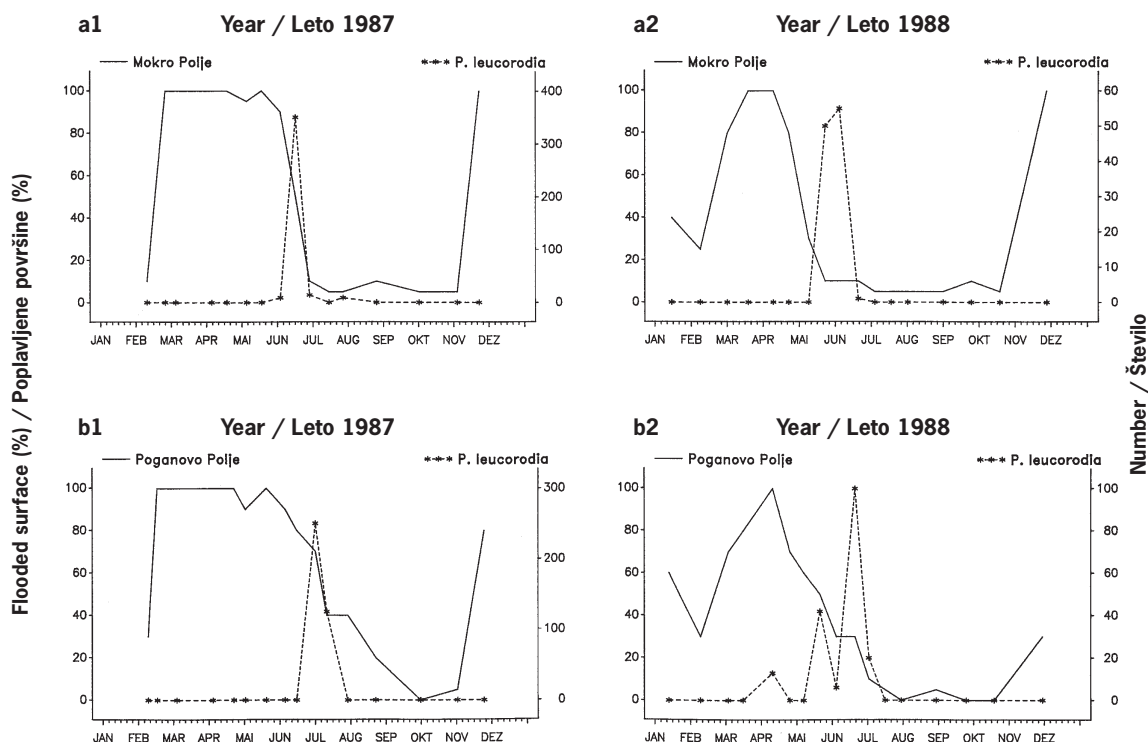
**Figure 4:** Preferred Spoonbill's feeding sites (n = 5491, no. of observ. = 101) in the profile of the Sava Wetlands (SCHNEIDER-JACOBY 1993)

**Slika 4:** Preferenčna žličarkina prehranjevališča (n = 5491, št. opaz. = 101) v profilu savskih mokrišć (SCHNEIDER-JACOBY 1993)

optimal sites. The advantage of the large-scale Sava wetlands lies in the fact that there are at least nine large pasture and two fish farms, each with more than ten ponds with different water regime. When the water surface shrinks (Figure 5) in the alluvial wetlands due to the decreasing water level, Spoonbills find, at each pasture, pools and depressions that offer, at a specific time, optimal hunting conditions and abundant prey. It is a short period (from few days to a month) but at this time up to 400 birds find plenty of food before they have to leave for the next site (Figure 4). During dry periods or high water levels, these key feeding sites did not host a single Spoonbill over long periods.

### 3.4. Home range of the colonies

The typical habitats for the Spoonbill in Croatia are the alluvial wetlands along the Sava river. The breeding ground is either situated at an oxbow filled with sedimentation and overgrown by succession, such as at Krapje Dol in Lonjsko Polje Nature Park or at a fishpond (Jelas Field). However, the monitoring in the Central Sava Basin has indicated that the Spoonbills use every appropriate feeding site within a range of 25 to 30 km from their breeding place (Figure 6a-b). It is therefore not necessary for the species' protected area to include the breeding site only (Special Ornithological Reserve Krapje Dol = 30 ha), but that a surface of some 60,000 ha alluvial



**Figure 5:** Changes in numbers of Spoonbills on the two most important feeding sites (Mokropolje in 1987 (a1) and 1988 (a2) and Poganovo polje in 1987 (b1) and 1988 (b2)) according to the flood and dry cycles of the Sava Wetlands, shown as percentage of flooded surface of the pastures (SCHNEIDER-JACOBY 1993)

**Slika 5:** Spremembe v številu žličarki na dveh najpomembnejših prehranjevališčih glede na poplavna in sušna obdobja na savskih mokriščih (Mokro polje leta 1987 (a1) in 1988 (a2) ter Poganovo polje 1987 (b1) in 1988 (b2)), prikazane v odstotkih poplavljenih površin polj (SCHNEIDER-JACOBY 1993)

wetlands and fish farms have to be protected as an alluvial ecosystem. Today, the Central Sava Basin's Lonjsko Polje Nature Park (50,600 ha in size) covers large areas of pastures and meadows. However, some of the most important alluvial areas on the right side of the Sava river at the Sunja tributary, as well as both fish farms that are Spoonbill's key foraging sites, are situated outside the protected area (compare Figure 3).

