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Expedition report

Monitoring wolf, jerboa, viper and bird populations and studying bird migration on the Kinburn peninsula, Black Sea, Ukraine

Expedition dates: 17 August – 28 September 2003

Report published: March 2004

Authors: Volodymyr Tytar
I.I Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine

Anatoly Poluda
Head of Ukrainian Bird Ringing Centre
I.I Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine

Matthias Hammer (editor)
Biosphere Expeditions

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Abstract

This study was part of an expedition to the Kinburn Black Sea peninsula in Ukraine run by Biosphere Expeditions from 17 August to 28 September 2003. It investigated wolves, jerboas, vipers and migratory birds and continued a study initiated in August/September 2001.

In the wolf (*Canis lupus*) study, relative abundance methods of counting wolf tracks along a transect were used to compute indices reflecting relative wolf densities. The quantitative baseline set in 2001 for monitoring the relative abundance of wolves in the area and checked in 2002, has been checked repeatedly against the data for 2003. There seems to be a sharp decline in wolf numbers, best indicated by regression analysis of cumulative numbers wolf tracks/km/day recorded on the transects. The decline may be due to the extremely cold and harsh winter of 2002/2003. Although wolf numbers seem to be very low, there has been no distortion of such pivotal population parameters as the sex ratio (remaining 1:1) and percentage of young individuals (up 50% of footprints belong to young wolves), giving hope that under favourable conditions (mild winter, sufficient food etc.), the wolf population in the area may restore itself.

In the study of Falzfein's thick-tailed three-toed jerboa (*Stylopidus telum falzfeini*), a rigorous quantitative approach of plotless and distance methods to estimate jerboa densities from field signs was used for the third year running. The results of this year's survey (together with data collected in the two preceding years) allow us to assume that the population, despite low numbers, is for now at least in a state of equilibrium, although the overall average of activity is obviously beyond the level that would be expected if used and unused jerboa holes were present in equal numbers. This may be warning of negative factors impacting the jerboa population in the area.

In the Eastern steppe viper (*Vipera ursinii*) study, vipers were recorded as a supplementary activity as they were found in the field during the wolf and jerboa studies. Abundance and density were calculated from these data, suggesting that the Eastern steppe viper may not be as seriously threatened on the Kinburn peninsula as in other parts of Ukraine. Moreover, a repeated survey has shown in one case a more than threefold increase in relative abundance of the viper. Monitoring, however, should continue in subsequent years to assist in confirming or rejecting any negative trends in the area.

In the study of migratory birds, 1569 birds of 45 species were caught and ringed over a period of 52 days (39 passerine and 6 non-passerine species) in several mist nets, measured and ringed.

Резюме

Звіт складено на основі польових досліджень вовка, тушканчика Фальфейна, степової гадюки та перелітних птахів, проведених учасниками Biosphere Expeditions на території регіонального ландшафтного парку «Кінбурнська коса» з 17 серпня по 28 вересня 2003 р.

Відносну чисельність вовка (*Canis lupus*) визначали як кількість слідів на 1 км трансекти. Порівнювали дані, отримані за 2001-2003 рр. Спостерігається значне зниження відносного інедекса чисельності вовків, яке найкраще фіксується коефіцієнтом регресії кумулятивного числа вовчих слідів/км/день на певний день спостереження. Це зниження пояснюється, можливо, вкрай тяжкими умовами зими 2002-2003 рр. Хоча чисельність вовків здається низькою, стабільними залишаються такі важливі популяційні параметри як співвідношення статей (1:1) та частка молоді (50% слідів належать молодим вовкам). Це дає надію, що популяція, за сприятливі умови, може відновити свою чисельність.

Третій рік поспіль застосовані площадні та дистанційні методи для визначення щільності популяції тушканчика Фальфейна (*Stylopidus telum falzfeini*). Досліджені минулорічні та нові площадки. На минулорічних щільність тварин продовжує становити приблизно дві особини на гектар і ці поселення перебувають, очевидно, у загрозливлму стані.

Додатково під час маршрутних обстежень відзначали наявність степової гадюки (*Vipera ursinii*). Хоча є проблеми стосовно обліку рептилій поза межами сезону парування, дані отримані у серпні-вересні два роки поспіль дають грунт для оптимістичних висновків щодо спроможності подібних обліків адекватно описувати структуру популяції, зокрема, кількість та відносну чисельність розмірно-вікових груп, представлених окремими кластерами. Популяція цього виду перебуває тут, очевидно, у задовільному стані. На одній із трансект відмічено навіть зростання відносної чисельності гадюки у три рази.

У частині досліджень, що стосуються птахів, піймано на протязі 52 днів за допомогою сіток-павутинок 1569 особин, які належать до 45 видів (39 горобинних та 6 негоробинних). Птахів кільцювали та реєстрували відповідні морфометричні показники.

T: +44-1502-583085 F: +44-1502-587414 E: info@biosphere-expeditions.org W: www.biosphere-expeditions.org

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1. Expedition Review

Matthias Hammer
Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Expeditions are open to all and there are no special skills (biological or otherwise) required to join. Expedition team members are people from all walks of life and of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at www.biosphere-expeditions.org.

This expedition report deals with an expedition to the Kinburnska Kosa peninsula, Black Sea, Ukraine from 17 August to 28 September 2003. The expedition conducted a large-scale survey of bird migration patterns by catching passing birds in nets and measuring, identifying, ringing, and releasing them. It also continued the first ever large-scale wolf survey in the area (initiated by Biosphere Expeditions in 2001) by and by tracking wolves along transects. The existing jerboa and the steppe viper studies were also continued.

The Kinburnska Kosa Landscape Park is part of the larger Kinburn peninsula. Relatively little internal data exists on wolf numbers in the park and one of the purposes of the expedition was to estimate relative numbers in the region. Data presented here will be used in the formulation of management plans, and to educate local people about their canine neighbours.

The peninsula is used by many bird species as a so-called “stepping stone” for crossing the Black Sea on their North-South migration routes from places such as Scandinavia and Siberia in the North to Africa and the Mediterranean in the South. Birds congregate on the peninsula to feed, rest and moult, because the area is relatively undisturbed and sufficiently remote. The concentration of migratory birds in autumn is so high that the area in vernacular Ukrainian is known as a “bird railway station”. Migratory patterns and species composition in this area needed to be investigated, particularly by long-term, concerted monitoring methods. Biosphere Expeditions in conjunction with local scientists established such a monitoring project and data presented here on birds and mammals will aid conservation efforts undertaken in the area and will support arguments for the extension of the current landscape park into a larger national park.

1.2. Research Area

The Kinburnska Kosa Landscape Park was created in 1992 and is situated in the Ukraine on the Northern shores of the Black Sea, at the confluence of the Dnieper river, North-West of the Crimea. The park measures 18,000 hectares including 12,000 hectares of terrestrial habitats and 6,000 hectares of aquatic habitats. Habitats include natural sand dune areas covered with steppe vegetation, planted pine forests, lagoons and marine environments. The climate is continental and semi-arid with hot summers and cold winters. The peninsula was created by the shifting sands of the Dnieper and Bug rivers, rising out of the Black Sea only in the Quaternary.

Fifteen flowering plant species are endemic to the region, amongst them orchids listed in the Red Data Book. In summer and early autumn hundreds of thousand birds use the Kinburn peninsula as a stopover during their annual migration. Wolves are common in the remoter parts of the peninsula, where they hunt mainly for wild boar and other, smaller mammals.

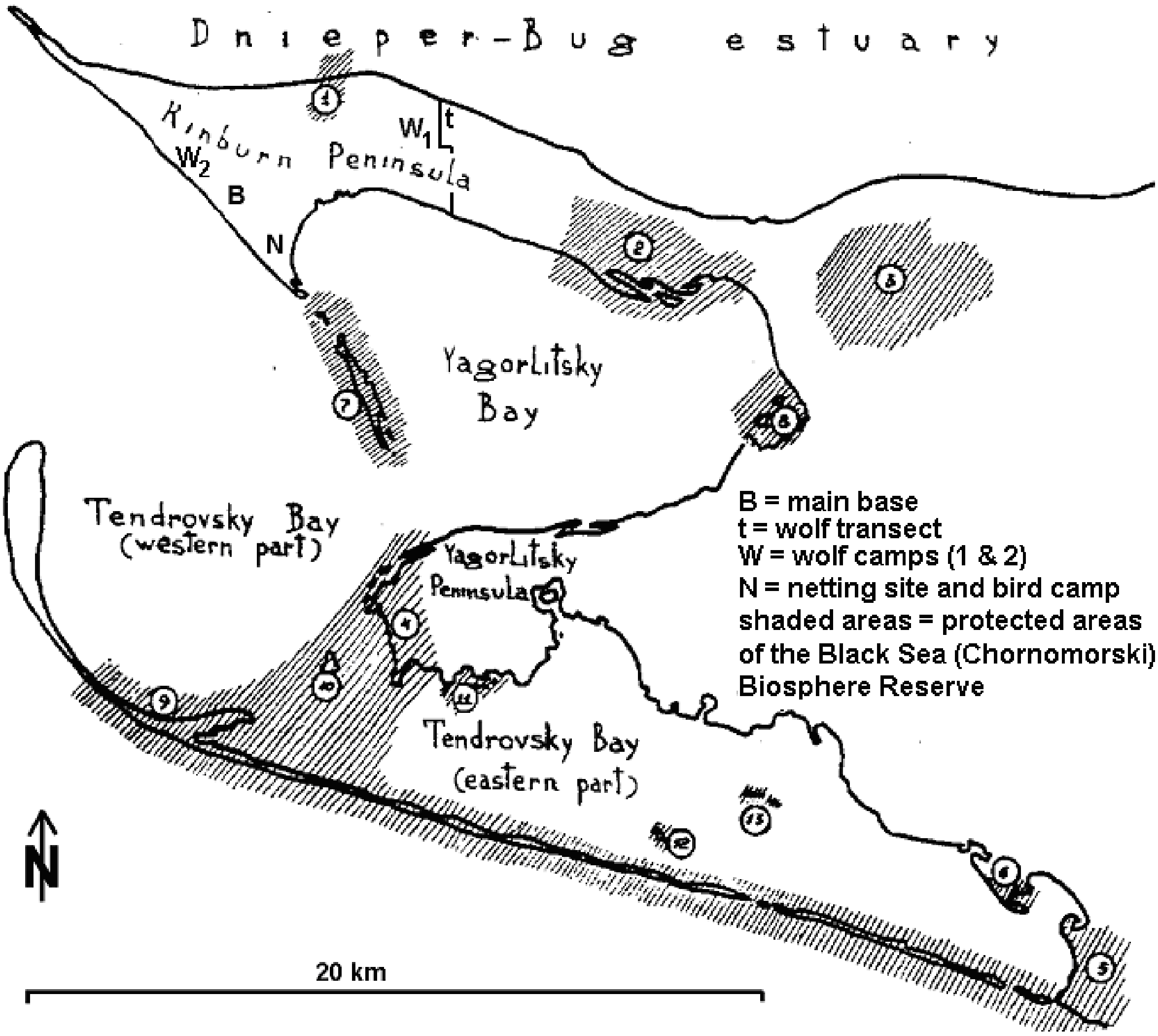

Fig 1.2a. The Kinburn peninsula (46º 30’ N, 31º 40’ E) and adjacent protected areas.
For location of the peninsula inside Ukraine, see map on front cover.

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1.3. Dates

The expedition ran over a period of six weeks divided into three two-week slots, each composed of a team of international research assistants, guides, support personnel and an expedition leader. Expedition team dates were

17 August - 31 August
31 August - 14 September
14 September - 28 September

Dates were chosen to coincide with the migratory season for birds and the end of the breeding season for wolves when they start to congregate into packs again.

1.4. Local Conditions & Support

Expedition base and study sites

The expedition team was based in the village of ПОКРОВКА (Pokrovka) in a summer house with basic amenities. There was an outdoor latrine, and an outdoor solar shower, central heating, but no running water (there was an outdoor well and pump instead). Three to four team members shared a basic room.

From this base teams were divided into study groups, one working on bird netting and censusing by the coast, the other working on wolves, jerboas, vipers and bird lists in the interior (see Figure 1.2a. for locations). The bird group stayed in a tent camp by the coast, the wolf group in tent camps, either in the interior, or near the coastline (camps were changed to suit conditions on the ground). Both groups were accompanied by a local scientist. Logistical support, amongst other things with food and water, was by Land Rover Defender 110 from the expedition base, where all meals for the study groups were prepared by an expedition cook.

Field communications

There is no landline telephone connection at base. Instead the expedition used an Iridium Motorola satellite telephone with internet connection. This worked extremely well and e-mail contact was available throughout. A mobile phone transmitter is also present on the opposite bank of the Dnieper river on the mainland. This provided intermittent but unreliable mobile phone coverage and the expedition used four pay-as-you-go mobile phones on the Kyivstar network. These were then used for fairly unreliable communication between base and the research groups. Towards the end of the expedition a radio repeater was installed at base, and six Motorola GP320 hand-held and two GM340 mobile radios, all courtesy of Motorola, were used for communication. This worked extremely well and the expedition research teams could communicate with each other reliably and easily at the press of a button and across the entire peninsula.

Transport & vehicles

Team members had to make their own way to the assembly point at Kiev main railway station. From there onwards and back to the train station all transport & vehicles were provided for the expedition team. Around the Kinburnska transport was by Land Rover Defender 110, provided courtesy of Land Rover, which was driven over from the UK by the expedition leader. The Land Rover had to have its fuel pump replaced at the end of the expedition, but otherwise was reliable (the cost for replacement was later reimbursed through Land Rover's warranty).

Medical support & insurance

The expedition leader was fully trained in expedition and wilderness medicine, and the expedition carried a comprehensive medical kit. Further medical support was provided by a medical post in Pokrovka village and a hospital in Ochakiv (12 km by ambulance and boat). All team members were required to be in possession of adequate travel insurance covering emergency medical evacuation and repatriation. Emergency evacuation procedures were in place. There were no major medical incidents. There were several cases of mild cases of diarrhoea during the expedition.

1.5. Local Scientists

The expedition team was divided into rotating activity groups, each of which was led by a local scientist.

(1) Bird group

Petro Gorlov was born in the Ukraine in 1967. He has a degree from Melitopol State Pedagogical University in biology and is a qualified geography and biology teacher. He is currently employed as an ornithologist at the Azov-Black Sea Ornithological Station, which is a sub-division of the Zoological Institute of the Ukrainian Academy of Sciences. His main research interest is passerine and wader migration studies. He has participated in various ornithological expeditions to the Ukraine, Siberia, and Poland.

(2) Wolf and mammal and small vertebrates group

Volodymyr Tytar was born in 1951. His Master's Degree in Biology is from Kiev State University. He started his career as an invertebrate zoologist before shifting towards management planning for nature conservation purposes in the Northern Black Sea area (for example the Ukrainian Danube delta, the Dnieper estuary etc.). He first visited the Kinburnska Kosa area in 1975 and has been involved in surveying and conservation measures there ever since.

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1.6. Expedition Leader

This expedition was led by Ben Gilbert. Ben joined Biosphere Expeditions in 2003 and is a qualified trekking, canyoning, survival and rescue guide/instructor. He set up World Peace trekking in Nepal and subsequently spent eight years leading groups and exploring the country. Apart from leading expeditions for Biosphere Expeditions, he works as a freelance guide in Australia, Japan, Thailand, Chile, Nepal and the Pyrenees. He also co-runs The Blue Space guides co-operative and leads film crews into difficult and dangerous terrain.

1.7. Logistics Co-ordinators and Helpers

Zinovy Petrovych, the Director of the Kinburnska Kosa Regional Landscape Park provided crucial park support and back-up. His son Orest Petrovych acted as a reliable translator, driver and helper.

The Asla Travel Group of Huntingdon, UK, provided important advice and logistical support in organising transport, train tickets, visas, etc.

1.8. Expedition Team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds

17 August - 31 August

Claudia Hammer (Germany), David Hausman (USA), Gerd Johann (Germany), Christopher & Jean Joyce (South Africa/UK), Constance Postupack (USA), Ben Rees (UK), Urs Rutschi (Switzerland), Simone Webber (UK).

31 August - 14 September

Janet Broderick (UK), Sieglinde & Sylvia Dittmann (Germany), Shaun Kilcoyne (UK), Mathew & Lynda Pouncey (UK), Natasha Ransom (UK), John Reay (UK), Simone Webber (UK).

14 September - 28 September

Edwin Doeg (UK/Sweden), Alison Field (UK), Tanya & Adam Laing (UK), Katja Rupp-Huckele (Germany), Stephanie Sands (UK), Lisa Spry (UK) Robert Watkins (UK), Nicky Whitehead (UK).

Throughout the expedition

Advisor: Zinovy Petrovych, Director of the Kinburnska Kosa Regional Landscape Park. Driver & translator: Orest Petrovych. Expedition cook, host and soul of the expedition: Svietlana Shibko with her daughter Yulia.

1.9. Expedition Budget

Each team member paid towards expedition costs a contribution of £990 per person per two week slot. The contribution covered accommodation and meals, supervision and induction, a permit to access and work in the Landscape Park, all maps and special non-personal equipment, all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses like telephone bills, souvenirs etc., as well as visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

Income	£	
Expedition contributions	26,590	
Expenditure		% of which spent directly on project
Accommodation and food includes Svieta's salary, house rent, all meals	5,070	100
Transport includes fuel, train journeys	1,038	100
Equipment and hardware includes research materials, research gear	2,344	approx. 80
Biosphere Expeditions staff includes salaries, travel and expenses to Ukraine	2,808	100
Local staff includes salaries, travel and expenses, Biosphere Expedition tips, gifts	2,765	100
Logistics etc includes bribes, Park fees, ploughing transect, taxis, sundries etc	876	100
Team recruitment Ukraine as estimated % of PR costs for Biosphere Expeditions	4,800	100
Income – Expenditure (unadjusted)	6,889	
Income – Expenditure (adjusted to % spent on project)	7,357	
Total percentage spent directly on project	72%	

1.10. Acknowledgements

This study was conducted by Biosphere Expeditions which runs wildlife conservation expeditions all over the globe. Without our expedition team members, who are listed above and provided an expedition contribution and gave up their spare time to work as research assistants, none of this research would have been possible. The support team and staff, also mentioned above, were central to making it all work on the ground. Thank you to all of you, and the ones we have not managed to mention by name (you know who you are) for making it all come true. Biosphere Expeditions would also like to thank Land Rover, Motorola, Silva, Field & Trek, Globetrotter Ausrüstung and Gerald Arnhold for their sponsorship.

1.11. Further Information & Enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org.

Enquires should be addressed to Biosphere Expeditions at the address given below.

2. Wolf Survey 2003

Volodymyr Tytar
I.I Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine

2.1. Introduction

Wolf natural history & regional history

The wolf (*Canis lupus*) is the third largest predator in Europe, after the brown bear and the polar bear. It looks like a large German shepherd dog. Since the species has a large distribution area and lives in a variety of habitats, its variation in size, colour, and weight is remarkably high. This variation has led to the subdivision of the species into several subspecies (up to 16), and the one present in the Kinburn area (see below) was though to be, at least in the past, *Canis lupus campestris* Dwigubski 1804, or the "steppe wolf". However, it may be that this particular subspecies has been driven out of the area (Bibikov & Filimonov 1985) and is being replaced by the nominate subspecies, *Canis lupus lupus* Linnaeus 1758, or "grey wolf".

An adult male wolf weighs from 20 to 80 kg; females are smaller (15 to 55 kg). Larger animals are found in more Northern latitudes; the average weight of wolves in Ukraine is 30 to 36 kg (Gurski 1985), rarely as much as 72 kg (one record from the Ukrainian Carpathians).

Wolves walk on their toes and their tracks are similar to those of a large dog, showing four toes and their nails. The fifth toe is found only on the front legs and does not touch the ground.

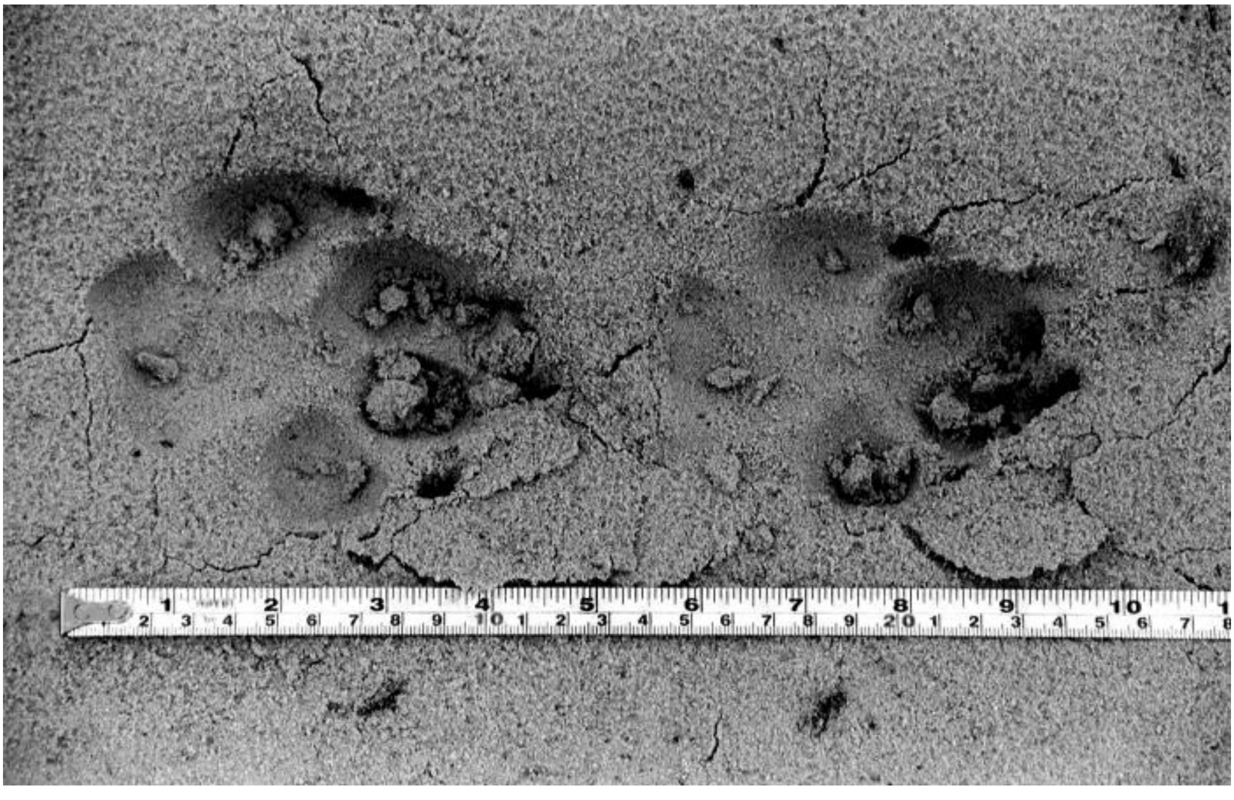

Fig. 2.1a. Wolf prints in the sand of the Kinburnska Kosa Landscape Park. Photo: Benedikt Teich.

Coat colour is extremely variable, from pure white in arctic areas to brown, reddish, grey, pale grey and silver. Individual variation in other body and head markings complicate colour patterns, although wolves tend to maintain a more uniform colour locally. Moulting occurs in spring and the new coat grows in early autumn. Wolves live 8 to 16 years in the wild, depending on the availability of food and other factors (Mech 1995).

