

УДК 598.422.1:591.16 (477.7)

BREEDING-SITE FIDELITY AND COLONY FORMATION IN THE GREAT BLACK-HEADED GULL

Kharitonov S.P.

Moscow Bird Ringing Centre, IEE RAS

Верность месту гнездования и формирование колонии у черноголового хохотуна. Харитонов С.П. Центр кольцевания птиц, ИПЭЭ РАН.

*Основная работа проводилась в апреле-начале мая 1989-1992 гг. на о-вах Коянлы (45.56 с.ш., 34.56 в.д.), Восточного Сиваша. Использовано некоторое количество данных, собранных в 1995 и 1999 гг. на о-вах Коянлы, Чонгарских о-вах и о. Китай (Центральный Сиваш). В 1989 г. на о-вах Коянлы гнездились 197 пар черноголового хохотуна - (*Larus ichthyaetus* Pall.). Птицы были распределены по 5 колониям. В 1990 г. здесь было 2 колонии, общей численностью 238 гнезд. В 1991 г. - 1 колония из 50 гнезд + одиночное гнездо, в 1992 г. - колония из 65 гнезд. На Чонгарских о-вах в 1991 г. во время периода работы колония насчитывала примерно 200 пар, в 1992 г. - 175 пар. В 1995 г. колония на Коянлы составила примерно 22 гнезда, Чонгарских о-вах - 45 гнезд, о. Китай - 303 гнезда. В 1999 г. хохотуны, колония 420 гнезд, были найдены только на о.Китай. В 1989 и 1990 г. при помощи альфахлоралозы на гнездах отловлено 58 взрослых птиц. Все они помечены крылометками. По окончании сезонных работ колонии картировались при помощи рулетки и компаса.*

За 4 года основной работы меченые птицы встречены 461 раз. На следующие после мечения года встречено 35 птиц: 22 - в течение 2 сезонов, 12 - трех сезонов, 1 - в течение всех 4-х лет работы.

Не отмечено ни одного случая, когда бы хохотуны гнездились точно на месте прошлогоднего гнезда. Данные о 35 переселениях по годам свидетельствуют о том, что в пределах колонии и группы близлежащих колоний черноголовые хохотуны практически не имеют гнездового консерватизма. В пределах этой области место гнездования выбирается ими каждый год случайно. Однако, в пределах большого р-на (несколько десятков км) хохотуны обнаруживают достоверную привязанность к определенному острову или группе близлежащих островов. Не обнаружено разницы в гнездовом консерватизме самцов и самок. Успешное вылупление оказывает некоторое положительное влияние на гнездовой консерватизм, однако это влияние слабо и недостоверно.

Заселение колоний было прослежено по выдуплению птенцов. На ранних стадиях колонии имеют групповое (иногда достоверно) или случайное распределение. Колонии формируются через случайные подселения птиц. Большие, окончательно сформированные колонии, имеют равномерное распределение гнезд. Малые колонии, предположительно, останавливаются на более ранних стадиях формирования. Прямые наблюдения показывают, что хохотуны прибывают на места гнездовий парами, место гнездования выбирается этими парами случайно. В колониях черноголового хохотуна места расположения первых гнезд меняются год от года. В пределах колоний не обнаружено более или менее привлекательных для гнездящихся птиц мест. Это говорит об отсутствии у черноголового хохотуна макроструктуры колонии, в противоположность тому, что обнаружено у других колониальных птиц. Также, в противоположность другим птицам, группа близлежащих колоний хохотуна не образует надколониальную систему, т.е. в пределах группы колоний не прослеживаются более или менее предпочитаемые колонии. Я рассматриваю социальную структуру колоний черноголового хохотуна как более примитивную по сравнению с другими колониальными птицами. Черноголовые хохотуны с легкостью образуют малые временные колонии и даже гнездятся одиночно. Во время работы специальные усилия были направлены на поиски групповой привязанности (этим термином обозначают сохранение группы при смене места гнездования) у черноголового хохотуна. За 4 года работы всего зафиксировано 17 случаев, когда меченые птицы гнездились рядом или через гнездо. Кроме пар соседей, зафиксированы также группы соседей до 6 пар. Однако, в 15 случаях эти группы соседей так же легко распались, как и сформировались. Лишь 2 случая позволяют говорить о возможной групповой привязанности, но все же это больше похоже на случайные совпадения. В целом, можно заключить, что групповая привязанность не является характерной чертой черноголового хохотуна как вида.

