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EXPANSION OF THE CORMORANT (*PHALACROCORAX CARBO SINENSIS*) POPULATION IN WESTERN LITHUANIA

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Abstract. Cormorants started to breed in western Lithuania in 1989. Number of nesting pairs has approached 2000 in the recent years. The majority of breeding Cormorants concentrates in a single colony on the Curonian Spit. Rapid expansion of the species in the area causes potential conflicts with fisheries and forestry. Nevertheless, it was estimated that the Cormorant conflict with fisheries on Curonian Lagoon should not be significant, as the birds are responsible for the consumption of a relatively small proportion of the total fish stock.
Key words: Cormorant, *Phalacrocorax carbo sinensis*, western Lithuania, fish consumption, fisheries

Introduction

Written material about Cormorants (*Phalacocorax carbo sinensis*) breeding in western Lithuania dates back to the 18th century (Ivanauskas 1938). In the 19th century, a big colony of the species was known on the Curonian Spit near Juodkrantė settlement (Ivanauskas 1938). From the early 20th century a rapid decline in its numbers followed, and breeding birds were not known at all until 1985 (Jusys 1997; Stanevičius & Paltanavičius 1997). From the 1980s numbers of non-breeding Cormorants started to increase in western Lithuania, and the first breeding birds were recorded in the colony of Grey Herons (*Ardea cinerea*) near Juodkrantė in 1989. Cormorants re-occupied the same colony where they stopped breeding over a century ago. Then number of breeding Cormorants peaked, following similar pattern observed elsewhere in Europe (Van Eerden & Gregersen 1995). An increased population of Cormorants has come into conflict with fisheries and aquaculture in many countries (Adamek *et al*. 1997), which is also expected to be the case in Lithuania.
The aim of this paper is to present the material about the expansion of Cormorant population in western part of Lithuania and discuss conservation and management issues related to this phenomenon.

Material and methods

The study area covers western part of Lithuania including the Nemunas River Delta, coastal area of Curonian Lagoon and the Baltic Sea, and the Curonian Spit.
Periods of presence, location of breeding colonies, and numbers of non-breeding Cormorants were recorded by regular bird censuses. Breeding bird numbers were obtained by nest counts at the colonies. Nesting success was assessed in 2001 and 2002 by counting fledged juveniles in 100 randomly selected nests along a transect across the colony near Juodkrantė.
Aiming to assess the impact of Cormorants on local fish resources, the diet of birds was studied from regurgitated material, which was collected in the colony near Juodkrantė during the breeding period in 2001. Nine visits were made to the colony to collect fish regurgitated by Cormorants. The period covered three months starting from early April until late June 2001.

Results and discussion

Periods of presence

Cormorants do not stay in western part of Lithuania all the year round. In winter, the birds are rare, and only single individuals were observed on the Baltic Sea coast during recent winters. The highest number of wintering Cormorants was recorded in winter 2001/2002, when up to 30 birds were recorded. Breeding Cormorants usually arrive to western Lithuania in late February, settle at the colony and lay eggs within two weeks after arrival. Non-breeding individuals appear in the

coastal region later – most often in late March–April. In autumn, Cormorants usually stay on Curonian Lagoon and along the coast of the Baltic Sea until the middle of October.

Numbers of breeding birds

Colony on the Curonian Spit near Juodkrantė (21°06'E 55°31'N) is the only where Cormorants have been breeding regularly since their appearance in 1989. The number of breeding Cormorants in the colony was steadily increasing from year to year, while the abundance of Grey Herons, which share the same colony, was relatively stable (Fig. 1). The average annual growth rate of Cormorant numbers in the colony during the recent five years (1997–2002) was 17%.

Cormorants also attempted to establish colonies on the Nemunas River Delta, where they started to breed in 1994. The first nests were found at the mouth of the Atmata River, where a colony of *c.* 40 nests had been established, but juveniles had not been raised successfully. In the same year (1994), another colony was found at the Skirvytė River, where Cormorants had built *c.* 270 nests. Juveniles had not been raised in that colony either. The birds attempted to breed in those colonies during the following years as well, but it was a failure. It is unclear why nesting was unsuccessful there. It can only be assumed that the colony at the mouth of the Atmata River was abandoned due to intensive boat traffic. In 1996, Cormorants started to breed in a colony at Lake Krokų Lanka, however juveniles were successfully raised just in 1999 and 2000. The colony was abandoned in the following years at early stages of the breeding season due to unknown reasons. The highest number of nests counted there was 126 in 2000.