Until recently the wolf had the largest distribution area of any terrestrial mammal. It occupied the whole Northern Hemisphere north of 20°, including the entire North American continent, Eurasia and Japan. Following extermination efforts by humans, the species' range is now greatly reduced. Originally found throughout Europe, at the end of the 18th century, wolves were still present in all European countries with the exception of Great Britain and Ireland. During the 19th century, and especially in the years following the Second World War, wolves were exterminated from all Central and Northern European countries. During the 1960s, wolf distribution was smaller than it is today, with small remnant populations in Portugal, Spain, Italy, Greece, and Finland, and more numerous populations in the East. In the last twenty years, the species has been recovering naturally in several parts of Europe, including Ukraine.

The wolf has a very diverse diet and is a true generalist that feeds opportunistically on what is most available in its habitat. Wolf diet may include large or small vertebrates, invertebrates, vegetables and carcasses. Diet composition throughout the geographic range depends on the relative abundance and seasonal variation of potential prey. In South West Ukraine, for instance, Gurski (1985) reports the wolf to prey on roe deer and wild boar, foxes and brown hare, and even consuming corn and water melons found in the fields. However, in this farmland area the predominant proportion of kills (Gurski states up to 90%) is considered to consist of domestic livestock, primarily sheep, horses, and cows. In summer resort areas, such as the beaches of the Kinburn peninsula, wolves may scavenge on refuse left aside by tourists camping at the seaside, seize stray dogs etc.

Wolves live in diverse habitat types and their broad distribution ranges show the species' adaptability to the most extreme habitat conditions. In general, large forest areas are particularly suitable for wolves in Europe (in Ukraine, for instance, the Northern forested region or the Carpathians), although wolves are not primarily a forest species.

Wolves live in social units (packs) that co-operate in hunting, reproducing and defending their territories. A pack is fundamentally a family unit that originates when a pair establishes a territory and reproduces. Strong social bonds between the pack members regulate internal stability and the dynamics of the pack. A linear hierarchy among pack members is built and maintained through ritualised aggressive behaviour. Individuals at higher dominance level take most of the initiative and have most of the privileges in feeding and reproducing. Young animals stay in the pack up to the age of two years, when they face the alternative of dispersing in search of a new partner and new territory, or staying in the pack and attempting to reach higher dominance levels. Prey densities, wolf density and availability of free territory play a role in determining what reproductive strategy to follow. The pack size ranges from two to 13 wolves, the number depending on its productivity, the success of dispersion, and prey density.

In Europe, pack size is mostly a function of human control, and large packs are extremely rare. In South West Ukraine, Gurski (1978) reports packs numbering 6-9 and 4-7 individuals. A wolf is sexually active when it is two years old. Oestrus lasts 5-7 days, once a year, generally from January to March. Parturition occurs after 60-65 days and litter size varies from 2-12 pups. Generally only one litter is produced in each pack.

Wolves are territorial and each pack actively defends its own territory from wolves of neighbouring packs. Territory size varies greatly, depending on wolf and prey densities, geographical features, human disturbance, and human infrastructure. In Europe territory size generally ranges from 100 to 500 km^2. Gurski (1978) considers wolves in South West Ukraine to occupy areas around 300 to 600 km^2. Territories are actively advertised by wolves through markings with urine and faeces left in strategic sites within the territory and along the boundaries.

Densities vary significantly. In Europe densities are generally 1-3 wolves per 100 km^2, although a comparison is extremely difficult due to the differences in methods and time of the year to which the estimates refer.

The wolf is often reported to be a direct threat to humans, but in post-war Ukraine there have been only two documented attacks of wolves, both in the region of the Carpathians (Heptner et al. 1967). A far more substantive basis for the age-old warfare between humans and the wolf is predation of domestic livestock, most notably cattle and sheep. The wolf has been persecuted, especially in the 20th century, because of its supposed threat to populations of ungulates and domestic livestock. This persecution has gone so far, particularly in Western and Central Europe, that wolves have almost disappeared there. No wonder that the species is now listed for protection under the Convention on the Conservation of European Wildlife & Natural Habitats (Bern 1979). In Ukraine, however, where the total wolf population according to official statistics is above 2,500 - although this is very likely to be a considerable over-estimation (Zhyla 2000) - the general public attitude to the species is much as to a pest.

Historically wolves have been met in abundance in Ukraine. Kirikov (1952, 1959), for instance, considers that about 1,000 years ago the area between the Lower Dnieper and the sea supported a significant wolf population, which reached densities of above 15 individuals per 1,000 km^2. Later, in the 13th to 16th centuries, when the Tatar hordes established themselves in the region, wolves were fairly abundant. So much so that in particular places the word "*byry*" (meaning "wolf" in Tatar) formed the root for a number of toponyms, for instance, *"Berezan"* (a river, estuary and island near the Kinburnska Kosa Landscape Park), *"Biryuchi"* (an island in the Sea of Azov).

However, with the colonisation of the area some 200 years ago, the wolf was already in decline (for instance in the Crimea), and since 1844 hunters were being rewarded for shooting wolves by a bounty system. Although today only a small number of hunters in Ukraine would consider the tracking down and shooting of wolves to be an economically worthwhile venture, previously the bounty system of encouragement appears to have worked quite well, particularly in the 1930s, when wolves were eradicated in the Southern and Central regions of Ukraine (Migulin 1938).

During the Second World War, when persecution of wolves was for obvious reasons not very high on the agenda, they once again returned to the area, but were put under varying pressures again by hunters when the war ended. However, as Roman *(*1996) states, wolf numbers in the Kinburn area were never high due to the scarcity of prey. Nevertheless, wolves have been re-establishing their numbers in the Kinburn area since 1947 after, according to Selunina (1992, 1996), a 30 year long absence. Their numbers continued to be low until the late 1980s, when the population of animals started to grow. In 1988 wolves reached the area of the Kinburnska Kosa Landscape Park.

Location

The Kinburnska Kosa Landscape Park was created in 1992 and is situated in Ukraine on the Northern shores of the Black Sea, at the confluence of the Dnieper river, North-West of the Crimea. The park measures 18,000 hectares including 12,000 hectares of terrestrial habitats and 6,000 hectares of aquatic habitats. Habitats include natural sand dune areas covered with steppe vegetation, planted pine forests, lagoons and marine environments. The climate is continental and semi-arid with hot summers and cold winters. The peninsula was created by the shifting sands of the Dnieper and Bug rivers, rising out of the Black Sea only in the Quaternary.

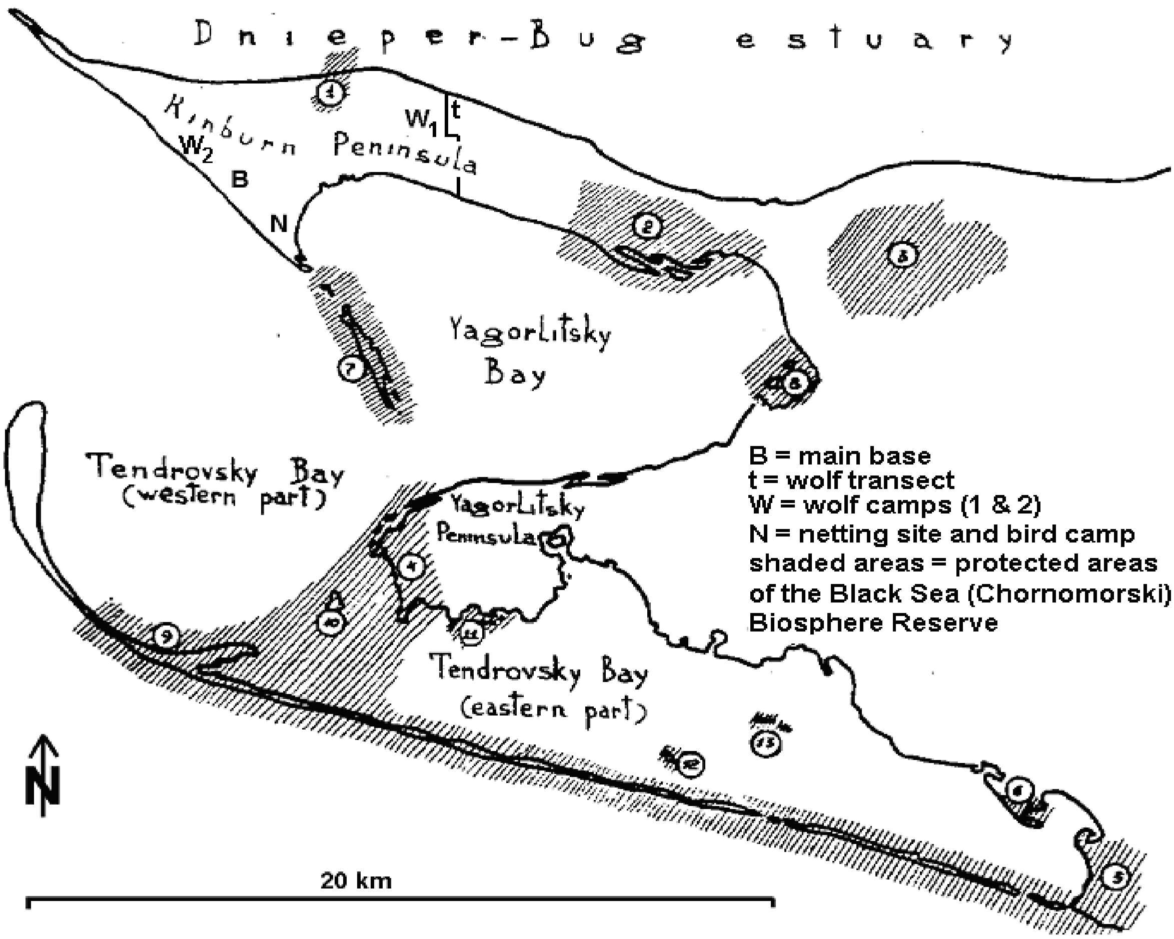

Fig 2.1b. The Kinburn peninsula (46º 30’ N, 31º 40’ E) with transect and adjacent protected areas of the Black Sea (Chornomorski) Biosphere Reserve (shaded).

Rationale

Large carnivores, including wolves, have traditionally been given a "high profile" by both wildlife managers and the public, because of their intimidating size and predatory behaviour. Wolves have become very popular in the global media, taking on a symbolic value as a survivor from a history of global persecution.

In Ukraine numbers have been controlled periodically in an effort to reduce predation on game and domestic livestock. The Kinburn area, where several hunting districts (one within the Kinburnska Kosa Landscape Park itself) and farms are located, in this respect, has been no exception. The reduction of wolf numbers was primarily the responsibility of these districts, however, most of them, as state enterprises, have come to an economic standstill and/or are in the state of being reorganised in one way or another. Due to the economic slowdown they are nowadays hard pushed to cope with only a fraction of their previous responsibilities, including the control of wolf numbers. This has become a cause of concern for the Kinburnska Kosa authority, because locals are perceiving wolves as an increasing threat to domestic livestock and are demanding eradication measures. The Kinburnska Kosa authority, however, is not considering the situation to be so alarming, but realises that a sound decision in this case can be made only if numbers or data reflecting the relative abundance of wolves in the area are available. The purpose of this survey was to gather such data and set a quantitative baseline for monitoring wolf abundance in the area in the coming years.

2.2. Materials and Methods

Numerous studies have been conducted on the ecology and population dynamics of wolves. However, because of their highly mobile nature and generally large home ranges, obtaining accurate and precise population estimates can be difficult. Nevertheless, because wolves leave behind conspicuous signs such as tracks, scats and kills, wolf inventories can be relatively successful. Various techniques for surveying wolves and estimating abundance have been developed, but most are non-statistical since they do not employ sampling. This disallows any probabilistic modelling, standardised replication, or establishment of confidence levels about a mean.

The best estimates of population sizes are considered to come from the total count methods using, for instance, aerial snow-tracking surveys, or radio-telemetry for determining absolute abundance. These methods, however, are not available to the staff of the Kinburnska Kosa Landscape Park for a variety of reasons, ranging from purely natural (for instance, in dense pine-forested areas where visibility is poor an aerial survey technique may not be practical) to technical (lack of suitable equipment and training).

Under these circumstances the prudent option is to focus, for the current study at least, on relative abundance methods which produce indices reflecting the density of the wolf population. For example, given a standard technique, such as counting tracks along transects, it is possible to say that if area A has a higher frequency of tracks than area B, there must be more animals in area A, even if we do not know the exact numbers in either area. Similar logic is used to compare relative abundance in the same area over time.

However, although a linear relationship is assumed between the index and actual density, indices have rarely been validated for most groups of animals. Despite this, indices are increasingly being employed in many management contexts, largely because of the problems associated with obtaining precise counts of estimates of population size. In this respect, track surveys are relatively quick, easy, and inexpensive methods for determining relative abundance of wolves. In some cases researchers have attempted to extrapolate from an index to a real density using correction factors. For instance, Danilov et al. (1996) used data about animal movement patterns (for example distance moved per day) to convert index data into real density. However, there are a number of assumptions that need to be made, which are rarely true or difficult to test. Nevertheless, making certain such assumptions may be useful for providing at least some guidance as to the numbers of animals in the area, keeping in mind, of course, the limitations of any such approach.

Wolf track surveys are usually limited to the winter months and snowy conditions. However, the sandy terrain of the Kinburn peninsula offers an opportunity to spot wolf tracks at any time of the year, although the track imprints might not be so clear in sand as they would be in snow, especially if for a week or two there has been no rain.

One uninterrupted ploughed transect line (encoded WCTR1), about 2 m wide and 7.33 km long, cross-cutting the peninsula in a near-to-longitudinal direction was established for track count surveys (see Fig 2.1b above). The transect, in fact, follows a lane between forest quarters 14/15, 34/35, 62/63, 87/88, 123/124, 157/158, 157/176. Natural borders for this transect are set by the fresh to subsaline waters of the Dnieper Estuary in the North and by sea waters of Yagorlitski Bay in the South. Hence any movements across the transect, particularly in a latitudinal direction (i.e., E-W, and vice-versa), are very likely to be detected. The transect crosses (and/or borders) a variety of habitats, consisting of both forested and open areas (see Table 2.2a below). This transect was surveyed in the beginning from Wolf Camp 1, located near the transect in forest quarter 86 (46º31.008’N, 31º44.005’E); later, after moving the campsite to another place, the transect was reached by Land Rover.

Table 2.2a. Variety and percentage of habitats crossed (and/or bordered) by the transect WCTR1.

<table>
<tr><td colspan="3">Forested area
65.6%</td><td colspan="2">Open area
34.4%</td></tr>
<tr><td colspan="2">Dense
56.3%</td><td>Patchy
9.3%</td><td>Open area with some pine
7.1%</td><td>Open grassland
27.3%</td></tr>
<tr><td>Mature
18.2%</td><td>Medium to small
38.1%</td><td></td><td></td><td></td></tr>
</table>

Because of the heat, but primarily because of the heavy devastation of the pine forest by pest of sawfly (*Neodiprion* sertifer), the campsite was moved to the seaside and located in forest quarter 139 (46º29.712’N, 31º37.607’E). A second ploughed transect (WCTR2), similar to the first one, was established following a lane between forest quarters 25/26, 44/45, 69/70, 104/105, ending up in quarter 139. In general, WCTR2 runs parallel to WCTR1, the distance between them being about 9 km. The terrain here is much more open (see Table 2.2b), and most of the mature forest plantations have perished from fires, having occurred in 2001 and 2002. In the destroyed pine forest stands most of the charred trees, although dead and deprived of needles, remain rooted for some time. In a short time the forest floor is taken over by an abundance of tall weeds and grasses. Later, in a year or two, the trees are toppled by winds and create in many places impassable heaps blocking, in particular, lanes running between the forest quarters. Foresters are removing the deadwood, but in the meantime most of it remains untouched.

Table 2.2b. Variety and percentage of habitats crossed (and/or bordered) by the transect WCTR2.

<table>
<tr><td colspan="2">Forested area
42.9%</td><td rowspan="2">Open area
consisting mainly of
grassland
57.1%</td></tr>
<tr><td>Burnt forest
(mature to small)
21.3%</td><td>Sparse pine forest
(medium to small)
21.6%</td></tr>
</table>

Surveys of the transects were done on foot. The expedition’s survey team consisted of several paying, untrained expedition team members who gave up their holiday time to assist in this research project. Their work and the expedition contribution they paid made this research possible. Expedition team members were taught how to recognise and record wolf tracks by the local scientists and the expedition leader. Field guides were also provided.

WCTR1 was surveyed 6 times. Crossings were recorded between 4 and 23 September 2003. The average time between two checks was about 6.8 days. WCTR2 was surveyed 9 times. Crossings were recorded between 8 and 19 September 2003. The average time between two checks was about 3.1 days.

All wolf tracks were registered on the transect routes and also if they were found by chance anywhere else. The tracks were also used to estimate the direction and number of animals. If the number of animals was unclear, it was clarified by following the tracks. A number of tracks were measured according to Rukovski (1984) and digital photos taken of them. However, many had to be rejected, because of their vague outlines in the sand. Measurements of footprints from digital images were carried out using software designed by F. James Rohlf (2001) for statistical analysis of landmark data in morphometrics (tpsDig, version 1.31) (see Fig. 2.2a).

Wolf scat location and condition was recorded, the condition being scored as (1) *very fresh* (recently deposited; usually less than a day), (2) *fresh* (moist; one or several days), (3) *medium* (dried; 1 to several weeks old), (4) *leached* (mostly hair remaining; probably more than 1 month old), (5) *amorphous and crumbly* (probably several months to a year old).

Results were registered in a log, indicating the survey route (transect), footprint direction and the number of animals, and occasionally footprint measurements. Abundance was calculated as the number of wolves (i.e. individual tracks) per kilometre of route. An array of conventional statistical methods were used to process the transect data.

Fig 2.2a. Screen copy of digital image of wolf footprint processed by the tpsDig programme. Colour image converted to B&W, 1-4 landmarks used for measuring foot length (L) and width (B).

In order to attract the wolves, bait was set nearby Wolf Camp 2 on 18 September (a cow head). The bait, however, remained untouched.

2.3. Results and Discussion

As in the previous reports, we start by exploring the relationship between track numbers and the number of wolves (or, possibly, their activity as far as wolves could have been moving around faster) in the area of the transect to check how constant this relationship is throughout the time of the survey. This can be assessed by plotting cumulated numbers of tracks against the dates from the beginning of the survey up to its end, and estimating corresponding regression values. For this purpose dates have been transformed, following Zaitsev (1984), into a continuous sequence of numbers, so, for instance 20 August (the start date of the survey) has the number 173, and 26 September (the final day of the survey) has the number 207. To avoid any bias, we use tracks/km/day instead of just simply the number of tracks recorded on a day.

Cumulated numbers of tracks/km/day versus dates for both, WCTR1 and WCTR2, fit well into the linear model (see fig.2.3a), R^2 being 0.687 and 0.815, the slope (B) equalling 0.048±0.016 (n=6) and 0.019±0.003 (n=9), respectively. The fact that the data are well approximated by the linear model means that wolf tracks are appearing on the the transects during the survey at a more or less steady rate, just as it was the case in the previous surveys of 2001 and 2002. However, comparing both surveys, it is clear that in the third year the rate of the appearance of wolf tracks crossing the transect is greatly reduced, meaning considerably less wolf activity and/or fewer animals populating the area.

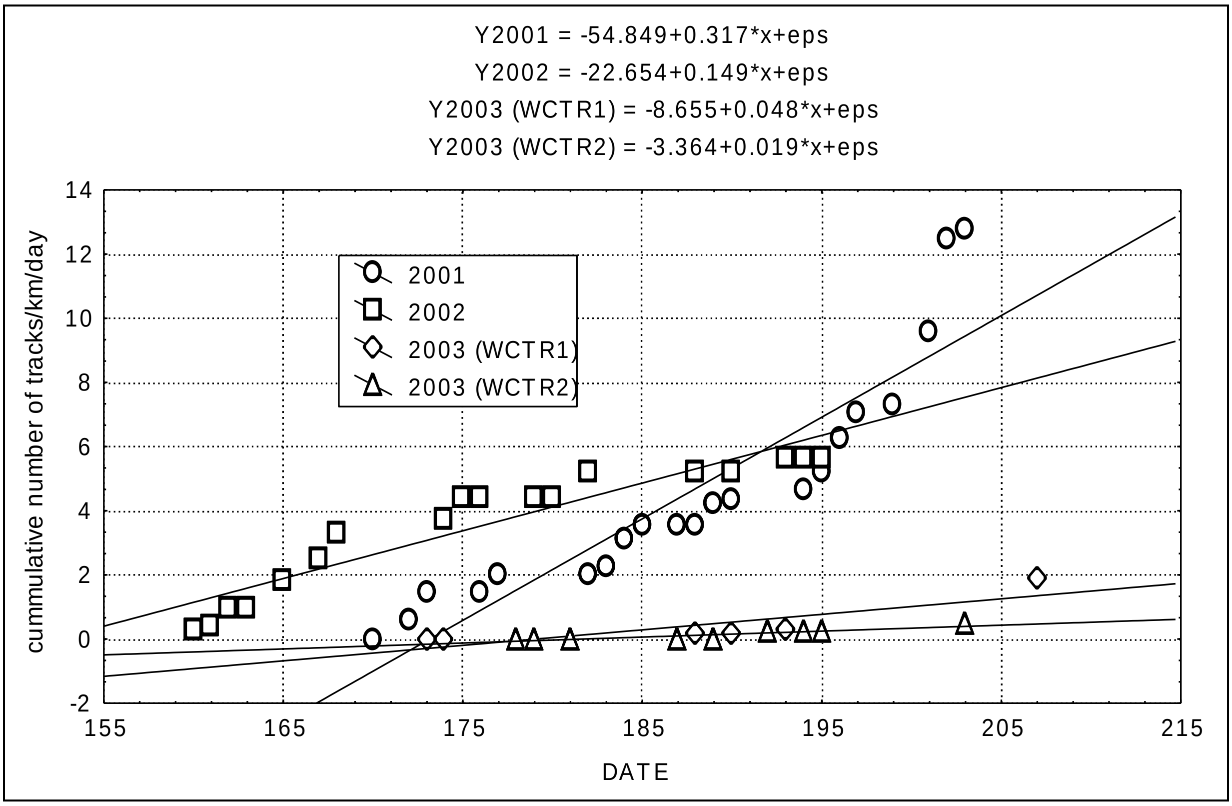

Fig. 2.3a. Growth of cumulative numbers of wolf tracks/km/day during the surveys of 2001, 2002 and 2003

Less wolf activity last year (2002) could be due to the earlier start of the survey, however, the survey of the same duration this year had started two weeks later, so more wolves could be expected to be recorded, as they tend to congregate into packs with advancing summer and approaching winter. Although the survey lasted until late September, no signs of such gathering of wolves into groups were detected. Wolves for most of the time of the survey continued to remain solitary. Indeed this year, usually 1 to 4 individuals would form a set of tracks (average for WCTR1, from which there is sufficient data, totalling 1.550±0.113, *n*=40), however in most cases (22) it was one animal recorded. If we consider animals to be spread out predominantly one by one, then the presence of one or more animals together could be a matter of chance. This is easily checked by viewing the record of one animal as no departure from the «norm» and assigning it the value of zero, the record of two animals as one departure (+1), and 3 as 2 (+2), and comparing the mean (M) and variance (σ^2) of this series. Both are fairly similar (0.550 and 0.511, respectively) and the relationship σ^2/M is identical to 1 (χ^2= 36.2, *df* = 39, $p > 0.05$), so we are dealing with a Poisson series, giving a theoretical number of solitary wolves expected to be met as 23.1.

