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THE DEVELOPMENT OF THE LARGEST COLONY OF THE GREAT CORMORANT (*PHALACROCORAX CARBO SINENSIS*) IN EUROPE

T.Kirikova¹, J.Gregersen², A.Grinchenko³

1 - Azov-Black Sea Ornithological Station

2 - Danish National Forest and Nature Agency

3 - Ukrainian Union for Bird Conservation



О формировании самой крупной колонии большого баклана (*Phalacrocorax carbo sinensis*) в Европе. - Т.А. Кирикова¹, Й. Грегерсен², А.Б. Гринченко³ 1. Азово-Черноморская орнитологическая станция; 2. Национальный департамент лесного хозяйства и природных ресурсов Дании; 3. Украинское общество охраны птиц.

*В данной статье представлена информация о самой крупной колонии древесного типа большого баклана (*Phalacrocorax carbo sinensis*) в Европе (14200 гнездящихся пар), сформировавшейся за последнее десятилетие в Крыму (на Керченском п-ове). До недавнего времени самой большой в Европе гнездовой колонией *Ph.c.sinensis* древесного типа была колония Конты Рыбацкие (Северная Польша), насчитывавшая около 11 637 пар (Висзта et al., 2007).*

По мнению авторов, возникновение и развитие рассматриваемой колонии является примером экологической пластичности вида в условиях трансформации окружающей среды и деятельности человека.

The Great Cormorant (*Phalacrocorax carbo sinensis*) commonly nests in colonies of two types (trees and ground nests), ranging from several hundreds to some thousands of nests per colony. Tree colonies of cormorants are usually situated inland, in deltas of large rivers, while colonies with ground nests are on small islands in lakes, lagoons or along the shore.



The object of our investigation was a tree colony of the great cormorant on Kerchensky Peninsula in the region of Lake Aktashskoye and the village Shchelkino.

According to the authors, the species shows a substantial flexibility to breeding sites and adapts easily to human disturbance.

This is expressed by: 1) redistribution of the species over the available breeding habitats; 2) transition from one type of habitat to another; 3) colonisation of new breeding areas; 4) a steady population growth within the limits of the breeding range.

The aim of our work was: 1) to improve the knowledge of the present state of the population of the Great Cormorant (*sinensis* subsp.) in Europe 2) to analyse population trends in the Azov-Black Sea region 3) to analyse the history of development, numbers, breeding success and spatial structure in the investigated colony.

Material and methods

The study was carried out during the breeding period in May 2004-2006. We recorded the number of nests, the number of chicks, the surface area and spatial structure of the colony. The work was executed by three ornithologists. Nests were counted by a method of a complete (total) count (Bibby et al., 1998). Chicks were counted by a sampling 100 nests.

Apart from field data, we used published information on this species in the region and in Europe as well as unpublished data of Pan-European Cormorant Breeding Colony Census in 2006 (under Wetlands International programme).

Results and discussion

Present status of the great cormorant population in Europe

Recent publications (Bregnballe, Gregersen, 1997a; Poluda et al., 1997; Delany et al., 1999; Wetlands International 2006; Kieckbusch, Knief, 2007) prove not only a sheer increase of the great cormorant numbers in Europe, but also redistribution of the species numbers within the long-existing local populations in delta areas of the Danube, Dniester, Dnieper and all over Azov-Black Sea region (Koshelev et al., 1997; Zhmud, 2000; Rusev, 2000; Rusev, 2004; Kostin, Tarina, 2004; Beskaravayny, in press; Chernichko et al., in press).

Thus, in Europe there are four main populations of the great cormorant (*sinensis* subsp.)

The Western population is concentrated along the Atlantic coast of the Netherlands and Great Britain. It is stable in numbers with about 30,000 pairs.

The Baltic population is still growing with recently about 112,000-120,000 pairs.

The Central European population and Mediterranean population is the smallest with only 16,000 pairs.

The Black Sea population consisted of 100,000 individuals (Rose and Scott, 1994). According to the Pan-European Cormorant Breeding Colony Census in 2006, the Black Sea population, including Ukraine, consists of 85,000 pairs.

At present the overall number of breeding pairs in the European population of the great cormorant is about 242,000-250,000 pairs (Table 1).