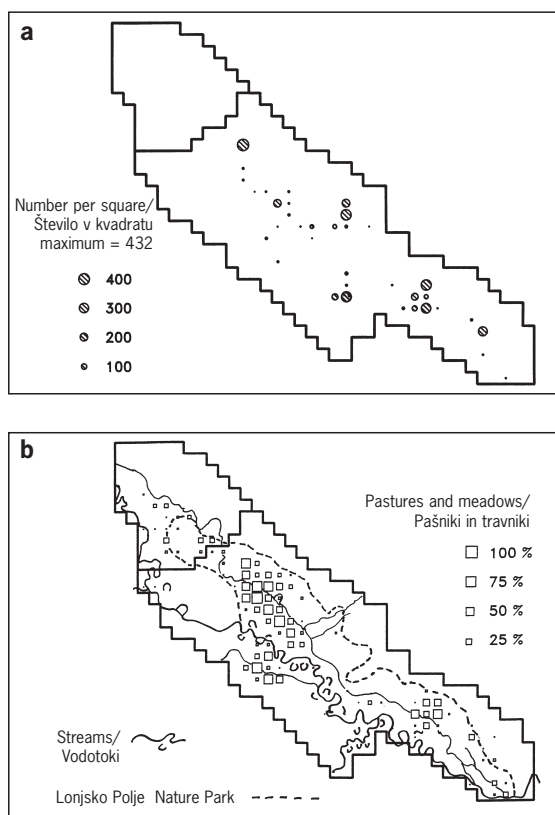
Within the Jelas Field colony along the Sava river some large feeding sites have been preserved. The birds from this colony fly east up to 35 km to feed in the remaining floodplain area at Dvorina and Gajna wet pastures, as well as up to 27 km upstream the Sava on the Bardača fishponds in Bosnia and Herzegovina and the appertaining wetlands. This is consistent with literature data that indicate that feeding areas are usually situated within 35-40 km of the nesting site (HANCOCK *et al.* 1992, HUT 1992, MÜLLER 1987B, WETTEN & WINTERMANS 1986).

It is also important to understand the development in the Našička Breznica fishponds that this area is still situated in the large complex of the remaining alluvial forest. Along the Vučica, a stream parallel to the Drava river, there are still some pastures and wet areas with changing water level. Thus these Spoonbills can also search for food outside the fishpond area. While in the lower Sava Basin near Jelas Field the Dvorina and Gajna pastures are protected, both breeding and foraging sites near Donji Miholjac and Našička Breznica fishponds are still lacking legal protection status. Moreover, due to the Cormorant depredation activities, fishermen are causing permanent disturbance near the colonies.

### 3.5. Post-breeding gathering sites

One of the most important post-breeding sites for Spoonbills in Croatia is Kopački rit with its wetlands. Up to 1,000 birds gather in late August and early





**Figure 6a-b:** a) Distribution of Spoonbills in the Sava Wetlands shown as the maximum of birds observed per 2 x 2 km grid square (SCHNEIDER-JACOBY 1993), b) distribution of pastures in the alluvial wetlands of the Sava river

**Slika 6a-b:** a) Razširjenost žličark na savskih mokriščih, prikazana kot maksimum ptic, zabeleženih v kvadratu, velikem 2 x 2 km (SCHNEIDER-JACOBY 1993), b) razširjenost pašnikov v savskih lokah

September to feed and roost before their autumn migration to the Mediterranean and Africa. During the day in late summer and autumn, birds forage in numerous natural shallow depressions with abundant prey or in draining fishponds, and roost on Kopačko Lake.

In the last few years, flocks of up to 120 birds are trying to overwinter, as indicated by the mid-winter waterfowl counts data, in the area between the Drava and Sava rivers.

#### 4. Discussion

##### 4.1. Population development

According to TUCKER & HEATH (1994) and BAUER &

BERTHOLD (1996), the Central European Spoonbill population is divided into the Dutch-Spanish and the Pannonian (Central European) populations. Its migration and wintering sites overlap only slightly (HUT 1992, MÜLLER 1984A,B). The Pannonian population is today concentrated in Hungary, where it has reached 600 – 750 pairs (BAUER & BERTHOLD 1996, MÜLLER 1984A,B). The basis for its survival are the good conservation measures particularly in Hortobágy National Park with a number of fish farms and traditional wet pastures, just as in the Sava Wetlands. Here the fishponds are included in the National Park's conservation scheme. In the areas where the alluvial dynamics has been destroyed, as in Kis Balaton, the Spoonbills left their breeding sites (MÜLLER 1987C). In Yugoslavia, the population reached 130-140 pairs during the 1990s (PUZOVIĆ *et al.* 1999). On Bečej fishponds (Tisza river), Spoonbills began to nest in 1990 (1 pair), and during 1992 the population increased to 45 pairs (LUKAČ & LUKAČ 1995). In 1997, 60-80 pairs bred there, 50-60 in 1998. Since the «sudden» increase corresponds with the «dispersal by accident» described in this paper, this could indicate that the birds also originate from the large colony in the Sava Wetlands as from those at Jelas polje.

Other countries (e.g. Austria, Slovakia and the Czech Republic) hosted only small colonies of 10 pairs on average in the early nineties (BAUER & BERTHOLD 1996). At Lake Neusiedl, the famous Spoonbill population dropped from up to 250 pairs to zero in 1990, as land-use around the lake had changed (DICK *et al.* 1994, MÜLLER 1984A,B, ÖGV 1993). In the last few years, the population rose again from 13 pairs in 1992 up to 77 pairs in 2000 and 40 pairs in 2001 (KLEIN, NEMETH, RANNER & RÖSSLER/Archiv BirdLife Austria, FESTETICS & LEISLER 2000). First actions have been undertaken to restore some of the former pastures (DICK *et al.* 1994).

