STUDIA ECOLOGIAE ET BIOETHICAE

2018, 16, 4: 43-50
ISSN 1733-1218
DOI: http://doi.org/10.21697/seb.2018.16.4.04

Does the vicinity of the Black-Headed Gull colony (*Chroicocephalus ridibundus*) increase the breeding success of the Common Tern (*Sterna hirundo*) on the islands of the middle Vistula?

Dariusz Bukaciński*, Monika Bukacińska, Milena Grabowska
Institute of Ecology and Bioethics, Cardinal Stefan Wyszyński University in Warsaw
ul. Wóycickiego 1/3, 01-938 Warsaw, Poland,
*d.bukacinski@uksw.edu.pl

Abstract
We conducted our study in the Common Tern colony (STH) located on an island in the middle Vistula River course, at the height of the city of Dęblin (km 393–394 of the waterway), in 2017. Our goal was to investigate some aspects of the biology and reproductive ecology of this species. Due to the fact that STH breeds both in single-species as well as in two- or multi-species colonies, in associations with Little Terns (*Sternula albifrons*), Black-Headed Gulls (*Chroicocephalus ridibundus*) (LAR) and/or Mew Gulls (*Larus canus*), we wanted to investigate whether the neighbourhood of other species (in this case LAR) affected hatching success and chick survival in STH. Our results clearly show that the presence of breeding terns in the neighbourhood of the LAR colony was not accidental and/or caused by the lack of space on the island and/or the possibility of nesting elsewhere. The height of nesting site, type of nesting habitat, clutch size, mean egg volume and mean egg mass of these STH pairs did not differ significantly from those that formed a single species colony, on the same island but several hundred meters away. However, STH nests in the neighbourhood of the LAR colony were established much earlier and both the hatching success and chick survival of STH during the early-chick stage were twice as high. Thus, we can conclude that the LAR colony could provide an effective protection against predation of crows, magpies and gulls, dangers which accounted for the vast majority of STH nest failures in the year of our study.

Keywords
middle Vistula River, Common Tern, Black-Headed Gull, breeding success, causes of failures

1. Introduction

In its middle course (between Puławy and Płock, km 370-632 of the waterway), the Vistula River flows within unregulated or only slightly transformed riverbed, having the character of a lowland braided river. The lack of a permanent, comprehensive hydrotechnical regime in the valley means that we still can find habitats that are difficult to see in Western Europe as a result of watercourse regulations (Tomiałojć and Dyrcz 1993, Keller *et al.* (eds) 2017). These are primarily islands and steep river banks as well as old willow and poplar riparian forests in the valley. Sandbanks and islands in transient stages of plant succession have the greatest

impact on the unique character of the river. Avifauna that inhabits them (mainly various species of gulls, terns and plovers) forms a typical ground-nesting bird communities of the unregulated lowland river, no longer found in such form and scale in other parts of Europe (Bukaciński *et al.* 2017).

Caring for the preservation and maintaining high ornithological values of this place, including a current assessment of the status of species endangered in Europan and/or national scale, above all Mew Gull *Larus canus*, Little Tern *Sternula albifrons* and Ringed Plover *Charadrius hiaticula* (Głowaciński 2001, BirdLife International 2004a,b, Bukacińska and Bukaciński 2004, Bukaciński and Bukacińska 2015a-e, Winiecki 2004, European Comision 2009) from the mid-twentieth century, large-scale inventory of breeding avifauna of the riverbed was carried out every few or several years (Luniak 1971, Wesołowski *et al.* 1984, Dombrowski *et al.* 1994, Bukaciński *et al.* 1994, 2017). However, this is not enough. In order to define current threats and take effective protection measures, it is also necessary (or perhaps the most important) to know the reproductive biology and ecology of typical species forming the core avifauna of the middle Vistula riverbed. While for most gull species the data are available (Bukaciński and Bukacińska 1994,1995, 2000, 2001, 2015a,b, Neubauer *et al.* 2006, Gwiazda *et al.* 2011, Bukaciński *et al.* 2018, Zieliński *et al.* 2019), for Vistula terns such information is only highly fragmented and difficult to access, published in the form of low-edition reports or expert reports (Głażewska *et al.* 1985, Kot *et al.* 1986, Bukaciński and Bukacińska 2015c,d).