Numbers of non breeding birds

In addition to breeding birds, a number of non breeding Cormorants was recorded staying on Curonian Lagoon and the Nemunas River Delta during the nesting period. According to the counts at the night-roosting sites of Cormorants in the Nemunas River Delta, 500–700 non breeding individuals were recorded in 2001 and up to 1,000 of them in 2002. They account for 20–25% of nesting bird numbers in the area.

Nesting success

Observation results suggest that nesting success of Cormorants in the colony near Juodkrantė was rather high. Mean number of fledged juveniles per nest was 2.72 ± 0.66 (±SD, range 1–4, n = 100) in 2001 and 2.66 ± 0.81 (±SD, range 1–4, n = 100) in 2002. By extrapolating those data for the entire colony it can be estimated that 4,820 juveniles were raised in 2001 and 5,270 in 2002.

Diet composition and food consumption

A total of 176 regurgitated fish specimens of 13 species was collected during the bird nesting period in 2001. Numerically, about a half (51%) of all fish consumed was made by roach *Rutilus rutilus*. The other important species were pike-perch *Stozostedion*

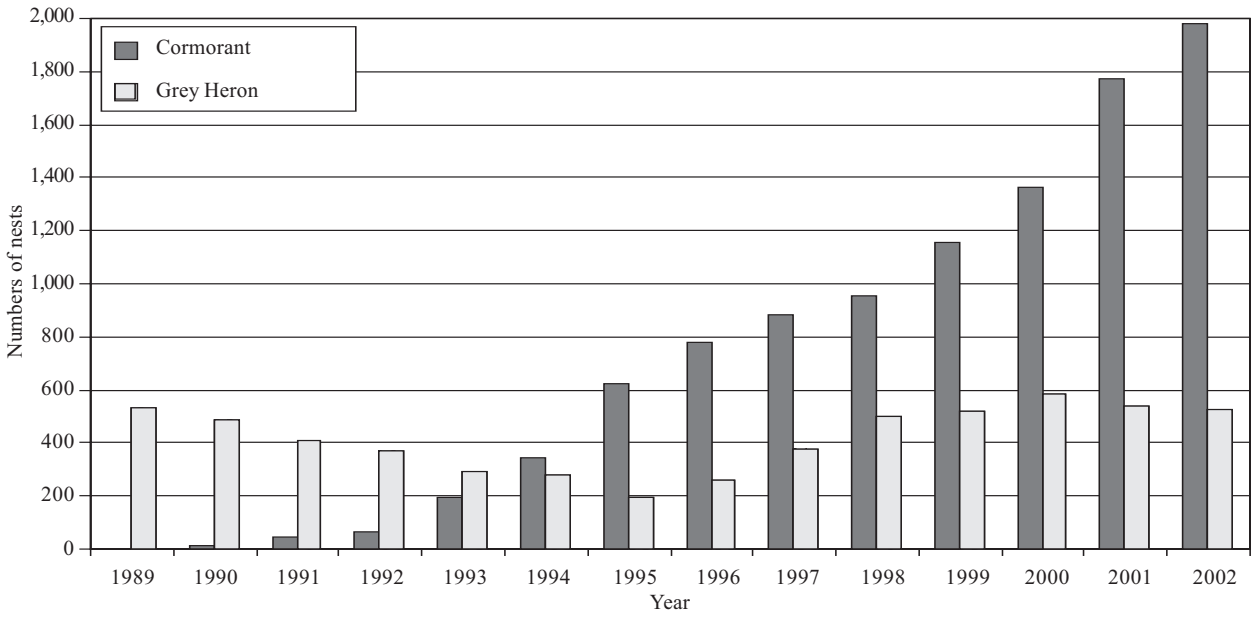

Figure 1. Dynamics of numbers of nests of Cormorants and Grey Herons in the colony on the Curonian Spit near Juodkrantė.

lucioperca (11%), perch *Perca fluviatilis* (9%), bream *Abramis brama* (7%), smelt *Osmerus eperlanus* (7%), and ruff *Gymnocephalus cernuus* (7%). The other species did not exceed 5% in terms of numerical abundance (Table 1). In terms of biomass, roach was the most important species again, accounting for 44% of aggregate fresh weight of all consumed fish. The other species that exceeded the 5% limit with regard to the total biomass were pike-perch (21%), bream (13%), and perch (5%; Table 1). The diet composition of Cormorants roughly corresponds to the structure of the fish stock in Curonian Lagoon, where according to biomass roach is the most abundant species (*c.* 33%), followed by bream (*c.* 22%), perch (*c*. 15%), and ruff (*c.* 13%; Repečka 1997). Some migratory fish species, such as smelt and vimba, become abundant in Curonian Lagoon during seasonal migrations (Virbickas 2000). Cormorants consumed roach more frequently than bream compared to available resources, as those birds prefer fish with more elongated body shape (De Nie 1995). Relatively high proportion of pike-perch in the diet of Cormorants compared to the fish stock composition can be explained by a fluctuating abundance of this fish species, which is determined by successful spawning seasons, the last of which was recorded in 1999 (L. Ložys pers. comm.).