Slope values of the linear model (B), given the appropriate time frame, seem to be good estimators of wolf number (and/or activity) dynamics and may be used for monitoring purposes. For this reason we consider a full account should be presented of the regression summaries (Table 2.3a).

Table 2.3a. Regression summaries for cumulative numbers of wolf tracks/km/day.

WCTR1: 17.08.-19.09.2001		
Model: Y=A+B*x		
R=.913 Variance explained: 83.474%		
n=21	A	**B**
Estimate	-54.849	0.317
Std.Err.	6.08	0.032
t(19)	-9.022	9.797
p-level	0	0
WCTR1: 7.08.-11.09.2002		
Model: Y=A+B*x		
R=.939 Variance explained: 88.191%		
n=18	A	**B**
Estimate	-22.654	0.149
Std.Err.	2.403	0.014
t(16)	-9.426	10.931
p-level	0	0
WCTR1: 4-23.09.2003		
Model: Y=A+B*x		
R=.829 Variance explained: 68.720%		
n=6	A	**B**
Estimate	-8.655	0.048
Std.Err.	3.063	0.016
t(4)	-2.825	2.964
p-level	0.048	0.041
WCTR2: 8-19.09.2003		
Model: Y=A+B*x		
R=.903 Variance explained: 81.517%		
n=9	A	**B**
Estimate	-3.364	0.019
Std.Err.	0.629	0.003
t(7)	-5.344	5.556
p-level	0.001	0.001

Indeed the subjective view of decreasing wolf numbers in the study area seems to be correct, as the slope value B (highlighted in bold in Table 2.3b) for WCTR1 steadily decreases from 0.317 in 2001 to 0.149 in 2002, and 0.048 in 2003, meaning an overall 6.6 decline. In conventional statistical terms these figures are highly significant ($p<0.05$). From the point of view of methodology it is also interesting to note the absence of difference between the regression slopes obtained in one year for the data from WCTR1 and WCTR2 ($t=1.83$, $df=11$, $p>0.05$), meaning our data derived from transect surveys are indeed producing replicable and well-justified results, despite the distance between both transects.

Somewhat contradictory may seem to be the results of calculations of abundances. As stressed earlier, one should be aware that we are dealing with relative abundances (i.e. indices), the significance of which appear when the transect is surveyed for wolf tracks in the same way a number of times. Table 2.3c presents the relative abundance of wolves, estimated as the number of tracks per one kilometer of transect recorded during the surveys of 2001-2003.

Table 2.3b. Relative abundance of wolves, estimated as number of tracks per 1 km of transect.

	Valid N	Mean	Minimum	Maximum	Std.Dev.	Standard Error
2001						
NUM/KM	21	0.607	0	2.887	0.738	0.161
SQ(NUM/KM)	21	0.941	0.61237	1.806	0.320	0.070
2002						
NUM/KM	18	0.313	0	0.852	0.340	0.080
SQ(NUM/KM)	18	0.805	0.61237	1.108	0.203	0.048
2003 (WCTR1)						
NUM/KM	6	0.318	0.000	1.637	0.650	0.265
SQ(NUM/KM)	6	0.781	0.612	1.418	0.316	0.129
2003 (WCTR2)						
NUM/KM	9	0.052	0.000	0.235	0.104	0.035
SQ(NUM/KM)	9	0.650	0.612	0.781	0.074	0.025

As far as the raw data is not distributed normally (in terms of statistics), transformations have been applied to make the comparison between the figures in a correct manner according to rules of statistical procedures (see Ludwig & Reynolds 1988). Most suitable is the conversion of raw data by adding to each value 3/8 and then extracting the square root. Although there is an obvious drop in the relative abundance of wolves in the area, nevertheless the general decline is not statistically significant. Whatever method is used for comparisons, *p* exceeds 0.05, the commonly accepted significance threshold. In other words this means that the probability of making a wrong conclusion about the equality of the relative abundances under comparison exceeds 5%. It may be, however, that we are treating the results gained by a fairly ‘rough’ method, as transect counts may be, especially if wolf numbers are very low, by a superfluous statistical standard. Indeed, most statistical surveys, particularly in the field of precise experimental research, require gaining estimates (of any kinds of parameters), standard errors of which will not exceed 5% of the estimate value itself. Biological field studies, where a countless number of factors are involved and the ‘experiment’ is beyond the control of the researcher, accept standard errors of up to 20% and more. In our case these percentages for the derived means (Table 2.3b) range from 26.5 (in 2001, when there seemed to be more wolves) to 83.3 (in 2003, when their numbers appeared in decline). So it is reasonable to reconsider the significance threshold of *p*, which may stand, for instance, at 0.20 (which, in fact, is an arbitrary decision). Indeed, *p* from the comparison of the means for 2001 and 2002

(WCTR1 data), using the non-parametric Mann-Whitney test (U), equals 0.195, so the probability of making a wrong conclusion about the equality of the means is around 19.5%. Comparison of means for 2001 and 2003 gives a *p* of 0.137, so the chances for wrong conclusions become lower (13.7%), thus strengthening our confidence of the presence of a trend for a decline in wolf numbers. In this respect slope values *B* discussed above have turned out to produce more reliable proof (values of *p* for between-year comparisons less than 0.05), possibly because of their relatively small standard errors (ranging from 9.4 to 33.3% of *B*).

Considering the question of whether there is any preferred direction in which wolves are moving, we have taken into account only generalised latitudinal movements (from E to W, and vice-versa) as these are most clearly defined by the nature of the transect and comprise the majority of the collected data (sufficient only for WCTR1) .

Generally speaking, in 2001 there was no preferred direction in which wolves moved. In 2002 wolf movements across WCTR1 were primarily in a Western direction, (possibly because bait was set twice West of the transect line). This has been checked by sorting out how many series there have been of alternative movements across the transect from the beginning up to the end of the survey, excluding those records when on the same day the transect was crossed in both directions by an equal number of wolves. This time series for 2003 can be shown in the following way:

W EE WW EEEEE WWW E

That is, we have six series of alterations. This sequence may be of non-random character if there are only a few series or, on the contrary, too many of them. A quantification of what is few or many is given by the serial criteria *R* (Runyon, 1977), and in our case these values are 3 = <*R*> = 12, so 6 is in between, meaning that wolves have been crossing the transect in both directions randomly. Note: no bait was set this time.

The data of this year is too scarce to confirm the random selection by wolves of habitat types along the transect. Records of wolf tracks have been made both in forested and open areas, and most of them, as usual, are confined to roads and lanes. A directional analysis of all wolf tracks recorded (33) shows no preferred bearing (χ^2=0.33, *df* = 3, *p* = 0.95). The sequence of bearings also seems to be of random character: 19 series of alterations (11 = <*R*> = 23).

In 2001 and 2002 the animals crossed WCTR1 predominantly in its middle part around the location of forest quarters 87/88. The pattern of this year is very different (see Fig. 2.3b) with wolves clearly avoiding the middle part of the transect. One substantial reason for such behaviour, in addition to the droughty weather, may be the devastated condition of the forest there, where much of the pine canopy has been destroyed or damaged by sawfly larvae, so shelter and shade were scarce.

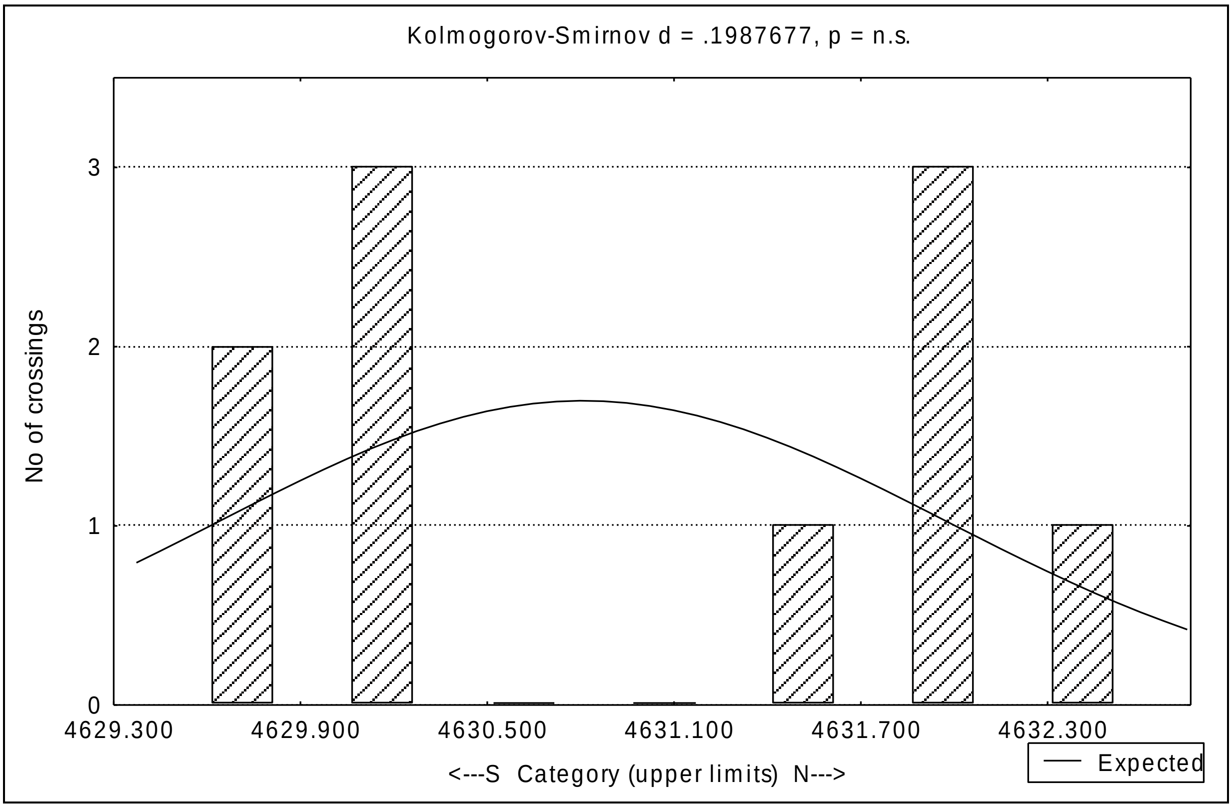

Fig.2.3b. Distribution of wolf track numbers along WCTR1 in the survey of 2003.

The analysis of track (footprint) measurements provides a pattern similar, in general, to the previous ones. As mentioned above, imprints of wolf tracks in sand may be fairly obscure, so they are not easy to measure and raise certain doubts that this can be done accurately enough to carry out a meaningful analysis. In total, 26 complete footprints of the wolf foreleg were measured. As in previous surveys, the measurements do not vary much as shown by their coefficients of variation: 9.90% (n = 29) for the length (L) of the footprint, 12.05% (n = 27) for the width (B), and 5.47% (n = 26) for the shape (S), computed as (B/L) x 100.

It is quite evident that tracks have been produced by a variety of animals differing by age and sex. One way to expose this fact is to plot foot length (L) against foot width (B) (see Fig 2.3c below). The scatterplot reveals two patches of plots: one of smaller animals and one of larger. For the sake of objectivity the method of *k*-means clustering was applied, using L and B as variables[1]. The pattern and figures thus obtained may be reflecting the ratio of young and adult wolves roaming in the area during the time of the survey. If so, young in 2001 made up at least 29% of the wolf population in the area, whereas in 2002 around 25%, and 38.5% in 2003. The differences are statistically insignificant ($p > 0.05$). Perhaps these figures could have changed, had the survey been extended for a month or two after the wolves had congregated. However, they do seem to be fairly consistent with figures found in the literature stating populations to consist of one third up to one half of young individuals (Makridin 1978).

[1] Data from previous surveys (2001 and 2002) were revised in this respect, so resulting figures have changed slightly.

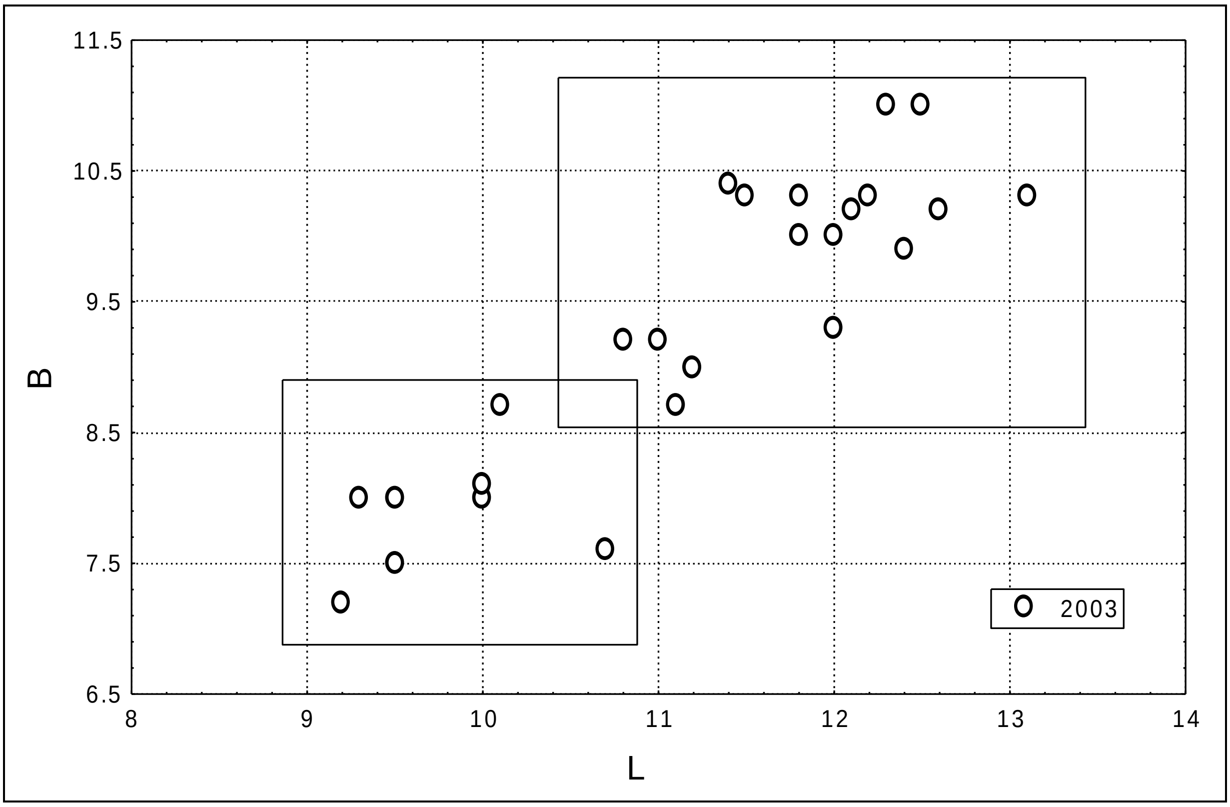

Fig. 2.3c. Scatterplot of wolf foot length (L) by foot width (B) measured in centimetres (cm)

As in the analysis of footprint measurements recorded in the previous survey, a fairly distinct classification was made of male and female footprints. Indeed, according to Rukovski (1984), male tracks should be wider (S being around 77%), whereas female tracks should be somewhat elongated (S around 67%). These proportions have been derived primarily from measurements of footprints made in the snow, so we can expect that our data may differ from these particular proportions. However, in any case the difference between male and female footprints should stay clear. The relatively small number of measured footprints in our sample may also be a source of variation. To separate the footprints by sex objectively, the method of *k*-means clustering was applied, this time using S as the only variable, and assuming that animals in different clusters are either females or males. Numbers of footprints belonging to a particular age group and sex, according to the results of the *k*-clustering analyses, as well as means of S for the distinguished clusters, are summarised in Table 2.3c below. The between-year differences for generalised figures of L, B and S, as indicated by the ANOVA test, are insignificant.

Table 2.3c. Results of *k*-means cluster analysis of footprint measurements.

Group	Sex	n (number of footprints)	S = (B/L) x 100
2001			
Adults	Female	9	79.70±1.71
	Male	8	91.32±1.44
Young	Female	1	89.41
	Male	6	91.44±1.34
2002			
Adults	Female	7	79.10±1.20
	Male	11	89.38±1.26
Young	Female	2	82.18±0.18
	Male	4	89.04±1.71
2003			
Adults	Female	5	79.45±0.62
	Male	11	86.30±0.87
Young	Female	6	79.94±1.45
	Male	4	85.39±0.45

Once again we may assume the ratio of footprints left behind by animals of different sex to be reflecting the proportion between males and females. If so, the ratio between adult male and female wolves inhabiting in the study area is identical to 1:1 (as indicated by the chi-square test: *p* in all cases is considerably above the value of 0.05).

An interesting fact resulting from the *k*-means cluster analysis of footprint measurements may be that most of the footprints recorded in 2001 and 2002 turned out to be from male individuals, 6 out of 7, and 4 out of 6, respectively. That could mean that young male wolves start exploring their surroundings earlier or moving a longer distance than their sisters. It may also be that we have to double the estimate of young, that may indeed total about half of the wolf population in the area. In the 2003 survey, however, the sex ratio of juveniles (according to footprint numbers) is fairly close to 1:1.

Finally, a few words on scat records. A total of 16 such records were made. The average score stands at 2.97±0.37, half of the records being considered of very fresh or fresh condition. Twice the diet of the animal was recorded vegetarian and consisted once of water melon (17 September) and on the other occasion (24 September) of grapes. The spatial pattern of scat distribution is, in general, random. Unfortunately, there is not enough data to check the character of the sequence of scat records, although it too seems be random.

2.4. Conclusions

During the 2003 survey, as in previous years, wolves were crossing the transect WCTR1 at a more or less permanent rate, which this year has considerably slowed down.

In moving around wolves continue to prefer roads and lanes, however, recorded bearings are distributed randomly.

In 2001 and 2002 the animals were crossing WCTR1 predominantly in its middle part around the location of forest quarters 87/88. The pattern of this year is very different, with wolves clearly avoiding the middle part of the transect. One reason for such behaviour, in addition to the droughty weather, may be the devastated condition of the forest there, where much of the pine canopy has been destroyed or damaged by a sawfly pest, so shelter and shade is scarce.

The quantitative baseline set in 2001 for monitoring the relative abundance of wolves in the area and checked in 2002, has been checked repeatedly against the data for 2003. There seems to be a sharp decline in wolf numbers, best indicated by regression analysis of cumulative numbers of recorded on the transects wolf tracks /km/day. The decline may be due to the extremely cold and harsh winter of 2002/2003.

Although wolf numbers seem to be very low, there has been no distortion of such pivotal population parameters as the sex ratio (remaining 1:1) and percentage of young individuals (up 50% of footprints belong to young wolves), giving hope that under favourable conditions (mild winter, sufficient food etc.), the wolf population in the area may restore itself.

T: +44-1502-583085 F: +44-1502-587414 E: info@biosphere-expeditions.org W: www.biosphere-expeditions.org

2.5. References

Anon (1985) *The Wolf*. Moscow, Nauka Publishers, 606 pp. (in Russian).

Bibikov D.I., Filimonov A.N. (1985) Spatial structure. In: *The Wolf*. Moscow, Nauka Publishers, pp. 408-414 (in Russian).

Caughley G. (1977) *Analysis of Vertebrate Populations*. London, John Wiley & Sons (Russian version, 1979, 362 pp.).

Danilov P., Helle P., Annenkov V., Belkin V., Bljudnik L., Helle E., Kanshiev V., Linden H., Markovsky V. (1996) Status of game animal population in Karelia and Finland according to winter track count data. *Finnish Game Research* 49: 18-25.

Gurski I.G. (1978) The wolf in the NW Black Sea coastal area (home range, population structure, reproduction). *Bull. MOIP, Section Biology* 83(3): 29-38 (in Russian).

Gurski I.G. (1985) Ukraine and Moldavia. In: *The Wolf*. Moscow: Nauka Publishers, pp. 486-492 (in Russian).

Heptner V.G., Naumov N.P., Yurgenson P.B. et al. (1967) *Mammals of the Soviet Union*. Moscow, Vyshaya Shkola, vol.2, part 1, pp. 123-193 (in Russian).

Kirikov S.V. (1952) Historical changes of the fauna of our country in the XII-XIXth centuries. Changes in the belt of broad-leaved forests and forest-steppe in the European part of the USSR. *Izv. AN SSSR. Series Geography* 6: 31-48 (in Russian).

Kirikov S.V. (1959) Changes of fauna in natural belts of the USSR (XIII-XIXth centuries): *The Steppe Zone and Forest-Steppe*. Moscow, Publishing House of the Academy of Sciences, 175 pp. (in Russian).

Ludwig J.A., Reynolds J.F. (1988) *Statistical Ecology*. John Wiley & Sons, 337 pp.

Mech L.D. (1995*) The Wolf: The Ecology and Behavior of an Endangered Species*. Minnesota University Press.

Makridin V.P. (1978) The Wolf. In: *Large Carnivores and Hoofed Animals*. Moscow, Lesnaya Promyshlennost, pp. 8-50 (in Russian).

Migulin A.A. (1938) *Mammals of Ukraine*. Kiev, Publishing House of the Ukrainian Academy of Sceiences, 421 pp. (in Ukrainian).

Roman E.G. (1996) Predators of the genus Canis in the Lower Dnieper area: population dynamics and strategy for survival. In: *Ecosystems of Wild Nature*, Odessa, pp.4-14 (in Russian).

Rukovski N.N. (1984) *Hunter and Tracker*. Moscow, Fizkultura i Sport, 119 pp. (in Russian).

Runyon R.P. (1977) *Nonparametric Statistics*. Addison-Wesley Publishing Company (Russian version, 1982, 198 pp.)

Selunina Z.V. (1992) Present state of the theriofauna of the Chernomorski Reserve. In: *Natural complexes of the Chernomorski State Biosphere Reserve*. Kiev, Naukova Dumka, pp.152-159 (in Russian).

Selunina Z.V.(1996) Mammals. In: Vertebrates of the Chernomorski Biosphere Reserve (annotated lists of species). *Vestn. Zoologii, Suppl. 1*: 39-44 (in Russian).

Zaitsev G.N. (1984) *Mathematical Statistics in Experimental Botany*. Moscow, Nauka, 424 pp. (in Russian).

Zhyla S. (2000) *Some peculiarities of the Carpathian population of wolves in Ukraine*. Large carnivores in the Carpathians, Ivano-Frankivsk: Siversia, pp. 31-33 (in Ukrainian).

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http://www.for.gov.bc.ca/Pubs/teBioDiv/WolfsandCougars/

http://www.primenet.com/~brendel/index.html

http://www.large-carnivores-Icie.org/wolf.htm

3. Jerboa Survey

Volodymyr Tytar
I.I Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine

3.1. Introduction

Jerboa natural history

Stylodipus telum is a medium sized, bipedal jerboa. The generic name *Scirtopoda* Brandt 1843, is often used for this species, particularly in the Russian and Ukrainian literature on mammals. In English, species of *Stylodipus* are referred to as “thick-tailed three-toed jerboas” (Macdonald 2001).

Fig. 3.1a. Falzfein’s thick-tailed three-toed jerboa (*Stylodipus telum falzfeini*).
This picture originates from a video sequence recorded with a video camera trap consisting of a Sony DCR-TRV19E “Handycam” digital video camera and a Trailmaster TM 700v “Passive Infrared Video Trail Monitor”. To the author’s best knowledge, it is the first-ever picture of *Stylodipus telum*. The author would like to thank all team members for making this recording possible, particularly Simone Webber for her inexhaustible enthusiasm in setting up the camera trap. The full video sequence © Biosphere Expeditions can be viewed at www.biosphere-expeditions.org/jerboa.