The aim of this research was to study some aspects of the biology and reproductive ecology of the Common Tern, one of the two species of terns inhabiting the islands in a middle course of the Vistula River. Due to the fact that STH breeds both in single-species, as well as in two- or multi-species colonies, in associations with Little Terns, Black-headed Gulls, *Chroicocephalus ridibundus* (LAR) and/or Mew Gulls, first of all we wanted to check whether the neighborhood of other species (in this case LAR) affected hatching success and chick survival in STH. Since the middle course of the Vistula River is a key breeding ground for this species of tern in Poland (it is inhabited by 35% -40% of the national population) the breeding success on the Vistula has a decisive impact on the status of this species throughout the country (Bukaciński and Bukacińska 2007).

2. Study area and methods

2.1. Study sites and species

Study area covered an island in the middle reaches of a large lowland, braided Vistula River at the height of the city of Dęblin (km 393-394 of the waterway; 51° 33' 33.88"N, 21° 49' 35.86"E). We conducted our research in two colonies of Common Terns (STH). One of these colonies (57 nests) was single-species and located approximately 400-450 meters from the Black-headed Gull colony (several hundred nests). The other (55 nests) was located on the edge of the Black-headed Gull colony (LAR). It was surrounded by nests of this species of gulls on three sides, on the fourth it bordered the shore of a river. The locations of both STH colonies did not differ in height above the water level (the highest places on the island) and in the type of a nesting habitat (sand with low grass vegetation, rarely clustered). Every year several dozen to several hundred pairs of STH nest at the study site (Bukaciński *et al.* 2017).

2.2. Field data collection

We conducted our study in April-June 2017. In the analyzes, we also used for comparative purpose data on the reproductive ecology of STH collected in the years 2015 and 2016. During the laying period the island was monitored every 2-3 days. Each nest was marked with a numbered stick. The date of laying the first egg in the clutch was considered to be the start of reproduction by the pair. Based on

this, we determined the average egg-laying date in each of the two STH colonies. All eggs were measured (length and breadth) and weighted. Egg volume (cm^3) was calculated according to the formula:

$EV=p/6 \times EL \times EB^2$, where EL – egg length (in mm), EB – egg breadth (in mm), p – specific constant (Vorgin 1998). We marked eggs in clutches A, B, C according to their laying order, with a waterproof, non-toxic marker (STH lay maximum 3-egg clutches). After a clutch completion, we checked nests every 3-5 days. This allowed us to follow the fate of clutches and determine causes of possible failures. For the purpose of this article, following causes of egg losses have been identified: bird predation (hooded crow *Corvus cornix*, magpie *Pica pica*, large gulls from *argentatus* complex, called later in the text „birds"), mammal predation (red fox *Vulpes vulpes*, American mink *Neovison vison*, called later „mammals"), rising river level (called later „water") and others (including embryo death at an early stage of incubation, not fertilized eggs, overheating, damage to the egg by one parent, etc.). A nest in which not all chicks hatched from the clutch was considered as a nest with partial losses. A nest with no hatchlings was considered as a nest with total losses. A nest in which at least one chick hatched was considered as a successful nest. At hatching, we determined hatching order of chicks, weighted them and ringed. The mean number of hatchlings per pair that laid eggs was considered as a measure of hatching success in the colony. We tried to follow the fate of chicks at least within the first 3-5 days after hatching, i.e. during the period when the brood reduction is most likely to happen (i.e. the death of some chicks in a brood). We considered the number of chicks that survived to the end of the third day of life per pair that laid eggs as a measure of chick survival in the early-chick period in a colony.

2.3. Statistical analyses

Standard statistical tests were used in the analyses. We used t-Student test to check the differences among colonies in the time of breeding, clutch size, egg volume, egg mass, hatching success and chick survival and chi-square test for the differences in frequencies of clutches with different egg mortality among colonies (SPSS 11.0 for Windows; SPSS inc, Chicago, USA).