Table 1. *Number of geographical populations of the great cormorant (*Phalacrocorax carbo sinensis*) in Europe (Kieckbusch, Knief, 2007).*

Таблица 1. *Численность географических популяций большого баклана (*Phalacrocorax carbo sinensis*) в Европе (Kieckbusch, Knief, 2007).*

Geographical populations Географические популяции	Regions Регионы	Country (wetlands) Страны (ВБУ)	N
Baltic Балтийская	Baltic Sea Балтийское море	Denmark (Kattegat and belts), Germany (Rügen), Poland (Gdansk Bay), Sweden, Finland, Lithuania, Estonia, Latvia, Russia Дания (пролив Каттегат), Германия (Руген), Польша (Гданьский залив), Швеция, Финляндия, Литва, Эстония, Латвия, Россия	112,000-120,000
Western Западная	Atlantic Sea Атлантический океан	Denmark (Jutland westcoast), German (Wadden Sea), Netherlands, England, Belgium Дания (западное побережье Ютландии), Германия (Вадензее), Голландия, Великобритания, Бельгия	30,000
Central European Центрально-европейская	European inland Европейская суша	Poland, Germany, France, Switzerland, Hungary, Slovakia, Bulgaria, Serbia, Croatia Польша, Германия, Франция, Швейцария, Венгрия, Словакия, Болгария, Сербия, Хорватия	15,000
	Mediterranean Средиземное море	Spain, Italy (Po delta) Испания, Италия (дельта По)	1,000
Black Sea Черноморская	Black Sea Черное море	Ukraine, Romania Украина, Румыния	85,000
Total number Общая численность			242,000-250,000

Note: N - size of geographical population (pairs).

Примечание: N - размер географической популяции (в парах).

Trends of changing numbers in the Azov-Black Sea region

Numbers of the great cormorant in Ukraine increased from 1,000-4,500 pairs to 24,000 pairs from the middle 1980s to early 1990s (Poluda et al., 1997).

In 1998 the breeding population in Ukraine was 34,000 birds. The majority of these birds (8.4 % out of the geographical population) was concentrated in the Crimea, in the Eastern Sivash (Siokhin, 2000). According to the unpublished data of the Pan-European Cormorant Breeding



Colony Census 2006, the numbers in Ukraine increased almost four times comparing with 1998 and reached about 65,600 breeding pairs (Table 2). This amounts approximately 26% of the entire breeding European population of *Ph.c.sinensis*. The majority of the Ukrainian population breeds on the Kerchensky Peninsula.

Table 2. *Numbers and distribution of breeding pairs of the great cormorant in wetlands of Ukraine in 2006 according to Pan-European Cormorant Census*

Таблица 2. *Численность и распределение гнездящихся пар большого баклана в ВБУ Украины в 2006 г. согласно данным общеевропейских учетов.*

Wetlands ВБУ	Colony name Название колонии	Colony type Тип колонии	N	Authors* Авторы*
1	2	3	4	5
Danube Delta (secondary delta of the Kiliya Branch) Дельта Дуная (вторичная дельта Килийского рукава Дуная)	Lebedinka and Kurylskie Islands о.Лебединка и Курильские острова	tree древесная	>2500	Platteeuw et al., 2004 ¹
Dniester delta Дельта Днестра	Island of Dniester delta остров в дельте Днестра	ground наземная	4000	Rusev I.T. Русев И.Т.
Black Sea (open sea) Черное море (открытая акватория)	Berezan island о.Березань	ground наземная	3600	Petrovich Z.O. Петрович З.О.
Dzharylgachsky Bay (Black Sea) Джарылгачский залив (Черное море)	Kalanchaksky (Chumaki) Islands о-ва Каланчакские (Чумаки)	ground наземная	70	Ardamatskaya T.B. Ардамацкая Т.Б.
Dzharylgachsky Bay (Black Sea) Джарылгачский залив (Черное море)	Karzhinsky Island 1 о.Каржинский 1	ground наземная	1000	Ardamatskaya T.B. Ардамацкая Т.Б.
Dzharylgachsky Bay (Black Sea) Джарылгачский залив (Черное море)	Karzhinsky Island 2 о.Каржинский 2	ground наземная	925	Ardamatskaya T.B. Ардамацкая Т.Б.
Dzharylgachsky Bay (Black Sea) Джарылгачский залив (Черное море)	Karzhinsky Island 3 о.Каржинский 3	ground наземная	515	Ardamatskaya T.B. Ардамацкая Т.Б.
Dniester Delta Дельта Днестра		tree древесная	100-120	Ardamatskaya T.B. Ардамацкая Т.Б.
Tendrovsky Bay and Yagorlytsky Bay (Black Sea) Тендровский Залив и Ягорлыцкий (Черное море)	Black Sea Biosphere Reserve Черноморский Биосферный заповедник	ground наземная	7120	Rudenko A.G. Руденко А.Г.
Tendrovsky Bay (Black Sea) Тендровский залив (Черное море)	Orlov Island о.Орлов	ground наземная	6620	Rudenko A.G., Yaremchenko O.A. Руденко А.Г., Яремченко О.А.
Yagorlytsky Bay (Black Sea) Ягорлыцкий залив (Черное море)	DOK	ground наземная	500	Rudenko A.G., Demidov A. Руденко А.Г., Демидов А.
Yagorlytsky Bay (Black Sea) Ягорлыцкий залив (Черное море)	Dolgy Island (Galcka) о.Долгий (Галка)	ground наземная	1500	Rudenko A.G., Yaremchenko O.A. Руденко А.Г., Яремченко О.А.
Karkinitsky Bay (Black Sea) Каркинитский залив (Черное море)	Lebyazhy Islands Лебяжьи о-ва	ground наземная	783	Tarina N.A. Тарина Н.А.

