ACTA ORNITHOLOGICA
Vol. 41 (2006) No. 2

Habitat and nest site selection in the Common Gull *Larus canus* in southern Poland: significance of man-made habitats for conservation of an endangered species

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Skórka P., Martyka R., Wójcik J. D., Babiarz T., Skórka J. 2006. Habitat and nest site selection in the Common Gull *Larus canus* in southern Poland: significance of man-made habitats for conservation of an endangered species. Acta Ornithol. 41: 137–144.

Abstract. The Common Gull is a rare and endangered breeding species at inland habitats in Poland as well as in some other countries in Europe. Breeding biology, habitat and nest site selection were studied in this species in southern Poland. Almost all birds nested on industrial water bodies (gravel pits, sedimentation basins), although fishponds and reservoirs were the most abundant habitat in the study area. Birds built their nests mainly on islets, man-made constructions and dry land on the shores of water bodies. The islets occupied by birds were smaller and were covered by lower vegetation than the unoccupied ones. When occupied islets on industrial water bodies were compared with a random sample of islets on fishponds, the latter were found to be larger, with taller and denser vegetation. This may explain why Common Gulls did not breed on fishponds in southern Poland. Shore-breeding birds nested in open areas with sparse vegetation, occupying sites with less vegetation cover and closer to shrubs or trees than randomly selected points. Breeding performance (mean date of clutch initiation, clutch size, clutch volume, hatching success and breeding success) did not differ among nests built on islets, man-made constructions or on the shores of the water bodies. Breeding success was more than twice as high as in large riverine colonies. Industrial water bodies may become important alternative breeding habitats for this species in Poland.

Key words: Common Gull, *Larus canus*, habitat selection, man-made habitats, nest sites, nest size, breeding biology

Received — July 2006, accepted — Nov. 2006

INTRODUCTION

Habitat and nest site selection studies are essential for effective protection and management of endangered species (e.g. Morrison et al. 1998, Väli et al. 2004, Hewson et al. 2005, Wesołowski et al. 2005). Nest-site selection is one of the most important factors determining breeding success and therefore fitness in birds (Partridge 1978, Cody 1985). Birds differ in nest-site selection patterns, some species select sites secure from predators, others select sites with easy access to foraging grounds or protected from adverse weather conditions (Parsons & Chao 1983, Jehl & Mahoney 1987, Xirouchakis & Mylonas 2005, Urios & Martinez-Abrain 2006). Birds also differ in the number of nest-sites utilized, some species are nest-site specialists while others show high plasticity in nest-site choice (Newton 1998, Velando & Freire 2003, De Kroon 2004).

The Common Gull occurs in North America and Eurasia (Cramp & Simmons 1983). The gull inhabits a variety of habitats such as lakes, marshes, rivers, harbours, roofs or even fields (Wesołowski et al. 1984, Bergman 1986, Burger & Gochfeld 1987, 1988, Vermeer & DeVito 1987, Bremer 1995). Besides the range of habitats occupied, this species also shows high plasticity in nest site choice within a habitat (Wesołowski et al. 1984, Burger & Gochfeld 1987, 1988). In Poland, this species nests mainly on islets in the Vistula River valley (Wesołowski et al. 1984, Stawarczyk & Tomiałojć 2003), but the population size in main colonies has declined by about 40% (Bukaciński & Bukacińska, 2003, Stawarczyk & Tomiałojć 2003, Bukaciński & Buczyński 2005). The Common Gull is now highly endangered in Poland as well as in Europe (Bukacińska & Bukaciński 2004). The colonies located in the Vistula river valley (about 90% of Polish population breeds there) suffer from mass outbreaks of black flies (Simuliidae), floods and invasion of Mink *Mustela vison* and Red fox *Vulpes vulpes* that depredate many nests, chicks and adult birds (Bukaciński & Bukacińska 2000, 2003, Bukaciński & Buczyński 2005). Special protection actions have been implemented recently to reverse the population trends in riverine colonies (Bukaciński & Buczyński 2005). However, the species also nests in other habitats in Poland such as lakes, fishponds and industrial reservoirs (Stawarczyk & Tomiałojć 2003). However, the importance of such habitats in nest site selection and breeding performance of the species has not been studied to date. Such data are urgent for the planning of conservation actions for this species.

In this paper we analysed habitats, nest site selection, and breeding performance of Common Gulls inhabiting man-made industrial reservoirs in southern Poland. Factors affecting population development, habitats, nest-site selection of this species in southern Poland and conservation implications are discussed.