3. Results

In 2017, a total of 112 STH pairs nested on the island at the height of Dęblin (km 393-394 of the waterway). They formed two colonies with a similar number of pairs, located several hundred (400-500 m) meters apart. One of them was on the shore of the island and bordered on three sides with LAR nests, which had been formed here a colony of about 550-600 pairs before terns. The second one was located in the central part of the island. Terns started laying in this place on average two days later than in the colony located in the vicinity of the LAR (May 21 ± 4.8 days *versus* May 19 ± 5.9 days; $t_{110}= 1.97$, p=0.05, Table 1). In both colonies, the large majority of pairs (over 80% in each colony) laid three eggs in the clutch (Table 1). Like the clutch size, the mean volume and mass of eggs in a clutch did not differ significantly between pairs from both colonies (Table 1). However, the hatching success and survival of STH chicks during the first three days of their life in the colony adjacent to the LAR colony was almost twice as high as in the single-species STH colony formed away from other gull species (2.55 ± 0.69 *versus* 1.84 ± 0.98; $t_{110}=4.45$, $p<< 0{,}001$ and 2.00 ± 0.79 *versus* 0.98± 0.95; $t_{110}=6.19$, $p<< 0{,}001$, for the hatching success and chick survival, respectively, Table 1).

In 2017, the bird predation, primarily crows and large gulls from the *argentatus* complex, and to a lesser extent magpies, were the main threats to STH clutches. Such losses accounted for 66.0% of all egg losses this year, with no losses due to mammal predation and river water rising (Table 2). Only in 8% of STH nests we found total egg losses at the incubation stage, which means that in 92.0% of nests at least one chick

Table 1. Breeding parameters in two colonies of the Common Tern (*Sterna hirundo*, STH) differing in a location relative to the Black-headed Gull colony on the island in middle Vistula River in 2017; n – number of nests, SD – standard deviation, p – significance of differences, NS – non significant

Breeding parameters	STH colony		t-Student test
	Away from the LAR colony (n=57)	At the edge of LAR colony (n=55)	
Time of egg-laying (in days) (mean ± SD)	May 21 ± 5,9	May 19 ± 4,8	**t_{110} =1.97 p = 0.05**
Clutch size (mean ± SD)	2.82 ± 0.38	2.82 ± 0.39	t_{110} =0, NS
Egg volume in 3-egg clutches (in cm3, mean ± SD)	19.11 ± 4.88	18.43 ± 4.35	t_{110} =0.78, NS
Egg mass in 3-egg clutches (in g, mean ± SD)	19.75 ± 1.36	19.63 ± 1.29	t_{110} =0.48, NS
Hatching success (mean/nest ± SD)	1.84 ± 0.98	2.55 ± 0.69	**t_{110} =4.45 P<<0.001**
Chick survival until 3rd day of life (mean/nest ± SD)	0.98 ± 0.95	2.00 ± 0.79	**t_{110} =6.19 P<<0.001**

Table 2. Causes of egg losses in the nests of the Common Tern (*Sterna hirundo*) in the colony at the height of Dęblin (km 393-394 of waterway) in 2015-2017; n – number of nests, χ^2 – test value, p – significance of differences, % of nests with success = proportion of nests in which at least one chick hatched

Year	n	Nest with egg losses due to different causes				Type of losses		% of nest with success
		birds	mammals	water	other	partial	total	
2015	81	4	9	72	0	0	81	0
2016	78	7	49	2	22	5	73	6.4
2017	112	33	0	0	17	39	9	92
χ2		252.68 (6), p<<0.001				135.35 (2), p<<0.001		

hatched (Table 2). In earlier years, STH hatching success was definitely lower (χ^2= 135.35 (2), P<<0.001, Table 2). In 2015, when the water level rising was the main threat to STH clutches (84,7% of all egg losses at the incubation stage) terns did not hatch chicks at all, and in 2016 when most clutches (88.7% of all egg losses) have been eaten by foxes and American minks or abandoned due to the pressure of these predators (understood as a permanent presence near the colony) successful STH pairs accounted for only 6.4% of those which laid eggs (Table 2).