Jerboas have extremely long hind feet and short forelegs; they always walk upright or hop like kangaroos. Solitary, nocturnal animals, with a low tolerance for heat, jerboas spend the day in individual burrows with plugged entrances. In the Northern parts of their range they hibernate; some jerboas of the true deserts aestivate. They feed on plant matter, especially seeds, and insects. They do not drink, but survive on water obtained from food or produced by their own metabolism. A jerboa can hop faster than a person can run, and a single leap may carry it more than 1.8 metres. Females have eight mammae, have 1 to 3 litters each year and give birth to 2 to 6 young in each litter.There are about 25 jerboa species, 22 of them in Asia.

They are classified in 10 genera of the phylum Chordata, subphylum Vertebrata, class Mammalia, order Rodentia, family Dipodidae (birch mice, jumping mice, and jerboas).

Head and body length of *Stylodipus telum* is 100-130 mm, tail length is 63-132 mm, and hind foot length is 45-60 mm; individuals weigh approximately 60 g. Its upper parts are sandy or buffy, being darkened somewhat by a sprinkling of black-tipped and completely black hairs. The hairs along the sides of the body have a white base and a bright buffy tip. The underparts, the backs of the feet, and the hip stripe are white. The tail is about the same colour as the back, except that the base may be encircled by white; there is no distinct terminal tuft or white tip. When the animal sits, the tail is used as a prop. Each hind foot has three digits, the middle one being the longest. Each toe has a stout claw concealed by stiff hairs; the soles of the hind feet are also haired. The ears are relatively short. The incisor teeth are white and grooved.

Stylodipus telum occurs across the belt of semi desert and North temperate deserts from Southern Ukraine to Eastern Kazakhstan. However, the continuous distribution of the species is interrupted between the Dnieper and Volga (see Fig 3.1b) and it is believed that this gap appeared in the late Pliocene just before the beginning of the ice ages (Selunina 1998) Since then the isolated population in Ukraine, which is found primarily in the sandy area in between the Dnieper and the Northern Black Sea coast, including the Kinburn peninsula, has been on its own pathway of evolution and adaptation. So much so that divergence from populations from the main home range of the species east of the Volga seems to have been far enough for it to be recognized as a separate subspecies, *Stylodipus telum falzfeini* (see Fig. 3.1a above). This subspecies, naturally, is endemic to the region and this is one of the reasons for listing it the Ukrainian Red Data Book (1994).

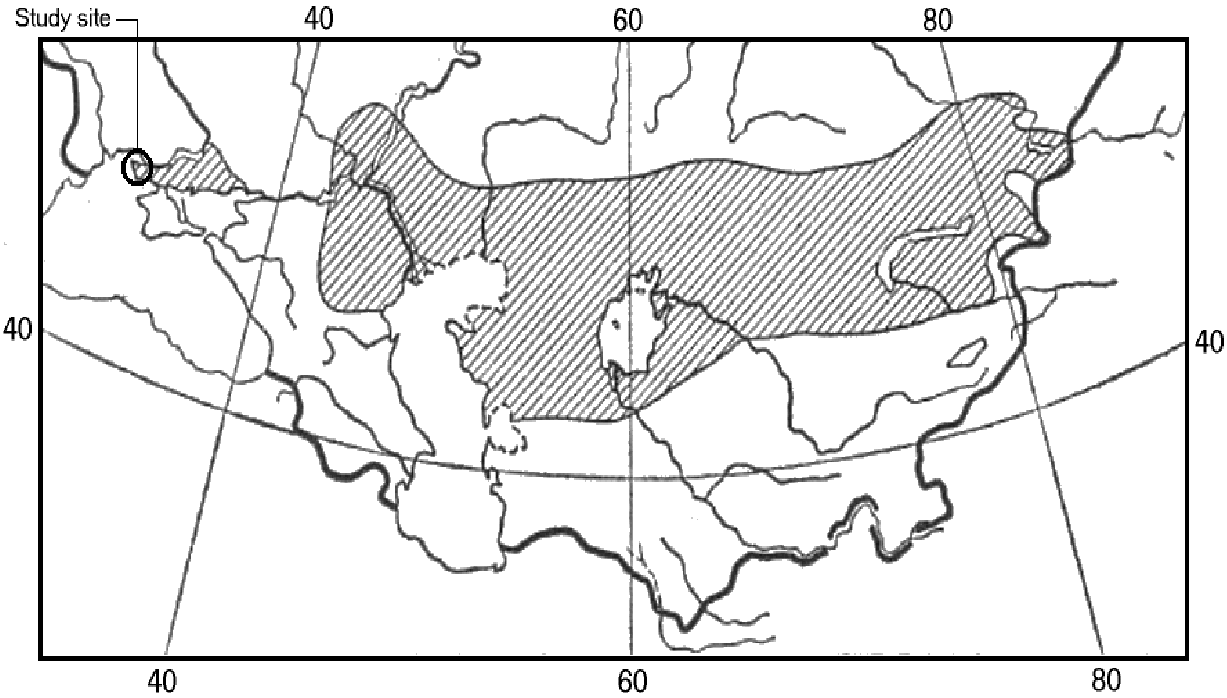

Fig. 3.1b. Geographical home range of the jerboa, *Stylodipus telum* with Kinburnska Kosa Regional Landscape Park study site location (see also Fig. 3.1.c). Note the disjunction between the Western and Eastern portions of the species' home range. Adapted from Flint et al. (1970).

Stylodipus telum generally inhabits deserts and steppes and occasionally has been reported in cultivated fields and pine forests (Selunina 1998). *Stylodipus telum falzfeini*, in particular, inhabits sandy areas usually appearing in the region as vast patches of open land (so-called “arenas”). The animal excavates two kinds of burrows for summer use. Simple temporary holes (tunnels 0.6-2 m long) are dug for one day's rest or for shelter and/or escape routes during the night. Entrances to these holes are never plugged and are often marked by small mounds or piles of dirt. The permanent burrows are more complex, usually having a main entrance, emergency exits, and one or more chambers. Overall length of the passageways according to Selunina (1988) is 3-18 m. The entrance is kept sealed by day and highly cryptic. No mounds or other field signs mark the permanent burrow.

Stylodipus is generally nocturnal, individuals appearing 1.5-2 hours after sunset with peaks of activity from about 22:00 to 24:00 hours and at around 03:00 hours[2]. It hibernates from September or October to mid-March. The diet consists of lichens, rhizomes, bulbs, seeds, and wheat. Individual home ranges are only 20-45 meters in diameter during the summer and do not overlap. Following its participation in reproductive activity, however, an individual may shift its range once or twice a month. The overall breeding season lasts from March to August, but it is not known whether females give birth more than once. The number of young per litter is 2-8, usually 3-5.

In the 1940s densities in sand areas reached 10-12 holes per hectare (Zubko 1940). In 1962 the total population of the subspecies was estimated to be 400,000 to 450,000 individuals. However, since then it has greatly suffered from intensive planting of forests which has in places totally destroyed the habitat of the jerboa. Declining numbers and shrinking habitats have been another reason for including the species into the Ukrainian Red Data Book (1994).

Selunina (1992) assumes that only 25,000 ha of habitat are left that are more or less suitable for the animal and estimates the number of individuals of the subspecies as 15,000 to 20,000, out of which 3,000 are found in the protected area of the Black Sea (Chornomorski) Biosphere Reserve, which neighbours the current study site in the Kinburnska Kosa Regional Landscape Park. For certain divisions of the Biosphere Reserve she provides the following densities: Ivano-Rybalchanski Division (46°26´N, 32°8´E): 1.5 ind./ha, 0.2 ind./ha on tops of dunes, 2.3 ind./ha on pasture land adjacent to the reserve, 2 individuals spotted from a motorcycle in the night along a transect 20 km long; Solonoozerny Division (46°28´N, 31°57´E): 0.5 ind./ha, 1.4 ind./ha on adjacent pasture and land occupied by recently planted pine.

[2] John Reay, an expedition team member in the 2nd slot, spotted one animal from the Land Rover during a night drive at around 21:00.

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T: +44-1502-583085 F: +44-1502-587414 E: info@biosphere-expeditions.org W: www.biosphere-expeditions.org

Location

The Kinburnska Kosa Landscape Park was created in 1992 and is situated in Ukraine on the Northern shores of the Black Sea, at the confluence of the Dnieper river, North-West of the Crimea. The park measures 18,000 hectares including 12,000 hectares of terrestrial habitats and 6,000 hectares of aquatic habitats. Habitats include natural sand dune areas covered with steppe vegetation, planted pine forests, lagoons and marine environments. The climate is continental and semi-arid with hot summers and cold winters. The peninsula was created by the shifting sands of the Dnieper and Bug rivers, rising out of the Black Sea only in the Quaternary (see also Fig 2.1b above).

Rationale

Declining numbers of *Stylodipus telum falzfeini* are a concern for the authority of the Kinburnska Kosa Regional Landscape Park, however numbers and densities have as yet not been thoroughly estimated. A first step in this direction has been made by Biosphere Expeditions (Tytar & Hammer 2003). However, an extended estimate would aid proper monitoring of the population by setting a quantified baseline. Therefore, the aim of this survey was to obtain appropriate data for establishing a baseline for densities of jerboa within the Park, seeking for new plots in habitats suitable for jerboa and reassessing numbers in plots surveyed one and/or two years ago within the frame of the monitoring programme of Biosphere Expeditions. A supplementary survey was undertaken of selected features of the spatial organization of the jerboa population for collecting additional quantitative data that may lead to a better understanding of population trends and peculiarities of jerboa biology.

3.2. Materials and Methods

One of the convenient methods for estimating densities of *Stylodipus telum falzfeini* is to count holes made by the animals within sample plots set up in the appropriate habitat. Gizenko (1983) considers that one animal digs up and makes use of 5 to 7 holes as temporary burrows. Heske and co-authors (1995) report similar figures, 4 and 6 for a population in Daghestan. Thus, by dividing the number of recorded used holes by 5 and/or 7, an estimate can be made of the number of animals within the plot, and dividing this number by the area of the plot (usually expressed in hectares) will produce the density. Gizenko used for this purpose sample plots measuring 200 x 50 metres. Selunina (1988 & 1992) followed this method in her estimation of *Stylodipus telum falzfei* densities in the Chornomorski Biosphere Reserve. We too have followed as far as possible Gizenko's method for at least two reasons: simplicity and possibility to compare the results for the Kinburnska Kosa Regional Landscape Park with those stated above for the Chornomorski Biosphere Reserve.

The expedition's survey team consisted of several paying, untrained expedition team members who gave up their holiday time to assist in this research project. Their work and the expedition contribution they paid made this research possible. Expedition team members were trained in how to set up plots and recognise jerboa field signs by the local scientists and the expedition leader. Field guides were also provided.

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For the purpose of this study four sample plots were chosen and measured by the expedition team and the expedition leader using a GPS device for pinpointing sample corners and holes, and determining hole entrance orientation. Three of the plots (2J, 8J, 9J) were the same ones as the ones studied in 2002, and 2J was studied in 2001 as well; one plot (11J) was examined for the first time. Plots 2J and 8J were located near to the inland wolf camp 1 (46º31.008' N, 31º44.005' E). The distance between them is about 90 m, and in fact they represent one large suitable jerboa habitat. The other two (9J and 11J) were surveyed from wolf camp 2 (46º29.712' N, 31º37.607' E) located near the sea beach about 8.5 km WSW of wolf camp 1. The distance between 9J and 11J is about 3.4 km.

Groups of three to four researchers systematically scanned the entire plot for jerboa holes by covering it on foot several times. Double counting holes was eliminated by marking holes already recorded. Because not all of the holes were in use, we defined activity as follows: 1 = used with marked signs of recent usage (tracks, seeds, droppings), 2 = used, 3 = not used, 4 = not used with marked signs (spider's webs, many roots, partially collapsed entrance). Only categories 1 and 2 were used for calculations of jerboa densities; holes that looked more likely to be in use (ranked 2.5) were included into the analysis as well.

Table 3.2a. Plot parameters.

Plot code	Adjusted plot corner coordinates (N, E) *		Adjusted size (m x m)	Adjusted area (ha)	Habitat; date(s) of survey(s)
2J	1: 46º 31.224' 2: 46º 31.331' 3: 46º 31.331' 4: 46º 31.224'	31º 44.046' 31º 44.046' 31º 44.086' 31º 44.086'	198.13 x 50.97	1.010	Sandy steppe, undulating small hills; 13.09.01; 24.08.02; 23.08.03
8J	1: 46º 31.329' 2: 46º 31.378' 3: 46º 31.378' 4: 46º 31.329'	31º 43.915' 31º 43.915' 31º 43.980' 31º 43.980'	90.73 x 82.82	0.751	Sandy steppe, undulating small hills; 28.08.02; 23.08.03
9J	1: 46º 30.902' 2: 46º 30.950' 3: 46º 30.868' 4: 46º 30.813'	31º 35.666' 31º 35.721' 31º 35.878' 31º 35.822'	254.68 x 118.7	3.025	Sandy coastal steppe, undulating small hills; 5.09.02; 26.08.03
11J	1: 46º 30.412' 2: 46º 30.479' 3: 46º 30.479' 4: 46º 30.412'	31º 38.301' 31º 38.301' 31º 38.647' 31º 38.647'	440.96 x 124.06	5.471	Open steppe, flat; 20.09.03

*adjusted coordinates, size and area may differ from year to year, depending on the pattern of hole distrubution and/or the extent of the area surveyed (for instance, smaller patches, compared to 2002, were surveyed in 2003 within sample plots 8J and 9J).

Sample plots were supposed to be of standard rectangular shape, approximately 200 x 50 m (1.00 ha), as in the case of 2J, or of varying size (depending on the convenience for scanning the area). However, in the field they proved difficult to measure and because of the undulating terrain, plot edge markers were difficult to see for expedition team members combing the inside of the plot for jerboa holes. All this meant that in practice plots were in some way or other distorted and a number of jerboa hole records were taken outside of the plot boundary line connecting the corners of the plot. In the case of 2J, for example, we get a tetragon with corner coordinates: 46º31.331' N, 31º44.046' E; 46º31.224' N, 31º44.046' E; 46º31.224' N, 31º44.086' E; 46º31.331' N, 31º44.086' E. To fit this tetragon into a rectangular, one corner is placed into the point of the minimum coordinate values (i.e., 46º31.224' N, 31º44.046' E) and the other one across the diagonal into the point with maximum coordinate values (i.e., 46º31.331' N, 31º44.086' E). This was done in order to accommodate all hole records into a rectangle, thus somewhat increasing the sample plot size to 1.010 ha (198.13 m x 50.97 m) (see Table 3.2a).

Statistical methods were then used to assess the pattern of distribution of holes within sample plots (random, clumped, or uniform) by examining the relationships between the mean (M) and variance (σ^2) for pinpointed holes (pooled samples and samples of used and unused holes are treated separately) in blocks of various size ranging from 100 to 1,000 m^2. The chi-square (χ^2) test was applied to confirm if the sample is in agreement with the theoretical Poisson (random) series, expecting the ratio of σ^2/M to be equal to 1.0 (Ludwig & Reynolds 1988).

In addition we tested plotless or distance methods (Greig-Smith 1983) for measuring spatial organization by calculating values derived from distances between holes (distances measured between a given hole and its nearest neighbour). In theory, the derived mean distance (D) is equal to one half of the square root of the average area (S) occupied by one individual (in our case hole): D= $\sqrt{S}/2$. This means that we can calculate how many individuals are present per hectare and/or the distances themselves may be used as a measure of population density. Where the measured distances were not distributed normally, logarithmic transformation was applied to the data. This allows for a justified use of statistical methods for quantitative comparisons, in particular *t*-tests.

The chi-square (χ^2) test was applied to check the assumption that holes grouped into activity categories (pooled 1 and 2, and occasionally 2.5, i.e. "used holes" on the one hand, and 3 and 4, i.e. "unused holes", on the other) are present in equal or unequal numbers. The same test was applied for assessing any prevalence of hole entrance direction.

Breakdown and one-way ANOVA were used to analyse annual and local trends of jerboa activity and burrow orientation.

3.3. Results and Discussion

Data on 2J, 8J, 9J and 11J regarding hole numbers, their use, and calculated densities (according to Gizenko's method) are summarized in Tables 3.3a and 3.3b. Figures in the tables are derived from the adjusted sample plots.

Table 3.3a. Number of holes encountered in each adjusted sample plot.

Plot code	Activity				Used holes	Unused holes
	1	*2*	*3*	*4*		
2J	5	6	6	13	11	19
8J	4	7	15	8	11	23
9J	0	9	2	8	9	10
11J	5	9	6	8	14	14
pooled data	14	31	29	37	45	66

As can be seen, densities from the "inland" plots (2J and 8J) are quite comparable with those recorded for the Chornomorski Biosphere Reserve, reaching up to 1.5 ind./ha and 2.3 ind./ha on pastureland adjacent to the reserve. These figures, however, are well below those recorded for the nominate subspecies in the Eastern portion of the species' home range, where densities may reach a maximum of 12-20 ind./ha (probably one of the reasons why direct sightings of the animals are rarely used for counting their numbers). Numbers for the "coastal" plots (9J and 11J) are even smaller.

Table 3.3b. Jerboa densities.

Plot code	Adjusted plots (ind./ha)
2J	1.55 - 2.18
8J	2.09 - 2.93
9J	0.43 - 0.60
11J	0.37 - 0.51

This may be evidence that *Stylodipus telum falzfeini* is at the verge of extinction as a species and at risk of local extinction if population numbers continue to decline, particularly if the species is disturbed in its habitat and/or, even worse, the habitat is being destroyed, as may happen if, for instance, current plans for additional forest plantations are enacted.

Yet the situation seems to be stable in some way in the sense that the population continues to maintain itself, despite its low numbers. Such a conclusion can be drawn by considering the ratio of used and unused holes in sample plots (Table 3.3c). In theory, a more or less rapidly declining population should be leaving behind more unused holes than used ones, whereas a conspicuously growing population should be revealing the opposite. In our case, used and unused holes are in fact present in roughly equal numbers.

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Table 3.3c. Ratios of used and unused holes.

Plot code	used	unused	χ^2	p
2J	11	19	2.13	< 0.05
8J	11	23	4.24	> 0.05 < 0.01
9J	9	10	0.05	< 0.05
11J	14	14	0.00	< 0.05

This conclusion is supported by the χ^2-test, and assuming that the population of animals within the surveyed sample plots are in some kind of equilibrium, whereby birth and death rates are approximately equal. The shift towards an increasing number of unused holes demonstrated by 8J gives reason to assume that this equilibrium is probably very fragile, especially considering the low total numbers of individuals present.

Density figures in Table 3.3b may be used for year-to-year comparisons for purposes of establishing population trends. Whether they prove to be robust may depend on how we set or adjust the boundaries for the sample plots, and at least 15-20 plots (Gizenko recommends 20) have to be surveyed each time to reach an acceptable standard error. In this respect distance sampling could be more effective, especially when individuals (holes) are sparse and widely scattered, presumably in a random order.

Clumping of holes, as well as either their random or uniform order of distribution was explored repeatedly in 2003 by examining the relationships between the mean (M) and variance (σ^2) for pinpointed holes in blocks of various size ranging from 100 to 1,000 m^2.

Blocks of various size are used in the analysis, because distribution patterns may change if clumping is the case. However, the ratio σ^2/M remains fairly stable and is not significantly different from 1.0, meaning a generally random distribution of holes within the sample plots. This conclusion is supported by the lack of any correlation between block size and σ^2/M. (For statistical details of the method and how the χ^2-test is applied in this case see Greig-Smith 1983 or Ludwig & Reynolds 1988). Plot 2J has been tested for this purpose three times, once in 2001, for the second time in 2002, and for the third time in 2003 (Fig. 3.3a). In all cases there is a good fit between the expected Poisson distribution and the observed data. (Note: the graph below depicts absolute figures; relative frequencies, say for empty (“zero” value) quadrats, are approximately the same, 85.7, 81.3 and 88.5%, respectively).

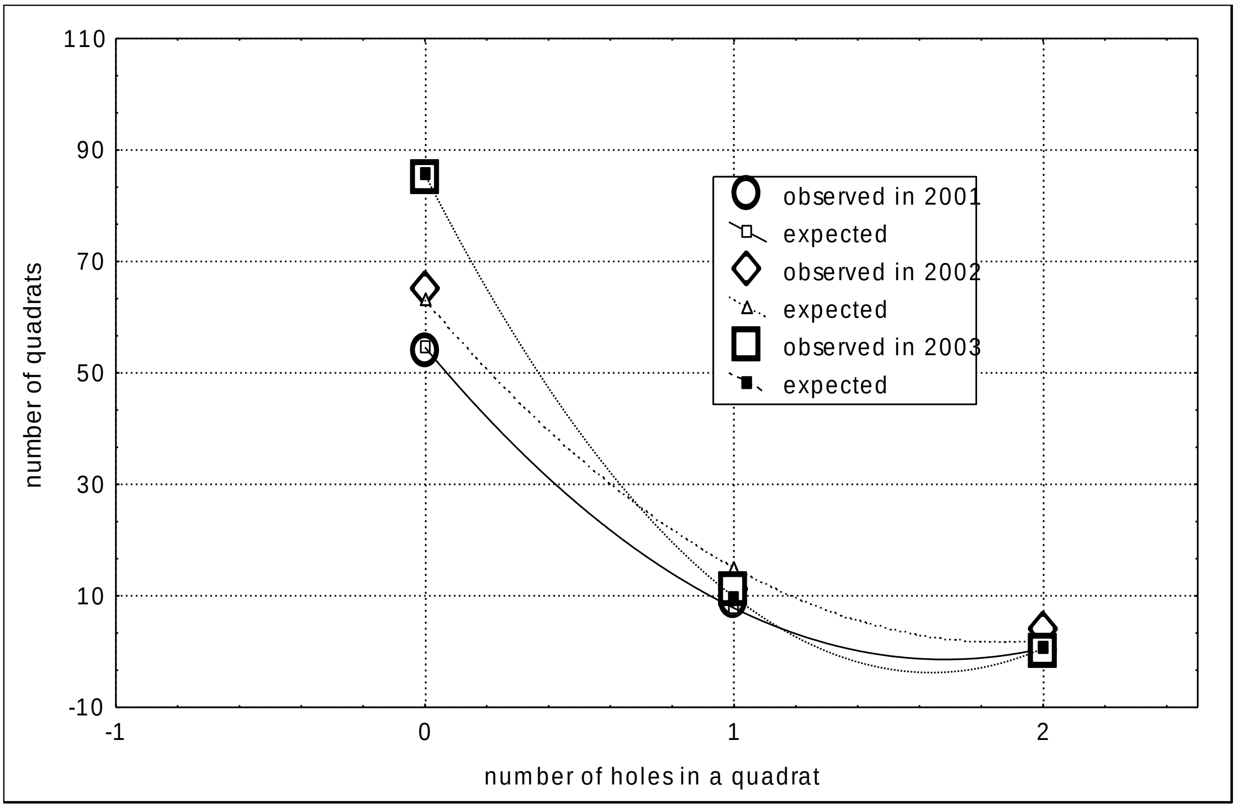

Fig. 3.3a. Poisson distribution fitting of spatial pattern of used jerboa holes in plot 2J.

