НАУКОВІ ЗАПИСКИ ДЕРЖАВНОГО ПРИРОДОЗНАВЧОГО МУЗЕЮ
Випуск 29 Львів, 2013 С. 45-54

УДК 595.768.11:574.47

A. M. Zamoroka

THE BIODIVERSITY PATTERNS AND CONSERVATION VALUE OF CERAMBYCIDAE COMMUNITIES AT HALYCH NATIONAL PARK (UKRAINE)

***Key words**: Cerambycidae, biodiversity, conservation areas*

Cerambycidae is one of the biggest families of beetles that constitute 25000 described species worldwide [7, 15]. Many of them are known as the serious wood boring pests, which attack living and recently cut trees and lumber [4, 12, 13]. Some Cerambycidae cause significant economic impact [3, 5, 9], but most of them are not pests [2, 13]. From ecological view the longhorn beetles are the first level consumers and are essential components of food chains of the forest ecosystems. They play an important role in utilization of dead wood they are a part of lesser nutrient or biogenic elements cycle in the ecosystem [16].

However the conservation value of Cerambycidae is still unclear. The main idea is that none of the species on some conservation area are not considered as pests. It means that even species widely accepted as pests should be protected as an inalienable part of natural ecosystem, especially if it is native. The longhorn beetles are saproxylic species, which are typical for forest ecosystems. The problem of conservation of saproxylic beetles is connected with extensive exploitation of forests and replacing natural old aged forests to managed trees plantations with lack of dead wood [10]. In most cases saproxylic beetles have become threatened as a result of the habitat loss. Thus, study of Cerambycidae, as most abundant and diverse saproxylic beetles, is important for forest ecosystem conservation.

The current study shows the distribution and conservation value of Cerambycids diversity at Halych National Park (HNP). HNP has been chosen as a model of an intermediate sized conservation area. The total area of HNP is 14684.8 ha, which consists of 11085 ha of forests, 2200 ha of swamps and wetlands, 1400 ha of steppes meadows. The high variety of biotopes on the relatively small area is caused by the unique position of HNP, which occupies two physiographic zones – Precarpathia Lowland, and Podillya Eminence (the part known as West Opillya). These zones represent different types of vegetation widespread there. Forest vegetation, including fir, beech and oak forests, dominates on Precarpathia Lowland and steppes prevail in vegetation of Podillya Eminence. The administrative area of Halych, where HNP is located, is one of the most populous in Ivano-Frankivsk Region, and the territory of HNP is divided into over 40 distinct clusters. In this respect the influence of habitat fragmentation and impact of ecological gradients on the ecosystems are crucial for understanding the biodiversity preserving and managing in isolated localities on the relatively small territories.

Matherial and Methods

The Cerambycids' communities were studied by the author during the years of 2008-2012 in 18 localities at Halych National Park (HNP) and adjacent territories (Tab. 1.). Fourteen localities included different types of natural vegetation such as forests, which presented by Oak-Beech-Fir (*Querceto roboris - Fageto - Abietum*), Hornbeam-Beech (*Carpineto - Fagetum*), Oak-Hornbeam-Beech (*Querceto roboris - Carpineto - Fagetum*), Willow (*Salicetum albae*) forests formations; and steppe meadows were presented by Feather Grass (*Stipeta capillatae*), Tor-Grass (*Brachypodieta pinnati*) and Wall Germander (*Teucrieta chamedrytis*) formations. Four localities were situated in human settlements and included gardens with fruit trees (*Malus sp.*, *Pyrus sp.*, *Prunus sp.*, *Cerasus sp.* and cet.).