4. Discussion

The middle Vistula River between Puławy (km 371 of the waterway) and Płock (km 631) is one of the key breeding grounds of STH in Poland, concentrating 20% -30% of the national breeding population (Bukaciński and Bukacińska 2015d, Chylarecki *et al.* 2018). Currently, the number of STH pairs on the Vistula is relatively stable, but at a lower level than it was recorded in the first half of the 1990s (Bukaciński *et al.* 2017, Chylarecki *et al.* 2018). On the islands in the Vistula riverbed, this species occupies a fairly wide spectrum of habitats from sandy and/or gravel

beaches without any vegetation to places completely covered with low grass or other herbaceous vegetation (Bukaciński and Bukacińska 2015d). As in other parts of its range, it nests almost exclusively in colonies, mostly single-species, less often in two- or multi-species colonies, in association with Little Terns, Black-headed Gulls, Mew Gulls, Ringed Plovers and Little Ringed Plovers *Charadrius dubius* (Becker and Ludwigs 2011, Bukaciński and Bukacińska 2015d). The presence of a large breeding population in the valley of the middle Vistula River means that the fate of breeding birds in this place have an impact on the condition and status of the entire national population. Due to the fact that STH inhabits usually low or medium height islands in the riverbed, the dynamic of river water level has a great impact on the breeding success, especially in May and June (Bukaciński and Bukacińska 1994, 2015d, Bukaciński *et al.* 2018). In the 20th century, in the years without or with low Vistula water risings, the largest losses in the local colonies were caused by the predation of crows and magpies and the farm animals grazing (mainly cows, to a lesser extent sheep and horses) (Bukaciński and Bukacińska 1994, 1995, 2001, 2015d). The situation has changed at the turn of the 20th and 21st centuries, along with the increasing each year pressure of American minks and red foxes. The presence of these predators in the Vistula breeding colonies of gulls and terns has since been a threat not less than high, frequent river floods usually leading to total nest failures (Bukaciński and Bukacińska 1994, 2001, 2008, 2015d, Bukaciński *et al.* 2018). The analysis of STH reproductive ecology on one of the islands in the middle course of the Vistula River in the years 2015-2017 showed the key conditions of breeding success of this species presented above. This was possible due to (1) the presence of STH colony during three consecutive breeding seasons in the same place, not only on one of the highest islands occupied by STH on this section of the river, but also in the highest possible place within the island, and (2) not observed on this island for 15 years the absence of mammalian pressure during the breeding season 2017. As a result, it was possible to present the conditions for breeding success of STH with three completely different, but realistically encountered in the Vistula colonies environmental and population scenarios: (a) a lack of high river water rising during the breeding season, but with a frequent presence of predatory mammals in breeding colonies (the year 2016, reflecting a situation typical for the first and second decades of the 21st century), (b) a presence of high water level rising in May/June, in an absence of mammalian pressure (the year 2015, reflecting a situation typical for the so-called „flood years" during last two decades of the 20th century), and (c) a lack of both river level risings and pressure of predatory mammals (the year 2017, reflecting a situation typical of the so-called „dry" years during last two decades of the 20th century) (Table 2, Bukaciński and Bukacińska 1994, 2018). The breeding success recorded on the island at the height of Dęblin in 2017 was one of the highest (if not the highest) that we recorded for this species in colonies on the Vistula islands during the first two decades of the 21st century (Bukaciński and Bukacińska 2015d, Bukaciński and co-workers, unpublished data).

Due to the fact that in 2017, STHs did not only avoid a presence of the LAR colony, but settled in its vicinity more willingly and earlier than in other places on the island (see Table 1), we decided to check whether such behavior was beneficial for pairs forming this colony. It turned out that the hatching success and chick survival during first few days of their life in this colony were definitely higher than in a single-species colony of this species located several hundred meters away. On the one hand, a neighborhood of LAR, a species considered „naturally aggressive"(Bannermnan 1962, Bukaciński and Bukacińska 2015b) inevitably had to be associated with more frequent and more aggressive territorial encounters and was at greater risk of injuries (Bukacińska

and Bukaciński 1996, Bukaciński and Bukacińska 1996, 2015a-d). On the other hand, however, a presence of a large LAR colony constituted a kind of (and as can be seen in Table 1 extremely effective) protective umbrella, especially when the bird predation (crows, magpies, gulls) was a main threat to breeding terns. It can be assumed that the close presence of an island's shore with direct access to water was an additional benefit for STH pairs in this colony, especially during the care of chicks older than 3-4 days (a period not covered by our research). Escape to water is one of the forms of anti-predatory reaction of older chicks of gulls and terns. Moreover, constant and close access to water makes it easier for both parents and their offspring to cool down during hot days (Bukacińska and Bukaciński 1996, Bukaciński and Bukacińska 1996, 2003, 2015a-d).