It is most likely that this spatial pattern is due to the overall decline in jerboa numbers, which has led to a sporadic distribution of individuals. Theoretically, and as individual jerboa home ranges do not overlap much, increasing animal numbers would not lead to a clumped spatial pattern. Instead a uniform distribution of animals, which would be indicated by the ratio σ^2/M being significantly less than 1.0, would be the result. This is exactly what may be occurring in the Eastern portion of the home range of the species. However, as the data above suggest, this is far not the case in the Southern part of Ukraine, where *Stylodipus telum falzfeini* is under intense pressure and in danger of extinction.

The random spatial pattern of unused holes suggests that the situation has been the same for some time, lasting at least as long as the holes stay more or less intact and can be detected by a researcher.

Given the random spatial distribution of jerboa holes and having confirmed this pattern in the 2002 and 2003 surveys, we can test once again distance sampling and the consistency of the method, which we consider to be a more efficient way of monitoring jerboa populations.

As said above, we have chosen the “nearest neighbour” method, and distances were measured between a given hole and its nearest neighbour in one and the same sample plot (2J), treating only used holes. The results are summarized in Table 3.3e and Fig. 3.3b. In this table mean distances between used holes may be useful in estimating numbers of jerboa per hectare.

There is no significant difference between values estimated in 2001, 2002 and 2003 for the 2J sample plot (*t*-tests have shown no marked differences, all $p > 0.05$). For reasons mentioned above, log-transformed data is used for statistical comparisons. This shows the method to be consistent, allowing standardised replication, or establishment of confidence levels about a mean. We can also conclude that jerboa densities in plot 2J have been fairly stable since the beginning of the monitoring programme.

Table 3.3e. Distance sampling of jerboa holes in plot 2J: DIST=raw distances in meters; LGDIST=log-transformed distances

2J (2001)				
	Valid N*	Mean	Std.Dev.	Standard Error
DIST	6	21.10	8.77	3.58
LGDIST	6	**2.94**	0.56	0.23
2J (2002)				
	Valid N*	Mean	Std.Dev.	Standard Error
DIST	13	14.83	12.36	3.43
LGDIST	13	**2.53**	0.51	0.14
2J (2003)				
	Valid N*	Mean	Std.Dev.	Standard Error
DIST	7	18.24	6.13	2.32
LGDIST	7	**2.85**	0.35	0.13

	t-value	df	p
		2001/ 2002	
LGDIST	1.59	17	0.13
		2001/ 2003	
LGDIST	0.36	11	0.73
		2002/ 2003	
LGDIST	1.48	18	0.16

* note valid N is not equal to the number of used holes

Taking into account that $D=\sqrt{S}/2$, and that one animal makes use of 5 to 7 temporary burrows, densities in plot 2J range on an average from about 1.21 to 1.69 ind./ha (pooled data for all years). Estimates obtained by using quadrat (or block) sampling methods seem to be less robust and considerably more variable. However, it is likely that these are merely statistical fluctuations, as indicated by lack of difference between the mean “neighbourhood” distances.

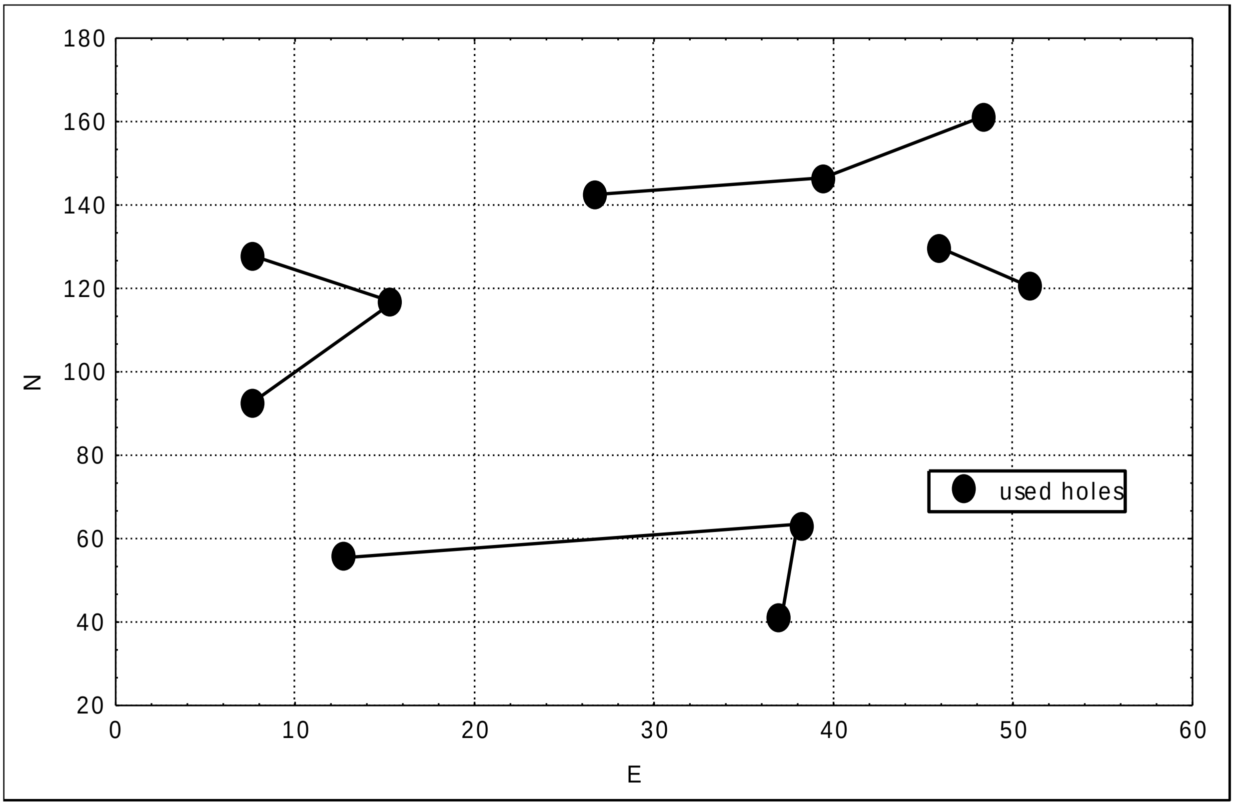

Fig. 3.3b. Scatterplot of used holes recorded in 2003 in plot 2J and distances between nearest neighbours

Finally, on the orientation of hole entrances. As in the previous study, no narrow specific direction was found to be preferred.

Three years on

Now, after three years of monitoring, certain conclusions can be made considering the entire jerboa population in the area, particularly as regards jerboa activity assessed by quantifying the freshness of burrows excavated by the animals (see above). The amount of data on this subject has reached 415 records made in 12 sampling plots where jerboa holes were found (note: additional 3 plots, 1J, 5J and 6J, were empty).

An ANOVA test (square root transformation has been used) has shown no significant year-to-year differences of activity (p = 0.765), so in general jerboa activity in the study area is fairly stable, revealing an average of 1.77 (transformed data); the reconverted average stands for 2.64. This is obviously above the 2.5 level that would the exact average if used and unused holes were in equal numbers (Fig. 3.3c)[3]. A χ^2-test confirms that there are more unused holes than ones that are in use (252 against 163; χ^2= 19.1, df = 1, p <0.00).

[3] Raw data has been used for better visualisation.

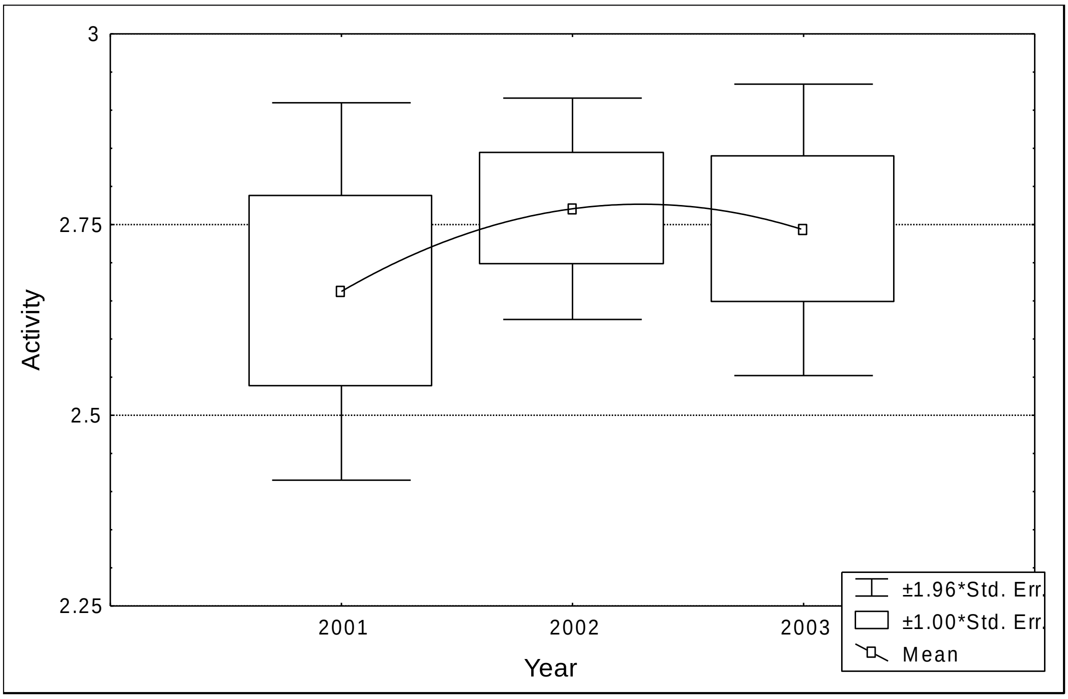

Fig. 3.3.c. Categorized box and whisker plots of jerboa activity recorded within the total study area in 2001-2003.

Not surprisingly, ANOVA shows considerable differences of jerboa activity between sites (p = 0.00). Figure 3.3d depicts categorized box and whisker plots for all the 12 sites where jerboa activity (i.e., presence of holes) was recorded.[4]

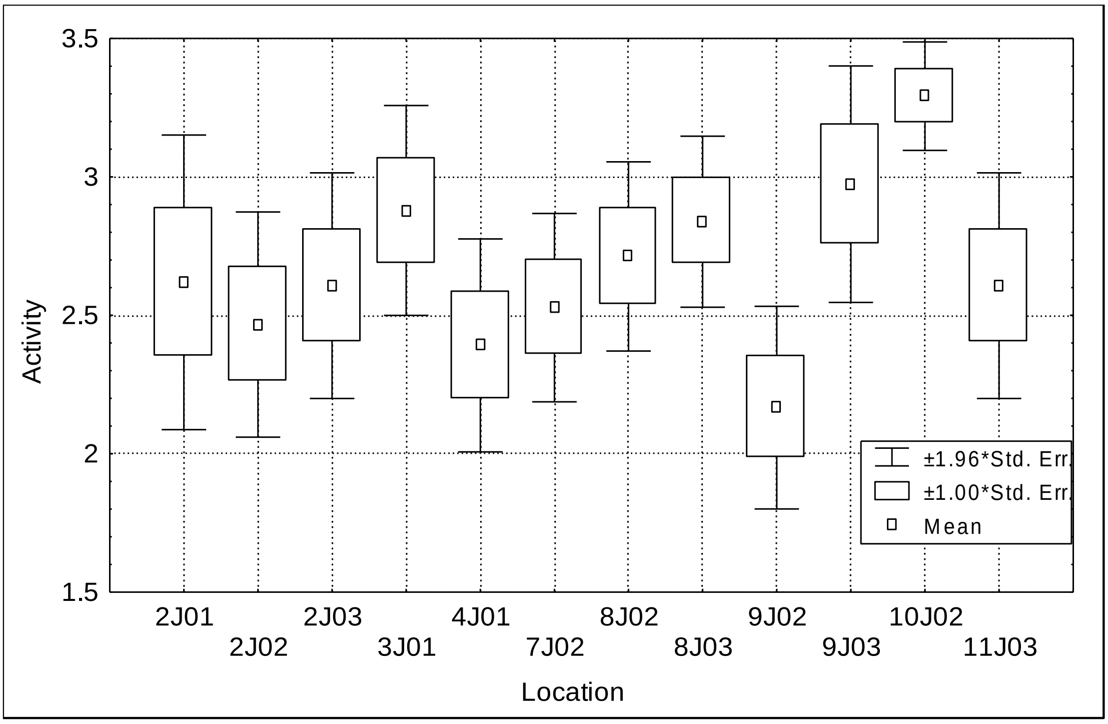

Fig. 3.3d. Categorized box and whisker plots of jerboa activity recorded within separate plots in 2001-2003.

[4] Raw data, as in the previous case was used for better visualisation because there are no discrepancies (as far as exact figures are ***not*** being considered) between conclusions made using either raw or transformed data.

For the purpose of assessing the well-being of the animals in each particular spot (in both spatial and, where data is available, temporal aspects) it may be interesting to examine how the “exact” activity mean of 2.5 fits into the confidence limits of ±1.00 × Std. Err. and ±1.96 × Std. Err. (table 3.3f). From both the graph and the table it is evident that in seven cases the “exact” mean fits into the ±1.00 × Std. Err., in one case into the ±1.96 × Std. Err., and four times is below the ±1.96 × Std. Err. confidence limit. Consequently, animals may be well off in plots 2J (all years yield the same pattern), 4J (2001), 7J (2001), 9J (2002) and 11J (2003).

Data in 2002 suggested that animals in plot 8J faired worse, a suggestion confirmed by the repeated survey in 2003: the “exact” mean has shifted down below the ±1.96 × Std. Err. confidence limit. One explanation for this decline could be predator pressure: within the plot a fresh fox den was found and entrances of 2 jerboa holes were found to have been enlarged by foxes presumably in an attempt to dig out jerboas hiding inside.

Table 3.3f. Position of the «exact» activity mean regarding confidence limits of ±1.00 × Std.Err. and ±1.96 × Std. Err.

	“Exact” mean:		
	within (or above) the ±1.00 × Std. Err. Confidence limits	within the ±1.96 × Std. Err. confidence limits	below the ±1.96 × Std. Err. confidence limits
2J01	+		
2J02	+		
2J03	+		
3J01			+
4J01	+		
7J01	+		
8J02		+	
8J03			+
9J02	+		
9J03			+
10J02			+
11J03	+		

An even more dramatic shift has occurred at 9J, a plot located in a coastal area named “Zeleni Kuchuhury” (green dunes). Many abandoned holes here could be due to the increased grazing pressure on the site. And finally, in an especially bad condition seems to be the population of jerboa in plot 10J surveyed once in 2002. This is a fairly lofty place (for the Kinburnska peninsula) and quite a remote one; it is not clear why the population has declined there.

Finally, once again on the orientation of hole entrances. As in the previous studies, no narrow specific direction was found to be preferred. ANOVA showed no year- or site-specific differences (p = 0.200 and 0.312, respectively).

3.4. Conclusions

This year’s survey has confirmed once again the low density of the population in the area of the Kinburnska Kosa Regional Landscape Park and the figures presented here are comparable with those quoted earlier for the neighbouring Chornomorski Biosphere Reserve.

Plotless or distance methods for this purpose have been repeatedly tested and the survey has confirmed the validity of the approaches we have chosen, especially in terms of replicability and comparability (as exemplified by the data from plot 2J).

The results of this year’s survey (together with data collected in the two preceding years) allow us to assume that the population in the Kinburnska Kosa Regional Landscape Park, despite low numbers, is for now at least in a state of equilibrium, although an overall average of activity of 2.64 is obviously above the 2.5 level that would be the exact average if used and unused holes were in equal numbers. This may be warning of negative factors impacting the jerboa population in the area.

The existing fragile equilibrium, however, can easily be disturbed by outside influences with drastic consequences for the continued existence of the species in the region (well exemplified by the fate of the jerboa population in the “Zeleni Kuchuhury” area of plot 9J).

Conservation measures targeting the jerboa *Stylodipus telum falzfeini* should therefore always be on the agenda of the park authorities. Appropriate measures should be undertaken to ease the grazing pressure in affected places. Perhaps measures should be worked out to control excessive numbers of red fox.

3.5. References

Anon. (1994) *Red Data Book of Ukraine. Animals.* Kiev: Naukova Dumka, 1994, p.393 (in Ukrainian).

Gizenko, A.I. (1983) The ecology of Falzfein's thick-tailed three-toed jerboa in Ukraine. *Vest. Zool.* 1: 53-57 (in Russian).

Greig-Smith, P. (1983) *Quantitative Plant Ecology*. University of California Press, Berkeley, CA.

Heske, E.J., Shenbrot, G.I., Rogovin, K.A. (1995) Spatial organization of Stylodipus telum (Dipodidae: Rodentia) in Daghestan (Russia). *J. Mammology* 76: 800-808.

Ludwig, J.A., Reynolds, J.F. (1988) *Statistical Ecology*. John Wiley & Sons.

Macdonald, D. (ed.) (2001). *The New Encyclopedia of Mammals*. Oxford University Press.

Selunina, Z.V. (1998) Contribution to the ecology of Falzfein's thick-tailed three-toed jerboa in the Chernomorski Reserve. In: *Studies of the Theriofauna of Ukraine, its rational use and protection.* Kiev: Naukova Dumka, pp.63-68 (in Russian).

Selunina, Z.V. (1992) Present state of the theriofauna of the Chernomorski Reserve. In: *Natural complexes of the Chernomorski State Biosphere Reserve.* Kiev: Naukova Dumka, pp.152-159 (in Russian).

Tytar, V.M., Hammer, M. (2003). Estimation of Falzfein's thick-tailed three-toed jerboa densities in the Kinburnska Kosa Regional Landscape Park (Ukraine). In: Collection of papers. Readings, dedicated to F.E. Falzfein.— Kherson: Kherson State University Publishers, 2003, pp. 8-9.

Zubko, Ya. P. (1940) The fauna of mammals of the Lower Dnieper. *Nauk. Zap. Khark. Derzh. Ped. Inst.* 4: 49-87 (in Ukrainian).

Fig. 3.1b is from: Flint V.E., Chugunov Yu.D., Smirin V.M. Mammals of the USSR. Moscow: Mysl, 1970, p. 318.

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http://www.press.jhu.edu/books/walker/rodentia.dipodidae.html

http://www.factmonster.com/ce6/sci/A0826183.html.

4. Viper Survey

Volodymyr Tytar
I.I Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine

4.1. Introduction

The Meadow Viper (*Vipera ursinii*), also known as Orsini's Viper in Western Europe, is a threatened and Red Data book listed rare snake that in Europe only occurs in scattered pockets. There are, however, several subspecies of Meadow Viper and one, *Vipera ursinii renardi*, is reasonably abundant throughout Eastern Europe and into the Caucasus and Central Asia (see Fig 4.1a.). In the Ukrainian and Russian literature this particular viper subspecies is commonly referred to as the "Eastern Steppe Viper" (Anon. 1988, Anon. 1994, Bannikov et al. 1977), and "Steppe Viper" is used for the whole species. It is this particular subspecies, the Eastern Steppe Viper, which is present in the area of the Kinburnska Kosa Landscape Park (see above).

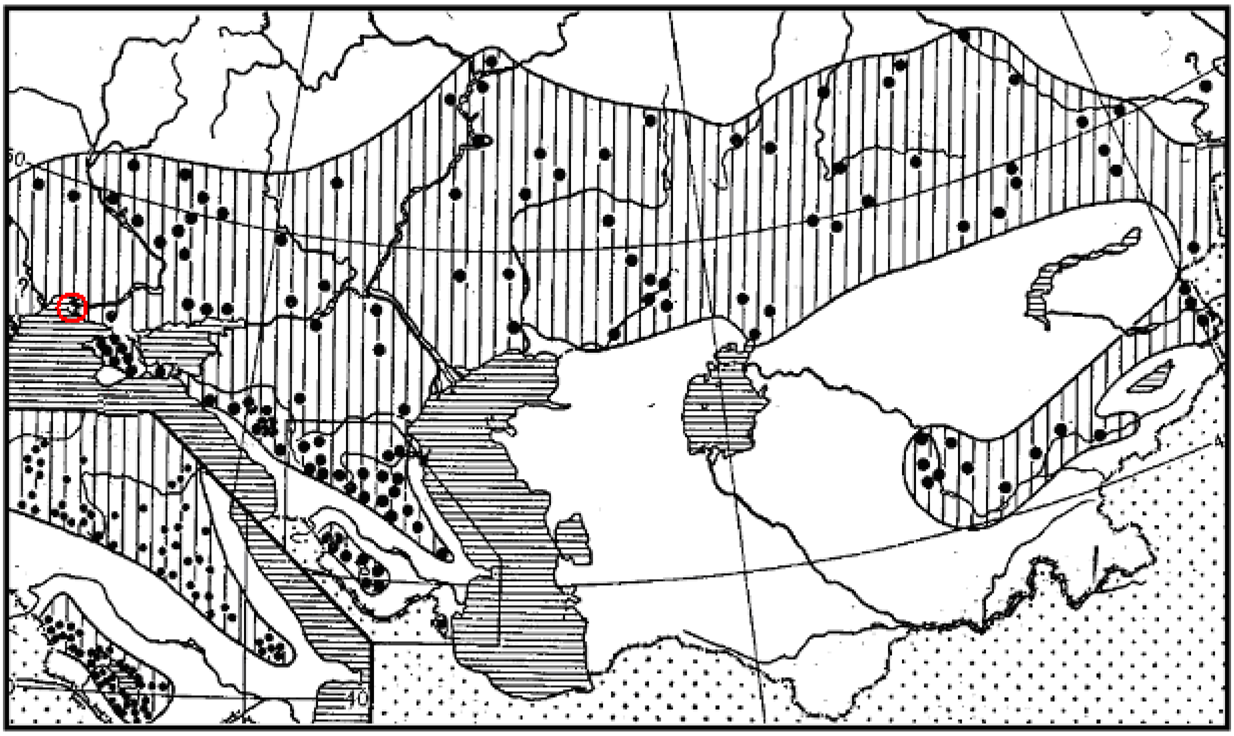

Fig. 4.1a. Home range of the Eastern Steppe Viper (*Vipera ursinii renardi*) in countries of the former Soviet Union. The red circle denotes the study area of the Kinburnska Kosa. From Bannikov et al. (1997).

The Steppe Viper is the smallest European viper, being fairly short and stout, usually reaching 35-45 cm (maximum up to 60 cm) in length. Like other vipers, it is remarkable for being able to flatten its body, which may be most pronounced when basking in the sun or in order to assume a more formidable appearance when threatened. Males generally have longer tails than females, the head is strongly depressed, and so broad at the back as to be abruptly defined from the anterior part of the body, or "neck". The eye has a vertical pupil. Sexes are alike in colouration. The ground colour of the back is brownish-grey with a dark dorsal zigzag band; dark brown or black spots extend along the sides (see Fig. 4.1b).

Mating takes place in spring. In the area of the Kinburnska Kosa Landscape Park this occurs particularly in April (Kotenko 1977), when sometimes great numbers of males can be seen wriggling around the females. Young undergo development within the oviducts and are born from July to September. The number of young in one brood varies from 5 to 20, and their length may vary from 12 to 18 cm. Young immediately after birth resist all handling, hissing and/or snapping, in the manner of their parents. The periodic shedding of the outer layer of the epidermis in a single piece, including even the covering of the eye, is one of the most striking peculiarities of snakes. The skin becomes detached at the lips, and is turned inside out from head to tail, without any sort of laceration when the snake is in good health. The first shedding (or exuviation) follows soon after birth and at least three exuviations take place during the period of activity (in April/May, July/August, and late August/September). The Steppe Viper reaches sexual maturity at the age of 3, when it is about 31-35 cm long. Lifespan in the wild is 7 or 8 years.