STUDY AREA METHODS

Study area

The study was carried out in southern Poland, encompassing an area of about 60 000 km^2 between 1999–2004 (Fig. 1, a detailed description of the study area is given in Walasz & Mielczarek (1992) and Walasz (2000)). Some data from 1996–1998 were also used. More detailed investigations of the breeding biology were made on industrial reservoirs on the Dunajec and Wisłoka river valleys and in the environs of Kraków. We also visited almost all potential breeding sites (three surveys per site during the season) in the whole region in 2002, 2003 and 2004.

Habitats

All breeding Common Gulls were noted, and nest location and type of habitat recorded. The potential breeding habitats were man-made industrial reservoirs (gravel pits, sedimentation basins) and dam reservoirs. We also surveyed most fishpond complexes, old riverbeds and some parts of river valleys (Dunajec, Raba, Skawa, Wisłoka, Vistula). Total area of a given habitat was received from literature (in case of fishponds and dam reservoirs) or from topographic maps and our GIS data (in case of industrial reservoirs).

Nest site selection

We distinguished three main nest sites: islets, anthropogenic constructions and dry shores of the reservoirs. All these nest sites were within man-made industrial reservoirs as the Common Gull bred almost exclusively in this habitat (see Results). The following environmental characteristics were measured for nesting habitat of Common Gulls on islets: area of islets (m^2), vegetation cover (%), presence/absence of shrubs or trees, vegetation height (cm), distance to the shoreline of occupied islets (m). The same characteristics were also collected for a random sample (n = 20) of islets unoccupied by Common Gulls. This approach was chosen because most of the occupied islets were very small, making it impossible to unambiguously establish random points on them. Most of islets on the reservoirs were small remains left by the companies after the cessation of the gravel production. Their size varied from about 1 to 100 m^2 and rarely was larger than 1 ha.

In case of nests located on anthropogenic constructions, most of the parameters were inapplicable, therefore only the height of the nest was measured and a general description of the nest site was made.

For nests found on shores, we measured the vegetation cover (%) in a 50 cm radius around the nest, vegetation height (cm), distance to the nearest shrub or tree (cm) and distance to water (m). The same parameters were taken for an equal sample (n = 19) of random points. The shores of the reservoirs varied a lot. They were covered mostly with grasses or/and trees and shrubs. The flat shores with sparse vegetation constituted only about 20% of total shoreline of the reservoirs.

Breeding biology

Breeding biology was studied in detail in 1999–2004 at sedimentation basins and gravel pits near Tarnów, gravel pits in the Wisloka river valley and in the Kraków environs (Fig. 1). We also collected data on breeding parameters at other reservoirs. All nests found were marked with small wooden sticks and their diameter was examined.

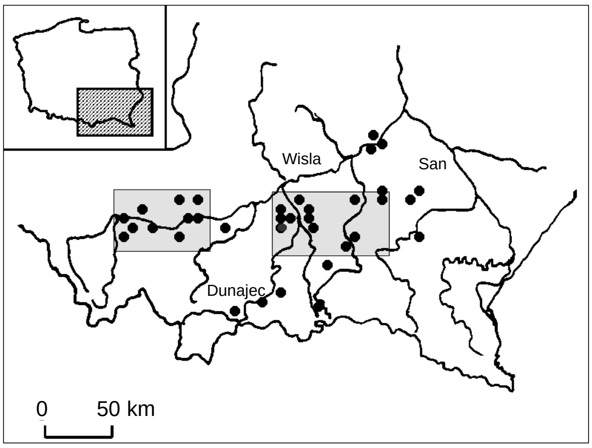

Fig. 1. Map of the study area. Black circles indicate breeding localities of Common Gull. The shaded rectangles show areas where the breeding biology of Common Gull was studied in details.

Eggs were measured to the nearest 0.1 mm and were permanently marked. We calculated egg volume according to Barth (1967). We visited nests at about one-week intervals to establish hatching success and egg losses. Exceptionally, we visited nests at two-day intervals at sedimentation basins in Tarnów in 2000. We assumed that chicks fledged at approximately 20 days of age. Since most of the breeding pairs were either solitary or in small numbers at one site (see Results), breeding success could be easily determined.

Statistics

Because gulls often nested on the same islets and anthropogenic constructions each year, information was used from only one randomly chosen year, in order to maintain data independence in some analyses and during presentation of the frequencies. The Student t-test was applied (for each variable separately) to check if parameters taken around nests built on shore differed from random points. To establish if the occupied islets differed in characteristics from unoccupied ones, multiple logistic regression analysis was used, which gives the probability of islet occupancy relative to the variables used (in reality each "unoccupied" islet could be taken by the gull in other years than the study was conducted, therefore probability of islet occupancy is a reasonable statistic). To compare the mean date of clutch initiation and mean clutch volume (for three-egg clutches only), we used the one-way analysis of variance ANOVA. To compare clutch size distributions, numbers of hatchlings and fledglings between nests built on islets, on anthropogenic constructions and on shore the *G*-test was employed. The *G*-test was also applied to compare the proportion of nests with hatching and fledging success among the nests built on islets, anthropogenic constructions and on the shore of the industrial reservoirs.

