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Exclusion Zone as Unique Site for Wolf Ecology Research in Ukraine

Key words: wolf, Chernobyl Exclusion zone, ecology, behavior, theriology, human-predator conflict

Introduction

Wolf, *Canis lupus* ssp. *lupus* Linnaeus, 1758, is a widespread species throughout the territory of Ukraine. During the XX century their number varied from 500 to 7,000 individuals (KRAYNEV 1971, KRYZHANIVSKYY 1999) depending on chasing level and socio-economic transformation of the territory.

At the beginning of nineteenth century wolf was common throughout Ukraine (KORNEYEV 1953). In the 1850s, as a result of a powerful campaign to reduce quantity in the interests of livestock holders, the number of wolves decreased significantly, and until 1914 the species was considered to be few (BIBIKOV 1974). During military operations in 1914–1920 their number had increased again. The next wave of fight stirring up against the wolf led to the fact that by 1938 year their distribution was extremely uneven (KORNEYEV 1953, MIGULIN 1938). The last quantity increase fell on the years of World War II: in 1947–1949 the number was estimated at the level of 7,000 individuals (KRYZHANIVSKYY 1999). Since 1947 a large-scale campaign was aimed to destroy the „pest“ and by 1970 years after accounting wolves number was determined at the level of 450 individuals (BIBIKOV 1985).

After 1970 the number gradually grew. In 1980 the statistics of users of hunting grounds indicated more than 1,000 individuals. And since

1994 wolves quantity has grown by 20–25 % (KRYZHANIVSKYY 1999).

Currently wolf is spread throughout Ukraine, including the Crimea. Official statistics indicates that at the end of 2017 year quantity of wolves is 2309 individuals.

In the conditions of Ukraine the main factor of wolves' hostility is competition for hunting species, prey for domestic animals and fear of predators' potential attack.

Active growth of animal protection initiatives is constantly raising a question species status in the plane of public discussion. In Ukrainian legal field the wolf is simultaneously a hunting species with no quotas for hunting and a year-round hunting season and at the same time is a so-called „harmful“ species (at the moment, in Ukrainian legislation there are no criteria defining this term for objects of fauna or flora).

In 2010 we offered students of National Forestry University ($n = 81$) to arrange in order of increasing sympathy six species of carnivores listed in the questionnaires. As a result, among the large carnivores, almost the same number of respondents ($\text{Mean} \pm \text{SD} = 16 \pm 2$) placed the wolf in each of the six possible positions (Fig. 1).

In general the results of analysis of questioned students' attitude are not paradoxical or unexpected. Wolves are present on the most territory of Ukraine and actively interact with environment. People are well acquainted with risks

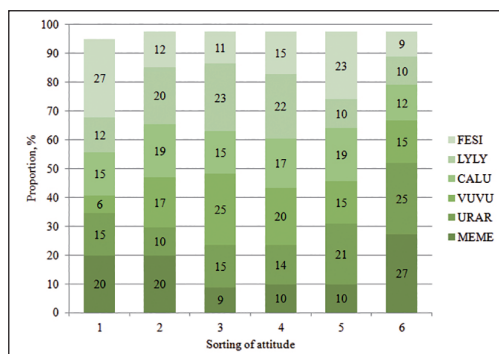


Fig. 1: Graduation of respondent's ($n = 81$) attitude to different species of Carnivores. Abbreviations: CALU – *Canis lupus lupus*; FESI – *Felis sylvestris* Schreber, 1777; LYLY – *Lynx lynx* (Linnaeus, 1758); URAR – *Ursus arctos* Linnaeus, 1758; VUVU – *Vulpes vulpes* (Linnaeus, 1758); MEME – *Meles meles* (Linnaeus, 1758). Gradient of sympathy among list of species: 1 – lowest → 6 – highest.

and do not exaggerate fear as it happens when meeting with unknown. Therefore, the wolf was not in the most „favorable“, but did not get into the most unacceptable. The results of the questionnaire are also determined by the origin of students – from families professionally connected with forestry and hunting, living in the countryside.

In this connection the question arises as to what criteria should be used to assess the level of conflict in Ukraine in generally. Obviously, reliable data on species ecology should be used as a basis. We've made an attempt to assess the potential of the conflict with the wolf based on the study of wolf ecology in different natural zones of Ukraine and in the Exclusion zone of ChNPP (EZ) as a model territory.