Acknowledgments

This study was conducted as part of maintaining the research potential of the Institute of Ecology and Bioethics, Faculty of Christian Philosophy, CSWU (project no. Umo PBF 5-17). We would like to thank to our colleagues and students of Environmental Protection Studies at the Faculty of Christian Philosophy, CSWU who assisted us in the field, especially Arkadiusz Buczyński, Bartosz Jaszewski and Aneta Pikulska.

Bibliography

Bannerman D.A., 1962, *The birds of the British Isles 11*, Oliver & Boyd, Edinburgh, UK.

Becker P.H., Ludwigs J.-D., 2011, *Common Tern Sterna hirundo*, Birds of Western Palearctic interactive 2.03, Oxford University Press, Oxford, UK.

BirdLife International, 2004a, *Birds in Europe: population estimates, trends and conservation status*, BirdLife Conservation Series No. 12, Cambridge, UK.

BirdLife International, 2004b, *Birds in the European Union: a status assessment BirdLife International*, Wageningen, The Netherlands.

Bukacińska M., Bukaciński D., 1996, *Funkcje i sposoby wyrażania agresji u mew i rybitw*, Kosmos, 45, 511-521.

Bukacińska M., Bukaciński D., 2004, *Larus canus (L., 1758) – mewa pospolita*, in: Gromadzki M. (ed), „Ptaki (część II). Poradniki ochrony siedlisk i gatunków Natura 2000 – podręcznik metodyczny", Ministerstwo Środowiska, Warszawa, T. 7, 166-170.

Bukaciński, D., Bukacińska M., 1994, *Czynniki wpływające na zmiany liczebności i rozmieszczenie mew, rybitw i sieweczek gniazdujących na środkowej Wiśle*, Notatki Ornitologiczne, 35, 79-97.

Bukaciński D., Bukacińska M., 1995, *The factors limiting breeding success in the Black-headed Gulls (Larus ridibundus) in different habitat types on the middle course of the Vistula River, Poland*, Archive für Hydrobiologie, Suppl. 101, Large Rivers, 9, 221-228.

Bukaciński D., Bukacińska M., 1996, *Uwarunkowania agresji u mew i rybitw w okresie lęgowym*, Notatki ornitologiczne, 37, 97-111.

Bukaciński D., Bukacińska M., 2000, *The impact of mass outbreaks of black flies (Simuliidae) on the parental behaviour and breeding output of colonial common gulls (Larus canus)*, Annales Zoologici Fennici, 37, 43-49.

Bukaciński D., Bukacińska M., 2001, *Zagrożenia ptaków gniazdujących na Wiśle środkowej*, in: Kot H., Dombrowski A. (eds), „Strategia Ochrony Fauny na Nizinie Mazowieckiej", MTOF, Siedlce, 117-126.

Bukaciński D., Bukacińska M., 2003, Larus canus Common Gull, Birds of Western Palearctic Update 5, Oxford University Press, Oxford, UK.

Bukaciński D., Bukacińska M., 2007, *Rybitwa rzeczna Sterna hirundo*, in: Sikora A., Rohde Z., Gromadzki M., Neubauer G., Chylarecki P. (eds), „Atlas rozmieszczenia ptaków lęgowych Polski 1985-2004", Bogucki Wyd. Nauk., Poznań, 242-243.

Bukaciński D., Bukacińska M., 2008, *Threatened bird species of the middle Vistula River islands: status, necessity for protection and proposed activities*, in: Uchmański J. (ed), "Theoretical and applied aspects of modern ecology", wyd. UKSW, Warszawa, 219-239.

Bukaciński D., Bukacińska M., 2015a, *Kluczowe gatunki ptaków siewkowych na środkowej Wiśle: biologia, ekologia, ochrona i występowanie, T. 1 Mewa siwa Larus canus, Monografia*, STOP, Warszawa.

Bukaciński D., Bukacińska M., 2015b, *Kluczowe gatunki ptaków siewkowych na środkowej Wiśle: biologia, ekologia, ochrona i występowanie, T. 2 Śmieszka Chroicocephalus ridibundus, Monografia,* STOP, Warszawa.

