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NESTING PECULIARITIES AND INTERLAY VARIABILITY
OF THE *STERNIDAE* FAMILY BIRDS' EGGS
IN THE PRIPYAT RIVER MIDDLE STRECH FLOODPLAN

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ОСОБЛИВОСТІ ГНІЗДУВАННЯ ТА ВНУТРІШНЬОКЛАДКОВА МІНЛИВІСТЬ
ЯЄЦЬ ПТАХІВ РОДИНИ *STERNIDAE*
У ЗАПЛАВІ СЕРЕДНЬОЇ ТЕЧІЇ РІЧКИ ПРИП'ЯТЬ

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ABSTRACT

Purpose: to analyze the nesting features of birds of the *Sternidae* family living in the floodplain meadow of the Pripyat River.

Methodology. For research, the route method was used, in which bird nests were identified during direct examination of the territory of the floodplain meadow. Hard-to-reach areas of the meadow were surveyed from a boat. To assess the morphological parameters of the eggs of birds of the *Sternidae* family, the eggs were measured using a caliper. The length (L) and diameter of the eggs (B) were measured. Based on the measurements, the index of intra-laying variability (i_v) was determined. During the study period, 245 eggs of birds of the *Sternidae* family were measured, of which 88 eggs were in the Common tern, 60 eggs in the Little tern, 51 eggs in the White-winged tern and 46 eggs in the Whiskered tern.

Scientific novelty. It has been established that the formation of multispecies colonies of birds of the *Sternidae* family makes it possible to qualitatively use territories favorable for nesting and provides protection of nests from raptors to accompanying bird species. The smallest intra-laying variability of the studied egg parameters was found in the common and barnacle tern, which is an indicator of the birds' adaptability to nesting conditions.

Conclusions. The nesting of White-winged black and Whiskered tern is directly dependent on floodwater level. A gradual decrease in the level of floodwaters leads to the drying up of the floodplain meadow and the impossibility of building nests, since these species build nests on aquatic plants or floating bogs.

Nesting of Little and Common tern is limited by biotic factors, such as predation by *Corvidae* birds and other animals, as well as anthropogenic factors - people resting on the shore, fishermen and locals visiting the meadow, which in turn creates a disturbance factor for the birds.

Among the bird species considered, the maximum value of the index of intra-variability of eggs laying in egg diameter (i_v) was found for White-winged black tern ($i_v = 4.10 \pm 0.52$). The minimum value of this index is observed in Whiskered tern ($i_v = 3.41 \pm 0.39$). It should be noted that differences in this index among Common tern are less pronounced than among Marsh tern

The maximum value of the index of intra-variability of eggs laying (i_v) was found for Little Tern ($i_v = 5.42 \pm 0.65$). The minimum value of this indicator was found in Common tern ($i_v = 3.90 \pm 0.44$). For Marsh tern (Whiskered and White-winged black tern), the value of the index of intra-variability of eggs laying length (i_v) does not differ significantly.

Key words: terns, nesting, eggs, intra-variability of eggs laying.

АНОТАЦІЯ

Мета: на заплавної луці річки Прип'ять провести аналіз гніздування та внутрішньокладкової мінливості морфологічних показників яєць птахів родини *Sternidae*.

Методологія. У дослідженні використовувалася маршрутний метод. Гнізда птахів виявлялися під час безпосереднього огляду території заплавної луки. Важкодосяжні ділянки заплави обстежувалися з човна. Для оцінки морфологічних показників яєць птахів родини *Sternidae* яйця вимірювали штангенциркулем. Вимірювали довжину (L) та діаметр яєць (B). На підставі вимірювань було визначено індекс внутрішньокладкової мінливості (i_v). За досліджуваний період виміряно 245 яєць птахів родини *Sternidae*, з них: крячка річковою – 88, крячка малого – 60, крячка білокрилого – 51 і крячка білощокого – 46 яєць.

Наукова новизна. Встановлено, що формування багатовидових колоній птахів родини *Sternidae* дозволяє ефективно використовувати сприятливі для гніздування території та забезпечує захист гнізд від хижаків для супутніх видів птахів. Найменша внутрішньокладкова мінливість досліджуваних властивостей яєць виявлена у крячків річковою та білощокого, що є показником пристосованості птахів до умов гніздування.