The Croatian Spoonbill population is part of the Pannonian population which may be understood as a meta-population, just as shown by the recent dispersal in Croatia and Yugoslavia and the research into the exchange of birds between different colonies (MÜLLER 1984A,B). Kopački rit as a post-breeding gathering site with up to 1,000 roosting birds also shows a connection between the colonies (MIKUSKA & MIKUSKA 1994). This is true of the entire Pannonian population, as birds from colonies in Hungary and Austria visit the site (MÜLLER 1984A,B).

The network of suitable habitats is most important for the Spoonbill's survival. A good basis to demonstrate the needs of the species are the Dutch

materials for the preparation of the species' conservation plan in the Netherlands (HUT 1992). The habitat requirements have been also shown at Lake Neusiedl (MÜLLER 1987B). After the dramatic decrease of floodplains in the last 200 years (SCHNEIDER 1987, DPRP 1999), only few suitable sites have survived in the Pannonian plain. In addition, the dramatic land-use and water-level changes have led to a dramatic decrease in some huge colonies, such as at Lake Neusiedl (DICK *et al.* 1994, ÖSTERREICHISCHE GES. VOGELKUNDE 1993) and Kis Balaton (MÜLLER 1987C). The recent development in Croatia shows how very important it is to have a network of sites suitable for breeding and foraging, as all breeding sites are surrounded by alluvial wetlands.

Until 1988, the entire Croatian population bred on one site only, i.e. at Krapje Dol, which is situated in the centre of the optimal habitats in Croatia. After the oxbow was drained, the birds failed to breed in the Central Sava Basin for two years, and it was only a well organised multi-partner project that helped to restore the breeding site in a very short time (DEZELIĆ & SCHNEIDER-JACOBY 2000). In the meanwhile, most of the birds found a retreat in the Jelas Polje fish farm (ŠETINA 1996). This protected breeding site and – most important for the overall population – feeding sites inside the fish farm and along the river Sava were throughout the breeding season the centre of the Croatian population for no less than ten years. It is still interesting to see that this network of alluvial wetlands and fishponds around Slavonski Brod, including the Bosnian side of the Sava, has been capable to provide enough food for such a large colony with more than hundred pairs.

At the same time, other new colonies were established or birds just attempted to breed during certain years (Kopački rit). On the two sites in Eastern Slavonia, Spoonbills have bred continuously for several years now. Concerning the stability of the population, the new distribution triggered off by the unfavourable situation in the Central Sava Basin during 1989 is somewhat better, as at present the breeding success does not depend on one site only and the population can use all possible feeding habitats for its reproduction. Considering that Lonjsko Polje Nature Park had hosted a much greater number of breeding pairs prior to 1990, the Croatian future capacity for the species can be estimated at 300 pairs at the least, if the breeding sites (e.g. in Jelas Polje) as well as feedings sites are preserved.

The preparations for the species' action plan are part of the Croatian conservation policy (RADOVIĆ 1999, COMPARE HUT 1992). For each site, a complete

list of all potential feeding sites and proposals for further restoration measures are needed (e.g. BRUNDIĆ *et al.* 2000). Kopački rit Nature Park has lost its transition zone since the flood control dike was built and large areas were drained and turned into intensive agriculture. The new management practice and the international GEF/Worldbank programme has to restore these lost habitats in order to improve breeding conditions, although not only for Spoonbills but for other species as well, such as Corn Crane *Crex crex*, White Stork *Ciconia ciconia* and Lesser-spotted Eagle *Aquila pomarina*.

The protection of the Krapje Dol colony has been improved in the recent years. A 50 ha buffer zone on the western side was created with the aid of Euronatur and the EECONET Action Fund. The Zoological Society of Frankfurt financed the construction of a new observation hide. The Nature Park controls the water level inside the oxbow to guarantee optimal breeding conditions and protection from terrestrial predators.

Other nesting sites have no such favourable status. The colonies at Donji Miholjac and Našička Breznica fishponds are not protected and no special management or protection measures have been applied. At Jelas Field, the disappearance of dense vegetation (*Typha* spp.) was triggered off by too high water level maintained for fish production purposes. Old reedbeds are a precondition for the establishment of Spoonbill colonies at Lake Neusiedl and have to be preserved (FESTETICS & LEISLER 2000). The Bern Convention prohibits deliberate damage of breeding sites of the Appendix II species. Recent economic trends and extremely high water fees are threatening the existence of all fishponds in Croatia despite the fact that they are crucial for the survival of many waterbird species, such as Spoonbill and Ferruginous Duck, and IBAs (compare MoEPP 2002, RADOVIĆ 1998, RADOVIĆ 1999). In the recent Birdlife International report, all three sites (Jelas Field, Donji Miholjac and Našička Breznica fishponds) meet the criteria of the Ramsar convention and qualify for the inclusion on the Ramsar list (BIRDLIFE INTERNATIONAL 2001). If the government and other stakeholders do not take immediate action, Croatia could lose all these important wetland sites.