The Great Black-headed Gull (*Larus ichthyaetus* Pall.) belongs to the cohort of colonial breeding birds that can be classified as obligate colonial species (Zubakin (Зубакин, 1983). Breeding-site fidelity and colony formation in this cohort is poorly studied. There are almost no data on marking of these birds in breeding settlements and their movements inside/outside of a colony. In many cases Great Black-headed Gulls nest on small offshore islands that suffer from irregular flooding caused by strong inshore winds. This kind of habitat can be called as an unstable one. It is hypothesised that low level of nest site fidelity but strong group adherence are attributable for Larids which breed in unstable conditions (McNicholl, 1975). In my own suggestions on the evolution of coloniality I presumed existence of the group adherence in the obligate colonial

species (Kharitonov (Харитонов, 1983), Kharitonov and Siegel-Causey, 1988, Siegel-Causey and Kharitonov, 1990). However, the direct data on this subject were absent till now.

At first, I should define what I mean speaking about the breeding-site fidelity. This term is not explicit itself: it can mean returning to the same nest site from year to year, to the same colony, to the same locality or even to the same region. In the recent years some ornithologists use the term “breeding philopatry” as a quantity value which reflects a fraction of birds (usually percentage) which return to breed at the same nest site or area (Gauthier, 1990). In this article as “breeding site” I mean three spatial levels: exactly the same nest site, the same colony, or an area restricted with group of islands where given colonies are located.

Materials and methods

Материал и методика

The main study was carried out in April-early May of 1989-1982 at the Koyanly Islands (45.56N, 34.56E), the Eastern Sivash, the Sea of Azov, the Southern Ukraine. Some data were collected in 1995 and 1999 at Koyanly Islands, Chongar and Kitay Islands were also involved. The total number of breeding Great Black-headed Gulls in 1989 on Koyanly Islands comprised 197 pair (5 colonies, from 4 to 111 nests), in 1990 - 238 pairs (2 colonies, 207 and 31 pairs). In 1991 Koyanly Islands held a single colony of 50 nest + one single nest. The colony on Chongar Islands in 1991 in the study period contained about 200 nests. In 1992 Koyanly Islands held a single colony of 65 nests, Chongar Islands about 175 nests. In 1995 a colony at Koyanly Islands contained 22 nest, Chongar held 45 nests, Kitay Island contained 303 nests. In 1999 the only colony of 420 nests was found at Kitay Island.

In 1989-1990 I performed catching and wing-tagging of adult gulls at breeding sites. The birds were caught with alfa-chloralose. This remedy was placed on pieces of fish taken from regurgitation of Great Cormorant nestling. The dose was near 100 mg. per bait. These pieces were placed on the rim of the Great Black-heads' nests (a technique is described in details in Kharitonov (Харитонов, 1987). If a bird felt bad after swallowing a drugged bait, I used two kinds of antidotes, Russian titles of which are BEMEGRID and KORDIAMIN. An antidote (1 ml.) was injected in the breast subcutaneously. Since birds were taken from colonies for several hours (up to a day), to prevent a clutch depredation by Yellow-legged Gull (*Larus cachinnans* Pall.) I temporarily shifted Great Black-headed Gull clutches with eggs of Yellow-legged Gulls. After several days I returned Great Black-heads' clutches back to their nests. Unfortunately, I did not start these shiftings from the very beginning of field work, therefore, at the very early period of my work more nests than later were destroyed due to disturbance.

In total, I caught 59 birds, and only one of them in 1989 died. The size of the plastic wing-tags for the Great Black-heads was 7x3.5 cm. In 1989 37 birds were marked, in 1990 21 ones (58 bird in total). Later on marked gulls were searched in the colonies. Besides marking we performed observations on the Great Black-headed Gull colony formation and behaviour from a hide posed 50-100 metres aside a colony. After each season (except to 1992) colonies were mapped with a ruler and compass. For the comparability between maps among years, a wooded orientation poles were dug into the

ground near each colony at Koyanly Islands. Therefore, it was possible to trace how a colony changed its configuration from year to year. One colony which was the largest on the study island was the only permanent one during four seasons. Smaller colonies existed for one or two years.