Висновки. Гніздування крячків білокрилого та білощокого безпосередньо залежить від рівня паводкових вод. Поступове зниження рівня паводкових вод призводить до висихання заплавної луки і неможливості будувати гнізда, оскільки ці види будують гнізда на водних рослинах або плаваючих болотах.

Гніздування крячків малого та річковою лімітується біотичними факторами (хижацтво воронових птахів та інших тварин), а також антропогенними факторами, зокрема перебуванням на березі річки відпочивальників, рибалок та місцевих жителів. Це, у свою чергу, створює фактор занепокоєння для птахів.

Серед розглянутих видів птахів максимальне значення індексу внутрішньокладкової мінливості діаметру яєць встановлено у крячка білокрилого ($i_v = 4,10 \pm 0,52$). Мінімальне значення цього показника спостерігається у крячка білощокого ($i_v = 3,41 \pm 0,39$). Варто зазначити, що відмінності за цим показником у крячка річковою менш виражені, ніж у болотних крячків.

Максимальне значення індексу внутрішньокладкової мінливості довжини яєць виявлене для крячка малого ($i_v = 5,42 \pm 0,65$). Мінімальне значення цього показника встановлено для крячка річковою ($i_v = 3,90 \pm 0,44$). Для болотних крячків (білощокого та білокрилого крячків) значення показника внутрішньої мінливості довжини яйцекладки (i_v) суттєво не відрізняється.

Ключові слова: внутрішньокладкова мінливість, гніздування, крячки, яйця птахів.

Introduction

There are 5 species of terns nesting in the country: Common tern, Little tern, White-winged black tern, Black tern and Whiskered tern. White-winged black-, Black- and Whiskered tern belong to the Morwennol group, which build their nests not on sand spits, but on various plant debris in the water. These species are mainly insectivores, with a small amount of fish fry in their diet. Common tern and Little tern belong to the *Sternidae* family. Fish is of paramount importance in the diet of these species. Unlike Marsh tern, Common tern and Little tern build their nests on sand spits, on aits with thin vegetation and along the waterside.

Most terns have the status of common nesting and are widespread in river floodplains. The exception is Little tern, which has the status of a rare nesting species in the country.

Sterna hirundo (Linnaeus, 1758) – Common tern is a common nesting migratory and transit migratory species. It inhabits the entire territory of the country, but is most widespread in the floodplains of the Polesye rivers.

Sternula albifrons (Pallas, 1764) – Little tern is a rare nesting migratory species in the southern part of the country and rare in the rest of the territory. Little tern is included in Annex I of the EU Rare Birds Protection Directive, Annex II of the Bern Convention, Annex II of the Bonn Convention and is classified as SPEC 3. The species is listed in the Red Books of Lithuania, Latvia, Poland and Russia. In our country, Little tern is listed as Category II of the Red Book [5, 99–100].

Chlidonias leucopterus (Temminck, 1815) – White-winged black tern has the status of a common nesting migratory and transit migratory species.

Chlidonias hybrida (Pallas, 1811) – Whiskered tern is a nesting migratory species that has been removed from the 4th edition of the country's Red Book. The population is gradually increasing, with fluctuations observed depending on the duration of spring floods in large river basins. The current abundance of Whiskered tern is of the least concern [1; 3; 4].

One of the forms of individual variability of birds of the *Sternidae* family is their intra-cladding

variability, which makes it possible to assess the state of the species population. The intraspecific variability of the oomorphological parameters of birds is relatively small and is largely due to hereditary differences between individual females. To some extent, the variability of eggs is influenced by environmental factors. It has been shown that with the decline of nesting conditions, the intra-laying variability of bird eggs increases [8, 209–214]. For this purpose, intra-laying variability of eggs of terns co-nesting in a floodplain meadow was studied.

Study area

The research was carried out in the floodplain meadow of the Pripyat River on the territory of the Turovsky Lug – a Biological Reserve of local importance, located in the vicinity of Turov city (Gomel region, 52.04 N 27.44 E). The characteristic features of this region are large fluctuations in the Pripyat River water level in different years and seasons (Figure 1).