Table 1

The list of the studied sites

Locality	Physiography	Vegetation	Abbreviation
Vysochanka	Precarpathia	Oak-Beech-Fir forests	OBF, Pr
Medynya	Precarpathia	Hornbeam-Beech forests	HB, Pr
Krylos	Precarpathia	Hornbeam-Beech forests	HB, Pr
Halych	Precarpathia	Hornbeam-Beech forests	HB, Pr
Deliiv	West Opillya	Oak-Hornbeam-Beech forests	OHB., WO
Vodnyky	West Opillya	Oak-Hornbeam-Beech forests	OHB., WO
Medukha	West Opillya	Oak-Hornbeam-Beech forests	OHB., WO
Halych	Precarpathia	Willow forests	Wi, Pr
Sokil	Precarpathia	Willow forests	Wi, Pr
Zalukva	Precarpathia	Willow forests	Wi, Pr
Halych	Precarpathia	Garden	Gr, Pr
Medynya	Precarpathia	Garden	Gr, Pr
Deliiv	West Opillya	Garden	Gr, WO
Bovshiv	West Opillya	Garden	Gr, WO
Mezhyhirtsi	West Opillya	Steppe meadows	Sp, WO
Bovshiv	West Opillya	Steppe meadows	Sp, WO
Tustan	West Opillya	Steppe meadows	Sp, WO
Podillya	West Opillya	Steppe meadows	Sp, WO

The main applied insects collecting methods included window and soil traps (4% formaldehyde) and entomological sweep-net and collecting on forage and host plants were used as additional methods. Insects were identified according to the Key to Insect Orders «Beetles of Central Europe».

The Stocker-Bergmann dominant classification was applied for Cerambycids communities describing. According these five dominance classes are exist: eudominants (31,1-100%), dominants (10,1-31%), subdominants (3,2-10%), residents (1,1-3,1%) and subresidents (0-1%) [8]. Faunistic similarity was calculated with the help of Jaccard Index and for communities similarity calculation Renconen Index was used. Simpson's Index was used for measuring species diversity [6].

The similarity of the assemblages of individual sites was evaluated by cluster analysis using Statistica 6.0. The relationships between species assemblages and the environmental variables were elucidated by Canonical Correspondence Analysis (CCA) using Canoco 4.5 [1].

Results

General species diversity. The Cerambycids fauna of Halych National Park (HNP) consists of 58 species which belong to 5 subfamilies, 20 tribes and 38 genera. It constitutes almost 72,52% of earlier predicted diversity of the longhorn beetles species for HNP [14]. Cerambycidae species are distributed very unevenly throughout HNP and its surroundings. It is more diverse in the natural ecosystems of Precarpathia such as Hornbeam-Beech forests, which consist 43 species; and Oak-Beech-Fir forest, where 40 species were found. In contrast to these, the low species richness was detected in Precarpathian fruit gardens over the human settlements, where 15 species were recorded. The data about the longhorn beetles species diversity are presented in Table 2.

Table 2

The average variation of Cerambycidae species diversity throughout studied ecosystems

	OBF Pr	HB Pr	OHB WO	Wi Pr	Gr Pr	Gr WO	Sp WO
Number of species	40	43	33	22	15	19	23
Percent from total number, %	69.0	74.1	56.9	37.9	25.9	32.8	39.7
Simpson Index, D	1.3	2.3	2.7	3.1	1.2	0.8	2.1

While the Cerambycids fauna of Beech and Fir forests of Precarpathia are most diverse, the Simpson's Biodiversity Index is the highest for Cerambycidae assemblages in the willow forests (D=3,1) and it does not depend on the number of species. According to mathematical nature of Simpson's Index, it depends on the dominant structure of communities. As it is shown below, in contrast to HB and OBF, the dominant nucleus of the longhorn beetles communities in Wi consists of eight species with relatively low rate of dominance. These mean that polydominant communities have higher value to ecosystem biodiversity than olygo- or monodominant ones.

The comparison of Cerambycidae faunistic assemblages using cluster analysis based on Jaccard Index (Fig. 1.) shows that six big patterns of fauna exist on the territory of HNP. Two main clusters divide all of the longhorn beetles on forests-type and steppe-type faunas which consist of different species (Tab. 3). The most similar assemblages are found in HB and OBF in Precarpathia, which are combined with cluster of OHB in West Opillya. They form closely related and widely distributed in the HNP Cerambycidae fauna of Beech forests. The distinct faunistic patterns are represented by Willow forests and Gardens.

Dominance structure. The composition of Cerambycidae communities changed due to vegetation and microclimatic conditions in HNP. The number and abundance of dominants vary in different ecosystems (Tab. 3).