All marked birds gave a total of 461 field sightings (up to 19 sightings per season). If one excludes a year of marking, I recorded 35 birds (60.3% of total wing-tagged). The total number of sightings in the successive years comprised 273 ones. In the length of the four seasons 22 gulls were recorded during 2 successive seasons, 12 gulls during 3 seasons (one of them in three seasons along within 4 years), 1 gull was noticed in all four seasons.

For the data treatment, in addition to the traditional statistical methods, I used a method of the assessment of the spatial nest distribution type (random, clumped or uniform) by nearest-neighbour distance (Clark and Evans, 1954). To define a colony square in this method, as a boundary of colony I considered a theoretical line that could be drawn around a colony at such distance from the edge nests that is equal to the distance to the nearest neighbour of each particular edge nest (Kharitonov, 1998b). For mapping colonies I used MapInfo-4 programme and my own special software "Colonmap". The latter allows to map a colony from field data, analyse many colony features (bearing and distance between any nests, distance from the 1st to 5th nearest neighbour, type of nest distribution, etc.), and convert the computerised data into MapInfo files.

Shifting of breeding sites and areas among years

Смена места или района гнездования год от года

We found no case where a bird nested exactly on the same nest site during two or more successive years. At the same time, all the colony areas were filled with nests, and in many cases other nests were present at the last-year nest site of a given pair. Therefore, we can undertake that all the colony areas were suitable for nesting, and the reasons for the nest site shift were other than ecological factors.

During 4 years of work I counted 24 cases of between-year nest site changings within the limits of the same island with colonies, and 11 cases of presence of a marked gull at the colony on Bolshoy Chongar Island (Chongar Bay, near 30 km from the main study island). Out of 24 cases of intra-island movements 8 comprised resettlements from one colony to another (up to 500 m), 16 cases covered movements within the largest colony on the island. Distance of a movement within a colony ranged from 240 cm to near 50 m. Since this colony was linear in all years and its length was different (Fig. 1), to compare inter-season resettlements I used relative quantity, i.e. relation of inter-nest distance in different years to the maximal length of the colony in the year of resettlement. For example, if a pair from 1989 to 1990 moved its location through 19.22 m, and colony length in 1990 was 73.08 m, I considered that the marked bird moved through 0.263 fraction of the colony. This data transformation allowed me to analyse all seasons in one data set (Table 1).

If Great Black-headed Gulls move from year to year randomly, i.e. any part of a colony is equal in the nest choice by gulls, the distribution of number of movements would not differ from the uniform one. If this distribution would be different from uniform to greater numbers of short movement, one can conclude that gulls prefer to nest close to

their previous nest site. Since the data set is not large I can combine number of movements joining the neighbouring columns of the Table 1. In the first analysis I considered two fractions: 0-0.5 and 0.5-1. Theoretical number of movements within each of these fractions is 0.5 because the selected fractions represent a half of the colony. 11 gulls moved within of 0.5 colony, 5 gulls moved through 0.5-1 part of a colony. This distribution does not differ significantly from uniform (8 for each fraction): $t=1.62$, $P<0.1$. However, the result is close to the significant one, and I can presume that only lack of data makes it not so clear. To clarify the situation I can diminish the first fraction and presume that in this case the nest site fidelity will be greater than along a half of a colony. But, when I grouped data in another way: 0-0.25 and 0.25-1 part of a colony (4 and 12 were theoretical number of movements), the analysis showed that, in spite of prediction, on the shorter distances the result is even less significant ($t=0.54$, $P<0.6$). This means, that within a colony Great Black-heads chose their nest sites randomly without preference of their last-year sites.

Table 1. *Distribution of relative inter-season movements within the largest colony.*

Таблица 1. *Распределение числа относительных переселений в самой большой колонии.*

Fraction of the colony Доля от длины колонии	0-0.1	0.1-0.2	0.2-0.3	0.3-0.4	0.4-0.5	0.5-0.6	0.6-0.7	0.7-0.8	0.8-0.9	0.9-1
Number of movements Число переселений	2	2	3	3	1	1	3	1	0	0

