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**RARE AND ENDANGERED BUTTERFLIES (*LEPIDOPTERA: HESPERIOIDEA, PAPILIONOIDEA*) IN THE FORMER RAPIDS AREA OF THE DNIEPER RIVER**

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Исследовано дневных чешуекрылых фауны природного комплекса порожиистой части р. Днепр. Выяснили, что среди комплекса *Lepidoptera* 19 видов занесены в охранные списки разного ранга. Таксономическая структура выявилась разнообразной – в комплексе редких и исчезающих видов представители 2 надсемейств, 6 семейств. Изменчивость условий выживания способствовала формированию интересного зоогеографического комплекса, представленного 5-ю основными группами (палеарктичной, понтоказахской, средиземноморской, евросибирской, европейской).

*Дневные бабочки, бывшая порожиистая часть р. Днепр, редкие и исчезающие виды, Днепропетровская область*

## INTRODUCTION

The uniqueness and exclusivity of the nature of the river Dnepr rapids has long attracted researchers. In this area eminent naturalists of the eighteenth century conducted their study – Vladimir Zuev in 1781–1782 [1] and J. de Boeber in 1792–1793 [2]. Special faunal survey of Lepidoptera in the province launched V.O. Yaroshevskiy who explored the area around the confluence of the Samara river doing entomological excursions [3].

Even during World War II entomological research occurred. Collection of Lepidoptera, including Papilionoidea, close to Vysokopole (modern Solonyansky region, Dnipropetrovsk region) conducted Albert B. and J. Zoffner (1941–1943) [4].

In the postwar years ravine forests of the former rapids of the Dnepr become subject to constant monitoring of the Dnepropetrovsk State University Comprehensive expedition to study artificial and natural forest of the steppe zone. The result of more than 40 years of monitoring studies of entomological complex of the gullies forest turns into a series of publications [5–9] which shows 89 species of this part of the valley of the river.

In modern times there was specialized research on Hesperioidea and Papilionoidea. The results set out in the regional monograph devoted to butterflies of Dnepropetrovsk area [10]. The current state of the natural landscape of the former rapids of the river Dnepr now attracting more and more attention. In the last decade, there is constant *Lepidoptera* collecting in the remains of virgin steppe ecosystems of the former rapids of the Dnepr river. In this part of the valley interesting faunal finds were made [11, 12]. The uniqueness of the landscape and the degree of conservation of ecosystems of this area definitely deserves more in-depth study of special *Papilionoidea* and *Hesperioidea*. Therefore the goal of our study was to investigate the butterflies of the faunal complex of the former rapids of the Dnepr River.

## MATERIAL AND RESEARCH METHODS

The main material is based on personal collections from the region of the research that was conducted over the last 15 years. In addition to personal collections there were used material assets of Entomological Department of the chair of Zoology and Ecology at O.Honchar Dnipropetrovsk National University, mostly memorial collection of V.O.Barsov. Worked out material provided the ability to set some features of the fauna of the region in nearly 60-year period. There were also materials from private collections of R.A. Velichko and I.M.Chernenko, so we want to endure them gratitude.

Field survey covered all the basic ecosystems in size and degree of preservation of the former rapids of the Dnepr River, in Dnipropetrovsk and Zaporizhia regions. Collecting of the imago was performed by route accounting [13, 14].

## RESULTS AND DISCUSSION

In the former part of the Dnepr river rapids we registered 19 species of butterflies with different conservation status (Table 1.). Taxonomic structure of the complex is quite diverse and represents all major butterflies of the day butterflies family, which are species that are protected. In this regard, taxonomic complex is formed by the two superfamilies (*Hesperioidea* and *Papilionoidea*) 6 families (*Hesperiidae*, *Papilionidae*, *Pieridae*, *Nymphalidae*, *Satyridae*, *Lycaenidae*). The most representative species in the steppe zone of the Palaearctic as well as in Ukraine belongs to (*Lycaenidae*).