#### 4.2. Ecological significance

All breeding sites in Croatia have been identified as IBAs and are part of larger wetland complexes along the Sava, Drava and Danube rivers (SCHNEIDER-JACOBY 1994). All these wetlands are excellent

examples for the former much larger Pannonian wetland complexes and host a variety of highly endangered plants and animals that have adapted, such as Spoonbills, to the flood and dry cycles of alluvial wetlands. In the Sava Wetlands, the distribution of the threatened water plants, such as *Marsilea quadrifolia*, *Nymphoides peltata* or *Trapa natans*, overlaps with the Spoonbill's feeding sites (SCHNEIDER-JACOBY 1990). Specialist fish species, such as *Umbra krameri* and *Misgurnus fossilis*, still live in these alluvial habitats. The Spoonbill colonies are excellent indicators of the rich large-scale alluvial landscapes and not only of the old reed stands (compare FESTETICS & LEISLER 2000). The extensively used shallow carp fishponds of Croatia have similar character species as the long flooded depressions of the Sava, Drava and Danube rivers. The bird species composition has a high similarity (SCHNEIDER-JACOBY 1993) and several endangered plants grow in areas covering thousands of hectares (*Nymphoides peltata* and *Trapa natans*).

The highly diverse alluvial landscape around the Spoonbill colonies provides the endangered bird species with their specific habitats. All colonies are mixed with other heron species or even Pygmy Cormorants and Glossy Ibises as in D. Miholjac or Jelas Field. Rare duck species, e.g. Ferruginous Duck, are still common where the traditional management has been maintained (RADOVIĆ *et al.* 1998). Large colonies of Whiskered Terns (up to 1000 pairs) also breed there on the floating water plants, such as in D. Miholjac in the summer of 2001 (TADIĆ in lit.). The Spoonbills just point at these great, highly diverse habitats and indicate the special ecological conditions through the flood and dry cycles and their extensive use.

#### 4.3. Long-term preservation endangered

The flooded pastures, being the key feeding site for many endangered bird species of the alluvial wetlands (SCHNEIDER-JACOBY 1993, 1999B), are to be maintained by using the old animal domestic species (e.g. KOVAČ 1994, SCHNEIDER-JACOBY 1994, 1999B). At Lake Neusiedl, pastures were very similar in the past to those in the Sava Wetlands (DICK *et al.* 1994), and their loss had a major impact on the Spoonbill population (MÜLLER 1987B). Croatia has already offered rewards for keeping the Posavina horses and the Turopolje pigs. Agricultural policy has to aim at maintaining private small farms and thus enabling the country to preserve its unique landscapes and intact ecosystems as a basis for tourism (GUGIĆ 1999, IUCN 1995, SCHNEIDER-1996, 2000A). The maintenance of

large-scale pastures in the lowlands is one of the key actions for the preservation of the Spoonbill colonies. All four active colonies still have such habitats within the home range of the colony. A marketing and management project for the products from these pastures is needed to guarantee the long-term use in the traditional way. The logo of Lonjsko Polje Nature Park already indicates a close connection between the pastures (symbolised by the leaf of *Marsilea quadrifolia*), the floods and the Spoonbill (Figure 7).



**Figure 7:** Logo of Lonjsko Polje Nature Park

**Slika 7:** Logotip Naravnega parka Lonjsko polje

By designating large retention areas in the Sava wetlands, the Croatian Water management has prepared the ground for the protection of these landscapes in the Central Sava Basin. The new review gives hope that more than 100,000 ha will be protected in the near future (BRUNDIĆ *et al.* 2000). From the ecological point of view, the designation of extensive floodplains for flood prevention is the only and appropriate strategy to pursue. The Croatian example of the Sava wetlands should be followed by all rivers basin management bodies in future. All preserved flooded areas are to be integrated in this

excellent conservation and floodcontrol programme (BRUNDIĆ *et al.* 2000), while measures to prevent flooding should have the smallest possible impact on the natural processes inside the alluvial wetlands (BRAUN 1993).

In other Croatian areas, the preservation of feeding sites in the alluvial wetlands has not been secured. The plans to built the Danube-Sava-Adria Canal (MARUŠIĆ 1993) have endangered the alluvial wetlands connected with the Jelas Field colony (SCHNEIDER-JACOBY 2001, WWF 2002), which has only a couple of years ago been the largest in Croatia. The dam near Samac, which would transfer 200 km of the Sava river into a reservoir, would flood the feeding sites and pastures along the Sava. The next dam is planned even inside Lonjsko Polje Nature Park itself (near Jasenovac) and would destroy the natural water regime of Mokro Polje, one of the most important feeding habitats for the Krapje Đol colony. All these plans are part of the actual Physical Planning Programme in Croatia (REPUBLIKA HRVATSKA 1999) and have been enforced by the Ministry for Traffic in 2001 (BEDNJICKI & GRUBIŠIĆ 2001). In addition, there are still plans to dam the Drava river, which would affect the colonies in D. Miholjac and Našička Breznica.

A big threat is also the rapid loss of fish farms in Croatia. One of the two fish farms – Okučani with 500 ha - in the Central Sava wetlands (compare Figure 3) has not been operational for the past three years at least and it is used for hunting tourism only. On the second farm (near Lipovljani), fish production has been maintained only on 30 % of the available surface by the Croatian Forest Enterprise, although with a great annual loss of money (GEC in lit.). From the five fish farms in the Central Sava Basin, three have been closed during the last years, including the Ramsar Site Crna Mlaka in 2001, while the other two operate on the basis of some 30 % of their capacities. This is a tremendous loss of wetlands and habitats for a number of endangered birds species. The overall situation in Croatia is similar, as the fish farms have economic problems due to the loss of markets and greatly increased water fees (rising up to 150 per ha in 2005). Although still maintained, the other three colonies are endangered by these crises. International conventions, such as those signed in Ramsar, Bonn and Bern, and the Croatian Biodiversity strategy do not allow a loss of these wetlands, since they host highly endangered species.