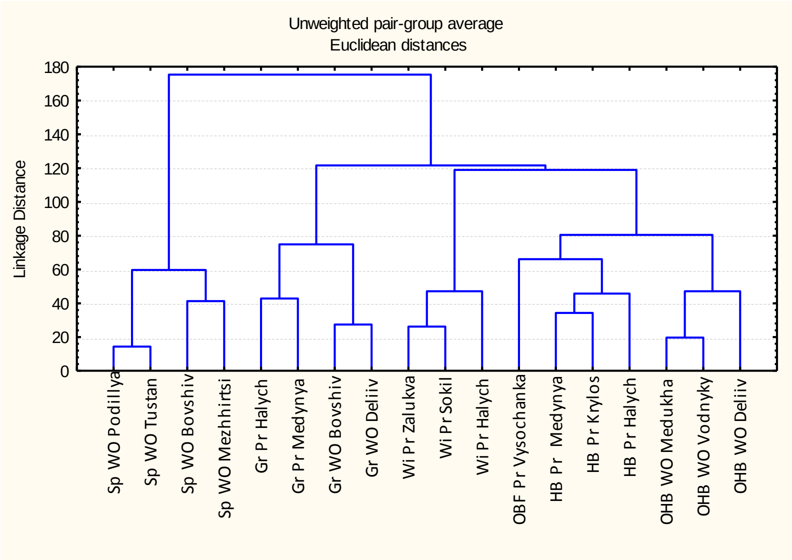

Fig. 1. Dendrogram of faunistic similarity in assemblage of the longhorn beetles based on Jaccard Index

Thus, communities with very few dominant species are considered as oligodominant, in contrast to these, the polydominant communities are characterized by numerous dominants. In olygodominant communities the dominance is "concentrated" among few species [13]. These were found in Cerambycidae communities of Sp (3-5 species), OBF (5 species) and HB (3-4 species). The polydominant communities are typical for OHB (5-6 species), Gr (6-7 species) and Wi (8 species).

In the steppe meadows three dominant species are typical for Cerambycidae communities, such as *Dorcadion holosericeum* Krynicki, 1832 which is eudominant with average relative number 35,4%; and two dominants *Dorcadion fulvum* Scop., 1763 (18,6%) and *Agapanthia cardui* L., 1767 (10,4%). These species are xerophilous and herbivorous (in both larval and adult stages) distributed in dry and open steppe biotopes of West Opillya. Thus, their assemblages are distinct in the faunistic and in the synecological meaning as it is shown in Fig. 1 and Fig. 2.

In forest ecosystems and in gardens there are three constant dominant species: *Dinoptera collaris* L., 1758, *Allosterna tabacicolor* L., 1758 and *Stenurella sennii* Sama, 2002, however with different relative number in each ecosystem type. Than in any other ecosystem, *D. collaris* (6,9%) and *A. tabacicolor* (17,3%) are less abundant in OBF. In contrast these species, the relative number of *S. sennii* (24,5%) is highest in OBF. These are completely the contrary in other forests ecosystems including gardens. Besides the above mentioned species, other Cerambycidae are dominant exclusively in some types of ecosystems. *Aromia moschata* L., 1758 (12%) and *Lamia textor* L., 1758 (9,8%) are dominants in the Willow forests; *Grammoptera ruficornis* F., 1781 is dominant in gardens (14,5%).