Bukaciński D., Bukacińska M., 2015c, *Kluczowe gatunki ptaków siewkowych na środkowej Wiśle: biologia, ekologia, ochrona i występowanie, T. 3 Rybitwa białoczelna Sternula albifrons, Monografia*, STOP, Warszawa.

Bukaciński D., Bukacińska M., 2015d, *Kluczowe gatunki ptaków siewkowych na środkowej Wiśle: biologia, ekologia, ochrona i występowanie, T. 4 Rybitwa rzeczna Sterna hirundo, Monografia*, STOP, Warszawa.

Bukaciński D., Bukacińska M., 2015e, *Kluczowe gatunki ptaków siewkowych na środkowej Wiśle: biologia, ekologia, ochrona i występowanie, T. 6 Sieweczka obrożna Charadrius hiaticula, Monografia*, STOP, Warszawa.

Bukaciński, D., Cygan, J. P., Keller, M., Piotrowska, M., Wójciak, J., 1994, *Liczebność i rozmieszczenie ptaków wodnych gniazdujących na Wiśle Środkowej – zmiany w latach 1973-1993*, Notatki Ornitologiczne, 35, 5-47.

Bukaciński D., Keller M., Buczyński A., Bukacińska M., 2017, *Awifauna lęgowa koryta środkowej Wisły w roku 2009 – zmiany liczebności i rozmieszczenia w ciągu ostatnich 36 lat*, in: Keller M., Kot H., Dombrowski A., Rowiński P., Chmielewski S., Bukaciński D., (eds), „Ptaki środkowej Wisły", M-ŚTO, Pionki, 97-127.

Bukaciński D., Bukacińska M., Buczyński A., 2018, *Threats and the active protection of birds in a riverbed: postulates for the strategy of the preservation of the middle Vistula River avifauna*, Studia Ecologiae et Bioethicae, 16, 5-30.

Chylarecki P., Chodkiewicz T., Neubauer G., Sikora A., Meissner W., Woźniak B., Wylęgała P., Ławicki Ł., Marchowski D., Betleja J., Bzoma S., Cenian Z., Górski A., Korniluk M., Moczarska J., Ochocińska D., Rubacha S., Wieloch M., Zielińska M., Zieliński P., Kuczyński L., 2018, *Trendy liczebności ptaków w Polsce*, Wyd. GIOŚ, Warszawa.

Dombrowski A., Nawrocki P., Krogulec J., Chmielewski S., Rzępała M., 1994, *Awifauna bocznych odnóg Wisły środkowej w sezonie lęgowym*, Notatki Ornitologiczne, 35, 49-78.

European Comision, 2009, *European Union Management Plan 2009-2011, Common Gull Larus canus*, Technical Report.

Głażewska E., Głażewski L., Kot H., Nawrocka B., Nawrocki P., Zyska E., Zyska P., 1985, *Wpływ czynników środowiskowych na produktywność populacji mew i rybitw na Wiśle Środkowej w roku 1985 w granicach województwa radomskiego i warszawskiego*, Maszynopis dla Wojewódzkiego Konserwatora Przyrody w Siedlcach, Siedlce.

Głowaciński Z. (ed), 2001, *Polska Czerwona Księga Zwierząt. Kręgowce*, Warszawa.

Gwiazda R., Bukaciński D., Neubauer G., Faber M., Betleja J., Zagalska-Neubauer M., Bukacińska M., Chylarecki P., 2011, *Diet composition of the Caspian Gull (Larus cachinnans) in inland Poland: effects of breeding area, breeding stage and sympatric breeding with the Herring Gull (Larus argentatus)*, Ornis Fennica, 88, 80-89.

Kot H., Głażewska E., Głażewski L. Nawrocki P., Zyska E., Zyska P., 1986, *Waloryzacja ornitologiczna Wisły środkowej na odcinku Dęblin-Góra Kalwaria oraz wyniki badań populacyjnych na wybranych gatunkach ptaków w roku 1986*, Maszynopis dla Wojewódzkiego Konserwatora Przyrody w Siedlcach. Siedlce.