It should be noted, however, that the diet composition of Cormorants from this rather small sample is incomplete and could vary during other seasons or years. Additional studies should be made (increased sample size, stomach and pellet analyses) to support the existing data and gain a reliable picture about the diet composition of Cormorants on Curonian Lagoon.

Size and weight of fish consumed by Cormorants varied greatly (Table 2). The largest consumed fish as to body length was burbot *Lota lota* of 410 mm. The largest fish as to fresh weight was vimba *Vimba vimba* of 395 g. Despite the ability of Cormorants to catch and ingest relatively large fish, the mean size of food objects was less (Table 2), indicating that the birds mainly prey on the non-commercial part of the fish stock.

We accept the suggestion in literature sources that an adult Cormorant consumes on average *c.* 330 g of fish per day (Feltham & Davies 1997). Considering numbers of breeding and non-breeding Cormorants, nesting success and the period of their presence in the area, it was estimated that the species consumed from 250 to 300 tones of fish in the Lithuanian part of Curonian Lagoon in 2001. This amount accounts for *c*. 25% of the official commercial fish catches in the Lithuanian part of Curonian Lagoon and the Nemunas River Delta, which amounted at *c*. 1,200 tones in 2001 (information from the Fisheries Department, Ministry of Agriculture). The total biomass of fish stock in the Lithuanian part of Curonian Lagoon differs with different literature sources. Virbickas *et al*. (1996) suggested that the total biomass is *c*. 5,000 tones, whereas according to Repečka (1997) the biomass of the whole stock is slightly over 8,000 tones. Nevertheless, it is likely that Cormorant consumption does not exceed 5% of the total fish biomass in the Lithuanian part of Curonian Lagoon annually.

Table 1. Diet composition of Cormorants based on the number and fresh biomass of regurgitated fish.

Prey species	Number of fish found	Diet composition based on numeric abundance of prey, %	Diet composition based on fresh biomass of prey, %
Osmerus eperlanus	13	7.4	0.03
Clupea harengus	1	0.6	1.85
Carassius auratus	1	0.6	1.24
Cyprinus carpio	5	2.8	3.05
Abramis brama	12	6.8	12.95
Blicca bjoerkna	2	1.1	0.75
Rutilus rutilus	90	51.1	45.01
Pelecus cultratus	2	1.1	3.71
Perca fluviatilis	15	8.5	5.01
Gymnocephalus cernuus	9	5.1	0.76
Stizostedion lucioperca	20	11.4	20.85
Vimba vimba	2	1.1	3.98
Lota lota	4	2.3	0.81

Table 2. Some statistical parameters regarding body length and biomass of fish consumed by Cormorants.

Prey species	N	Fish body length, mm				Fish biomass, g			
		Mean	Min	Max	SD	Mean	Min	Max	SD
Osmerus eperlanus	13	150.5	95	185	28.8	17.3	3.8	30.0	7.9
Clupea harengus	1	150.0	150	150		3.2	3.2	3.2	
Carassius auratus	1	190.0	190	190		150.7	150.7	150.7	
Cyprinus carpio	5	142.4	82	165	34.6	74.1	61.4	86.2	11.8
Abramis brama	12	224.6	160	300	43.6	130.9	37.4	300.0	85.8
Blicca bjoerkna	2	150.0	130	170	28.3	45.4	21.8	69.0	33.4
Rutilus rutilus	90	168.2	70	304	43.9	60.7	5.6	370.0	69.1
Pelecus cultratus	2	320.0	270	370	70.7	225.0	150.0	300.0	106.1
Perca fluviatilis	15	144.0	110	230	30.9	40.5	7.7	161.5	36.8
Gymnocephalus cernuus	9	95.2	70	125	19.1	10.2	4.2	22.0	6.7
Stizostedion lucioperca	20	251.0	150	340	45.6	126.5	24.0	250.0	61.3
Vimba vimba	2	277.5	210	345	95.5	241.3	87.6	395.0	217.4
Lota lota	4	282.5	170	410	120.4	24.7	14.7	37.7	9.9

Conflicts related to the expansion of Cormorant population

Similarly to many other countries, it is expected that growing number of Cormorants will cause a conflict with fisheries. Local fishermen already complain that Cormorants are responsible for the decreased catches of some fish species in Curonian Lagoon. However, as shown above, Cormorants are responsible only for the consumption of relatively small proportion of the total fish stock. Results of this study agree with the literature statement that being opportunistic hunters, Cormorants feed on the easiest and most available prey (Cramp & Simmons 1997). So the impact of Cormorants on the fish stock in Curonian Lagoon should be minimal or insignificant as they feed on common and widespread fish species. The birds could cause more appreciable damage to aquaculture in artificial fishpond systems located inland.