Exclusion zone of ChNPP is of great interest precisely from the side of knowledge about the variability of characteristics of wolf population of Ukraine in terms of environmental and behavioral characteristics. Criteria used for collecting data throughout Ukraine were also applied in the Exclusion zone, in some aspects at a deeper level. In our opinion such parameters as share of wild animals in the diet, land area, frequency of conflict with human, characteristics of biological signal field are the least transformed factors of anthropogenic origin in comparison with other stationeries studied before.

Materials and Methods

Field studies were carried out during 2002–2017 in different places of Ukraine, including the Exclusion zone of ChNPP.

The following software Libre Office Calc v. 5.4.4.2 and PAST v. 3.2 (Hammer et al., 2001) were used for databases organization, subsequent statistical processing and visualization of obtained results. QGIS v.3.0.1-Girona (QGIS 2018) was used for GIS processing and mapping.

General methods

Track records and follow-up tracking, individuals' identification with trace marks, searching of excrements and remains of prey, polls were conducted in order to obtain primary research material. Places of findings, stationeries etc. were fixed with the help of GPS devices.

We were primarily interested in understanding if the wolf of the Exclusion zone is „typical“ for Polissya grouping in general. The following criteria were chosen: territory usage, diet, conflict with human.

Determination of distribution in the territories used

Wolves breeding areas were determined by pair paths during mating season and cubs' birth period and fixation of broods howling and their visual encounters during summer period. Territories of individual areas of family packs were determined by polygon method – at the extreme points of traces of an adult pair stay. Anthropogenic resources usage was characterized quantitatively by prey for domestic animals, cultivated plants (fodder resources) and territory of settlements, bridges, etc. (spatial resource) usage.

For the analysis of wolves' distribution official statistics provided to us on request were also used (State statistics service of Ukraine).

Definition of food objects

Food objects from excrements, food remains, wolves' stomachs, remains of prey were determined as „findings“ and identified visually with the subsequent distribution on 25 groups.

For the convenience of results analysis the territory of Ukraine was divided into five regions (in brackets mentioned oblasts): East (Donetsk, Lugansk), North (Zhytomyr, Kyiv, Chernigov), West (Lviv, Zakarpattia), South (Kherson, Mykolaiv), Center (Vinnytsia). To calculate the frequency (Fr, %) of detecting separate „findings“ (SF) from the total number of food objects (FO) the formula was used:

$$\{1\} \quad Fr, \% = \Sigma SF / \Sigma FO.$$

For the total values of certain categories of food objects, standard deviation was calculated. To compare feeding characteristics between individual regions and the Exclusion zone, the Spearman rank correlation coefficient (Rs) was used.

Mounting of photo-traps

In order to find out the nature of territory usage, photo-traps were installed periodically, on trails, on prey remains, on separate plots of land where it was impossible to find out the nature of stay by other methods.

Data obtained with the use of photo traps were also used in the construction of wolves' spread map on the territory of Ukraine.

Results and Discussion

Wolves' quantity on the territory of Ukraine

In order to analyze wolves' dispersion on the territory of Ukraine, we focused on species killing as the most objective indicator in view of inability to summarize data from different user categories and low quality of data records (Fig. 2). We used our own field and statistical official data on wolves hunting for mapping. The presence of animals hunting clearly demonstrates the fact of species presence in a particular territory.

The map shows our field stationeries. In most of them the flock monitoring was provided during the period from 2001 to 2010 years. In the Exclusion zone researches continue till now. Basing on the data obtained from stationeries in different areas, we can state both the low quality of official data and also that the Exclusion zone wolf is model-usable from the point of expectations of characteristics of ecology and biology of the species.

An important nuance for accountants quality assessing is situation in the occupied areas. It is noticeable that occupation of a part of Ukrainian territories influenced significantly data of official statistics (Fig. 3): the Autonomous Republic

