The National Academy of Sciences of Ukraine
The Ministry of Education and Sciences of Ukraine

Melitopol State Pedagoagical University named after Bogdan Khmelnytsky, Institute of Biodiversity Research of Surface and Water Ecosystems of Ukraine, the Azov-Black Sea Ornithological Interdepartmental Station of I.I. Schmalhausen Institute of Zoology of National Academy of Sciences of Ukraine and Melitopol State Pedagogical University named after Bogdan Khmelnytsky

Scientific Report

on Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region. Development of the Reasoned Expert Judgment (within Agreement № 1n dated 06.06.2011).

Melitopol 2012

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"Approve" _____ Director of LLC "EUROCAPE UKRAINE I" Peter Justin O'Brien	**"Approve" _____** Rector of Melitopol State Pedagogical University named after Bogdan Khmelnytsky professor V.V. Molodychenko

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Chapter 1. General description of the Wind Park area.

1.1. The territories and the place of location of the planned Wind Park plots.

Administratively the Wind Park plots and adjacent areas 1 km away are located within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region.

According to the project documentation during the study the Wind Park area includes three relatively separated plots (Annex 2 to Agreement № 1n/06-11 dated 06.06.2011) - fig.1.1:

The first plot is the adjacent areas within the territories of Mordvynivka Village (Mordvynivka Village Council in Melitopol District), 20 wind turbines;

The second plot is the adjacent areas within the territories of Dobrivka Village (Dobrivka Village Councils in Pryazovske District), 30 wind turbines;

The third plot is the territories between Girsivka Village (Girsivka Village Councils in Pryazovske District), Dunaivka Village (Dunaivka Village Councils in Pryazovske District), Divnynske Village (Divnynske Village Councils in Pryazovske District), 127 wind turbines.

In the area of the Wind Park 200 wind turbines with total power of 500 MW are planned to be located. In the West of the area the Wind Park borders on the Wetland of international importance the Milk Estuary which is located 4-6 km distantly from it (fig. 1.2). On the other parts the Wind Park plot is surrounded with agricultural lands. The Wind Park plot itself is located at agricultural lands and agricultural hedgerows. The most part of the area consists of various agrophytocenosises (agricultural fields, agricultural lands which are not cultivated for now) with unpredictable crops rotations. Forest plantations consist of agricultural hedgerows including species composition of trees plantations, width and shrub layer. Essential part of agricultural hedgerows are on the decline because of essential man impact (deforestation, fires) leading them to essential degradation. Natural steppe vegetation is well persisted only within agricultural hedgerows and separate the lower reaches of the locality (ravines and small streams canals – the Dzakelnja river, etc.). The only inconsiderable in area the woodland (46,5 ha) is located in buffer zone to the plot at the territory of Mordvynivka Village Council and consists of minimum species composition of trees and shrubs.

The road infrastructure within the plot consists of local importance roads locating mostly alongside of agricultural hedgerows.

Studies of the planned Wind Park in Melitopol and Pryazovske Districts indicated that here the area here mostly consists of dry arrable land with surveyed field-protecting agricultural hedgerows. The important agricultural activity are tillage and cattle breeding. Natural formations which bats can use as diurnal places of safety are absent. Therefore basic places of these animals centering are forest plantations, inhabitable and utility constructions in villages.

The disposition of the Wind Park area is represented at the sattelite photograph from anthropogenic landscape positions (fig.1.2).

1.2. Physical-geographical division of the territory into districts and buffer zones.

The territory of Zaporizhia Region pursuant to physical-geographical division of Ukraine is located within steppe zone. The research territory including the Wind Park area and buffer areas up to 5-20 km are part of the Central steppe subarea and the south-west steppe slopes of the Azov Seaside height.

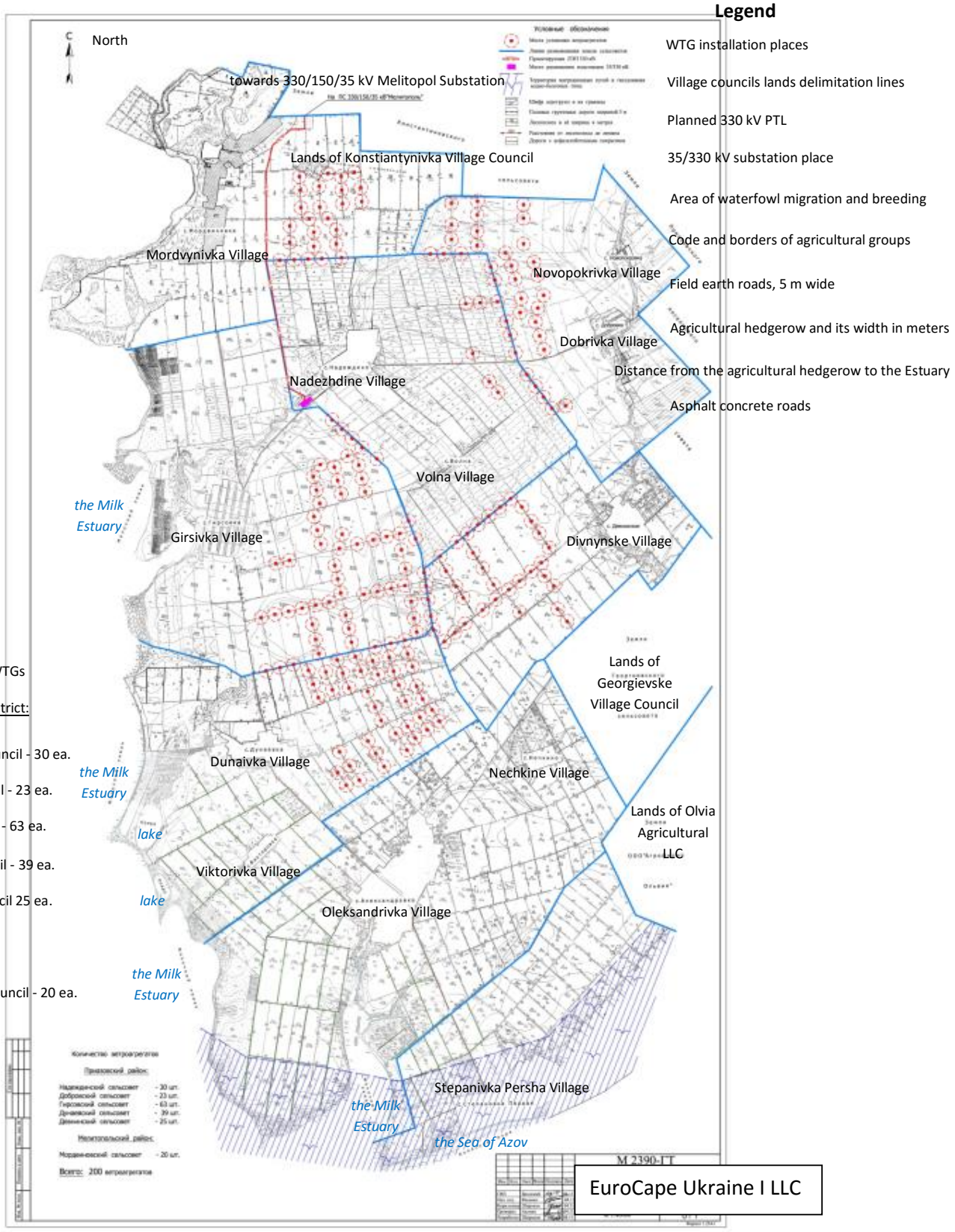


Fig. 1.1. Project scheme of the Wind Park location within Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region.

Fig. 1.2. General location scheme of the Wind Park plot at the sattelite photograph

The area of south-west steppe slopes of the Azov Seaside height attains the south-east up to the Azov Sea. Its landscape structure consists of average analoges of all areas of northern Pryazovske steppes, i.e. from the higher Ostantsevy near the water-devide to the coastal areas. Notable wide terraces on the left bank of the Milk river downstream. Holes variety don't indicate of the region extention. Its territory is an approximately 40-km zone of south chernozem soils outspread at south-west slopes of the Azov Seaside height extending at more than 100-km ark from the rear seam of the right-bank bottomland of the middle Tokmak and Milk rivers downstream to Berdjanska and Obitochna spits. The region area is approximately 4500 km^2. The whole territory is located in the south-west of Zaporizhia Region.

The area is completely located in the Azov Sea Basin. Rivers draining this area have steep fall of the profile and strong erosive impact. Clay court is southern middling and heavily eroded chernozem soils, on bottoms of ravines and across thalwegs of other erosion forms deposited, often meadowy and слабоглеєні. Delluvial slope holes and summits of erosive circuits are tilled, they have vegetation of agricultural lands, erosion-preventive plantation and crops of permanent grasses. Nature vegetation (wheat grass, fescue, feather grass, wormwood, spurge) which is heavily degradationed under the influence of livestock pasture has persisted at the steep slopes of ravines and their bottom. On the periphery of the height slopes the gully ravine lands go over the valley ravine lands. Low-level localities of the area are divided into parts by gorges. Erosive slope localities are expanded alongside of the river valleys. All lands of the rivers' benches are tilled on the forests. Vegetation of partly allied steppes of fescue and feather grasses is replaced with agricultural crops of grain crop rotations.

Localities of the sea benches in the area of south-west slopes of the Azov Seaside height consist of late Pliocene (kujalitska) bench. This seaside part of the are consists of lowlands plain with absolute heights of 30-40 m. Shield rocks are covered here with the Neogene marine deposits. Structural basis is formed by clay deposits of Sarmat layer and overlying them late Pliocene argillo-arenaceous stratas. Higher quaternary heavy loess-like loams with thickness of 15-25 m lie. The locality is divided into separate holes of flat interfluves by streaks of erosive cut. South few-humus chernozems with vegetation of agricultural lands are expanded on the flat interfluves.

The localities of the modern sea plains don't have solid clay vegetative court in pursuance of the special structure of surface stratas (sand, shelly-clactic material) and juvenility of the plains consisting of beach belts and continuing their being in the process of re-formation. Fragmentary clay court forms not completely developed differences of cespitose soils taken with saline variants. Vegetation is sedge cerial and xerophyte galophyte (foxtail, arenaceous cumin, glassworts). The given localities include lands of spits, beaches and solonetzes.

The Milk Estuary Wetland is a natural area, it is of particular importance for the research area.

Typical landscape and biotopical elements are aqual biotopes, meadows, water meadows, salt marshes, ravines with shrubby vegetation, spits and islands. Landscapes of the Milk Estuary Wetlands belong also to Prysyvaske-Pryazovske low-lying steppe of dry steppe landscape subzone and follow the law of geographical географічної zonality. Generally the area consists of one of the lowest ordnance-datums of steppe zone of Ukraine, the least quantity of atmospheric precipitates, maximum evaporativity, minimum indexes of relative air humidity and surface runoff.

1.3. The territories of natural protected pool

The only area of NRF is the Milk Estuary Wetlands of International Importance, it is located within the Adjacent Areas up to the Wind Park plot.

The estuary is recognized to be the land of international importance which is protected by the International Ramsar Convention, therefore activity within the land is subordinated also to regulation of cabinet council of Ukraine dated 23.11.1995 №935 "About measures on Conservation of Wetlands of International Importance" and regulation of cabinet council of Ukraine dated 29.08.2002 №1287 "About order of assignment Wetlands status of the Wetlands of International Importance". As a result of establishment of Pryazovsky National Natural Park (decree of the President of Ukraine dated 10.02.2010 № 154/2010) the Milk Estuary Wetlands became its part.

The most important in ecosystem terms are the shore sea abrasion and accumulative (old and modern benches) landscape complexes with different biotopes and also riverine landscape complexes with relatively persisted natural steppe and flood plain vegetation.

Mouth lengths of the small Pryazov rivers play a special role where environment contrast entailed emergence of unique Wetlands landscapes, the existence places of many waterbirds all the year. The very mouth lengths play almost the most important role in supporting birds species diversity. Besides, the rivers and ravines which flow into the estuary are ecological landscape corridors which join Pryazovsky massif with the shore territory.

The adjacent to the estuary watershed spaciousnesses and benches above the flood plain where agricultural activity is developed intensively and also some right bank areas which are altered as a result of reactionary activity are antropogenically changed.

Special feature of the Milk Estuary ecosystem is specificity of its saline conditions under semiexposed conditions. Contact of water and terrestrial environments makes the researched area one of the most important at north of the Azov Seaside north-west.

Vulnerability of the Milk Estuary is high enough which accounts for the abrupt change of stream conditions depending on the level of its connectedness with the Azov Sea and as a result – change of biological diversity and fish capacity.

The Wetlands of international importance "the Milk Estuary" (is included in register of the Ramsar convention) is important element in generic structure of ecosystem of areal, national and Pan-European levels.

Landscape structure of the area within the Milk Estuary Wetlands assemble 5 localities (fig. 1.3):

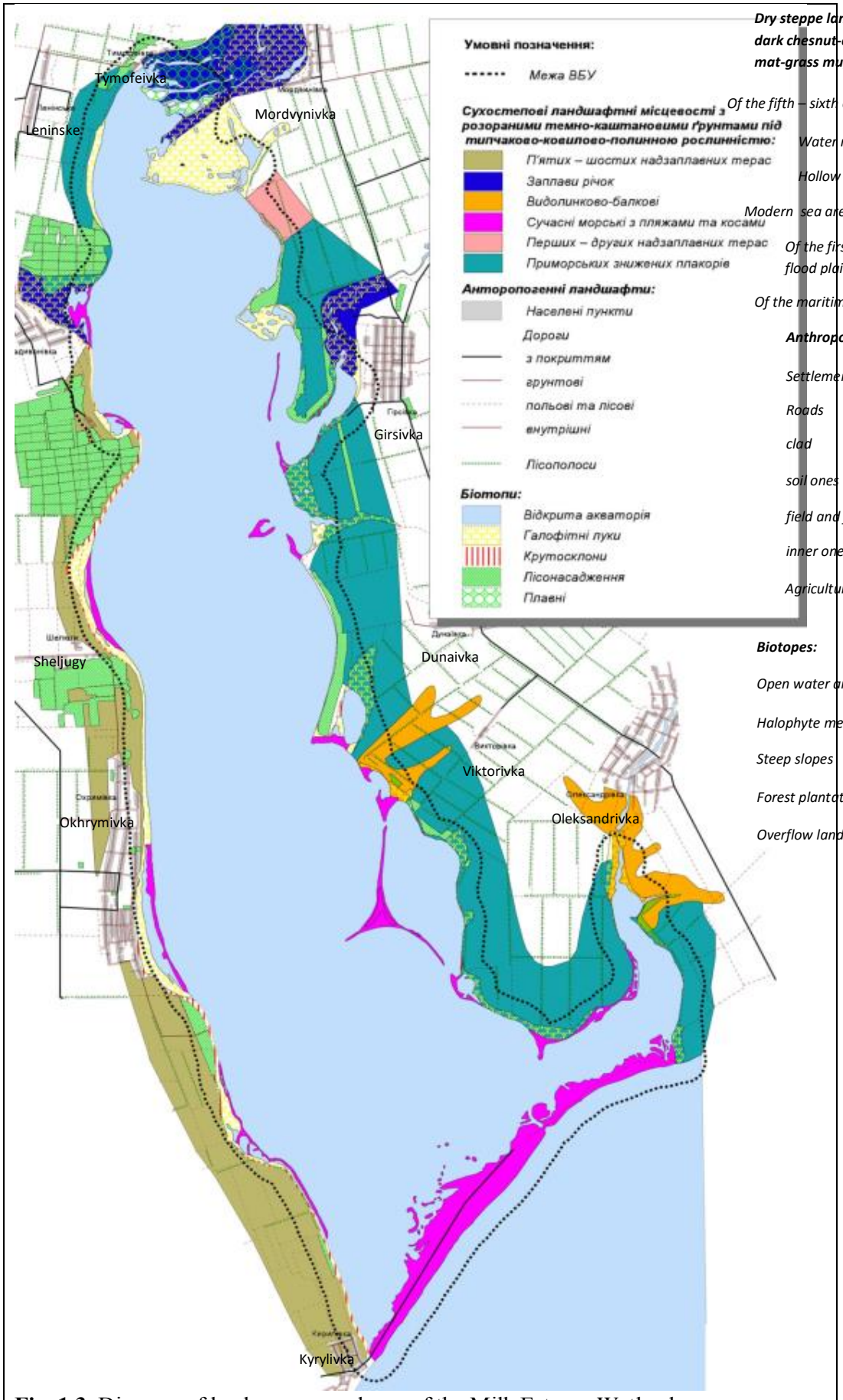
- the localities of the river benches. *Typical biotypes:* clay precipices, remains of the steppe vegetation at the slopes, artificial forest plantation at the bench slopes at sands alongside of the right bank, salt marshes, pastures and greenlands, old gardens, recreational buildings of children health centers;
- flood plain localities (the wellhead part of the Milk and Taschenak rivers). *Typical biotypes:* sand silty beaches, meadows, shallow waters, deep-water plots of the riverbed, tangle rush and water-swamp vegetation;
- localities of seaside coastal halogenous plains (stretched on the spits). *Typical biotypes:* saline cavities, tangle rush in coastal part, sand silty beaches, shallow water, islets, buildings. Big accumulative islands (Pidkova, Dovgyy) allocated alongside of the estuary left bank enjoy the status of separate landscape locality. *Typical biotypes:* shallow water, depleted vegetative covering, parterre rush tangle;
- seaside abrasive localities alongside of precipitous estuary shores. *Typical biotypes:* sandy clay precipices, sand silty beaches;
- seaside abrasive halogenous localities (alongside of left bank of the estuary). *Typical biotypes:* shrub brake, forest hedgerows, solitary trees, saline swamps

Natural importance of the Milk Esture consists of the next positions.

1. Biological complex of water-swamp land is sufficiently variegated and includes:
   - 274 species of birds (112 species build their nests, 213 are marked in migration period, 98 are marked in winter period) with total amount of birds in different seasons over 250 thousand of specimens;
   - 700 species of vascular plants;
   - 33 species of fish;
   - 2 species of amphibious and 6 species of reptiles;
   - 30 species of mammals;
   - more than 300 of species of other biological complex representatives
2. The Milk Estuary is important area for conservation of rare species of animals and plants:
   - 149 species of birds cover Pan-European Conservation meaning (SPEC). 15 species are protected by the International Union for Conservation of Nature (IUSN), 259 species are protected by the Bern Convention and 147 species are protected by the

Bonn Convention. 96 species are guard-protected by the Agreement on the Conservation of African-Eurasian Migratory Waterbirds" - AEWA; 41 species fall under the penumbra of the Convention on International Trade in Endangered Species (CITIES). Besides, 44 species of birds are booked in Red Book of Ukraine;

- 33 species of vascular plants are under protection at World, European and state levels. 9 species are put on the World Red List (IUCN), 16 species are put on the European Red List. Vascular plants grow at the researched area. 17 species of vascular plants of 439 are booked in Red Book of Ukraine;
- 33 species of insects are booked in Red Book of Ukraine and the European Red List.



Legend:

Border of Wetlands

Dry steppe landscape areas with tilled dark chesnut-colored soils under fescue mat-grass mugwort vegetation:

Of the fifth – sixth over flood plain terraces

Water meadows of rivers

Hollow and ravine ones

Modern sea areas with beaches and spits

Of the first – the second over flood plain terraces

Of the maritime reduced flat interfluves

Anthropogenic landscapes:

Settlements

Roads

clad

soil ones

field and forest ones

inner ones

Agricultural hedgerows

Biotopes:

Open water area

Halophyte meadows

Steep slopes

Forest plantations

Overflow lands

Fig. 1.3. Diagram of landscape complexes of the Milk Estuary Wetlands

Chapter 2. Legislative base of Ukraine concerning planning of works on design the Wind Park plots, protection of natural complexes and execution of expert works in connection with the Wind Park building.

2.1. Basic international and national normative legal schedule

During carrying out works and preparation of expert's report the international and national regulatory, legal framework and nature conservation conventions and agreements being ratified or supported by the state were taken into consideration.

At the international level in the scope of biodiversity conservation and monitoring, natural areas and their complexes conservation the most considerable and significant are:

- The Convention on Biological Diversity (Rio de Janeiro, 1992);
- The Convention on Wetlands of International Importance mainly as environment existence of Waterbirds (Ramsar, 1971, 1987);
- The Convention on Conservation of European Wildlife and Flora and their Natural Habitats (Berne, 1979);
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979);
- The Pan-European Biological and Landscape Diversity Strategy (Sophia, 1995).
- The Agreement on the Conservation of Populations of European Bats (EUROBATS) (The Law of Ukraine "On adherence of Ukraine to the Agreement on the Conservation of bats in Europe" — № 663–XIV (663–14) dated 14.05.1999)

At the national level modern fundamentals of legislation of Biological and Landscape Diversity Conservation in Ukraine are regulated legal acts of the state.

The first group consists of legislative acts which regulate legal relations concerning environment support favorable for Biological and Landscape Diversity Conservation:

- "Reference directions of the state ecological policy in the scope of environmental conservation, natural resources use and ensuring of ecological safety " (1998);
- "The Environmental Conservation Act" (1991);
- The Law "On Ecological Expertise" (1995);
- Land Code (2001);
- Water Code (1995);
- Forest Code (1994);
- The Decision of Ukraine's Cabinet of Ministers "On affirmation of Disposition on the State Environmental Monitoring System" (1998).

The second group is formed by the acts aimed at mainly conservation of biological diversity problem solving:

- Law of Ukraine on Nature Reserve Fund (1992);
- The Law "On Animal World" (2001);
- The Law "On Vegetation" (1999);
- The Law "On Red Book of Ukraine" (2002);
- Regulations on Green Data Book of Ukraine (1997);
- The Decision of Ukraine's Cabinet of Ministers "On Measures on Conservation Strengthening of Wetlands of International Importance" (1995);
- The Decision of Ukraine's Cabinet of Ministers "On the Concept for Conservation of Biological Diversity of Ukraine" (1997);
- The Law "On a Nationwide Programme for the Creation of a National Ecological Network in Ukraine for 2000-2015" (2000).

The third group is formed by the normative acts aimed at the materials structure and content of environmental impact assessment (EIA) for design and construction of enterprises, houses and buildings and other normative documents under the common group title "Windpower engineering:

- The structure and content of environmental effect estimates (EEE) on plants, buildings, houses design and construction (The Ukrainian Building Code A 2.2-1-2003)

- Wind Power Engineering. Plots for the Wind Park. The Wind Park environmental effort estimations (The State Standards of Ukraine to come into force on IV quarter 2012)

There are two **National** Programs as for biodiversity conservation, natural resources management, and ecological situation improvement etc. concerning sites of Wetlands of international importance and coastal environment. These are "National Program for Ukraine Ecological Network Creation for 2000-2005" as of act of Ukraine Sept 21, 2001 N 1989 III and "National Program for Azov and Black Sea Coastal Environment Conservation and Improvement" as of Act of Ukraine of March 22, 2001 N 2333-III.

As of **regional** programs, the National Azov District Nature Park creation foreseen by "Program of social and economic, scientific and technical as well as national and cultural development of Zaporizhia Region for 2000-2010" approved by Zaporizhia Region Council as of 08/12/1999 N1. Other than that, following programs are developed to be introduced in Zaporizhia Region:

1. "Zaporizhia Region Environment Monitoring Program"
2. "Environmental Management Program"
3. "Azov Sea Geological Information System Program"

Within task performance framework and international requirements as for species composition and seasonal distribution study of bats on projected territories of the Wind Park building and dangers for bat habitation on these territories and recommendations of 5th session of Parties conference (Ljubljana, Slovenia, 4-6 Sept 2006, EUROBATS MoP 5. Record Annex 9 Resolution 5.6 are the Wind Parks and bat population) directed on European bats population and their places of habitation conservation), agreement work performed in respect with the Resolution.

Given the Equator Principals in social and environment efforts Estimation frames as well as international directives and World Bank and International Finance Corporation Standards were taken into consideration on report preparation.

2.2 The legislative basis on work organization and performance for specific measures on natural landscapes damage or demolition prevention.

General Statutes

Work organization and performance for natural landscapes conservation is anticipated by acting Legislation of Ukraine. The significant part of the Legislation and legal acts of our state describes general statutes as for natural landscapes damage or demolition prevention.

Given Legislation of Ukraine "National Program for Ukraine Ecological Network Creation for 2000-2015" indicated that natural landscapes maintenance provided on 40% of Ukraine territories.

They are less modified on lands occupied by forests, bushes, wetlands, open spaces; the area is about 19.7 percent of Ukraine territory. Taking into consideration that 44 percent only of forests provide protective and environment oriented functions, it could be supposed that almost 12.7 percent territory of country is native natural.

The main purpose of the Program is to enlarge the area of native landscapes up to level that is enough to maintain the diversity of wildlife nature, to form the unified territory purposed for natural ways of species migration, plants and animal population expansion and natural ecosystem maintenance.

Special measures should be provided on territories of national ecological network concerning natural landscapes damage or demolition prevention as well as native plant environment included into Green Book of Ukraine, animal and plant variety included into Red Book of Ukraine protection, their habitat conservancy, due conditions providing for their breeding in natural conditions and settling.

To ensure the nature protection functions completion of national ecological system, following measures are foreseen by the Program:

1) Animal habitat conservancy on migration and wintering time and their protection measures providing;
2) Aquatic habitat extension for fish migration;
3) Plant species variety, animals and phytocoenosis breeding conditions providing at natural sites;
4) Wetlands of international and national importance protection;
5) To take measures for negative impact prevention at natural complexes elements of natural ecological system;
6) Conservation system implementation for natural complexes elements of natural ecological system maintenance;
7) Animal and plant variety of species conservancy is ensuring; taking measures for animals and plants migration support at nature and transport corridors crossing.

Under the Law of Ukraine on "Protection of the Environment" the task for environment protection legislation is to coordinate protection, management and restoration of natural resources, ecological safety insurance, economic activity adverse environmental effect prevention and elimination; conservation of natural resources, living nature genetic fund, landscapes and other nature complexes, unique territories and nature sites of historical-culture inheritance.

In accordance with article 5 of the above Law, the following resources fall down under state protection and regulation in the territory of Ukraine: environment as integrity of natural and social provision and procedures, natural resources both as involved in state ownership and which are not used in state ownership at specific period of time (land, entrails of the earth, water, atmospheric air, forests and other plants, animals), landscapes and other natural complexes.

Taking any measures concerning protection, rational usage and fauna reproduction as well as pursuing any activities which may have impact on wild animal environment and fauna status, the following requirements and principals have to be met:

- conditions conservation of type and population diversity of animals in wildlife;
- inadmissibility of environment deterioration, migration routes and breeding conditions of wild animals.

Animal life protection is pursued in the following way:

- protection of environment, breeding conditioni and migration routes of the animals;
- prevention of animal death in course of performing any manufacturing or production processes.

Article 39 of the Law "Protection of environment, breeding conditions and migration routes of the animals" says that:
"Enterprises, companies, organizations and citizens in course of performing any activity that have impact or may have impact on fauna conditions should take care of environment protection, breeding conditions, and migration routes of animals.
Thus natural landscapes should be preserved.

During ecological expertise of acting objects, plant building and reconstruction projects, facilities and other units providing, new technic, technology, materials and substance the impact on animal life, environment, migration routes and breeding conditions should be taking into consideration.

The Law of Ukraine "About plant life" Article 5 "Main requirements on conservancy, environment management and recreation of plant life" foresees that on activity that may have impact on conservancy, environment management and plant life recreation following requirements should be met: conserving wild plants and natural plant units' habitat conditions.

As for Azov seashore landscapes conservancy, a number of measures are foreseen by "National Program on Azov and Black Sea Environment Conservancy and Recreation".

The purpose of the Program is to develop state policy, strategy and measures directed on anthropogenic influence on Azov and Black sea environment prevention, ecologically safety activity development assistance on Azov-Black sea region, sea biodiversity and resources conservancy and recreation, favorable environment creation for habituation, health promotion and recreation of population.

Following priorities to solve main problems of Azov and Black sea ecological state are determined by the Program:

1) marine environment pollution level and anthropogenic influence on their ecosystems decreasing;
2) human health risks related to sea and seashore pollution decreasing;
3) biodiversity, natural landscapes, costal, biological species habituation conservancy and recreation, wildlife area, protected woodlands extension, national parks creation;
4) seashore demolition prevention and coastal territories conservancy;

5) integration of rational management of nature in water conservation zone of marine environment, coastal area, territorial waters of Ukraine;
6) monitoring system upgrading for estimation of natural and anthropogenic influence on environment.

Other than that, Water Code, Land Law and Forest Law of Ukraine foresee number of measures directed on natural landscapes demolition as indicated in following:

Natural landscapes of international importance are created in accordance with international agreements of Ukraine, in particular Convention on the Wetlands of International Importance Especially as Wildlife Habitat (995_031) (1971), Convention Concerning the Protection of World Cultural and Natural Heritage (995_089) (1972), Convention on the Conservation of the European Wildlife and Natural Habitats (995_032) (1979), Convention on the Conservation of Migratory Species of Wild Animals (995_136) (1979), Convention for Black Sea Marine Protection from Pollution (995_065) (1992), Convention on the Conservation of Biodiversity (995_030) (1994), European Strategy for Biological and Landscapes Diversity Conservation (1995).

Convention on the Protection and Use of Transboundary Watercourses and International Lakes (994_273) (1999).

Regulatory points on special works providing.

The Law of Ukraine " On Natural-reserved Fund of Ukraine"

Territories of the Wind Park and adjacent territories are of no relevance to natural-reserved fund and situated in the distance of more than 4 km from NRF.

Thus there are no limits as for wind-driven generators building outside.

Water Code of Ukraine.

In accordance with Article 5 "Water segments of national and local importance" of Water Code of Ukraine, the Milk Estuary is water body of national importance.

In accordance with Article 87 "Water Conservation Zone" of Water Code of Ukraine for most favored status of water body creation, their pollution, littering and exhaustion prevention, bank vegetation and animals, as well as runoff variability reduction along the river, coast and lakes, storage reservoirs and other basins, water protective areas should be established. Water protective area is the conservation territory of administration management.

On water protective area is prohibited:

1) persistent and acute pesticide usage;
2) cemeteries, burial grounds, dumps, filtration fields arrangement;
3) waste water dropping with local relief disposal (gorges, lower reaches of a river, quarry etc.) also in streams.

In individual cases sand and gravel extraction could be afforded outside of water fund lands, on flood plain or deltaic level under coordination with natural environment conservation authorities, water management and geology.

Outside water protection areas should be established by special projects. ***The Milk Estuary water protection area project has not yet been accomplished.***

The water protection areas and boundaries assessment procedure and administration management should be determined by Cabinet of Ministries of Ukraine. Local Executive Committees should inform inhabitants and all organizations involved about resolutions concerning water protective area boundaries and coastal guard plot as well as water protection conditions on these territories.

Local Executive Committees and national environmental authorities should control the water protection areas and boundaries assessment procedure as well as territory management keeping. In Accordance with Article 88 "Water Protection Coastland" of Water Code of Ukraine to protect water basins from pollution and littering, to conserve the water content along rivers, seas and around lakes, storage reservoirs and other basins, lands for coastal guard plot should be provided. Coastal water protection zone should be established on both riversides and around water basins along water front (in middle of summer) as wide as:

- 25 meters for small rivers, springs and streams as well as for ponds of less than 3 hectares area;
- 50 meters for middle-size rivers, water reservoirs, basins and ponds more than 3 hectares;
- 100 meters for large rivers, reservoirs on them and lakes.

When the degree of slope is above 3 the coastal guard plot should be doubled.

Within populated areas the coastal guard plot should be determined according to local conditions. ***Alongside the coasts, around gulfs and estuaries the coastal guard plot is of not less than 2 kilometers width from water front***. ***Territories of the Wind Park are in the far distance.***

In accordance with Article 90 "Administration management restrictions in coastal guard plot alongside coasts, sea gulfs, estuaries and on islands of internal sea waters" the coastal guard plot alongside coasts, sea gulfs, and estuaries is of sea protection sanitary zone and could be used for health resorts only with centralized water supply and sewerage as a must.

In coastal guard plot alongside coasts, sea gulfs, estuaries and on islands of internal sea waters is prohibited:

1) persistent and acute pesticide using;
2) industrial and domestic garbage, waste water disposal by way of landfill;
3) dump well arrangements for domestic sewage of more than $1m^3$ per 24 hours. ***Thus there are no limits as for wind-driven generators building.***

Land Law of Ukraine.

According to Article 58: "Forming Part of Water Fund Lands" water fund lands consist of lands, occupied by:

a) seas, rivers, lakes, water reservoirs, other water objects, wetlands, islands not occupied by forests;
b) coastal guard plot alongside seas, rivers, water basins with the exception of lands occupied by forests.

According to Article 59: "Right of Water Fund Lands Use" Lands of Water Fund may be of state, common or private ownership. Citizens or legal entity may receive the permission from local executive authorities or local self-government to rent the water fund land of coastal guard plot, waterway plots as well as lakes, water reservoirs, other basins, wetlands and islands for mowing, fishery, cultural and healthy, recreation, sport and tourist purposes, research works and so on. ***Thus there are no precise restrictions for wind-driven generators building.***

Article 62 "Limits for plots utilization of coastal guard plots alongside coasts, sea gulfs, estuaries and on islands of internal sea waters".

1. In coastal guard plots alongside coasts, sea gulfs, estuaries and on islands of internal sea waters is prohibited:
   a) industrial and domestic garbage, waste water disposal by way of landfill;
   b) dump well arrangements for domestic sewage of more than 1m3 per 24 hours;
   c) filtration fields and other structures for sewage and decontamination of liquid waste arrangement;
   d) acute pesticide using;
2. Business activity policy on plots of coastal guard belts alongside coasts, sea gulfs, estuaries and on islands of internal sea waters established by Law.
   Thus there are no precise limitations for wind-driven generators building.

Requirement and regulatory documentation.

Estimations of permitted activity effect on natural environment (plants and animals) were provided in accordance with the Ukrainian Building Code A 2.2-1-2003 "The structure and content of environmental effect estimates (EEE) on plants, buildings, houses design and construction".

Furthermore the State Standards of Ukraine "Wind Power Engineering". Plots for the Wind Park. The Wind Park environmental effort estimations the State Standards of Ukraine the standard is at the design stage, to come into force on IV quarter 2012 year)".

Part 3. Methodical approaches to work implementation, research methods

3.1. Scientific-methodical basement for work implementation

Structural approach to work implementation

Preliminary bat research conducted by Executor in years of 2009-2010 under Agreement "Ornithological expertise conducting of electrical wind machine project site effects on territories adjoining state reservation the Milk Estuary within the Azov and Melitopol Districts of Zaporizhia Region" (№ 3n dated 01.04.2009). In accordance with above agreement the work on bat species composition determination, their seasonal location on the Wind Park territory projected and buffer zones was provided.

Client and international experts requested more detailed bat researches within the Wind Park plot and buffer zones, provided on 2011-2012 as part of the Agreement "Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region, motivated expert conclusion development" (Agreement N 1 dated 06.06.2011).

The work implementation research structure and methodical approaches are determined in Technical Specification (Attachment 5 to Agreement n 1/06-11 dated 06.06.11) submitted in A**ttachment 1** to scientific report with following items of work included:

- Work results;
- Examination conduction methods;
- Analysis/study conduction place;
- Minimum number of monitoring sessions;
- Time gap between monitoring sessions;
- Recording device type;
- Software for recording examinations;
- Weather conditions recording;
- Examination results keeping.

For bat voice registration 2 kit of devices were used (detector and tape recorder) Pettersen Ultraschalldetektor D240X, Zoom H2 Aufnahmerecorder. The examination places were fixed by GARMIN GPS MAP 78s. (2 pc.) according to determined points and transects, and traces of moving. Weather and climate examination conducted by mobile electronic meteorological station La Crosse Technology WS2355 with digital data registration. Transportation of Expedition by vehicle NIVA – 2 pc. For bat sound (voices) analysis licensed computer Program BatSound v.4.14 was provided by the Client.

Methodical approaches to work implementation

Data collection and registration of initial filed information

Executor reported to Customer for each trip by means of a quarterly report. The following information was provided as per each filed trip:

- Briefings on methods of examination and results;
- Tables with results of detector scanning of bats;
- Description of weather and climatic conditions for the period of field examination within the Wind Park plot;
- Routes of bats' observation (tracks) made in "Google Earth" software;
- Points with detector scanning of bats' voices and their quantity with the data reflected in the maps;
- Records of bats' voices.

Schematic, types of work and their periodicity were provided in calendar plans of work performance.

(Attachment 1 to Agreement № 1n/06-11 dated 06.06.2011) - Table 3.1.

Table 3.1. Structure and calendar plan of work performance

№	Type of work	Approximate dates	Number of trips	Reports	Notes
1.	Selection of points for performance of route registration and key points for examination with a detector	1 June 2011	1	Maps, database, lists of types, quantity	Investigation of the project territory
2.	Reproduction is a peak of activities in local populations	1 June – 31 July 2011	4	/-/-	All the night long with a break for intervals for each 5 days
3.	Study of known shelters of migrating bats and search for new ones. Gathering in flocks.	1 August – 15 August 2011	1	/-/-	Day-time observation
4.	Disintegration of nesting colonies. Beginning of autumn migration, swarming. Identification of migrants, directions and heights of their relocation, search for places of animals' concentration.	1 August – 15 September 2011	6	/-/-	Once a week after sunset observation
5.	Registration of migrating bats in autumn migration and swarming with a detector, identification of directions and heights of their flights	16 September – 31 October 2011	6	/-/-	Observation Once a week, two hours before sunset
6.	Observation over autumn shelters and late migrants, over beginning of hibernation	1 November – 15 November 2011	2	/-/-	Half an hour before sunset
7.	Observation over winter stay places	1 – 15 December 2011	1	/-/-	Daytime observation
8.	Observation over bats after their hibernation and their flights within the examined territory	15 – 31 March 2012	2	/-/-	After sunset
9.	Spring migrations. Search for nesting colonies and other accumulations of bats, accounting of their number, description of hunting areas of bats, etc.	1 April – 15 May 2012	6	/-/-	After sunset
			29		

Based on results of performed work the following attachments have been developed. **Attachment 2** to the Scientific Report (observation materials over bats within the Wind Park plot and adjacent areas located in the Azov and Melitopol Districts in 2011-2012) reads tables with the results of bat detector scanning; description of weather and climatic conditions for the period of field examination

within the Wind Park plot; Routes of bats' observation (tracks) made in "Google Earth" software. **Attachment 3** to the Scientific Report provides spectrograms of bat sounds received in course of the study in 2011 – 2012. **Attachment 4** to the Scientific Report provides audio files with recorded sounds based on 2011 – 2012 results (in separate mediums).
Format of provided initial materials are enclosed in diagrams 3.1-3.5. of tables 3.2-3.3. Routes of area observation have changed as per the season of the year and seasonal behavior of bats (diagram 3.1. – 3.3).