Table 3

The percentage variation of Cerambycidae abundance at HNP

Species	Deliiv, OHB. WO	Vodnyky, OHB, WO	Medukha, OHB, WO	Mezhhirtsi, Sp, WO	Tustan, Sp, WO	Podillya, Sp, WO	Bovshiv, Sp, WO	Halych, HB, Pr	Krylos, HB, Pr	Medynya, HB, Pr	Vysochanka, OBF, Pr	Halych, Wi, Pr	Sokil, Wi, Pr	Zalukva, Wi, Pr	Deliiv, Gr, WO	Bovshiv, Gr, WO	Medynya, Gr, Pr	Halych, Gr, Pr
P. coriarius	1.3	0.7	1.6	0.6	0	0	0	2.2	1.6	1.7	0.7	0.7	0.4	1.3	0	0	0	0
Rh. inquisitor	0	0	0	0	0	0	0	0.1	0	0	1.5	0	0	0	0	0	0	0
Rh. mordax	3.6	2.6	3	0	0	0	0	2.9	2.6	2.3	1.1	1.9	0.9	3.3	0	0	0.8	1
D. collaris	10.2	12	12.2	10.1	1.8	4.6	2.7	10.3	9.8	11.5	6.9	8.9	8.4	9.6	12.9	9.3	12.3	11.7
P. lurida	0	0	0	0	0	0	0	0.1	0.3	0.6	1.3	0	0	0	0	0	0	0
N. sanguinosa	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0
G. ruficornis	4.9	2.6	2.1	1.2	0	0	0.7	3.3	4.5	4.1	3.6	3	4.9	1.7	9.7	13	13.9	21.4
A. tabacicolor	29.1	28.9	28.5	7.1	0.9	2.3	3.3	24.7	27.5	28.4	17.3	21.6	14.2	20.4	22.6	33.3	27.9	28.2
J. cerambyciformis	2.8	4.2	2.8	0.6	0	0	0	3.3	3.8	2.7	4.5	0.7	0.4	0	1.6	1.9	1.6	1
S. melanura	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0
S. sennii	10.4	2.6	11.5	0.6	0	0	0.7	20.8	22.8	20.5	24.5	7.8	3.1	5.4	6.5	3.7	12.3	9.7
S. nigra	0.6	0.2	0.2	3.6	0.9	3.1	1.3	0.7	0.6	0.4	0.5	0.7	0.4	0.4	1.6	0	0.8	1
L. quadrifasciata	0	0	0	0	0	0	0	2.2	3.3	3	4.1	7.4	6.6	3.8	0	0	0	0
L. annularis	1.5	4.2	4.6	0	0	0	0	4.6	3.6	5.1	5.9	1.9	3.5	0.4	0	0	0	0
L. aethiops	0.9	0.5	1.1	0	0	0	0	0.6	0.4	0.1	0.3	0.4	0.4	0	0	0	0	0
L. maculata	7.9	9.8	5.1	1.2	0	0	0	5	2.9	2	2.3	5.6	5.3	8	0	0	0	0
S. attenuata	5.1	4.2	4.3	1.8	0	0	1.3	2.2	2.9	5	2.6	2.2	0.9	3.3	0	0	2,5	1
C. rubra	0.2	0	0	0	0	0	0	0.7	0.1	0.1	5.6	0	0	0	0	0	0	0
C. scutellata	0.2	0.5	0.2	0	0	0	0	0.1	0.1	0	0.2	0	0	0	0	0	0	0
A. sanguinolenta	0	0	0	0	0	0	0	0.1	0	0	0.4	0	0	0	0	0	0	0
A. dubia	0	0	0	0	0	0	0	0	0	0	1.8	0	0	0	0	0	0	0
A. sexguttata	0.4	0.9	0.2	0	0	0	0	0.1	0.3	0.1	0	0	0	0	0	0	0	0
B. maculicornis	6.8	5.8	8.1	8.9	0.9	1.5	4.7	2.3	2.2	2.8	2.9	1.5	4	8.8	11.3	7.4	7.4	4.9
P. livida	1.3	4.2	2.7	3.6	1.8	3.1	5.3	0.3	0.1	0.4	0.1	0.4	0	0	1.6	3.7	0	0
T. castaneum	0.2	0	0	0	0	0	0	0.3	0	0	0.6	0	0	0	0	0	0	0