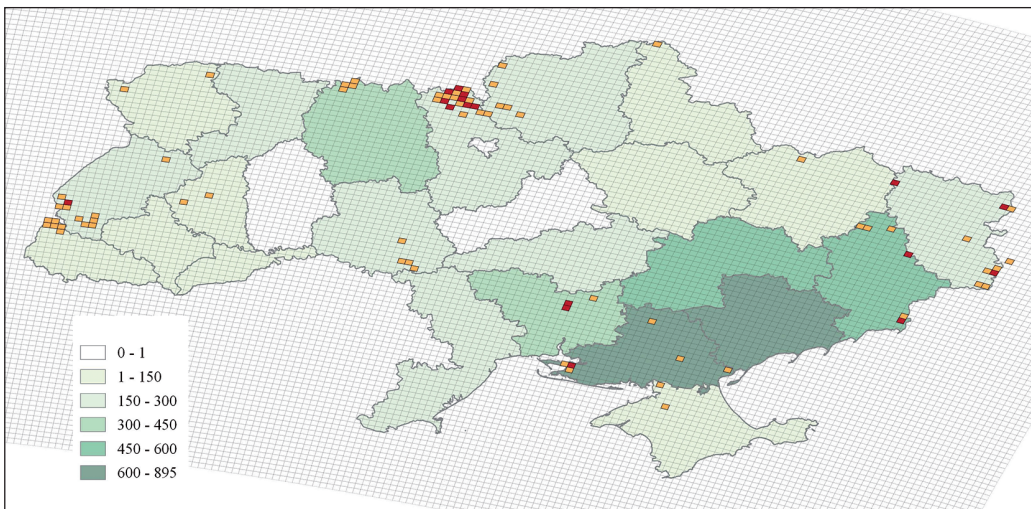


Fig. 2: Species presence in Ukrainian regions. Notes: Administrative regions of Ukraine are marked by a color gradient, depending on the total number of wolves obtained (hunted) by users during the period 2012–2016 years; Data of own field studies collected at different time intervals for the period 2001–2018 are indicated on the grid: orange color – species presence; red color – registered breeding

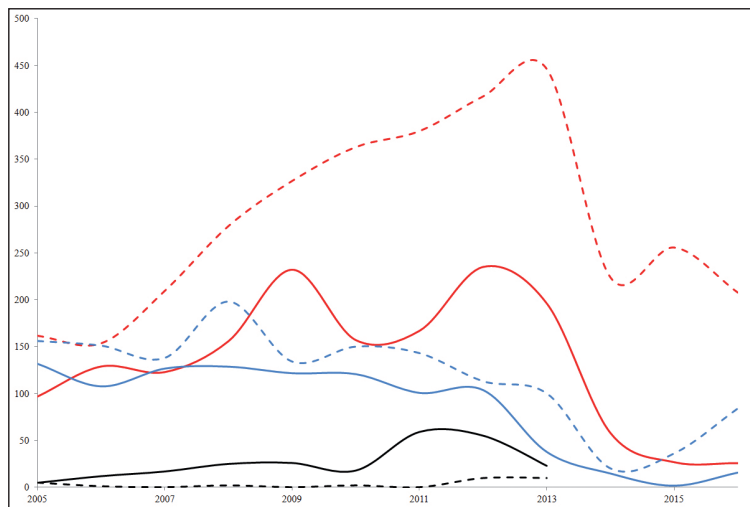


Fig. 3: The effect of military occupation on wolves' hunting (official statistics).
Legend: red line – Donets'ka oblast; black line – Crimea; blue line – Lugans'ka oblast. Solid line – hunted animals, dotted line – approximate number of animals

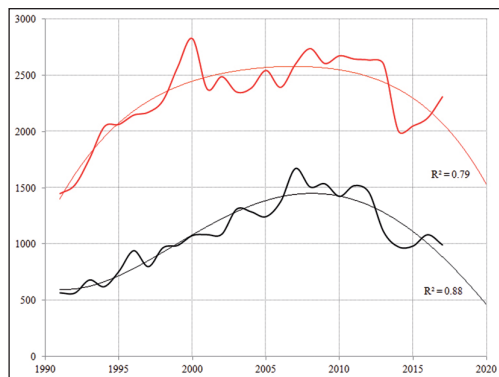


Fig. 4: Dynamics of wolves number in Ukraine in the period 1991–2017 years according to data of the official 2-TII statistics with trend analysis.

Legend: red color indicates the approximate number of animals, black – actually shot wolves; polynomial curves (polynomial degree = 4) for each data type are present on the diagram, the index R^2 is indicated

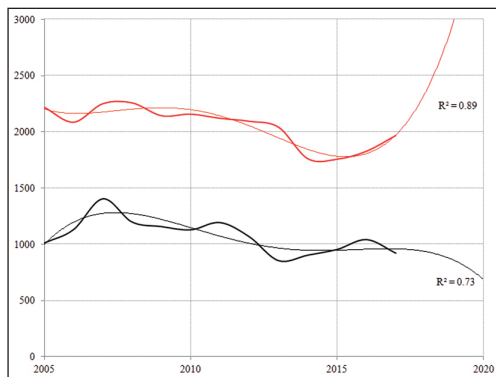


Fig. 5: Dynamics of wolves number in Ukraine in the period 2005–2017 years according to data of the official 2-TII statistics with trend analysis without taking into account statistical data from Crimea, Lugansk and Donetsk oblasts.