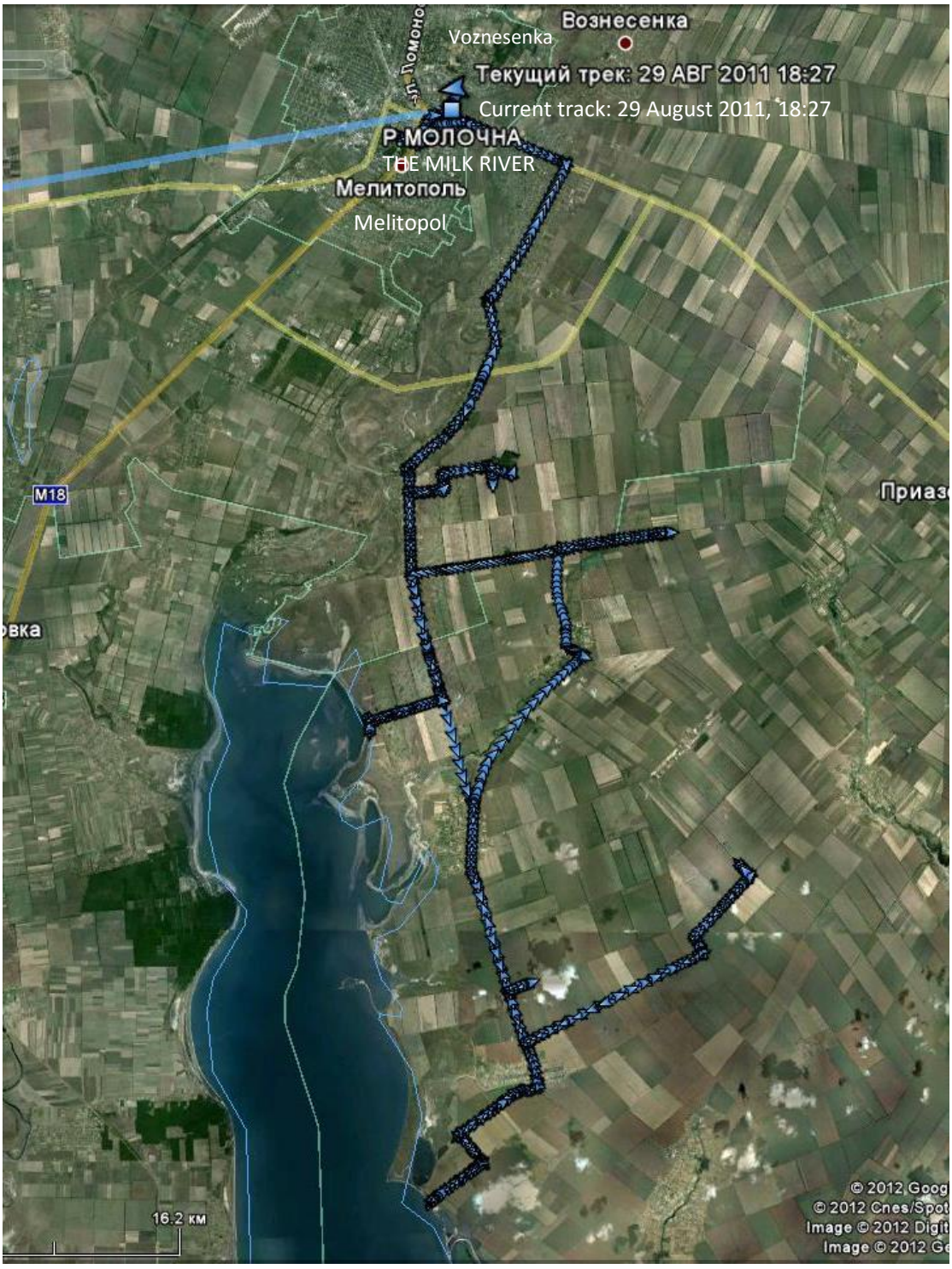


Fig 3.1. Routes of Bats' Observations for 29 August 2011

Fig 3.2. Routes of Bat' Observations for 10-11 October 2011

Fig 3.3. Routes of Bats' Observations for 21-29 October 2011

Fig 3.4. Distribution of bat intensification registration in transect C (yellow signs: no bats' sounds registered; red signs: bats encountered; in brackets: intensity of records is number of sounds per 10 minutes) on 27 July 2011.

Fig 3.5. Distributions of bat intensification registration in transect B (the places where bats have been identified are highlighted in red; in brackets: meaning of registration intensification is number of sounds per 10 minutes) on 27 July 2011.

Table 3.2. Characteristics of meteorologic conditions in the area of examination on the Wind Park plot for a period of the study.

Date	Time	Air temp., °C	Air Pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
22 April 2012	21:00	10.7	758.7	E	3	100%	
	18:00	11.3	758.4	SSE	5	100%	
	15:00	14.4	758.1	SSE	4	90 or more, but not less than 100%	
	12:00	13.1	757.8	SSE	1	90 or more, but not less than 100%	
	9:00	11.3	757.6	ESE	2	100%	4.0
	6:00	10.3	757.4	SSE	1	100%	
	3:00	10.6	757.4	SSE	3	100%	
	0:00	9.0	757.6	ESE	1	No clouds	

Table 3.3. Materials of Bats' Examination for 29-30 September 2011 in Melitopol and Pryazovske Districts (Annex 2, 2.12)

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
28 Sept. 2011	**Mordvynivka Forest**	35.413738 46.744717	18.50- 19.10			40	No record	1
						20	-	None
Transect 1 (Mordvynivka, near the forest)								
28 Sept. 2011	**Station 1**	35.405086 46.745038	19.12- 19.22			40	-	None
						20	-	None
	Station 2	35.405514 46.742903	19.24- 19.34			40	001	1
						20	-	None
28 Sept. 2011	**Mordvynivka Bar**	35.371171 46.726005	19.42- 19.52			40	002-006	6
						20	-	None
	Random stopping, on account of bats abundance in headlights' light	35º22'26.18 в 46º42'29.59 с	19.54- 20.04			40	007-011	8
						20	-	None
	Estuary 2 (near Mordvynivka Village)	35.354463 46.670399	20.12- 20.22			40	012	1
						20	-	None
Transect 4 (between the Villages of Dunaivka and Dobrivka)								
28 Sept. 2011	**Station 5 (closer to Dobrivka)**	35.479869 46.728077	20.45- 20.55			40	013-015	3
						20	-	None
	Station 1 (closer to Nadezhdine)	35.473850 46.727440	20.56- 21.06			40	016-020	5
						20	-	None
28 Sept. 2011	**Nadezhdine Threshing Floor**	35.443862 46.692744	21.30- 21.40			40	021, 022	3
						20	-	None
28 Sept. 2011	**Girsivka-North**	35.399419 46.651674	21.52- 22.02			40	-	None
						20	-	None
	Girsivka-South	35.397428 46.634750	22.04- 22.14			40	023-029	Voice flow, without pauses
						20	-	None

Transect 2. Stele								
28 Sept. 2011	Station 1 (near the Stele)	35.415746 46.596439	22.20-22.30			40	030-035	14 (4-flight, 10 – eat)
						20	-	
	Station 5 (remote)	35.422694 46.598390	22.31-22.42	Light rain about 5 minutes		40	036-038	15 (voice flow, eat)
						20	-	
Transect 3 (8 km to the east of Dunaivka Village)								
28 Sept. 2011	Station 5	35.510416 46.632838	22.57-23.07			40	-	None
						20	-	None
	Station 1	35.514130 46.628667	23.09-23.19			40	039-041	5 (flight to the west)
						20	-	None
28 Sept. 2011	**Dunaivka-Garden**	35.420929 46.581172	23.26-23.36			40	042-045	6
						20	-	None
28 Sept. 2011	**Estuary 1 (near Dunaivka Village)**	35.380800 46.534509	23.46-23.56			40	046-050	8
						20	-	None
29 Sept. 2011	**Stepanivka Persha (seashore, steeps)**		00.24-00.44			40	051-055	11
						20	-	None
TOTAL							**55 records**	**87 + voices in the flow**

Organization of field research

Basic research was implemented in the areas of the Wind Park and in the Adjacent Areas including settlements (which are the basic abiding-places of bats at this time of year).

First of all the organization of monitoring research was related with selection of monitoring plots in transect format (500 m) and separate monitoring points which would be representative for bats allocation and quantity estimation in the plot's area.

In the first stages of the research (till 25 June 2011) two transects were laid (A, B), in the second stage (in the middle of July) two transects more were laid (C, D) with their length of 500 m. (fig. 3.6).

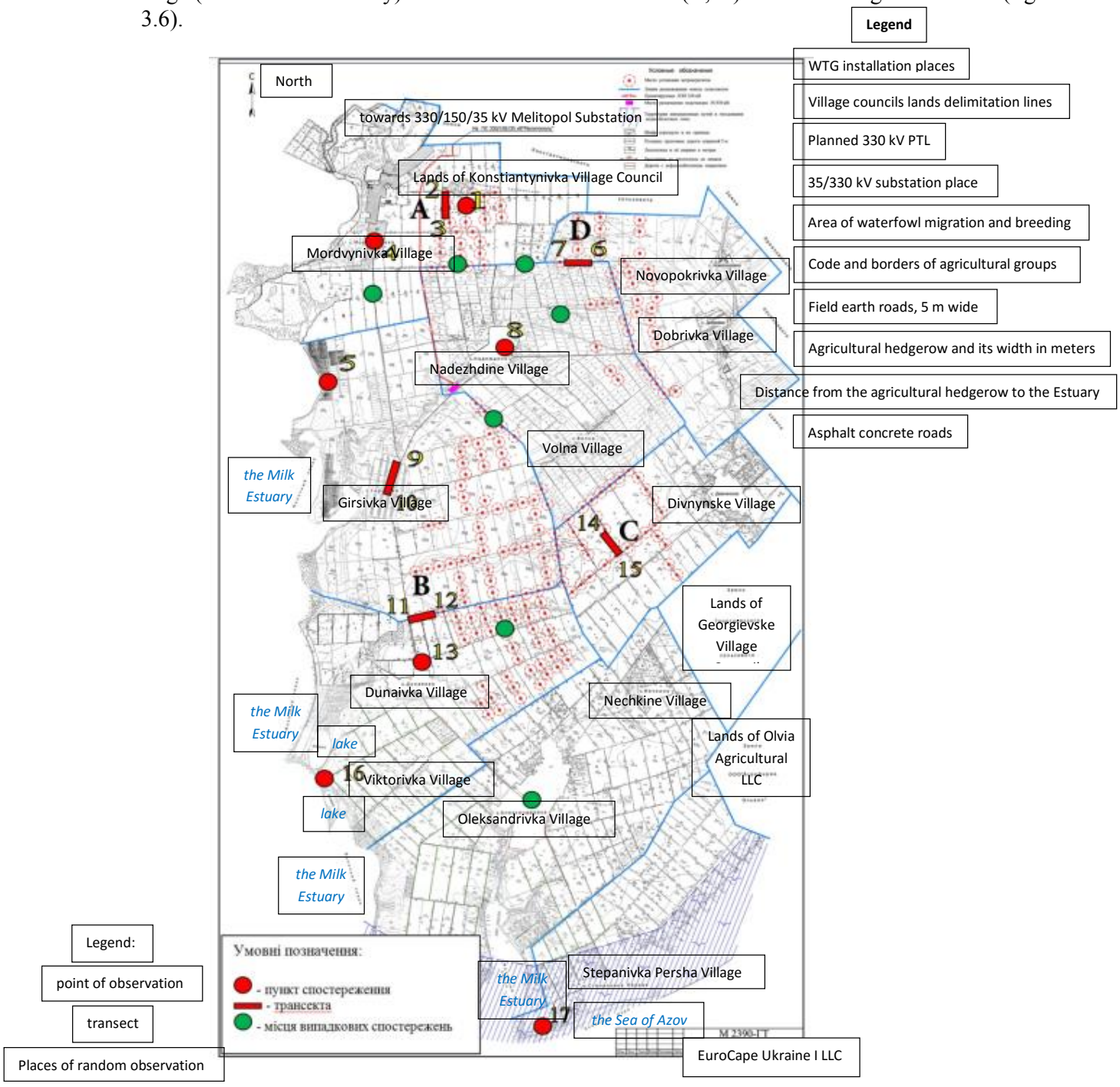


Fig. 3.6. Scheme of transects and monitoring points placement

Besides 7 points of obligatory examination were determined and 7-15 points of sampling observation. In alt 17 obligatory points of monitoring were determined in the form of transects and points being formed during June-August (table 3.4). Thus in August of 2011 two points of observations were added. They were situated at the bank of the Milk Estuary (Estuary 1 is point 16, and Estuary 2 is point 5; table. 3.4). It was done from positions of bats migrations as observations at transects and fixed points showed that majority of bats migrated along agricultural hedgerows towards the Milk Estuary. Direction of their migration was determined.

Table 3.4. Reckoning of monitoring points of observation (Annex for fig. 3.6)

№	Point of Observation Name	Coordinates	
1	Forest in Mordvynivka Village	35.413738	46.744717
2	Transect 1 (or A) point 1	35.405086	46.745038
3	Transect 1 (or A) point 2	35.405514	46.742903
4	Mordvynivka-Bar	35.371171	46.726005
5	Estuary 2	35.354463	46.670399
6	Transect 4 (or D) point 1	35.479914	46.728009
7	Transect 4 (or D) point 2	35.474048	46.727448
8	Nadezhdine-Tok Village	35.443862	46.692744
9	Transect in Girsivka Village (Girsivka North)	35.399419	46.651674
10	Transect in Girsivka Village (Girsivka South)	35.397428	46.634750
11	Transect 2 (or B) point 1	35.415746	46.596439
12	Transect 2 (or B) point 2	35.422694	46.598390
13	Dunaivka – Garden	35.420929	46.581172
14	Transect 3 (or C) point 1	35.510416	46.632838
15	Transect 3 (or C) point 2	35.514130	46.628667
16	Estuary 1	35.380800	46.534509
17	Stepanivka Persha - Shore.	35.301555	46.272297

Further observations showed that flight activity and also a number of voice registrations in two points on the bank of the Milk Estuary is higher than in the area of the Wind Park plot. Flight direction of bats at the Milk Estuary according to the visual observation (either at half-lights or in the light of powerful torches) – from the north-east to the south-west i.e. towards the Azov Seaside. That fact induced to a search of observing site on the sea shore. The point like this is put by us on the precipitous shore of the Azov Sea near Stepanivka Persha Village (point 17, table 3.4 and fig. 3.6). Previous research allow us to state that activity of bats along the shore lines of the Milk Estuary and Sea of Azov is more than at the area of the Wind Park.

With the purpose of obtaining comparative data of the bats research not only within the Wind Park plot, but also in the adjacent territories, the specialists of Biodiversity Research Institute made a number of trips, where along with the main tasks they conducted research of traffic of bats. Thus, for 22 August – 23 August 2011 information on the daily activity of bats was collected on the Obytichna Spit (52 km to the east of the Wind Park plot) and for 26 August – 27 August 2012 – on the Biriuchiy Island Spit (49 km to the west of the Wind Park plot). The places were also selected because the landscapes of the seaside steppe, where there are no large massifs of wood plantations or high buildings, may be indicators of the start of migratory traffic. And this very traffic was detected. Furthermore, a place of migratory bats' rest was observed on the Obytichna Spit (a roof of a single-storey house) and a shelter was found on the Biriuchiy Island Spit.

Besides, detector research was regularly carried out in Askania Nova and adjacent to it plots. As the areas of the Wind Park plot and Askania Nova are located in one landscape zone and in one migration zone, data from both territories provide sufficient comparative information. This scheme was used for making characteristics of the territories in Sivaske District and provided positive analytical information.

An important moment in conducting monitoring works is installation of transects. Determined were 4 basic season transects were determined (fig. 3.6., table 3.4).
Transect A (500 m) consists of agricultural hedgerow and is located near woodland at a distance of 5 km from Mordvynivka Village, surrounded with agricultural lands.

Transect B (500 m) is an agricultural hedgerow and is located at a distance of 2 km from Dunaivka Village, on the northern side of which there is a garden with the area of 4,5 ha which is surrounded with agricultural lands.

Transect C is an agricultural hedgerow and is located between the Villages of Dunaivka (7,6 km) and Divnynske (3,3 km), surrounded with agricultural lands.

Transect D is an agricultural hedgerow and is located between the Villages of Nadezhdine (4,5 km) and Dobrivka (2,7 km), and on the southern side there is Volna Village (2,4 km), surrounded with agricultural lands.

"Classical" scheme of observation of the Wind Park areas with the fixed 17 monitoring points is performed at fig. 3.7.

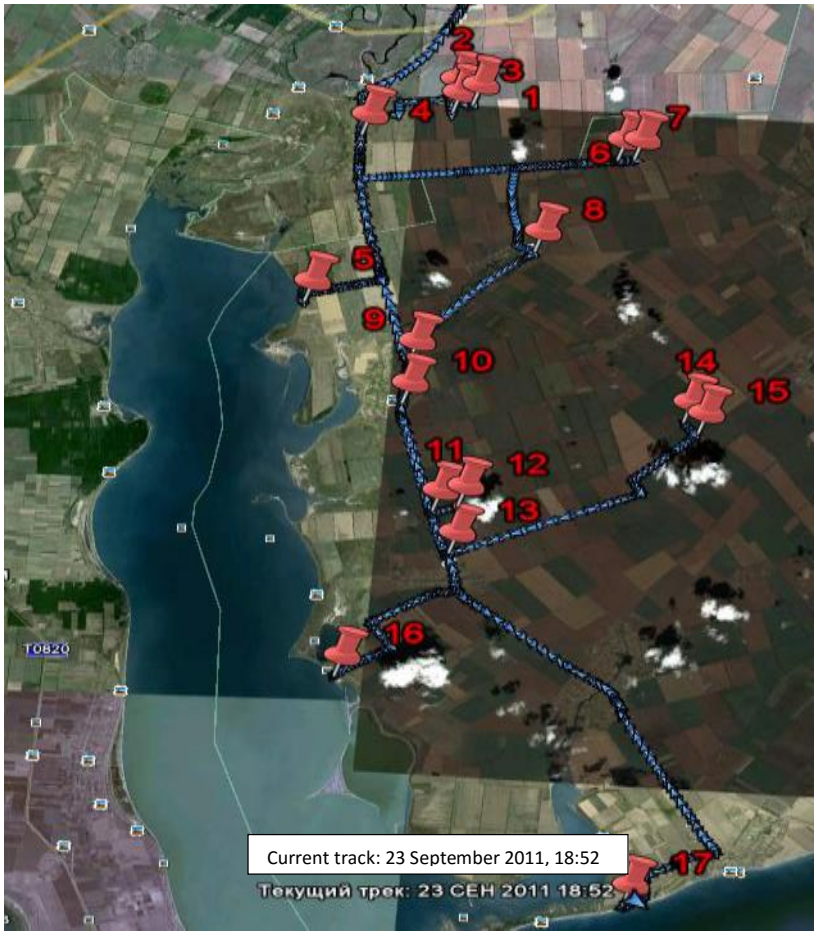


Fig. 3.7. Scheme of observation of the Wind Park areas with fixed monitoring points

Scheme of field trips

While conducting field research, in the dusk visual observation was carried out to the extent allowed by the illumination and after dark the space was scanned with two "Pettersson D 240x" ultrasound detectors tuned mainly to the frequencies of 20 and 40 kHz.

When moving by car on the territory of the plot and buffer zones, transects, the number of bats' signals which arrived for 10 minutes was calculated. The geographical coordinates were registered with "GARMIN GPSmap 78S" navigator for their further processing in "Google Earth" software. Bats' sounds were recorded with "ZOOM Handy Recorder H2" digital device. Apart from the transects, the intensity of Chiropterans' movement was also determined at some points in the settlements and in the agrocenosis. Besides, places for random listening were chosen depending on the situation. E.g., if quite a large number of bats appeared in the headlights light, a stop was made for listening beyond the fixed route (transects and points of obligatory listening).

Automobile route of each trip was registered by the Garmin GPSMAP 78s navigator which provided opportunity for exact orientation on the territory at night, and computer processing of the data provides extra opportunity for route control. Besides, the determined places for scanning within the Wind Park plot and in the adjacent areas with the dates of their examination is presented in Annex 2 of the scientific report (the files can be opened with Google Earth software (Planet Earth) and allow to see not only the main route but also direction of movement, including time of stay on each concrete point or transect). As an example on the fragment of observation route on Transect A is presented at fig. 3.8. Carrying out of field research is presented on fig. 3.9 – 3.11.

Fig. 3.8. Scheme of observation of Transect A and forest near Mordvynivka Village (triangles are scheme of movement, squares are scanning points)

Fig. 3.9. Preparation for work on Transect A

Fig. 3.10. Examination on the shore of the Milk Estuary

Fig. 3.11. Work at night-time

3.2. Main research methodologies (presented in Chapter 4).

Chapter 4. Dynamics of bats population in space and time on the plot of the Wind Park and in the adjacent areas.

4.1. General landscape climatic description and working procedures

Landscape climatic description of the researched area. According to physical-geographic division of Ukraine into districts, Melitopol and Pryazovske Districts of Zaporizhia Region are situated in of near-Black and Azov Sea region of dry steppe province within Prysyvaske-Azov lowland. Its surface is undulating plain-land, descending from north to south. Climate is continental with hot summer and relatively warm winter with small amount of snow. Average temperature in July is +23°C, in January –4°C. Average annual precipitation is 448 mm, and its maximum amount falls in summer as rain. In April-May there can be dry winds, from time to time can emerge dust storms. On the average there are 225 sunny days a year [1].

Agricultural production plays leading role in the economies of both districts, that is why their territory is marked by significant amount of arable lands. Thus, the area of the agricultural lands of Melitopol District is 156,8 thou. ha (87,6% of the general area of the district), where arable land is 134 thou. ha (74,9%), perennial plants are 4 thou. ha (2,2%). Agricultural lands of Pryazovske District occupy 166,2 thou. ha (85,2%), which includes arable land is 143,3 thou. ha (73,5%), forest plantations are 1034 ha (0,5%). In the structure of sown areas grain crops occupy 50–52%, sunflower is 22–25% [2,3].

On the examined area there are small villages with more than century-long history. Divnynske Village includes population of 668 specimens (180 ha), Volna Village includes 87 (42), Girsivka includes 1,313 (370,9), Dobrivka includes 449(80,6), Dunaivka includes 624(171,7), Nadezhdine includes 494 (120) and Mordvynivka includes 1,004(348) [4,5].

Work methodologies. During examination of chiropterans main methodological recommendations proposed by H. Limpens *[6] were taken into consideration*. In the dusk visual observation was carried out to the extent allowed by the illumination and after dark the space was scanned with two "Pettersson D 240x" ultrasound detectors tuned mainly to the frequencies 20 and 40 kHz. When moving by car on the transects, we calculated the number of bats' signals which arrived for 10 minutes and registered the geographical coordinates with "GARMIN GPSmap 78S" and "iFINGER H2O" navigators for their further processing in "Google Earth" software (Annex 1). Bats' sounds were recorded with "ZOOM Handy Recorder H2" digital device with further determination of animals species according to species-specific parameters of sonograms created by means of computer program *"BatSound 4pro"* [7]. *and known sound signals frequencies* (table 4.1).

Current weather conditions indicators were obtained using electronic meteorological station "La Crosse Technology WS2355" registering data in digital format.

Apart from transects, intensity of chiropterans' traffic was also determined at some points in the settlements and in the agrocenosis. Besides, places for random listening were chosen depending on the situation. For instance, if quite a large number of bats appeared in the light of headlights, we stopped for listening beyond the fixed route.
Statistic data processing was made by means of computer software " ? "
The most detailed methodological approaches to conducting field works and processing of their results were presented in Chapter 3. Methodological approaches to organization of works, research methodologies.
Complete results of field research and cameral data processing are presented in **Annexes 1 and 2.**

Table 4.1. Main parameters of sound signals of European bats

Species	Pulse duration, ms	Frequency, kHz				Source of information
		Upper	Central	When sound power is maximum	Lower	
Lesser horseshoe Bat *Rhinolophus hipposideros* (Bechstein, 1800)	– 21,6 45±10,46	– 110,6 93,88±3,42	– – 111,82±1,46	110(110–117) 107,5 111,57±0,98	– 89,8 91,31±4,88	[8] [9] [10]
Greater Horseshoe Bat *Rhinolophus ferrumequinum* (Schreber, 1774)	– 22,7 55,93±20,69	– 84,1 67,4±2,37	– – 82,69±0,43	83(80–90) 79,7 82,26±0,27	– 69,1 63,95±3,66	[8] [9] [10]
Greater mouse-eared Bat *Myotis myotis* (Borkhausen, 1797)	– 6,0	– 86,0	– –	35(30–35) 37,1	– 22,2	[8] [9]
Bechstein's Bat *Myotis bechsteinii* (Kuhl, 1817)	– 4,3 1,84±0,48	– 103,5 117,57±13,78	– – 75,37±7,5	45(45) 48,4 71,92±4,74	– 26,5 37,47±3,45	[8] [9] [10]
Natterer's Bat *Myotis nattereri* (Kuhl, 1817)	4,1 3,17±3,5	108,6 125,49±20,97	– 73,24±27,88	40,4 60,29±27,85	14,0 24,9±2,46	[9] [10]
Geoffroy's Bat *Myotis emarginatus* (Geoffroy, 1806)	– 3,6	– 113,1	– –	50 45,7	– 27,5	[8] [9]
Brandt's Bat *Myotis brandtii* (Eversmann, 1845)	– 4,6 4,15±1,19	– 103,6 106,93±10,01	– – 60,06±7,8	45 45,7 53,96±3,36	– 27,5 31,13±7,39	[8] [9] [10]
Whiskered Bat *Myotis mystacinus* (Kuhl, 1817)	– 3,6 2,64±0,83	– 99,7 106,2±19,28	– – 63,79±9,4	45 46,8 54,32±7,87	– 27,9 33,16±8,66	[8] [9] [10]
Pond Bat *Myotis dasycneme* (Boie, 1825)	–	–	–	35	–	[8]

Daubenton's Bat *Myotis daubentonii* (Kuhl, 1817)	– 3,9 2,72±1,28	– 81,2 87,86±6,89	– – 56,42±4,31	45(45–50) 42,7 55,13±6,24	– 27,3 31,87±4,31	[8] [9] [10]
Brown Long-eared Bat *Plecotus auritus* (Linnaeus, 1758)	– 2,9 0,82±0,53	– 55,7 52,73±17,72	– – 51,17±18,01	25,45 37,7 50,47±19,70	– 22,7 37,4±19,88	[8] [9] [10]
Gray Big-eared Bat • *Plecotus austriacus* (Fischer, 1829)	– 5,8	– 45,3	– –	25,45 36	– 18,0	[8] [9]
Western Barbastelle *Barbastella barbastellus* Schreber, 1774	– 4,3 2,91±1,22	– 48,3 38,76±9,04	– – 34,45±6,89	35,65 36,0 34,24±6,89	– 25,7 27,99±6,46	[8] [9] [10]
Lesser Noctule *Nyctalus leisleri* (Kuhl, 1817)	– 9,3 7,37±3,34	– 49,4 63,48±16,84	– – 32,23±4,88	25–30 27,4 31,01±3,91	– 22,1 26,86±4,48	[8] [9] [10]
Common Noctule *Nyctalus noctula* (Schreber, 1774)	– 14,4 15,56±10,91	– 33,8 36,4±20,46	– – 24,55±5,24	20(18–24) 22,1 23,68±4,62	– 17,7 21,75±4,03	[8] [9] [10]
Giant Noctule *Nyctalus lasiopterus* (Schreber, 1780)	–	–	–	20	–	[8]
Kuhl's Pipistrelle *Pipistrellus kuhlii* (Kuhl, 1817)	– 6,3	– 63,6	– –	38–40 39,6	– 33,6	[8] [9]
Nathusius' Pipistrelle *Pipistrellus nathusii* (Keyserling, Blasius, 1839)	– 6,9	– 61,5	– –	35–38 41,3	– 36,1	[8] [9]
Common Pipistrelle *Pipistrellus pipistrellus* (Schreber, 1774)	– 6,3 5,23±2,94 –	– 73,8 81,31±15,11 –	– – 47,61±3,47 –	58(40–50) 47,4 46,63±2,67 45	– 42,6 44,92±3,15 –	[8] [9] [10] [11]
Pygmy Pipistrelle *Pipistrellus pygmaeus* (Leach, 1825)	6,0 7,47±2,59 –	84,1 95,7±20,51 –	– 53,22±2,27 –	56,2 52,73±2,08 55	51,5 50,82±3,32 –	[9] [10] [11]
Savi's Pipistrelle	–	–	–	35	–	[8]

Hypsugo savii (Bonaparte, 1837)	7,3	48,2	–	24,6	20,2	[9]
Parti-coloured Bat or Rearmouse *Vespertilio murinus* Linnaeus, 1758	– 15,0	– 35,8	– –	28 24,6	– 20,2	[8] [9]
Serotine Bat *Eptesicus serotinus* (Schreber, 1774)	– 10,9 6,83±3,83	– 47,2 64,45±8,78	– – 34,67±5,18	25(26–32) 26,8 33,20±5,20	– 22,4 26,37±4,39	[8] [9] [10]
Eptesicus lobatus *Eptesicus lobatus* (Zagorodniuk, 2009)	–	–	–	–	–	[12]
The Northern Bat *Eptesicus nilssonii* (Keyserling, Blasius, 1839)	– 10,7	– 48,2	– –	27–32 29,8	– 24,6	[8] [9]
Common Bentwing Bat *Miniopterus schreibersii* (Kuhl, 1817)	6,2	87,3	–	53,9	47,4	[9]

4.2. Overview of bats fauna of the Ukrainian Azov Seaside

4.2.1. Extent of bat research

For a long time bats have been nearly one of the less examined kind of mammals in Ukraine. The first data concerning their spreading having relation to our sphere of examination were published by O.O. Brauner [13] yet in 1923. In his book “Agricultural zoology” he speaks about 15 species of chiropterans, the most widespread of which at that time in Ukrainian near-Azov district judging by Latin names were: Common Noctule *Nyctalus noctula* (Schreber, 1774), Serotine Bat *Eptesicus serotinus* (Schreber, 1774), Brown Long-eared Bat *Plecotus auritus* (Linnaeus, 1758) and Common Pipistrelle *Pipistrellus pipistrellus* (Schreber, 1774). Later O. O. Migulin (1927, 1938) [14,15] among 17 bats species of Ukraine, apart from the mentioned, named characteristic for the whole territory such species as Parti-coloured Bat *Vespertilio murinus* Linnaeus, 1758, Natterer's Bat *Myotis nattereri* (Kuhl, 1817), Daubenton's Bat *M. daubentonii* (Kuhl, 1817) and Whiskered Bat *M. mystacinus* (Kuhl, 1817), Lesser Noctule *N. leisleri* (Kuhl, 1817), as well as Giant Noctule *Nyctalus lasiopterus* (Schreber, 1780) which was found in Melitopol, Kherson, Hola Prystan, Odesa and in other cities.

Important enough for understanding of dynamics of chiropterofauna at that time became scientific monograph by M. Charlemagne "Zoogeography of USRR" (1937) [16]. In his work he elucidated the state of bat fauna exploration in Meotic or Upper-Azov zoogeographical district, which fully covers the territory of our research. At that time it was known about findings of 6 species (pipistrelle is Common Pipistrelle *Pipistrellus pipistrellus* and Nathusius' Pipistrelle *nathusii* (Keyserling, Blasius, 1839), noctule is common noctula *Nyctalus noctula*, Lesser Noctule *N. leisleri* and Giant Noctule *N. lasiopterus*, and also Parti-coloured Bat *Vespertilio murinus*) from the mentioned order of bats. Besides that the author assigns all of them to the category of rare species.

A significant event in summarizing state of bats research during the first half of the XX century was publishing of the book «Bats» (1950) [17] and scientific publication by V. I. Abelentsev and V. M. Popov. "Order chiroptera or bats Chiroptera" (1953) [18]. They contain deep analysis of the state of geographical regions, geographic and biotopic expansion of animals, as well as peculiarities of their nutrition, reproduction, extent of parasitic contamination etc. Special meaning had the attempt of evaluation of bats number by separate species and regions. It allows to state that the above mentioned publications despite the lasting period of time, which passed after their publication, remain basic for all zoologists. M. Kovtun and Y. Krochko (1998) [19] consider that scientific papers of O.P. Kuziakin (1950) [17], V. I. Abelentsev and V. M. Popov (1953) [18] have attracted young researchers’ attention to bats and became an organizational basis for their further research.

An important milestone for generalization of not numerous scientific papers on bats research in Ukraine became monograph by I.T. Sokur "Ukraine fauna mammals and their agricultural role" (1960) [20]. In it information about their expansion and biology in different districts of our country can be found. According to the mentioned book, it can be concluded that in the third quarter of the XX century on the territory, where we carried out our research later, there lived 100 bats species. The most noticeable of them were: Whiskered Bat and Daubenton’s Bat, Brown Long-eared Bat, Common Noctula and Giant Noctula, Lesser Noctule, Serotine Bat and Parti-coloured Bat. For the territory of Ascania-Nova, The Black Sea Reserve and The Arabat Spit in the monograph there mentioned cases of observing Nathusius' Pipistrelle (Sokur, 1960) [20].

It is worth mentioning that number of publications on chiropterans of South Ukraine of that years was very small. As a rule bats were researched on the territory of natural reservations, one of which was the Black Sea Biosphere Reserve. All teriologists who worked here have done their best to explore the not enough researched animals. Among them we should distinguish Y.P. Zubko, V.I. Abelentsev and A.I. Gyzenko who mentioned respectively: 8 (Zubko, 1940) [21], 10 (Abelentsev,

1967) [22] and 7 (Gyzenko, 1967) [23] bats species which can be seen in the Lower Dnipro Basin. These are: Brown Long-eared Bat, Noctule – Lesser, Pond and Whiskered Bat, Noctule – Common and Giant Noctule, Pipistrelle – Common and Nathusius' Pipistrelle, as well as Serotine Bat and Parti-coloured Bat. Later these data were repeated by D.S. Berestennikov (1977) [24] while writing his generalizing paper on mammals of the Black Sea Biosphere Reserve, and he did not register in the reserve only Whiskered and Parti-coloured Bat. At the end of XX century Z.V. Seliunina (1998) [25] named on its territory only 6 species of bats: from the list above she did not register Lesser, Pond and Whiskered Bat, and Brown Long-eared Bat. It should be said that findings of all the mentioned species on the territory of South Ukraine are proven by zoological collections (Zagorodniuk, Godlevska, 2001) [26].

In 70-80's of the XX century at the Institute f Zoology of Ukrainian SSR there was created a scientific school, representatives of which deeply and in detail researched bats morphology (Kovtun, 1980) [27] and its connection with functional meaning of particular structures of their organism.

Founder of the school was prominent Ukrainian zoologist doctor of biological sciences, professor M.F. Kovtun. He published scientific monograph "Comparative morphology and evolution of chiropterans' locomotion organs" (Kovtun, 1984) [28], which still determines direction of morphological research of bats and other mammals.

An important event for scientific community were publications concerning ringing of bats in Ukraine during 1939-1967 (Abelentsev and others, 1968, 1969) [29,30]. Together with other works they (Paniutin, 1980; Volokh, Karmyshev, 2001; Godlevska, 2001; Postava, 2001) [31,32,33,34] broadened our knowledge about the character of abiding of animals in particular territories, duration of their winter sleep period (hibernation), length and direction of migration ways etc.

To the north from our research places bats fauna was researched by zoologists of the Dnipropetrovsk National University who registered existence on the territory of Dnipropetrovsk region at the beginning 13 species (Bulakhov, Chegorka, 1998) [35], and later registered 14 species (Bulakhov, Pakhomov, 2006) [36]. Aong those interesting is information about the Lesser Horseshoe Bat *Rhinolophus hipposideros*, which, with reference to the data of prof. V.V. Stakhovskyi, till 1950 obviously could be seen in Samarskyi forest. Doubtful enough also can be seen existence in the mentioned region of Bechstein's Bat *Myotis bechsteini*, all places of existence of which are now in the Precarpathian and Zakarpattia regions (Zagorodniuк and others, 2002) [37]. Considering the fact that this data are not proven by any collection materials (Zagorodniuk, Godlevska, 2001) [26].

At the end of the XX century due to educational and organizational activity of the candidate of biological sciences, assistant professor I.V. Zagorodniuk, research of bats reached in Ukraine rapid uprising. An important event in its development became session of 5 teriological school dedicated to 2nd European Bat Night with financial support from the International Solomon University (Kyiv). As a result a collection of scientific papers "European Bat Night `98 in Ukraine", in which for the first time in our state were presented materials concerning only order Chiropterans. Among the important works in this area it is worth to mention article by V. Domashlinets on international-law aspects of bats protection, by I. Zagorodniuk and co-authors on activity of Ukrainian chiropterological center, as well as other researchers on regional chiropterofaunas and ecological peculiarities of bats. In 1999 book " Mammals of Ukraine protected by the Bern Convention" (Zagorodniuk and other, 1999) [38] was published, in which 100 pages are dedicated to research and preservation of Chiropterans in Ukraine.

In 3 years after signing of The Agreement on the Conservation of Populations of European Bats (Law on annexation of Ukraine, 1999) [39] UNEP proclaimed year 2001 International Year of the Bat. In our country this important date was marked by publication of Collection of Scientific Papers named "Migratory status of bats in Ukraine". It covered the essence of bats migration, provided control list of their families and kinds and general picture of dynamics of Ukrainian chiropterofauna (Zagorodniuk, 2001) [40]. In the mentioned collection of papers were also placed reviews concerning ringing (Godlevska, 2001) [33] and about presence of bats in zoological collections (Zagorodniuk, Godlevska, 2001) [26], as well as information about regional peculiarities of chiropterofauna and also different notes. Among the papers we considered interesting for understanding of peculiarities of bats fauna formation in the region of our research and their migrations works by A. Dulytskyi and Mykhailova (2001) [41], as well as by I. Zagorodniuk (2001 a) [42].

A significant problem has always been problem of bats identification, which was made by means of particular determinants (Bobrynskyi et al, 1965; Korneev, 1965 et al) [43,44]. But all of them were very old editions, which did not provide possibility to exactly determine species identification of some close species. That is why in Ukraine after rise of interest to bats this drawback was corrected by publication of new determinants (Zagorodniuk and others, 1999; Voloshyn, Bashta, 2001; Zagorodniuk and other, 2001) [38,45,26]. At present particularly important meaning for our works has manual for field research "Bats of Ukraine and adjacent countries" written by I. Zagorodniuk, L. Godlevska, V. Tyshchenko and Y. Petrushenko (2002) [46].

Along with development of technical devices there appeared possibility of identification of bats on distance, without taking them by hands, at the beginning by means of ultrasound detector "D-200" produced by firm Pettersson (Sweden), and later of other its modifications and different devices. Experimental basis for this became experiments conducted by O.I. Konstantinov (1973) [47] and M.D. Petliakovych (1980) 48[], who starting from 1966 together with other biophysicists of the USSR started research of echolocation system and making catalogue of location signals of bats family Vespertilionidae. These zoologists applied method of multiplication frequency transformation, which means reproduction of previously recorded on tape recorder ultrasound signal with speed 32 times less than than speed of recording. This provided opportunity of transformation of high-frequency bats signals into sound range, appropriate for perception by human hearing analyzer. Besides, the above mentioned scientists carried out research of impulses using different oscillographs, which enabled to obtain such important characteristics of bats' signals as: duration, length, frequency of impulses filling, intervals between them etc., which was later used by foreign specialists while creating computer program "BAT SOUND" and other.

In Ukraine among the first to use the above mentioned detector was I. Zagorodniuk (1998) [49], who by means of this device registered number and kinds of bats in some districts of Kyiv.

Significant influence on development of detector registrations had "Seminar on determination of bats and localization of their shelters by means of ultrasound detectors" conducted on 30.04-03.05.2000 on the biological station "Yaduti" of the Chernihiv State Pedagogical Institute. The seminar was conducted according to German project "Bat conservation expert training and data collectioning Southeast Europe a German contribution towards the implementation of EUROBATs transboundary programmes", aimed at The Agreement on the Conservation of Populations of European Bats (EUROBATs). Its main problems were:

– introduction to zoologists working in reserves, national parks and at biological stations modern methods of work in the sphere of bats preservation,

– preparation of experts for use of ultrasound detectors and creation of monitoring network in Ukraine.