Продолжение таблицы 2.

1	2	3	4	5
Dnieper wetlands (Kakhovskoe Reservoir) Днепровские угодья (Каховское водохранилище)	Bolshy and Maly Kuchugury о-ва Большой и Малый Кучугуры	tree древесная	3957	Busel V. Бусел В.
Dnieper wetlands (Kakhovskoe Reservoir) Днепровские угодья (Каховское водохранилище)	Tavolzhан Island о.Таволжан	ground наземная	120	Busel V. Бусел В.
Central Sivash Центральный Сиваш	Kitay island о.Китай	ground наземная	250	Our data Наши данные
Eastern Sivash Восточный Сиваш	Chongarsky Islands Чонгарские о-ва	ground наземная	200	Our data Наши данные
Eastern Sivash Восточный Сиваш	Koyanly Islands о-ва Коянлы	ground наземная	1145	Our data Наши данные
Eastern Sivash Восточный Сиваш	Poligonaya Spit Полигонная коса	ground наземная	2500	Our data Наши данные
Eastern Sivash Восточный Сиваш	Seменов Kut Семеновский кут	ground наземная	2100	Chernichko R.N., Kinda V.V. Черничко Р.Н., Кинда В.В.
Eastern Sivash Восточный Сиваш	Soleprom Islands о-ва Солепром	ground наземная	400	Grinchenko A.B. Гринченко А.Б.
Wetlands of Kerchensky Peninsula (north part) Керченские угодья (северная часть)	Lake Aktashskoye (island) near Shchelkino Озеро Акташское (остров) в окр/ пгт.Щелкино	ground наземная	4095	Our data Наши данные
Wetlands of Kerchensky Peninsula (north part) Керченские угодья (северная часть)	Forest colony near the Shchelkino Лесная колония в окрестностях пгт.Щелкино	tree древесная	14200	Our data Наши данные
Wetlands of Kerchensky Peninsula (south part) Керченские угодья (южная часть)	Lake Achi оз.Ачи	ground наземная	350	Beskaravayny M.M. ² Бескаравайный М.М. ²
Molochansky wetlands of the Azov Sea Молочанские угодья Азовское море	Molochny Liman Молочный лиман	ground наземная	1531	Popenko V.M. Попенко В.М.
Obitochny Bay of the Azov Sea Обиточный залив Азовского моря	Bolshoy Island о.Большой	ground наземная	5500	Popenko V.M. Попенко В.М.
Total number Общая численность			65600	

Notes: N - Number of breeding pairs; * - Authors of census materials or reference to information about number; 1 - Platteeuw M., J. Botond Kiss, M.Y. Zhmud & N. Sadoul 2004. Colonial waterbirds and their habitat use in the Danube Delta. As an example of a large-scale natural wetland. RIZA report 2004.002. ISBN 90.369.5658.7. Institute for Inland Water Management and Waste Water Treatment, RIZA, Lelystad, The Netherlands; 2 - Beskaravainy M.M Southern borders of distribution of some elements of breeding ornithofauna of the plains and foothills of the Crimea//Branta - 2007. - Issue 10. -in press. (in Russian).