Fig. 4.1b. The Eastern Steppe Viper (*Vipera ursinii renardi*). Photo: M. Hammer.

Steppe Vipers are typical ground snakes living above ground, apparently favouring open meadows and grassland, and occasionally climbing bushes or entering the water. A vertical pupil denotes more or less nocturnal habits. Nevertheless the species is far from being exclusively nocturnal, basking in the sun, and pairing and breeding in the daytime. They do, however, shun high temperatures and as daily temperatures rise, the vipers switch to a nocturnal pattern of behaviour. Hibernation is from late October to November to the first half of March (Kotenko 1977).

The species subsists on a varied diet, including rodents, lizards, frogs and nestlings. A considerable amount of prey consists of orthopteran insects (grasshoppers, locusts etc.). Although venomous, the poison of this rather placid viper is not considered dangerous to humans.

It is largely this poison factor that led until recently to the persecution of the animal. Remarkably, even within protected areas, such as of the Chornomorski Reserve, which borders the Kinburnska Kosa Landscape Park, wardens up to the late 1950s were paid a bonus for killing vipers (Anon. 1988). However, the species has to a much greater extent suffered from human encroachment, which has destroyed or considerably reduced suitable habitats, resulting in a strong decline in numbers. Since 1980 the Eastern Steppe Viper has been listed in the national Red Data Book, which assigns it the status of a "declining species". Another, more recent blow and continuing threat to the viper population has been illegal harvesting of venom for medicinal purposes and trade of specimens being captured for zoos and private collections. The authority of the Kinburnska Kosa Landscape Park is strongly opposed to such activities and is doing its best to keep poachers out of the area.

Rationale

To date there are no good figures characterising abundance of the vipers in the Park, which can provide baseline data for the efficiency of protection measures. The purpose of this survey was to provide (incidentally during other survey work) some baseline data for estimating viper abundance in the park.

4.2. Materials and Methods

The expedition and therefore viper counts took place in August and September and as such are likely to consist of many recently born juveniles, not all of which will survive the winter to reappear once again in spring. Although probably the best time for estimating viper numbers and abundance would be the breeding season when the animals are most gregarious, Darevski (1987) encourages estimation reptile numbers and abundance at any time of the year once there is a chance to see the animals.

Methods applied in this survey were very basic. Vipers were recorded during the inspection of transects (WCTR1 and WCTR2) within an approximately 2 m wide strip used for counting wolf tracks; records were made of the date, time of day and of the approximate length of the animal, which was assessed visually, so there was no handling of the animals. This year ground temperature was also recorded on the spot where vipers were detected. Vipers were recorded by surveyors as well during the counting of jerboa holes and on occasional walks occurring between the camps and points on the transects used for detecting wolf tracks, and between the campsite on the beach and expedition base in the village.

The question of any preferred daytime hour for inspecting the routes (thus increasing or decreasing the chance of recording a viper) has been checked by the Kolmogorov-Smirnov test, assuming that inspections (for both the transect and occasional walks) were distributed throughout the daytime. A total of about 153 hours was spent directly and indirectly on looking for vipers; these are more or less equally (28, 56, 37,32) divided between four time intervals (Kolmogorov-Smirnov d = 0.067, p = n.s.). However, one hour intervals reveal a departure from regularity (d = 0.110, $p < .05$). For instance, more time was spent on looking for vipers between 10:00 and 11:00, and less between 16:00 and 17:00, than would be expected if our search effort would be evenly distributed throughout the daytime. In order to avoid bias, weighting has been used to “adjust” the contribution of individual cases to the outcome of the analysis.

Since the survey lasted for more than a month weather conditions and temperatures could have had an impact on the time of viper detection during the day and as well lead to a shift in the size of viper likely to be detected. Fortunately, we have by and large escaped these complications for the *whole* set of data as shown by Fig. 4.2a, which shows the absence of any definite trend (indicated by the linear fit). There are, however, certain trends within particular subsets of data on which we will focus later.

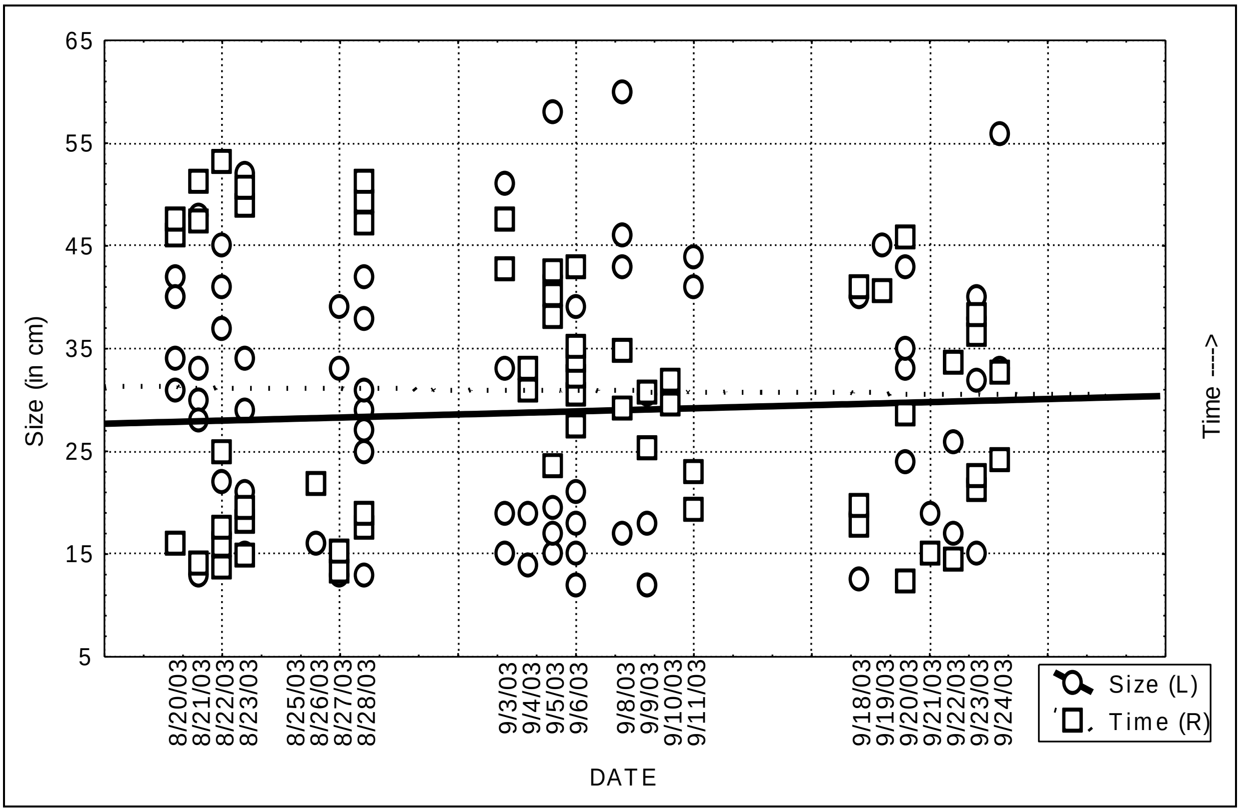

Fig. 4.2a. Scatterplot: dates versus the size of viper detected (left) and of dates versus time of the viper detection (right).

Abundance is calculated as the number of vipers per kilometre of route. Conventional statistical methods and transformations have been employed to process the data.

4.3. Results and Discussion

A total of 99 records of vipers were made during the survey lasting from 20 August to 24 September 2003 (three of them were dead animals crushed by vehicles). The total record of vipers in the survey of the previous year (2002) was about the same, 109.

WCTR1 was inspected six times (between 20 August and 23 September); 31 records were made here and on all occasions vipers (numbers ranging from 1 to 14) were found along the transect. The average abundance can be estimated as 0.705±0.276 ind./km (ranging between 0.136 and 1.910 ind./km). A year ago (2002) these figures here were 0.198±0.042, 0.136, and 0.568, respectively. The difference is statistically significant (t = 3.07, df = 22, p = 0.006), meaning a 3.6 increase in the relative abundance of vipers. (Because of the skewed data, a square root transformation was used, adding the each value 3/8).

WCTR2 was inspected ten times (between 25 August and 22 September); 9 records were made here (numbers ranging between 1 and 3) and in 5 cases no vipers were detected. The average abundance can be estimated as 0.211±0.082 ind./km (ranging between the minimum positive record of 0.235 and 0.704 ind. /km). This is statistically less (approximately three times) than on WCTR1 (t = 2.02, df = 14, p = 0.045).

In other places near the study area, the highest records of vipers come from Orlov Island (46°17’ N, 32°44’ E) and Potievska Tendra (about 46°8’ N, 32°13’ E): with 5 ind./km and 1-4 ind./km respectively. In these locations the viper is considered to be very abundant. However, in most places of the reserve, estimates fluctuate between 0.2-2 ind./km, and may also depend on the type of habitat and time where assessment of population abundance were made. One should also have in mind that only a portion of the transects crossed open grassland, the preferred habitat of the viper, although by far not the only kind of habitat they use. For instance, open grassland habitat along WCTR1 comprises less than a third of its length. Nevertheless, the transect survey yields meaningful and comparable results when conducted on a regular and standardised statistical basis.

As mentioned, the Eastern Steppe Viper shuns high temperatures and tends to avoid the midday heat, which reaches its peak at around 15:00. This is exactly what was observed in the previous two years (2001 and 2002): viper numbers increasing in the morning hours, later declining all the way down to a minimum during the hottest part of the day, and once again rising in the late afternoon when temperatures drop down. This year, however, the pattern of the day time record of viper numbers was complicated by a sharp drop of the ambient temperature around the end of August that lasted until mid-September, when the temperature rose again, but only to a moderate level (Fig. 4.3a[5]).

[5] Extrapolations for better view are made for the period between 1 August and 3 October, but for our purpose of interest is the middle portion of the graph related to the time of the survey.

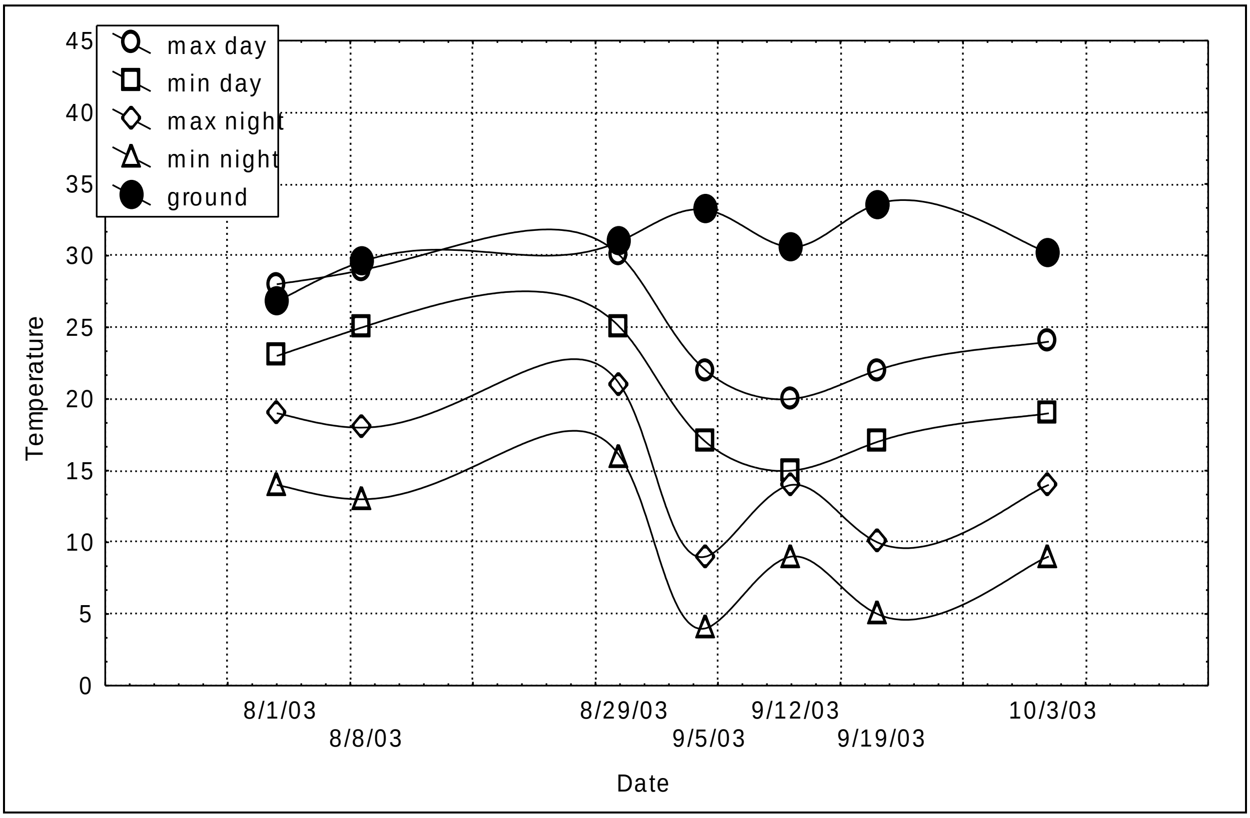

Fig. 4.3a. Ambient and ground temperature fluctuations.

In general, as our measurements have shown (*n* = 85), vipers prefer a fairly narrow range of temperatures of their immediate surroundings, best reflected by the ground temperature. Although individuals were found at ground temperatures ranging between 21.5 and 39.5ºC, the average score is 30.3±0.4ºC, with close 95% confidence limits (29.4 and 31.2ºC). This narrow preference of ground temperatures is quite obvious when compared with fluctuations of the ambient temperature, as one can see on the same graph. The consequences of this temperature dependence are that on hot days vipers will indeed tend to appear in the morning and evening hours (avoiding the midday heat), whereas under cooler conditions they will come out of their hides later, when the ground temperature reaches about 30ºC. Depending on how cool the weather is, the time when suitable for the vipers ground temperatures are available, and vipers will be appearing from their hides, will be shifting towards midday. The results of this year seem to follow this pattern, where three phases (represented by three subsets of data) can be distinguished[6] (Fig. 4.3b).

[6] These phases have largely by chance coincided with slot terms.

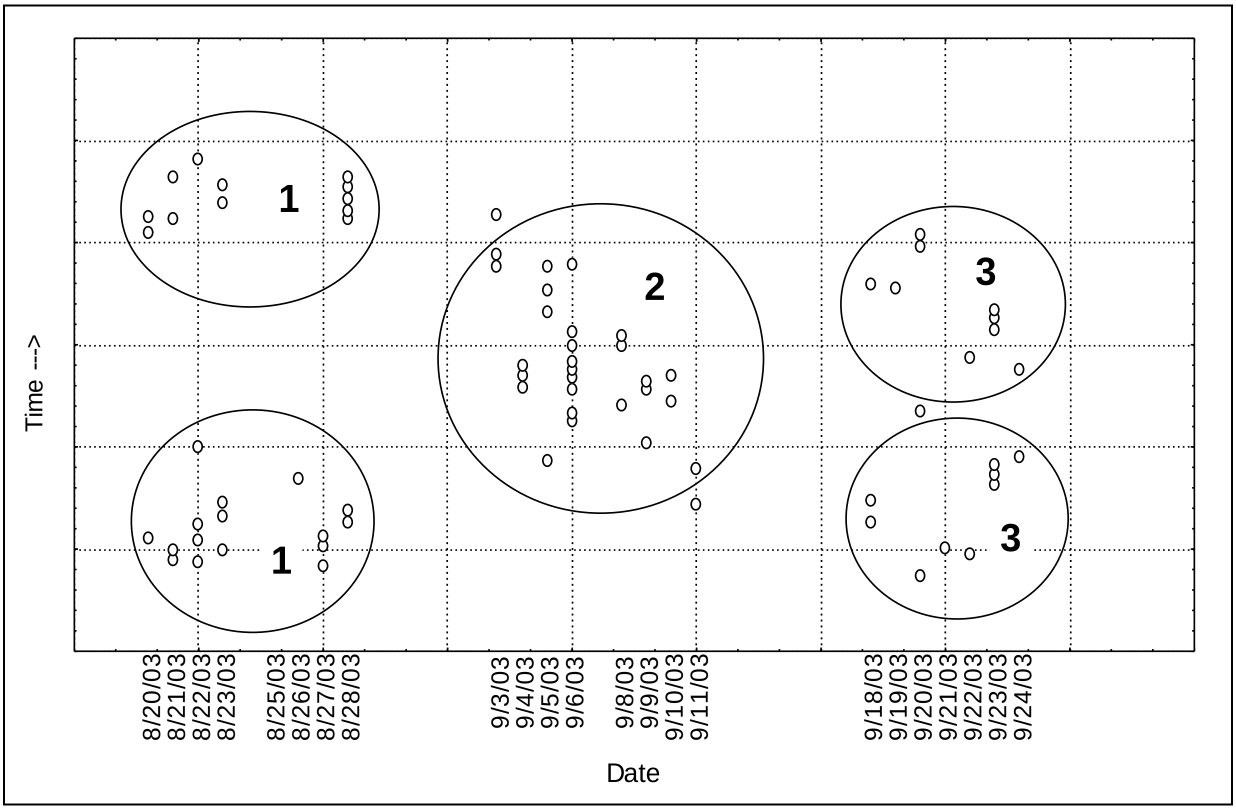

Fig. 4.3b. Scatterplot: dates versus viper detection time.
Three subsets of data, representing three phases (1, 2, 3) of viper behaviour during the survey

In the first phase (late August, before the temperature drop) viper records were clearly confined to morning and evening hours (the gap between circles 1 is obvious). In the second phase (after the temperature drop) viper records are centred around midday (circle 2). The third phase (late September, after a small temperature rise) resembles the first phase, however not so as to clearly distinguish morning and evening hours (gap between circles 3 narrow and indistinct). Together this produces a pattern of the day time record of viper numbers different, as mentioned, from those of previous years (Fig. 4.3c).

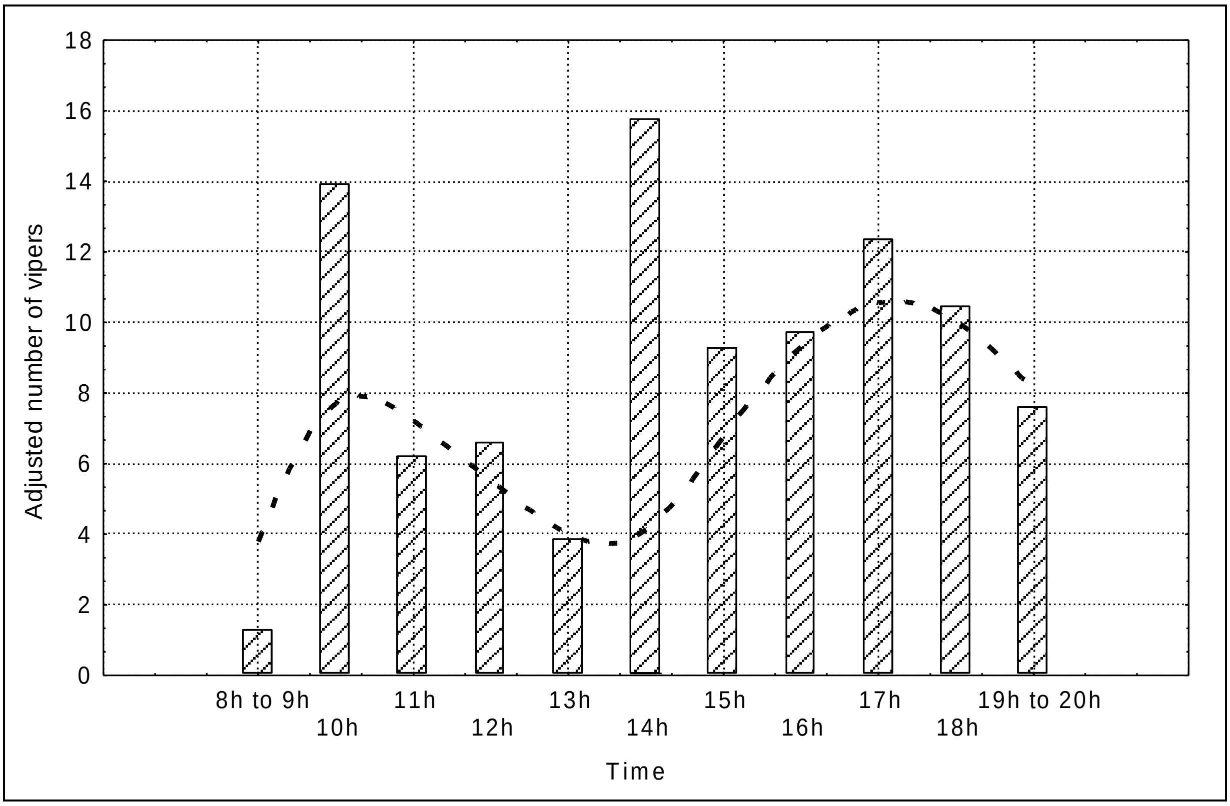

Fig. 4.3c. Daytime records of viper numbers.

However, it is just enough to exclude the 14:00 column from the data set to obtain once again the familiar pattern (depicted by the dashed line, produced by the least square fit) of morning and evening activity, though there is an obvious shift to the later hours of the day, possibly because more than could be expected, vipers appeared mostly in the afternoon due to increased number of cool days in 2003.

The analysis of size length has shown no between-year difference: 29.98±1.12 cm in 2002, and 28.78±1.26 cm in 2003. Log-transformation was used for this purpose, because data were not distributed normally due to the obvious mix of several groups. This issue is addressed below. There no differences in the size length of vipers from the transects either, neither between records made on WCTR1 in 2002 and 2003, nor between those made on WCTR1 and WCTR2 in 2003.

Our data has repeatedly yielded a fairly clear pattern of the population structure of the viper in the study area represented by the histogram of viper length data (see Fig. 4.3d). Such histograms are usually used for identifying population structure composed of various age groups (or size groups if the precise age of the animals is unknown).