RESULTS

Population size and habitat selection

In total, 32 breeding localities of Common Gulls were found and nesting was probable at three further sites (Fig. 1). Almost all sites were localised on industrial reservoirs (gravel pits, sedimentation basins). It is interesting that this type of habitat constitutes only about 20% of total area of wetlands in southern Poland (Fig. 2). Fishponds are most readily available potentially suitable habitats but we have no data indicating that Common Gulls use this habitat for nesting (Fig. 2). The total number of pairs in the area ranged from 80–140 pairs. Solitary pairs prevailed on most of breeding localities (Fig. 3).

Nest site selection

Common Gulls built nests (n = 125 nests analysed in total) in three nest-site types: islets (51%), anthropogenic constructions (34%) and dry land on the shores of reservoirs (15%).

The probability of nest occurrence was higher on smaller islets (Wald $\chi^2 = 4.215$, $p < 0.05$) and on islets with low vegetation (Wald $\chi^2 = 8.000$, $p < 0.001$, Fig. 4). Vegetation cover, distance to the shore and presence of trees or shrubs did not affect the probability of nest occurrence on islets (Fig. 4). When occupied islets on industrial reservoirs

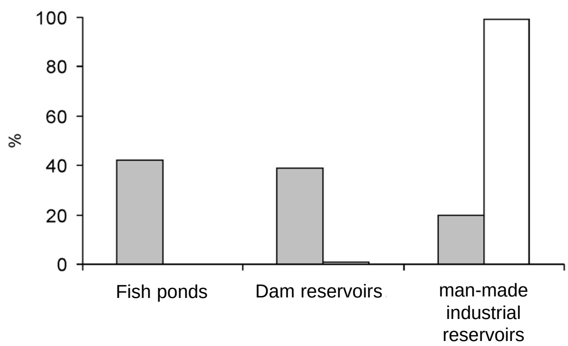

Fig. 2. Habitat selection by Common Gull in southern Poland. Grey bars indicate availability of the given habitat type, white bars shows percent of locations (total n = 32) of breeding Common Gulls in a given habitat type. The difference was significant ($G_2 = 44.546$, $p < 0.0001$).

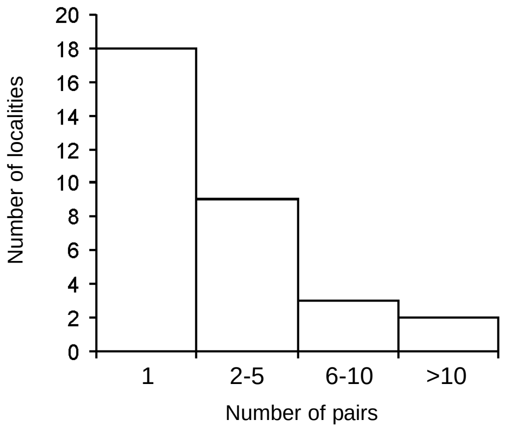

Fig. 3. Number of breeding pairs of Common Gull per locality.

were compared with a random sample of islets on fishponds, the latter were found to be larger (mean ± SD: 1283 ± 2565 m^2, t_{47} = -2.646, $p < 0.01$), with taller vegetation (120.8 ± 51.5 cm, t_{47} = -7.672, $p < 0.0001$) and greater vegetation cover (95.0 ± 16.1%, t_{47} = 5.059, $p < 0.0001$, see Fig. 4 for parameters of islets occupied by the species on industrial reservoirs).

Examples of anthropogenic constructions used by birds included gravel conveyors belts on gravel pits, concrete columns and poles, cantilevers of pipelines on sedimentation basins or pylons. A characteristic feature of these breeding sites was that they were higher than surrounding areas.

Nests built on the shore were built up to 200 m from the water. The nests were in places with very sparse and low vegetation, although open shore constituted about 20–25% of total shore area (calculated for all reservoirs together). These conditions were found only in new gravel pits or in sites where bulldozers disturbed the shore 1 to 3 years earlier, or on dried-up parts of sedimentation basins. Most of the shores of the reservoirs were covered with shrubs, dense grasses and trees. The analysis showed that birds breeding on shores built nests in places with lower vegetation cover (t_{36} = -2.217, $p < 0.05$) and closer to shrubs/trees (t_{36} = - 3.245, $p < 0.005$) than found from random points (Fig. 5).

Two atypical nests were found. The first was built on top of a Magpie *Pica pica* nest about 10 m above ground. The second was built on a thick branch of a tree, about 3 m above ground.