Movements from colony to colony between years confirm the random way of nest site selection in this species. To check whether this bird prefers a larger or smaller colony to nest, I used the same method as it was applied to the Black-headed Gull (*Larus ridibundus* L.) described in Kharitonov (1993). If gulls chose a colony randomly, they would have settled in respect to a number of gulls in a colony. In 1990 the study island held a total of 238 nests: 207 (0.87 of the total) were in the largest colony, 31 (0.13) in the smaller one. The number of gulls marked in 1989 in the biggest colony and nested in 1990 in the same colony were 14 of 16 total (0,875). 2 of those (0.125) gulls nested in the small colony. These fractions are exactly the same as the theoretic ones ($t=0.06$ $P>0.95$). Out of birds marked in 1989 at the colony No 3, in 1990 3 birds nested at the largest colony, 2 birds nested in the smaller one ($t=1.79$ $P<0.14$, NS). Therefore, both birds from the large colony and from the small colony chose a colony randomly. These results suggest that Great Black-headed Gulls hardly have any nest site phidelity within a zone of several hundred meters.

At the same time, the data show that Great Black-heads are definitely site-tenacious birds within a larger area. If one compares number of marked gulls which nested on Koyanly and Chongar Islands, the strong preference of the last-year nesting area will be observed. In 1991 the number of nests at Koyanly was 51, Bolshoy Chongar Island held 200 nests, the total was about 250 (see above). Theoretical fraction of birds that should nest on Koyanly comprised 0.2. Really this fraction was 0.55 ($t=3.9$, $P<0.001$). Therefore, Great Black headed Gulls prefer rather to nest in the familiar area, than to form a remote

colony. This suggestion is confirmed by the fact that the colony on Chongar formed slowly: in 1989 there were about 11 birds, but only 2 nests. The mechanism of this new colony formation was the same as described for new colonies in many bird species (Kharitonov and Siegel-Causey, 1988).

In the limit of the available data set no differences in the breeding-site fidelity between males and females were found. I managed to define sex in 36 birds (on catching or later by behaviour). The data set contains 13 movements between years in birds that were defined as "males" and 24 movements of "females". Nine of the former and 17 of the latter did not change colony or island from year to year (practically no differences between these fractions (9/13 and 17/24) were found ($t=0.1$, $P>0.92$).

Nest-site fidelity and hatching success

Верность месту гнездования и успех вылупления птенцов

Since my work with Great Black-headed Gulls in a season lasted not later than 6 May, I could trace only hatching. In 1989 hatching commenced on 13 April, in 1990 on 12 April, in 1991 on 27 April. No data were available for 1992. Hatching was considered as successful if at least one nestling per nest appeared. Depredated nests and nests where chicks died at hatching were classified as failure.

In the first analysis I considered only birds that were seen breeding in successive years. 20 of 36 such birds were successful in a previous year, 16 were not successful. 8 of the former 20 changed colony or island. 11 birds of the latter 16 changed colony or the island as well. The differences are close to be significant ($t=1.71$, $P<0.095$). Therefore, I can assume that Great Black-heads tend to change colony or island more often after hatching failure, than after success.

Since the non-significance in the result can be caused by lack of data, I decided to enlarge my samples with the birds which "disappeared" (were not seen) in a colony in the successive years. Operating like that, I keep in mind that after failure birds would leave the area more often, than after success. Since the samples are small, I can consider a bias due to birds that died as equal for successful and non-successful birds. After this operation the number of birds which clutches successfully hatched became 38, failed 23 ones. Twenty five of the former changed colony location or disappeared. In the latter ones this number comprised 16 bird of 23. The difference is definitely insignificant ($t=0.3$, $P<0.76$). This points, that the trend to change nesting site after hatching failure is very little. Finally, I can conclude, that hatching success has little influence on the nest-site fidelity in the Great Black-headed Gull. In this it differs from many other bird species (Lack, 1968).

Colony formation and structure

Формирование и структура колонии

In the Southern Ukraine Great Black-headed Gulls start nest initiation in March (Siokhin et al. (Сиюхин и др., 1988). Since this study began from early April when colonies were mostly formed, I traced colony formation through the hatching sequence. This method is not valid for any particular nest, but if we consider nest distribution we can assume that hatching process in a colony generally reflects nest initiation sequence. Estimates of nest distribution in the entire colonies using nearest-

neighbour distance method (Clark and Evans, 1954) show random and uniform distribution of nests in the Great Black-headed Gull colonies (Table 2).