A. moschata	0	0	0	0	0	0	0	0.1	0.3	0	0	12.6	10.6	12.9	0	0	0	0
M. minor	0	0	0	0	0	0	0	0.1	0	0	0.6	0	0	0	0	0	0	0
M. umbellatarum	0.4	0.2	0.9	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0
H. bajulus	0	0	0	0	0	0	0	0.1	0.1	0	0.3	0	0	0	0	0	0	0
R. macropus	0.4	0.9	0.2	0	0	0	0	0.7	0.3	0.6	0.2	0	0	0	0	0	0.8	1.9
Ph. testaceus	0.2	1.2	2.1	0	0	0	0	0.9	0.1	0.1	0	0	0	0	0	0	0	1
A. mysticus	0.2	0	0.2	0	0	0	0	0.1	0.1	0	0	0	0	0	1.6	1.9	0	1
C. arietis	0	0	0	0	0	0	0	0.1	0	0	0.3	0	0	0	0	0	0	0
L. textor	0	0	0	0	0	0	0	0	0.1	0	0.5	6.7	12.8	9.6	0	0	0	0
M. sartor	0	0	0	0	0	0	0	0	0	0	1.5	0	0	0	0	0	0	0
M. saltuarius	0	0	0	0	0	0	0	0.1	0	0	1.8	0	0	0	0	0	0	0
D. fulvus	0.2	0	0	16.7	21.1	16	20.7	0	0	0	0	0	0	0	0	0	0	0
D. holosericeus	0.2	0.2	0.4	25.6	45	42.8	28	0	0	0	0	0	0	0	0	0	0	0
A. testacea	0.2	0	0	0	0	0	0	0.1	0.3	0.4	0.1	0	0	0	0	0	0.8	0
A. clavipes	0	0	0	0	0	0	0	0.1	0.1	0.1	0.8	0	0	0	0	0	0	0
L. nebulosus	1.3	0.5	1.6	0	0	0	0	2.2	1.9	3	1.2	0.4	0	0	1.6	1.9	1.6	1
L. femoratus	0.2	0.2	0	0	0	0	0	0.6	0.3	0.1	0.2	0	0	0	0	0	0.8	0
E. lusitanus	0.4	0.2	0.2	0	0	0	0	0.4	0.3	0.9	0.2	0.4	0	0	1.6	1.9	1.6	1
A. villosoviridescens	3.4	6.1	2.5	1.2	0.9	4.6	0.7	4	4.6	2	2.4	10	14.2	6.3	9.7	5.5	7.4	6.8
A. cardui	0.9	0.5	1.2	7.7	15.6	9.2	15.3	0.1	0.1	0	0	0	0	0	4.8	3.7	0	0
A. intermedia	0	0	0	3	2.8	0.8	2	0	0	0	0	0	0	0	0	0	0	0
A. violacea	0	0	0	0.6	0.9	1.5	0.7	0	0	0	0	0	0	0	0	0	0	0
T. praeusta	0.6	0.2	0.4	0.6	0.9	1.5	0.7	0.6	0.3	0.3	0.1	0	0	0	9.7	5.5	5.7	1
S. carcharias	0	0	0	0	0	0	0	0.6	0.3	0.6	0	0	0	0	0	0	0	0
S. ferrea	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0
O. oculata	0	0	0	0	0	0	0	0	0	0	0	0.4	1.8	0.8	0	0	0	0
O. erythrocephala	0	0	0	2.4	0	2.3	1.3	0	0	0	0	0	0	0	0	0	0	0
Ph. tigrina	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
Ph. affinis	3.4	5.4	2.3	0	0	0	0	1.7	1.2	0.7	1	4.8	7.1	4.6	3.2	7.4	1.6	6.8
Ph. pustulata	0	0	0	0.6	1.8	0.8	0.7	0	0	0	0	0	0	0	0	0	0	0
Ph. cylindrica	0.6	0.5	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ph. coerulescens	0	0	0	1.8	2.8	5.3	3	0	0	0	0	0	0	0	0	0	0	0
Ph. uncinata	0	0	0	0.6	1.8	0.8	0.7	0	0	0	0	0	0	0	0	0	0	0
Total:	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

The analysis of the longhorn beetles communities similarities based on Renkonen Index showed that they are divided in the same way as faunistic assemblages: steppes and forests (Fig. 2) are the main groups. However, the most similar dominant structures are found in OHB and HB communities, which clustered together with OBF community. In contrast to faunistic assemblage similarity, the dominance structure of Cerambycidae communities in the gardens are more close to communities in Beech and Fir forests, than to the same in Willow forests.

