УДК 574.3

NOISE POLLUTION OF THE TERRITORY OF PRYDNIPROVSKYI PARK AS A FORMING FACTOR OF ENVIRONMENTAL HAZARD

O. Sakun
Kremenchuk Mykhailo Ostrohradskyi National University
vul. Pershotravneva, 20, Kremenchuk, 39600, Ukraine. E–mail: oksana_anat_s@mail.ru

The episodes of the noise adverse effect upon birds are considered. The noise pollution levels within the territory of Prydniprovskyi park, which is a sample of landscape architecture, are investigated. The sources of noise within the park territory that are exceeding the maximum permissible noise-stress rate standards are determined. The bird response behavior to the sounds of different volume is analyzed. A short characteristic of the adaptation stages of living organisms under the influence of the stress factors is done. Some changes taking place in the avifauna of the park through the noise stress influence are ascertained

Key words: noise pollution, noise levels, background noise, stress factor, intensity.

ШУМОВЕ ЗАБРУДНЕННЯ ТЕРИТОРІЇ ПРИДНІПРОВСЬКОГО ПАРКУ ЯК ФАКТОР ФОРМУВАННЯ ЕКОЛОГІЧНОЇ НЕБЕЗПЕКИ

О. А. Сакун
Кременчуцький національний університет імені Михайла Остроградського
вул. Першотравнева, 20, м. Кременчук, 39600, Україна. E–mail: oksana_anat_s@mail.ru

Розглянуто факти шкідливого впливу шуму на птахів. Досліджено рівні шумового забруднення на території пам’ятки садово-паркового мистецтва Придніпровський парк. Визначено джерела шуму у межах парку, які за гучністю значно перевищують максимально допустиме шумове навантаження згідно з встановленими нормами. Проаналізовано реакцію птахів на різну гучність звуку. Коротко охарактеризовано стадії адаптаційного синдрому живих організмів під впливом стрес-факторів. Встановлено зміни, які відбуваються у орнітофауні Придніпровського парку під впливом шумового навантаження.

Ключові слова: шумове забруднення, рівні шуму, шумовий фон, стрес-фактор, інтенсивність.

PROBLEM STATEMENT. Noise is an integral part of our life today. Intense noise adversely affects birds, exciting their nervous system. Strong sounds disturb the birds, cause their fearfulness. Prolonged exposure of the exorbitant noise slows the growth of the birds, it reduces their live weight, lowers their productivity. A specific example of the influence of noise on living organisms, can be considered the following events: during the dredging on the spit near the Bird Arm Fast (Danube Delta) the unhatched chicks were killed. The noise from operating equipment echoed for 5-7 km, has caused a negative impact on adjacent areas of the Danube Biosphere Reserve.

From the Act of Survey of the Bird Spit. July 16, 2004: "During the actual survey of the Bird Spit (near Rapid Arm) at the location of large colonies of pestronosoy (950 nests and 430 nests - on the basis of accounting 28.06.2004), and common tern (120 nests − according to the same account) were found the remains of many hundreds of eggs of these species. The nature of their injuries clearly indicates that chicks have not hatched from them. The most likely reason for the disappearance of the colony (nowadays there are no even the adult birds at this place) is the excessive human disturbance caused by the working dredging equipment nearby, and serving its boats."

The previous research on the influence of the noise on birds hasn’t shown any significant adverse noise influence. Frings and Dzhumber reported that 85 dB at a distance of 10 m are dangerous for starlings. To find the "road effect" on bird populations Reti measured their number in the forest areas up to 1 km from the road [1]. Such species as *Tetrao urogullus*, *Lyrurus tetrix* and *Lagopus lagopus* were also studied. The reduction of 25 % of their population had been found in the distance within 250 meters, density of traffic was 700–3000 vehicles a day. Unfortunately, the noise level had not been measured.

Nowadays the studying of the influence of the road noise on bird populations has become increasingly urgent. The Netherlands scientist Van der Azanda and colleagues came to a conclusion that the populations of certain species of birds should be at a distance of not less than 500–600 m on rural roads and 1600–1800 m from busy highways. The noise caused the reduction of the density of gulls (*Vanellus Vanellus*), black-and-large Veretennikov (*Limosa*) and herbalists (*Haematopus ostralegus*) nesting.