Table 2. *Distribution of nests in formed colonies and at different stages of colony maturity.*

Таблица 2. *Распределение гнезд в сформированных колониях и на различных стадиях формирования колонии.*

Colony Колония	Stage Стадия формирования	N	Sr_rast	Rand_rast	R	Character of distribution Тип распределения	Significance Достоверность
1	2	3	4	5	6	7	8
1989, largest colony 1989, самая большая колония	hatch 13-19 April, (1 st stage) Вылупление 13-19 апреля (1 стадия)	12	174.4	241.13	0.72	Nearly grouped Почти групповое	t=1.83, P<0.09
1989, largest colony 1989, самая большая колония	hatch 20-25 April (2 nd stage) Вылупление 13-19 апреля (1 стадия)	36	114.11	139.22	0.81	Grouped Групповое	t=2.07, P<0.05
1989, largest colony 1989, самая большая колония	hatch after 25 April (3d stage) Период после вылупления 25 апреля (3 стадия)	49	123.94	119.33	1.04	Random Случайное	t=0.5, P<0.6
1989, largest colony 1989, самая большая колония	Entire colony Полностью сформирования колония	111	94.05	79.28	1.19	Uniform Равномерное	t=3.75, P<0.001
1989, colony №2 1989, колония №2	Entire colony Полностью сформирования колония	37	128.91	139.98	0.92	Random Случайное	t=0.92, P<0.36
1989, colony №3 1989, колония №3	Entire colony Полностью сформирования колония	33	114.44	114.87	1.00	Random Случайное	t=0.04, P>0.95
1989, colony №4 1989, колония №4	Entire colony Полностью сформирования колония	12	182.41	203.15	0.90	Random Случайное	t=0.6, P<0.5
1990, largest colony 1990, самая большая колония	hatch 12-20 April (1 st stage) вылупление 12-20 апреля (1 стадия)	12	277.68	331.66	0.84	Random Случайное	t=1.08, P<0.3
1990, largest colony 1990, самая большая колония	hatch 21-27 April (2 nd stage) вылупление 21-27 апреля (2 стадия)	52	160.61	159.33	1.01	Random Случайное	t=0.11, P>0.91

Продолжение таблицы 1.

1	2	3	4	5	6	7	8
1990, largest colony	hatch after 27 April (3d stage)	66	144.63	141.42	1.02	Random Случайное	t=0.35, P<0.7
1990, самая большая колония	Период после вылупления 27 апреля (3 стадия)						
1990, largest colony	Entire colony	207	97.19	79.85	1.21	Uniform Равномерное	t=5.98, P<0.001
1990, самая большая колония	Полностью сформированная колония						
1990, colony №2	Entire colony	31	209.19	233.88	0.89	Random Случайное	t=1.12, P<0.3
1990, колония №2	Полностью сформированная колония						
1991, the only colony	Entire colony	50	138.27	147.07	0.94	Random Случайное	t=0.81, P<0.42
1991, единственная колония	Полностью сформированная колония						
1995, Koyanly Islands	Nest initiation Начало гнездования	22	178.41	198.14	0.90	Random Случайное	t=0.89, P<38
1995, о-ва Коянлы							
1995, Bolshoy Chongar Island	Entire colony	45	162.74	166.45	0.98	Random Случайное	t=0.28, P<0.78
1995, о.Большой Чонгарский	Полностью сформированная колония						
1995, Kitay Island	Entire colony	303	93.58	88.61	1.06	Nearly uniform Почти равномерное	t=1.87, P<0.06
1995, о.Китай	Полностью сформированная колония						
1999, Kitay Island	Entire colony	420	95.00	86.98	1.09	Uniform Равномерное	t=3.61, P<0.001
1999, о.Китай	Полностью сформированная колония						

Примечания:

N – number of nests; Sr_rast – average nearest neighbour distance (r_A , cm); Rand_rast – nearest neighbour distance in random distribution (r_g , cm); R - distribution index $R=(r_A)/(r_g)$.
 N - кол-во гнезд; ; Sr_rast - среднее расстояние до ближайшего соседа; Rand_rast - расстояние до ближ. соседа при случайном распределении; R - показатель распределения $R=(r_A)/(r_g)$.