In the last few years, some large scale programmes, such as the Central Sava Basin project (BRUNDIĆ *et al.* 2000) and the Drava-Mura Biosphere Reserve

(EURONATUR 1998, SCHNEIDER-JACOBY 1998) have emerged. These new approaches to the maintenance of alluvial wetlands support the biodiversity strategy of the country (RADOVIĆ 1999). Urgent measures are needed to change the old projects and programmes, such as the Danube-Sava-Adria Canal (MARUŠIĆ 1993) and the Physical Planning Programme of Croatia (REPUBLIKA HRVATSKA 1999). It is of utmost importance to adapt the old programmes to the country's new environmental policy and its international political framework in order to maintain the unique natural heritage.

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## 5. Povzetek

Populacija žličark na Hrvaškem je del panonske populacije, ki jo lahko razumemo kot "meta populacijo", tako kot je to pokazala nedavna gnezditvena razpršitev vrste na Hrvaškem. Kopački rit deluje kot nekakšno pognezditveno zbirno mesto z do 1000 prenočujočih žličark. Mreža ustreznih mokrišč je nadvse pomembna za preživetje te vrste. Njena populacija je rasla do leta 1988, ko je v koloniji Krapji Đol v savski loki, še preden je bila ta uničena zaradi mednarodnega melioracijskega programa (slika 1), gnezdilo 180 parov. To je bil hkrati tudi začetek razprševanja te populacije. Tako so vzdolž Save in Drave nastale tri nove kolonije. V zadnjih treh letih pa se je največja kolonija na Jelas polju naglo zmanjšala, in sicer zaradi prenizke vodne gladine v tamjkajšnjem ribniku. Za ohranitev te pomembne lokacije so potrebni nujni ukrepi. Tako je ohranitev kolonije žličark v Krapje Đolu dober primer, kako so zaščitni ukrepi potrebni in tudi uspešni. Kapaciteta hrvaških mokrišč je vsaj 300 parov žličark (vsota maksimumov na lokaliteto med letoma 1980 in 2000), vendar pa je gnezdeča populacija zaradi neučinkovite ohranitve gnezdišč (vsa imajo status IBA) v letu 2001 štela le 88 parov. Zadnji maksimum je bil dosežen leta 1997, ko je gnezdilo 218 parov. Ker so slabo zavarovana tudi prehranjevališča žličark v ribnikih in lokah, je potreben nujen akcijski program za to vrsto. Gospodarke težave ribogojnic (predvsem zastran plačevanja vodnogospodarskih pristojbin) in veliki



vodnogospodarski načrti, kakršen je na primer kanal Donava-Sava-Jadran, ogrožajo ne le žličarko, marveč tudi enkratno naravno dediščino hrvaških lok vzdolž Save in Donave. Ker je Hrvaška podpisala riodejaneirsko, bonsko, bernsko in ramsarsko konvencijo, je dolžna spremeniti stare načrte in uveljaviti novo biodiverzitetno strategijo.