In order to raise the effectiveness of study to Yaduti were invited European specialists G. Limpens and P. Lina (Netherlands). They shared their experience and pointed out difficulties arising during species identification of bats found by means of ultrasound detector (Limpens, 2000) [50]. At present this direction is developing rapidly in Ukraine and, as works by different zoologists (Zagorodniuk, Godlevska, 2000) [51] and our research (Polishchuk, 2001; Volokh, 2010) [52,53] have shown, it has significant perspectives not only for monitoring of bats population, but also for applied aims. Among the latter important enough is conducting of ecological expertise in the areas of Wind Parks constructing.

4.2.2. Present-day fauna of bats

General number of bat species in the territory of Ukraine diminishes within gradient of distance from the mountain area and reaches its minimum number in steppe zone (fig 4.1).

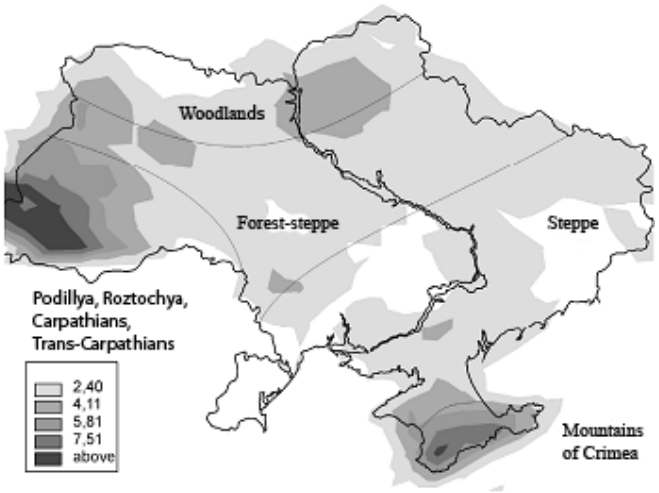


Fig. 1.1 – Density of bat allocation in nature zones of Ukraine [8].

During different years in the examined by us territory and also in the adjacent areas 9 types of bats have been discovered (Abelentsev, Popov, 1956; Selyunina, 1998; Polishchuk, 2003, Zagorodnyuk, Godlevska, 2001; Volokhx, 2002) [18,25,54,38,55]. Including 3 species of bats which are settled (Common serotine, Rearmouse and Kuhl's pipistrelle) and 5 (Whiskered, Grey long-eared, Common long-eared, Common noctule and Pipistrelle small) are migrating. Greater noctule, taking into consideration rare cases of its registration, can be attributed to a flying species. (table 4.2).

Table 4.2. Fauna fauna of Azov Seaside

№	Types of Bats	Character of Residence
1.	Whiskered (*Myotis mystacinus*)	Migrating
2.	Grey long-eared (*Plecotus austriacus*)	Migrating
3.	Common long-eared (*P. austriacus*)	Migrating
4.	Common noctule (*Nyctalus noctula*)	Migrating*
5.	Greater noctule (*N. lasiopterus*)	Flying in
6.	Common serotine (*Eptesicus serotinus*)	Settled
7.	Parti-coloured or Rearmouse (*Vespertilio murinus*)	Settled
8.	Pipistrelle small (*Pipistrellus pipistrellus*)	Migrating
9.	Kuhl's pipistrelle *(P. kuhlii Kuhl)*	Settled

*Registered some case of wintering

It is worth mentioning that Common noctule settles on irregular basis but a lot of species of its species are making available during spring and autumn migrations. Some other researchers reported about this fact (Yarmysh and others, 1980) [56] in the area of the Russian Azov Seaside.

An important area for bats residence which is adjacent to the area of our research is the Sivash District. Till the present day the museum exhibits prove that Whiskered bats (Kherson area, Genichesky district, peninsula Chongar, village Salkovo), Common and Greater noctules (Kherson area, village Gola Prystan, Chaplinsky area, village Askaniya-Nova), Nathusius' Pipistrelle (Golopristansky area, village Potiyevka and island Tendra) and Pipistrelle small (Chaplinsky area, village Askaniya-Nova) (Zagorodnyuk, Godlevska, 2001) [26] have stayed in this region. It is known that in the 1950s broods of Rearmouse have been frequently detected in the cracks of waterside steeps of the Sivash (Abelentsev, Popov, 1956) [18].

Also, not far from the planned park of the Wind Parks Common long-eared bats have been registered and Rearmouse bats have been detected in the western hillsides of the Milk Estuary (Abelentsev, Popov, 1956) [18]. However taking into account results of more than 30 years of research work we can confirm residence of these species in the Ukrainian Azov Seaside. But this conclusion cannot exclude a possibility of staying of these and other species in the indicated area because a significant number of bats are migrating through the territory of this geographical area. For example, Rearmouse and Common long-eared bats have been discovered in the biosphere reserve Askaniya-Nova (Polishchyuk, 2003) [54].

In particular it is worth mentioning that in the Azov Seaside there are no natural forests with old hollow trees that are frequently used by bats as temporary shelters or place of residence of brooding colonies in other countries. That is why despite a fact that some species of the bats settle in this region (ref table 4.1), every year significant relocations of about all of bats are detected here. These relocations are in particular visible in spring, in late summer and in early autumn. It requires regular monitoring over dynamic of population of these species in the areas of potential effect and influence of the Wind Parks.

4.3. Bats identification

Communicating bats use social sounds which by their physical characteristics are close to the sounds of other groups of mammals. However being in flight they use signals which have maximum amplitude in ultrasonic within 20–120 kHz. Analyzing echo receiving from high-frequency signals bats can detect obstacles and small objects that is very important for their orientation in space and food hunting. Permanent ultrasound communication makes possible to detect bats, to figure out their quantity and to keep track of their relocations in space.

Generally speaking, every species of bats has its own characteristic ultrasound signals, which, after appropriate transformation by the detector, can help to identify exact species of the examined specimen. But frequencies of some of our species can overlap (Kuhl's Pipistrelle and Whiskered Bat). It makes identification process much more difficult. For resolving this task German hyropterologs in addition to frequency became to take into consideration such indicator as duration of signal (MC), and we used this information to record ultrasound signals in slow-down mode. Using special tables (Table 2.1) it made possible to perform species identification of bats, which has been defined more accurately later by means of computer program «BAT SOUND». However there are still difficulties to distinguish some close species of specimen. For example, Gray Big-eared and Common Long-eared bats have got not only similar frequencies of their signals but also similar length of wave (Table 4.3).

Our Dutch colleagues (Limpens, 2000) [50] who are experts in species identification of bats by means of ultrasonic detector mentioned that taking into account ecological peculiarities of the region, signal frequencies of examined species can have significant dynamics. In the first place it relates to the process of hunting to nutrition objects which requires continued development and leads to formation of original ultrasonic signals. Difference in behavior of bats living in relatively close areas requires mandatory adaptation of methods to local conditions.

Table 4.3. Types of bats and peculiarities of their sound signals, kHz*

Type	Frequency, kHz	Wave length, мс	15-20	20-25	25-30	30-35	35-40	45-50	50-55	55-60	Signal picture
Myotis mystacinus	44 (40-55)	3-7						xx			drumming
Plecotus austriacus	50 (40-45)	3-6						x	xx		chirring
Plecotus auritus	50 (40-45)	3-6						x	xx		chirring
Nyctalus noctula	20 (18-24)	6-26	x	xx							drops
Pipistrellus pipistrellus	43 (40–49)	4-8						xx	xx	xx	drops
Pipistrellus kuhlii	40-45 (42)	6-10						xx			–
Eptesicus serotinus	25 (26-32)	10-16		x	xx	x					staccato
Vespertilio murinus	25 (15-25)	12-20		x	x						throbbing

* Ref: Limpens, Roschen (1995); Zagorodnyuk, Godlevska, (2000)

Analysis of ultrasonic signals (fig. 4.2), shows the signals registered next to the villages located all along one provisional line not far from each other and proves their specific. Thus in transect D signal frequency of Common Noctule fluctuates within 20,0-20,7 and of Kuhl's Pipistrelle is 40,0-41,0 kHz, whereas in Mordvynivka Village the above specimen have fluctuations, correspondingly: 20,0-22,6 and 40,0-40,5 kHz.

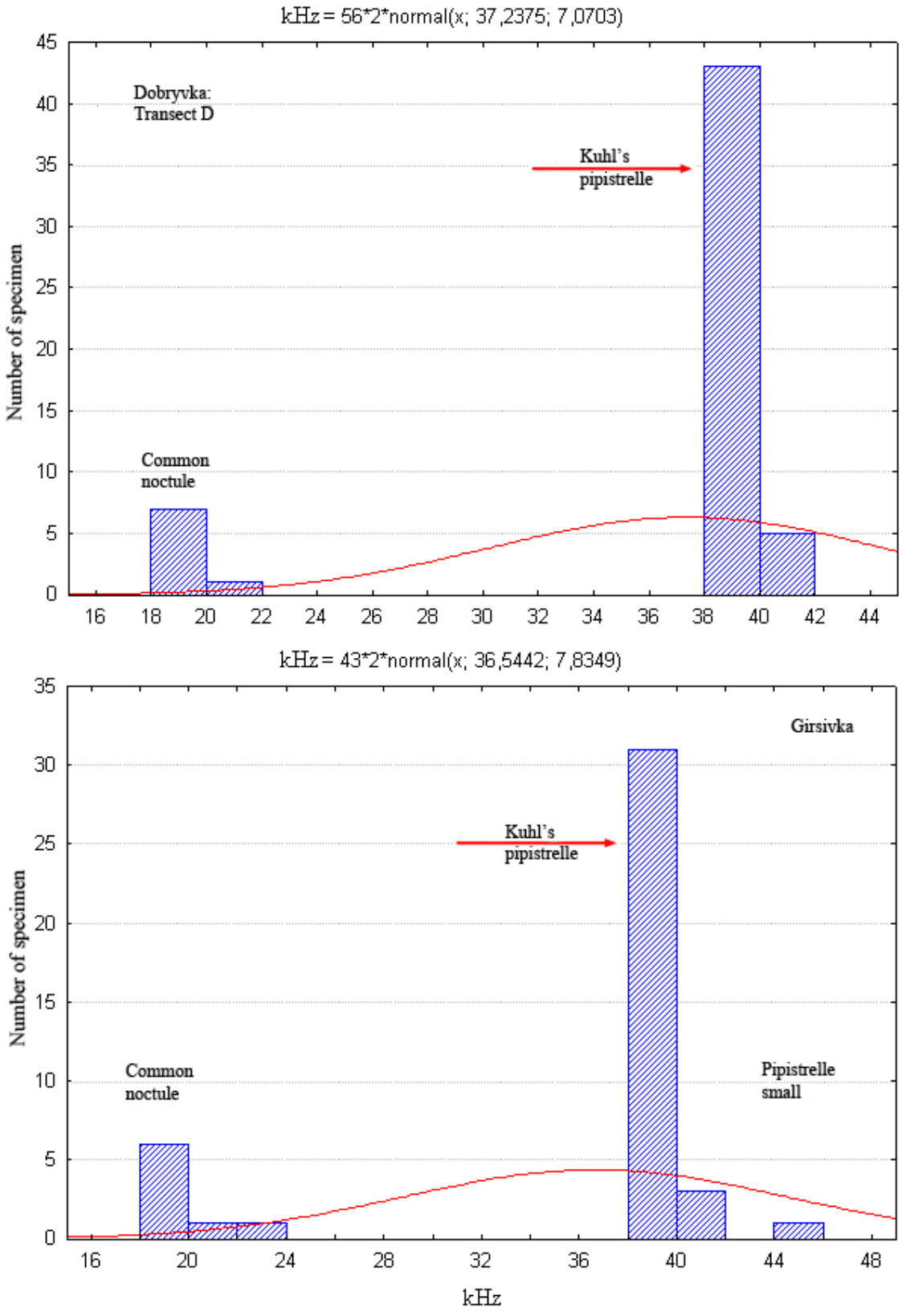


Fig 4.2. Dynamics of ultrasonic signals of various species of bats in places located within ~10 km zone in process of their collective relocation.

Our examination of ultrasonic signals relating to other places of the Wind Park WTGs location proves also appropriate dynamics of the first (Fig. 4.3).

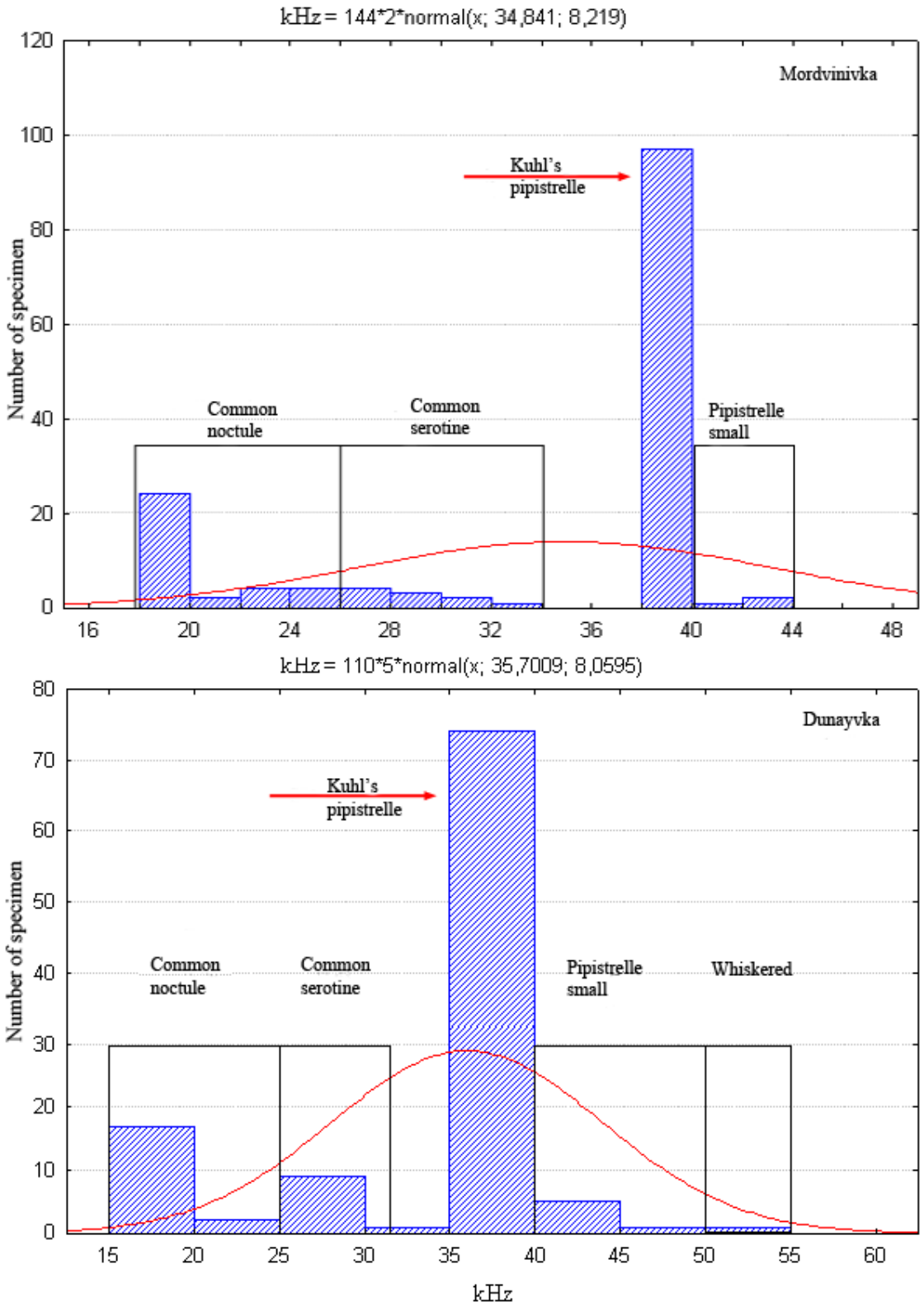


Fig 4.3. Dynamics of ultrasonic signals of different species of bats in places located in the north (Mordvynivka Village) and in the south (DunaivkaVillage) in the Wind Park plot.

This, summing up the received materials we can conclude that distribution of bats in various places as per their signal frequencies (Table 4.4) proved their insignificant difference between them.

Comparing research results in various points as per indicator of average/standard deviation (Std. Dev.), we can report about considerable identity of bat species diversity in the whole territory of the Wind Park.

Table 4.4. Bat signal distribution in various places as per frequencies (kHz)

№ з/п	The closest village	Transect, place	Number of bats	M ± m	Min	Max	Std. Dev.
1.	Mordvynivka	Forest	84	33,0±1,31	20	40	7,81
2.	Mordvynivka	A	222	32,5±1,13	20	43	9,01
3.	Mordvynivka	Village (bar)	91	38,7±1,05	20	44	5,44
4.	Mordvynivka	Estuary 2	24	40,0±0,00	40	40	0,00
5.	Nadezhdine	Threshing Floor	39	36,4±2,44	20	40	8,09
6.	Dobrivka	D	170	37,2±0,94	20	41	7,07
7.	Girsivka	North	34	36,7±1,76	20	45	8,06
8.	Girsivka	South	67	36,4±1,66	20	40	7,79
9.	Devninske	C	62	33,2±1,25	20	48	7,62
10.	Dunaivka	B	260	34,5±0,94	20	52	8,59
11.	Dunaivka	Garden	29	40,5±0,50	40	48	2,00
12.	Dunaivka	Estuary 1	45	38,0±2,00	20	40	6,33
13.	Stepanivka Persha	Seashore	545	36,3±1,61	20	50	8,83
Total:			**1672**	35,9±0,39	20	52	8,06

In places of our research we received the following results (table 4.5) that made it possible to identify 5 species of bats based on results of detector readings.

Table 4.5. Signal dynamics of various types of species in the places of research, kHz

Type of bats	Number of specimens	M ± m	Min	Max	CV, %	Std. Dev.
Common noctule	206	20,8±0,20	20,0	27,0	3,21	1,79
Kuhl's pipistrelle	1253	40,0±0,01	38,8	41,3	0,03	0,18
Pipistrelle small	9	45,4±0,72	43,0	48,0	3,61	1,90
Common serotine	149	29,6±0,28	28,0	33,0	1,62	1,27
Whiskered bat	55	50,7±0,67	50,0	52,0	1,33	1,16

Taking into consideration that variability coefficient (CV, %) of signals was characterized by rather low meanings it shows insignificant frequency fluctuations within range of one species. That is why used method of identification is absolutely acceptable and can be used in further research work.

4.4. Brief description of bats population

4.4.1. Species diversity and structure of bat population

Performing this research work we examined 1672 species of cheiroptera in 13 locations. Analyzing 5 species of registered bats (Fig. 4.4) 3 types were accounted as the most numeral: Kuhl's

Pipistrelle, Common Noctule and Serotine Bat. Rather rare types were: Whiskered Bat, big colonies of which were located in 1950s next to Terpinnya Village, Melitopol District (Abelentsev, Popov, 1956) [18], and Common Pipistrelle.

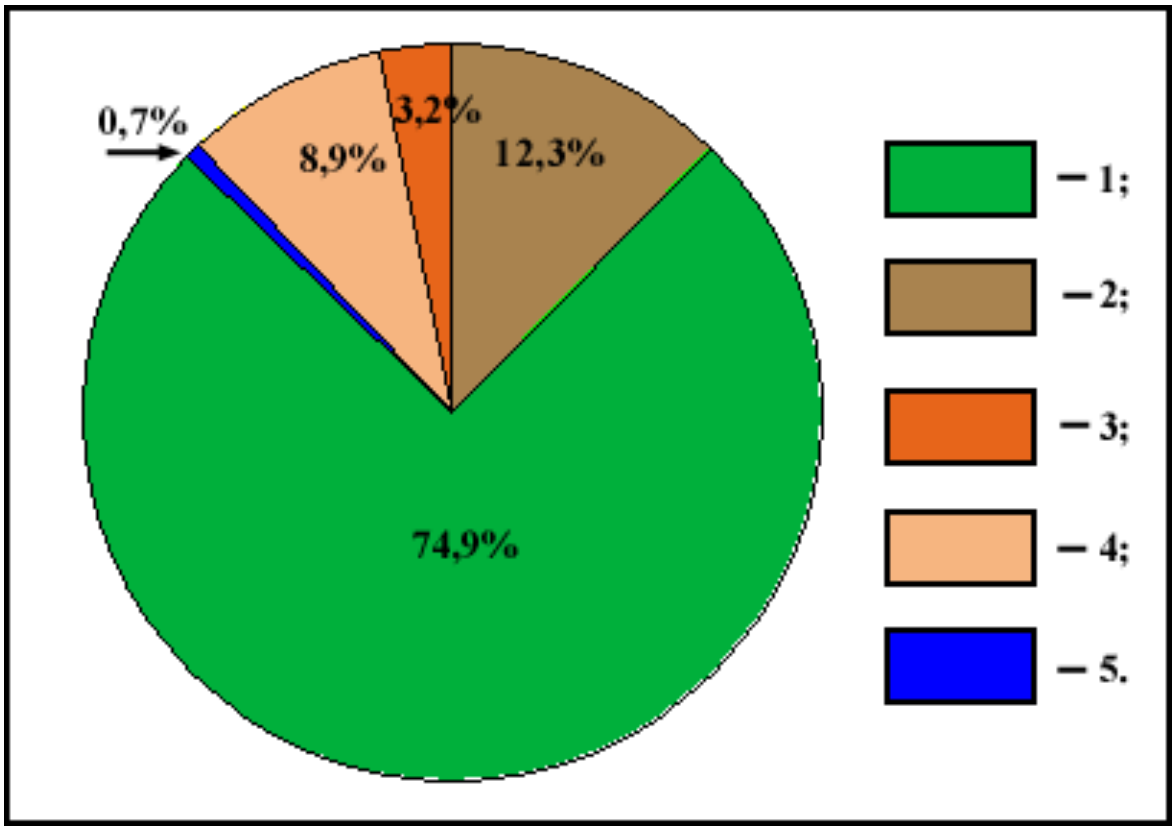


Fig. 4.4. Distribution of bat population as per quantity (%) and types: 1 – Kuhl's Pipistrelle; 2 – Common Noctule; 3 – Whiskered Bat, 4 – Serotine Bat, 5 – Common Pipistrelle (Small).

Taking into account that population of bats in the examined territory during the year is significantly changed that relates to migration peculiarities and reproduction processes of the specimen, we analyzed its dynamics in different seasons of the year (Table 4.6). By-season distribution of materials has been performed in the following way:

- Spring time lasts from March till 1 June when bats awake after winter hibernation, perform spring migration and build colonies;
- Summer for bats ends on 15 August when autumn migration processes become visible in the region;
- Autumn in the year of research lasted until 21 October when bats stopped flying.

Table 4.6. Dynamics of bat population as per season of the year and phase of biological cycle

Species of bats	Spring		Summer		Autumn	
	Abs.	%	Abs.	%	Abs.	%
Common Noctule	11	4,0	65	16,3	130	13,0
Kuhl's Pipistrelle	263	96,0	303	75,9	687	68,8
Pipistrelle Small	–	–	7	1,8	2	0,2
Common Serotine	–	–	23	5,8	126	12,6
Whiskered	–	–	1	0,2	54	5,4
Total:	**274**	**100,0**	**399**	**100,0**	**999**	**100,0**

It turned out that in spring only species of bats reside in the examined territory – Kuhl's Pipistrelle and Common Noctule. We could not find out Common Serotine in this season of the year although earlier we registered its residence in other places of the region. During summer season within boundaries of the planned Wind Park plots we registered 5 species of bats. Besides that identification of 1 Whiskered Bat, which was registered by detector on 12 July 2011 in the forest belt next to Dunaivka Village, arouse no doubts. This animal had steady signal of 52 κHz frequency that distinguishes it from Pipistrelle Small, closest by frequency range whose signal varies in the range of 40–49 κHz. In autumn species diversity of bats remained unchanged but its structure changed as number of Common Serotine and Whiskered Bats grew up. This correspondingly diminished domination of Kuhl's Pipistrelle from 96,0% in spring up to 68,8% in autumn.

Since bat fauna of the Ukrainian Azov Seaside has been studied poorly, it may happen in future that the species of bats which have been tracked down by the researchers in the past will be discovered. It is also worth anticipating that as a result of significant landscape transformation new for this region bat species may be discovered as well. To a certain extent, dynamics of abiotic factors cyclicity relating to climate aridization contributes to these changes.

4.4.2. Impact of ecological conditions to bats

Abiotic ecological factors which are very variable in the Ukrainian Azov Seaside have a very strong impact on bat space distribution and their activities. In general bats are heat-loving animals since insects are their major food. Growth and breeding of insects depend directly upon temperature range, humidity and other abiotic factors.

Making analysis of air temperature dynamics in the territory of the planned Wind Parks on the Azov Seaside (Table 4.7), it is required to pay special attention to its significant amplitude during the whole period of research work. It was caused by cold weather in spring 2012, which stayed cold until early April. More favorable for bats air temperature 9ºC was fixed only after 19 April, but in general up to 21 April night temperature was not higher than 11 ºC. It is quite natural that this factor led to delay of beginning of bat migration, although 3 Kuhl's Pipistrelle species were registered on 19 March 2012 at 17:57 with +14ºC temperature, but later on their activities have not been witnessed because light frosts used to happen rather frequently at night. The winter in December – January 2012 was rather mild but temperature in February and during the whole spring was rather cold. The weather in late March was similar to winter weather. In particular, it was very cold at night on 17 March, when night temperature was 0ºC- +2,6°C. Only in the first decade of April the night frosts have gone and it contributed to awakening of Kuhl's Pipistrelle that started flying. But low night temperature which was 4-6°C, hindered to active awakening of bats and growth of small insects which are their major food.

Table 4.7. Air temperature dynamics (ºC) for 5 July – 28 October 2011 and 17 March – 8 May 2012 in the following locations.

The closest village	Number of checks	M ± m	Min	Max	Std. Dev.
Mordvynivka	193	16,1±0,45	-4,5	23,1	4,18
Nadezhdine	34	15,1±1,23	1,5	23,0	7,16
Dobrivka	81	17,6±0,66	1,4	24,0	3,37
Girsivka	74	14,9±0,82	1,6	23,0	7,10
Devninske	73	21,4±0,68	7,0	28,0	5,81
Dunaivka	169	17,7±0,54	1,6	28,0	7,05
Stepanivka Persha	57	11,4±0,81	2,9	20,0	6,14

Low air temperature, high air humidity, frequent return of frosty weather and durable hibernation during winter 2011-2012 resulted in major energetic losses and death of many animals. First two migrating Common Noctules were registered on 6 April 2012 at 19:00 at +15ºC. These species flew to the east. Starting from this particular moment bat activities accelerated and we witnessed their evening and early morning flights more and more often and also fixed them using a detector.

In 2011 the last migrating specimens (Kuhl's Pipistrelle and Common Noctule) were registered on 21 October, when air temperature dropped to 6–9ºC. Later on a few specimens of Kuhl's Pipistrelle which belonged to a local group appeared only within boundaries of local communities that is a characteristic feature for this type of sinanthropus.

In general during the period of research work which was reserved at possible term of bats' coming out from hibernation and beginning of their active life we have not notified any essential correlation between dynamics of night temperature and active life of animals (Fig. 3.2). Most probably, it relates to the phenomenon that intensification of bat's metabolism is evolutionarily determined with start-up of meteorological spring when air temperature goes over 0ºC and is stabilized exclusively in positive degrees of its scale.

For those small animals, like bats, which are characterized by soaring flight, wind may have essential impact on their travelling in space. But in process of our studies there were not any powerful wind flows (Table 4.8). Wind speed fluctuated in insignificant range from 0 to 5,6 m/sec.

Probably, that is why our attempts to evaluate wind impact on activity and migration of bats have become unsuccessful. In any event we failed to find out any correlation between their quantity and wind force (diagram 4.5), although rather extended period of time and registration data of a large number of animals have been taken into account (n = 1672).

Table 4.8. Dynamics of wind force (m/sec) for 5 July – 28 October 2011 and 17 March – 8 May 2012 in the following locations.

The closest village	Number of checks	M ± m	Min	Max	Std. Dev.
Mordvynivka	193	2,1±0,08	0	5,6	1,15
Nadezhdine	34	2,2±0,21	1,0	5,6	1,23
Dobrivka	81	2,4±0,12	1,0	5,6	1,06
Girsivka	74	2,3±0,14	0	5,6	1,20
Devninske	73	2,4±0,12	0	4,1	0,68
Dunaivka	169	2,5±0,07	0	5,0	0,59
Stepanivka Persha	57	2,1±0,20	0	4,3	1,49

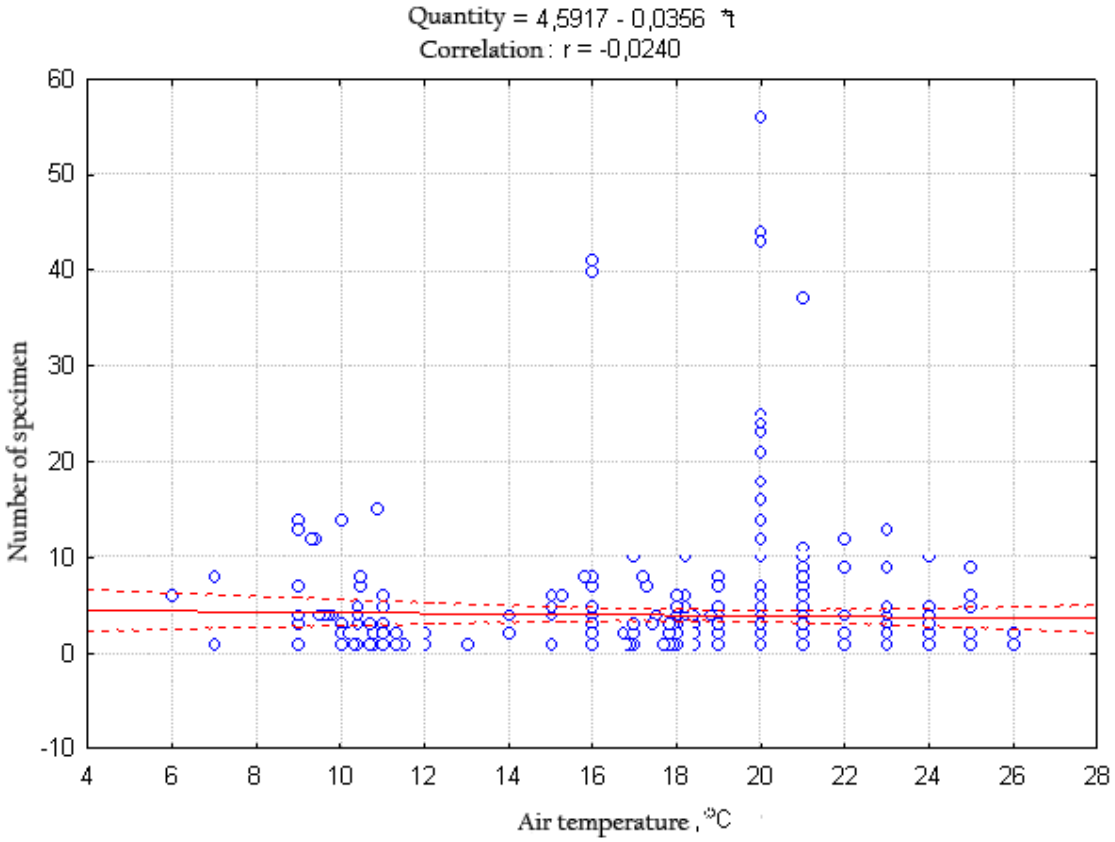


Fig 4.5. Correlation between number of bats and air temperature dynamics.

Instead in the past we visually noticed the bats that flew in the daytime or in the morning in strong eastern wind (diagram 4.6). For example, in Askania-Nova the bats flew everywhere on 19-22 and 24 March 2012 when wind force reached 6–4 m/sec and min temperature was $+9,5^0$C, but on 23 March with wind force 10 m/sec and air temperature $+9,0^0$C we could not find them even in seclusion between multistorey buildings. Most likely, the animals stayed weak after hibernation because in April they did not decrease their activity with wind speed 14 m/sec.

All vesper (or evening or common) bats (Vespertilionidae), which are the subjects of our examinations, belong to the animals demonstrating twilight or nightfall activity and depend significantly upon length of a sunny day or duration of sunny radiance. In the evening a lot of bat species strive for leaving shelter within relatively short period of time and all animals travel along just one or a few alternative routes. They return to the shelter for longer period of time and use bigger number of routes. Typically, it is more convenient to observe a bat in flight during sunset (Limpens, 2000). [50]

As per our observations within the planned Wind Park plots, we labored under the impression that bats starts activities very slowly. Only in the middle of night these animals as if in mass flew out of daytime shelters (Table 4.9). However permanent observation in Askania-Nova proved that bats rapidly leave their shelters after sunset and within village boundary for 10-20 minutes fly relatively in a close flow both all along the streets and over the roofs of one-storied buildings to the neighbouring fields where they gradually concentrate.

We registered more than 70% of all bats within a daytime mainly from 21:00 to 24:00. It is interesting to mention that after 01:30 activities of these animals rapidly went down (approximately in 3 times) and until morning time they practically did not resume their activities. In general, bats'

activities within area of the planned Winds Parks were small. However in August we observed significant agility of Kuhl's Pipistrelle in brooding colonies located in Melitopol, Kyrylivka Village, and spit of Biryuchy Island (this data was not reflected in Table 4.9). Their summer activities were considerable: in some places up to 37 species have been registered within 10 minutes. Starting from morning twilight at 04:00-04:10 all bats instantly hid to their day-time shelters.

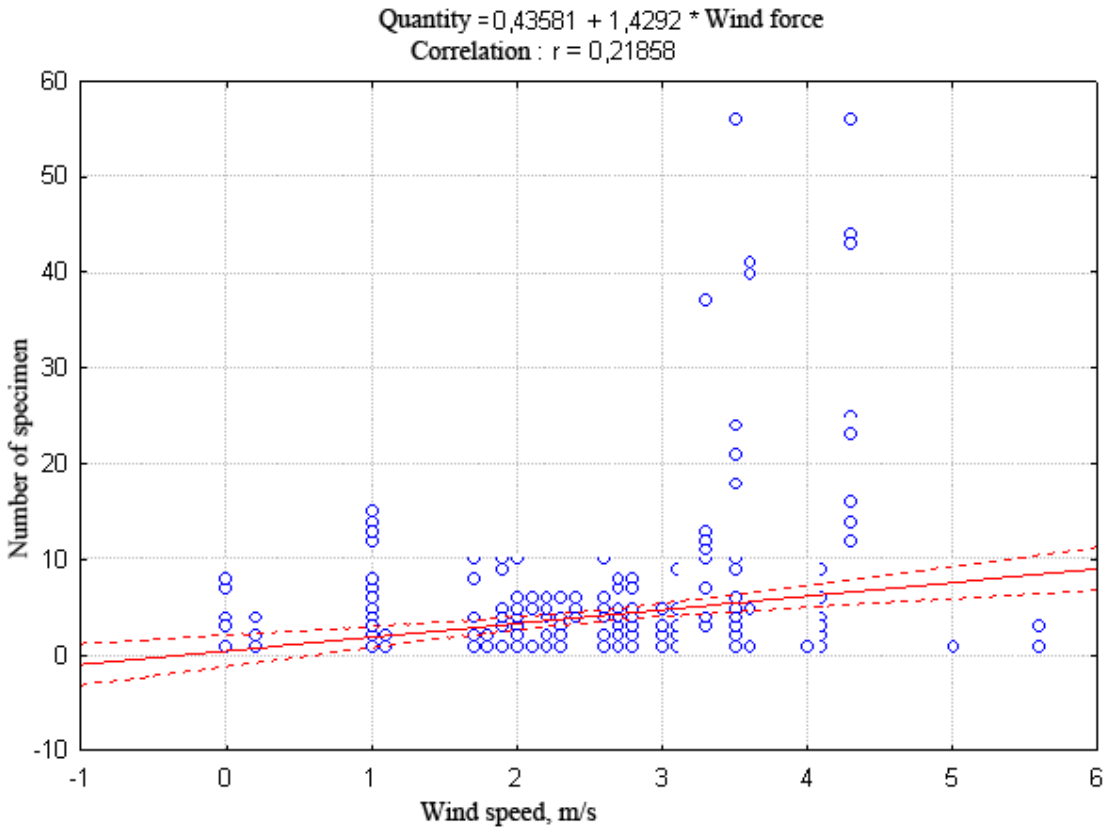


Fig 4.6. Correlation between number of bats and wind force.

Table 4.9. Distribution of bats as per activity time

№	Term of activity		Total	
	beginning	end	specimens	%
1.	17-30	18-25	26	1,6
2.	18-26	19-25	32	1,9
3.	19-26	20-25	17	1,0
4.	20-26	21-25	128	7,7
5.	21-26	22-25	267	16,0
6.	22-26	23-25	447	26,7
7.	23-26	0-25	382	22,9
8.	0-26	01-25	219	13,1
9.	01-26	02-25	67	4,0
10.	02-26	03-25	69	4,1
11.	03-26	04-25	18	1,0
Total:			**1672**	**100,0**

A rather important feature of any bat grouping is its distribution as per biotypes. Results of our research work (Table 4.10) prove that the bigger number of animals have been registered within forest shelter belts, on the coastline of the Azov sea and in the settlements.

Table 4.10. Distribution of bats across biotopes

№	Biotope	Number of measurements			Total	
		abs.	with bats	%	specimens	%
1.	Deciduous forest	38	30	78,9	84	5,0
2.	Garden	36	16	44,4	29	1,7
3.	Agricultural hedgerows	361	249	69,0	714	42,7
4.	Agrocoenosis	70	36	51,4	73	4,4
5.	Inhabited localities	75	49	65,3	158	9,5
6.	Estuary shoreline	42	19	45,2	69	4,1
7.	Sea shoreline	59	27	45,8	545	32,6
Total:		**681**	**426**	**62,6**	**1672**	**100,0**

This can be explained by the fact that in our area the shelters for bats are presented by inhabited buildings mainly or those that are used temporarily. The latter include numerous recreation centres in the coastal area which were built in Soviet times. To a lesser extent during animal migration, bats hide in the cracks formed during the slide of different by size massifs from high argillaceous banks between the Villages of Botieve and Stepanivka in Pryazovske District of Zaporizhia Region and occasionally in nesting-boxes and hollows of old trees in man-made forest plantations.

The largest percentage of animals was recorded near a small woodland and in adjacent agricultural hedgerows as well as in the settlements. But for different reasons the research in these areas was conducted with the greatest profusion (table 4.10). That is why for a more objective index of bats activity, we used calculations of the intensity of their flight in different biotopes within 10 minutes (table 4.11). This gave us an opportunity to identify the importance of certain plots for the planned Wind Parks during the animal migration not separating by species. After all, to study the influence of the Wind Park on wing-handed animals, all species of which are the objects of strict protection in Europe and Ukraine (Red Book of Ukraine, 1994; 2009) [57,58]. After all, this is not that important.