In small colonies as well as at the earlier stages of colony formation in the large colony, nest distribution was mostly random with the trend to be grouped (i.e. $R<1$, Table 2). At early stages grouped distribution can be significant. Colonies matured through random or, sometimes, grouped addition of nests (see the 2 and 3 stages of colony formation in the Table 2), and finally distribution becomes uniform (see large colonies in the Table 2). This fact concords with, mostly, random choice of a nest site revealed in the previous section of the article. At the same time, microcolonies (groups of neighbours which are to greater or lesser extent separated from other such groups) can be noticed

in(within) a colony (Fig.1), especially on the earlier stages. The same is observed in the Black-headed Gulls (Kharitonov (Харитонов, 1981). Since the smaller colonies have random distribution of nests and large colonies are mostly uniform, I think that only large colonies in this species are formed completely (to the end). Smaller colonies really represent those ones which stop to form at some early stage.

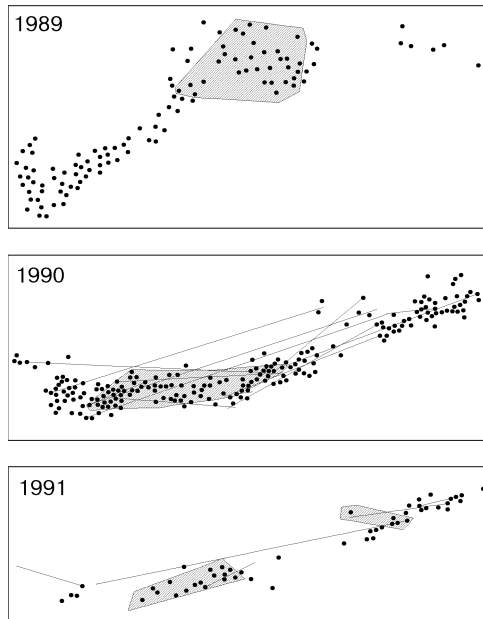


Fig.1. Maps of the largest colony (represented in different scale) on the study island at Koyanly Islands in the three seasons. Dots are nests, stippled areas are centres of colony, lines are movements through years from one site (bare end of a line) to another one (dotted end of a line).

Рис. 1. Карты самой крупной колонии (представленные в разном масштабе) на обследованном острове из системы островов Коянлы за три сезона. Точками обозначены гнезда, заштрихованные области - это центры колоний, линиями обозначены перемещения гнезд внутри колонии в разные годы.

Direct observations on Great Black-headed Gull colony formation were carried out in 1991, when hatching commenced as late as on 27 April. New settlers arrived at colony in already formed pairs. We never observed groups of new settlers, only separate pairs were detected. After exchanging some acoustic signals, these pairs landed in a colony and established a territory. These pairs could have landed in any part of a colony. Arrivals formed nesting territories as close as possible to a territory of an earlier nesting pair and often literally “squeezed” onto the nesting birds. This kind of behaviour is widespread in colonial bird species (Kharitonov and Siegel-Causey, 1988). Later on the new pair could have changed the location of its territory.

In many colonial birds various parts within a colony have different attractiveness to individuals (Patterson, 1965, Coulson, 1971 and many others). The most preferable part of a colony may be referred to as the biological centre of the colony. Usually the centre is a place of colony initiation. Here as a centre of a colony I considered an area where nests hatched during about 1 week after hatch commencing (Fig.1). The central area in this species turned out to be very changeable: in 1989 and 1990 the centre occupied 0.28 and 0.45 of a total colony length respectively, in 1991 colony had 2 centres with some distance between them. Then I tested whether central area is more preferable than other parts of the colony. Another than centre colony area I referred to as a periphery. Resettlements were traced from 1989 to 1990 (12 records), from 1990 to

1991 (4 records) and from 1989 to 1991 (1 record). Of the total of 17 resettlements within the largest colony (Fig. 1), 5 took place from centre to periphery, 6 from periphery to centre, and 6 from periphery to periphery. The centre-periphery movements did not differ from random ($t=0.3$, $P<0.77$), centre-periphery and periphery-periphery movements were practically random ($\chi^2=0.126 \ll 6$, $df=2$, $P<0.8$).

Two tests showed that the differences from random resettling here were not significant. For this reason I concluded that the centre of a colony for Great Black-headed Gulls is equal to its other parts. No preference either of the centre or other areas was found. As any part of a Great Black-headed Gull colony is equal, I can suggest that a colony of this species has no macrostructure. This surprising result differs greatly from those obtained from many other species. E.g., in a Black-headed Gull colony the centripetal stream of resettlements is 2 or more times greater than the centrifugal one, and almost no movements occur from periphery to periphery (Kharitonov (Харитонов, 1993).