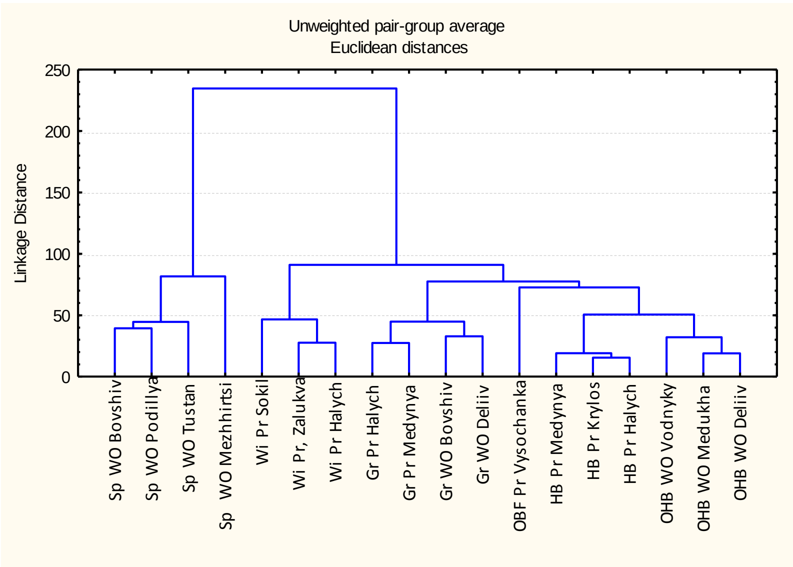

Fig. 2. Dendrogram of communities' similarity of the longhorn beetles based on Renkonen Index.

The patterns of β-diversity. The general trend of ecological gradients is directed from south-west to north-east on the territory of HNP. These include changes in rates of main ecological factors such as temperature, precipitation and altitude, which were used for analysis of environmental footprints on Cerambycidae diversity. Other factors (e.g. duration of vegetation period, thickness of snow cover, depth of soil freezing, sun radiation balance et cet.) with the same direction as the main factors were excluded from analysis. Thus, the CCA was used for analysis of environmental factors influence on the longhorn beetles diversity patterns (Fig. 3). The cumulative percentage variance of species data is 63,4%, which is explained by first (24,1%) and second (39,3%) axes of CCA ordination map. Three main ecological factors mostly explain β-diversity patterns of Cerambycidae over the territory of HNP.

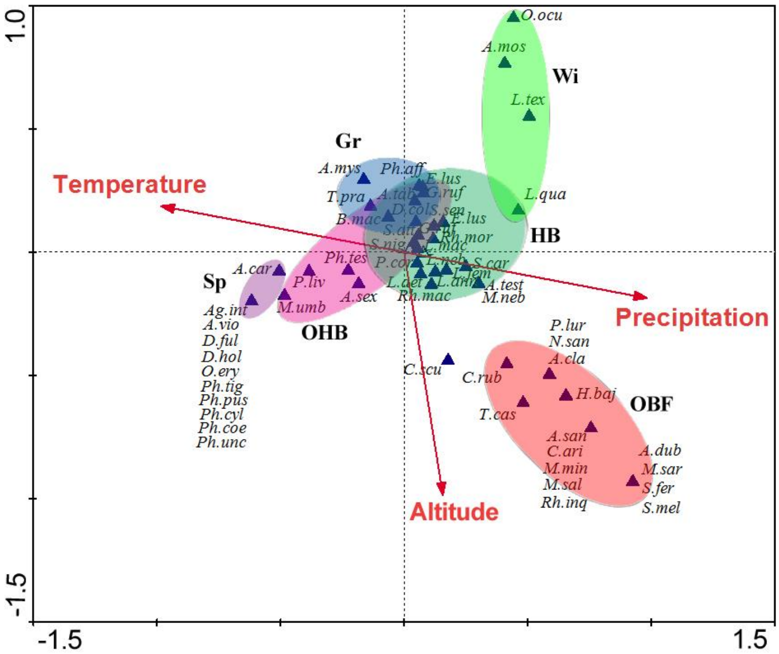

Fig. 3. The distribution of β-diversity patterns of the longhorn beetles in Halych National Park (Ukraine) under influence of main environmental variables based on a CCA.

Concentration of three of the six species patterns at the centre of the ordination diagram is explained by their insensibility to the medium scale variation of the environmental gradients. These species form the core of the diversity at HNP and they were found in most of all the studied ecosystems. The distinct species patterns are presented in the first, third and fourth quadrants of the ordination diagram. Species, presented in the first quadrant (positive values on both axes 1 and 2), are exclusively associated with Willow forests, and do not depend on studied ecological variables. The xerophilous species of Steppe meadows are grouped into a very compact pattern in the third quadrant of the ordination diagram (negative values of both axes 1 and 2). Their distribution over HNP is completely explained by relatively dry and warm environmental conditions which occur on Podillya Eminence. Also these species are exclusively herbivorous on larva and adult stages. The directions of two main ecological gradients (altitude and precipitation) go through the forth quadrant (positive value of axis 1 and negative value of axis 2) of the ordination map. These depict the relatively cold environmental conditions at HNP which correspond to Fir forest ecosystems (OBF). Thus, here presented a big pattern of Cerambycids species connected to Silver Fir (*Abies alba* L.) in their life cycle.