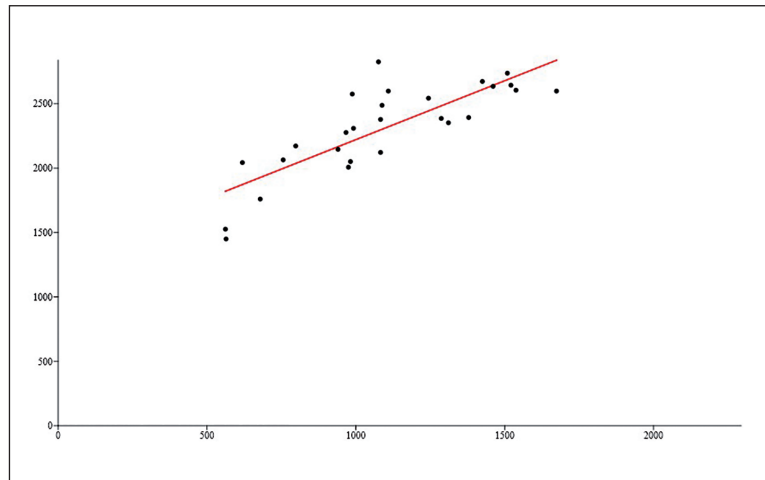
Legend: red color indicates the approximate number of animals, black – actually shot wolves; polynomial curves (polynomial degree = 4) for each data type are present on the diagram, the index R^2 is indicated

of Crimea stopped providing data on the number of animals, Lugansk and Donetsk oblasts provide highly garbled data that could not be verified.

Official position of forestry states that during the last years there is a trend of population growth that reduces tolerance level to wolf (Press service of SAFRU 2016, SHEYGAS 2017). However, if we assume that the number of wolves' annual shooting depends on population density

and, consequently, frequency of meetings with users of hunting grounds, a polynomial analysis of the dynamics of wolves hunting with a sufficiently high degree of support predicts the opposite effect aimed at animals shooting reduction in the following one to two years (Fig. 4). To exclude perverting influence of statistical data from occupied territories, a polynomial analysis was carried out without taking into account the data from the Autonomous Republic

Fig. 6: Diagram of linear regression of co-dependence of the approximate number of wolves and the number of animals shot (based on the official data). Along the X axis – number of animals shot, along the Y axis – approximate number of wolves



of Crimea, Lugansk and Donetsk oblasts in the period 2005–2017 years (Fig. 5), which with a smaller but also a high degree of support predicts animals shooting decrease.

The estimation of the linear regression line, with H_0 , that the estimated number of wolves correlates with the number of animals shot, is determined by the following equation:

$$\{2\} \quad y = 0.91 \times x + 1306.36, \\ \text{when } R^2 = 0.66, SD = 209.92.$$

From this it follows indirectly that in 39% of cases, official statistics data on the estimated number of wolves in Ukraine do not correlate with the number of animals shot (Fig. 6).

In connection with mentioned above there is vexed problem of verifying results of official methods of recording wolves in Ukraine. Accounting problems include several blocks:

1. Responsible party. Hunting farms submit accounting data to the State Main Department of Statistics in accordance with the established form „2-TP Myslyvstvo“ (SMDS 2012). Entities from the nature reserve fund of Ukraine maintain separate reporting document „Litopys“ (MENRU and NASU 2002). Data from the nature reserve fund is provided to the Ministry of Environmental Protection without compiling subsequent summaries. There is practically no control over accounting methods on the territory of these facilities. Data on the number are not submitted by all users of hunting grounds in

the official statistics and their quality is questionable.

2. Problems of methodology adequacy. The official recommendations on wolves accounting are the following: „The records of hunting fauna in forest lands, conducted mainly by the method of noise run on test areas or by the method of double tracing mapping. In mountains, the route accounting method (by tracks on snow) or the complete visual observation of deer in the staging areas (places of winter clusters) near foothills, slopes and on logs (logging) are used. ... Record of the Red Book and a few hunting species (bison, bear, wolf, lynx, wild cat, otter, wild boar, black grouse and others) is to be conducted by questionnaire method“ (RIZUN and BONDARENKO 2016). In fact it is not always possible to determine which method was used in accounting. In Ukraine, a wolf is considered to be harmful according to Article 33 of Ukrainian Law “About hunting husbandry and hunting” (VERKHOVNA RADA 2000): “Shooting and capture of carnivores and harmful animals, obtaining of hunting animals for scientific purposes, resettlement to new places of residence, obtaining of wolves, foxes, raccoon dogs, homeless dogs and cats, gray crows belongs to the official duties of workers authorized to protect hunting grounds and is carried out without a special permission during the year”. Not all users of hunting grounds show actual figures of population as don't want to

cause complaints about the control over carnivores' population. Also not always wolves obtained during poaching are included in the statistics of obtained animals (e. g. $n = 3$ from 2011 according to official statistics data). At the same time there is also a problem of double counting. Packs, whose plots of land are located on the territories of two or three users of the territories could be counted independently in both organizations and summarized in the final report.