In addition to the conflict with fisheries, the expanding colony of Cormorants on the Curonian Spit is causing increasing concern among foresters. The colony is located in an old part of protected forest of Kuršių Nerija National Park. Trees there get dry quickly affected by acid excrements of Cormorants, and the colony expands circularly occupying new trees and increasing the area of the destroyed forest.

At present Cormorants breeding in the colony on the Curonian Spit are not subjected to any management measures. According to the law of Lithuania, this species is listed among game species, which can be hunted only at artificial fishponds with special permissions from the Ministry of Environment.

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References

Adamek, Z., Klinger, H. and Staub, E. 1997. Cormorants in Europe – EIFAC/FAO questionnaire campaign. *Supplemento alle Ricerche di Biologia della Selvaggina XXVI* (*IV European Conference on Cormorants*): 347–353.

Cramp, S. and Simmons, K. (eds) 1997. *Birds of Europe, the Middle East and North Africa. I. Ostrich to Ducks*. Oxford: Oxford University Press.

De Nie, H. 1995. Changes in the inland fish populations in Europe in relation to the increase of the Cormorant *Phalacrocorax carbo sinensis*. *Ardea* 83 (1): 115–122.

Feltham, M.J. and Davies, J.M. 1997. Daily food intake of cormorants: a summary. *Supplemento alle Ricerche di Biologia della Selvaggina XXVI* (*IV European Conference on Cormorants*): 259–268.

Ivanauskas, T. 1938. *Lithuanian Birds*. 1. Kaunas: State Publishers of Encyclopaedias, Dictionaries, and Scientific Literature. [Ivanauskas, T. 1938. *Lietuvos paukščiai*. *I tomas*. Kaunas: Valstybinė enciklopedijų, žodynų ir mokslinės literatūros leidykla.

Jusys, V. 1997. The Cormorant *Phalacrocorax carbo* in western Lithuania. *Ekologia Polska* 45 (1): 69–70.

Repečka, R. 1997. *Investigation of abundance and topo-*

graphical structure of commercial fish in Curonian Lagoon. Report for Lithuanian Hidrobiological Society (in Lithuanian).

Stanevičius, V. and Paltanavičius, S. 1997. The Cormorant *Phalacrocorax carbo* in southern and eastern Lithuania. *Ekologia Polska* 45 (1): 123–124.

Van Eerden, M.R. and Gregersen, J. 1995. Long-term changes in the northwest population of Cormorants *Phalacrocorax carbo sinensis*. *Ardea* 83 (1): 61–79.

Virbickas, J. 2000. *Fishes of Lithuania*. Vilnius: Trys žvaigždutės. [Virbickas, J. 2000. *Lietuvos žuvys*. Vilnius: Trys žvaigždutės.]

Virbickas, J., Domarkas, A. and Pašukonis, J. 1996. On exploitation of fish stocks in the Baltic Sea (LEEZ) and the Lithuanian aquatory of Kuršių Lagoon. *Žuvininkystė Lietuvoje* II: 61–68]. [Virbickas, J., Domarkas, A. and Pašukonis, J. 1996. Apie žuvų išteklių eksploataciją Baltijos jūros Lietuvos ekonominėje zonoje ir Kuršių marių Lietuvos akvatorijoje. *Žuvininkystė Lietuvoje* II: 61–68 (in Lithuanian with English summary).]

Kormoranų (*Phalacrocorax carbo sinensis*) populiacijos ekspansija vakarų Lietuvoje

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Santrauka

Kormoranai pradėjo perėti Lietuvoje nuo 1989 metų. Beveik 2000 šios rūšies porų perėjo vakarų Lietuvoje pastaraisiais metais. Dauguma perinčių kormoranų telkėsi vienoje kolonijoje Kuršių Nerijoje. Greitas kormoranų populiacijos augimas regione gali sukelti konfliktus su žvejyba ir miškininkyste. Preliminariai apskaičiuota, kad kormoranų konfliktas su žvejyba neturėtų būti reikšmingas, nes šie paukščiai suvartoja tik palyginus nedidelę dalį visų žuvų išteklių.

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