Conclusions

The results argue that the six diversity patterns of the longhorn beetles exist on the territory of Halych National Park. Five of them are combined into one cluster and depict the forest-type fauna; another one presents the steppe-type fauna. These patterns were distinguished by different methods of analyses including faunistic similarity and communities' similarity and multifactor ordination. The core of the Cerambycidae diversity in Halych National Park is formed by polyphagous species connected with broadleaf trees in their life cycle. They are insensible to the medium scale variation of the main environmental gradients. Species associated with extrazonal ecosystems (e.g. steppes meadows or Fir forests) are mono- or oligophagous and are restricted by environmental variables. These species play a crucial role in supporting high rate of general biodiversity on the medium sized conservation areas such as Halych National Park. Thus, the conservation value of Cerambycidae depends on number of their environmentally isolated diversity patterns on the restricted territory.

1. Braak C.J.F.T. Canonical Correspondence Analysis: A New Eigenvector Technique for Multivariate Direct Gradient Analysis / Braak C.J.F.T. // Ecology. – 1986. – 67(5). – P.1167-1179.
2. Evans, H.F. Biology, ecology and economic importance of Buprestidae and Cerambycidae. / Evans, H.F.; Moraal, L.G.; Pajares, J.A. In: Lieutier, F.; Day, K.R.; Battisti, A.; Grégoire, J.-C.; Evans, H.F., eds. Bark and wood boring insects in living trees in Europe, a synthesis. Dordrecht, The Netherlands: Kluwer Academic Publishers. – 2004. – P.447-474.
3. Gutowski J. The role of Cerambycidae and Buprestidae (Coleoptera) in forest ecosystems and some remarks on their economic significance / Gutowski J. // IV-th Symposium on the protection of forest ecosystems. – Warsaw. – 1988. – P.165-175.
4. Karasev V.S. About the causes of coniferous lumber infestans by Callidium violaceum (Coleoptera, Cerambycidae) / Karasev V.S. // Journal of Zoology. – 1974. – T.LIII, vol. 8. – P.1196-1199.
5. Krcmar-Nozic E. The potential impacts of exotic forest pests in North America: a synthesis of research Information / Krcmar-Nozic E., Wilson B., Arthur L. [Report BC-X-387], 2000. – 33 p.
6. Krebs C. J. Ecological Methodologies. / Krebs C. J. Harper and Row, New York, NY. – 1989. – 654 p.
7. Sama G. A new catalogue of the Cerambycidae (Coleoptera) of Israel with notes on their distribution and host plants. / Sama G., Buse J., Orbach E., Friedman A.-L.-L., Rittner O., Chikatunov V. // Mun. Ent. Zool. – 2010. – Vol. 5, No.1. – P.1-51.
8. Stocker G. Ein Modell der Dominanzstrucktur und seine Adwendung. 1. Modellbildung. Modellrealisierung. Dominanzklassen / Stocker G., Bergmann A. // Arch. Naturschults. U. Laundschaftsforsung. – 1977. – Bd. 17, №1. – P.1-26.
9. Vetrova V.P. The influence of Monochamus urussovi on Fir forests / Vetrova V.P. // Lesovediniye – 1986 – №1 – C.43-50.
10. Wermelinger B. Dynamics of saproxylic beetles (Coleoptera) in windthrow areas in alpine spruce forests / Wermelinge B., Duelli P. Obrist M. K. // For. Snow Landsc. Res. – 2002. – Vol. 77, ½. – P.133-148.
11. Wermelinger B. Horizontal and vertical distribution of saproxylic beetles (Col., Buprestidae, Cerambycidae, Scolytinae) across sections of forest edges / Wermelinger B., Fluckiger P. F., Obrist M. K. and Duelli P. J. // Appl. Entomol. – 2007. – 131 (2). P.104–114.
12. Zahaykevych I.K. The Longhorn beetles / Zahaykevych I.K. // The agricaltural and forest pests – 1974. – 2. – P.24-49.
13. Zamoroka A. M. Ecological features of long horn beetles entomocomplexes (Coleoptera: Cerambycidae) in the forest ecosystems of the north-eastern macroslope of the Ukrainian Carpathians: diss. thesis Ph.d. in boil. sci.: 03.00.16 Ecology / Zamoroka, A. M. – Dnipropetrovsk National University, 2009. – 16 p.
14. Zamoroka A.M. Contribution to knowledge of the longhorn beetles (Insecta: Coleoptera: Cerambycidae) of Halych National Park. / Zamoroka, A.M. // Conference communication – 2010. – P. 652-655.