Table 4.11. Average intensity of bats flight in different biotopes within 10 minutes

Biotope	Number of		M ± m	Min	Max	Std. Dev.
	measurements with bats	bats				
Deciduous forest	30	84	2,7±0,59	1	14	3,27
Garden	16	29	1,8±0,23	1	3	0,91
Agricultural hedgerows	249	714	2,9±0,22	1	37	3,43
Agrocoenosis	36	73	2,0±0,24	1	6	1,44
Inhabited localities	49	158	3,2±0,33	1	10	2,28
Estuary shorlines	19	69	3,3±0,56	1	8	2,57
Sea shorelines	27	545	20,2±3,16	1	56	16,43
Total:	**426**	**1672**	**3,9±0,32**	**1**	**56**	**6,57**

An avarage intensity of bats flight within 10 minutes was the most in the sea shore area, and then in other biotopes. And in the latter case there is no statistically significant differences between its values. The situation that was observed near the garden of Dunaivka Village, where only 29 animals were counted, stands out from the general picture.

4.4.3. Spatial distribution of bats

Considering the great responsibility of our state in maintaining species diversity of bats (The Law "On adherence of Ukraine to the Agreement on the Conservation of bats in Europe", 1999) [57,58], all segments of population must take care of this problem. The most important task is to reduce negative impacts of these animals during the creation of new enterprises, which also include the Wind Parks. Therefore, the latter have specific requirements with the installation of equipment and formation of appropriate infrastructure being almost the first point in the list.

Knowledge about the behavior peculiarities and use of resources of a particular landscape by bats, which at a crucial moment of observation is the key for finding shelters and corridors of the most intensive migration play an important role for an efficient study of the spatial distribution of bats. The latter is particularly important for the Ukrainian Azov Seaside which is the place of noticeable movement of bats in spring to the west and in late summer and autumn - to the east.

The general picture of autumn migration flows in the south of Ukraine is presented at fig. 4.7.

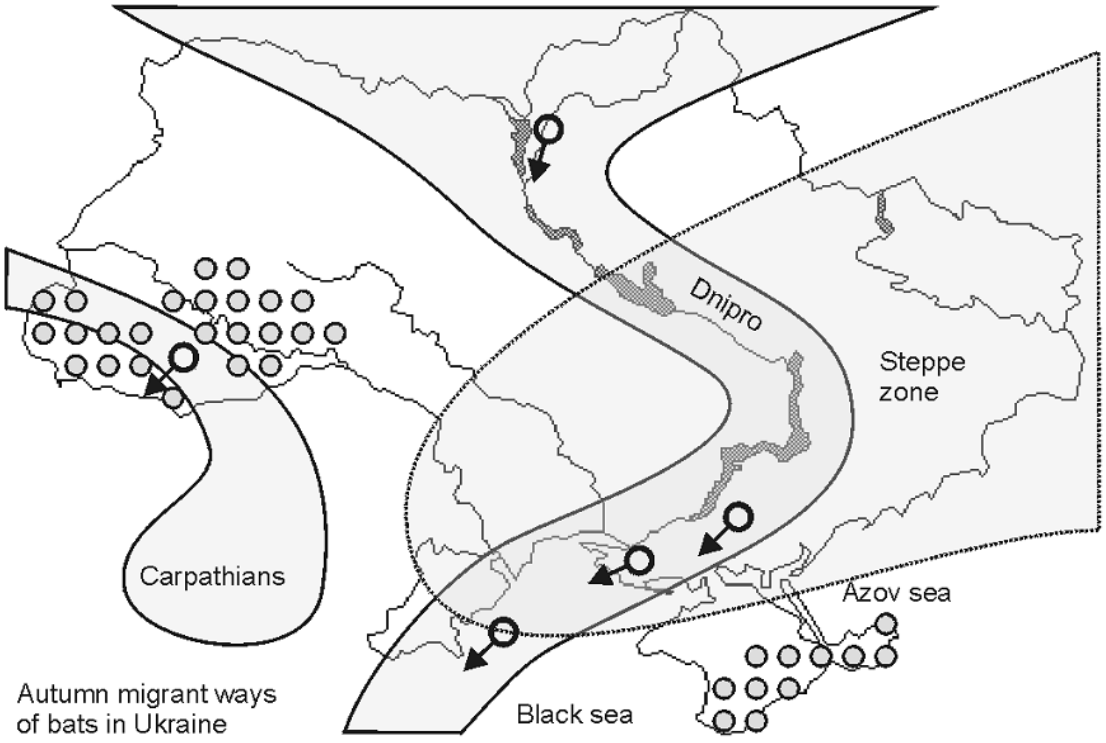


Fig. 4.7. Diagram of the main direction autumn migratory flows of bats in Ukraine [42].

The main migration path of bats in Ukraine, according to I.V. Zagorodniuk [42], is in the valley of the Dnipro river directing to the Balkans. In the Azov Seaside, the animals get through the eastern branch of the Dnipro corridor through Askania-Nova and the Milk river.

The main migration flow detected by us in other areas of the Azov Seaside is located in a narrow strip between Oleksandrivka Village in the north and the sea shore in the south with 32.6% of all recorded animals (table 4.12).

Table 4.12. Spatial distribution of bats (species) accounted for 10 minutes in different places for 5 July – 28 October 2011 and 17 March – 8 May 2012.

Nearest Village	Transect, place	Bats in total	M ± m	Min	Max	Std. Dev.
Mordvynivka	Forest	84	2,7±0,59	1	14	3,27
Mordvynivka	A	222	2,8±0,31	1	15	2,75
Mordvynivka	Village (bar)	91	3,4±0,44	1	10	2,31
Mordvynivka	Estuary 2	24	2,7±0,60	1	6	1,80
Nadezhdine	Stream	39	2,6±0,49	1	6	1,88
Dobrivka	D	170	3,2±0,41	1	13	2,99
Girsivka	North	34	1,6±0,19	1	4	0,87
Girsivka	South	67	3,1±0,49	1	10	2,28
Devninske	C	62	2,1±0,35	1	9	1,87
Dunaivka	B	260	3,1±0,50	1	37	4,54
Dunaivka	Garden	29	1,8±0,23	1	3	0,91
Dunaivka	Estuary 1	45	3,8±0,87	1	8	3,02
Stepanivka Persha	Seashore	545	20,2±3,16	1	56	16,43
Total:	**–**	**1672**	**3,9±0,32**	**1**	**56**	**6,58**

Comparing the features of the spatial distribution of bats in terms of relative number (table 4.12) and in terms of standard deviation (Std. Dev), we can talk about the significant similarity of the first in different phases of our research. This is primarily due to the uniformity and monotony of landscapes that represent field areas not fully suitable for bats. Therefore, despite the relatively few bat fauna of the region, we observe some differences in the structure of the population of these animals, as well as their number in the observation areas. And in some large villages where the location of buildings is predominantly linear, the difference is quite essential (fig. 4.8).

A small number of bats in spring moves from east to west along the Milk Estuary, and a part moves away from the main stream much earlier. In the settlements that somewhat stand out from the overall picture (Mordvynivka – Estuary 2, Dunaivka-Garden), very few animals were counted to say about any local features of their spatial distribution.

The bat population in the villages that are located at short distance between each other which undoubtedly is connected with the influence of local environmental factors turned out to be different. Thus, in the territory of Girsivka Village we registered 3 species, and in the territory of Mordvynivka Village which is located ~6 km we registered 4 species. In the last village the total number of bats prevailed compared to the previous one more than 3 times.

Even more striking difference was found during the record of bats in the forest biotopes on the outskirts of Mordvynivka Village (fig. 4.9). A thorough count of the number of bats using a detector during visual observations that were conducted in the evening and at night with a flashlight in the forests and agricultural hedgerow (transect A) which is closely adjacent to it, showed a significant difference in species diversity and number of animals.

The most comfortable for bats, from our point of view, would be a small artificial forest covering about 30 ha which was founded in the 50s of the 20th century. There is a particular number of old hollow trees at its territory and a tractor station with a lot of places suitable for animals shelters. Despite this fact, a small number of bats (n=84) of three species was fixed on the forest outskirts, whereas in field-protecting the agricultural hedgerow which is no different from hundreds of similar forest plantations of the region, we counted almost 3 times more animals (n=222) represented by 4 species. This can be explained only by the attraction of bats to the air space over a field of young sunflower which bordered on the specified agricultural hedgerow. Visually and through the

detector, many different kinds of owlet moths i.e. nocturnal insects, which are an important part of the summer feeding of all species of bats were recorded over it.

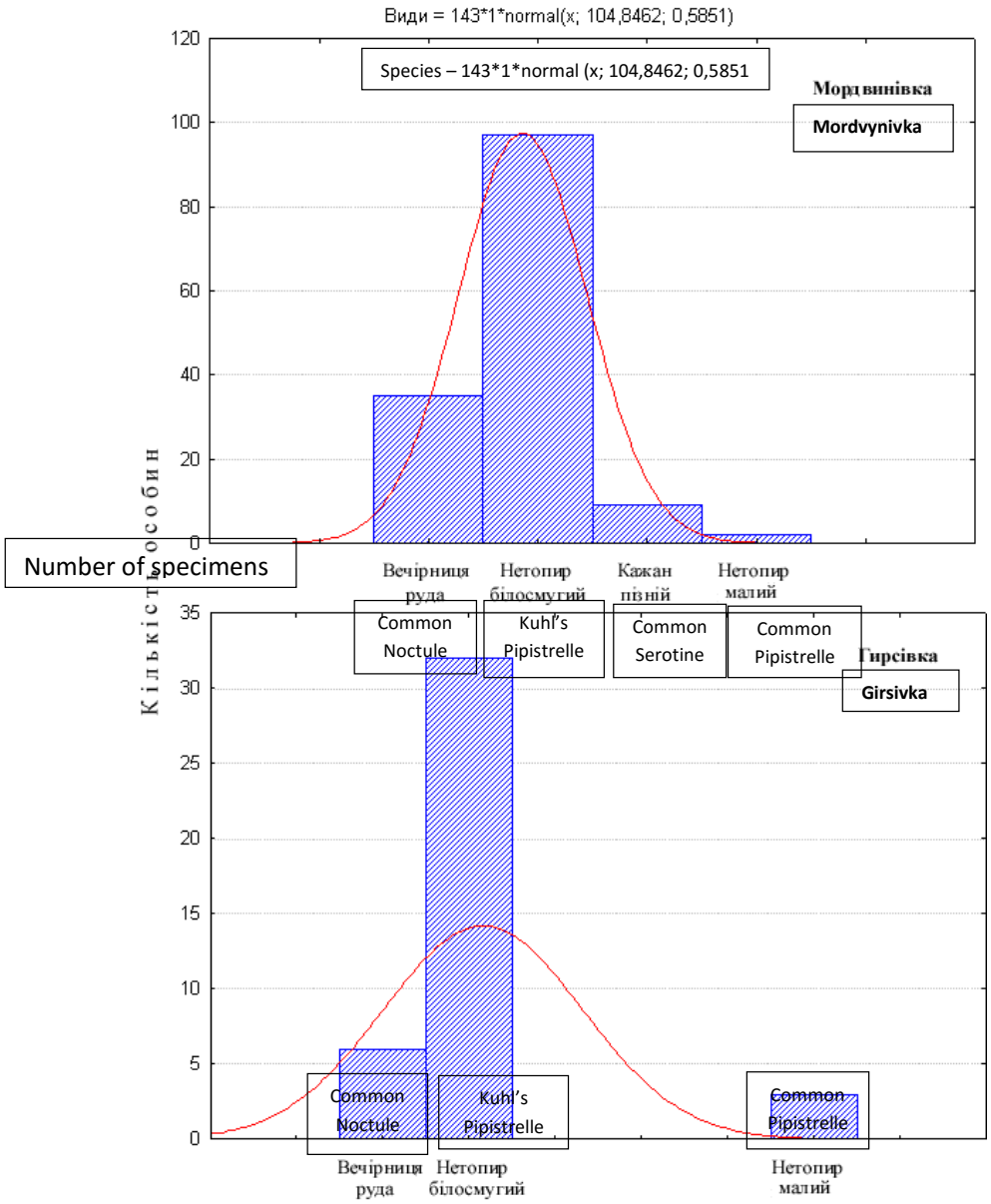


Fig. 4.8. Description of bats population in neighboring villages located near the Milk Estuary.

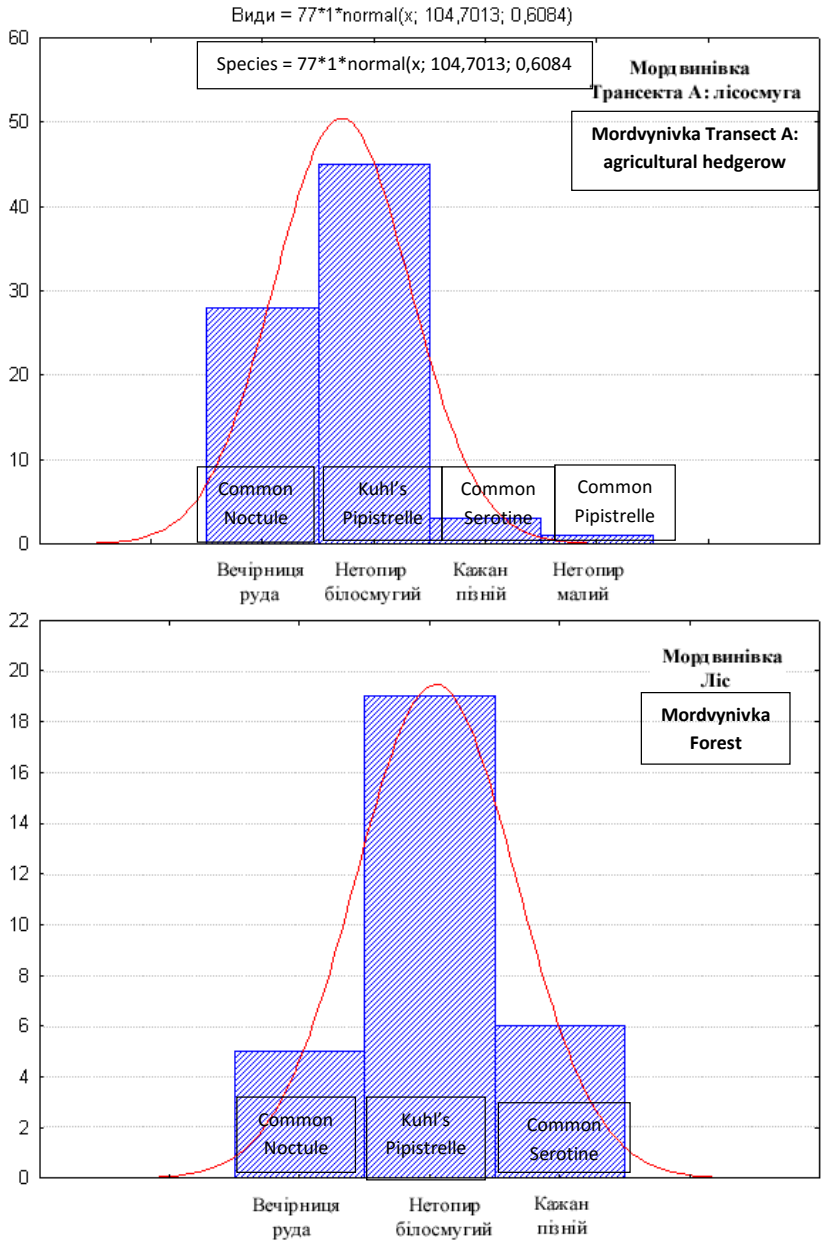


Fig. 4.9. Description of bats population in forest biotopes with distance ~ 300 m between them.

A difference in the population and number of bats between the observation points (the Villages of Devninske and Dunaivka), which are located at the short distance from each other and, in our opinion, are on the same migration route, was also essential (fig. 4.10).

Generally, in most cases during the warm seasons, the high concentration of bats was observed in different places of breeding of moths which were used by animals for feeding during a certain time. After the reduction of their number, which is connected with the biological cycle of insects and agrotechnical works in the agricultural lands which dominate in the Azov Seaside, a spatial redistribution of bats occure.

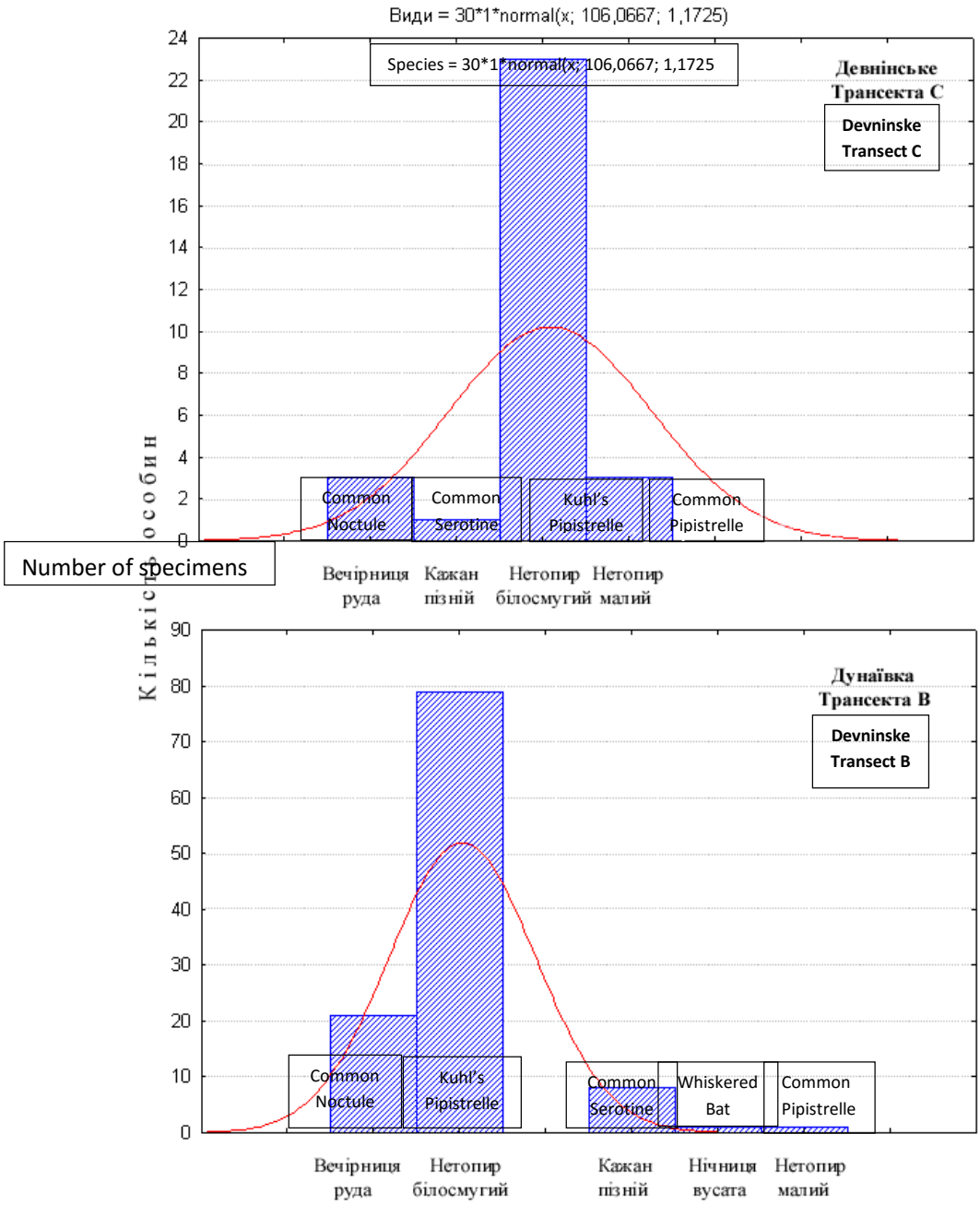


Fig. 4.10. Description of bats population in places of observation which are located on a straight line: west-east-west at the distance of 9 km.

The above mentioned may state the following:

- at the territory of our examinations, there is considerable dispersion of bats in space that is connected with agricultural crop rotations which determines the concentration of their main items of nutrition;
- the migration flows of the studied animals at the coastal areas have a very limited width and require further special explorations. Their goal should be an establishing of existence duration and coordinates of migration channels.

In general we can say that, in terms of preventing the potential negative impact of the Wind Park on bats, a place for their construction and subsequent operation was chosen pretty successfully. A

small number of bats fly across the designated area during the year, including the periods of spring and autumn migration.

4.4.4. Population dynamics of bats

Most of our bats relate to migratory species. Even those which seemingly have a nonmigratory lifestyle are inclined to significant seasonal movements. Due to this fact they explore new territories, but during migrations they face different life situations, fall under the influence of environmental factors to which they have not adapted properly. For this reason in modern dynamic world all spieces of our bats are very vulnerable that affects the dynamics of their population. Certainly during our short-term study we were unable to assess the changes in the number of different bats groups which occured and keep occuring during a year. But we received the materials that allow us to analyze the corresponding changes during a year.

In the north of the Wind Park plot the heterogeneous processes are observed; they in whole, indicate the general trend of the number of bats during the year to its reduction (Fig. 4.11).

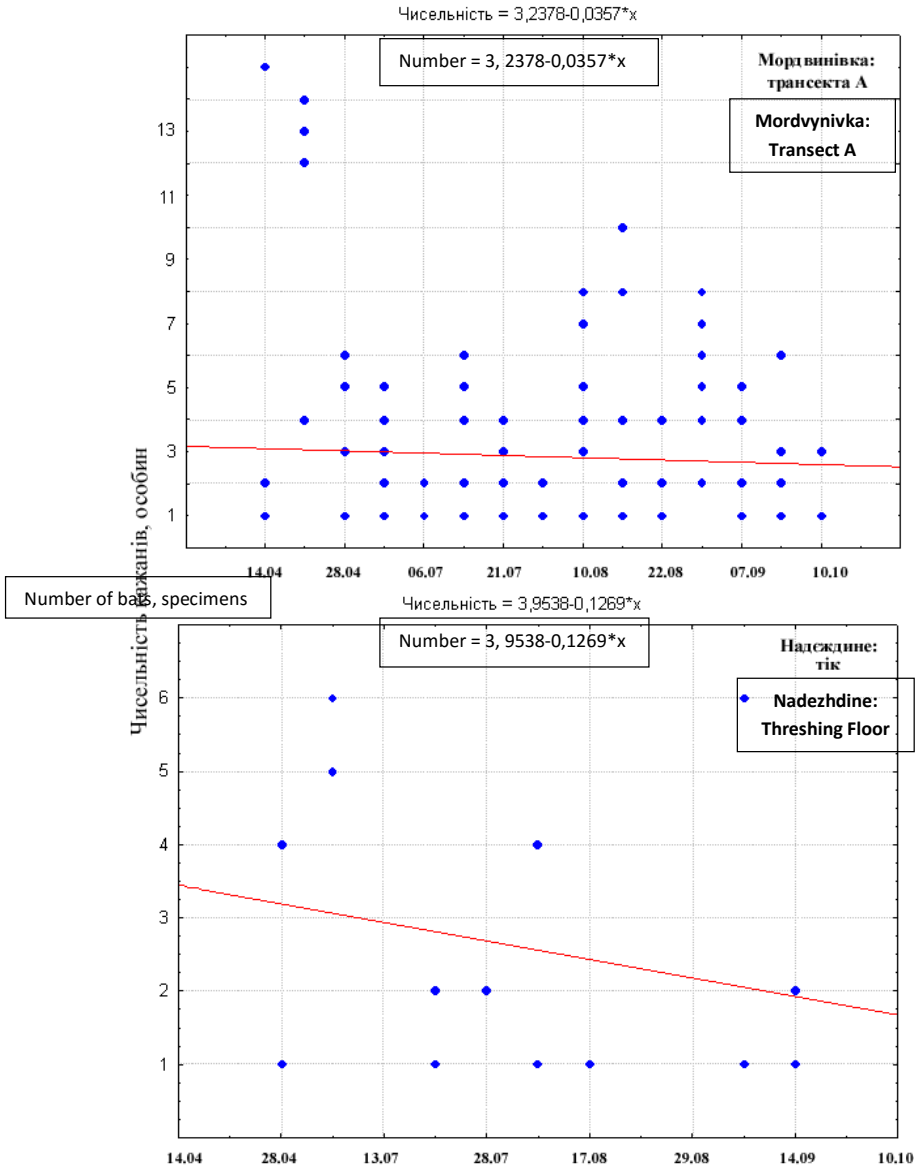


Fig. 4.11. Dynamics of bats population in the north of the Wind Park plot.

However, within Transect A and in Mordvynivka Village which is significantly extended, relatively large number of animals lives constantly. This defines the burst of their number after awakening in spring, the gradual stabilization at the beginning of summer, growth of their number after the breeding and reduction in the autumn as a result of migration. Instead of this, in agrocenoses near Nadezhdine Village Threshing Floor, bats occur to be only during migration and hunting for which they fly mainly from the surrounding villages. Therefore, having the common with the previous plot trend the processes of the number reduction in autumn occurr faster than near Mordvynivka Village. This is evidenced by the overall small number of counted animals, their a bit different distribution in time with early spring peak and a greater slope of the regression line.

A very similar pattern is observed in the northeast of the Wind Park plot near Transect C, placed in the agricultural hedgerow near Dobrivka Village (fig. 4.12).

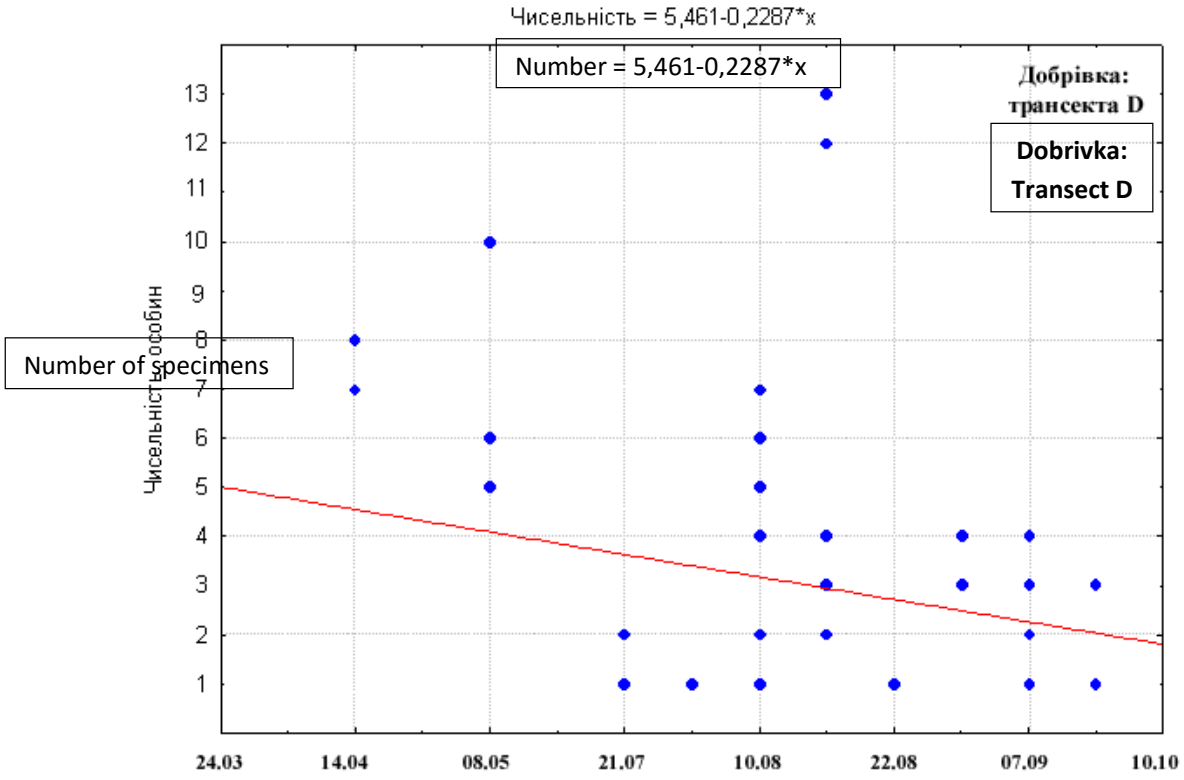


Fig. 4.12. Population dynamics of bats in the northeast of the Wind Park plot.

The latter one is represented by watery forest stand and is characterized by low density of forest plantations located between agrocoenoses away from the settlements. Although the bats can be more often met here than at Nadezhdine Village, their presence is also limited in time and the number which reaches its maximum after the end of animals breeding period is insignificant. But their number growing in spring after their hibernation, stabilization at the beginning of summer and growth at the end as well as the reduction in autumn time can be clearly traced.

Quite peculiar is the dynamic trend regarding the number in the southeast within Transect C placed in the field biotops near Devninske Village (fig. 4.13). Here, while maintaining the already mentioned cyclicity of biological processes, a gradual increase in the number of counted bats occurs. Given their small number (n=62), we will not argue that this phenomenon is regular. Certainly in future we will make more efforts to obtain more complete material of this place and similar ones, as far as the indicated trend is observed in several other borders of the Wind Park plot.

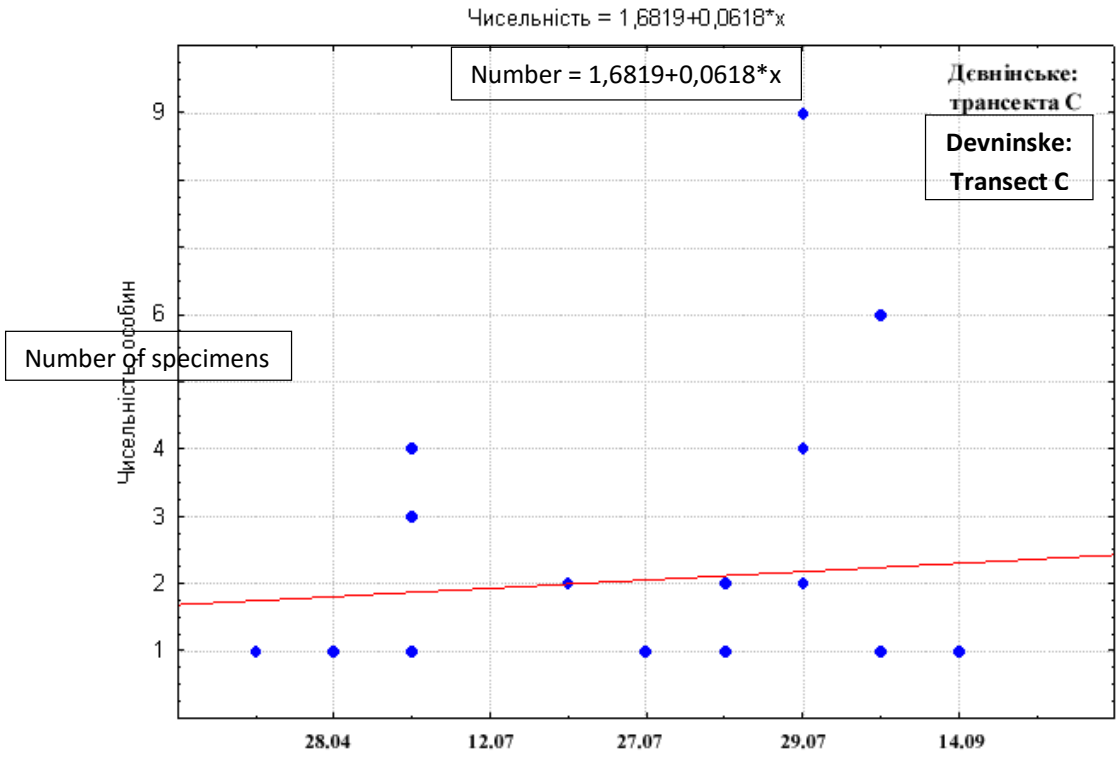


Fig. 4.13. Dynamics of bats population in the southeast of the Wind Park plot.

In the northwest area of our research conducted in the northern outskirts of Girsivka Village and the south of the settlement, pretty peculiar population dynamics of bats was observed (fig. 4.14).

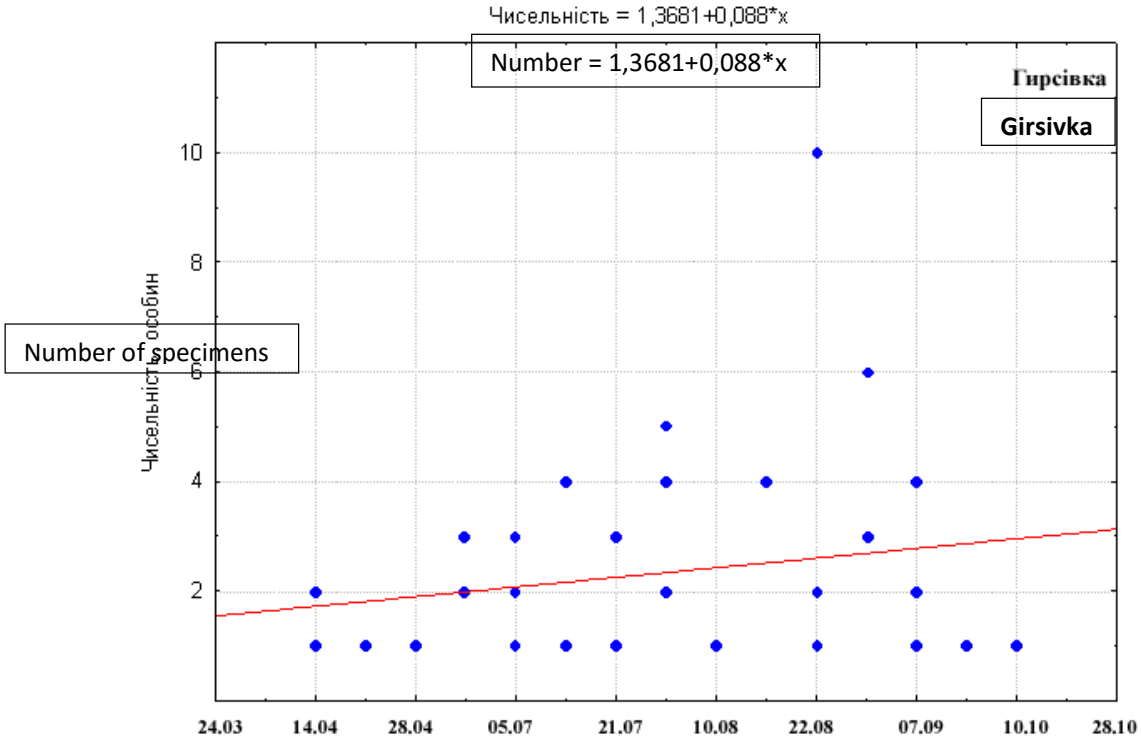


Fig. 4.14. Population dynamics of bats in the northwest of the Wind Park plot.

The mentioned pecularity is that during winter there are very few bats in this village. Only when summer warm weather is set, their number grows steadily reaching its maximum in the last days of summer. At this time an active migration of bats occurs in our region and apparently the first migration wave passes through the southern outskirts of the village. In any case here we have counted 2 times more animals than on its northern outskirts. In early September there is a sharp decline in their number that in 2011 and 2012 was connected with a decrease of migrants flow.

In the southwest area of the Wind Park the mentioned pattern repeats (fig. 4.15). And a lot more bats were counted here (n=334) than in the northwest (n = 101), and the observation was carried out near Dunaivka Village in 3 places (Transect B, Garden, Estuary shoreline).

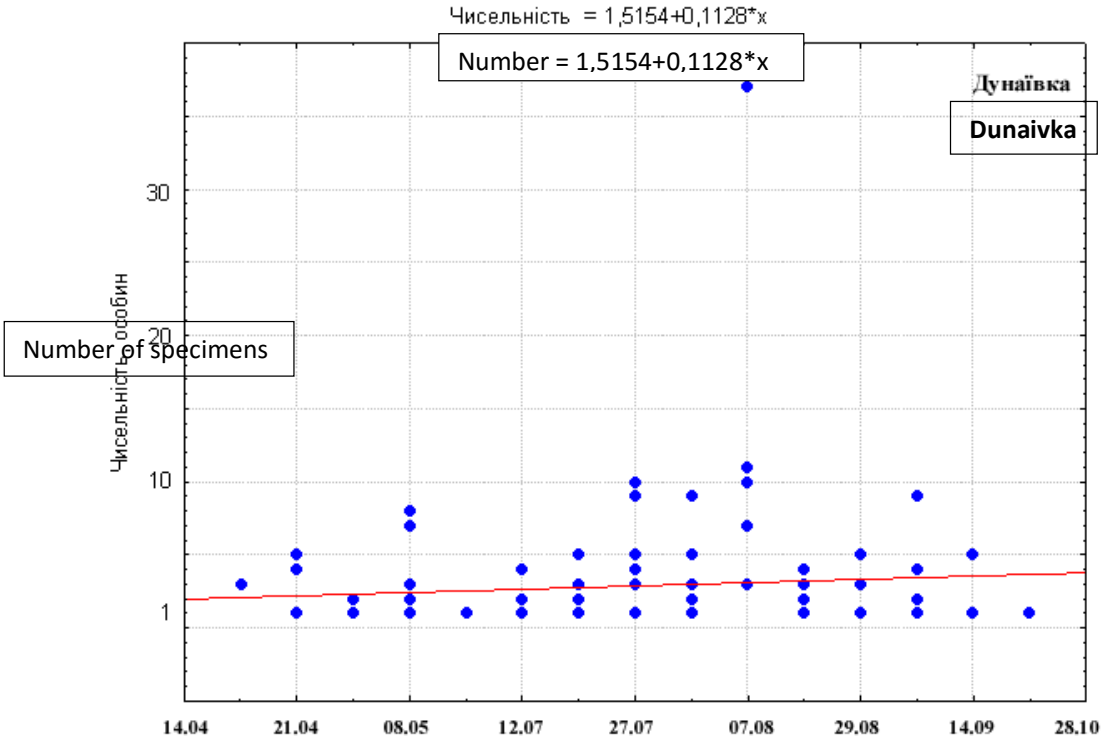


Fig. 4.15. Dynamics of bats population in the southwest of the Wind Park plot.

This shows an identical cyclicity of biological processes and similarity of migration features in areas which are directly adjacent to the Milk Estuary. Visually we repeatedly observed the bats flying its territory over from the south or north during the autumn migration. This forms the peculiarity of migratory flows which directly pass the shoreline of the estuary and the surrounding villages.

Unfortunately we rather late began to study the Azov Sea shore along which a large number of migrating bats fly. Figure 4.16 shows a rapid increase in the number of animals during the last spring month due to the migration of bats along the coastal biotopes during feeding where a large number of insects breed occurs at the same time.