Nesting site and breeding success

No differences were found in mean date of clutch initiation, clutch volume, proportion of clutches with hatching and fledging success or in numbers of hatchlings and fledglings between nests built on islets, human constructions and on shore (Table 1). We found that nests on shores were small compared to nests built on islets and anthropogenic constructions (mean diameter ± SD for islets: 29.2 ± 3.8 cm, n = 26 nests, for anthropogenic constructions: 27.4 ± 3.1 cm, n = 17, for shore: 16.1 ± 2.8 cm, n = 19, one-way ANOVA $F_{2,59}$ = 94.387, $p < 0.001$). This difference was related to outer size of the nest as the inner area was of the similar size at all nest sites. The small nests were sometimes only cavities with a few grass stems.

The main cause of breeding losses in all nesting sites was predation by corvids, mainly by Hooded Crows *Corvus corone cornix*, Jackdaws *C. monedula* (n = 7 nests) and in one site by Yellow-legged Gulls *Larus cachinnans* (n = 3 nests). In nests built on dry land breeding failures were due to predation by mammals, probably by foxes (or domestic cats).

DISCUSSION

Previous studies (Walasz & Mielczarek 1992) showed that in the study area population size of the species in the early 1990s was about 30–50 pairs. Our results indicate that the number of breeding pairs of the Common Gull doubled in about ten years and that many new breeding localities were founded in southern Poland. Almost all breeding localities were on man-made industrial reservoirs despite the predominance of fishponds as the most accessible habitats. Our analysis also showed that the lower availability of small, relatively bare islets may explain why Common Gull do not breed on fishponds in southern Poland. Moreover, the industrial reservoirs themselves, contrary to fishponds, are similar to coastal shore — the primeval breeding habitat of the species.

Common Gulls appear to be habitat specialists in southern Poland, although high plasticity in nest-site selection is evident. Islets in the industrial reservoirs were the most frequently utilized breeding sites. Small islets with low vegetation were favoured. This may be the result of antipredator behaviour of this species as lower vegetation enhances vision and quick detection of an approaching predator. Larger islets with denser vegetation may conceal predators more effectively and facilitate penetration of the gull