15. Zamoroka A. M. The catalogue of the longhorn beetles (Coleoptera: Cerambycidae) of western Podillya, Ukraine. / Zamoroka A. M., Panin R. Yu., Kapelukh Y. I. & Podobivskiy S. S. // Munis Entomology & Zoology. – 2012. – 7 (2). – P.1145-1177.
16. Zamoroka A. M. Recent records of rare and new for Ukrainian Carpathians species of Longhorn beetles (Insecta: Coleoptera: Cerambycidae) with notes on their distribution. / Zamoroka A. M. & Panin R. Yu. // Munis Entomology & Zoology – 2011. – 6 (1). P.155-165.

1. Precarpathian National University named after Vasyl Stefanyk, T. Shevchenko str., 57, Ivano-Frankivsk, Ukraine. *zamoroka@hotmail.com*
2. Halych National Park, Lvivska str., 1, Krylos, Halych dstr., Ivano-Frankivsk Reg., Ukraine

Заморока А. М.

Значення угруповань жуків-вусачів (Cerambycidae) для охорони біорізноманіття в Галицькому національному парку (Україна)

Природоохоронні території середніх розмірів, як Галицький національни природний парк є добрими об’єктами для вивчення біорізноманіття в умовах високої щільності населення і фрагментації середовища існування. Внаслідок інтенсивної експлуатації лісів виникла загроза існуванню угруповань сапроксильних комах, у тому числі і жуків-вусачів. У результаті наших досліджень на території національного парку виявлено 6 комплексів жуків-вусачів з різними рівнями різноманіття і подібності. П’ять із них об’єднуються у кластер, який репрезентує лісову фауну, а шостий – є самостійним кластером репрезентуючим степові угруповання. Ядро різноманітності вусачів формується видами-поліфагами на листяних породах, які малочутливі до екологічних градієнтів у національному парку. Види асоційовані з екстра зональними екосистемами є моно- або олігофагами, розповсюдження яких обмежене екологічними факторами. Ці види відіграють важливу роль у підтриманні високого загального рівня біорізноманіття резервату. Таким чином, природоохоронне значення жуків-вусачів буде тим більше, чим більше екологічно ізольованих їх комплексів існує на певній території.

Ключові слова: *Cerambycidae, біорізноманіття, природоохоронні території*

Заморока А. М.

Значение сообществ жуков-усачей (Cerambycidae) для охраны биоразнообразия в Галицком национальном парке (Украина)

Природно-заповедные территории средних размеров, как Галицкий национальный природный парк, являются хорошими объектами для изучения биоразнообразия в условиях высокой плотности населения и фрагментации среды существования. Вследствие интенсивной эксплуатации лесов возникла угроза существованию сообществ сапроксильных насекомых, в том числе и жуков-усачей. В результате наших исследований, на территории национального парка, выявлено 6 комплексов жуков-усачей, с разными уровнями разнообразия и сходства. Пять из них объединяются в кластер представляющий лесную фауну; шестой – является самостоятельным кластером, представляющим степные сообщества. Ядро разнообразия усачей формируется видами-полифагами на лиственных породах, которые малочувствительны к экологическим градиентам в национальном парке. Виды ассоциированы с экстразональными экосистемами являются моно- или олигофагами, распространение которых ограничивается экологическими факторами. Эти виды играют важную роль в поддержании высокого общего уровня биоразнообразия резервата. Таким образом, природоохранное значение жуков-усачей будет тем выше, чем больше экологически изолированных их комплексов существует на определённой территории.

Ключевые слова: *Cerambycidae, биоразнообразие, природно-заповедные территории*