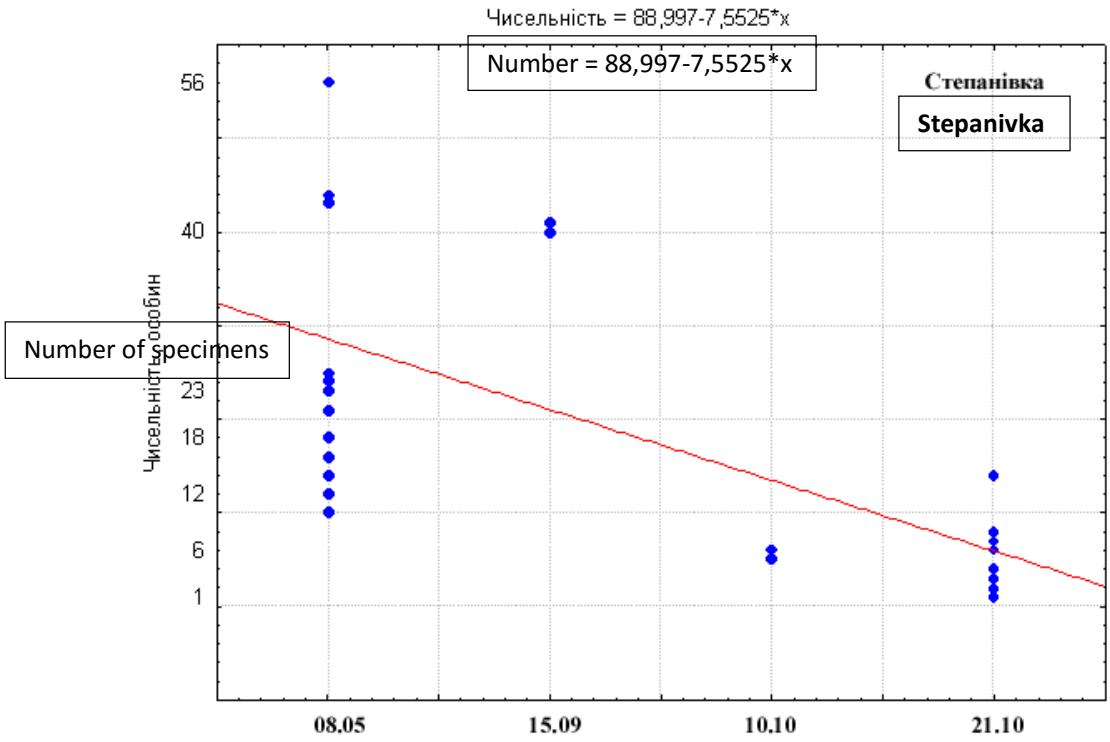


Fig. 4.16. Dynamics of bats population in south of the Wind Park plot.

The second population peak is at the end of October, when between the Villages of Oleksandrivka and Stepanivka Persha a considerable number of bats migrates.

Determination of duration of biological cycle phases is of great importance to understand the peculiarities of bat population dynamics of the mentioned animals. Among which the key are:

- Departure from hibernation places, spring migrations and formation of nidifugous colonies;
- Breeding and subdivision of nidifugous colonies and the beginning of autumn migrations;
- Formation of colonies and autumn migrations.

Analyzing the change in bat population regarding mentioned biological characteristics, it is clear that in spring their abundance is small (table 4.13). Among 2 recorded species, Kuhl's Pipistrelle has the biggest one.

Table 4.13. Average number of bats (specimens) counted within 10 minutes in spring (17 March – 31 May)

Species of bats	Number of specimens	M ± m	Min	Max	Std. Dev.
Common Noctule	11	1,1±0,11	1	2	0,33
Kuhl's Pipistrelle	263	4,0±0,43	1	15	3,47
Total:	**274**	**3,6±0,39**	**1**	**15**	**3,39**

After the waking from hibernation and the end of spring migration, more species appear in the investigated area, and population of the dominant species doesn't increases but decreases (table 4.14). This is due to the eviction of the part of animals which is especially noticeable in August, and in some warm years - in the first half of September as well.

Table 4.14. Average number of bats (specimens) counted within 10 minutes in summer (01 July - 15 August)

Species of bats	Number of specimens	M ± m	Min	Max	Std. Dev.
Common Noctule	65	1,5±0,19	1	6	1,23
Kuhl's Pipistrelle	303	2,5±0,19	1	10	2,07
Common Pipistrelle	7	1,2±0,17	1	2	0,40
Serotine Bat	23	1,3±0,14	1	3	0,58
Whiskered Bat	1	–	–	–	–
Total:	**399**	**2,2±0,16**	**1**	**10**	**1,90**

In relatively close to the Azov Seaside Districts (The Black Sea Biosphere Reserve), large concentrations of Common Noctules, Common and Nathusius' Pipistrelles, occasionally – Whiskered Bats, Giant and Lesser Noctules have recently been observed from the second half of August. The bats used hollows, cracks and holes in the tree bark, different covers in domestic buildings, haystacks, as well as rodents and carnivores holes as shelters (Abelentsev, 1980).

In autumn the species composition of bats in the area of examination is practically unchangeable (table 4.15), but due to migrants number of Kuhl's Pipistrelle population increases approximately in 2 times, and population of Common Noctule increases in 3 times.

Table 4.15. Average number of bats (species) counted within 10 minutes during autumn (16 August – 10 September)

Species of bats	Number of specimens	M ± m	Min	Max	Std. Dev.
Common Noctule	130	4,5±1,15	1	23	6,20
Kuhl's Pipistrelle	687	5,5±0,78	1	56	8,76
Common Pipistrelle	2	–	–	–	–
Serotine Bat	126	24,6±8,73	4	56	19,51
Whiskered Bat	54	27,0±17,00	10	44	24,04
Total:	**999**	**6,2±0,77**	**1**	**56**	**9,79**

At the end of September, Kuhl's Pipistrelles can be found in attics, vent holes under ledges and other parts of various buildings. Individual animals can be observed in the air in warm evenings in October and even November. According to the results of ringing, many Common Noctules from Central Russia fly through the Azov Seaside for hibernation in the foothills of the Crimea (Panyutin, 1980)[31].

Especially notable in autumn is the increase of Serotine Bat and Whiskered Bat population by several times which is now a rare inhabitant of the region.

Conducting bat population studies an important indicator of thie population is the distribution of animals by the size of colonies. Within the plots of the planned Wind Park, the largest values of this index, strange as it may seem, were established in the colonies of Whiskered Bat and Serotine Bat. (table 4.16).

Table 4.16. Distribution of bats in investigated areas by a colony size

Species of bats	Number of colonies	Number of specimens	M ± m	Min	Max	Std. Dev.

Common Noctule	82	206	2,5±0,45	1	23	4,04
Kuhl's Pipistrelle	312	1253	4,0±0,34	1	56	6,05
Common Pipistrelle	7	9	1,3±0,18	1	2	0,34
Serotine Bat	22	149	6,8±2,93	1	56	13,43
Whiskered Bat	3	55	18,3±13,09	1	44	22,68
Total:	**426**	**1672**	**3,9±0,32**	**1**	**56**	**6,58**

This indicates the ability of these animals to concentrate significantly in our territory which greatly increases their vulnerability to various environmental factors. Instead, all other species are described by considerable dispersion in space and low ability to form colonies during migration.

In general we can say that the dynamics of bats population during the year has specific features in different areas of the plot 1. In the north, south and east it increases in spring, then stabilizes in early summer and grows in early autumn. It also demonstrates a general tendency to decrease. In the west, on the contrary it rapidly increases from spring to late summer, then declining sharply as a result of departure of a significant number of animals.

4.4.5. Protection of the Azov Seaside bats

Among bats species of the Azov Seaside there are no species a population of which would be under the threat of extinction (table 4.17, in bold).

Table 4.17. Distribution and population of bats in Ukraine*[59]

№	Species	Distribution	Condition	Tendencies in population changes
1	*Rhinolophus ferrumequinum*	r	o	s
2	*Rhinolophus hipposideros*	r	o	?/s
3	*Miniopterus schreibersii*	r	e	в
4	*Myotis blythii*	r	o	s
5	*Myotis myotis*	r	o	s
6	*Myotis bechsteinii*	r	s	?/s
7	*Myotis nattereri*	w	s	?/s
8	*Myotis emarginatus*	r	vs	?/s
9	*Myotis dasycneme*	w	s	?/s
10	*Myotis daubentonii*	w	c	s
11	*Myotis brandtii*	r	s	s
12	***Myotis mystacinus***	**w**	**o**	**s**
13	*Plecotus auritus*	w	o	s
14	*Plecotus austriacus*	r	o	s
15	*Barbastella barbastellus*	r	s	s
16	*Nyctalus leisleri*	w	s	s
17	***Nyctalus noctula***	**w**	**c**	**s**
18	*Nyctalus lasiopterus*	r	vs	?/–
19	***Pipistrellus kuhlii***	**w**	**c**	+
20	*Pipistrellus nathusii*	w	o	s
21	***Pipistrellus pipistrellus***	**w**	**c**	**s**
22	*Pipistrellus pygmaeus*	w	o	?
23	*Hypsugo savii*	r	vs	s
24	*Eptesicus nilssonii*	r	vs	?/–
25	***Eptesicus serotinus***	**w**	**c**	**s**
26	*Vespertilio murinus*	w	c	s

Notes.* Species distribution: w – wide; r – restricted; condition (occurrence): o – often; e – extinct, s – seldom, vs – very seldom, c – common; trends of population change for last 10 years: ? – unknown, s – stable, (+) – increase, (–) – decrease.

Considering the fact that among mammals of Europe, all bats are considered to be the most sensitive species, our wing-handed animals are also included in the protection lists (table 4.18).

Table 4.18. Bats of the Azov Seaside in the state and international protection lists*

№	Species	RBU	BC	CMS
		Categories		
1.	Whiskered Bat (*Myotis mystacinus* Kuhl, 1817)	S	2	2
2.	Common Noctule (*Nyctalus noctula* Schreber, 1774)	S	2	2
3.	Kuhl's Pipistrelle (*Pipistrellus kuhlii* Kuhl, 1817)	S	2	2
4.	Common Pipistrelle (*Pipistrellus pipistrellus* Schreber, 1774)	S	3	2
5.	Serotine Bat (*Eptesicus serotinus* Schreber, 1774)	S	2	2

***Notes:**
RBU – Red Book of Ukraine [58] : S – sensitive;
BC – The Bern Convention 1979, [60]; Annex 2 includes strictly protected species, 3 species protected species;
CMS – The Convention on the Conservation of Migratory Species of Wild Animals 1979. [61]: Annex 2 includes the species which are in unfavorable condition, maintenance and management of which must be an object of international agreements, as well as the species condition of which could be significantly improved due to international cooperation based on international agreements.

Of course, a short-term exploration did not allow to detect all species. It is quite possible that Gray Big-eared Bat inhabits here which is rare for the Azov Seaside. Giant Noctule that was observed and extracted in Melitopol (1898), in Kherson (1910), in Hola Prystan (1937), in *Solonoozerna* plot in the Black Sea Reserve (1935, 1936) and in Askania-Nova (Kuzyakyn, 1950)[17]. should be mentioned as well. Whereas in the late 20th century the presence of the bat was recorded twice (1976, 1977) in the outskirts of Rostov (Yarmysh et al, 1980)[56], we can assume the possibility of its occurrence in present days in the Ukrainian Azov Seaside as well.

4.5. Conclusion regarding the impact of the Wind Park building on vital activity of bats on the Wind Park plots and in the Adjacent areas

The study carried out by us in 2011–2012 on the Territories of Melitopol and Pryazovske Districts of Zaporizhia Region within the Wind Park plots and on adjacent territories allowed to draw the following conclusions:

1. In terms of preventing potential negative impact of the Wind Park on bats, a place for its construction and subsequent operation was chosen rather successfully. Through the territory of its location during the year, including the periods of spring and autumn migrations, a small number of the mentioned animals fly. Their migration routes are in the form of narrow bands, one of which passes through the upper part of of the Milk Estuary on the northern boundaries of the Wind Park plot, the other - along the coast of the Azov Sea, that is outside the Wind Park plot at all. On the territory of the Wind Park plot there are no registered shelters of bats and their main places of residence are the adjacent villages. The territory of the plot is used by bats as a feeding area with different intensity and sizes depending on crop rotation which determines the concentration of the main objects of feeding;

2. In future, the owners of the Wind Park plot should provide the implementation of a set of measures concerning monitoring of bats population and more in-depth study of their migration in the period of the Wind Park functioning.

These conclusions are based on carefully conducted research with the following statement of conclusions derived from the analysis of factual material:

- bats in the Ukrainian Azov Seaside are a poorly studied group of vertebrates, as evidenced by single regional publications. The features of their population ecology (gender and age and spatial structure of colonies, the dynamics of their population) and all phases of their biological cycle (duration of hibernation, formation and disintegration of colonies, reproduction, migration) remain unknown. In connection with modern taxonomic concepts, the clarification of species list is also required;

- in different years in the territory of the planned Wind Parks, 5 species of bats were found. Among them 2 (Kuhl's Pipistrelle and Serotine Bat) are nonmigratory, and 3 (Whiskered Bat, Common Pipistrelle and Common Noctule) - migratory. Several species (Gray Big-eared Bat and Brown Long-eared Bat, Giant Noctule and Parti-coloured Bat or Rearmouse), which previously were recorded in the investigated area, were not found;

- during the ultrasound recording the dynamics of ultrasonic signals within the boundaries of one species of bats distinguished by low amplitude. For Kuhl's Pipistrelle the fluctuations were 38.8-41.3, for Common Pipistrelle – 43.0-48.0, for Common Noctule - 20.0-27.0, for Serotine Bat – 28.0-33.0 and for Whiskered Bat 50.0-52.0. This makes the detecting method for identification of bats quite acceptable for an expert assessment of the impact of the Wind Park on them;

- for the period of the study 1672 specimens of bats in 13 location were counted. Among 5 species the most numerous were: Kuhl's Pipistrelle (74,9%); Common Noctule (12,3%) and Serotine Bat (8,9%). Very rare were Whiskered Bat (3,2%) and Common Pipistrelle (0,7%);

- among ecological conditions, which significantly affect the bats, early spring cold weather, the duration of which is determined by the ice phenomena of the Azov Sea, should be considered. However, in general between air temperature, wind strength and number of animals during the period of our observations significant dependence was not found;

- in spring only 2 species of bats inhabit the territory of examination – Kuhl's Pipistrelle and Common Noctule. During summer season 5 species of bats were recorded within the planned Wind Park plot. In autumn species diversity of bats remained unchanged but its structure changed due to the growth of Serotine Bat and Whiskered Bat population. Therefore, this reduced the dominance of Kuhl's Pipistrelle - from 96,0% in spring to 68,8% – in autumn;

- peak of bats activity is from 21 to 24 p.m., during which over 70% of specimens were counted. In spring the animals were detected in flight from 17-57 (19.03) to 2-15 (28.04), in summer - from 20-50 (09.08) to 3-37 (28.07) and in autumn - from 17-30 (21.10) to 1-44 (01.09). In general, at 1:30 the bat activity sharply declined and didn't recommence until the morning;

- among the defined plot biotopes, the biggest population of bats was counted in agricultural hedgerows (42,7%) which in the monotonous agricultural landscape of the steppe zone are important environmental corridor for these animals. Quite a lot of bats (32,6%) are recorded in the Azov Seaside beyond the planned Wind Park plot; it indicates its convenient location on the northern boundary of the main migration route. Among other biotopes especially

significant in the region are the settlements (9,5%) that distinguish by a large number of shelters on the treeless coastal plain;

- after harvesting crops, which is at the end of June, the spatial redistribution of bats occurs. In warmer seasons their highest concentration was observed in areas of moths breeding which are an important component of the bats feeding. In late summer, after the reduction of the insects population, there is another noticeable change in the spatial distribution of bats that coincides in time with the beginning of their autumn migration;

- the main migration flow is in a narrow strip between Oleksandrivka Village in the north and the Azov Seaside in the south, where 32,6% of all recorded animals were counted. An average intensity of bat flight along the seaside in 10 minutes was 20,2±3,16, whereas in other areas it varied from 1,8±0,23 to 3,3 ± 3,3±0,56 specimens;

- the number of bats on the Wind Park plot during the year in the north, south and east increases in spring, then stabilizes in early summer and grows in early autumn. In the west it increases rapidly from spring to late summer, then declining sharply as a result of departure of a significant number of animals;

- in the Ukrainian Azov Seaside, according to Red Book of Ukraine (2009), 5 species (Whiskered Bat, Common Noctule, Serotine Bat as well as Kuhl's Pipistrelle and Common Pipistrelle) are considered to be vulnerable and 1 species (Gray Big-eared Bat) - rare. Giant Noctule that previously occurred to be in the region is an endangered species which is additionally confirmed by its inclusion in the European Red List.

Chapter 5. Monitoring and management of important natural constituents in the area of the Wind Park plots and buffer zones.

Approaches to bat monitoring within the Wind Park plot and in the adjacent areas.

General Approaches.

This section is based on the following key positions:

- the extensive study of bats during all seasons were conducted at the Wind Park plot; such study have not been conducted at any Wind Park plot being planned in Ukraine;
- the study was carried out by experienced chiropterologists;
- the study was provided with professional identification equipment, weather equipment, advanced software and automobile transport;
- - during the field study and based on generally accepted methods, original procedure for material collection was developed; it was adapted to the concrete conditions of the Wind Park plot;
- the structure of research and working procedure were specified by the Customer basing on consultations with well-known European scientists;
- an important point was to identify the bats as the most vulnerable group of animals regarding the Wind Park.

To conduct a comprehensive study of bats in the area of possible impact of the Wind Parks on their population, the main tasks were determined.

1. To analyze the previous study of bats at the Ukrainian Azov Seaside.
2. To identify the species composition of bats in the territory of the Wind Parks.
3. To study the dynamics of ultrasonic signals and to rationalize the peculiarities of its use to define the bat species.
4. To analyze the duration of animals activity in different seasons and investigate their distribution through the biotopes.

5. To identify the species diversity, population structure and investigate the influence of environmental conditions on the bats in the region.
6. To find out the nature of the spatial distribution and dynamics of animals population during the year.
7. To analyze the regional bat fauna in terms of preservation of rare species and their diversity.
8. To assess reasonably the impact of the existing Wind Parks on bats in the region.

Methodological approaches.

The population of bats at the area of examination changes essentially during the year due to the migration peculiarities of animals and the processes of reproduction. We analyzed its dynamics in different seasons. Besides that seasonal distribution regarding the conducted works and collection of material will be done in the following way:

- during the spring time, the period from March till June 1 is selected, when bats wake up after winter hibernation, have spring migration and form colonies;
- summer for bats ends on 15 of August, when autumn migration processes in the region become visible;
- the fall in the studied year continued until 21 of October when bats stopped flying.

The created system of transects and points which was used to conduct research on the project is planned to be the basis for selection of monitoring areas of work.

The schedule of monitoring work and their content is presented in table table 5.1. Further possible adjustment of the trip number is possible.

Table 5.1. Schedule of monitoring work.

№	Type of work	Estimated dates*	Number of trips	Reports	Notes
1.	Selection of places for route accounting and key points to research using a detector	1 June 2011	1	Map	Exloration of the project area
2.	Breeding - the peak of activity for local populations	1 June – 31 July 2011	4		The whole night with a break at intervals of every 5 days
3.	Survey of known shelters of migratory bats and search of new ones. Creation of colonies.	1 August – 15 August 2011	1	Maps, databases, lists of species, population	Midday observations
4.	Disintegration of breeding colonies. Beginning of autumn migrations, swarming. Recording of migrants, directions and *heights* of their movement, search of animal concentration areas.	1 August – 15 Sept. 2011	6	Maps, databases, lists of species, population	Observations once a week, after sunset
5.	Conducting a recording of migratory bats during autumn migration and swarming using	16 Sept. – 31 October 2011	6	Maps, databases, lists of	Once a week, 2 hours before sunset

	detector, determination of directions and *heights* of their flight.			species, population	
6.	Observation of autumn shelters and late migrants at the beginning of hibernation	1 Nov. – 15 Nov. 2011	2	Maps, databases, lists of species, population	Half an hour before sunset
7.	Observation of wintering areas	1 Dec. – 15 Dec. 2011	1	Maps, databases, lists of species, population	Midday observations
8.	Observation of bats after wintering and their movements within the area of investigation.	15 March – 31 March 2012	2	Maps, databases, lists of species, population	After sunset
9.	Spring migrations. Searches for breeding colonies of bats and other colonies, record of their population, shape determination of hunting plots of animals, etc.	1 April – 15 May 2012	6	Maps, databases, lists of species, population	After sunset

Approaches to complex monitoring of biological components within the Plots of the Wind Park and in the Adjacent Areas.

The basis for the establishment of the proposed local monitoring is earlier developments by the Azov and Black sea ornithological observatory which are already implemented on a regional scale within the Azov and Black sea coast of Ukraine:

- the scientific program "Monitoring and Sustaining of Biological Diversity of the Wetlands of Ukraine (Melitopol, 1995);
- the program of monitoring aquatic birds of the Azov and Black sea region of Ukraine, developed in collaboration with Wetlands International-AEME, The Netherlands the Black sea program Wetlands International, Kyiv (Melitopol, 1998);
- program of Regional ornithological monitoring (ROM- The Azov and Black sea coast), Melitopol-Kyiv, 2001;
- adjustment of the International Waterfowl – IWC methods for creation of the regional monitoring program "Winter Tracking of Birds in the Azov and Black Sea Region", developed in collaboration with the Black sea program of Wetlands International, Melitopol-Kyiv, 2009

The Azov and Black sea ornithological observatory is an organizational and methodological scientific division which implements the program of Regional ornithological monitoring and monitoring program "Winter Tracking of Birds in the Azov and Black Sea Region of Ukraine" together with Wetlands International. The National Research Institute of Biodiversity of terrestrial and aquatic ecosystems of Ukraine is the organization conducting regional monitoring of flora and plant aggregations, reptiles and amphibians, and also bats on the initial stage.

The proposed monitoring program is a purpose-designed monitoring program associated with evaluation tasks of the Wind Park plots impact on the seasonal natural complexes and their

management. This program differs from the basic monitoring programs by the number of monitoring parameters as well as amount and list of management actions. All the other formats of monitoring programs are identical.

The materials apresented in this chapter include only general structured approaches to organization and realization of monitoring and management. The program itself will be created after making a decision about its implementation.

Structured approaches to organization and realization of monitoring. There are 3 stages.
First stage. Determination of tasks, development of system of the monitoring implementation and management measures.
Second stage. Includes the following actions:

- evaluation of terms and stages of monitoring research;
- definition of the monitoring parameters list;
- evaluation of the monitoring areas with the corresponding coordinate parameters;
- determination of the basic methods of conducting monitoring research;
- development of cartographic materials on the basis of geographic information system;
- development of automated system of database creation, file structuring and their control**;**
- determination of delivery formats of monitoring information to Customer;

Third stage. Conducting of monitoring and presentation of results for management measures development.

Terms of conducting monitoring research.
In this aspect one should distinguish frequency and duration of tracking within year and duration of monitoring works by years.

Frequency and duration of tracking within year. Terms of the research conduct are connected with the activity periods of the natural components (table 5.2).

Birds. Birds monitoring is intended for a long period of time and includes technological periods of infrastructure development and the Wind Park plots construction as well as operation period of the Wind Park.

Seasonal activity of the birds in this region is 11 months and includes nesting time, spring and autumn migrations, wintering. 13 trips are suggested altogether and 3 more are reserved for migration periods. The reserved tracking falls at: one on spring migration and two – on autumn migration. While defining research terms and periods, we relied upon the possibility of obtaining the maximum number of monitoring figures which describe the given season of the year and are connected functionally with the Wind Park plots.

Table 5.2. Periods of activity and structure of tracking.

№	Objects	01	02	03	04	05	06	07	08	09	10	11	12
1	Birds	w (1)	w (1)	ms (2)	ms (1) nt (1)	nt (1)	nt (1)		gt (1)	ma (1)	ma (2)	ma (1)	w(1)
2	Vegetation				(1)	(1)				(1)			
3	Amphibians				(1)	(1)	(1)			(1)			
4	Reptiles				(1)	(1)	(1)			(1)			

5	Bats				m(1)	p(1)	p(1)		m(1)	m(1)	m(1)		

Notes:
Birds; w – wintering, ms – spring migration, nt – nesting, gt – autumn gathering, ma – autumn migration, (1-2) – number of monitoring visits
Bats; m – migrations, p – breeding season.

Specific dates for the surveys within the year specified on the basis of longterm works in the given areas.

Spring migration. Carrying out of works during this period falls at the first and third ten-day period of March, first ten-day period of April. An additional tracking falls on March or April. Depending on weather characteristics of a particular year, the terms of tracking can be changed within the March-April months by taking operational decisions. Additional tracking falls at March or April.

Nesting. The first breeding record happens for 25 April – 15 May, and the second record happens for 25 May – 20 June. Information recorded during these terms will include data on early and late nesting birds.

Autumn gathering. Data recording should be conducted in the first ten-day period of August. This makes it possible to compare the recordings with data from previous years. Also in the second-third ten-day period of August hunting begins, and state ornithological areas will be significantly changed.

Autumn migration. Recording includes the second ten-day period of September, the first and second ten-day period of October and first ten-day period of November. Two additional recordings fall at October - November. Correction of record terms according to weather condition and migration waves is allowed.

Wintering. Terms of the records conduction for a wintering period are devided the following way. The period of wintering formation - the second ten-day period of December. The period of formed wintering - the second ten-day period of January. Decline of wintering - the second ten-day period of February. These terms are also defined as a result of long-term research.

Vegetation. The monitoring of plant aggregation is designed mainly for technological periods of infrastructure creation and construction of the Wind Park plots. It includes three terms of investigation with three periods of field works (April, May, September), which enable to assess the state of vegetation in different stages of vegetation. The monitoring of the Wind Park plots after its commissioning may be conducted in a compressed format to determine the status of plant aggregation.

Amphibians and reptiles. The monitoring of these groups of animals is also designed mainly for technological periods of infrastructure creation and construction of the Wind Park plots. It includes four periods of investigation with four periods of field works (April, May, June, September), which enable us to assess their distribution, state of the population according to the stages of their reproductive cycles. Monitoring of the Wind Park plots after its commissioning may be conducted in a compressed format to identify the effects regarding the distribution and the population of amphibians and reptiles.

Bats. The monitoring of bats designed for a long-term period and includes both technological periods of infrastructure creation and construction of the Wind Park plots and the Wind Park functioning period. Due to the fact that our research and historical data, the territory of the Wind Park plots and buffer zones are not the high diversity areas with big population of bats, including

both their shelters during reproductive cycles and migrations. 6 trips are suggested and 2 are reserved for migration periods. The recordings that are reserved, fall at spring migration - one and one - at autumn migration.

Monitoring area.
When discussing the given subdivision, we should consider the fact that this territory is characterized by high exploration degree for many years and basic monitoring works have been done.

When determining the areas of monitoring, in our opinion, the following points should be considered:

- the Wind Park plots should include comprehensive monitoring sites at natural areas (for assessment of nesting birds, plants, amphibians and reptiles), specialized monitoring plots (for an individual assessment of nesting birds, plants, amphibians and reptiles, bats). In agricultural areas (for the assessment of utilization of feeding areas by birds and bats). Directly on the Wind Park plots (to assess the possible death of birds and bats);
- within the area of 1- and 2 km zones, comprehensive and specialized monitoring sites that reflect the structure of dominant landscape-biotopic complexes (for assessment of nesting birds, plants, amphibians and reptiles), and monitoring transects (to determine the feed and migratory activity of bats in different seasons) should also be located;

- at the adjacent distant territories (the Milk Estuary wetlands, areas of the Azov Seaside) should be identified as monitoring sites with large population and long-term use of these territories birds for the period of nesting, autumn gatherings, migration stops and winterings);

The number of monitoring sites will be determined when designing the monitoring programs and discussing with Customer. But their number should not exceed the possibility of their investigation within 2-3 days. When identifying the monitoring sites, those one where the Azov-Black Sea Ornithological Station conducts the long-term research will be used as well; they were chosen for the period of the scientific study preparation during the project implementation.

Main tasks of monitoring research.
Ornithological monitoring. Includes nesting periods (N), migration (in spring and autumn, post-breeding *gatherings*) - M, wintering (W). These signswill be used in further creating mapping and tabular material.

N. Nesting.

The general plan of monitoring works processing includes at this stage consists of four blocks (1-4) with the corresponding list of tasks.

Tasks.

1. Description and clarification of species of the birds that nest.
1.1. Creation of species lists in relation to:
- ecological groups of birds;
- main types of nesting biotopes;
- endangered species according to national legislation;
- endangered species listed in international conventions and lists of protected species;
- determination of vulnerable species having varying degree of influence of the Wind Park.

2. Landscape and biotop description of nesting areas.
2.1. Cartographic description of biotope diversity.
2.2. Identification of areas that are used by birds for nesting.
2.3. General description of the dominant plant groups in nesting areas (for steppe zones - determination of projective cover and height of vegetation).

2.4. Determination of factors of impact on landscape-biotope complexes.
2.5. Creation of landscape-biotope classification for nesting areas with the determination of dominant and secondary elements, degree of succession processes.
3. Distribution and abundance of nesting birds.
3.1. Type science of bird settlement (individual and colonial, etc.).
3.2. Cartographic characteristics of nesting complexes location.
3.2. Determination of the level of stability and "comfort" of nesting settlements.
3.3. Determination of the number of colonial birds (absolute and extrapolation calculations) and dispersed species (determination of population with their graduation on minor, common, and rare).
3.4. Description of long-term dynamics of bird population in nesting settlements (mainly for colonial species).
3.5. Determination of factors of impact on the population and distribution of birds, including the possible impact of the Wind Park.
4. Trophic migrations.
4.1. Location and description of feeding sites and determination of trophic groups of birds.
4.2. Trophic migrations and their seasonal dynamics, compilation of cartographic materials for long distant migrants and threatened species.
4.3. Determination of factors influencing the feeding behavior and trophic migrations within the Wind Park plots and buffer zones (2 and 5 km), including the possible impact of the Wind Park.

M. Migrations and post-breeding *gatherings*.
The general scheme of monitoring of seasonal birds accommodation includes includes 2 periods during a year with the relevant list of tasks.
Spring (Ms).
a) The dynamics of arrival, migration and formation of migration colonies:
- appearance of the first migrants (phenological registration);
- chronological changes in population and species composition;
- species composition of migratory waves, the dominant and threatening species and their population;
- terms of appearance of birds of the local bird fauna on the breeding sites;
- completion of migration (recording of transit flocks of the last migrants).
Autumn(Ma).
b) Formation of post-breeding *gatherings* (the dynamics of species composition and size, main locations of gathering).
c) Migration of local bird species.
d) Dynamics of flight, migration and the formation of migrating clusters:
- chronological changes in population and species composition of migrants;
- migration waves, species composition, dominant and dangerous species and their population;
- phenological registration of last migrating clusters and flocks.
Tasks.
1. Description and clarification of species composition of birds for the Wind Park Plots, buffer zones and areas of high diversity within the adjacent territories of Central Syvash Wetlands.
2. Determining the status of species: partially sedentary, nesting or partially migratory, migratory, moult, roosting time.
3. Determination of phenology of migratory birds in spring and autumn.
4. Registration of periods of maximum species diversity of migratory species and the major migration waves.
5. Determination of daily dynamics of wetland birds during migration at the fixed observation points.
6. Registration of periods of maximum species diversity of migratory species.
7. Analytical assessment of the influence of weather factors on migrations.

8. Zoning, location of migration and post-breeding *gatherings* connected to the biotopes or landscape elements.
9. Area zoning to define species when forming the areas for feeding, rest, moult, roosting time.
10. Determination of the terms of existence of gathering in time and analytical assessment of the impact of weather and other factors on their formation.
11. Stability assessment and trends in the spatial distribution of migratory gathering of birds of a wetland complex.
12. Determination of the number of migratory birds (absolute and extrapolation calculations) and dispersed species (determination of population with their graduation on minor, common, and rare).
13. Preparation of lists of endangered species of migrants which are protected at the national and international levels, are vulnerable in relation to the operation of the Wind Park.
14. Determination of daily trophic migrations and the degree of utilization of bird feeding biotopes within the Wind Park plots and buffer zones (1 and 2 km), impact factors, including the possible impact of the Wind Park.
15. Creation of a register of feeding biotopes which birds visit during migrations. Determination of stably existing areas in recent years and the emergence of new ones.
16. Analytical assessment of the Wind Park plot influence on bird migration, seasonal gathering, trophic migration to determine the management parameters.
17. Cartographic description of location of seasonal gathering, migration direction, trophic migrations and feeding areas.

W. Wintering.
Tasks.
1. Determination and description of landscape elements on which wintering complexes of birds are formed.
2. Compiling a list of wintering birds in accordance with the dynamics of their formation, the maximum diversity and decline.
3. Description of diversity and abundance of wintering complexes and dispersed species in aquatic and terrestrial landscape elements within the Wind Park plots, buffer zones (2 and 5 km) and adjacent wetland areas of Central Syvash Wetlands.
4. Determination of trends in dynamics of bird population of wetland complex and location of wintering complexes.
5. Type designs and creation of a register of gathering in accordance with the species composition, population, place of localization, stability over time.
6. Determination of daily trophic migrations and degree of utilization of feeding biotopes by birds within the Wind Park plots and buffer zones (1 and 2 km), impact factors, including the possible impact of the Wind Park.
7. Determination of factors influencing the formation and existence of wintering complexes of birds (abiotic, anthropogenic, feeding, impact of the Wind Park), development of management plans.
8. Cartographic description of location of wintering complexes and feeding areas.

Monitoring of plant aggregations.
Tasks.
1. General description of landscape vegetative cover within the Wind Park plots.
2. Description of predominant plant aggregations as well as definition of their correlation.
3. Evaluation of the groups' floristic composition together with their brief description and the list of predominant and rare species.
4. Mapping of complex and specialized floristic monitoring plots with natural vegetation.
5. Description of impact on natural plant aggregations resulting from works on infrastructure development and the Wind Park construction.

6. Development of management plan on minimizing of the Wind Park construction influence and evaluation of measures concerning natural plant complexes recovery after the construction completion.
7. Handling of control and monitoring operations concerning estimation of the plant aggregations within the Wind Park plots by the 2nd-3rd year after the Wind Park construction completion.

Monitoring of amphibians and reptiles.
Tasks.
1. Description, typification and mapping of the main biotopes of habitation.
2. Evaluation of species composition and biotope distribution of mature animals.
3. Evaluation of areas on the microsites level for breeding season and biotope distribution of larvae and underyearling.
4. General description of breeding conditions and analysis of abiotic factors influence.
5. Description of abiotic factors influence on biotope and seasonal distribution.
6. Description of impact on amphibians and reptiles settlement resulting from works on infrastructure development and the Wind Park construction.
7. Development of management plan on minimizing of the Wind Park construction influence and evaluation of measures concerning amphibians and reptiles habitat recovery after the construction completion.
8. Handling of control and monitoring operations concerning estimation of amphibians and reptiles settlements within the Wind Park plots by the 2nd-3rd year after the Wind Park construction completion.

Monitoring of bats.
Tasks.
1. Determination of places for performing tracking on transepts and monitoring plots with broadband detector (with recording device) to register ultrasound and social bat signals.
2. General landscape and biotope descriptions of territories, predominant natural biotopes and artificial forest plantations on the Wind Park plots and in 1-2 km buffer areas.
3. Description of breeding period (identification of bat species, approximate number and habitat distribution, development of their habitations registry with the evaluation of types as well as their location, determination of hunting areas and their diurnal activity, description of local migration activity of the bats.
4. Description of regional and continental migrations period (determination of bat species, approximate number and habitat distribution, direction of migrations, their intensity and altitude, definition of terms of the highest migration intensity (migration waves), possible description of the main regional migration routes.
5. Definition of the most intensive periods of the year concerning bats presence in the specified area.
6. Development of cadastre of the key seasonal areas in the coordinates system.
- preliminary conclusions on the Wind Park impact on formation and condition of the seasonal settlement of bats and possible ways to minimize the Wind Park impact.
7. Evaluation of influence factors on seasonal condition of bats, development of the management plans on minimization of the possible Wind Park impact.

Monitoring parameters.
The final list of monitoring parameters will be determined during monitoring program development. Preliminary list of monitoring parameters database structure, as an example, is given for the migration period of birds (table .9.2, 9.3).

Table 9. 2. List of monitoring characteristics for migrations evaluation (M).

Code	Parameter name	Note
M 1.	Date	
M 2.	Time	Beginning-end of the observations
M 3.	Code of place or monitoring plot	According to the specified encoding
M 4.	Biotope name or code	According to the established registry or specified encoding
M 5.	Cloudiness scale	0-clear, 1-separate heap clouds, 2-less than half of the sky in clouds, 3-less than half of the sky is cloudless, 4- thick clouds, 5-stratus clouds
M 6.	Precipitation	According to the data from meteorological offices and portable weather station (within the interval of 3 hours)
M 7.	Wind direction (8 rhumbs)	1-north, 8 – north-western direction
M 8.	Wind force scale (0-5)	0-calm, 1-light breeze, up to 3m/s, 3-fresh breeze up to 10 m/s, 4 – strong breeze up to 17 m/s, 5 – storm up to 25 m/s.
M 9.	Bird species	Name or specified code
M 10.	Absolute number or density	Index number
M 11.	Species status	Partly sedentary, nester or partly migrant, migrant, molting, wintering.
M 12.	Character of species stay	Rest, roosting, feeding, molting
M 13.	Flying altitude	According to the data from altimeter and other data
M 14.	Range of trophic migrations	Based on cartographic documents
M 15.	Type of the feeding field	

Table 9.3. Structure of computer databases on bird migration at the observation station or monitoring plot

Field	Field name	Type	Width
1	Date	Date	8
2	Place or code of monitoring plot	Character	6
3	Coordinates Lat	Character	5
4	Coordinates Lon	Character	5
5	Beginning of observations	Numeric	5
6	End of observations	Numeric	5
7	Species	Numeric	2
8	Number at the 1st hour	Numeric	4
9	Number at the 2nd hour	Numeric	4
10	Number at the 3rd hour	Numeric	4
11	Number at the 4th hour	Numeric	4
12	Number at the other daylight hours	Numeric	4
13-20	Number by rhumbs	Numeric	5
21-24	Number by heights	Numeric	5
25	The maximum number in colony	Numeric	3
26	Average number in colony	Numeric	3

27	Informer/ observer	Character	6

Organizational approaches to monitoring and management

According to organization polls and monitoring performance, as well as the national legislation, the following scheme is suggested.

Customer.

1. Is responsible for the construction of infrastructure and the Wind Park plots, their exploitation and has legal rights to use specified areas.
2. Provides development of the technical assignment and finances monitoring works.
3. Renders additional technical data and documentation for management plans and monitoring.
4. Provides Contractor with the necessary monitoring equipment.
5. According to management plans, buys and installs on the Wind Park plots the equipment necessary to minimize the Wind Park impact on natural components.
6. According to management plans, sticks to the conditions of minimizing impact on natural complexes during infrastructure development and the Wind Park construction.
7. Provides compensatory measures for the recovery of affected natural complexes.

Contractor.

1. Is a state institution, has the basic scientific data for the specified area, as well as experience in monitoring works.
2. Is determined by means of competitive bidding, rule of choosing one contractor, or by different procedures.
3. Performs monitoring program development, conducts monitoring research, develops management plans and the procedure of their implementation.
4. Establishes and strategically presents to Customer measures on minimizing or avoiding the impact made by the working Wind Parks on natural components.
5. Uses monitoring and expeditionary equipment, transport in Contractors' balance, while performing monitoring works.

Financial component.

It includes expense items corresponding to the type of works by seasons and years (table 5.3, 5.4) according to the main monitoring tasks and terms of performing monitoring works on natural components.

Distribution of funds is shown in table 9.5. Expense items and extra fees correspond to the national legislation. More detailed determination of the expense items will be presented during documentation preparation for the agreement on monitoring performance.

Table 5.3. Work scope

Activity	1-year	2nd year	3rd year	4th and the following years	
Development of monitoring program					
Organization and performance of monitoring					
of Birds					
of Flora					
of Amphibians and reptiles					
of Bats					

Table 5.4. Distribution of funds on monitoring by years (hrn.)

	Expense items	1-year	2nd year	3rd year	4-6 years
1.	Expense part (business trips, hotel expenses, car fuel, car repair, materials, office machines and equipment maintenance, indirect costs, financial development of the Contractor's institutions)	33140	28450	28450	27450
2.	Reward of contractors	37900	30400	30400	21900
3.	Extra charge for reward (36,3 %)	13757	11035	11035	8000
4.	Contractors-performers	4000	3000	3000	3000
5.	Value added tax (20%)	17759	14577	14577	12070
6.	Funds reservation (inflation index)	10000	6000	6000	5100
	Total	116556	93462	93462	77520

Chapter 6.