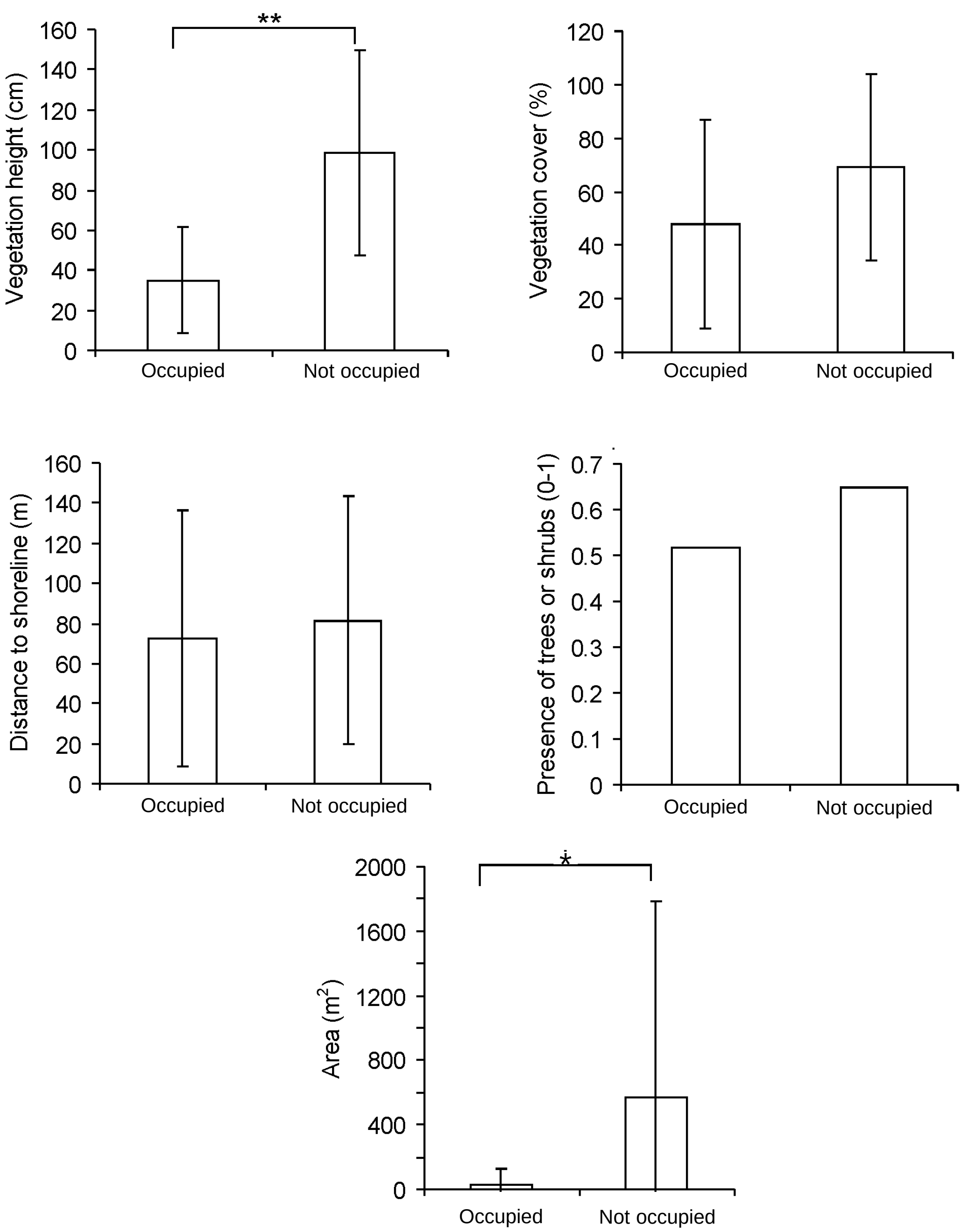

Fig. 4. Factors affecting presence of breeding Common Gulls on islets. Parameters are given as means ± SD except presence of trees or shrubs, expressed as a proportion. Sample sizes were n = 29 occupied islets and random sample of n = 20 islets unoccupied by Common Gull. Results of multiple regression analysis are shown: * — $p < 0.05$, ** — $p < 0.01$.

territory (Bergman 1986, Vermeer & DeVito 1987). Predators may also preferentially search dense vegetation (Wysocki 2005). Our results are similar to those of Vermeer & DeVito (1987), but differ significantly from the studies by Burger & Gochfeld (1987, 1988). The latter authors found that Common Gulls built their nests in sites with higher vegetation cover. They argued that higher vegetation reduces the visibility of nests and therefore decreases the probability of nest predation. This difference is difficult to explain but may result from a different predation pressure and different predator community composition in different geographical regions or from local adaptations.

Table 1. Breeding performance of Common Gulls in different types of nest-sites. Means ± SD are given, sample sizes (number of nests, eggs or chicks) are in parentheses. [a] — only three-egg clutches included, [1] — one-way ANOVA, [2] — *G*-test, [3] — *G*-test comparing distribution of clutch sizes among the types of nest-site.

Parameter	Islets	Anthropogenic constructions	Shore	Statistic	df	p
Mean date of clutch initiation	1 May ± 8 days (13)	28 April ± 7days (9)	4 May ± 4 days (7)	0.261[1]	2,26	0.67
Clutch volume (cm^3)[a]	147.4 ± 10.8 (17)	151.1 ± 6.0 (10)	150.3 ± 4.5 (7)	0.755[1]	2,31	0.51
Mean clutch size	2.52 (31)	2.42 (19)	2.50 (14)	0.100[3]	2	0.99
% of clutches survived to hatching	68 (31)	63 (19)	79 (14)	0.928[2]	2	0.66
% of eggs hatched	82 (49 eggs)	82 (28 eggs)	78 (27 eggs)	0.204[2]	2	0.76
% of pairs with fledging success	48 (23)	47 (15)	44 (9)	0.029[2]	2	0.99
% of chicks fledged	50 (40 chicks)	44 (23 chicks)	38 (21 chicks)	0.812[2]	2	0.67

Also the spatial structure of the populations that differs among geographical regions may play a role.

Nests built on anthropogenic constructions were easily detectable as they were built above the ground or water surface. Similarly, nests on shores were built in places with sparse vegetation. Gulls breeding in such places can detect predators quickly and may defend the nest more efficiently. Nests built on shores were also potentially easily accessible for mammalian predators and should have suffered a higher rate of predation. However, breeding success and other breeding parameters did not differ among the three types of nest-sites. This may be related to the smaller size of nests built on shores, which may reduce probability of predation (Antonov 2004). Incubating Common Gulls are able to detect predators early