## 6. References

- BEDNJICKI, A. & N. GRUBIŠIĆ (2001): The waterway Danube within the croatian transport policy. Ministry of maritime affairs, transport and communications republic of Croatia, Danube meets Business needs - 3rd Conference on the Danube Region Symposium "Danube - Economic Backbone of Europe" 26<sup>th</sup> - 27<sup>th</sup> April 2001, Vienna.
- BIRDLIFE INTERNATIONAL (2001): Important Bird Areas and potential Ramsar Sites in Europe. BirdLife International, Wageningen, The Netherlands.
- BRAUN, M. (1993): Savski nizinski biotop u sustavu za zaštitu od poplava srednjeg Posavlja. Hrvatska vodoprivreda 2 (8-9): 18 - 21.
- BAUER, H.-G. & P. BERTHOLD (1986): Die Brutvögel Mitteleuropas – Bestand und Gefährdung. Aula Verlag, Wiesbaden.
- BRUNDIĆ, D., D. BARBALIĆ, V. OMERBEGOVIĆ, M. SCHNEIDER-JACOBY, & Z. TUSIĆ (2000): Alluvial Wetlands Preservation in Croatia - The Experience of the Central Sava Basin Flood Control System. Proceedings of the Conference River Restoration 2000 - July 17, 2000.
- CONSORTIUM POLYTECHNA-HYDROPROJEKT-CARLO LOTTI & C. PRAG-ROMA (1972): Study for Regulation and Management of the Sava River in Yugoslavia. United Nations, Prague – Rome.
- DEŽELIĆ, R. & M. SCHNEIDER-JACOBY (1999): Restoration of the Spoonbill colony Krapje Dol. Bilten parka prirode Lonjsko Polje (1) 29 - 31.
- DICK, G., M. DVORAK, A. GRÜLL, B. KOHLER & G. RAUER (1994): Vogelparadies mit Zukunft? Ramsar-Gebiet Neusiedler See – Seewinkel. Umweltbundesamt, Wien.
- DPRP - DANUBE POLLUTION REDUCTION PROGRAMME (PCU UNDP/GEF) (1999): Evaluation of Wetlands and Floodplain Areas in the Danube River Basin. Final Report, May 1999. Prepared by WWW Danube Carpathian Programme and WWF-Auen-Institut.
- ERN, H. (1985): Die Save-Auen in Jugoslawien. Ber. Deutscher Rat Vogelschutz 25: 51 – 64.
- ERN, H. (1990): Threatened wetland ecosystem in the floodplains of the River Sava and its tributaries (Northern Yugoslavia). In: BOHN, U. & R. NEUHÄUSEL (Hrsg.): Vegetation and flora of temperate zones. The Hague, SPB Academic Publ.: 51-59.
- EURONATUR (1999): European Lifeline Drava-Mura. Map 1: 500 000. PIN Matra Programme, Radolfzell.
- FESTETICS, A. & B. LEISLER (2000): Die Brutkolonien der Reiher und Löffler am Neusiedler See – Bestandsentwicklung, Nistökologie, Naturschutz. Ökol. Vögel 21: 269 – 329.
- GRIMMETT, R. & T.A. JONES (1989): Important Bird Areas in Europe. ICBP Technical Publications No. 9.
- GUGIĆ, G. (1999): Traditional Pasture Activities in the Nature Park as Tourist Attraction. Bilten parka prirode Lonjsko Polje 1 (1): 17 – 19.
- HAGEMEIJER, W.J. & M.J. BLAIR (1997): The EBCC Atlas of European Breeding Birds – Their Distribution and Abundance. European Bird Census Council, T & AD Poyser.
- HANCOCK, J.A., J.A. KUSHLAN & M.P. KAHL (1992): Storks, Ibises and Spoonbills of the World. Academic Press, London.
- HEATH, M.F. & M.I. EVANS (2000): Important Bird Areas - Priority sites for conservation. BirdLife Conservation Series. Vol 2 (8) Cambridge.
- HORVAT, I., V. GLAVAC & H. ELLENBERG (1974): Vegetation Südost-Europas. G. Fischer Verlag, Stuttgart.
- HUT, V.D. R.M.G. (1992): Biologie en bescherming van de Lepelaar *Platalea leucordia*. Technische rapport 6, Vogelbescherming Nederland, Zeist.
- IUCN EUROPEAN PROGRAMME (1995): Best practice for Conservation Planning in Rural Areas. IUCN Gland, Switzerland.
- KOVAČ, M. (1994): Hrvatski Posavac - Posavina Pferd - Posavina Horse. Poljoprivredni centra Hrvatske, Zagreb.
- KRALJ, J. (1997): Croatian ornithofauna in the last 200 years. Larus 46: 1-112.
- KUSHLAN, J.A. (1993): Colonial waterbirds as bioindicators of environmental change. Colonial Waterbirds 16: 223-251.
- KUSHLAN, J.A. (1997): The conservation of wading birds. Colonial Waterbirds 20: 129-137.
- LUKAČ, Š. & A. LUKAČ (1995): Ornitofauna ribnjaka «Bečej». Ciconia 4: 4-27.
- MAJCEN, J. (1990): Specijalni ornitološki rezervat «Krapje Dol». Troglodytes 3: 2-3.
- MAJIĆ, J. & J. MIKUSKA (1972): Zum Bruten der Reiher im Reservat von Kopačevo und seiner naheren Umgebung in der Jahren 1954 bis 1970. Larus 24: 65-77.
- MARUŠIĆ, J. (1993): Aktivnosti na realizaciji projekta višenamenskog kanala Dunava-Sava u 1993 g. Hrvatska Vodoprivreda (12): 7 – 9.
- MIKUSKA, J. & T. MIKUSKA (1994): Price Dunava na području Hrvatske. Anali Zavoda za znanstveni rad u Osijeku 10: 109-175.
- MOEPP – MINISTRY OF ENVIRONMENT AND PHYSICAL PLANNING (2002): Carp Fishponds – a component of the ecological network of the Republic of Croatia. Leaflet for the Int. Wetlands Day, Zagreb.
- MÜHLENBERG, M. (1989): Freilandökologie. UTB Quelle & Meyer, 2. Aufl. Heidelberg, Wiesbaden.
- MÜLLER, C. Y. (1984A): Ethologische und ökologische Untersuchungen an den Löfflern (*Platalea leucorodia* L.) am Neusiedlersee mit Vergleichen zu den ungarischen Beständen. Dissertation, Universität Wien.
- MÜLLER, C. Y. (1984B): Bestandsentwicklung und Zugverhalten der Löffler (*Platalea leucorodia*) im österreichisch-ungarischen Raum. Egretta 26: 43 – 46.
- MÜLLER, C. Y. (1987A): Beiträge zur Fortpflanzung und Jungenaufzucht der Löffler (*Platalea leucorodia*) im Neusiedlerseegebiet. Egretta 30: 13 – 23.
- MÜLLER, C. Y. (1987B): Nahrungs- und Ruhehabitate des Löfflers *Platalea leucorodia* am Neusiedlersee