The high taxonomic diversity can be explained by the unique geographical situation of the territory, which is entirely azonal conditions of the valley of the Dnepr river. This situation makes it possible to penetrate this different zoogeographical groups of *Lepidoptera*. Zoogeographical analysis of protected species on the NP territory allowed to select 5 main groups (Pic. 1). It was found that most species have the Palaearctic or Pontokazach habitat area. To the specificity of this component of the fauna add so-called "northern" species that make up 52% (representing Palaearctic, Eurosibirian and European groups). Their existence in this area is only possible thanks to the boreal ecosystems of the valley.

Due to its location on the territory of the complex there are natural variations presented of almost all ecosystems typical for steppe zone: prairie, meadow, forest and marsh. The presence of such a motley set of habitats causes the formation of this highly diverse set of butterflies. Analysis of the biotopic benefits of protected *Lepidoptera* species on the territory revealed the presence of all 6 members of environmental groups that stand for *Lepidoptera* fauna of Central Europe [15].

Table 1 – List of species of *Lepidoptera* fauna of the former rapids of the Dnepr River listed in the Red Lists of different levels

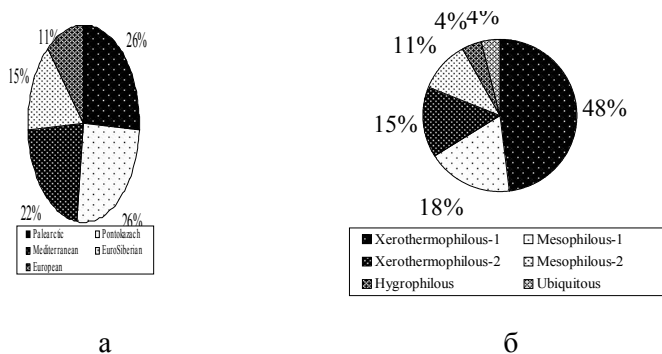
№	Species	Category			
		Red book IUCN *	Red book of Ukraine	European Red List of animals and plants that are endangered in the world scale	Red Book of European butterflies
<i>Hesperiidae</i> Latreille, 1809					
1	<i>Syrichthus tessellum</i> (Hübner, [1802])			K	
<i>Papilionidae</i> Latreille, 1802					
2	<i>Zerynthia polyxena</i> ([Denis et Schiffermüller, 1775])		Vulnerable	*	
3	<i>Papilio machaon</i> (Linnaeus, 1758)		Vulnerable		
4	<i>Iphiclidea podalirius</i> (Linnaeus, 1758)		Vulnerable		
5	<i>Parnassius mnemosyne</i> (Linnaeus, 1758)		Vulnerable	*	
<i>Pieridae</i> Duponchel, 1835					
6	<i>Colias chrysotheme</i> (Esper, [1777])	VU			SPEC3
<i>Nymphalidae</i> Swainson, 1827					
7	<i>Apatura metis</i> (Freyer, 1829)	NT		E	
8	<i>Nymphalis xanthomelas</i> (Esper, 1781)	VU			SPEC3
9	<i>Neptis sapho</i> (Pallas, 1771)	LR (NT)			
<i>Satyridae</i> Boisduval, 1833					
10	<i>Hipparchia statilinus</i> (Hufnagel, 1766)		Rare		
11	<i>Kirinia climene</i> (Esper, 1783)		Vulnerable		
<i>Lycaenidae</i> Leach, 1815					
12	<i>Tomares nogelii</i> (Herrich-Schäffer, 1851)	EN	Vulnerable		SPEC2
13	<i>Glaucopsyche alexis</i> (Poda, 1761)	VU			SPEC3
14	<i>Maculinea arion</i> (Linnaeus, 1758)	EN		V	
15	<i>Pseudophilotes vicrama</i> (Moore, 1865)	VU			SPEC3
16	<i>P. bavius</i> (Eversmann, 1832)	EN	Vulnerable		SPEC3
17	<i>Scolitantides orion</i> (Pallas, 1771)	VU			SPEC3
18	<i>Plebeius pylaon</i> (Fisher von Waldheim, 1832)		Vulnerable		
19	<i>Plebejus argyrognomon</i> (Bergsträsser, 1779)	NT		*	
Всього		11	9	6	7

Note: \* <http://www.iucnredlist.org>; \*\*<http://ec.europa.eu/environment/nature/conservation/species/redlist.htm>

As shown in pic. 1b in complex of the protected species, most belong to xerothermophilous groups (xerothermophilous-1 – species that exist in xerotherm upland grass coenosis and in ancient steppe zone slopes and ravines systems and xerothermophilous-2 – species that exist under conditions of neighboring of the steppe shrub formations and woodlands), which is typical for the geographical area in which the natural complex exists.