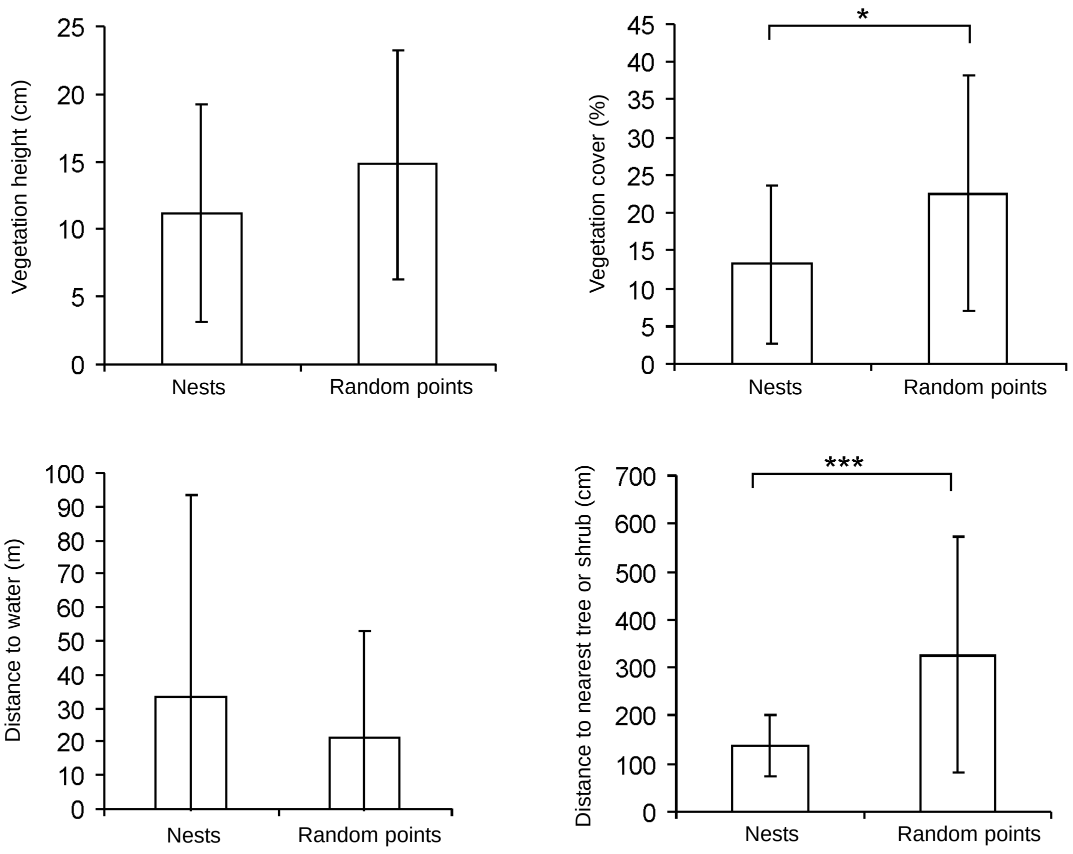

Fig. 5. Nest-site selection in Common Gulls breeding on shores of industrial reservoirs. Parameters are given as means ± SD. Sample sizes were n = 19 nests and n = 19 random points. Results of t-tests are shown: * — $p < 0.05$; *** — $p < 0.001$.

enough to leave the nest and a smaller nest is probably more difficult for the predator to find. Our behavioural observations and experiments with artificial nests showed that smaller nests had lower rate of predation and Common Gulls incubating on shores left nest earlier than those on islets when an observer approached them (Authors' own data). As Common Gulls, in our study area, are mostly solitary breeders, the observed pattern of habitat and nest-site selection is probably shaped by antipredatory behaviour. Small nests built by Common Gulls were also reported by Gotmark & Anderson (1980) and Bianki (1967).

Man-made industrial reservoirs appeared to be an important habitat for Common Gull, offering a range of nest sites of probably similar quality. Population size in the study area increased contrary to that in colonies located in the Vistula River and our results provide a good example of how man-made habitats may enhance conservation of endangered species. Most of the gulls breeding on the industrial reservoirs are solitary pairs. It means that the extinction of the one inhabited patch has little effect on the whole population (Hanski 1999). It is in contrast to the birds breeding in the Vistula river, where most of birds breed in a few large colonies (Bukaciński & Bukacińska 2000, 2003, Stawarczyk & Tomiałojć 2003), and extinction of one colony is therefore related to rapid population decrease. Moreover, mammal predators, such as the Mink, can easily find large colonies and exploits them constantly as a rich food resource, while solitary pairs breeding on industrial reservoirs may avoid predation pressure. This pattern is also visible in breeding parameters because the hatching success of birds breeding in the industrial reservoirs was about 80% (Table 1) while it dropped to the level of 20–40% in riverine colonies (Bukaciński & Buczyński 2005).

The Common Gull population might benefit more from the human activity if the companies exploiting gravel and sand left at least a few islets on the reservoirs after the termination of their activity. Such sites could be colonized and population size of the species could grow. The islets on the industrial reservoirs also provide nest sites for many species, including endangered ones, such as Common Tern *Sterna hirundo* or Mediterranean Gull *Larus melanocephalus* (Skórka et al. 2005, authors' own data). Another possibility is to create artificial islets or floating rafts (Loose 1998, Quinn & Sirdevan 1998) that could be equally beneficial. It would be also reasonable to keep shores of the reservoirs in the early stages of succession, with sparse vegetation which could enable the breeding of gulls there. Hopefully, at least several new gravel-pits are being created in southern Poland every year, therefore the importance of such habitats for Common Gull and other species may increase further.