Expert Judgment

on Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region. Development of the Reasoned Expert Judgment

Contractor: Melitopol State Pedagogical University named after Bogdan Khmelnytsky, Institute of Biodiversity Research of surface and water ecosystems of Ukraine, The Azov-Black Sea Ornithological Interdepartmental Station of I.I. Schmalhausen Institute of Zoology of National Academy of Sciences of Ukraine and Melitopol State Pedagogical University named after Bogdan Khmelnytsky Ministry of Education, Science, Youth and Sports of Ukraine.

Basis for establishing expert judgment:

Agreement № 1n dated 06.06.2011 on Creation of Research and Technical Deliverables "Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region. Development of the Reasoned Expert Judgment";

- The State License of I.I. Schmalhausen Institute of Zoology of National Academy of Sciences of Ukraine and its "Decree" №1 d/d 15.10.1998;

- Scientific Report on Creation of Research and Technical Deliverables "Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region. Development of the Reasoned Expert Judgment";

- Report Documentation:

Scientific Report (88 pages of text material, 26 tables, 30 figures)
Annex 1 (6 pages of text material, 1 tables)
Annex 2 (94 pages of text material, 48 tables, 33 figures)
Annex 3 (75 pages of text material, 113 tables, 130 spectrograms)
Annex 4 (664 audio files, GPS files – 21 tracks)

- Scientific materials, databases on the seasonal distribution of bats on a regional scale and project area over the previous years of The Azov-Black Sea Ornithological Interdepartmental Station, Institute of Biodiversity Research of surface and water ecosystems of Ukraine (Melitopol), Tavria State Agrotechnological University (Melitopol), Biospherical Reserve Askania-Nova.

According to the cartographic documents provided by Customer, as well as other project documentation on the plan structure of the Wind Park location, scientific research conducted by Contractor, which was registered in Plan calendar and Technical assignments to the Agreement № 1 n/10 d/d 12.02.2010 and Agreement № 10n/07-10 d/d 14.07.2010, along with the scientific documents and database of the Institute of Biodiversity Research of surface and water ecosystems of Ukraine (Melitopol), Tavria State Agrotechnological University (Melitopol), Biospherical Reserve Askania-Nova, and coordinated map-scheme with borders and plan structure of the Wind Park location within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region, Contractor derived the following basic conclusions:

1. According to general positions the conclusions are based on the following things:

- the extensive study of bats during all seasons were conducted at this Wind Park plot and this context such studies have not been conducted at any Wind Park plots being planned in Ukraine;
- the study was conducted by experienced chiropterologists;
- the study was provided with professional identification equipment, weather equipment, advanced software and automobile transport;
- - during the field study and based on generally accepted methods, original procedure for material collection was developed; it was adapted to the concrete conditions of the Wind Park plot;
- the structure of research and working procedure were specified by the Customer basing on consultations with well-known European scientists;
- the important point was to identify the bats as the most vulnerable group of animals regarding the Wind Park.

2. To conduct a comprehensive study of bats in the area of possible impact of the Wind Parks on their population, the main tasks were determined.

2.1. To analyze the previous study of bats at the Ukrainian Azov Seaside.

2.2. To identify the species composition of bats at the territory of the planned Wind Park.

2.3. To investigate the dynamics of ultrasonic signals and rationalize the peculiarities of its use to define the bat species.

2.4. To analyze the duration of animals activity in different seasons and investigate their distribution through the biotopes.

2.5. To identify the species diversity, population structure and to investigate the influence of environmental conditions on the bats in the region.

2.6. To find out the nature of the spatial distribution and population dynamics of animals during the year.

2.7. To analyze regional bat fauna in terms of preservation of rare species and their diversity.

2.8. To assess reasonably the impact of the existing Wind Park on bats in the region.

3. Research conducted by CONTRACTOR in 2011–2012 in Melitopol and Pryazovske Districts of Zaporizhia Region within the plot of the Wind Park construction and in the adjacent areas allowed to state reasonably:

3.1. In terms of preventing potential negative influence of the Wind Park on bats, the place for its construction and further operation was quite a good choice. Small number of specified animals flies through its location area, including spring and autumn migrations. Their migration routes have the form of narrow lanes, one of which passes over the Milk Estuary along the northern border of the Wind Park plot, another – along the Azov sea coast, that is outside the Wind Park borders at all. No bat settlements are registered on the Wind Park plot, their main places of residence are located in the adjacent villages. The plot is used by bats as feeding territories with different intensity and area, depending on the crop rotation which influences their main prey items concentration;

3.2. In future the owners of the Wind Park plot should provide the complex of measures concerning monitoring of bat population and more profound study of their migrations during the Wind Park functioning period.

3.3. These conclusions are based on the detailed scientific research with the following statement of conclusions obtained after the analysis of factual material:

- based on separate regional publications, the bats on the Azov seaside are not a well-researched group of vertebrate animals. Their population ecology specifics (reproductive, age and space group structure, population dynamics) and all the phases of the biological cycle (duration of hibernation, formation and disintegration of colonies, reproduction, migrations) remain unknown. The species list also needs updating due to the latest taxonomical perceptions;
- over the years 5 bat species were discovered on the territory of the planned Wind Park. 2 of them (Kuhl's Pipistrelle and Serotine Bat) are sedentary, and 3 (Whiskered Bat, Common Pipistrelle, Common Noctule) are migratory. Several species (Gray Big-eared Bat and Brown Long-eared Bat, Giant Noctule and Parti-coloured Bat or Rearmouse), which had been registered in the studied area before, were not detected;
- during the ultrasound recording the dynamics of ultrasonic signals within the boundaries of one species of bats distinguished by low amplitude. For Kuhl's Pipistrelle the fluctuations were 38.8-41.3, for Common Pipistrelle – 43.0-48.0, for Common Noctule - 20.0-27.0, for Serotine Bat – 28.0-33.0 and for Whiskered Bat 50.0-52.0. This makes the detecting method for identification of bats quite acceptable for an expert assessment of the impact of the Wind Park on them;
- among environmental conditions, which significantly affect the bats, early spring cold weather, the duration of which is determined by the ice phenomena of the Azov Sea, should be considered. However, in general between air temperature, wind strength and number of animals during the period of our observations significant dependence was not found;
- in spring only 2 bats species inhabit the investigated territory, they are Kuhl's Pipistrelle and Common Noctule. During summer season 5 bats species were recorded within the planned Wind Park plot. In autumn species diversity of bats remained unchanged but its structure changed due to the growth of Serotine Bat and Whiskered Bat population. Therefore, this reduced the dominance of Kuhl's Pipistrelle from 96,0% in spring to 68,8% in autumn;
- peak of bats activity is falls for the period from 21 to 24 p.m., during which over 70% of specimens were counted. In spring the animals were detected in flight from 17-57 (19

March) to 2-15 (28 April), in summer - from 20-50 (9 August) to 3-37 (28 July) and in autumn - from 17-30 (21 October) to 1-44 (1 September). In general, at 1:30 the bat activity sharply declined and didn't recommence until the morning;

- among the defined plot biotopes, the biggest population of bats was counted in agricultural hedgerows (42,7%) which in the monotonous agricultural landscape of the steppe zone are important environmental corridor for these animals. Quite a lot of bats (32,6%) are recorded in the Azov Seaside outside the planned Wind Park plot; it indicates its convenient location on the northern boundary of the main migration route. Among other biotopes especially significant in the region are the settlements (9,5%) that distinguish by a large number of shelters on the treeless coastal plain;
- after harvesting crops, which is at the end of June, the spatial redistribution of bats occurs. In warmer seasons their highest concentration was observed in areas of moths breeding which are an important component of the bats feeding. In late summer, after the reduction of insects population, there is another noticeable change in the spatial distribution of bats that coincides in time with the beginning of their autumn migration;
- the key migration flow is in a narrow strip between Oleksandrivka Village in the north and the Azov Seaside in the south, where 32,6% of all recorded animals were counted. An average intensity of bats flight along the seaside in 10 minutes was 20,2±3,16, whereas in other areas it varied from 1,8±0,23 to 3,3 ± 3,3±0,56 specimens;
- the number of bats on the Wind Park plot during the year in the north, south and east increases in spring, then stabilizes in early summer and increases in early autumn. In the west it grows rapidly from spring to late summer, then declining sharply as a result of departure a significant number of animals;
- in the Ukrainian Azov Seaside, according to Red Book of Ukraine (2009), 5 species (Whiskered Bat, Common Noctule, Serotine Bat as well as Kuhl's Pipistrelle and Common Pipistrelle) are considered to be vulnerable and 1 species (Gray Big-eared Bat) - rare. Giant Noctule that previously occurred to be in the region is an endangered species which is additionally confirmed by its inclusion in the European Red List.

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Annex 1. Requirements Specification (Annex 5 to the Contract № 1/06.11 dated 06.06. 2011)

Requirements Specification

on Creation of Research and Technical Deliverables "Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region. Development of the Reasoned Expert Judgment".

Title: "Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region. Development of the Reasoned Expert Judgment".

Aim and purpose of the research: The aim of the research is Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region. Development of the Reasoned Expert Judgment on the impact of the Wind Park construction and location within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske and Melitopol Districts of Zaporizhia Region on bats.

Research and Technical Deliverables must include:

1. Research Report with Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Pryazovske and Melitopol Districts of Zaporizhia Region including items 1-9 of the reporting materials structure.
2. Motivated expert opinion on impact of the Wind Park construction and location within the Study area on bats (according to its definition given below in item 3 of the reporting materials structure).
3. Quarter research progress reports containing results of Reading Sessions held during the calendar month (for the quarters being the subject to reading). The first report shall be provided by the Contractor for the first month, and all subsequent ones – on quarterly basis.
4. The actual raw data in digital format collected during Reading Sessions in the manner prescribed below in item 9 of the reporting materials structure.

Structure and research technique

1. **Results of the Work**

- Analysis of the impact of the proposed Wind Park construction on bats within the area of examination.

- Definition of the index of bats activity for each bats species and for each functional part of each transect with their analysis based on the results of voices recording (hereinafter - the

"Index of bats activity"). The Index of bats activity is a numerical value expressed in units of activity per hour, it is defined in each observation in every particular reading point or in each functional part of a transect and calculated separately for each species or species group (for all bats) using the formula:

Ix = Lx * 60 / T
where:
Ix – shall be the index of activity of "x" species or species groups;
Lx – shall be the number of units of activity of bats for species or species groups marked with "x" defined in a continuous registration session in a given part of the transect or in a given reading point (or during all the records under consideration);
T – shall be the duration of a given record (for all the records under consideration) expressed in minutes. In interpreting the results, auxiliary concepts can be used such as "average index of activity of bats" as a numeric value expressed in units of activity per hour defined for a given period - for example, for the period of autumn migrations or for the entire year - and calculated as the arithmetic mean of indexes reported in this period.

The "Unit of activity" means a registered continuous sequence of ultrasonic signals from one animal with duration from one impulse to 5 (five) seconds. In most cases, a Unit of activity corresponds to one specimen passing over the detector sensitivity area that lasts at least 5 (five) seconds. In case of registration of a continuous sequence of signals for a longer time than 5 (five) seconds, it is considered as a number of units of activity being equal to record time in seconds divided by 5 (five) and rounded to whole numbers. In case of registering a sequence of signals produced by numerous animals and a possibility to determine their number by the sonogram, units of activity are calculated separately for each animal. In case of signals registering produced at the same time by so many bats that they cannot be counted and distinguished by the sonogram, the number of bats in a simultaneous record, in order to prevent inflated values, is taken as 3 (three). Where possible, units of activity should be counted separately for each species or species group.

- Indicators of bats activity must be defined after each Reading Session in each functional part of a transect or in each reading point.
- Bats should be divided by species and, where possible, by species groups or types.
- The analysis must also use the average indexes of bats activity.
- Identification/monitoring/analysis of potential/possible locations of bats brood colonies within the Study area. The locations must be visited/updated based on estimates made by a chiropterologist based on his/her personal experience regarding the most likely places to find a bats brood colony.
- Identification/monitoring/analysis of potential bats hibernation sites within the Study area (e.g. caves, basements) based on a chiropterologist`s experience.
- Analysis of the potential impact of the proposed Wind Park construction, operation and subsequent demolition on bats.
- Analysis of the impact on nature protected areas: within the feeding period, the activity indexes are analyzed for bats species being a subject to the risk of elimination in the protected area within the flight routes of these species to feeding areas, and, during the migration period, Indices of activity in the areas where there is a reasonable risk of migration of bats (those species that have to be protected) out from the protected area.
- Identification of areas where no wind turbines generators can be placed because of high potential risk of significant adverse effects on bats – in case of an appropriate conclusion.
- Proposals regarding measures to prevent, reduce and compensate for the impact if necessary and can be effectively implemented.
- Guidance on monitoring after the construction finish (if any).

2. **Methods of research**

- Name in the final report the persons who performed the Work and their qualification with regards to the Work including both collecting and analyzing the data.
- Initial identification of any information available on bats within the Study area and characteristics of the construction plot within the Study area including the plot visits and satellite photos representation.
- Monitoring is to be performed in permanent transects or in permanent reading points.
- Number, location and length of transects and reading points will be agreed with the Customer in writing prior to execution of the Work and documented in the final report to be delivered to the Customer.
- All transects and reading points will be mapped and refined separately according to the size of the given area, landscape, planned turbines location, etc. Transects within the territory of the planned Wind Park should be selected so as to include all types of places of habitat, but it is recommended that they be located in close proximity to the planned positions of wind turbines. The number and location of transects or reading points is to be determined in proportion to the size of the Study area and its diversification in areas of habitat. The parties, however, agree that the minimum length of the functional part of a transect should be 500 meters. During the data collection in reading points, the height which the records are made at will also be documented.
- For each Reading Session, the date, start and end time of each Reading Session in each transect or in each reading point, altitude of recording equipment positioning (if the Reading Session takes place in a reading point), weather conditions (detailed below), the recording equipment used (detailed below), and analysis software (detailed below) will be documented according to an established order.
- During a series of sessions (nights) reading through transects coverage should start alternately from different parts, and in case of recording in reading points – should change correspondingly the sequence of recording in each reading point.
- During Reading Sessions, the minimum period of monitoring carried out in a particular reading point is 10 minutes.
- Indicators of activity of bats for each species and for the functional parts of each transect will be presented along with their analysis.

3. Place for analysis/study conduction

Monitoring should cover both the Wind Park plot (within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District according to the layout map (Annex 2) and selected places of habitat located within about 1 (one) kilometer from its borders and places which, in the opinion of a chiropterologist, are of a special importance for bats and affect their activity in the Wind Park plot (e.g. potential feeding or shelter areas) (hereinafter - the "Study area").

4. The minimum number of observation sessions

It is necessary to carry out at least 28 control observations recording voices of bats (that does not also exclude other methods of observation).

5. The time interval for observation sessions

- Leaving the winter hibernation areas – between the 15th and 31st of March, observations to be conducted once a week, start of observations - after the sunset;
- Spring migrations, formation of brood colonies – the 1st of April – 15th of May: observation to be conducted once a week, start of observations - after the sunset;

- Breeding - the activity peak of local populations – the 1st of June - the 31st of July, 31: 4 night-round observations at regular intervals (minimal frequency - every 5 days) taking into account weather conditions;
- Fragmentation of brood colonies and start of autumn migration, gathering in flocks – the 1st of August – 15th of September: observations once a week, start of observations - after the sunset;
- Autumn migrations and gathering in flocks – the 16th of September – 31st of October: observations once a week, 2 hours before the sunset;
- The last flights between shelters, start of hibernation – the 1st of November – 15th of November: observations once a week, half an hour before the sunset;
- Surveys of wintering places – the 1st December - 15th of December, daytime observations;
- Surveys of known shelters of migratory bats and search for new ones, gathering in flocks: the 1st-15th of July.

6. Type of recording equipment

- Before carrying out the Work, the Contractor shall agree in writing with the Customer all the recording equipment to be used for the Work performance.
- In the research, a broadband detector (with a recording device) will be used to record bat positioning and social signals in a continuous real-time mode with a level of quality that provides for subsequent computer analysis of results and identification of species. The detectors used to record voices should work in a system with frequency multiplexing or provide for possibility to record raw ultrasound (high-frequency recording). Also, the use of a time scale increasing detector which provides automatic sampling every 0.1 seconds is allowed.

7. The software used to analyze the results

- Before carrying out the Work, the Contractor shall agree in writing with the Customer all the software used to analyze the recorded information relating to the Work.
- To record the data from detection equipment, a technology should be used that enables direct sound recording in lossless format (e.g. WAVE, FLAC, APE, WavPAck) or Anabat system files.
- A software is to be applied that allows to perform spectral analysis or zero level crossing analysis.

8. Recording of weather conditions

- The source data of weather conditions that occurred during the study should be recorded and represented in the report (temperature, precipitation, wind velocity).
- The temperature should be measured at least twice: at the sunset and at the end of an observation.

9. Storing of observations results

- The observations and raw data are to be archived by the research main contractor for the period of at least 5 (five) years after execution of the research.
- The Customer (for each quarter in which the Reading Sessions were held) is given on a quarterly basis 1 (one) digital copy of all raw data collected in observations along with a research progress quarter report.

Structure of reporting materials

№	Content	Form of representation
1	Methodological approaches to organizing work and research techniques	Text materials, maps
2	General landscape and biotope description of the territories, dominant natural biotopes and artificial forest plantations, plants groups in the Wind Park plot and within 1-km area.	Text materials, maps
3	General description of seasonal ornithological conditions of the Wind Park plot and adjacent area within a 2-5 km radius. (Species composition, areas of high diversity, rare birds species included into international and national lists, identification of the most intense periods in ornithological terms, retrospective analysis of publications.	Text materials, tables, maps
4	Seasonal description of conditions of habitat (stay) of bats in the Wind Park plot and adjacent area within a 1 km radius. (Based on the results of observations): - Description of the breeding season (identification of bat species, approximate number and distribution over habitats, establishment of a register of their shelters with definition of types and locations, identification of hunting areas and daily activity, description of local migratory activity of bats; - Description of the period of regional and continental migrations (determination of species of bats, the approximate number and distribution of habitats, migration directions and their intensity and height, definition of greatest intensity of migration (immigration wave), possible description of the main migration routes at the regional level; - Rare bats species included into international and national lists (seasonal stay durations, approximate number; - identification of the most intense periods of the year in terms of bats staying within the area, a retrospective analysis of publications; - Establishment of a cadaster of key areas within a coordinates system; - Preliminary conclusions on the impact of the Wind Park plot on the formation and state of seasonal staying of bats and possible ways to minimize the impact of the Wind Park plot.	Text materials, tables, maps
5	Motivated expert opinion on the impact of construction and location of the Wind Park plot within the Study area on bats.	Text materials, tables, maps

Materials submitted at the end of the research:

- Research report on Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Pryazovske and Melitopol Districts of Zaporizhia Region including items 1-9 of the reporting materials structure.

- Research progress quarter reports along with all data collected during a given quarter;
- 1 (one) digital copy of all raw data collected in accordance with the specifications of present Terms of Reference – to be delivered to the Customer on a quarterly basis along with research progress quarterly reports;
- Motivated expert opinion on the impact of construction and location of the Wind Park plot within Pryazovske and Melitopol Districts of Zaporizhia Region on bats;
- Report of scientific and technical products acceptance made in triplicate including estimates of the actual costs detailed by articles.

All materials are to be provided in three copies in paper and electronic media.

Annex 1. Requirements Specification (Annex 5 to the Contract № 1/06.11 dated 06.06. 2011)

Requirements Specification

on Creation of Research and Technical Deliverables "Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region. Development of the Reasoned Expert Judgment".

Title: "Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region. Development of the Reasoned Expert Judgment".

Aim and purpose of the research: The aim of the research is Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District of Zaporizhia Region. Development of the Reasoned Expert Judgment on the impact of the Wind Park construction and location within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske and Melitopol Districts of Zaporizhia Region on bats.

Research and Technical Deliverables must include:

1. Research Report with Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Pryazovske and Melitopol Districts of Zaporizhia Region including items 1-9 of the reporting materials structure.
2. Motivated expert opinion on impact of the Wind Park construction and location within the Study area on bats (according to its definition given below in item 3 of the reporting materials structure).
3. Quarter research progress reports containing results of Reading Sessions held during the calendar month (for the quarters being the subject to reading). The first report shall be provided by the Contractor for the first month, and all subsequent ones – on quarterly basis.
4. The actual raw data in digital format collected during Reading Sessions in the manner prescribed below in item 9 of the reporting materials structure.

Structure and research technique

1. **Results of the Work**

- Analysis of the impact of the proposed Wind Park construction on bats within the area of examination.

- Definition of the index of bats activity for each bats species and for each functional part of each transect with their analysis based on the results of voices recording (hereinafter - the

"Index of bats activity"). The Index of bats activity is a numerical value expressed in units of activity per hour, it is defined in each observation in every particular reading point or in each functional part of a transect and calculated separately for each species or species group (for all bats) using the formula:

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where:
Ix – shall be the index of activity of "x" species or species groups;
Lx – shall be the number of units of activity of bats for species or species groups marked with "x" defined in a continuous registration session in a given part of the transect or in a given reading point (or during all the records under consideration);
T – shall be the duration of a given record (for all the records under consideration) expressed in minutes. In interpreting the results, auxiliary concepts can be used such as "average index of activity of bats" as a numeric value expressed in units of activity per hour defined for a given period - for example, for the period of autumn migrations or for the entire year - and calculated as the arithmetic mean of indexes reported in this period.

The "Unit of activity" means a registered continuous sequence of ultrasonic signals from one animal with duration from one impulse to 5 (five) seconds. In most cases, a Unit of activity corresponds to one specimen passing over the detector sensitivity area that lasts at least 5 (five) seconds. In case of registration of a continuous sequence of signals for a longer time than 5 (five) seconds, it is considered as a number of units of activity being equal to record time in seconds divided by 5 (five) and rounded to whole numbers. In case of registering a sequence of signals produced by numerous animals and a possibility to determine their number by the sonogram, units of activity are calculated separately for each animal. In case of signals registering produced at the same time by so many bats that they cannot be counted and distinguished by the sonogram, the number of bats in a simultaneous record, in order to prevent inflated values, is taken as 3 (three). Where possible, units of activity should be counted separately for each species or species group.

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- Bats should be divided by species and, where possible, by species groups or types.
- The analysis must also use the average indexes of bats activity.
- Identification/monitoring/analysis of potential/possible locations of bats brood colonies within the Study area. The locations must be visited/updated based on estimates made by a chiropterologist based on his/her personal experience regarding the most likely places to find a bats brood colony.
- Identification/monitoring/analysis of potential bats hibernation sites within the Study area (e.g. caves, basements) based on a chiropterologist`s experience.
- Analysis of the potential impact of the proposed Wind Park construction, operation and subsequent demolition on bats.
- Analysis of the impact on nature protected areas: within the feeding period, the activity indexes are analyzed for bats species being a subject to the risk of elimination in the protected area within the flight routes of these species to feeding areas, and, during the migration period, Indices of activity in the areas where there is a reasonable risk of migration of bats (those species that have to be protected) out from the protected area.
- Identification of areas where no wind turbines generators can be placed because of high potential risk of significant adverse effects on bats – in case of an appropriate conclusion.
- Proposals regarding measures to prevent, reduce and compensate for the impact if necessary and can be effectively implemented.
- Guidance on monitoring after the construction finish (if any).

2. **Methods of research**

- Name in the final report the persons who performed the Work and their qualification with regards to the Work including both collecting and analyzing the data.
- Initial identification of any information available on bats within the Study area and characteristics of the construction plot within the Study area including the plot visits and satellite photos representation.
- Monitoring is to be performed in permanent transects or in permanent reading points.
- Number, location and length of transects and reading points will be agreed with the Customer in writing prior to execution of the Work and documented in the final report to be delivered to the Customer.
- All transects and reading points will be mapped and refined separately according to the size of the given area, landscape, planned turbines location, etc. Transects within the territory of the planned Wind Park should be selected so as to include all types of places of habitat, but it is recommended that they be located in close proximity to the planned positions of wind turbines. The number and location of transects or reading points is to be determined in proportion to the size of the Study area and its diversification in areas of habitat. The parties, however, agree that the minimum length of the functional part of a transect should be 500 meters. During the data collection in reading points, the height which the records are made at will also be documented.
- For each Reading Session, the date, start and end time of each Reading Session in each transect or in each reading point, altitude of recording equipment positioning (if the Reading Session takes place in a reading point), weather conditions (detailed below), the recording equipment used (detailed below), and analysis software (detailed below) will be documented according to an established order.
- During a series of sessions (nights) reading through transects coverage should start alternately from different parts, and in case of recording in reading points – should change correspondingly the sequence of recording in each reading point.
- During Reading Sessions, the minimum period of monitoring carried out in a particular reading point is 10 minutes.
- Indicators of activity of bats for each species and for the functional parts of each transect will be presented along with their analysis.

3. Place for analysis/study conduction

Monitoring should cover both the Wind Park plot (within the Territories of Divnynske, Dobrivka, Dunaivka, Girsivka and Nadezhdine Village Councils in Pryazovske District and Mordvynivka Village Council in Melitopol District according to the layout map (Annex 2) and selected places of habitat located within about 1 (one) kilometer from its borders and places which, in the opinion of a chiropterologist, are of a special importance for bats and affect their activity in the Wind Park plot (e.g. potential feeding or shelter areas) (hereinafter - the "Study area").

4. The minimum number of observation sessions

It is necessary to carry out at least 28 control observations recording voices of bats (that does not also exclude other methods of observation).

5. The time interval for observation sessions

- Leaving the winter hibernation areas – between the 15th and 31st of March, observations to be conducted once a week, start of observations - after the sunset;
- Spring migrations, formation of brood colonies – the 1st of April – 15th of May: observation to be conducted once a week, start of observations - after the sunset;

- Breeding - the activity peak of local populations – the 1st of June - the 31st of July, 31: 4 night-round observations at regular intervals (minimal frequency - every 5 days) taking into account weather conditions;
- Fragmentation of brood colonies and start of autumn migration, gathering in flocks – the 1st of August – 15th of September: observations once a week, start of observations - after the sunset;
- Autumn migrations and gathering in flocks – the 16th of September – 31st of October: observations once a week, 2 hours before the sunset;
- The last flights between shelters, start of hibernation – the 1st of November – 15th of November: observations once a week, half an hour before the sunset;
- Surveys of wintering places – the 1st December - 15th of December, daytime observations;
- Surveys of known shelters of migratory bats and search for new ones, gathering in flocks: the 1st-15th of July.

6. Type of recording equipment

- Before carrying out the Work, the Contractor shall agree in writing with the Customer all the recording equipment to be used for the Work performance.
- In the research, a broadband detector (with a recording device) will be used to record bat positioning and social signals in a continuous real-time mode with a level of quality that provides for subsequent computer analysis of results and identification of species. The detectors used to record voices should work in a system with frequency multiplexing or provide for possibility to record raw ultrasound (high-frequency recording). Also, the use of a time scale increasing detector which provides automatic sampling every 0.1 seconds is allowed.

7. The software used to analyze the results

- Before carrying out the Work, the Contractor shall agree in writing with the Customer all the software used to analyze the recorded information relating to the Work.
- To record the data from detection equipment, a technology should be used that enables direct sound recording in lossless format (e.g. WAVE, FLAC, APE, WavPAck) or Anabat system files.
- A software is to be applied that allows to perform spectral analysis or zero level crossing analysis.

8. Recording of weather conditions

- The source data of weather conditions that occurred during the study should be recorded and represented in the report (temperature, precipitation, wind velocity).
- The temperature should be measured at least twice: at the sunset and at the end of an observation.

9. Storing of observations results

- The observations and raw data are to be archived by the research main contractor for the period of at least 5 (five) years after execution of the research.
- The Customer (for each quarter in which the Reading Sessions were held) is given on a quarterly basis 1 (one) digital copy of all raw data collected in observations along with a research progress quarter report.

Structure of reporting materials

№	Content	Form of representation
1	Methodological approaches to organizing work and research techniques	Text materials, maps
2	General landscape and biotope description of the territories, dominant natural biotopes and artificial forest plantations, plants groups in the Wind Park plot and within 1-km area.	Text materials, maps
3	General description of seasonal ornithological conditions of the Wind Park plot and adjacent area within a 2-5 km radius. (Species composition, areas of high diversity, rare birds species included into international and national lists, identification of the most intense periods in ornithological terms, retrospective analysis of publications.	Text materials, tables, maps
4	Seasonal description of conditions of habitat (stay) of bats in the Wind Park plot and adjacent area within a 1 km radius. (Based on the results of observations): - Description of the breeding season (identification of bat species, approximate number and distribution over habitats, establishment of a register of their shelters with definition of types and locations, identification of hunting areas and daily activity, description of local migratory activity of bats; - Description of the period of regional and continental migrations (determination of species of bats, the approximate number and distribution of habitats, migration directions and their intensity and height, definition of greatest intensity of migration (immigration wave), possible description of the main migration routes at the regional level; - Rare bats species included into international and national lists (seasonal stay durations, approximate number; - identification of the most intense periods of the year in terms of bats staying within the area, a retrospective analysis of publications; - Establishment of a cadaster of key areas within a coordinates system; - Preliminary conclusions on the impact of the Wind Park plot on the formation and state of seasonal staying of bats and possible ways to minimize the impact of the Wind Park plot.	Text materials, tables, maps
5	Motivated expert opinion on the impact of construction and location of the Wind Park plot within the Study area on bats.	Text materials, tables, maps

Materials submitted at the end of the research:

- Research report on Description of the Species Composition, Quantity and Territorial Distribution of Bats during the Period of Their Spring and Autumn Migration, Breeding and Wintering on the Plots of the Wind Park and in the Adjacent Areas within the Territories of Pryazovske and Melitopol Districts of Zaporizhia Region including items 1-9 of the reporting materials structure.

- Research progress quarter reports along with all data collected during a given quarter;
- 1 (one) digital copy of all raw data collected in accordance with the specifications of present Terms of Reference – to be delivered to the Customer on a quarterly basis along with research progress quarterly reports;
- Motivated expert opinion on the impact of construction and location of the Wind Park plot within Pryazovske and Melitopol Districts of Zaporizhia Region on bats;
- Report of scientific and technical products acceptance made in triplicate including estimates of the actual costs detailed by articles.

All materials are to be provided in three copies in paper and electronic media.

Annex 2. Results of the Field Research (Materials of Bats' Examination on the Plot of the Wind Park and in the Adjacent Areas within the Territories of Pryazovske and Melitopol Districts in 2011-2012)

Calendar plan of work performance

№	Mission objective	Time frames	Number of trips	Number of persons\days
1	Selection of locations for itinerary measurements and key points for examinations using detector.	1 June 2011	1	3/1
2	Breeding – activity peak in local populations.	1 June – 31 July 2011	4	3/2
3	Examination of known shelters of migrating bats and search of new ones. Gathering in flocks.	1 August – 15 August 2011	1	2/2
4	Disintegration of nest colonies. Start of autumn migrations, swarming. Keeping record of migrants, directions and heights of their travel, search of places of the animals' concentration.	1 August – 15 September 2011	6	2/2
5	Keeping record of migrating bats during autumn migration and swarming using detector, determination of directions and heights of their flights.	16 September – 31 October 2011	6	2/2
6	Observation of autumn shelters and late migrants when winter dormancy begins.	1 November – 15 November 2011	2	3/2
7	Examination of wintering.	1 December – 15 December 2011	1	3/1
8	Bats' observation after their wintering and translocations within the territory of examination.	15 March – 31 March 2012	2	3/2
9	Spring migrations. Searches of nest colonies and other bat swarms, register of their population, determination of bats' hunting areas etc.	1 April – 15 May 2012	6	2/2

Table 1.1. Materials of Bats' Examination for 5-6 July 2011 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range of listening	Record	Number of specimens
05 July 2011	**Transect 2 (Dunaivka-Stele)**							
	Station 1	46 º 33' 250" N 35 º 27' 112" E	-	Dark	Cloudiness - 20%, southwestern wind – 2,0 m/s, t+28ºC, at night: t+12-19ºC	No bats were registered neither visually nor using detector	-	-
	Station 2	46 º 35' 788" N 35 º 24' 933" E	-	Dark			-	-
	Station 3	46 º 35' 763" N 35 º 24' 840" E	22.43	Dark		20,6 kHz	No record	1
			22.48	Dark		40,0 kHz	No record	1
	Station 4	46 º 35' 916" N 35 º 25' 423" E	22.55	Dark		25,1 kHz	No record	1
			23.01	Dark		25,3-28,0 kHz	File 026	1
	Girsivka Village (south)		23.15	Dark		No bats were registered neither visually nor using detector	-	-
	Girsivka Village (north)		23.30	Dark		No bats were registered neither visually nor using detector	-	-
	Girsivka Village (south) (near the cemetery)		23.36	Dark		45,0 kHz		1
			23.37	Dark		45,0 kHz		1
			23.41	Dark		40,0 kHz		1
	Mordvynivka Village (near the shop)	46 º 43' 485 "N 35 º 22' 274" E	23.58	Dark		40,0 kHz		1

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range of listening	Record	Number of Specimens
Transect 1 (Forest and agricultural hedgerow near Mordvynivka Village)								
06 July 2011	Forest	46 º 44' 672" N 35 º 24' 801" E	0.15-0.25	Dark	Cloudiness - 20%, southeastern wind – 2,0 m/s, t+28ºC, at night: t+12-19ºC	22,6 kHz		1
						30,6 kHz		1
						40,0 kHz	File 028	2
	Agricultural hedgerow Station 1	46 º 44' 798" N 35 º 24' 289" E	0.34	Dark		38,8 kHz	File 034	1
			0.44			20,0 kHz	File 035	1
			0.44			40,0 kHz	I.Polischuk	1
			0.44			20,0 kHz	No record	1
			0.44			30,0-33,0 kHz	I.Polischuk	1
	Agricultural hedgerow Station 2	In 100 m	0.50	Dark		23,5 kHz	File 036	1
			0.58			27,0-28,0 kHz	File 038	1
						40,0 kHz	I.Polischuk	1
	Agricultural hedgerow Station 3	In 100 m	1.04	Dark		23,0 kHz	File 039	1
			1-10			26,0-26,5 kHz	File 040	1
	Agricultural hedgerow Station 1	In 100 m	1.18	Dark		40,0 kHz	I.Polischuk	1
			1.20			23,5-28,0 kHz	File 041	1
			1.25			25,0 kHz	File 043	1
			1.25			43,0 kHz	I.Polischuk	1
	Agricultural hedgerow Station 5	In 100 m	1-31	Dark		No bats were registered	-	-
06 July 2011	Forest near Mordvynivka Village	46 º 45' 011" N 35 º 25' 045" E	1.50	Dark	Cloudiness - 20%, southeastern wind – 2,0 m/s, t+28ºC, at night: t+12-19ºC	25,0 kHz	File 045	1
			1.54			21,0-25,0 kHz	File 046	1
			1.55			28,0-30,0 kHz	File 047	1
						28,0 kHz	File 048	1
			1.59			26,0-29,0 kHz	File 049	1
						28,0-29,0 kHz	File 050	1
TOTAL							**24 records**	**24**

Notes: The examination was carried out during moonless night.

Table 1.2. Materials of Bats' Examination for 5-6 July 2011 in Melitopol and Pryazovske Districts

Place of observations	Coordinates, According to fig. 1	Time	Illumination	Weather	Result	Recording of sounds, directory, file
Agrocenosis	46⁰ 39. 303′N 35⁰ 25. 003′E 1		Sunset	Southern, scant wind. Clear sky.	No bats were visually registered	
Agrocenosis	46⁰ 40. 962′ 35⁰ 27. 718′ 2		Dusk	— " —	— " —	
Transect B Agricultural hedgerow, arable land	46⁰ 35. 816′ 35⁰ 25. 003′ Agricultural hedgerow	22:17 – 22:28	Dark	Southern, scant wind. Clear sky.	No bats were registered	
	46⁰ 35. 835′ 35⁰ 25. 109′ Agricultural hedgerow	22:33 – 22:43	— " —	— " —	— " —	
	46⁰ 35. 873′ 35⁰ 25. 223′ Agricultural hedgerow	22:47 – 22:57	— " —	— " —	Intensity of records – 2 sounds/10 minutes, 24 and 40 kHz, transit	None
	46⁰ 35. 923′ 35⁰ 25. 411′ Agricultural hedgerow	23:02 – 23:12	— " —	— " —	Intensity of records – 2 sounds/10 minutes, 20 and 28 kHz, transit	— " —
Girsivka Village	46⁰ 37. 982′ 35⁰ 23. 839′ Southern outskirts	23:21 – 23:31	— " —	— " —	No bats were registered	— " —
— " —	46⁰ 35. 923′ 35⁰ 25. 411′ Southern outskirts	23:37 – 23:47	— " —	— " —	Intensity of records – 4 sounds/10 minutes, 40 and 45 kHz, transit	Melit Zvuk, 5 July 2011, 45 Melit-000
Mordvynivka	46⁰ 43. 492′	23:58	One	— " —	No bats were registered	

Village	35^0 22. 268′ Center	– 00:08	street lamp			
Glade, blossoming sunflower field	46^0 44. 707′ 35^0 24. 833′ Forest edge	00:24 – 00:34	Dark	— " —	Sounds flow within 28 and 40 kHz, circling of bats	Melit Zvuk, 5 July 2011, 40 Melit-001, 28-40 Melit-002-005
Transect A Agricultural hedgerow, wheat and sunflower field	46^0 44. 793′ 35^0 24. 282′	00:40 – 00:50	— " —	Calm	Intensity of records – 2 sounds/10 minutes, 40 kHz. o\s register 28 kHz	Melit Zvuk 5 July 2011, 40 Melit-006. 28 Melit-007
	46^0 44. 733′ 35^0 24. 297′	00:56 – 01:06	— " —	— " —	Intensity of records – 3 sounds/10 minutes, 20 and 40 kHz, transit	
	46^0 44. 670′ 35^0 24. 310′	01:10 – 01:20	— " —	— " —	Intensity of records – 3 sounds/10 minutes, 20 and 40 kHz, transit	
	46^0 44. 606′ 35^0 24. 325′	01:23 – 01:33	— " —	— " —	Intensity of records – 3 sounds/10 minutes, 20, 28 and 40 kHz, transit	Melit Zvuk 5 July 2011, 40 Melit-008, 28 Melit-009
	46^0 44. 606′ 35^0 24. 325′	01:37 – 01:48	— " —	— " —	Intensity of records – 1 sound/10 minutes, 20 kHz, transit	
Glade, wheat field	46^0 45. 031′ 35^0 25. 024′ Forest outskirts 1	01:56 – 02:07	— " —	— " —	Intensity of records – 4 sounds/10 minutes, 20 and 40 kHz, possibly circling	Melit Zvuk 5 July 2011, 40 Melit-010 – 014

While moving after the sunset and during dark period of the day no bats were noticed on the way. The first sound on Transect B was registered in full darkness (table 1) and it should be admitted that on the 5th of July the sunset was at 20:32 in Melitopol District, and the dusk was over at 21:10 [http://redday.ru/sun/?d=6&m=7&y=2011&city=218&let=ON]. Thus before beginning of registration using the device bats were active for at least 1.5 hour long. It meant that agricultural hedgerow was not their area of localization in the day-time. They probably rushed hunting from

Dunaivka Village which is 2 km away from the transect (fig. 2). This can be proved by observations in Askania-Nova on the 6th of July – in the residential district of one-storey buildings the first bat record was registered at 21:25, and in the ancient part of dendropark where hollow trees grow - on the 7th of July, and amongst multistorey buildings - on the 8th of July at 21:15.