Fig. 1. Turovsky Lug – a Biological Reserve of local importance

Turovsky Lug is a Biological Reserve that was established in 2008 to protect the unique ecosystem of vast floodplain meadows along the banks of the Pripyat River and has the international status of an Important Bird Area (IBA). It is one of Europe's largest nesting and staging areas for waterbirds during migration.

Material and methods

To assess the intra-variability of eggs laying of morphological parameters, full clutches consisting of 3–4 eggs were considered. Over the study period were examined 65 full clutches (245 eggs) of birds of the *Sternidae* family, of which Common tern had 29 clutches (88 eggs), Little tern – 20 clutches (60 eggs), White-winged black tern – 17 clutches (51 eggs) and 15 clutches (46 eggs) had Whiskered tern. One clutch of 4 eggs was found in Common tern and Whiskered tern nests. Observations of birds of

the *Sternidae* family have been carried out in the region annually during the spring-summer period since 2006. Data from 2006 were used to estimate the intra-variability of eggs laying, since it was this year that 4 out of 5 species of terns were observed nesting on the territory of the floodplain meadow. In later years, there were isolated nests of Marsh tern, which did not allow collecting sufficient material for processing.

Based on the measurements taken from the eggs, linear dimensions were determined: length (L) and largest diameter (B). To calculate the index of intra-variability of eggs laying (i_v) the method proposed by Melnikov M. V. [7, 70–79] was applied.

Results and Discussion

The morpho-biological characteristics of birds of the *Sternidae* family have historically developed under the simultaneous influence of

the aquatic environment in which birds procure food and the terrestrial environment with which they are associated in their reproduction. The heterogeneity of these environments determined different directions in the development of adaptability to each of them [6, 49–50].

Colonies of Common tern, Little tern, White-winged black tern and Whiskered tern were found in the study area. It should be noted that these species are not isolated from each other, but form joint colonies. Therefore, White-winged black- and Whiskered tern nested together in a more watered area of a floodplain meadow. Common tern and Little tern form a polyspecies colony together with Black-headed gull (*Larus ridibundus*). The periphery of this colony was occupied by Common tern (*Sterna hirundo*) and, in small numbers, by Little tern (*Sternula albifrons*). The Black-headed gull (*Larus ridibundus*) was located in the central part of the colony. Other bird species such as waders (*Limosa limosa*, *Vanellus vanellus*, *Tringa totanus*) and ducks (*Anas platyrhynchos*) have also nested in and around this colony. Their breeding in the direct neighborhood to Black-headed gull nests is most likely due to the fact that it occurs at a time when gulls already have baby birds in their nests and gull aggressiveness is at its highest, thus providing other species with protection from predatory birds.

Our observations have shown that the nesting of terns, as well as their numbers in the floodplain meadow area depend on biotic, abiotic and anthropogenic environmental factors. In particular, the nesting of White-winged black- and Whiskered tern is directly dependent on floodwater level. A gradual

decrease in the level of floodwaters leads to the drying up of the floodplain meadow and the impossibility of building nests, since these species build nests on aquatic plants or floating bogs.

Nesting of Little and Common tern is limited by biotic factors, such as predation by *Corvidae* birds and other animals, as well as anthropogenic factors – people resting on the shore, fishermen and locals visiting the meadow, which in turn creates a disturbance factor for the birds.

In addition, the overgrowth of floodplain meadows with trees and shrubs has a significant impact on nesting of birds of the *Sternidae* family with the consequence that many species lose their nesting territories. The main reason for this is the cessation of haying and grazing of farm animals.

Intraspecies variability in morphological parameters of birds is relatively low and in a substantial way due to hereditary differences between individual females. To some extent, egg variability is influenced by environmental factors such as weather and related feeding conditions, age structure of the population, egg-laying time, biotopic differences and specific nesting year.

Among the bird species considered, the maximum value of the index of intra-variability of eggs laying in egg diameter (i_v) was found for White-winged black tern ($i_v = 4.10 \pm 0.52$). The minimum value of this index is observed in Whiskered tern ($i_v = 3.41 \pm 0.39$). It should be noted that differences in this index among Common tern are less pronounced than among Marsh tern (Table 1).