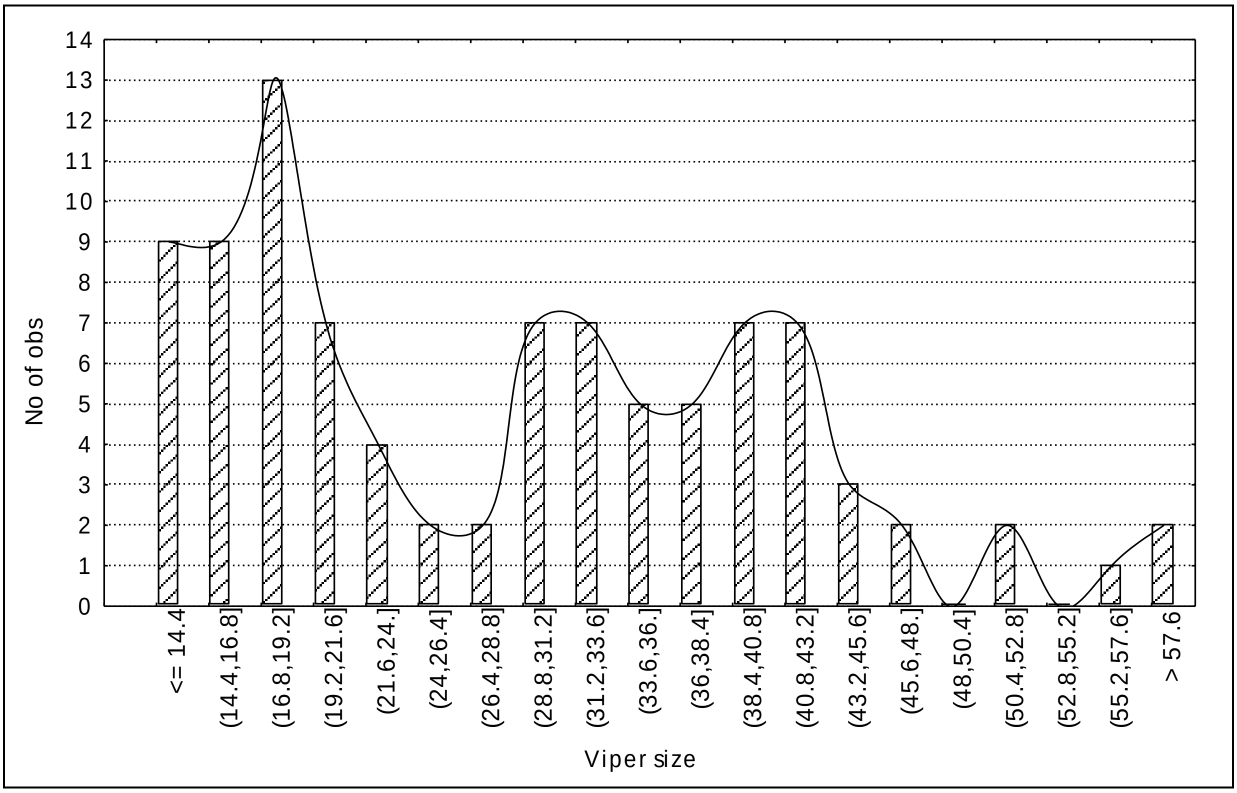

Fig. 4.3d. Distribution of viper length.

The graph quite clearly indicates the presence of at least 4 (maybe 5) size classes. By using k-means cluster analysis (choosing the option to maximise the initial between-cluster distances) these can be distinguished as 4 clusters (i.e. *k*=4). Within each cluster, size records are distributed normally, so data transformation is unnecessary (Table 4.3a).

Table 4.3a. K-means cluster analysis of viper size data (surveys 2002 and 2003).

		2002*, *n* = 96		
Clusters	No.1	No.2	No.3	No.4
number of cases (%)	33 (34.4)	27 (28.1)	31 (32.3)	5 (5.2)
average size of individuals (cm) in the cluster	17.76±0.46	29.26±063	39.90±047	53.00±2.32
		2003, *n* = 94		
number of cases (%)	42 (44.7)	23 (24.5)	23 (24.5)	6 (6.4)
average size of individuals (cm) in the cluster	17.25±0.49	31.11±0.58	40.87±0.53	54.17±1.87
		Between-year difference		
average size	no	yes (t = 2.12, df = 188, p = 0.04)	no	no
%	no	no	no	no

* Figures are slightly different (but statistically insignificantly) from those in the 2002 report; this is due to standardising the results of the two years, so they can be properly compared.

There are hardly any differences between the two sets of data (for the years 2002 and 2003), the only exception being the somewhat larger size of animals in cluster No. 2. In general, the pattern of the distribution of size length (and, presumably, the corresponding pattern of age classes) seems to be fairly stable, meaning no drastic changes in the reproduction and death rates of the population in the study area. As mentioned above, vipers reach sexual maturity at the age of 3, being by that time 31-35 cm long. Clusters 2 and 3 consist predominantly of such animals. In 2002 they comprised 37.5% of records, and in 2003 30.9%. The difference is statistically insignificant (p = 0.170). So it may be that this amount of reproducing individuals is enough to maintain the population in the area. However, more data would be needed to make a sound conclusion.

The same kind of stability can be stated for the viper size length distribution pattern recorded on WCTR1. The number of animals is insufficient to make a cluster-by-cluster comparison (18 and 30 in 2002 and 2003, respectively), so the first two and last two are pooled (Table 4.3b). Data from the WCTR2 (6 records of viper size[7]) is too poor to make any conclusions.

Table 4.3b. Numbers of vipers in pooled clusters for WCTR1

	Clusters 1 & 2	Clusters 3 & 4
2002	9	9
2003	23	7

Considering the WCTR1 data, there seems to be an increase in the numbers of animals of smaller size that could be indicative of an increased birth rate or better survival, however in statistical terms the difference between the years is insignificant (χ^2= 3.6, df = 1, p = 0.058).

Finally, are there any time and ground temperature preferences by animals belonging to different clusters? Hardly any. Vipers of any group prefer a ground temperature of about 30°C (the general average, as mentioned above) and all keep to a fairly narrow range of temperature fluctuations (coefficients of variation range between 13 and 15%). Time preferences are more difficult to assess, because of the predominantly bimodal distribution of time records throughout the daytime. Some insight to this issue may be gained from the time of the first and last sighting of a viper belonging to a particular group (i.e. cluster) (Table 4.3c).

Table 4.3c. Time of the first and last sighting of a viper, regarding cluster membership (data 2003).

Clusters	First sighting	Last sighting
1	9:12	18:46
2	9:22	18:24
3	9:39	18:19
4	11:40	18:19

[7] Sometimes vipers escape to thier hides (usually jerboa holes) so fast that it is impossible to make a visual assessment of their size.

These figures seem to indicate that vipers of all clusters appear to leave from and return to their hides at around the same time. The somewhat late appearance of vipers of cluster 4 (length 48 cm and above) may be due to the insufficient number of records (6).

4.4. Conclusions

The threat to the Eastern Steppe Viper may not be as serious in the Kinburnska Kosa Landscape Park as in other parts of Ukraine and numbers seem to be similar to those estimated for strictly protected areas and surroundings of nature reserves. Moreover, a repeated survey has shown a more than threefold increase in relative abundance of the viper (WCTR1).

Although there are some problems associated with data collected beyond the breeding season, data from the current (2003) and previous (2002) survey taking place in August/September seem to be fairly robust and replicable, especially regarding the population structure and the ratio of size/age groups represented by distinguishable clusters. The stability of this structure is a very good sign of the well-being of the species in the study area.

Monitoring, however, should continue in subsequent years. Comparative data from future surveys will test the quality of baseline and current data, assist in confirming or rejecting any negative trends in the area.

4.5. References

Anon. (1986) *Rare and Declining Plants and Animals in Ukraine*. Kiev, Naukova Dumka, 164-165 (in Russian).

Anon. (1994) *Red Data Book of Ukraine. Animals.* Kiev, Ukrainian Encyclopaedia Publishers, 301 (in Ukrainian).

Bannikov A.G., Darevski I.S., Ishchenko V.G., Rustamov A.K., Shcherbak N.N. (1997) *Key to Amphibians and Reptiles of the Fauna of the USSR*. Moscow: Prosveshchenie, 415 pp. (in Russian).

Darevski I.S. Methods for studying reptiles in nature reserves. In: Amphibians and reptiles of protected areas. Collection of papers. Moscow, 1987, pp. 25-32. (in Russian).

Kotenko T.I. (1977) Herpetofauna of the Chernomorski Reserve and adjacent areas. *Vestnik Zool.* N 2, 55-56 (in Russian).

Kotenko T.I. (1996) Amphibians and reptiles. In: Vertebrate animals of the Black Sea Reserve (annotated list of species). *Vestnik Zool.,* Supplement N1, 14-19 (in Russian).

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http://www.nafcon.dircon.co.uk/euro_snakes.html

http://www.herper.com/ebooks/
(from this site an electronic version is available of the book by G.A.Boulenger «The Snakes of Europe», 1913)

http:// www.unep-wcmc.org%20/species/animals/animal redlist.html (UNEP-WCMC. Animals of the World Database).

5. Autumn Migration of Passerines on the Kinburn Peninsula

Anatoly Poluda
Head of Ukrainian Bird Ringing Centre
I.I Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine

5.1. Introduction

This study was carried out on the territory of the Regional Landscape Park “Kinburnska Kosa” (Kinburnskaya spit) over the period 3 August 2003 to 26 September 2003. It was organized and supported by the international organization “Biosphere Expeditions”.

5.2. Materials and Methods

26 amateur ornithologists participated in the expedition. They were divided into three research groups. Each group consisted of 9 people and was split in half, with half the people working in the interior on wolves, jerboas and other animas, and the other half from a tent camp by the Black Sea coast, working on birds.

The ringing work consisted of two stages:

Stage 1 (preparatory stage run by Petro Gorlov mostly by himself) from 3 to 13 August 2003. The purpose of this stage was to find out what species of passerine birds begin autumn migration. 40 metres of mist nets were used for this.

Stage 2 (main stage run by Petro Gorlov with the assistance of expedition team members) from August 17 to 28 September 2003. Birds were captured with the help of 15 mist nets (nearly 150 m), located in shrubs at a distance of 30 - 120 m from the camp. The mist nets were coloured black and had 4 pockets. Nets were between 12 m, 4 - 9 m, 1 - 10 m and 1 - 6 m in length. They were located in shrubs at a distance of 30 – 118 m from the camp.

5.3. Results

1569 birds of 45 species were caught and ringed over a period of 52 days (1 species of Falconiiformes, 1 species of Cuculiformes, 1 species of Caprimulgiformes, 1 species of Coraciiformes, 1 species of Upupiformes, 1 species of Piciformes, 39 species of Passeriformes) (see Table 5.3a). This is fewer individuals than in 2002 (1704), but 6 more species than in 2002 (39).

During 2002 the most common species captured was the Swallow (18.6% of all individuals captured), of which the majority were caught in a Helgoland trap. In 2003 this trap was not established, as it was deemed more productive in terms of species yield to have more mist nets, rather then fewer mist nets and a big Helgoland trap (a supposition which turned out to be correct as shown by the increase in species captured) and consequently Swallows made up only 2.7% of all individuals captured.

Table 5.3a. Bird species captured during the expedition.

SPECIES	NUMBER	%
Accipiter nisus - Sparrowhawk	2	0.1
Cuculus canorus - Cuckoo	1	0.1
Caprimulgus europaeus - Nightjar	2	0.1
Alcedo atthis - Kingfisher	6	0.4
Upupa epops - Hoopoe	3	0.2
Jynx torquilla - Wryneck	5	0.3
Hirundo rustica - Swallow	42	2.7
Anthus trivialis - Tree Pipit	6	0.4
Motacilla flava - Yellow Wagtail	6	0.4
Motacilla alba - Pied Wagtail	4	0.3
Lanius collurio - Red-backed Shrike	116	7.4
Lanius minor - Lesser grey Shrike	10	0.6
Oriolus oriolus - Golden Oriole	4	0.3
Locustella luscinioides - Savi's Warbler	1	0.1
Locustella fluviatilis - River Warbler	3	0.2
Acrocephalus schoenobaenus - Sedge Warbler	12	0.8
Acrocephalus palustris - Marsh Warbler	8	0.5
Acrocephalus scirpaceus - Reed Warbler	15	1.0
Acrocephalus arundinaceus - Great Reed Warbler	10	0.6
Hippolais icterina - Icterine Warbler	28	1.8
Sylvia nisoria - Barred Warbler	21	1.3
Sylvia atricapilla - Blackcap	130	8.3
Sylvia borin - Garden Warbler	126	8.0
Sylvia communis - Whitethroat	42	2.7
Sylvia curruca - Lesser Whitethroat	29	1.8
Phylloscopus trochilus - Willow Warbler	249	15.9
Phylloscopus collybita - Chiffchaff	18	1.1
Phylloscopus sibilatrix - Wood Warbler	67	4.3
Ficedula hypoleuca - Pied Flycatcher	24	1.5
Ficedula albicollis - Collared Flycatcher	4	0.3
Ficedula parva - Red-breasted Flycatcher	277	17.7
Muscicapa striata - Spotted Flycatcher	94	6.0
Saxicola rubetra - Whinchat	21	1.3
Oenanthe oenanthe - Wheatear	2	0.1
Phoenicurus phoenicurus - Redstart	42	2.7
Phoenicurus ochruros - Black Redstart	5	0.3
Erithacus rubecula - Robin	18	1.1
Luscinia luscinia - Thrush Nightingale	58	3.7
Turdus merula - Blackbird	8	0.5
Turdus philomelos - Song Thrush	15	1.0
Parus caeruleus - Blue Tit	5	0.3
Parus major - Great Tit	14	0.9
Fringilla coelebs - Chaffinch	8	0.5
Carduelis chloris - Greenfinch	3	0.2
Carduelis carduelis - Goldfinch	5	0.3
Total	1569	100.0

The most numerous bird species were Red-breasted Flycatcher (17.7%), Willow Warbler (15.9%), Blackcap (8.3%), Garden Warbler (8.0%), Red-backed Shrike (7.4%) and Spotted Flycatcher (6.0%). The five new species captured were Black Redstart, Blackbird, Blue Tit, Chaffinch and Greenfinch.

Catpure dynamics analysis of all Passerine birds showed the presence of several migratory waves on the Kinburn peninsula during August to September, with waves most evident for common species.

This year the autumn migration of passerine birds began on 6 August 6 – we marked the first peak from 6-8 August (Icterine Warbler, Willow Warbler, Wood Warbler, Pied Flycatcher, Spotted Flycatcher, Thrush Nightingale). Most birds were captured during the 3rd decade (= 10 days) of August (53.6%), 1st decade (44.2%) 2nd decade (30.3%) and 3rd decade (only 6 days – 13.1%) of September.

Figure 5.3a. Day-by-Day frequency of bird species captured during the expedition.

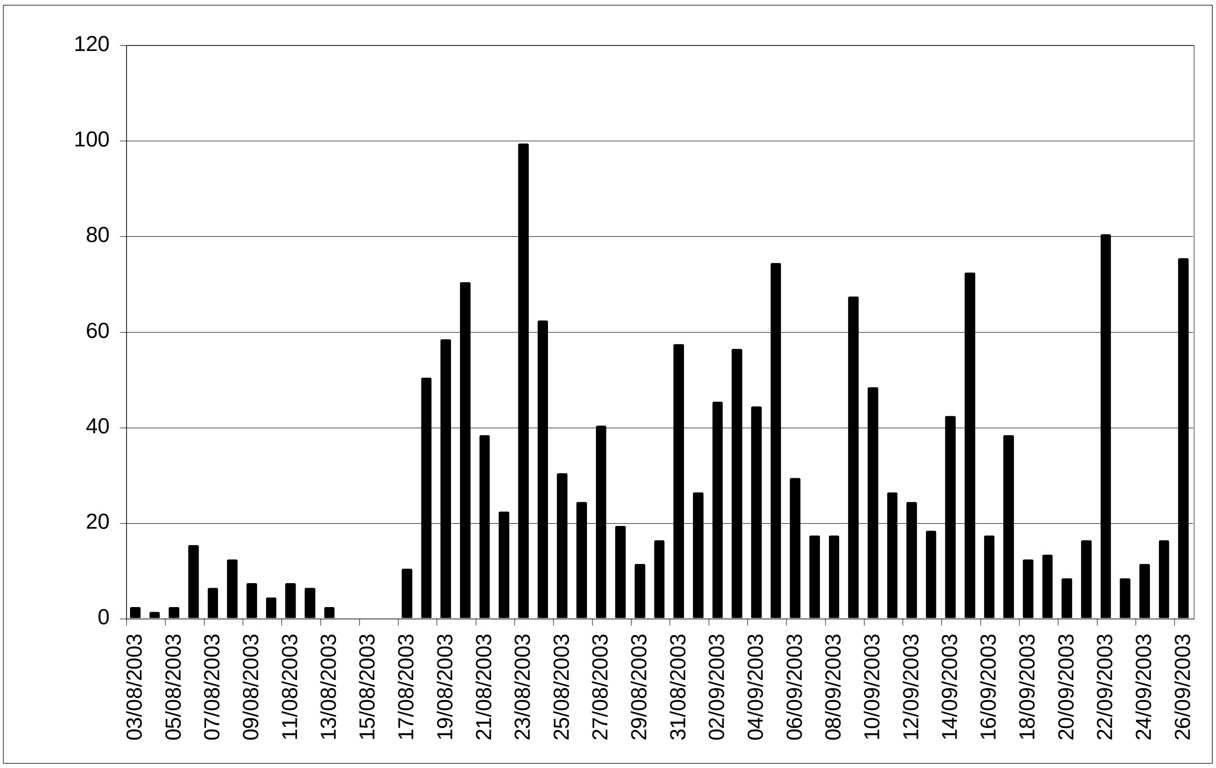

Table 5.3b shows the year-on-year capture results of all Biosphere Expeditions studies. Within these three years there, 4683 birds of 52 species were ringed. Unfortunately, so far no rings have been returned.

Table 5.3b. Year-on-year capture results of all Biosphere Expeditions studies 2001-2003

SPECIES	2001	2002	2003	SUM	%
Accipiter nisus - Sparrowhawk	5		2	7	0.15
Coturnix coturnix - Quail	1			1	0.02
Cuculus canorus - Cuckoo	1	1	1	3	0.06
Caprimulgus europaeus - Nightjar	1		2	3	0.06
Alcedo atthis - Kingfisher	3	9	6	18	0.38
Upupa epops - Hoopoe	1	3	3	7	0.15
Jynx torquilla - Wryneck	5	23	5	33	0.70
Riparia riparia - Sand Martin	1	47		48	1.02
Hirundo rustica - Swallow	6	331	42	379	8.09
Anthus campestris - Tawny Pipit		1		1	0.02
Anthus trivialis - Tree Pipit	2	5	6	13	0.28
Motacilla flava - Yellow Wagtail	2	1	6	9	0.19
Motacilla alba - Pied Wagtail	7	7	4	18	0.38
Lanius collurio - Red-backed Shrike	112	151	116	379	8.09
Lanius minor - Lesser grey Shrike	4	6	10	20	0.43
Oriolus oriolus - Golden Oriole	5	5	4	14	0.30
Sturnus vulgaris - Starling		9		9	0.19
Locustella luscinioides - Savi's Warbler	1	3	1	5	0.11
Locustella fluviatilis - River Warbler	3	4	3	10	0.21
Acrocephalus schoenobaenus - Sedge Warbler	10	12	12	34	0.73
Acrocephalus palustris - Marsh Warbler	14	1	8	23	0.49
Acrocephalus scirpaceus - Reed Warbler	3	29	15	47	1.00
Acrocephalus arundinaceus - Great Reed Warbler	8	15	10	33	0.70
Hippolais icterina - Icterine Warbler	25	31	28	84	1.79
Hippolais pallida - Olivaceous Warbler		1		1	0.02
Sylvia nisoria - Barred Warbler	4	25	21	50	1.07
Sylvia atricapilla - Blackcap	129	98	130	357	7.62
Sylvia borin - Garden Warbler	124	82	126	332	7.09
Sylvia communis - Whitethroat	29	36	42	107	2.28
Sylvia curruca - Lesser Whitethroat	8	16	29	53	1.13
Phylloscopus trochilus - Willow Warbler	210	113	249	572	12.21
Phylloscopus collybita - Chiffchaff	2	7	18	27	0.58
Phylloscopus sibilatrix - Wood Warbler	58	123	67	248	5.30
Ficedula hypoleuca - Pied Flycatcher	11	58	24	93	1.99
Ficedula albicollis – Collared Flycatcher	8	2	4	14	0.30
Ficedula parva - Red-breasted Flycatcher	290	241	277	808	17.25
Muscicapa striata - Spotted Flycatcher	128	154	94	376	8.03
Saxicola rubetra – Whinchat	6	8	21	35	0.75
Oenanthe oenanthe - Wheatear	1	1	2	4	0.09
Phoenicurus phoenicurus - Redstart	53	22	42	117	2.50
Phoenicurus ochruros - Black Redstart			5	5	0.11
Erithacus rubecula – Robin	15		18	33	0.70
Luscinia megarhynchos - Nightingale		1		1	0.02
Luscinia luscinia - Thrush Nightingale	29	93	58	180	3.84
Turdus merula – Blackbird			8	8	0.17
Turdus philomelos - Song Thrush	2		15	17	0.36
Parus caeruleus - Blue Tit			5	5	0.11
Parus major - Great Tit	2		14	16	0.34
Certhia familiaris - Treecreeper		1		1	0.02
Fringilla coelebs – Chaffinch			8	8	0.17
Carduelis chloris - Greenfinch			3	3	0.06
Carduelis carduelis - Goldfinch	9		5	14	0.30
TOTAL	1338	1776	1569	4683	100.00

5.4. Conclusions

1569 birds of 45 species were captured by mist nets and ringed during August to September 2003 on the Kinburn peninsula. Most birds were captured during the 3rd decade in August (53.6%). The most numerous bird species were Red-breasted Flycatcher (17.7%), Willow Warbler (15.9%), Blackcap (8.3%), Garden Warbler (8.0%), Red-backed Shrike (7.4%) and Spotted Flycatcher (6.0%). Together these species comprised more than 63% of all birds captured. In comparison to previous expeditions in 2001 and 2002, 5 new species (Black Redstart, Blackbird, Blue Tit, Chaffinch, Greenfinch) were captured this year. All in all, the work of the expeditions shows clearly that the territory of the Kinburnska Kosa Landscape Park is a very important area for migration of passerine birds. Birds restore their energy supplies here before their long flight across the Black Sea. The area around the Kinburn spit, where the expedition bird camp was situated and studies were conducted, should be protected from human impact to allow birds to rest and feed undisturbed before crossing the Black Sea.

6. Expedition leader's diary

by Ben Gilbert

9 August

Lists and packing, checking and forgetting - so it starts at the Biosphere base on the Suffolk Broads. Released , on the road and heading for some wolves on a sandy spit - Claudia and I sweat buckets and groove to some Japanese Rock'n'Roll as the Land Rover whines its way down South. So far so good and see you tomorrow or the next day when things start to roll over the water and into the EU wonder world!

10 August

Land Rover main beam failed to light up darkest Sussex last night, some kind of wiring fault. Checked fuses, yep, fuse hanging out. Fixed. Long, long day, boiling heat, busy roads, lack of sleep and after twelve and a half hours driving and loud music - Claudia and I had had enough. Bed.

12 August

15 hours on the road, check wheel nuts, fastenings on top, re-pack back, foot to the floor in every gear, shake, rattle and nearly roll a few times - arrive in Krakow bleary eyed - we only saw the tarmac, fumes and the lorries, which nearly carved us in half - there must be more to Poland than this.

13 August

Tarmac, stinky trucks, police checks - hanky panky grease my palm – hotels only booked by the hour - 2am stop for a sleepless night in a greasy truckers shack. Orest slept in the Land Rover in case the wheels went walkabout - Ukraine.

14 August

Trance state, hyper, red eyed and in Kinburnska.

16/17 August

Lots of packing, lots of work. Everyone here - Scientists, cook etc.

Saw a roe deer and a red fox with the biggest pointed ears imaginable. Claudia ran over a viper, she's so cruel that girl, it seemed ok, picked it up and a frog's head, statuesque and very dead, stared out and into oblivion from the shocked snake's mouth. Wolf tracks and pigs diggings. Zinovy saw three wolves together last month.

This place is hot, full of green reeds, dense scrub, tall grass and pine forest - you could hide an army here, in fact the Russian special forces used to practice on the peninsula. Great sea and great off road driving - not got stuck yet, but Orest and I are working on it.

20 August

Hot and lazy, reading a book on the beach, an empty sandy spit where I can see for miles each way and swim in a black sea. Think I'll go walkabout under the coming moonlight, let you know what I find in the silver forest.