Of particular note is the complex mesophilous (mesophilous-1 – species that exist in grassland ecosystems and mesophilous-2 – species that inhabit the forest ecosystem), because their presence underlines the exclusiveness of this site. Trophic species mesophilous associated with meadow and woody vegetation, and thus exist in terms of environmental non-compliance, this is why the status of their populations can be regarded as potentially threatening. Only one species represents hygrophilous group – *A. metis*. In Ukraine, this species is known only from the valley of the steppe zone of the Dnepr and the Danube rivers. Within boundaries of the former rapids area it is recorded in coastal habitats in the bushes of Ivo beat (*Salix alba* Linnaeus, 1753), to which itrophic caterpillars are connected. Also, only one species – Swallowtail (*P. machaon*) belongs to ubiquitous (species is constantly observed on the territory due to the wide trophic links as imago and caterpillars).

According to current IUCN evaluation, among 19 species of rare and endangered butterflies of the former rapids of the Dnepr River, the greatest danger threatening the two *Lycaenidae* – *M. arion* and *P. bavius*. On the global level the status of their population is measured as EN (species that are endangered). Our records indicate that both species are seen annually. Local population *M. arion* does not raise concerns, as it is recorded on all steppe areas of natural complex, where it is a part of the subdominant group of complex *Lycaenidae*. *P. bavius* – one of the rarest species of lycaenid of Ukrainian fauna, is seen individually and only in virgin steppe ecosystems. Most species (45%) protected in the NP are listed in the IUCN Red List with the status of vulnerable (VU). Species in a state of near – threatened (NT) are *A. metis* and *P. argyrognomon*. If the first is being registeted sporadically in small phytocoenosis area, the second is the background of the territory of the Park.



Picture 1 – Zoogeographic (a) and ecological (b) structure of the complex of rare and endangered species of fauna of the former rapids of the Dnepr river.

Important tool for the conservation of biological and landscape diversity in the European continent is the "Convention on the protection of wild flora and fauna and natural habitats in Europe" (Bern, 1979). In 1996, Ukraine adopted the Law of Ukraine accession to the Berne Convention [16]. In the former rapids of the Dnepr river were registered three species of *Lepidoptera* – *A. metis*, *Lycaena dispar rutila* (Werneburg, 1864) and *M. arion*, which are protected by the Bern Convention.

## CONCLUSIONS

1. On the territory of the former complex natural rapids of the Dnepr river area there are registered 19 species of butterflies that are listed in the security lists of different categories (11 species to the list of IUCN, 9 – Red Book of Ukraine, 6 – European Red List of animals and plants that are endangered in the world scale, 7 – Red Book "of European butterflies").

2. Taxonomic structure appeared to be diverse – in a complex of species that are protected in the NP there are two representative superfamilies (*Hesperioidea* and *Papilionoidea*) 6 families (*Hesperiidae*, *Papilionidae*, *Pieridae*, *Nymphalidae*, *Satyridae*, *Lycaenidae*).

3. The diversity of living conditions allow to form an interesting zoogeographical complex represented by 5 major groups (Palearctic – 26 %, Pontokazach – 26 %, Mediterranean – 22%, EuroSiberian – 15 %, European – 11 %).

4. Interesting is the ecological structure: xerothermophilous-1 – 46 %, mesophilous-1 – 18%, xerothermophilous-2 – 15 %, mesophilous-2 – 11 %, hygrophilous – 4 %, ubiquitous – 4 %.