Table 1

**Intra-variability of eggs laying in morphological parameters of birds
of the *Sternidae* family**

Type	i_v	
	length (<i>L</i>)	Diameter (<i>B</i>)
White-winged black tern (<i>Chlidonias leucopterus</i>)	5.12 ± 0.80	4.10 ± 0.52
Whiskered tern (<i>Chlidonias hybrida</i>)	5.08 ± 0.73	3.41 ± 0.39
Common tern (<i>Sterna hirundo</i>)	3.90 ± 0.44	3.66 ± 0.33
Little tern (<i>Sternula albifrons</i>)	5.42 ± 0.65	3.51 ± 0.67

In addition, the differences in this index between the Whiskered tern and Common tern are also less pronounced. According to literature data [2, 100–117], fish and amphibians are more important in the diet of Whiskered tern, which in this aspect brings this species closer to Common tern. Among Marsh tern, Whiskered

tern has a larger size and it is pantophagous. Consequently, Whiskered tern has similar features to Common tern, in particular its appearance and food. Comparing the morphometric parameters of the eggs of four species of this family, the similarity of Whiskered tern and Little tern was revealed (Figure 2).

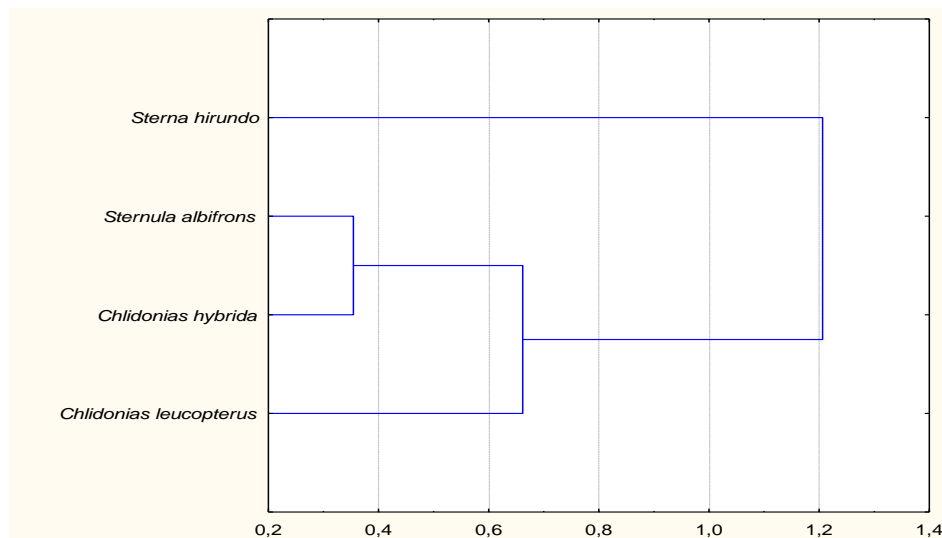


Fig. 2. The similarity of the egg parameters of Marsh and Common tern

Analyzing the variability in egg length within a clutch, the maximum value of the index of intra-variability of eggs laying (i_v) was found for Little Tern ($i_v = 5.42 \pm 0.65$). The minimum value of this indicator was found in Common tern ($i_v = 3.90 \pm 0.44$). For Marsh tern (Whiskered and White-winged black tern), the value of the index of intra-variability of eggs laying length (i_v) does not differ significantly. Among the two groups of terns under consideration, differences in the index of intra-variability of eggs laying length in Common tern are more pronounced than in Marsh tern.

Conclusions

Thus, the formation of multi-species colonies of birds of the *Sternidae* family makes it possible to qualitatively use territories favorable for nesting and provides protection of nests from raptors to accompanying bird species. Nesting of terns in the floodplain meadow depends on abiotic, biotic and

anthropogenic factors. Among the most important factors, it should be noted the water level in the Pripyat River, predation by corvids, as well as human disturbance.

It has also been established that the formation of polyspecies colonies of birds of the *Sternidae* family allows the qualitative use of favorable nesting areas and provides protection of nests from predatory birds by accompanying bird species.

The greatest intra-laying variability of the oomorphological parameters of birds of the *Sternidae* family is characterized by the length of the eggs, and the smallest is the diameter. Among the studied parameters, egg diameter is a stable feature compared to its length.

Among the birds of the *Sternidae* family, the lowest intra-laying variability of the studied egg parameters is characteristic of the common and barnacle terns. The variability of egg parameters is an indicator of the adaptability of birds to nesting conditions.

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