3. The problem of accountants' qualification. Low competence in questions connected with species biology is also a problem. The spatial and social structures of groupings, seasonal dynamics, settlement processes, and nature of movements during breeding season are not taken into account. Species are not always correctly identified according to tracks. In addition, the snow cover in recent years is unstable. And modern technological methods are not officially approved and available to all. There are no research centers-cores providing methodological support at the global level. There is no full monitoring of species and Action Plan on the scale of the country.

In general, we can characterize the main trend as an expansion of species to undeveloped territory. A reliable number remains in question.

For the time being we can speak about the presence of three territorial groups in the territory of Ukraine: Polissya, Carpathian and Steppe that in recent decades are actively populating new areas. These groups are parts of the Baltic and Carpathian populations respectively.

Samples collected from wolves in Ukraine and particularly in the Chernobyl exclusion zone were used in the global study conducted by PILOT et al. (2010). The study analyzed phylogeographic history of European wolves and provided the spatial distribution of mt DNA haplotypes.

It was determined that mtDNA haplotypes were represented by two investigated haplogroups. In Eastern Europe, these two haplogroups had highly overlapping distribution. Haplogroup 1 predominated in region, occurring in 87% of individuals. Wolves from the Ukrainian Polissya are also a part of haplotypes of European haplogroup 1. In ancient European wolves, haplogroup 2 was predominant. All ancient wolf samples from Bel-

gium, Germany, Czech Republic, Hungary, and Ukraine (south), dated from between 44,000 to 1,400 years B. P., belonged to this haplogroup.

Size of brood areas. Nature of territory usage

According to our data sizes of packs' areas varies from 127 to 397 km² (SHKVYRIA 2008) in different natural zones. On average sizes of packs' areas consisting of 5–7 animals in Polissya (woodland) and Lisostep (forest-steppe) was 300 ± 49 km². In steppe regions of southeast, 158 ± 18 km², which is obviously connected a high number of wolves, smaller number of suitable places for lairs arrangement with optimal protective properties, as well as with specific nature of species composition of prey and nature of its spatial distribution. For the Carpathian grouping is also characterized by a small size of territorial area, but for the mountain region not only the projection area, but also the area of vertical relief should take into account. According to our data in this region the average linear area of the territorial plots of packs was 219 ± 9 km², with the elevation above sea level ranging from 400 to 1,000 m.

Territories used by wolves had different status of nature management – from protected to actively mastered by man. In general, up to 40% of the total number of species registrations in anthropogenically transformed biotopes is observed (SHKVYRIA and KOLESNIKOV 2008)

Area of brood sites in the Exclusion Zone looks quite typical for the Northern part of Ukraine (SHKVYRIA and VYSHNEVSKIY 2012): were identified 6 wolf packs with total number 30–40 specimens, the average pack area was 246 km². Evaluation of wolves' number is quite adequate to the area of the Exclusion Zone (2600 km²), based on our knowledge of the area of pack sites in Ukraine.

Features of BSF

The role of anthropogenic influence on biological signal field (BSF) characteristics of the wolf also has been studied (SHKVYRIA and YAKOVLEV, 2016).

The main design of the study was to study the biological signal field (BSF) characteristics of

wolves at different levels of anthropogenic load on territories with different economic status of the species as animals under preservation in Białowieża National park (Poland) and game animals in the Chornobyl exclusion zone. The study has found that the number of route reports was almost the same on both territories, considering that the density discrepancy of the geographical groups was insufficient (*Fig. 7*). The significance of area categories to animals varied according to the stages of the pack life cycle. Statistical analysis shows that there was no correlation between the features of a site and the differences in wolf behavior on the studied territories. It was found that the main factors

determining the type of wolf activity are not the degree of the anthropogenic load and hunting, but rather life cycle periods, seasonality, and geographical distribution of groups.

Thus, that the main factors determining the type of wolf activity are not the degree of the anthropogenic load and hunting pressure, but rather life cycle periods, seasonality, and geographical distribution of groups.