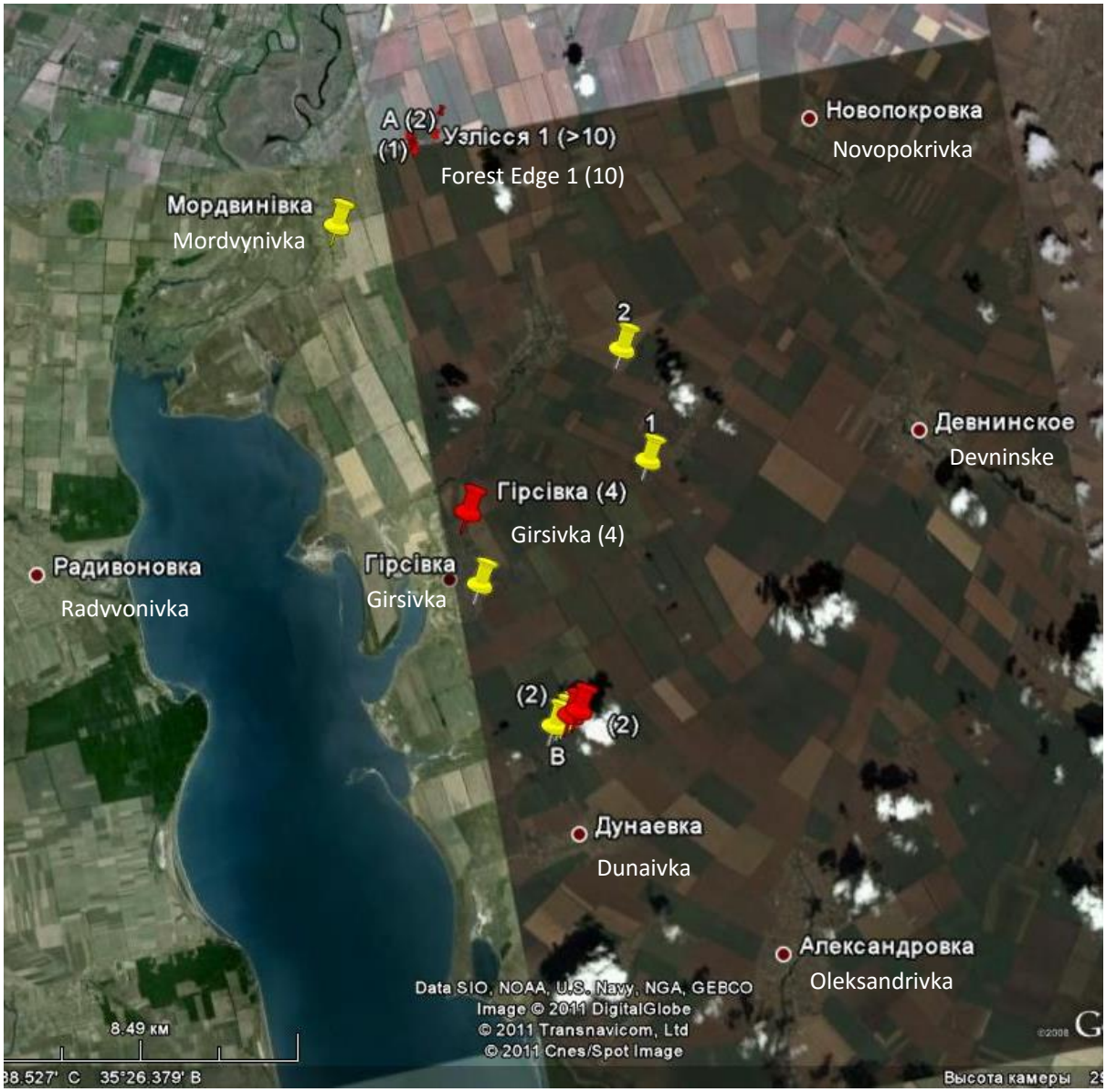


Fig. 1. Points of the detector space scanning in the area of the planned Wind Park in Pryazovske and Melitopol Districts on 5-6 July (yellow signs: no bats' sounds registered; red signs: bats encountered; in brackets: intensity of records - sounds/10 minutes).

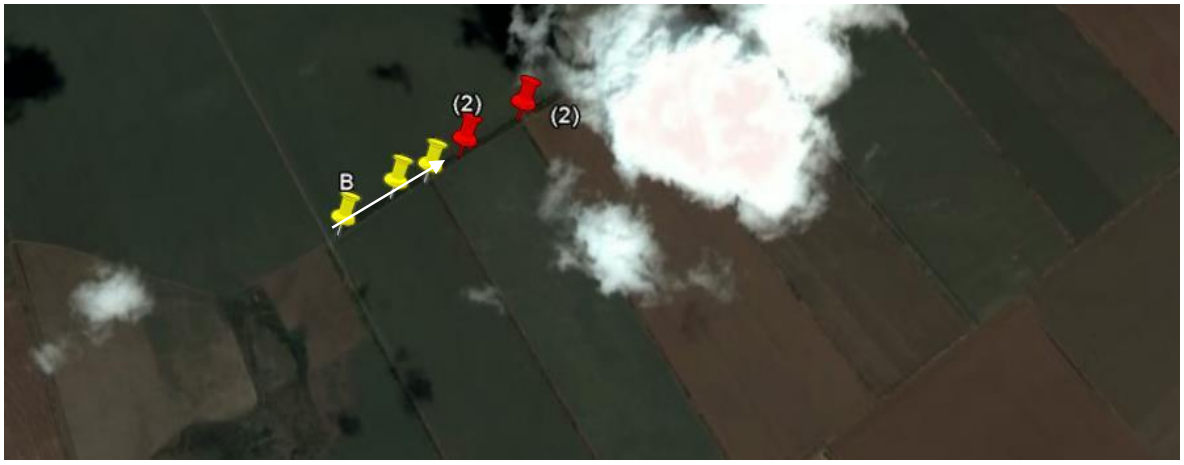
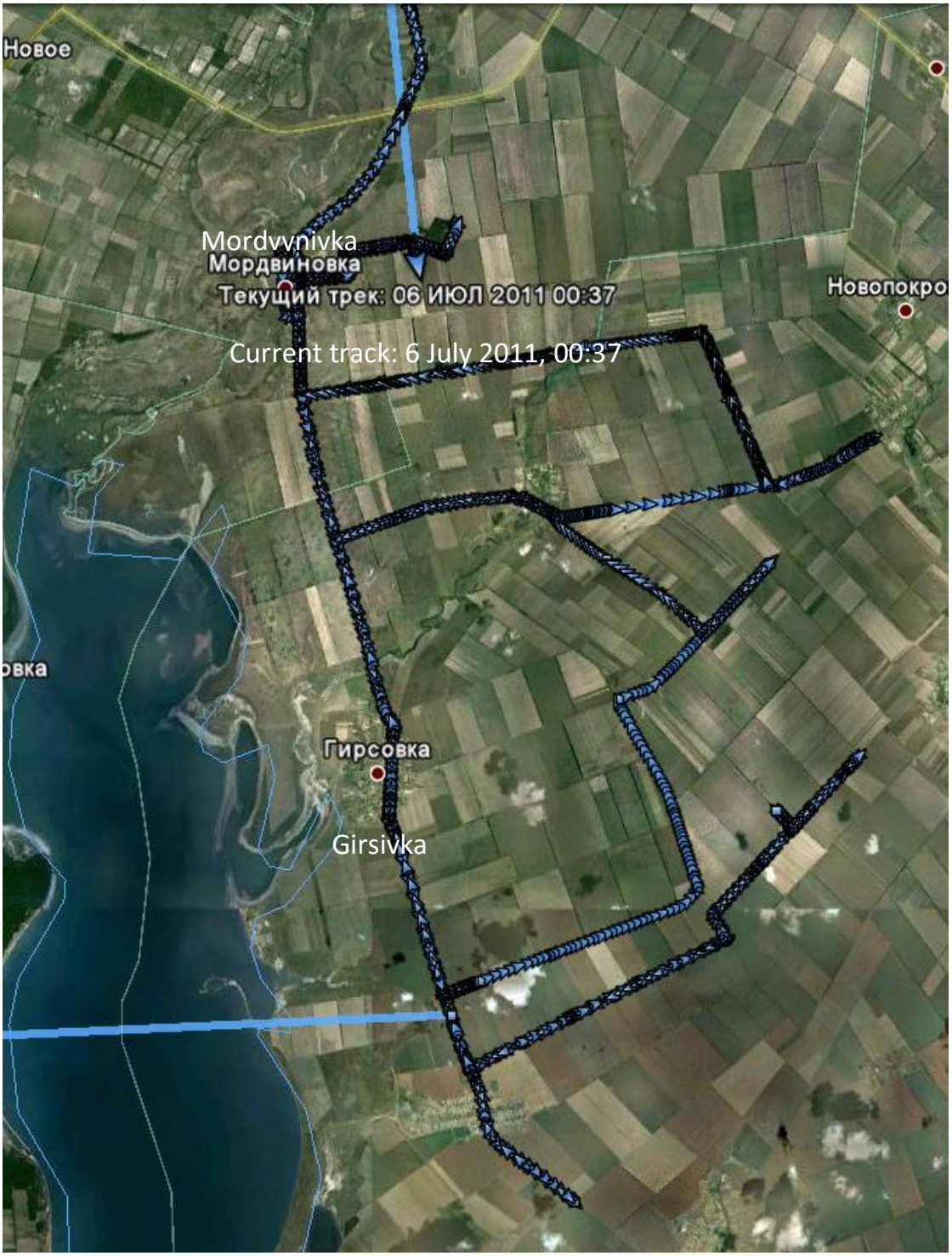


Fig. 2. Rusult of the detector space scanning on Transect B (the arrow shows the direction of the observers' movement).

It is interesting that the expected density of bats was not observed in the Villages of Girsivka and Mordvynivka (the intensity of records is 0–4 sounds/10 minutes). Circling of bats was registered at forest edge and the sounds in the detector did not cease during the whole period of scanning. At least two species were hunting there. The glade of about 46.5 ha probably affected the distribution of the animals on Transect A established along the agricultural hedgerow, and they were heard at all the points (1–4 sounds/10 minutes).

Fig. 3. Result of the detector space scanning on Transect A (the arrow shows the direction of the observers' movement)



Routes of Bats' Examination for 5-6 July 2011

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, °C	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
05 July 2011	21:00	21.4	757.6	S	4	20–30%.	1.0
	18:00	22.4	757.6	SSE	3	40%.	
	15:00	21.8	757.4	SS	2	70 – 80%.	
	12:00	22.2	757.6	SSW	4	70 – 80%.	
	9:00	20.6	757.4	WSW	2	60%.	
	6:00	14.9	757.5	CLM	0	20–30%.	
	3:00	15.6	757.5	CLM	0	No clouds	
	0:00	17.2	756.8	W	1	No clouds	
06 July 2011	21:00	21.0	757.7	CLM	0	100%.	
	18:00	23.5	757.7	SE	2	70 – 80%.	
	15:00	24.7	758.4	SSE	2	70 – 80%.	
	12:00	23.3	758.6	SSE	3	90 or more, but not 100%	
	9:00	22.4	758.6	S	2	70 – 80%.	
	6:00	17.4	758.4	CLM	0	No clouds	
	3:00	17.6	758.2	WSW	1	No clouds	
	0:00	21.0	757.5	S	3	No clouds	

Table. 2. Materials of Bats' Examination for 11-12 July 2011 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Listening range	Record
11 July 2011	Transect 3 (Divninske) Station 1	46°37.974 N 35 °30.618 E	21.10 21.20	Dusk	Cloudiness – 0%, wind – 0 m/s, +28°C	No bats were registered neither visually nor using device	
	Station 2	46 °37.929 N 35 °30.675 E	21.25 21.35	Dark	-	No bats were registered neither visually nor using device	
	Station 3	46 °37.888 N 35 °30.730 E	21.40 21.50	Dark	-	No bats were registered neither visually nor using device	
	Station 4	46 °37.849 N 35 °30.783 E	21.55 22.05	Dark	-	No bats were registered neither visually nor using device	
	Station 5	46 °37.780 N 35 °30.870 E	22.10 22.20	Dark	-	No bats were registered neither visually nor using device	
	Dunaivka Village (the garden in the north)	46 °34.882 N 35 °25.262 E	22.42 22.52	Dark	Cloudiness - 10%, eastern wind 1-2 m/s	48 kHz	File 051
	Transect 2 (Dunaivka-Stele) Station 1	46 °35.766 N 35 °24.861 E	23.00 23.10	Dark	-	20 kHz 40 kHz 52 kHz	File 052 File 053 File 054
	Station 2	46 °35.788 N 35 °24.933 E	23.12 23.22	Dark	-	20 kHz 20 kHz	No record File 055
	Station 3	46 °35.809 N 35 °24.013 E	23.25 23.35	Dark	Cloudiness - 20%, eastern wind 1-2 m/s	20 kHz	File 056
	Station 4	46 °35.832 N 35 °25.092 E	23.38 23.48	Dark	-	30 kHz 30 kHz 40 kHz 40 kHz 40 kHz 40 kHz	File 057 No record File 059 File 060 File 061 File 062

12 July 2011	Station 5	46 °35.853 N 35 °25.173 E	23.53 00.03	Dark	-	21 kHz 40 kHz 40 kHz	File 063 File 064 File 065
12 July 2011	Girsivka Village	46 °38.177 N 35 °23.860 E	00.17 00.27	Dark	Cloudiness - 30%, eastern wind 1-3 m/s	21 kHz 40 kHz 40 kHz 40 kHz 40 kHz	File 066 File 067 File 068 File 069 File 070
	Mordvynivka Village	46 ° 43.485 N 35 ° 22.274 E	00.35 00.45	-	-	40 kHz 44 kHz	No record
	Forest near Mordvynivka Village	46 ° 44.722 N 35 ° 24.852 E	00.57 01.07	-	-	40 kHz 40 kHz	No record File 072
	Transect 1 (Forest-South) Station 1	46 ° 44.797 N 35 ° 24.279 E	01.17 01.27	-	Cloudiness - 40%, eastern wind 2-4 m/s	40 kHz 40 kHz 20 kHz	File 073 File 074 File 075
	Station 2	In 100 m	01.27 01.37	-	-	20 kHz 20 kHz 20 kHz 20 kHz 20 kHz 20 kHz 30,7 kHz	File 076 File 077 File 078 File 079 File 080 File 081 File 082
	Station 3	In 100 m	01.38 01.48	-	-	40 kHz 40 kHz 40 kHz 40 kHz 20 kHz	File 083 File 084+085 File 086 File 087 File 088
	Station 4	In 100 m	01.49 01.59	-	-	40,9 kHz 20,1 kHz 20 kHz 20 kHz 20 kHz	File 089 File 090 File 092 File 094 File 095

	Station 5	In 100 m	02.01 02.11	-	Cloudiness - 50%, eastern wind 2-4 m/s	40 kHz 40 kHz 40 kHz 40 kHz 40 kHz 20 kHz 20 kHz	File 096 File 097 File 098 File 099 File 100 File 101 File 102
	Nadezhdine Village (Threshing Floor)	46 º 41.537 N 35 º 26.697 E	02.34 02.44	-	Cloudiness - 80%, eastern wind 4-6 m/s Small rain	No bats were registered neither visually nor using device	
	Transect 4 (Dobrivka) Station 1	46 º 43.688 N 35 º 28.864 E	03.22 03.32	-	Cloudiness - 60%, eastern wind 2-4 m/s	No bats were registered neither visually nor using device	
	Station 2				-	No bats were registered	
	Station 5	46 º 43.663 N 35 º 28.471 E	03.35 03.45	The day is dawning	Cloudiness - 50%, eastern wind 2-4 m/s	No bats were registered neither visually nor using device	

Notes: The examination was carried out at night for 11-12 July 2011. 14 July – full moon.

Routes of Bats' Examination for 11-12 July 2011

Characteristics of meteorological conditions in district of observations

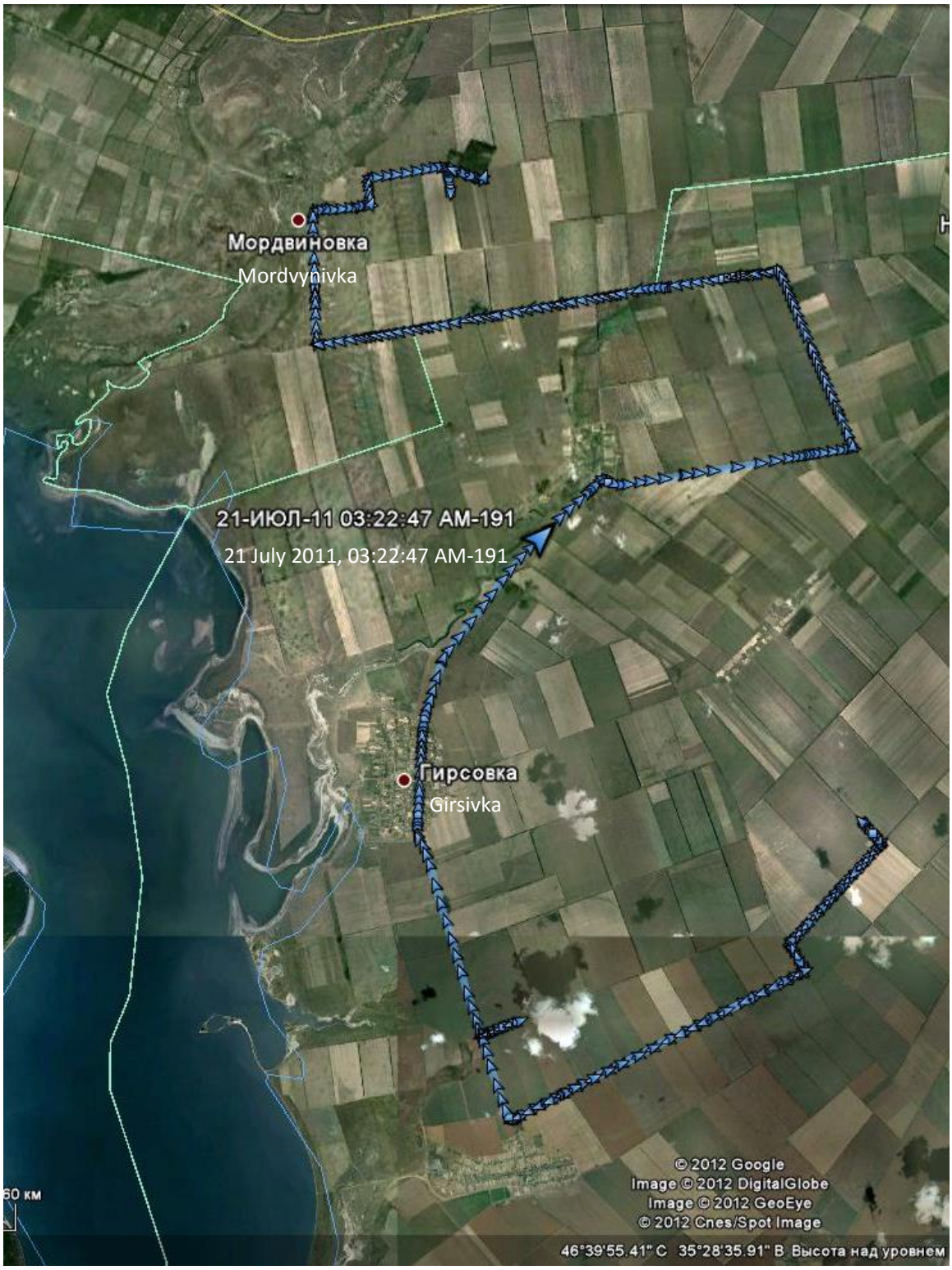
Date	Time	Air temperature, °C	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
12 July 2011	21:00	24.6	759.3	CLM	0	No clouds	
	18:00	27.3	759.1	ESE	4	No clouds	
	15:00	28.8	759.6	SE	4	10% or less, but not 0	
	12:00	27.8	759.8	ESE	3	20–30%	
	9:00	25.8	759.5	ENE	3	No clouds	
	6:00	20.4	759.2	N	2	No clouds	
	3:00	20.6	759.0	N	1	No clouds	
	0:00	21.8	758.9	N	1	No clouds	
13 July 2011	21:00	24.8	760.6	E	1	No clouds	
	18:00	28.5	760.4	ESE	4	10% or less, but not 0	
	15:00	28.9	760.4	ESE	3	20 –30%	
	12:00	28.3	760.4	ENE	3	70 – 80%	
	9:00	25.4	760.0	NE	4	20 –30%	
	6:00	19.0	759.3	CLM	0	No clouds	
	3:00	20.5	759.3	NE	1	70 – 80%	
	0:00						

Table 3. Materials of Bats' Examination for 20-21 July 2011 in Melitopol and Pryazovske Districts

Place of observations	Coordinates	Time	Illumination	Weather	Range, kHz	№ of record	Number of specimens	Note
Station 1		21.20-21.30	Dusk	Cloudiness - 0%, calm t+28°C. No the moon.	No bats	–	–	
Station 2		21.33-21.43	Dark			–	–	
Station 3		21.45-21.55	Dark			–	–	
Station 4		22.00-21.10	Dark			–	–	
Station 5		22.12-22.22	Dark		40,0	None	1	
			Dark		40,0	103	1	
			Dark		40,0	104	1	
			Dark		40,0	105	1	
Village Dunaivka (near the garden)		23.31-22.41	Dark	Cloudiness - 0%, calm t+26°C. No the moon.	40,0	106	1	
			Dark		40,0	107	1	Floats circling
			Dark		40,0	108	1	
21 July 2011. Transect 2 (Dunaivka-Stele)								
Station 1		23.43-23.53	½ Moon – low above the horizon	Cloudiness - 0%, calm t+24°C.	40,1	None	1	–
					40,4	109	1	–
					40,4	110	1	–
					40,0	111	1	Gurgling
					40,0	None	1	Gurgling
Station 2		22.54-23.04			40,0	112	1	–
					40,0	113	1	Gurgling
					40,0	114	1	–
					40,0	115	1	Gurgling
					40,0	116	1	–
					28,5	117	1	–
					20,0	118	1	Record?
Station 3		23.05-23.15			20,0	119	1	–
					40,0	120	1	–

Place of observations	Coordinates	Time	Illumination	Weather	Range, kHz	№ of record	Number of specimens	Note
Station 4		23.16-23.26	½ of the moon – little light	Cloudiness - 0%, calm t+24°C.	40,0	None	1	–
					40,0	121	1	Gurgling
					31,0	122	1	Record?
					39,5	123	1	–
					40,0	124	1	–
					40,0	125	1	–
					40,0	127	1	–
Station 5		23.28-23.38			No bats	-	-	-
Girsivka Village (south)		23.46-23.56	½ of the moon – a little light	Cloudiness - 0%, calm t+23°C.	40,0	128	1	–
					40,0	129	1	–
					40,0	130	1	–
					40,0	131	1	–
					40,0	132	1	–
					40,0	133	1	–
Girsivka Village (north) near the cemetry		23.59-0.09	½ of the moon – a little light	Cloudiness - 0%, calm t+23°C.	41,3	134	1	–
					41,0	135	1	Gurgling
					40,5	136	1	–
					22,6	137	1	–
Nadezhdine Village (Threshing Floor)		0.17-0.27	½ of the moon – a little light	Cloudiness - 0%, calm t+23°C.	40,0	None	1	Gurgling
					40,0	138	1	–
					40,0	None	1	Gurgling
22 July 2011. Transect 4 (Dobrivka)								
Station 1		0.48-0.58			41,0	None	1	–
					40,9	141	1	–
Station 2		0.59-01.09			40,7	142	1	–
Station 3		01.10-01.20			20,7	143	2	1 – no record
Station 4		01.21-01.31		Cloudiness - 0%, calm t+23°C.	40,0	144	1	–
					41,0	145	1	–
					41,0	146	1	–

Place of observations	Coordinates	Time	Illumination	Weather	Range, kHz	№ of record	Number of specimens	Note
Station 5		01.33-01.43			40,0	148	1	–
					40,0	149	1	–
					40,0	150	1	–
Mordvynivka Village (near the shop)		02.00-02.10		Cloudiness - 0%, calm t+23°C.	No bats	-	-	–
21 July 2011. Transect 1 (Forest and agricultural hedgerow near Mordvynivka Village)								
Forest (outskirts)		02.15-02.20		Cloudiness - 0%, calm t+23°C.	No bats	-	-	-
Station 1		02.27-02.37	½ of the moon – it is light	Cloudiness - 0%, calm t+23°C.	40,0	151	1	Gurgling
					40,0	152	1	
					40,0	153	1	
					40,0	154	1	Gurgling
Station 2		02.39-02.49		Cloudiness - 0%, calm t+21°C.	40,0	155	1	
					20,0	156	1	Record?
					20,0	157	1	
					20,0	158	1	
					20,0	159	1	
Station 3		02.50-03.00	½ of the moon – it is light	Cloudiness - 0%, calm t+21°C.	20,0	160	1	Record?
					20,5	161	1	
					40,0	162	1	
					40,0	163	1	
					40,0	164	2	
Station 4		03.01-03.1			No bats	-	-	-
Station 5					40,0	165	1	-
					40,0	166	1	
					20,0	167	1	Record?



Routes of Bats' Examination for 21 July 2011

Characteristics of meteorological conditions in district of observations

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
20 July 2011	21:00	25.9	753.3	CLM	0	No clouds	
	18:00	30.7	753.8	SSE	3	10% or less, but not 0	
	15:00	33.5	754.5	S	3	20–30%	
	12:00	34.5	755.0	ESE	3	No clouds	
	9:00	29.9	755.8	NNE	2	No clouds	
	6:00	21.1	755.9	N	1	20–30%	
	3:00	20.7	756.0	NNW	1	No clouds	
	0:00	21.1	756.1	NN3W	1	No clouds	
21 July 2011	21:00	25.4	751.2	CLM	0	No clouds	
	18:00	27.7	751.6	SE	4	No clouds	
	15:00	29.3	752.2	SE	4	No clouds	
	12:00	29.4	752.0	SE	4	10% or less, but not 0	
	9:00	28.3	751.8	ESE	3	40%.	
	6:00	21.8	751.8	CLM	0	No clouds	
	3:00	21.2	752.2	CLM	0	No clouds	
	0:00	21.9	752.7	CLM	0	No clouds	

Table 4. Materials of Bats' Examination for 27-28 July 2011 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Result	Record
1	2	3	4	5	6	7	8
27 July 2011	Agricultural hedgerow, wheat stubble, sunflower	46^0 38. 004′N 35^0 30. 582′E Transect C	21:07 – 21:17	Dusk	Calm. Clear sky	No bats were registered visually	
		46^0 37. 965′ 35^0 30. 635′	21:25 – 21:35	Dusk	— " —	— " —	
		46^0 37. 925′ 35^0 30. 688′ Agricultural hedgerow	21:36 – 21:46	Dark	— " —	— " —	
		46^0 37. 880′ 35^0 30. 741′ Agricultural hedgerow	21:49 – 21:59	— " —	— " —	Intensity of records – 1 sound/10 minutes, 40 kHz, transit	None
		46^0 37. 846′ 35^0 30. 795′ Agricultural hedgerow	22:02 – 22:12	— " —	— " —	No bats were registered visually	— " —
	Crossing of field road and highway, the garden	46^0 34. 883′ 35^0 25. 272′ Garden	22:02 – 22:12	— " —	— " —	Intensity of records – 5 sounds/10 minutes, 40 kHz	— " —
	Transect B Agricultural hedgerow, arable land	46^0 35.773′ 35^0 24.843′	22:42 – 22:52	— " —	— " —	Intensity of records – 9 sounds/10 minutes, 40 kHz	f 5–13
		46^0 35.790′ 35^0 24.909′ Agricultural hedgerow	22:55 – 23:05	— " —	— " —	Intensity of records – 19 sounds/10 minutes, 40 kHz	f 14–23
		46^0 35.807′	22:21 – 23:31	— " —	— " —	Intensity of records –	f 24–28

		35^0 24.991′ Agricultural hedgerow				13 sounds/10 minutes, 20, 28-30, 40 kHz	

Date	Place of observations	Coordinates	Time	Illumination	Weather	Result	Record
		46^0 35.828′ 35^0 25.060′	22:55 – 23:05	— " —	— " —	Intensity of records – 9 sounds/10 minutes, 20, 28-30, 40 kHz	f 30
		46^0 35. 849′ 35^0 25.135′	22:55 – 23:05	— " —	— " —	Intensity of records – 7 sounds/10 minutes, 40 kHz	f 31–34
28 July 2011	Girsivka Village	46^0 38.047′ 35^0 23. 842′ Southern outskirts	23:54 – 00:04	— " —	— " —	Intensity of records – 9 sounds/10 minutes, 40 kHz	f 36–39
	Girsivka Village	46^0 38. 054′ 35^0 23. 937′ Northern outskirts	00:09 – 00:19	— " —	— " —	Intensity of records – 4 sounds/10 minutes, 40 kHz	
	Nadezhdine Village	46^0 41. 543′ 35^0 26. 703′ Threshing Floor	00:29 – 00:41	Brightly illuminated with street lamps at all sides	— " —	Intensity of records – 4 sounds/10 minutes, 40 kHz. The sounds of insects create strong background and the bats can be barely heard	f 42
	Agricultural hedgerow, sunflower	46^0 41. 904′ 35^0 30. 455′ Transect D	01:14 – 01:24	— " —	— " —	Intensity of records – 1 sound/10 minutes, 40 kHz	f 44
		46^0 41. 955′ 35^0 30. 424′	01:28 – 01:38	— " —	— " —	Intensity of records – 2 sounds/10 minutes, 40 kHz, transit	
		46^0 42. 006′ 35^0 30. 390′	01:42 – 01:52	— " —	— " —	Intensity of records – 2 sounds/10 minutes, 40 kHz, transit, hunting	f 45
		46^0 42. 062′ 35^0 30. 359′	01:54 – 02:04	— " —	— " —	Intensity of records – 1 sound/10 minutes, 40 kHz, hunting	f 46

Date	Place of observations	Coordinates	Time	Illumination	Weather	Result	Record
		46^0 42. 112′ 35^0 30. 329′	02:06 – 02:16	— " —	— " —	No bats were registered	
	Mordvynivka Village	46^0 43. 495′ 35^0 22. 267′ Center	02:42 – 02:52	One street lamp	— " —	Intensity of records – 2 sounds/10 minutes, 40 kHz. Strong background of insects' sounds	
	Transect A Agricultural hedgerow separates the wheat field and blossoming sunflower	46^0 44. 794′ 35^0 24. 283′	03:02 –03:12	— " —	— " —	Intensity of records – 4 sounds/10 minutes, 20 and 40 kHz	f 47
		46^0 44. 754′ 35^0 24. 288′	03:15 –03:26	— " —	— " —	Intensity of records – 4 sounds/10 minutes, 40 kHz	f 50–52
		46^0 44. 705′ 35^0 24. 303′	03:27 –03:37	— " —	— " —	Intensity of records – 3 sounds/10 minutes, 40 kHz	f 53–55
		46^0 44. 644′ 35^0 24. 315′	03:40–03:50	— " —	— " —	Intensity of records – 2 sounds/10 minutes, 40 kHz	f 56
		46^0 44. 593′ 35^0 24. 327′	03:53 –04:03	— " —	— " —	No bats were registered	

Fig. 4. Transects (A–D) and points (asterisks) of the detector space scanning in the area of the planned Wind Park of Pryazovske and Melitopol Districts for 27-28 July.

Bats' observation on the 27th of July begins with the transect C at 21:07 [sunset – 20:15, ending of dusk – 20:50 (http://redday.ru/sun/?d=27&m=7&y=2011&city=218&let=ON)]. The only sound was fixed here at 21:58, that is more than an hour after it gets dark (fig. 5). In Askania Nova, along with shelters of natterer's bats in different bays of three-storey building (fig. 6), on the 3rd of August (sunset – 20:06, ending of dusk – 20:40) the first bat sounded at 20:58. Thus agricultural hedgerow was not their area of localization in the day-time, and, more likely, the nearest villages are Devninske – 3,7 km from the transect, or Georgiivka – 6,1 km.

The most intensive movement of bats was recorded along the transect B (fig. 7). It was set up 2 km from Dunaivka Village from the northern side of which there is a garden area of 4,5 ha (fig. 7). In the settlements, the situation, compared with observations for 5-6 July changed a lot. If at the southern boundary of Girsivka Village the bats had not been identified at that time, they were heard with quite high intensity this time (table 2, fig. 1 and 7). The bats were heard in Mordvynivka Village too.

Fig. 5. Distribution of intensity of bats records in Transect C (yellow marks – no bats' sounds registered; red marks mean places with bats existence; in brackets meaning of intensity of records is shown – number of sounds/10 minutes).

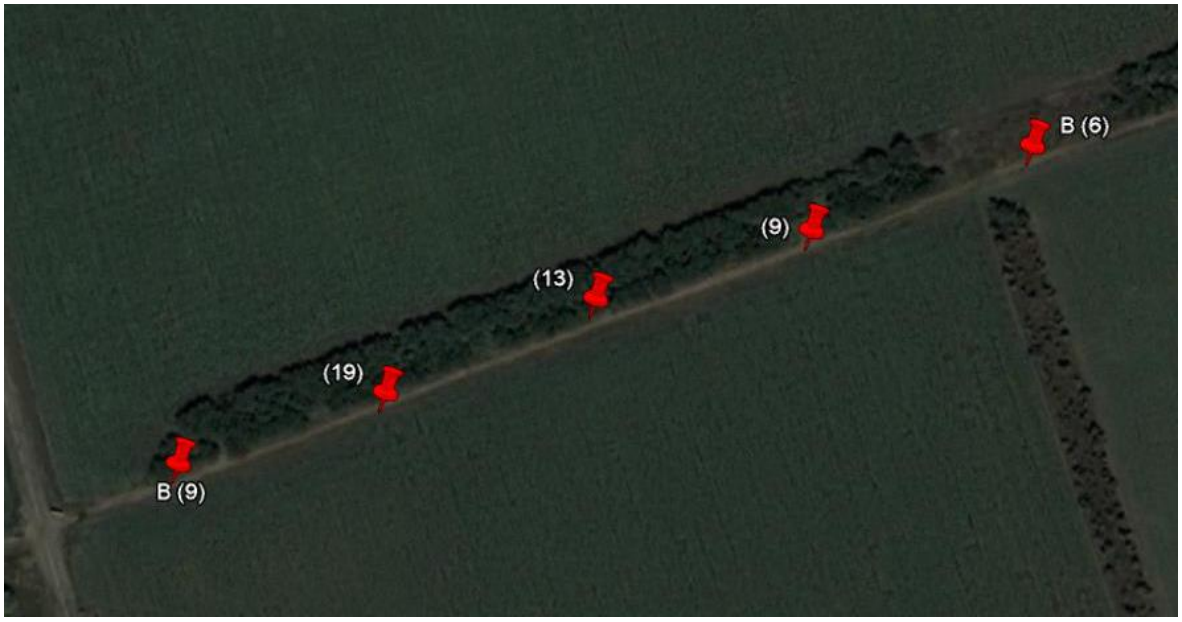


Fig. 7. Distribution of intensity of bats records in Transect B.

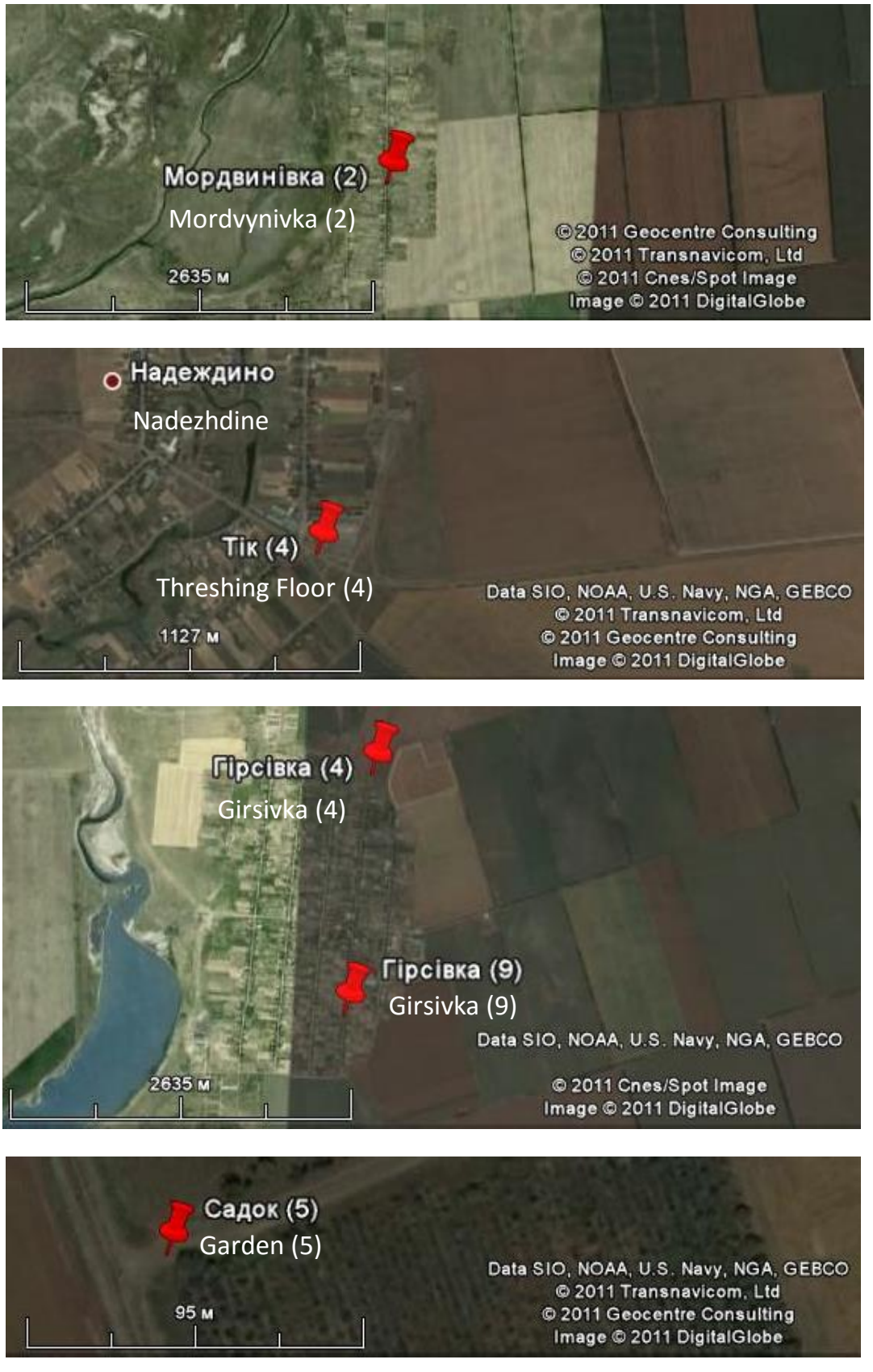


Fig. 8. Distribution of intensity of bats records in separate points of area.

Transect D set up between the Villages of Nadezhdine (4,5 km) and Dobrivka (2,7 km), and from the southern side there is Volna Village (2,4 km) (fig. 9). However, despite such a proximity of the settlements, the high activity of bats is not recorded.