During inter-colony and inter-island movements birds moved from/to any part of the largest Koyanly colony. As described in the first section ("Shifting of ..."), within a cluster of colonies Great Black-heads choose a colony by chance. Therefore they have no preferable colonies within a cluster of colonies. This suggestion explains the fact that Great Black-heads easily form temporal small colonies and even single nests. In our study, besides small colonies, two-nest group in about 30 m away from the colony were found at Kitay Island in 1995. In 1991 a single nest was built on the neighbouring island in about 700 m from the main colony. These single pairs suffered very much from territorial (not predatory) attacks of neighbouring pairs of Yellow-legged Gulls, as it was described by Mierauskas and Buzun (1991).

Since the nest-site choice in the Great Black-headed Gulls within a colony or nearby colonies is mostly random, and colonies of this species have no visible macrostructure, I consider the colony structure of this species as more primitive one than in many other colonial species, e.g. Black-headed Gulls (Kharitonov, 1985), Kittiwakes (*Rissa tridactyla* L., Coulson, 1968), etc. As no preferable colony in a cluster of colonies were found, cluster of colonies in this species do not form overcolonial system as it was found in the Black-headed Gull (Kharitonov (Харитонов, 1998a, Kharitonov, 1998b).

On group adherence in the Great Black-headed Gull

О групповой приязанности у черноголовых хохотунов

The above results showed that in most cases Great Black-headed Gulls choose their nest site by chance. In this situation one cannot expect existence of any group adherence in these birds. Our data can shed light on this phenomenon.

While marking gulls, I tried to catch birds from known neighbouring nest and later trace the fate of each of these groups of neighbours. If a group adherence was attributable to this species, I would have observed the same groups of birds nesting together from year to year (McNicholl, 1975). During four seasons of the main study I observed 17 cases where marked birds were neighbours (not compulsory nearest ones, but nested in the close proximity). Mostly, there were pairs of nests, however larger groups of neighbours were also observed: a group of 4 birds in 1989, a group of 6 and a group of 3 nests in 1990. Groups and pairs of nests with marked birds were observed both in dense and in loose parts of colonies.

Tracing the fate of these birds showed that in 15 cases of 17 group adherence was totally absent. In these cases each bird from such bounds moved from season to season independently on the other ones of the bounds. The bounds came into existence in one year and disintegrated in the next season.

However, 2 cases of 17 are worth dwelling upon. The first one: two birds were in close proximity in 1989 (however, only one nest was exactly identified), then they were neighbours in 1990, in 1991 they both were seen at Chongar (one with nest, the other one without nest). Possibly, this case can be treated as a record of group adherence, however, it also might be accidental. The second observation has even more chance to be considered as accidental. Two birds were marked in the same compact group in 1989 (also nest of only one bird was detected), both were seen in the same colony in 1990 (one bird only once), and were in the same group, separated by some other nest in 1991.

Therefore, most likely, the group adherence in Great Black-headed Gulls is absent. If it, nevertheless, exists, it occurs in very little extent. The McNichols' hypothesis is not applicable for this species, and my earlier suggestions on the obligate colonial species (Kharitonov (Харитонов, 1983), Siegel-Causey and Kharitonov, 1990) are very likely to be not valid for this species as well.

Conclusions

Заключение

Within an area of several hundred metres Great Black-headed Gulls choose their nest site mostly by chance. No nest-site fidelity within an area of an island or a group of nearest islands was detected. However, this fidelity exists at longer distances (several tens km.). Hatching success has very little influence on the site-fidelity in these birds. As a consequence of the random choice of the nest site within a colony, colonies of this species contain no preferable parts, i.e., these colonies have no macrostructure. The same is right for groups of colonies: no preferable colony in a cluster of colonies was detected. It means that a cluster of colonies in this species does not form overcolonial system. Colony structure of this species can be considered as more primitive than in many other colonial species. I cannot say that group adherence is totally absent in the Great Black-headed Gull (some observations allow to assume that such relations could exist), but group adherence is definitely not a characteristic feature of this species.