Diet

Analysis of frequency of findings of various wolf's food objects is presented in Table 1. A significant proportion in wolf's diet in Ukraine

Table 1: Wolf feeding objects founds frequency in different regions and in EZ partially.

Notes: Feeding objects of anthropogenic origin are marked by gray color.

	FOOD	Center, %	East, %	North, %	South, %	West, %	General ratio in regions $\pm$ SD	EZ, %
1	Beaver	0	0	4	0	3	2 ± 2	2
2	Cow	6	5	6	7	2	5 ± 2	3
3	Cultivated plants	6	5	3	4	3	4 ± 1	1
4	Domestic birds	10	7	4	6	4	5 ± 2	2
5	Domestic dog	8	16	10	9	17	12 ± 4	4
6	Domestic pig	0	2	0	0	0	0–1	0
7	Fallow deer	10	0	1	0	3	2 ± 4	0
8	Fish	2	0	1	1	0	1 ± 1	1
9	Fox	0	5	1	2	0	2 ± 2	1
10	Garbage	4	2	4	2	2	3 ± 1	2
11	Hare	12	10	7	24	4	10 ± 7	6
12	Horse	4	0	3	4	3	3 ± 2	1
13	Invertebrates	4	2	1	2	2	2 ± 1	0
14	Marmot	0	3	0	0	0	1 ± 2	0
15	Mole rat	0	0	0	2	0	0–1	0
16	Moose	2	0	9	0	1	4 ± 4	1
17	Raccoon dog	0	2	0	0	0	0–1	0
18	Red deer	6	0	2	1	13	4 ± 5	38
19	Reptiles	2	1	2	1	1	1 ± 1	1
20	Roe deer	10	7	19	6	21	15 ± 7	17
21	Sheep	0	9	0	4	7	4 ± 4	0
22	Small rodents	0	9	2	11	3	5 ± 5	5
23	Wild birds	6	4	1	7	2	3 ± 3	0
24	Wild boar	6	5	17	2	6	9 ± 6	11
25	Wild plants	6	6	4	5	4	5 ± 1	4
Summ of cases		52	116	216	85	151	620	157



Fig. 7: Using of anthropogenic constructions (melioration channels) by wolf in Exclusion zone.

belongs to forage of natural origin – 64%, 34% of belongs to wild ungulates.

Two features are the most striking regional differences in wolves' diet: share of wild ungulates and share of anthropogenic types of forage in the diet.

In the territory of Polissya, Carpathians and Forest-Steppe regardless the regime of nature management of the territory, the most important among other groups of feed in the wolf's diet are wild ungulates – up to 48% in Polissya. The largest percentage of anthropogenic resource (domestic animals, crops, waste, etc.) in predator's diet is inherent in the steppe group – up to 35%; the smallest percentage of Polissya group – 29%.

In general the analysis with Spearman rank correlation coefficient (Table 2) demonstrates steady trend towards certain diet similarity between animals in the Southern and Eastern part of Ukraine, as well as in the North and Central,

Central and Western parts. Analysis of wolves' diet from the Exclusion Zone shows a very high degree of similarity with wolves' diet from the Northern part of Ukraine, and some similarity with the Western part of Ukraine. Wolves' diet from the Eastern part of Ukraine is less similar with the Central part of the Ukraine and the Northern one.

With regard to anthropogenic resource in the diet usage, reliable correlation is observed in animals of the Central and Northern, Southern and Central, Northern and Southern parts of Ukraine. The Exclusion zone demonstrates reliable strong correlation with the Northern part of Ukraine, as well as some similarity with Central and South Ukraine.

Rodents typical for wolves diet in the south-eastern regions have unessential share compared to large ungulates that dominate in the diet of other groups, anthropogenic resources is usually also localized (livestock grazing sites, cattle

Table 2: Spearman R_s correlation between feeding in different regions of Ukraine and in Exclusion zone. Notes: in upper part is p (uncorr); cells with $p > 0.05$ are marked with gray color; level of correlation and probability are marked with gradient color.

	Center, %	East, %	North, %	South, %	West, %	EZ, %
Center, %		0.11866	0.00059	0.01114	0.00047	0.01144
East, %	0.32019		0.11426	0.00001	0.01144	0.06263
North, %	0.63888	0.32386		0.02910	0.00120	0.00000
South, %	0.49884	0.75954	0.43662		0.00621	0.01759
West, %	0.64758	0.49723	0.61025	0.53189		0.00032
EZ, %	0.49727	0.37777	0.80848	0.47060	0.66125	

cemetery and garbage dump, etc.) so the hunting area of the wolves packs of the steppe population (and, accordingly, the territorial area as a whole) occupies smaller area.