21 August

Orest took me to a salt water mud pan where the thick oily mud smeared on one's body gives relief and cures to joints and whatever; we smeared ourselves with the thick shiny, obsidian nectar and baked in the afternoon furnace. 15 minutes later we were cooked, well done, and washing ourselves in another pan and smelling to high heaven of stinky sulphurous mud.

That night I swam in a black sea full of luminous creatures, igniting the smooth water with a million green phosphor sparkles, every movement ensuring another flare; and above this green brilliance, the Milky Way and its trillion stars echoing the fluorescence below. Even the jellyfish glowed in the dark making it easy to dodge their fiery demons.

22 August

Walked around a SaHa, which is a freshwater swamp enclosed by acacia, elder and oak trees – a very essential and unique piece of environment, each one marooned in this sea of sand and pines. Home to a multitude of flora and fauna, none of which I can really name, nevertheless we came across a huge moth, dark and patterned like a piece of delicate embroidery and the pattern of a scull clearly stamped on its back; they call it the Devil Head Moth in Kinburnska. It specializes in robbing bees' nests and can mimic the sounds of the queen bee and so ensuring its own safety. This place is a treasure trove of Nature.

26 August

One thousand mosquito bites, dam those demons of fire.

Saw a steppe eagle swoop down and take a viper in its savage talons.

Independence day for Ukraine - endless parties, days of them, vodka swilled like no tomorrow, every day seems like Independence day here, toasts and speeches that turn into epics, songs, dour songs of love and revolution - I went swimming and stayed well clear of drunken demon, splashed with the fluorescent angles and awoke with a clear head.

We had to move the Wolf Camp; the forest is dry as tinder in this heat, pines dying from a parasitic caterpillar, turning brown and withering into lifeless stalks - and there is no wolf activity on the transect. We scoured the landscape in search of a better location, tested the vehicle to the max, and found a site under the Russian olives near the beach. Zinovy and I traced a new transect, 4.5 km from coast to coast and found evidence of recent wolf tracks and as a bonus a badgers' set; these animals are in the red book (we have to assume the cover is red and not blue or pink). Volody is excited, very excited - badgers are so rare in the Ukraine and here in Kinburnska are four known sets. No study has been made here and it is not even known if they are a subspecies of the ones found elsewhere.

This is the Ukraine and there is a twist to the above - The President's daughter or cousin twice removed would like very much indeed to build a swanky resort on the coast for the wealthy or just those with big bags of 'don't ask where this came from' cash. So if we can collect important data re-wildlife and endangered species etc then just maybe the rich and famous will have to lounge in Mallorca, not Kinburnska.

Of course Wolf Camp is plumb bang on the best resort spot going. Strange that.

Jellyfish have gone home to jelly land and the sea is void of these fun spoiling monsters. Does anything eat jellyfish (answer: turtles do)?

Orest and I got stuck, the Land Rover straddled on a sandy ridge in the boiling midday sunshine - oh well shovels and sand ladders, jacks and grunts, we are almost experts at it.

Volody found some wolf scat, it had eaten wild boar. Hassled the tractor driver today to plough the new transect. He flashed a full set of gold teeth and promised to get straight to it tonight.

Bird Camp collecting mussels and cooking them in embers from the fire. They requested white wine and garlic, maybe tomorrow they will request a waiter.

28 August

Racoon Dog in headlights. Apparently they were a common, albeit introduced, species on the peninsula; shooting soon took their numbers down. A guy from WWF told me he manages two wetland projects in the Danube Delta, one 10,000 hectares, the other 2,500 hectares - The Landscape Park on Kinburnska has 12,000 hectares of land, and that is a maze, so I guess The Danube Delta must also be a confusing swath of geography. The jackal has established itself there along with the European wildcat. The jackals swam across the Danube and have established themselves near Odessa, and it is reasonable to think they may swim to Kinburnska one day.

Saw a lot of nightjars in the headlights, a lot of hares, but nothing else. Vipers everywhere. Pig tracks galore.

Going to the other end of the peninsula in a few days to look for wolf tracks, see if they are established near the Biosphere reserve.

29 August

Saw the reed beds on the Dnieper estuary, behind the forestry buildings - before the river was dammed upstream they flooded every spring, but now there is not enough flood water and a channel has been built from the beach into the reeds - every spring it is opened and huge wild carp come in and spawn amongst the reeds. Small fish attract pelicans and other birds. But the fishermen complain the pelicans eat their catch and the Ministry of Fish and No Pelicans and Ultimately No Fish has banned the channel being opened this year, but the fish came anyway and were hauled away in nets; the pelicans ate cake.

31 August

Went to a Biosphere Reserve somewhere about 4 hours drive East - 36,000 hectares of virgin steppe and a breeding centre for the endangered Mongolian horse whose name I can't spell or pronounce. So successful has the breeding been that 30 were recently sent back top Mongolia (as Mongolia very efficiently exterminated most of its population).

Back home driving through the bumpy steps of Kinburnska late at night we spotted two white eyes staring at us, maybe a wolf, not a pig, that would have been off into the reed beds sharpish. We checked the sand, two separate tracks, two wolves within the last hour had passed, clear tracks with clear pad prints. Volody will be pleased.

1 September

Bee Eaters and Tree Frogs make a dawn chorus. Picked up Orest for the red eye run to Kherson train station. He has more wasps' nests at his house than all the black money in the local hotel.

2 September

Zinovy hacked around the steppe, found wolf crap and two sets of tracks - things looking good. Saw the white tailed eagle again.

Orest and I went to see the Scythian burial mounds on a barren salt plain where you can see flatness in all directions, interrupted occasionally by the odd grassy bump. They are said to be 4000 years old - saw cows on one, and on another a cemetery full of crosses and bright plastic flowers - the locals now use it, just as the Scythians may once have had. A few men were digging a grave and smoking cigarettes.

A few days ago we saw a stone statue, weathered and worn by the elements. There are seven of these statues, each more than 1000 years old, all looking eastward. On Easter Island all the statues look inwards, but I forget the rest of the story.

The moon is getting fatter by the day and Mars is still shining lamplight yellow. Found two dead dolphins; the seagulls think they taste just fine.

3 September

Weather changed. Raining for frogs. Went to the local SaHa, knee deep in mud, a real swampy quagmire, this place is huge, a lost world of reeds, rushes, tall grasses, bogs, beastly nettles, pigs tracks and pig wallows, no one comes here - it is almost impossible to walk without sinking with every step. Alders, willows, acacias, elders, wild garlic, and burdock are a few names in this jungle I know. Saw a great zebra spider, no zebras though. Some frogs, unknown, hopped out of my way, that makes three species I've seen counting the tree frogs and the sand frogs at Wolf Camp.

Bought some honey from Orest's neighbour, thick, deep syrup from the acacia tree flowers that grow all around this SaHa.

Nearly time to buy a cow or sheep or dog or horse or Team Member to drag around the peninsular and attract the wolves to trigger the passive infared and record onto film.

4 September

Drove Wolf Camp around at night (driving very carefully in accordance with The Great Off Road Charter 2003 - a book I keep along side my stamp collection, antique Toby jugs and scrabble set), countless hares and nightjars, maybe a fox or badger, no wolves or pigs, no raccoon dogs or roe deer.

This morning the Wolf Camp temperature read 12.9; I strolled to the sea, it measured 18.3 - so best sleep in the water for a cosy night if you forget your sleeping bag.

Good light for photography today, contrast, clouds, shadows and definition, unlike the bleaching sun of previous days.

Dropped off Wolf Camp at the top end of the old transect - a great place on the Dnieper estuary. Picked them up later at the South end on the bay - another great location with a lot of herons hanging out on the seashore. They found wolf prints at the top end, a young animal had passed that night.

A plane flew overhead, a twin winged job, like the planes from WW1, same sound effects too - apparently they are still made. It likes to land on the orchid fields as it is an easy landing strip. Zinovy goes crazy. If you see a plane full of bullet holes rotting in the sand, just think of orchids and conservation, try not to think about the carnage littering the bleached sands of Kinburnska.

Such is life in Ukraine. And it is cold now, people requesting blankets. Bring a hot water bottle - and the hot water.

6 September

Saw an huge grasshopper, Saga Pedo or something or other, the largest non flying grasshopper around - and very, very rare.

(8 September

Sieglinde Dittman puts in her thoughts: My first day in Bird Camp. Yesterday Petro showed us how to pick up birds out of the net. Now it is 7am and it is my turn to do it. I am stressed, and the bird is stressed, too. I have got one going out of the net, the other is still there. Oh no, I can't believe it - they are both in the net! I have never held a bird in my hand. In childhood there were frogs, hamsters, rabbits and dogs, but no birds. Will it be painful for this little friend? Then he is free of the strings - and in the same moment free in the air! OK. I think we will meet again in the next three days! We bring 15 birds to Petro, how to call them, nobody knows without Petro. Luscinia luscinia*,* Sylvia borin*,* Sylvia atricapilla*,* Ficedula parva *and* Lanius minor *- at the end of the day I can distinguish between* S. borin *and* S. atricapilla *and I know, why all the members of Bird Camp are able to declare clearly -'This is a Shrike!' In the evening we count: 70 birds were ringed, measured. Not bad.*

I had a nice, interesting time, was lazy in the middle of the day with sunbathing and swimming. After the days in the Wolf Camp (also interesting, but more activities) it is a good recreation before starting work on 17th September in Dresden.)

9 September

Last night set up night camera with movement sensor and infared outside a jerboa bolt hole. It took an age for me and a TM to get the settings right, a trial and error routine until we thought the trigger was
correctly positioned. Volody tutted that it would not work, technology etc etc...
We returned this morning to find a short film of a jerboa, the first ever recorded evidence of this subspecies occurring only on the Kinburnska peninsular!

I found Volody looking at small wolf tracks on the new transect very close to the beach and Wolf Camp. I nonchalantly passed him the camera, seemingly uninterested in the matter, and waited. Volody saw a ghost, or maybe God, went goggle eyed, jumped with joy, kissed the TM, hugged me, and became a scientist who had been looking for something never really believing he would find it, and now there it was on film at last. Maybe he was just plain in love or something. I left before the vodka was produced - this party may go on for weeks.

10 September

No badgers again. They are a subspecies invisible I think. All these late nights and early mornings - I need a holiday.

Marsh Harrier flew into garden looking for sparrow breakfast - sparrows got away just in the nick of time.

Bird Camp can't catch fish. That is science. But they can cadge a few herrings or something from a local fisherman. Petro marinated them in some Black Sea delicacy and left them out all night. In the morning they were gone, gobbled up by...Orest's dog?

Full moon tonight. Wolf Camp howling and setting camera up in the reed beds. I'm having a night off - after all there are wolves out there!

Milked Orest's cow. Prefer to buy it in a bottle myself. Actually I only pretended to milk it so I could say I have if I ever go to a milking maids' party.

One last thing: Why do they call it The Black Sea? Nobody here can tell me that. Can you?

11 September

Sparrowhawks and Marsh Harriers dive bombing the bird nets - one small bird eaten alive.

Wolf Camp did not film a thing - too dark, too near hay makers, too rubbish at operating camera, maybe they never left the camp fire!

Took Bird Camp on a tour of Yagorlitski Bay, went deep, long way out to the edge of the Biosphere Reserve, no houses, no people and no forest. There are acres and acres of salt and sand flats, dry lagoons, muddy lagoons, water lagoons and steppe. The salt producers forbid the forest to be planted around the salt pans, and now there is an eerie, desolate landscape, a surprise from the endless pines, planted without thought for the environment. I drove around this beautiful landscape, with red salt grasses and reeds. A real treat to be here. In one dried out pan I counted at least 30 pigs crossing - no wolf prints.

Petro counted herons (11 million and three), red shanks, hobbies, red footed hawks, egrets, the lesser spotted dolphin catcher, so many birds - how does he remember them all? I say 'Mmmmmm, yes Petro, left or right here?'

Got the Land Rover stuck, eel grass proved slippery, too slippery, wheels spun, dug in, under eel grass - shale, sand. Glue?

Two TM's fascinated by the procedure of sand ladders, spade and jacks. Twenty minutes later back on the eel grass and wriggling back to camp.

11 Buzzards and an Osprey with a fish. Not bad for a day out.

Wolf Camp wanted more filming. Back to badger the badgers. Simple use of sensor - placed it on the ground outside the hole. No playing about from 10 yards!

Full Moon, cloudy sky, cool wind. Saw a boy in a woolly hat and warm coat - does he expect snow? I stopped to give him a lift, but he smiled and walked into the forest and the oncoming night. I've noticed the locals drinking more than usual, hotel shut up - it gets to minus 20 in the winter and plus 40 in the summer. What do you think that does to you?

13 September

I could write a lot about today, but I'll keep it clean, give you the washed and well scrubbed version, no I won't, I'll talk about wildlife and the such. So, second slot, very rare wildlife and should really be in a zoo, or at least in a cage, have gone. They enjoyed themselves, might have even liked me a bit, but probably not - got roaring drunk last night -some danced (I hid under the table) and decided to donate good money into the artificial bird breeding islands on the salt pan lagoons. Zinovy was well pleased, gave a lecture in Russian, Petro translated and was also over the moon at this generous offer. Six islands are to be built in the high saline lagoons.

Went to Nikolaiv zoo today, saw the elusive badger, not like the UK's at all, smaller, sleeker and rather pretty. Saw wolves, yes wolves from Kinburnska - two young and fine looking wolves that Zinovy rescued from the hunters. I said hello, tried to chat, but they looked away, gazed at freedom through iron bars and ignored my interest. Do you blame them?

Back on the road, night, dark night - saw a fox and then a stoat - dodging hedgehogs and it started to snow, piling down and covering the windscreen. Not snow, but moths, millions of them wasting away on the glass. Never seen anything like it, nor had Orest.

Back on the peninsula, a jerboa frozen in the headlights - we stopped and it gave us a performance for about two minutes, its long tail looking like a really long tail!

14 September

Kinburnska deserted, a wind-swept barren landscape with weather to match - last night it rained and poured and blew the house down, well almost - Bird Camp flattened. Tents twisted, poles dislodged, gazebo demolished; Petro, red eyed and blasted, peered out of his tent at midday followed by the base camp dog. Was a wild night at Bird Camp. I repaired the mess and staked the tents down with the gazebo poles. Talked to Zinovy - asked to use the old fishing hut in these windy gales.

Saw a bird soar, high as a kite, but not a kite, Osprey I think, and yes it tucked its wings up like a three dimensional W and dived to the water, snatching a small something from the lagoon. Never seen that before.

I think today, a rare thing some may say, about what I've done here. First comes to mind is the Land Rover, the valuable experience of driving this vehicle in very difficult terrain. Next comes the GPS gear and video gear - learned a heap about that, and radio equipment. The wildlife - I have spent a lot of time tracking on foot and think that is the best way here, to spend days on end walking, looking, checking - there is a lot here, hidden in the trees, reeds, the SaHa and steppe, waiting for a moment when we are all asleep or round the corner to sneak out, because that is what they do - sneak from the huntsman and his dogs, and the Land Rover I expect.

15 September

Saw two foxes last night, one with a black tail.

Weather is miserable, raining and damp - good for frogs.

18 September

John - you missed a treat - I forgot to tell. On Kherson red-eye run I followed Zinovy on the sand; he hit floor with me following, sand skating across the steppe as the dawn cracked and I woke up. He tried to leave us standing - no way - I was wide awake by tarmac! He now thinks I'm OK, one of the lads, except I don't drink vodka but he's got over that.

So, interesting day yesterday. Took Wolf Camp on an extended tour. Looking for wolf tracks elsewhere, try to get a picture of what is really happening to the wolves in this area.

Went to the Salt Works, acres of dry pans, glistening in the morning sunshine, the place I had seen so many pigs tracks. Zinovy came with us, seemed really interested in the day's agenda and agreed to help in this survey of missing wolf tracks. First stop was a wildlife enthusiast who lived by the tarmac - he had not spotted wolf tracks on the peninsular for at least a week, but a calf had been taken two weeks previously in this area.

Next we drove to the Biosphere Reserve between the salt pans and the burial mounds, crossing the protected vegetation and, on finding a fire tower climbed it for a panoramic vista of the peninsular. Red deer still roam this spot.

We found a warden and Zinovy established that wolves were in this area, but seldom passed into Kinburnska these days. He had heard wolves howling near some vegetable fields and pointed the way. We soon found tracks, a pair of young wolves, and some shit full of water melon seeds - the warden had been right.

Next on the list we drove to an old village, 2700 years old to be exact, where pottery had been produced, now it was only sand dunes with ceramic pieces scattered around from the robbers who still dig for treasure.

Driving on the beach through the eel grass we saw the same two wolf prints heading towards the mainland.

Into the bleak, windswept plain where the burial mounds stand the test of time and cultures - across the empty fields to a sanctuary that used to belong to the Scania Nova reserve, a vast steppe land with shepherds and nothing else. We saw another pair of wolf tracks - making the total number of the day 4.

Across a huge forests, bigger than the whole of Kinburnska and there we found 4 wolf tracks - now it is 8 wolves for the day.

© Biosphere Expeditions, Sprat's Water, near Carlton Colville, The Broads National Park, Suffolk NR33 8BP, UK.
T: +44-1502-583085 F: +44-1502-587414 E: info@biosphere-expeditions.org W: www.biosphere-expeditions.org

And to round things off we ended up in a peat bog wetland reserve - Karda Shinski, battling through reeds 4 metres high, a jungle quagmire of bog, water, reed, sedge and nettles where it was impossible to see for more than 2 metres in any direction. This is the home to a small colony of pygmy cormorants and beaver. I climbed a tree and saw reeds to the horizon in every direction and imagined the mosquitoes, wanting blood for free. Zinovy had done research here on the pygmy cormorants but now seemed more interested in finding the claw traps used to hunt beaver - we found two of the iron crushers and took them away.

Zinovy claims that the bottleneck that makes up the peninsular has a twofold effect on the wolf - it can get the game that wanders into this area as things tend to get stuck here, but it is also a really good place for the hunter, a place where everyone knows everyone else, everyone is married to a cousin at least, the geography makes for easy hunting where wolves can be forced into a desired area by the use of vehicles and find themselves trapped by the sea with no way out except through the hunting net. Now wolves are savvy to such things and tend to sneak in and out without settling.

Anyway, back to business - there is a head, whose head I don't know, sitting in a bag in the LR, ready for something's dinner, maybe a lone wolf, maybe a fox. We'll give it a go - let you know.

Yargorlitski Bay tour for Bird Camp, checking for birds in the shallows and lagoons. Herons, egrets, Montague harrier or eagle or something, bee eaters and a steppe eagle - carefully identified with books and boffins - a very rare sight here indeed, just one hanging around. They have not been seen for years.

Bird Camp keep catching Devil Head and Hawk Head Moths in the mist nets. They went fishing in the lagoons using an old net, planned the net position with regards to the herons eating breakfast. Science and fishing don't mix, they caught a few tiddlers.

Abundant pig tracks and diggings in the dry mud ponds - and a wolf tack, maybe a few days old - took a photograph. Found a giant jerboa hole near the birch groves.

Wolf Camp went to film the badgers at night, a moody dark twilight, a few spots of rain, problems with the sensor, but we really aborted the mission as I did not want to leave two TMs on a black night with poachers blasting 500m away; they hacked up the transect in a black Discovery with the plate covered up and stopped, examined the goodies and drove off. Orest phoned Zinovy, who needed the plate number of course. Better safe than sorry.

I have a different idea for badgers. Sit up on a dune on a full moon with night sights, camera at the ready, the infared light set by the set entrance and once we see activity start the camera rolling. Maybe at least find out if they are different to mainland badgers. Problem is the infared battery only lasts 3 hours and we have one only. If badgers decide on a sleep-in we're stuffed as we have to set it on and then walk away..no radio control.

Giant spider in loo, getting bigger, fell on my head, the fat bastard could hardly move as it has eaten so many flies.

Black Discovery nearly ran a TM over on the beach this morning.

Found fresh wolf prints on the steppe.

Weather warming up again. Mosquitoes must be really hungry now.

Ha! But now it’s raining again!

19 September

A very smart TM told me that the Black Sea is called such because the Greeks quite ancient set sail in this jelly sea, and experienced dark nights, storms, monsters, but no wolves and, I suppose, shit their pants and called it the Black Sea. Volody reckons that the weather was much worse in the old days and perhaps it really was a Black Sea.

Saw a very small roe deer near Bird Camp, it hopped and skipped into the grass clearly displaying a black stripe down its back.

Sunset through charred trees and a textured sky, looking like a sombrero, fire orange and melting into the Black Sea which is quite blue.

Dragged the head around, down the new transect, staked it into the sand - god it stinks -eyes and tongue lolling - set the camera up and came back this morning.

Nothing on film but fresh wolf tracks very close by to now really smelly head. Get the TMs to crawl across the sensor near the vile, rotting flesh, just to check it works; I pretend to be technical, in charge, just so I don' t have to gag by the wretched thing.

What will eat this? Could anything but a maggot find it delicious?

Maybe tomorrow a wolf. Volody assures me the wolves will dine with pleasure!

20 September

No wolves of course - but tonight the camera is drying out as condensation has turned it off - a dark night, two pairs of eyes stared at us in the headlights, and last night a TM saw large eyes in the burnt forest.

No filming, so do you think the cow's head will be eaten?

Orest told me that 7 years ago petrol was so scarce that no one had cars in Kinburnska - horses and carts were in use and there were over 70 horses used for transport. At that time no roads criss-crossed the peninsular. He used to bring the cows in on horseback and twice caught 4 wolves chasing the cattle; he lost 2 large cows and two calves to wolves. Once petrol became available the horses became sausages and now the horses left are semi-wild and their offspring wild.

21 September

Head still there - minging or what!

The bait station area is called Joshua's Dunes. Volody says Joshua once owned them but has now moved out due to the smell.

A boat is cruising the beach, an old gun metal grey trawler. They shoot the birds coming out to sea. Volody phoned Zinovy but the police don't have a boat and were out to lunch - dining on shell duck no doubt.

25 September

No Wolves!

A TM saw a wolf in the burnt forest, a fleeting glimpse of a young wolf disappearing into trees.

Got Wolf Camp doing a badger set/hole count - recording locations of holes, footprints and activity. Maybe next year a full count and numbers can be established.

Saw a badger toilet, been eating apples.

And then saw a badger close up. Not like European badgers, this one fat and small, all dark with a flatter face - not like the one in the Gola Prista museum. So maybe it is a subspecies. DNA testing through scat?

Petro wants to move Bird Camp to the top spit next year. Good spot, Zinovy agrees.

Dolphins along the coast every morning - swimming not washed up!

Weather is good, warm and dry.

26 September

No wolves on camera!

Took TMs to Berisan Island by boat. The Greeks settled there in 640 BC and had a temple for travellers. Homer Simpson is supposed to be buried there.

Well we did a viper count - zero - they don't like the Greek cooking. Plenty of grass snakes in the sea - where was the grass?

And then we did a cormorant nest count - 1600 - really. They have only been nesting for two years. And some gull, red book, the lesser fish eating spotted I think. Zinovy wants to get the Island into the Kinburnska Park. During the winter months the sea freezes and animals come to Berisan, and we saw evidence of fox. Berisan means Wolf Island, and we suppose wolves used to trot across the ice for a visit.

Saw loads of dolphins on the boat journey. Zinovy told us that Kinburnska Peninsular means 'Cape as thin as a hair' after the thin spit near Okchakiv.

And I saw wolf tracks by the black mud bath, they were wet and fresh and ten minutes later dry, must have frightened the two wolves off seconds before I arrived.

Well it is over. Nowt to say but bye --so bye everyone.