- (Österreich). Orn. Beob. 84: 237 – 245.
- MÜLLER, C. Y. (1987c): Biotopveränderungen und ihre Auswirkungen auf die Löfflerbestände (*Platalea leucorodia* L.) in Ungarn. BFB-Berichte, 63: 109 – 124.
- MÜLLER, C. Y. (1988): Nahrungssuche beim Löffler (*Platalea leucorodia*, Threskionithidae) - Begleitveröffentlichung zum wissenschaftlichen Film C 1818 des ÖWF. Wiss. Film (Wien) Nr. 38–39: 52 – 58.
- ÖGV (1993): Atlas der Brutvögel Österreichs. Ergebnisse der Brutvogelkartierung 1981 – 1985. Umweltbundesamt.
- PRPIĆ, B. & D. RAUS (1991): Situation der Flußauen in Jugoslawien. ANL, Laufener Seminarbeitr. 4/91: 58 - 65.
- PUZOVIĆ, S., J. GERGELJ & Š. LUKAČ (1999): Heron and cormorant colonies in Serbia 1998. Ciconia 8: 11-114.
- RADOVIĆ, D., J. KRALJ & V. TUTIŠ (1998): Ferruginous ducks at Draganic fish-ponds, NW Croatia, and a population estimate for Croatia. TWSG News No. 1, IUCN/Wetlands International.
- RADOVIĆ, J. (1999): Pregled stanja biološke i krajobrazne raznolikosti Hrvatske. Državna uprava za zaštitu prirode i okoliša, Zagreb (published in English, December 2000 by the Ministry of Environment and Physical Planning, Zagreb).
- REPUBLIKA HRVATSKA (1999): Program prostornog uređenja Republike Hrvatske. Ministarstvo prostornog uređenja, graditeljstva i stanovanja –Zavod za prostorno planiranje, Zagreb.
- RUCNER, D. (1970): Avifauna of Lonjsko Polje. Larus 21 – 22: 33 – 64.
- SCHNEIDER, M. (1988): Endangered and rare birds in the alluvial wetlands of the Sava River in the Posavina / Croatia. Larus 40: 167-178.
- SCHNEIDER-JACOBY, M. (1990): Verbreitung gefährdeter und typischer Wasserpflanzen-Arten in der Save-Stromau im Bereich des geplanten Naturparks "Lonjsko Polje". Acta Bot. Croat. 49: 125 – 136.
- SCHNEIDER-JACOBY, M. (1993): Vögel als Indikatoren für das ökologische Potential der Saveauen und Möglichkeiten für deren Erhaltung. Naturerbe Verlag Jürgen Resch, Überlingen (for Croatia: Hrvatsko ekološko društvo, Zagreb).
- SCHNEIDER-JACOBY, M. (1994): Sava and Drava - Ecological value and Future of the Two Main Rivers in Croatia. Periodicum Biologorum, Zagreb. Vol. 96 (4): 348- 356.
- SCHNEIDER-JACOBY, M. (1995): Drau und Mur - Leben durch Flußdynamik. Naturerbe Verlag Jürgen Resch, Überlingen.
- SCHNEIDER-JACOBY, M. (1996): A view from abroad: Nature Preservation in Croatia - an investment in the future of the country. Turizam 11-12: 276 - 292.
- SCHNEIDER-JACOBY, M. (1998): Održivi razvoj Pomurja i Podravine kao mogućnost unapređenja graničnog prostora između Austrije, Slovenije, Hrvatske i Mađarske (Sustained use of the Drava-Mura lowland as a bordering region of Austria, Croatia, Slovenia and Hungary). Proceedings International Conference Sustainable Use of the Lowland Rivers and the Protection of Nature and Environment. Hrvatsko šumarsko društvo & Euronatur, Zagreb. 70 - 82 (Engl. 154 - 155).
- SCHNEIDER-JACOBY, M. (1999a): Values of the Lonjsko Polje Nature Park and the Sava Wetlands. Bilten parka prirode Lonjsko Polje 1 (1): 21 - 27.
- SCHNEIDER-JACOBY, M. (1999b): Ptice kao indikatori zaštite prirode u analizi krajolika na primjeru poplavnog područja Posavina. Četvrti hrvatski seminar perivojne kulture. Sisak, Horting Siscia: 137 - 161.
- SCHNEIDER-JACOBY, M. (1999c): Breeding, distribution and ecology of the Black Stork *Coonion nigra* in the Sava alluvial wetlands, Croatia. Acrocephalus 20 (97): 167 – 176.
- SCHNEIDER-JACOBY, M. (2000): Tourism and nature preservation basic ideas for a co-operation in Croatia. Turizam/Tourism, Zagreb 48 (4): 329 – 340.
- SCHNEIDER-JACOBY, M. (2001): Der Donau-Save-Adria Kanal - Ein unrealistischer Plan verschlingt Mittel und Landschaft in Kroatien. Euronatur Info, Radolfzell.
- ŠETINA, M. (1996): Jelas fish ponds – an ornithological reserve. pp. 55-57. In: TUTIŠ, V. & J. RADOVIĆ: Importance of carp ponds for the protection of waterbirds in Croatia. Proceedings of a Workshop. Croatian Ornithological Society, Zagreb.
- SNOW, D.W. & C. M. PERRINS (1998): The Birds of the Western Palearctic. Vol 1. Non-Passerines. Oxford University Press.
- TUCKER, G.M. & M.F. HEATH (1994): Birds in Europe: their conservation status. Cambridge, U.K. BirdLife International (BirdLife Conservation Series no. 3).
- VOSLAMBER, B. (1994): De ontwikkeling van de broedvogelaantallen van de Lepelaar *Platalea leucorodia* in de Nederland in de periode 1961 – 93. Limosa 67: 89 – 93.
- WETTEN, VAN J.C.J. & G.J.M. WINTERMANS (1986): The food ecology of the Spoonbill. Instituut voor Taxonomische Zoologie, Iniversiteit van Amsterdam.
- WWF (2002): Waterway Transport on Europe's Lifeline, the Danube. Vienna.