ACKNOWLEDGEMENTS

Mariusz Cichoń, John Coulson, Szabolcs Lengyel, Michal Woyciechowski and an anonymous referee read and gave valuable comments on the manuscript. We thank Józef Ciosek, Piotr Kawa and Tomek Wilk for information about breeding Common Gulls in the environs of Rzeszów and Kraków. We also thank landowners for access to their properties. The research project was co-financed from the European Social Fund and National Budget in the frame of The Integrated Regional Operational Programme. PS was a beneficiary of the Grant for Young Scientist of The Foundation for Polish Science.

REFERENCES

Antonov A. 2004. Smaller Eastern Olivaceous Warbler *Hippolais pallida elaeica* nests suffer less predation than larger ones. Acta Ornithol. 39: 87–92.

Barth E. K. 1967. Egg dimensions and laying dates of *Larus marinus*, *L. cachinnans*, *L. fuscus*, *L. canus*. Nytt Mag. Zool. 15: 5–34.

Bergman G. 1986. Feeding habits, accommodation to man, breeding success and aspects of coloniality in the Common Gull *Larus canus*. Ornis Fennica 63: 65–67.

Bianki V. V. 1967. Gulls, shorebirds and alcids of Kandalaksha Bay. Israel program for scientific translations, Jerusalem, 1977.

Bremer P. 1995. Breeding habitat of the Common Gull in the Noordoostpolder. Limosa 68: 97–101.

Bukacińska M., Bukaciński D. 2004. [*Larus canus* (L.) — Common Gull.] In: Gromadzki M. (ed.). [Birds. Vol. II. A guide to protection of habitats and species of Natura 2000]. Ministry of the Environment, Warszawa pp: 166–170.

Bukaciński D., Buczyński A. 2005. [Protection of gulls in the Middle Vistula river: risk sources and proposal for active protection on the example of the Common Gull (*Larus canus*)]. Wszechnica Biebrzańska 17.

Bukaciński D., Bukacińska M. 2000. The impact of mass outbreak of black flies (Simuliidae) on the parental behaviour and breeding output of colonial common gulls (*Larus canus*). Ann. Zool. Fennici 37: 43–49.

Bukaciński D., Bukacińska M. 2003. *Larus canus* Common Gull. BWP Update 5: 13–47.

Burger J., Gochfeld M. 1987. Nest-site selection by Mew Gulls (*Larus canus*): a comparison of marsh and dry-land colonies. Wilson Bull. 99: 673–687.

Burger J., Gochfeld M. 1988. Habitat selection in Mew Gulls: small colonies and site plasticity. Wilson Bull. 100: 395–410.