Acknowledgements

Благодарности

I am grateful so much to Drs. Valery D. Siokhin, Igor Belashkov, Josef I. Chernichko and other staff members of the Melitopol Pedagogical Institute and Azov-Black Sea Ornithological Station for the great support of the study, especially in the field logistics. Without their help my studies at Sivash would have been hardly possible. I also would like to thank my field companions, a student of the Irkutsk State University, Olga L. Kalashnikova and two staff members of the Moscow Bird Ringing Centre, Sergei B. Vorobyev and Irina A. Kharitonova.

References

Литература

- Зубакин В.А. Роль различных факторов в возникновении и развитии колониальности у чайковых птиц. // Колониальность у птиц: структура, функции, эволюция. Куйбышев. 1983.-С.37-64.
- Колониальные гидрофильные птицы юга Украины: Ржанкообразные. /Сюхин, В.Д., Черничко И.И., Ардамацкая Т.Б., Лысенко В.И., Костин С.Ю., Гринченко А.Б., Корзюков А.И., Жмуд М.Е., Стойловский В.П., Молодан Г.Н., Щеголев И.В., Греков В.С., Степанковская Л.Д., Маликова Л.В., Соломко Р.М., Нехороших З.Н., Смогоржевская Л.А., Корнюшин В.В., Искова Н.И. Киев. Наукова Думка. 1988.-176 с.
- Харитонов С.П. О формировании микроколоний у озерной чайки (*Larus ridibundus*). // Зоологический журнал. 1981. т.60. вып. 4.- С.540-547.
- Харитонов С.П. К вопросу о развитии колониальности у птиц. // Колониальность у птиц: структура, функции, эволюция. Куйбышев. 1983.-С.93-104.
- Харитонов С.П. Опыт отлова и мечения некоторых видов околородных птиц. // Кольцевание и мечение животных, 1983-1984 годы. Москва, «Наука». 1987. - С.10-27.
- Харитонов С.П. Гнездовой консерватизм (гнездовая филопатрия) и переселения озерных чаек *Larus ridibundus* в пределах колонии. // Русский орнитологический журнал. 1983. т.2. вып.3. -С.361-382.
- Харитонов С.П. Верность месту гнездования и особенности переселений озерных чаек (*Larus ridibundus*) в пределах группы колоний. // Известия Российской Академии наук. Серия биологическая, 1988а. №2. -С.250-257.
- Clark, P.J., Evans, F.C. Distance to nearest neighbour as a measure of spatial relationships in populations. // Ecology, 1954, 35, 4, -P.445-453.
- Coulson J.C. Differences in the quality of birds nesting in the centre and the edges of a colony. / Nature 1968, 217, -P. 478-479.
- Coulson J.C. Competition for Breeding Sites Causing Segregation and Reduced Young Production in Colonial Animals. // Dynamics Number Popul., Oosterbeek, 1970; Wageningen, 1971, - P.257-260.
- Gauthier G. Philopatry, nest-site phidelity and reproductive performance in buffleheads. //Auk, 1990, 107, 1, -P.126-132.
- Kharitonov S.P. On the structure of Black-headed Gulls (*Larus ridibundus*) colonies. // Acta XVIII Congressus Internationalis Ornithologici, 1985, vol. II, Moscow, «Наука», -P.1228-1229.
- Kharitonov S.P. Waterbird colony structure: system approach. //Ornithologia, Moscow State University, Moscow, 1998b, v. 28,-P.26-37.
- Kharitonov S.P., Siegel-Causey D. Colony formation in seabirds. // Current Ornithology, Plenum Press, New-York - London, 1988, N5,-P.223-272.
- Lack, D. Ecological adaptations for breeding in birds. Methuen & Co, London, 1968. -409p.
- McNicholl, M.K. Larid site tenacity and group adherence in relation to habitat. // Auk, 1975, 92, 1, -P.98-104.
- Mierauskas P., Buzun V. Competitive Interactions between the Herring Gull *L. cachinnans* and the Great Black-headed Gull *L. ichthyaetus*, // Seevogel, Hamburg, 1991, Band 12, H.2. - P.34-35.
- Patterson J.J. Timing and Spacing of Broods in the Black-headed Gull (*Larus ridibundus* L.). // Ibis, 1965, 107, 4. - P.433-459.
- Siegel-Causey D., Kharitonov S.P. Evolution of coloniality in birds. // Current Ornithology, N7, Plenum Press, New-York - London, 1990. -P.285-330.