#### LITERATURE:

1. Zuev V. *Travel Vasilja Zueva from S. Petersburg to Kherson in 1781 and 1782.* – S. Petersburg, 1787. – 353 p. (in Rus.).
2. Buber R. *Ueber einige entomologische Merkwürdigkeiten von Taurien // Magazine des Thierreichs.* – 1793. – Bd. 1. – S. 135–140.
3. Yaroshevskiy V. A. *Information about the fauna of Lepidoptera insects (Lepidoptera) of Kharkiv and its surroundings – Kharkiv: Kharkiv University, 1879.* – C. 1–20. (in Rus.).
4. Alberti B., Soffner J. *Zur Kenntnis der Lepidopteren-Fauna Sьd- und Sьdostruslands // Mitteilungen der Mьnchener Entomologischen Gessellschaft.* – 1962. – S. 148–198.
5. Apostolov L. G. *Harmful entomofauna of forest biogeocoenoses of the Central Dnieper* — Kiev; Odessa: *Vishha shkola*, 1981. – 232 p. (in Rus.).
6. Barsov V. A. *Some data on the fauna of forest gullies of Dnieper rapids // Questions steppe forestry – 1968.* – Vol. 1. – P. 174–176. (in Rus.).
7. Barsov V. A. *To the fauna of Lepidoptera of the steppes of South-Eastern Ukraine // Questions steppe forestry – 1975.* – Vol. 5. – P. 205–210. (in Rus.).
8. Barsov V. A. *Protection of open landscapes, their vegetation and entomofauna in the conditions of the steppe Dnieper // Endangered and rare plants, animals and landscapes Dnepropetrovsk region.* – Dnepropetrovsk : DSU, 1983. – P. 103–110. (in Rus.).
9. Barsov V. A. *Order Lepidoptera - butterflies // Method. the decree. to изуч. the theme of «Rare and endangered invertebrate species in the Pridneprov'je».* – Dnepropetrovsk : DSU, 1984. – P. 24–41. (in Rus.).
10. Goloborodko K. K., Pakhomov A. *Ye Biological Diversity of Ukraine. The Dnipropetrovsk region. Butterflies (Lepidoptera: Hesperioidea, Papilionoidea) / Prof. O.Ye. Pakhomov (ed.).* – Dnipropetrovsk : Dnipropetr. Nat. Univ. Press, 2017. – 304 p. (in Ukr.).
11. Goloborodko K. K. *Analysis of the current state of biotopes Tomares nogelii dobrogensis Caradja, 1895 (Rhopalocera, Lycaenidae) in Dnipropetrovsk region // Questions of modern natural Sciences. Abstracts of the all-Ukrainian conference of young scientists – Simferopol', 2003.* – P. 25–26. (in Ukr.).
12. Goloborodko K. K., Pakhomov A. *Ye Biodiversity and ecological and faunistic review Lycaenidae (Lepidoptera, Lycaenidae) in Dnipropetrovsk region // Ecology and Noospherology.* – 2005. – Vol. 16, № 1-2, – P. 68-73. (in Ukr.).
13. Descimon H., Napolitano M. *L'etude quantitative des populations de Papillons (Lepidoptera). Alexanor.* – 1990. – Vol. 16, № 7, – P.413–426.
14. Kuzjakin A. P., Mazin L. N. *Route-calculation of the imago of day butterflies of the method of catch per unit time // Influence of anthropogenic factors on the structure and functioning of ecosystems and their individual components.* – Moscow, 1993. – P. 61–66. (in Rus.).
15. Macek J. *Motěli a housenky stuednn Evropy. Vol. 1. Nounn motěli / J. Macek, et al. Praha: Academia, 2007.* – 376 p.
16. Ermolenko V. *Description of rare Lepidoptera species / Invertebrate animals of Ukraine, protected by the Bern Convention / Edited by I. Zagorodniuk. Kyiv, 1999.* – P. 33–46 (in Ukr.).

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Досліджено денних лускокрилих фауни природного комплексу колишньої порожистої частини р. Дніпро. З'ясувалось, що серед комплексу *Lepidoptera* 19 видів занесені до охоронних списків різного рівня Таксономічна структура виявилась різноманітною – у комплексі рідкісних і зникаючих видів представники 2 надродин, 6 родин. Строкатість умов існування дозволила тут сформуватись цікавому зоогеографічному комплексу, представленому 5-ю основними групами (палеарктичною, понтоказахською, середземноморською, євросибірською, європейською).

Бібл. 16. Рис. 1. Табл.1.