In the Exclusion Zone 87% belongs to the feed of natural origin (wild ungulates – 68%). What is typical for Polissya (71%), but certainly not for the whole Ukraine. Low share of anthropogenic forages and livestock in particular (4%) is a positive moment from the point of monitoring the level of conflict with human.

Separately it should be noted that total share of dogs in the diet on the territory of Ukraine as a whole is 8–17%. Thus, the Exclusion Zone is distinguished by a basically low share of dogs in the diet (4%). The presence of dogs is due, first of all, to the nature of dogs keeping.

Unfortunately, the question of homeless dogs in the Exclusion Zone has not been systematically studied in view of the specifics of regime territory functioning. Homeless dogs in the Exclusion Zone are mainly concentrated in large locations near the enterprises (Chernobyl, Pripjat, 3 and 4 nuclear power units) and dis-

persed in the places of personnel concentration – checkpoints and watch posts of law enforcement structures, forestry, etc. If large groups are characterized by a permanent residence within inhabited locality/ enterprise, then the second category is usually practically defenseless against large and medium predators, since it is kept in the middle of the forest near camps of employees of law enforcement structures which is not protected from penetration by wild predators.

In view of indicated features, homeless dogs often live no longer than 1–3 years and are usually hunted by wolf and fox.

Attacks on human

An essential aspect of the human-wolf conflict is the fear of attacking a person. We combined 16 cases of attacks on human recorded since 2002 (Table 4, Fig. 8). In the general summary of cases combined by us, the Exclusion Zone looks modest (7, 10). Both cases have a confirmed diagnosis – rabies.

Table 3: Spearman R_s correlation between anthropogenic recourses in feeding in different regions of Ukraine and in Exclusion zone. Notes: in upper part is p (uncorr); cells with $p > 0.05$ are marked with gray color; level of correlation and probability are marked with gradient color.

	Center, %	East, %	North, %	South, %	West, %	EZ, %
Center, %		0,28393	0,03254	0,03512	0,33452	0,03254
East, %	0,44173		0,41587	0,07857	0,05218	0,41587
North, %	0,78395	0,33743		0,03810	0,56468	0,00060
South, %	0,77020	0,66672	0,75778		0,10610	0,03810
West, %	0,39027	0,72729	0,23782	0,62587		0,56468
EZ, %	0,78395	0,33743	1,00000	0,75778	0,23782	

Table 4: Detailed description of wolf attacks in Ukraine .

	Date	Rabies	Human professions	Number of attacked people	General information
1	15.12.2002	unknown	Farmers, hunter	1	Two wolves attack four people (2 males, 2 females) in two close located villages, one wolf was killed .
2	01.04.2004	Yes	Rangers	> 1	One man was wounded, few in contact .
3	01.01.2005	Yes	unknown	unknown	–
4	16.02.2005	unknown	Farmers	1	Seven people were attacked; wolf was escaped .
5	12.06.2007	unknown	Farmers	1, > 1	Two attacks; wolf was killed by axe .
6	13.08.2007	unknown	Walking, guarding	1	Man and woman were wounded; wolf was shot .
7	28.08.2009	Yes	Workers	> 1	Six people and Sheppard dog were wounded; wolf was shot .
8	15.01.2012	Yes	Farmer	1	Woman got damages of face; wolf was killed by pitchfork damage .
9	02.04.2012	unknown	unknown	unknown	Two men and one woman were wounded; wolf was shot .
10	22.08.2012	Yes	Workers	1, > 1	Four people and two domestic dogs were wounded; wolf was shot .
11	01.11.2012	Yes	Walking	1	Three people and horse were wounded, one dog killed; wolf was manually killed through compressed asphyxia .
12	15.11.2014	Yes	Farmers	1	Two more women were attacked by this animal, but without injuries .
13	19.11.2014	unknown	Farmers	1, > 1	Three-time attack; Wolf was killed without analysis .
14	06.02.2015	Yes	Farmers	unknown	Ten people were wounded .
15	04.02.2017	Probably	Farmer, border guards	> 1	Wolf attacked farmer, two border guards killed it with knife .
16	16.01.2018	Yes	Local	> 1	Wolf attacked local woman and was killed . Analyses proved rabies .

In nine cases in Ukraine rabies was confirmed, one has an unconfirmed status. All attacks were not lethal for humans, but differed in their level of injures. Most cases occurred directly within the boundaries of inhabited localities or not far from them. The age of the victims varies from 20 to 80 years old. By profession they were farmers, shepherds, local people, and foresters. In one case it were employees of the Chornobyl NPP.