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## APPENDIX / PRILOGA

**Table 4:** The Spoonbill population in Croatia according to literature data and information of the authors. As for some years no exact nest counts have been available – no systematic visits to the colonies – the numbers of pairs could only be estimated: a) Kopački rit: continued monitoring, except in 1992 – 1998 due to war operations. No nesting attempts from 1954-1990. Nesting failed in 1990. After 1999, pairs throughout the year but no nesting recorded (MAJIĆ & MIKUSKA 1972, MIKUSKA unpubl. 1990-1991, MIKUSKA unpubl. 1999-2001), b) Krapje Dol: G = possible breeding since 1948 (KRALJ 1997), ? no exact information, first confirmed breeding in 1961 (ERN 1985), then increase until 1988, D = dry, new start after rehabilitation measures, GELENCIR J. unpubl. 1962-1984; RUCNER 1970, MAJČEN 1990, SCHNEIDER-JACOBY 1993, PP Lonjsko polje unpubl. until 2001), c) Donji Miholjac: no record of breeding prior to 1995 (TADIĆ unpubl. 1965-2001). Jelas field: monitoring since the 1960's, birds began to breed in 1990; in 2001, they were searching for a new breeding site, as the old colony had been destroyed due to the high water level in the pond (ŠETINA 1996, unpubl.), d) Našička breznica: no information on breeding prior to 1993 (MIKUSKA unpubl. 1993-1995).

**Tabela 4:** Populacija žličark na Hrvaškem glede na literaturo in podatke avtorjev. Ker gnezda žličark v kolonijah nekaj let niso bila natančno preštet, je ocena parov bolj ali manj približna: a) Kopački rit: stalen monitoring razen v obdobju med letoma 1992 in 1998 zaradi vojnih operacij v območju. Nobenega poskusa gnezdenja v obdobju 1954-1990. Neuspešno gnezdenje leta 1990. Po letu 1999 pari opaženi skozi vse leto, a brez ugotovljenega gnezdenja (MAJIĆ & MIKUSKA 1972, MIKUSKA neobj. 1990-1991, MIKUSKA neobj. 1999-2001), b) Krapje dol: G = možno gnezdenje od leta 1948 dalje (KRALJ 1997), ? nobenega natančnega podatka, prvo potrjeno gnezdenje leta leta 1961 (ERN 1985), potem porast do leta 1988, D = suh, nov začetek po obnovitvenih ukrepih, GELENCIR J. neobj. 1962-1984; RUCNER 1970, MAJČEN 1990, SCHNEIDER-JACOBY 1993, PP Lonjsko polje neobj. do leta 2001), c) Donji Miholjac: nobenega podatka o gnezdenju pred letom 1995 (TADIĆ neobj. 1965-2001). Jelas field: monitoring od 60ih let 20. stoletja dalje, ptice začele gnezdit leta 1990; v letu 2001, potem ko je bila uničena stara kolonija zaradi previsoke vodne gladine v ribniku, so žličarke začele iskati novo gnezdišče (ŠETINA 1996, neobj.), d) Našička breznica: nobenih podatkov o gnezdenju pred letom 1993 (MIKUSKA neobj. 1993-1995).

Year / Leto	Donji Miholjac Fishponds / ribniki	Jelas Field Fishponds	Kopački rit	Krapje Dol/ Sava Wet lands/ savska mokrišča	Našička Breznica Fishponds	Total/ Skupaj
1948	-	-	-		-	-
1949	-	-	-	G	-	-
1950	-	-	-	?	-	-
1951	-	-	-	?	-	0
1952	-	-	-	?	-	0
1953	-	-	-	?	-	0
1954	-	-	II	?	-	II
1955	-	-	0	?	-	0
1956	-	-	0	?	-	0
1957	-	-	0	?	-	0
1958	-	-	0	?	-	0
1959	-	-	0	?	-	0
1960	-	0	0	?	-	0
1961	-	0	0	?	-	0
1962	-	0	0	10	-	10
1963	-	0	0	13	-	13
1964	-	0	0	25	-	25
1965	0	0	0	32	-	32
1966	0	0	0	48	-	48
1967	0	0	0	42	-	42
1968	0	0	0	3	-	3
1969	0	0	0	46	-	46

*continuation of Table 1 / nadaljevanje tabele 1*

Year / Leto	Donji Miholjac Fishponds / ribniki	Jelas Field Fishponds	Kopački rit	Krapje Đol/ Sava Wet lands/ savska mokrišća	Našička Breznica Fishponds	Total/ Skupaj
1970	0	0	0	69	-	69
1971	0	0	0	81	-	81
1972	0	0	0	90	-	90
1973	0	0	0	105	-	105
1974	0	0	0	98	-	98
1975	0	0	0	108	-	108
1976	0	0	0	96	-	96
1977	0	0	0	105	-	105
1978	0	0	0	102	-	102
1979	0	0	0	112	-	112
1980	0	0	0	104	-	104
1981	0	0	0	90	-	90
1982	0	0	0	84	-	84
1983	0	0	0	77	-	77
1984	0	0	0	72	-	72
1985	0	0	0	120	-	120
1986	0	0	0	150	-	150
1987	0	0	0	170	-	170
1988	0	0	0	180	-	180
1989	0	0	0	D	-	0
1990	0	99	3	D	-	102
1991	0	102	0	30	-	132
1992	0	100	?	30	-	130
1993	0	112	?	50	10	172
1994	0	125	?	36	31	192
1995	3	107	?	50	22	182
1996	6	112	?	50	25	193
1997	5	123	?	70	20	218
1998	11	110	?	50	32	203
1999	9	58	0	50	30	147
2000	9	1	0	50	30	90
2001	8	0	0	50	30	88