Примечания: N - число гнездящихся пар; * - авторы учетных материалов или ссылка на информацию о численности; 1 - Platteeuw M., J. Botond Kiss, M.Y. Zhmud & N. Sadoul 2004. Colonial waterbirds and their habitat use in the Danube Delta. As an example of a large-scale natural wetland. RIZA report 2004.002. ISBN 90.369.5658.7. Institute for Inland Water Management and Waste Water Treatment, RIZA, Lelystad, The Netherlands; 2 - Бескаравайный М.М О южных границах распространения некоторых элементов гнездовой орнитофауны равнинного и предгорного Крыма // Бранта. - 2007. - Вып. 10. - в печати.



The cormorant population is present in the Crimea since 1976 when the first colony of the great cormorant was discovered on Lebyazhy (Swan) Islands in Karkinitsky Bay (Kostin, 1983).

Over the period 1980s-early 1990s the numbers of cormorants in the Crimea were constantly growing in connection with intensive development of fish (pond??) industry, which provided a sufficient feeding base. At the same time new breeding sites were colonised.

In 1982 the great cormorant was for the first time recorded breeding on spits of Tyup-Tarkhan (Eastern Sivash)- with about 800 pairs (Grinchenko A., pers.comm.); in 1983 on Genichesky Islands (Eastern Sivash)- 140 pairs; in 1984 at the Koyanly Islands (Eastern Sivash) with about 5,000 pairs (Siokhin, 2000).

Until the second half of 1990s all colonies of the Crimean population of the cormorant were located in the Sivash (Siokhin, 2000). Numbers in the Sivash colonies varied from 140 pairs (Genichesky Islands) to 6,136 pairs (Koyanly Islands).

Since the mid 1990s there was further redistribution of birds in developed colonies on the Kerchensky peninsula (Lake Aktashskoye and its surrounding area). This redistribution was caused by human disturbance related to the local fish-pond industry at the Sivash. Frequently ground nesting birds were killed in colonies of the Eastern and Central Sivash.

History of development, numbers, breeding success and spatial structure in the investigated colony

In the mid 1990s, a ground colony started to develop on an island at Lake Aktashskoye close to the dismissed nuclear power plant. After the water level in the lake had been raised artificially (it must be a part of a cooling system of the power plant), the islands were isolated from predators and people for a number of years. By the end of 1990s in the breeding population at the island colony increased to 7,000 pairs. That was the time of attempts of spontaneous regulation of the species numbers: the islands were destroyed by local fishermen, that brought about the change of a breeding type in 1999, and the cormorants started to nest on trees in an artificial pine forest near Aktashskoye Lake. Already in 2004 the tree colony reached 13,500 pairs. At this time, the old colony on the island still gave shelter to several thousands of breeding cormorants (4,095 pairs in 2006). Old and new colonies are situated 800 m apart.

By 2006 the tree colony consisted of 14,200 pairs (circa 6% of the European population and 22% of breeding pairs in the Azov-Black Sea region).

It is the largest colony of the great cormorant within the *sinensis* breeding range. Until recently the largest European colony was at Katy Rybackie (northern Poland), which contained 11,637 pairs (Buczma et al., 2007).

Nesting trees in the investigated colony were represented by one species - the pine *Pinus pallasiana* D. don., over 20 years in age. The average number of nests in one tree was 2.5. The structure of colony is heterogeneous and scattered over the area of near 1.25 km² (2500x500 m). The colony has several centres, but the colony density is relatively low comparing with other large colonies of the cormorant in Europe.

This is due to the death of trees and degradation of the canopies to consequent occupation of young trees at the periphery of the colony.

Reproduction success of the great cormorant was estimated during breeding counts in May 2004-2006 and equalled 4.1-4.2 chicks/pair. These high values are made possible by excellent feeding conditions in the Azov Sea where (Gobiidae) represent the main prey up to 83.9%



in the diet of adults and chicks of different age groups in this part of the breeding range (Demchenko, 1999).

Most likely, variation of bird numbers in the different colonies and the redistribution of the species over the local breeding range are connected with this feeding resource. In spite of increased numbers of cormorants in the Azov region, catches of Gobiidae over the last seven years became more than 10 times greater (according to annual official data of the Ministry of Agroindustrial Policy of Ukraine). The Kerch colony does not cause any considerable loss to the local fishery, because the feeding area of the birds is in natural water bodies, and not in fishponds. However, intensive exploitation of artificial pine forest by the great cormorant is leading to gradual exhaustion of forest resources.

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