Keller, M., Kot H., Dombrowski A., Rowiński P., Chmielewski S., Bukaciński D. (eds), 2017, *Ptaki środkowej Wisły*, M-ŚTO, Pionki.

Luniak M., 1971, *Ptaki środkowego biegu Wisły*, Acta Ornithologica, 13, 17-113.

Neubauer G., Zagalska-Neubauer M., Gwiazda R., Faber M., Bukaciński D., Betleja J., Chylarecki P., 2006, *Breeding large gulls in Poland: distribution, numbers, trends and hybridisation*, Vogelwelt, 127, 11-22.

Tomiałojć L., Dyrcz A., 1993, *Przyrodnicza wartość dużych rzek i ich dolin w Polsce w świetle badań ornitologicznych*, in: Tomiałojć L. (ed), „Ochrona przyrody i środowiska w dolinach nizinnych rzek Polski", Wyd. Instytutu Ochrony Przyrody PAN, Kraków.

Vogrin M., 1998, *Egg size of the Common Tern Sterna hirundo in Slovenia*, Ornis Svecica, 8, 87- 90.

Wesołowski T., Głażewska E., Głażewski L., Nawrocka B., Nawrocki P., Okońska K., 1984, *Rozmieszczenie i liczebność ptaków siewkowatych, mew i rybitw gniazdujących na wyspach Wisły środkowej*, Acta Ornithologica, 20, 159-185.

Winiecki A., 2004, *Sterna albifrons – rybitwa białoczelna*, in: Gromadzki M. (ed), „Ptaki (cz. II). Poradniki ochrony siedlisk i gatunków Natura 2000 – podręcznik metodyczny", Ministerstwo Środowiska, Warszawa, T. 8, 195-198.

Zieliński P., Iciek T., Zielińska M., Szymczak J., Gajewski M., Bukaciński D., Bukacińska M., Betleja J., Bednarz Ł., Loręcki A., Kołodziejczyk P., Ławicki Ł., 2019, *Identification of hybrids Mediterranean x Black-headed Gull in Poland*, Dutch Birding, 41, 318-330.

Czy sąsiedztwo kolonii śmieszki (*Chroicocephalus ridibundus*) zwiększa sukces lęgowy rybitwy rzecznej (*Sterna hirundo*) na wyspach środowej Wisły?

Streszczenie

Badania prowadziliśmy w roku 2017 w kolonii rybitwy rzecznej *Sterna hirundo* (STH) usytuowanej na wyspie środowego biegu Wisły, na wysokości miasta Dęblin (km 393-394 szlaku wodnego). Naszym celem było poznanie wybranych aspektów biologii i ekologii rozrodu tego gatunku. W związku z tym, że gnieździ się ona zarówno w koloniach jednogatunkowych, jak również w dwu- lub kilkugatunkowych, wspólnie z rybitwą białoczelną *Sternula albifrons*, śmieszką *Chroicocephalus ridibundus* (LAR) i/lub mewą siwą *Larus canus* przede wszystkim chcieliśmy sprawdzić czy ich sąsiedztwo (w tym przypadku LAR) wpływało na sukces klucia się i przeżywalność piskląt STH. Uzyskane wyniki jednoznacznie wskazują, że obecność lęgowych rybitw w sąsiedztwie kolonii LAR nie było przypadkowe i/lub też efektem braku miejsca i/lub możliwości gnieżdżenia się w innym miejscu. Wysokość miejsca gniazdowania, typ siedliska lęgowego, wielkość zniesienia, objętość jaj i masa jaj lęgów tych ptaków nie różniły się istotnie od tych, które utworzyły kolonię na tej samej wyspie, ale kilkaset metrów dalej. Jednak w sąsiedztwie kolonii LAR gniazda STH były zakładane znacząco wcześniej a sukces klucia się i przeżywalność piskląt w okresie wczesnopisklęcym były dwukrotnie wyższe. Tym samym można stwierdzić, że kolonia LAR mogła zapewniać skuteczną ochroną przed drapieżnictwem wron, srok i mew, które odpowiadały za zdecydowaną większość strat jaj rybitw w roku badań

Słowa kluczowe

środkowa Wisła, rybitwa rzeczna, sukces lęgowy, śmieszka, przyczyny strat jaj i piskląt