Summarizing data obtained by us, we can state that the Exclusion zone is typical from the point of expectations as to species ecology. Stable ter-

ritorial structure, very low share of anthropogenic feed in the diet and an appropriately low level of conflict with human make the Exclusion zone unique testing area for species research in situation with reduced pressure of human activity factor. Of course, the next logical step is to review the status of the species in this area. We do not talk about changing hunting to protecting, but we believe that the Exclusion zone and adjacent territories should receive a balanced plan of population management, and the fight against the predator should be transformed into the rational usage and grouping protection.

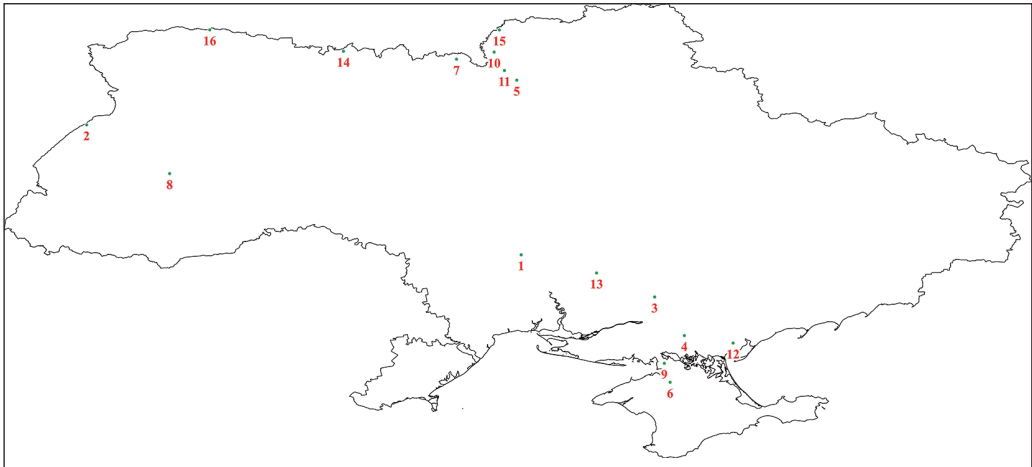


Fig. 8. Statistics of wolves attacks on human in Ukraine. Numbers are equal to numbers of cases in Table 4.

Summary

Wolf, *Canis lupus* ssp. *lupus* Linnaeus, 1758, is a widespread species on the territory of Ukraine. Constantly raising a question of species status and adequacy of current situation with all-Ukrainian population management. Problems of official accounting methodology, lack of basic data on ecology, the number and level of conflict actualize the reconsider of our views and creation of state monitoring system of this species. We've made an attempt to assess the potential of the conflict with the wolf based on the study of wolf ecology in different natural zones of Ukraine and in the Exclusion zone of ChNPP as a unique ground for studying grey wolf ecology. As a result of population evacuation and a significant reduction of economic activity we were able to compare data from local grouping with similar data from other regions. In article we analyze and review results of studies were carried out during 2002–2017 in different places of Ukraine, including the Exclusion zone and data of official statistics. It was found out that the size of pack plots in Exclusion zone is typical for Northern part of Ukraine, the diet includes mainly natural resources, and the conflict with a human could be considered as extremely low. These results are very important for creating an adequate population management plan. Results

of research in the Exclusion zone and other regions are also posing a question as to the adequacy of current situation with all-Ukrainian population management.

Zusammenfassung

Der Wolf (*Canis lupus* ssp. *lupus* L., 1758) ist in der Ukraine weit verbreitet. Die steigende Frage zum Status ist mit dem gesamten Populationsmanagement der Ukraine in Einklang zu bringen. Es ist ein staatliches Monitoringsystem erforderlich, dass Basisdaten zur Ökologie, zu den Bestandszahlen und Konflikten liefert. Diesen Fragen wurde zwischen 2002 und 2017 in verschiedenen Naturzonen der Ukraine und der Tschernobylregion nachgegangen. Die Sperrzone um das Reaktorunglück von Tschernobyl ist ein einzigartiges Studiengebiet zur Erforschung der Ökologie des Wolfes, da es von anthropogenen Zugriffen weitgehend verschont ist. Die Rudelstruktur in der Sperrzone ist typisch für den Nordteil der Ukraine. Die Nahrung besteht hauptsächlich aus Naturressourcen und der Konflikt zum menschlichen Umfeld war bemerkenswert gering. Die Ergebnisse sind bedeutsam, um einen adäquaten Managementplan für alle Regionen der Ukraine zu erstellen.

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