Reijnen and all the others reported that a reduction in the numbers of breeding birds adjacent to a busy highway (30,000–40,000 vehicles/day) and at a distance of 300 m. The level of noise was not measured. Reijnen and Foppen studied the willow warbler (*Phylloscopus trachilus*) and found out that the density of territorial males was lower at the distances of up to 200m than at the further distances (up to 400 m). The older males were also more abundant at the further distance from the road.

The aim is to determine the levels of ecological noise contamination hazard at the territory of the protected horticulture Prydniprovskyi park.

EXPERIMENTAL PART AND RESULTS OBTAINED. Analysis of noise pollution in the Prydniprovskiy park was carried out with the noise gauge DT–805. Frequency range was 31.5 Hz - 8 kHz. Measuring range of noise levels was: 30–100 dB (Lo),

PDF created with pdfFactory Pro trial version www.pdffactory.com

60–130 (Hi). The type of filter A had been used. The results of measuring levels of noise pollution in the park are listed in Table 1.

Table 1 − The results of measuring levels of park noise pollution

Description of noise source	Distance to a source of noise, m	Levels of noise pollutions	
		min	max
Vehicle (Daewoo Lanos)	2,5	49,7	55,4
The vehicle horn	1,5	70	95
Vehicle (VAZ-2101)	3	74,0	85,3
Route bus RUTA	2,5	58,0	67,3
Trolleybus (old model)	1,5	69,7	75,6
Cafe «Assol»	5	70,4	76,8
Sideshow «Observation Wheel»	3	56,4	61,8
Sideshow «Funny switch back»	5	68,3	75,0
Kid's cars	10	64,3	69,5
Sideshow – train «Gay fellow»	5,5	65,7	74,3
Puffing the kid's rubber sideshows №1	2,5	78,1	82,4

The noise caused by leaves in light wind is 33 dB. Natural background noise in the Prydniprovskiy park is 43,7–45,0 dB. Crows (*Corvus cornix*) and jay (*Garrulus glandarius*) increase the noise level to 47,3 and 50 dB correspondingly, it is the maximum noise load caused by natural resources. However, anthropogenic noise pollution at levels far exceeding even the most natural sounds.

The highest level of noise is created by cars, especially during the boom (90 dB). Significant noise coming from the inflatables during Pump (approximately 70–80 dB). The noise of 65–70 dB is created by a variety of the establishment of feed.

Most noise sources provide acceptable noise load on nature, that is up to 75 dB. Maximum noise in accordance with State building codes Ukraine DBN 360-92 for public recreation areas is 85 dB in the daytime. Thus the excess of these standards in the park there because of driving old cars like VAZ and during motor humming or alarm.

For protected fund poppy-symalni noise levels up to 50 dB. Loud music that is heard from cafes, bars, dance floor is much higher than the maximum permissible level of noise load on the natural objects of the park Prydniprovskiy. For example, even a minimum level of sound from the cafe "Assol" at a distance of 5 m in the daytime is 70,4 dB. When the mass celebrations in this institution noise increases significantly, the birds leave the nest undr compulcion in the surrounding area.

In the area of attraction at lunch time noise exceeds 70-75 dB. When using special pumps for inflating rubber children's attraction level of noise load exceeds 80 dB. Attraction " Funny switch back " in the absence of passengers creates noise 68–75 dB.

On weekends and holidays noise stress increases significantly due to the increasing intensity of the attraction, the changes in their workload. And of course, add the human factor.

One child machine generates noise at a distance of 10 meters, reaching the level of 70 dB.

High levels of noise are the stress factor for ornithology of Prydniprovskiy park. H. Selye [2] called the general adaptation syndrome all non-specific changes that occur in the organism under the influence of the stressor, Clinic of the general adaptation syndrome consists of three successive stages:

- Stage of anxiety − the body mobilizes defense mechanisms against the harmful effects of the stresor. The reaction time is from 6 to 48 hours;
- The stage of resistance is different by non-specific increasing in the overall stability, resistance to other irritants that have not influenced the organism yet. Such resistance is called cross-resistance and can last up to 24-36 hours;
- With the continuing impact of the stressor the organism loses its resistance and the stage of exhaustion comes, which is characterized by "worn-out" of biological systems of the body, the development of degenerative processes and the death of the animal.