Cody M. L. (ed.). 1985. Habitat selection in birds. Academic Press, New York.
Cramp S., Simmons K. E. L. (eds). 1983. The Birds of the Western Palearctic. Vol. III. Oxford Univ. Press.
De Kroon G. H. J. 2004. A comparison of two European breeding habitats of the Water Rail *Rallus aquaticus*. Acta Ornithol. 39: 21–27.
Götmark F., Andersson M. 1980. Breeding association between Common Gull *Larus canus* and Arctic Skua *Stercorarius parasiticus*. Ornis Scand. 11: 121–124.
Hanski I. 1999. Metapopulation ecology. Oxford Univ. Press.
Hewson C. M., Fuller R. J., Day C. 2005. An investigation of habitat occupancy by the nightingale *Luscinia megarhynchos* with respect to population change at the edge of its range in England. J. Ornithol. 146: 244–248.
Jehl J. R. Jr, Mahoney S. A. 1987. The roles of thermal environment and predation in habitat choice in the California Gull. Condor 89: 850–862.
Loose J. 1998. Common Terns *Sterna hirundo* nesting on rafts. Vogelwelt 119: 253–258.
Morrison M. L., Marcot B. G., Mannan R. W. 1998. Wildlife–Habitat Relationships: Concepts and Applications, 2nd ed. Wisconsin, Univ. Wisconsin Press.
Newton I. 1998. Population limitation in birds. Academic Press, San Diego.
Parsons K. C., Chao J. 1983. Nest cover and chick survival in Herring Gull. Colonial Waterbirds 6: 154–159.
Partridge L. 1978. Habitat selection. In: Krebs J. R., Davies N. B. Behavioural ecology: an evolutionary approach. Sinauer Assoc., Sunderland, Massachusetts.
Quinn J. S., Sirdevan J. 1998. Experimental measurement of nesting substrate preference in Caspian terns, *Sterna caspia*, and the successful colonisation of human constructed islands. Biol. Conserv. 85: 63–68.
Skórka P., Wójcik J. D., Martyka R. 2005. Colonization and population growth of Yellow-legged Gull *Larus cachinnans* in southeastern Poland: causes and influence on native species. Ibis 147: 471–482.
Stawarczyk T., Tomiałojć L. 2003. [The Avifauna of Poland. Distribution, Numbers and Trends]. PTPP "pro Natura", Wroclaw.
Urios G., Martinez-Abrain A. 2006. The study of nest-site preferences in Eleonora's falcon *Falco eleonorae* through digital terrain models on a western Mediterranean island. J. Ornithol. 147: 13–23.
Väli U., Treinys R., Lohmus A. 2004. Geographical variation in macrohabitat use and preferences of the Lesser Spotted Eagle *Aquila pomarina*. Ibis 146: 661–671.
Velando A., Freire J. 2003. Nest site characteristics, occupation and breeding success in the European Shag. Waterbirds 26: 473–483.
Vermeer K., De Vito K. 1987. Habitat and nest-site selection of Mew and Glaucous-winged Gulls in coastal British Columbia. Stud. Avian Biol. 10: 105–118.
Walasz K. (ed.). 2000. The Atlas of Wintering Birds in Małopolska. Małopolska Ornithological Society, Kraków.
Walasz K., Mielczarek P. (eds). 1992. Atlas of the breeding birds in Małopolska 1985–1991. Biologica Silesiae, Wrocław.
Wesołowski T., Czeszczewik D., Rowiński P. 2005. Effects of forest management on Three-toed Woodpecker *Picoides tridactylus* distribution in the Białowieża Forest (NE Poland): conservation implications. Acta Ornithol. 40: 53–60.
Wesołowski T., Głażewska E., Głażewski L., Nawrocka B., Nawrocki P., Okońska K. 1984. Distribution and numbers of waders, gulls and terns nesting on islands in the middle course of the Vistula. Acta Ornithol. 20:159–185.
Wysocki D. 2005. Nest site selection in the urban population of Blackbirds *Turdus merula* of Szczecin (NW Poland). Acta Ornithol. 40: 61–69.
Xirouchakis S. M., Mylonas M. 2005. Selection of breeding cliffs by the Griffon Vulture *Gyps fulvus* in Crete (Greece). Acta Ornithol. 40: 155–161.

STRESZCZENIE

[Siedliska oraz miejsca gniazdowania mewy pospolitej w południowej Polsce: znaczenie środowisk pochodzenia antropogenicznego w ochronie zagrożonego gatunku]

Mewa pospolita jest rzadkim i zagrożonym gatunkiem na terenach śródlądowych w wielu krajach europejskich, w tym w Polsce. Celem niniejszych badań było poznanie biologii lęgowej, wyboru siedlisk i miejsc na gniazdo u tego gatunku w południowej Polsce (Fig. 1). Znaczna większość stanowisk lęgowych była zlokalizowana na zbiornikach przemysłowych (żwirowniach, osadnikach), pomimo tego, że stawy rybne i zbiorniki zaporowe były najbardziej dostępnym potencjalnym siedliskiem lęgowym (Fig. 2). Na poszczególnych stanowiskach przeważały pojedyncze pary ptaków (Fig. 3). Mewy pospolite zakładały gniazda głównie na wyspach zbiorników, różnorakich konstrukcjach przemysłowych, oraz na suchych brzegach zbiorników, porośniętych skąpą roślinnością. Wyspy zajęte przez mewy były mniejsze i pokryte niższą roślinnością niż te, które nie były zajmowane (Fig. 4). Kiedy porównano wyspy zajmowane na zbiornikach przemysłowych z wyspami na stawach rybnych, okazało się że te ostatnie były większe i pokryte były wyższą i gęstszą roślinnością. Może to tłumaczyć dlaczego mewa pospolita nie zasiedlała stawów rybnych na badanym terenie.

Ptaki gniazdujące na brzegach zbiorników budowały gniazda w otwartych miejscach ze skąpą roślinnością. Wokół gniazd pokrycie roślinności było mniejsze, a same gniazda były bliżej krzewów lub drzew niż w punktach losowych (Fig. 5). Parametry rozrodcze (średnia data przystąpienia do lęgu, objętość zniesienia, sukces klucia oraz sukces lęgowy) nie różniły się pomiędzy ptakami gniazdującymi na wyspach, brzegach oraz konstrukcjach antropogenicznych (Tab. 1). Parametry rozrodcze na badanym terenie były ponad dwukrotnie wyższe niż w dużych koloniach zlokalizowanych na wyspach wiślanych. Zbiorniki przemysłowe mogą zatem stać się ważnym alternatywnym siedliskiem dla tego gatunku w Polsce.