CONCLUSIONS. At a high level of noise (92–107 dB) increases the activity of inhibitory processes in the central nervous system, which is clinically shows the depressed state of birds and lowering their productivity. The low levels of constant noise (62–70 dB) increase the excitability of the nervous system of birds to irritants and contribute to slower their growth and reduce egg production. Permanent noises of medium intensity (82 dB) do not have a significant influence on birds productivity. Volume of sounds in 90 dB increase the egg breaking to 4 % in the course of 15 minutes, but in the course of 30 minutes it is increased to 6 % and during 1 houre it is increased to 12 %.

Under the influence of noise the ornithology of Prydniprovskiy park has been changing. In spring and summer *Fringílla coélebs, Ficedula hypoleuca, Phylloscopus collybita, Carduelis carduelis, Phoenicurus phoenicurus, Motacilla alba, Sturnus vulgaris, Cuculus canorus, Luscinia luscinia, Oriolus oriolus, Turdus merula, Turdus pilaris, Chloris chloris, Parus major, Parus caerueleus, Parus montanus, Aegithalos caudatus, Dendrocopos major, Dendrocopos minor, Dendrocopos syriacus, Coccothraustes, Sylvia borin, Athene noctua, Certhia familiaris* [4] and many other species can be found in the park.

In the spring- summer period there are also such typical representatives of the city ornithology as: *Columba livia, Streptopelia turtur, Corvus monedula, Corvus frugilegus, Corvus cornix, Passer domesticus* and *Passer montanus*; *Apus apus* and *Delichon urbicum. Larus argentatus, Hydrocoloeus minutus, Sterna hirundo* can be watched from the embankment of the park.

There is a reduction in the number of bird species that nest near busy places. Birds try to avoid of the

PDF created with pdfFactory Pro trial version www.pdffactory.com

crowded places, and they are almost absent in the entertainment area of the park.

During the study found that the most susceptible to the effects of noise pollution in the park, monument of landscape architecture Prydniprovskiy are representatives of the genus Sparrows, including woodcock (*Haematopus ostralegus*) showed reduction in density.

The general conclusion is that some (although not all) bird species are sensitive at least during breeding to noise levels and that the distances over which this effect is seen can be considerably varied from a few meters to more than 3 km.

REFERENCES

1. Effects of noise on wildlife and other animals - U.S. Environmental Protection Agency Office of Noise Abatement and Control Washington, 1971. – 74 p.

2. Hans Selye, "Essays on the Adaptation Syndrome" − Medgiz, 1960. – 35 p. [in Russian]

3. Conservation beauty Poltava / T.L. Andrienko, A.M. Ravine, M.I. Zaludyak and others. - Poltava: IVA "Astraea", 1996. – 188 p. [in Ukrainian]

4. Demiokhin G.A., Muzychenko N.V., Sokolov I.M. The bird population of Kremenchuk. – Poltava, 2008 – 96 p. [in Ukrainian]

ШУМОВОЕ ЗАГРЯЗНЕНИЕ ТЕРРИТОРИИ ПРИДНЕПРОВСКОГО ПАРКА КАК ФАКТОР ФОРМИРОВАНИЯ ЭКОЛОГИЧЕСКОЙ ОПАСНОСТИ

О. А. Сакун

Кременчугский национальный университет имени Михаила Остроградского

ул. Первомайская, 20, г. Кременчуг, 39600, Украина. E–mail: oksana_anat_s@mail.ru

Рассмотрены факты вредного влияния шума на птиц. Исследованы уровни шумового загрязнения на территории памятника садово-паркового искусства Приднепровский парк. Определены источники шума в пределах парка, значительно превышающие по громкости максимально-допустимую шумовую загрузку в соответствии с установленными нормативами. Проанализирована реакция птиц на разную громкость звука. Приведена короткая характеристика стадий адаптационного синдрома живых организмов под воздействием стрессовых факторов. Установлены изменения, происходящие в орнитофауне Приднепровского парка под влиянием шумовой нагрузки.

Ключевые слова: шумовое загрязнение, уровни шума, шумовой фон, стресс-фактор, интенсивность.

Стаття надійшла 03.12.2012.
Рекомендовано до друку
Никифоров

PDF created with pdfFactory Pro trial version www.pdffactory.com