Fig. 9. Distribution of intensity of bats records in transect D.

The interception of the transect A was done at the time preceding dawn (on the 28th of July, 03:02-04:03 (on the 28th of July, 03:02–04:03; beginning of dusk – 04:40, sunrise – 05:15) and, regarding the gradual decrease of registrations frequency when moving towards the opposite end of agricultural hedgerow, the bats were heading to the shelters which were in glade or commercial buildings (fig. 10).

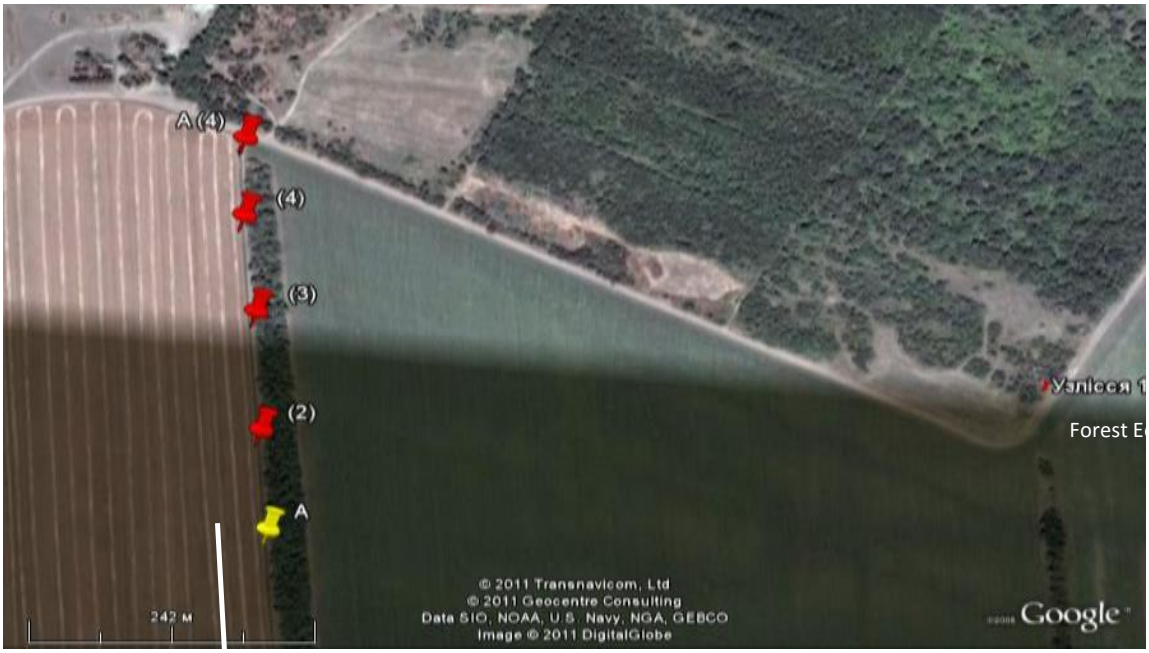
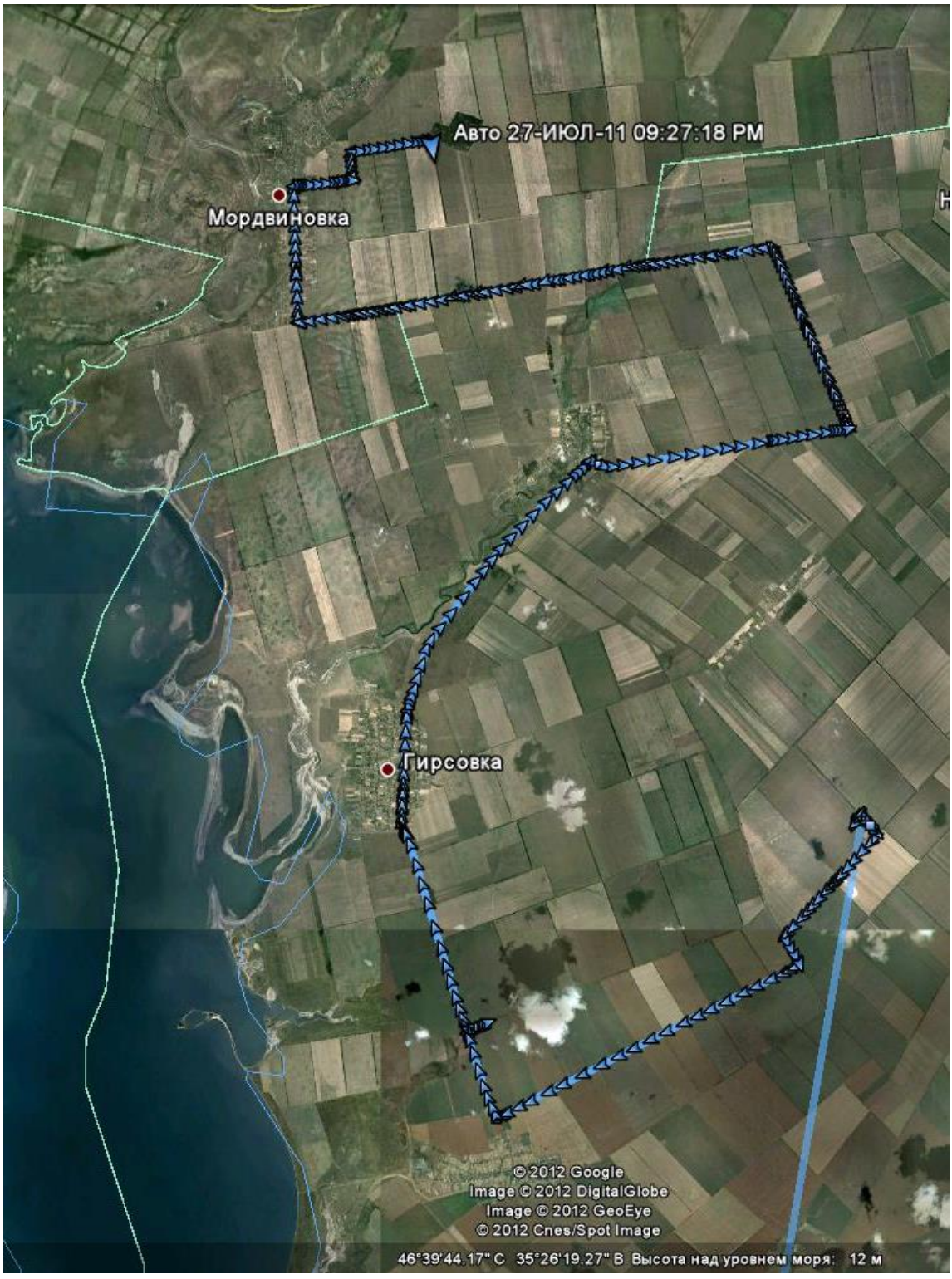


Fig. 10. Distribution of intensity of bats records in Transect A the direction of the observers' movement is marked by the arrow.



Routes of Bats' Examination for 27 July 2011

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, °C	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
27 July 2011	21:00	29.0	759.8	SW	1	40%	
	18:00	34.9	760.4	SSE	3	No clouds	
	15:00	33.3	760.9	S	2	No clouds	
	12:00	29.3	760.9	CLM	0	No clouds	
	9:00	20.0	760.4	NNW	1	No clouds	
	6:00	21.5	760.0	NNW	1	No clouds	
	3:00	23.8	760.0	CLM	0	No clouds	
	0:00						
28 July 2011	21:00	27.3	758.7	CLM	0	No clouds	
	18:00	31.7	758.7	SSW	3	No clouds	
	15:00	34.0	759.7	S	5	No clouds	
	12:00	34.0	760.0	WSW	3	No clouds	
	9:00	29.4	760.2	WSW	2	No clouds	
	6:00	23.4	759.9	NW	2	20–30%.	
	3:00	24.6	759.7	WNW	1	No clouds	
	0:00	26.3	759.8	SW	2	No clouds	

Table 5. Materials of Bats' Examination for 09-10 August 2011 in Melitopol and Pryazovske Districts

9 August 2011. Transect 3 (Divninske)							
Place of observations	**Time**	**Illumination**	**Weather**	**Range, kHz**	**№ of record**	**Number of specimens**	**Note**
Station 1	20.50-21.00	Dusk	Cloudiness - 0%, Calm t+23°C. 2/3 of the moon	-	-	3	Determined visually
Station 2	21.02-21.12	Dusk		40,0	003	1	–
				40,0	004	1	–
				45,0	005	1	–
				40,0	006	1	–
				40,0	007	1	–
				20,0	008	1	–
Station 3	21.14-21.24	Dusk		40,0	-	1	–
				45,0	009	1	–
Station 4	21.25-21.35	Dusk		-	-	0	No bats
Station 5	21-37-21.47	Dark		-	-	0	
Dunaivka Village (near the garden)	21.58-22.08	Dark	Cloudiness - 0%, eastern wind - 2 numbers. t+21°C. 2/3 of the moon	40,0	010	1	–
				40,0	011	1	–
				40,0	012	1	–
				40,0	013	3	Gurgling

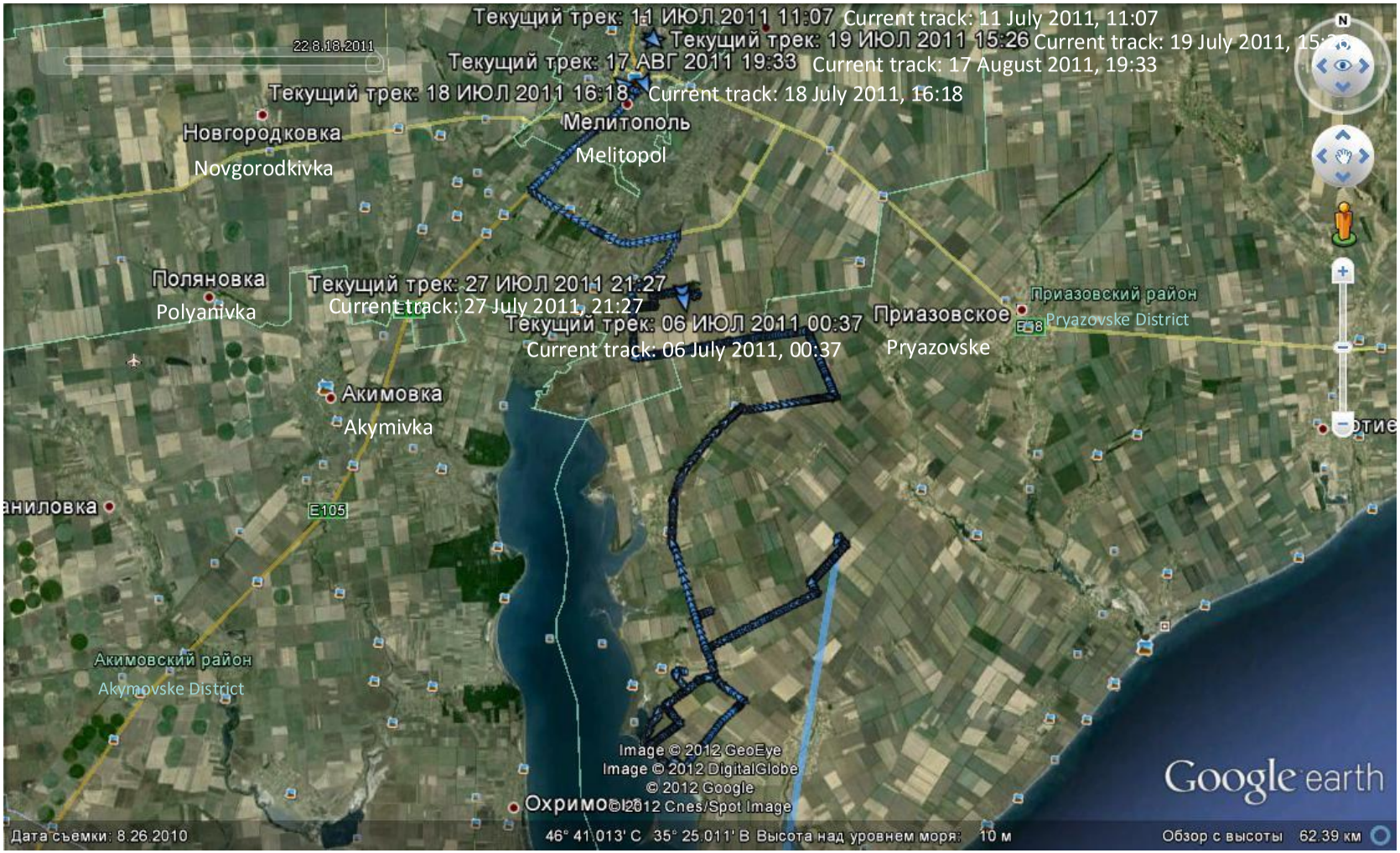


Fig. 11. Way of the territory observation for 9-10 August 2011

Table 6. Materials of Bats' Examination for 17-18 August 2011 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
17 August 2011	**Estuary 1 (near Dunaivka Village)**	35.380800 46.534509	20.20-20.40			40	-	None
						20	-	None
Transect 3 (8 km to the east of Dunaivka Village)								
17 August 2011	Station 5	35.510873 46.632459	21.05-21.15			40	037-041	7
						20	-	None
17 August 2011	Station 1	35.514981 46.629202	21.17-21.27			20	042-048	13
						40	050-060	12
17 August 2011	**Dunaivka-Garden**	35.420929 46.581172	21.40-21.50			40	061-062	6
Transect 2. Stele								
17 August 2011	Station 5	35.422732 46.598374	21.55-22.05			40	063-064	Many; stream
						20	065-068	7
17 August 2011	Station 1	35.413474 46.595907	22.08-22.18			40	070-072	Approx. 10
						20	069	11
17 August 2011	**Girsivka-South**	35.397428 46.634750	22.25-22.35			40	073-078	8
						20	-	None
	Girsivka-North	35.399419 46.651674	22.40-22.50			40	-	None
						20	-	None
17 August 2011	**Nadezhdine Threshing Floor**	35.443862 46.692744	22.59-23.09			40	080	1
						20	-	
Transect 4 (between the Villages of Dunaivka and Dobrivka)								
17 August 2011	**Station 1**	35.473574 46.727404	23.25-23.35			40	083-084	2
						20	081-082	2
	Station 5	35.467110 46.726778	23.37-23.47			40	085-091	8
						20	092-097	6

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
18 August 2011	**Mordvynivka Bar**	35.371171 46.726005	00.10-00.20			40	099-107	10
						20	098	1
18 August 2011	**Mordvynivka Forest**	35.413738 46.744717	00.33-00.43			40	108-113;115	8
						20	114	1
Transect 1 (Morvynivka, near the forest)								
18 August 2011	**Station 1**	35.405086 46.745038	00.45-00.55			40	-	None
						20	116-117	2
18 August 2011	**Station 2**	35.405514 46.742903	00.57-01.07			40	118-121	4
						20	122	1
TOTAL							**46 records**	**110**

Table 6.1. Bats observations at fixed points in Stepanivka Persha of 18 August 2011 (35.508937B 46.458661C)

Time	Range	File Records	Number of specimens
22.20-22.30	40	123-136	14
22.30-22.40	30	137-139	2
22.40-22.50	20	141	1
22.50-23.00	50	142-153	12
23.00-23.10	40	154-166	13
23.10-23.20	30	167	1
23.20-23.30	20	168	1
23.30-23.40	50	169-178	10
23.40-23.50	40	179-195	16
TOTAL			**70**

Note: Most of the observed bats showed stable migratory behavior while moving along to the south-west (towards Kyrylivka Urban Village). Even the strong light of lamps with a great number of insects did not attract bats to stop for feeding.

Routes of Bats' Examination for 17 August 2011

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
17 August 2011	21:00	23.5	757.0	SSW	1	40%	
	18:00	29.5	755.8	NNW	3	20–30%	
	15:00	28.8	756.2	NNW	3	60%	
	12:00	26.4	756.6	NW	3	60%	
	9:00	20.8	756.5	NW	1	The sky is not visible because of the fog and/or other meteorological phenomena	
	6:00	17.5	756.7	CLM	0	The sky is not visible because of the fog and/or other meteorological phenomena	
	3:00	18.6	756.8	CLM	0	70 – 80%	
	0:00	20.4	756.8	WSW	1	60%	
18 August 2011	21:00	20.8	759.8	NNW	2	No clouds	
	18:00	25.8	759.0	NNW	4	20–30%	
	15:00	26.9	758.8	NW	5	70 – 80%	
	12:00	26.4	758.6	NW	3	100%	
	9:00	22.7	758.6	NNW	3	100%	
	6:00	19.4	758.0	NW	2	No clouds	
	3:00	20.5	757.8	NW	3	No clouds	
	0:00	21.3	757.0	NW	1	No clouds	

Table 7. Materials of Bats' Examination for 22-23 August 2011 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
22 August 2011	**Estuary 2 (near Mordvynivka Village)**	35.354463 46.670399	20.15-20.25			40	-	None
						20	-	None
22 August 2011	**Mordvynivka Forest**	35.413738 46.744717	20.55-21.05			40	000-001	3
						20	-	None
Transect 1 (Mordvynivka, near the forest)								
22 August 2011	**Station 1**	35.405086 46.745038	21.07-21.17			40	002	1
						20	-	None
	Station 2	35.405514 46.742903	21.20-21.30			40	-	None
						20	-	None
22 August 2011	**Mordvynivka Bar**	35.371171 46.726005	21.40-21.50			40	003-007	8
						20	-	None
Transect 4 (between the Villages of Dunaivka and Dobrivka)								
22 August 2011	**Station 1 (closer to Nadezhdine)**	35.473850 46.727440	22.07-22.17			40	008	1
						20	-	None
	Station 5 (closer to Dobrivka)	35.479869 46.728077	22.20-22.30			40	009	1
						20	-	None
22 August 2011	**Nadezhdine Threshing Floor**	35.443862 46.692744	22.43-22.53			40	-	None
						20	-	None
22 August 2011	**Girsivka-North**	35.399419 46.651674	23.20-23.30			40	010	1
						20	-	None
	Girsivka-South	35.397428 46.634750	23.32-23.42			40	013-021	10
						20	011-012	2

Transect 2. Stele								
23 August 2011	Station 1 (near the Stele)	35.415746 46.596439	23.50-00.00			40	023	1
						20	022	2
	Station 5 (remote)	35.422694 46.598390	00.02-00.12			40	024-027	4
						20	-	None
23 August 2011	**Dunaivka-Garden**	35.420929 46.581172	00.18-00.28			40	No record	1
						20	-	None
Transect 3 (8 km to the east of Dunaivka Village)								
23 August 2011	Station 5	35.510416 46.632838	00.43-00.53			40	028	1
						20	-	None
	Station 1	35.514130 46.628667	00.55-01.05			40	030-032	3
						20	029	1
23 August 2011	**Estuary 1 (near Dunaivka Village)**	35.380800 46.534509	01.30-01.40			40	033	1
						20	No record	1
TOTAL							**34 records**	**42**

Notes:

1. It was quiet on air when listening near Mordvynivka Forest, although the background noise of other insects had always been heard there before. Few insects were also detected visually. It might have been caused by change in the weather: it was sultry (+24 oC) and completely calm.
2. Instead, on Transect 4 (between the Villages of Nadezhdine and Dobrivka), a sufficient amount of insects and butterflies was seen in the headlights, which, however, did not lead to the increase in the number of bats (see the table above, only two voices).
3. At 23.20, a half of the moon's disk appeared above the horizon.

Routes of Bats' Examination for 22-23 August 2011

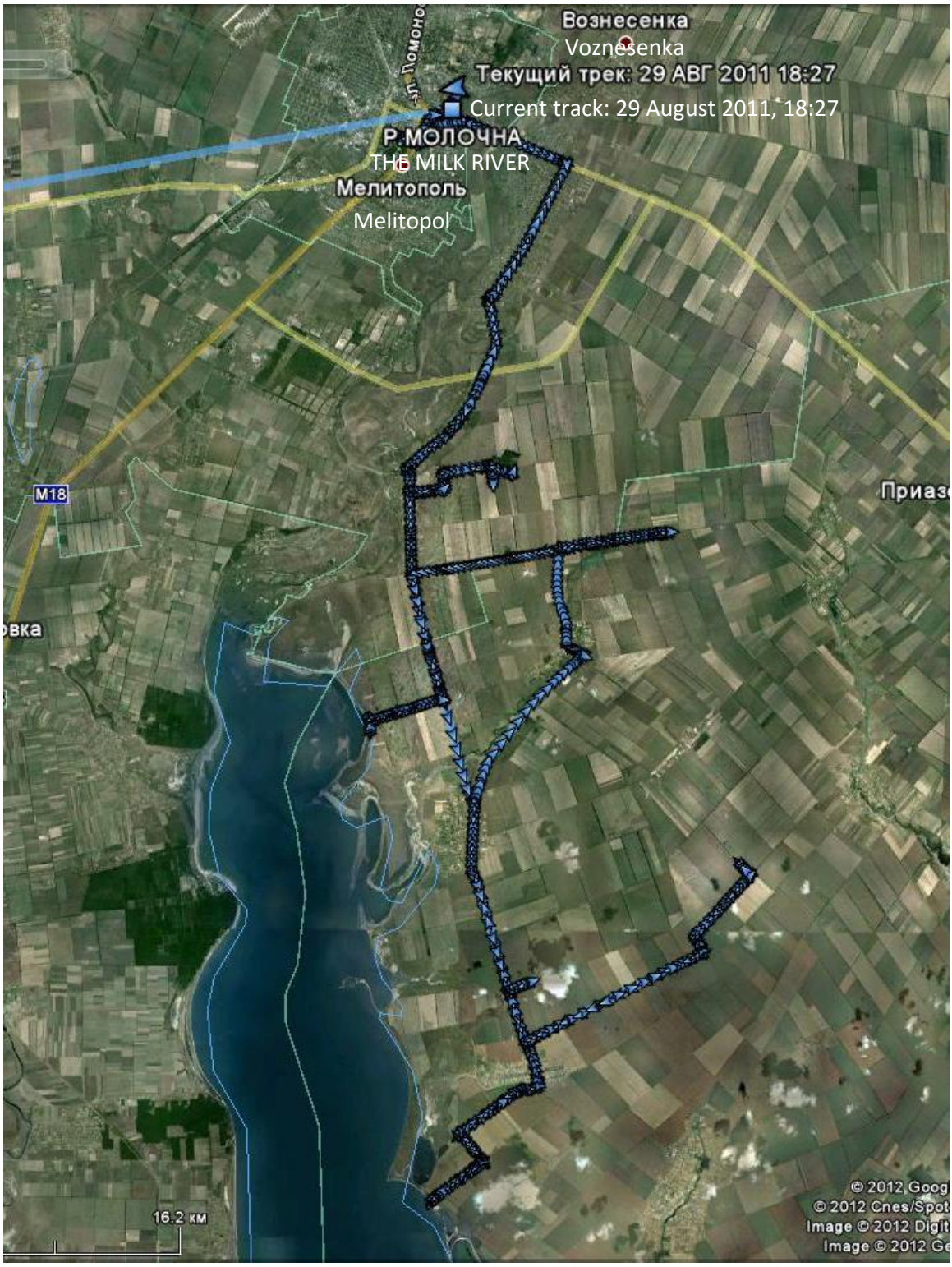
Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, °C	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
22 August 2011	21:00	19.4	762.7	NNW	1	20 – 30%	
	18:00	24.6	761.6	NNW	4	70 – 80%	
	15:00	25.7	761.5	NNW	4	70 – 80%	
	12:00	24.8	761.7	NW	5	60%	
	9:00	21.8	761.7	NW	3	10% or less, but not 0	
	6:00	14.5	761.7	CLM	0	10% or less, but not 0	
	3:00	15.3	761.2	CLM	0	20 –30%	
	0:00	19.0	761.2	CLM	0	60%	
23 August 2011	21:00	22.2	763.0	SW	2	20 – 30%	
	18:00	24.4	763.3	SSW	2	60%	
	15:00	25.0	763.6	SSW	4	100%	
	12:00	26.9	764.3	SW	2	70 – 80%	
	9:00	21.9	764.7	CLM	0	20–30%	
	6:00	14.0	763.7	SW	1	No clouds	
	3:00	15.8	763.6	SW	1	No clouds	
	0:00						

Table 8. Materials of Bats' Examination for 29-30 August 2011 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Result	Recording of sounds
1	2	3	4	5	6	7	8
29 August 2011	Between agricultural hedgerow and the Milk Estuary	46^0 32. 075′N 35^0 22. 849′E Estuary 1	20:20 – 20:30	Dusk	Calm. Clear sky	Intensity of records – 2 sounds/10 minutes, 40 kHz, transit	Folder 2
	Crossing of field road and highway, the garden	46^0 34. 882′ 35^0 25. 280′ Garden	20:44 – 20:54	— " —	— " —	No bats were registered	None
	Agricultural hedgerow	46^0 37. 974′ 35^0 30. 889′ Transect C	21:09 – 21:20	Dark	— " —	Intensity of records – 15 sounds/10 minutes, 40, 48, 28 kHz	Folder 3
	Agricultural hedgerow	46^0 37. 766′ 35^0 30. 635′ Transect C	21:23 – 21:33	— " —	— " —	Intensity of records – 8 sounds/10 minutes, 40 kHz, transit	— " —
	Agricultural hedgerow, arable land	46^0 35.779′ 35^0 24.869′ Transect B	21:46 – 21:56	— " —	— " —	Intensity of records – 6 sounds/10 minutes, 40 kHz, transit	Folder 4 f0–f4
	Agricultural hedgerow, arable land	46^0 35. 922′ 35^0 25. 412′ Transect B	21:59 – 22:09	— " —	— " —	Intensity of records – 10 sounds/10 minutes, 40 kHz, transit	— " —
	Girsivka Village	46^0 38.145′ 35^0 23. 852′ South outskirts	22:17 – 22:27	— " —	— " —	Intensity of records – 12 sounds/10 minutes, 40 kHz	Folder 4 f 5–f8
	Girsivka Village	46^0 39. 043′ 35^0 23. 935′ Northern outskirts	22:31 – 22:41	— " —	— " —	Intensity of records – 6 sounds/10 minutes, 40 kHz	Folder 4 f 9–f10
	Threshing Floor	46^0 41. 542′ 35^0 26. 705′	22:50 – 23:00		— " —	The strong background of insects' sounds. Bats are almost not heard.	None

Date	Place of observations	Coordinates	Time	Illumination	Weather	Result	Recordings of sounds
	Agricultural hergerows, sunflower crops	46^0 43. 694′ 35^0 28. 856′ Transect E	23:17 – 23:27	— " —	— " —	Intensity of records – 7 sounds/10 minutes, 40 kHz	Folder 4 f 11–f16
	— " —	46^0 43. 656′ 35^0 28. 440′ Transect E	23:31 – 23:41	— " —	— " —	Intensity of records – 7 sounds /10 minutes, 40 kHz,	— " —
30 August 2011	Between agricultural hedgerow and the Milk Estuary	46^0 40. 215′ 35^0 21. 266′ Transect 2	00:09 – 00:19	— " —	— " —	Intensity of records – 4 sounds /10 minutes, 40 kHz, transit	None
	Mordvynivka Village	46^0 43. 507′ 35^0 22. 264′ Center	00:32 – 00:52	One street lamp	— " —	Intensity of records – 15 sounds /10 minutes, 40 kHz. The strong background of insects' sounds	Folder 4 f 17–f19
	Glade	46^0 44. 725′ 35^0 24. 847′ Agricultural hedgerow	00:53 – 01:03	— " —	— " —	Intensity of records – 9 sounds /10 minutes, 40 kHz	Folder 4 f 20–f22
	Agricultural hedgerow, sunflower	46^0 44. 759′ 35^0 24. 286′ Transect A	01:08 – 01:18	— " —	— " —	Intensity of records – 10 sounds /10 minutes, 20 and 40 kHz	Folder 4 f 23–f…
	— " —	46^0 44. 495′ 35^0 24. 353′ Transect A	01:21 – 01:31	— " —	— " —	Intensity of records – 9 sounds /10 minutes, 20 and 40 kHz	— " —
	Melitopol		02:30 – 03:00	— " —	— " —	Weak constant sounds at 20 and 40 kHz. The noise of trees hinders	Folder 5



Routes of Bats' Examination for 29 August 2011

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
29 August 2011	21:00	20.9	760.9	CLM	0	No clouds	
	18:00	27.8	761.6	ESE	4	No clouds	
	15:00	28.7	762.7	ESE	6	No clouds	
	12:00	28.5	764.0	ESE	5	No clouds	
	9:00	24.3	764.4	E	4	No clouds	
	6:00	13.3	764.7	N	2	No clouds	
	3:00	13.4	765.3	N	1	No clouds	
30 August 2011	21:00	22.2	756.2	ENE	1	No clouds	
	18:00	26.7	755.9	ESE	6	No clouds	
	15:00	28.6	756.7	ESE	6	No clouds	
	12:00	28.1	757.5	E	7	No clouds	
	9:00	25.7	758.0	ENE	5	No clouds	
	6:00	18.8	758.8	ENE	2	No clouds	
	3:00	16.0	759.6	NNE	1	No clouds	
	0:00	20.3	760.1	NE	2	No clouds	

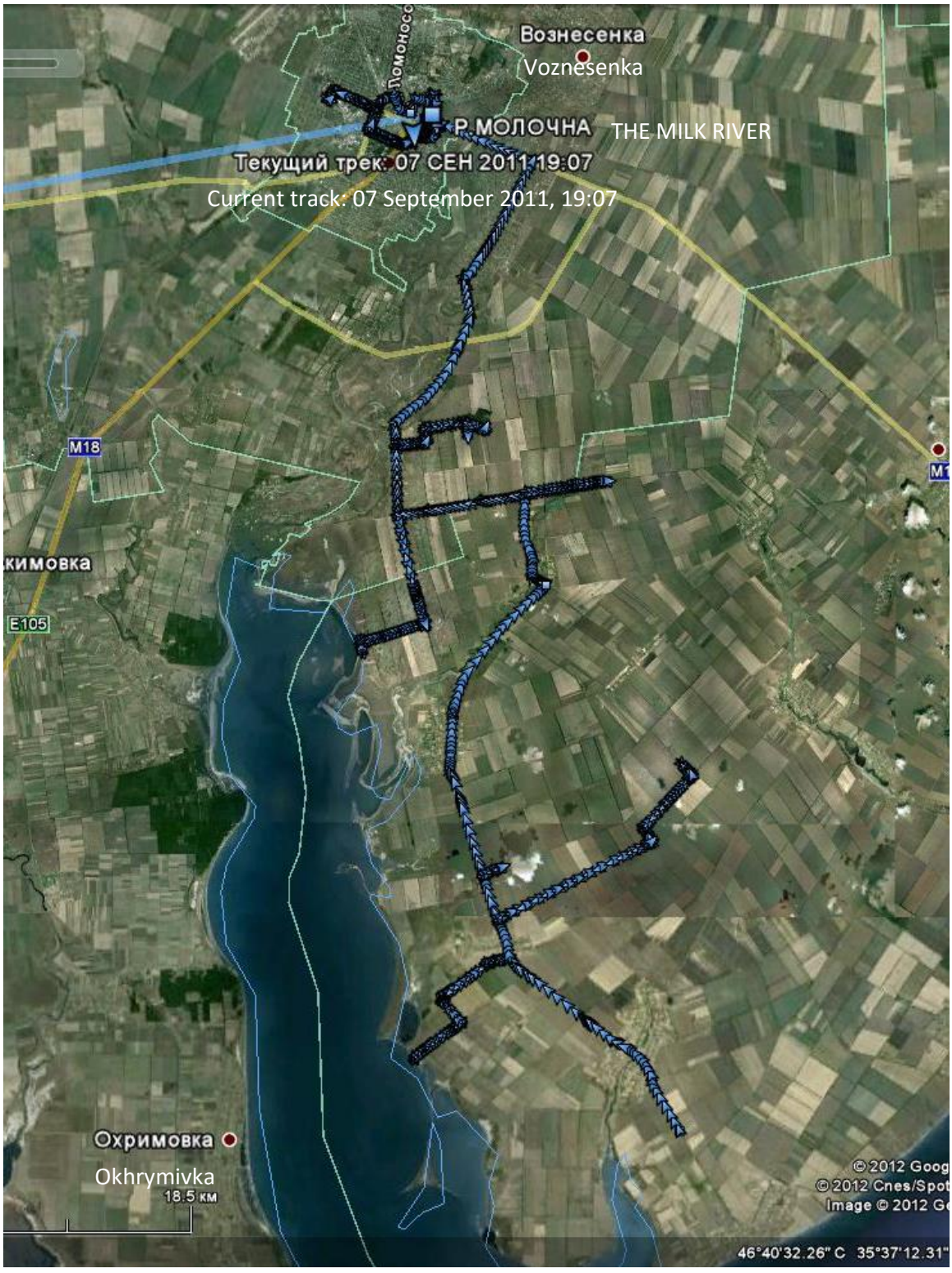
Table 9. Materials of Bats' Examination for 7-8 September 2011 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
7 Sept. 2011	**Estuary 1 (near Dunaivka Village)**	35.380800	19.50-20.00			40	-	None
		46.534509	19.50-20.00			20	-	None
Transect 3 (8 km to the east of Dunaivka Village)								
7 Sept. 2011	Station 5	35.510873	20.20-20.30			40	018, 019	2
		46.632459				20	-	None
7 Sept. 2011	Station 1	35.514981	20.32-20.42			40	021-026	6
		46.629202				20	020	1
7 Sept. 2011	**Dunaivka-Garden**	35.420929	20.50-21.00			40	027-029	3
		46.581172						
Transect 2. Stele								
7 Sept. 2011	Station 5	35.422732	21.04-21.14			40	030-035	9
		46.598374				20	037	1
7 Sept. 2011	Station 1	35.413474	21.16-21.26			40	038-040	4
		46.595907				20	No record	1
7 Sept. 2011	**Girsivka-South**	35.397428	21.30-21.40			40	No record	2
		46.634750				20	041	1
	Girsivka-North	35.399419	21.42-21.52			40	042-044	4
		46.651674				20	-	None
7 Sept. 2011	**Nadezhdine Threshing Floor**	35.443862	21.57-22.07			40	045-048	6
		46.692744				20	No record	1
Transect 4 (between the Villages of Dunaivka and Dobrivka)								
7 Sept. 2011	**Station 1**	35.473574	22.20-22.30			40	049-051	4
		46.727404				20	052, 053	2
	Station 5	35.467110	22.31-22.41			40	055, 056	3
		46.726778				20	054	1

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
7 Sept. 2011	**Estuary 2 (near Mordvynivka Village)**	35.354463 46.670399	23.03-23.13			40	057, 058	2
						20	-	None
7 Sept. 2011	**Mordvynivka Bar**	35.371171 46.726005	23.26-23.36			40	059-064	9
						20	-	None
7 Sept. 2011	**Mordvynivka Forest**	35.413738 46.744717	23.45-23.55			40	065-068	4
						20	069	1
Transect 1 (Mordvynivka, near the forest)								
7-8 Sept. 2011	**Station 1**	35.405086 46.745038	23.57-00.07			40	070-072	3
						20	-	None
8 Sept. 2011	**Station 2**	35.405514 46.742903	00.09-0019			40	-	None
						20	-	None
TOTAL							**55 records**	**70 specimens**

Notes:

1. On Transect 4, all the bats were flying along the agricultural hedgerow towards the Milk Estuary (almost westwards).
2. In Nadezhdine Village most of the registered bats (with the use of a strong lamp) were feeding in the observation area.
3. On the estuary near Mordvynivka Village at Estuary 2 Point, the voices of several hundreds of common cranes were heard gathering there for the roosting time. According to Y.I. Chernichko, there were about 1,300 specimens there.



Routes of Bats' Examination for 7 September 2011

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
7 Sept. 2011	21:00	22.4	757.0	W	2	100%	
	18:00	27.6	756.8	W	2	40%	
	15:00	29.3	758.1	WSW	3	60%	
	12:00	27.1	759.8	NW	2	20 –30%	
	9:00	19.5	760.8	S	1	40%	
	6:00	10.7	761.6	N	1	No clouds	
	3:00	11.1	762.2	N	1	No clouds	
	0:00	15.6	762.9	WSW	1	No clouds	
8 Sept. 2011	21:00	18.7	753.4	SW	2	70 – 80%	0.5
	18:00	22.0	753.1	WNW	5	100%	
	15:00	23.9	753.8	SSW	6	90 or more, but not 100%	
	12:00	23.4	755.0	W	3	90 or more, but not 100%	
	9:00	19.3	755.3	W	2	90 or more, but not 100%	0.3
	6:00	20.5	756.4	WSW	2	100%	
	3:00	20.4	756.8	WSW	2	100%	

Table 10. Materials of Bats' Examination for 14-15 September 2011 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
14 Sept. 2011	**Mordvynivka Forest**	35.413738 46.744717	19.25-19.35			40 20	- -	2 visually -
Transect 1 (Mordvynivka, near the forest)								
14 Sept. 2011	**Station 1**	35.405086 46.745038	19.37-19.47			40 20	073, 074 -	2 -
	Station 2	35.405514 46.742903	19.49-19.59			40 20	075 -	1 -
14 Sept. 2011	**Mordvynivka Bar**	35.371171 46.726005	20.08-20.18			40 20	076-079, 081 080	6 1
14 Sept. 2011	**Estuary 2 (near Mordvynivka Village)**	35.354463 46.670399	20.31-20.41			40 20	082-087 -	6 -
Transect 4 (between the Villages of Dunaivka and Dobrivka)								
14 Sept. 2011	**Station 5 (closer to Dobrivka)**	35.479869 46.728077	21.04-21.14			40 20	088-092 -	6 -
	Station 1 (closer to Nadezhdine)	35.473850 46.727440	21.16-21.26			40 20	093 -	2 -
14 Sept. 2011	**Nadezhdine Threshing Floor**	35.443862 46.692744	21.40-21.50			40 20	095 094	1 2
14 Sept. 2011	**Girsivka-North**	35.399419 46.651674	21.57-22.07			40 20	096-097 -	2 -
	Girsivka-South	35.397428 46.634750	22.10-22.20			40 20	098 -	2 -

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens

Transect 2. Stele								
14 Sept. 2011	Station 1 (near the Stele)	35.415746 46.596439	22.26-22.36			40	-	-
						20	-	-
	Station 5 (remote)	35.422694 46.598390	22.45-22.55			40	-	-
						20	-	-
Transect 3 (8 km to the east of Dunaivka Village)								
14 Sept. 2011	Station 5	35.510416 46.632838	23.10-23.20			40	099-100	2
						20	-	-
	Station 1	35.514130 46.628667	23.22-23.32			40	101	1
						20	102	1
14 Sept. 2011	**Dunaivka-Garden**	35.420929 46.581172	23.41-23.51			40	103	2
						20	-	-
15 Sept. 2011	**Estuary 1 (near Dunaivka Village)**	35.380800 46.534509	00.14-00.24			40	104-109	10
						20	-	
15 Sept. 2011	**Stepanivka Persha (seashore, steeps)**		00.51-01.01			40	111-116	File 116 – 10 minutes – 81 bats!
						20	-	-
TOTAL							**44 records**	**130 specimens**

Notes:

1. Files 111-115 were recorded because there was a solid stream of bats, but with the possibility to track the migratory flight. We saw active flight of the animals south-westwards in the light of strong lamps and fog lamps of a car directed towards the height which provided for good observation of bats. Even File 116, which lasted ten minutes, includes 81 bats. Generally, the intensity of passing flight was each 5-15 seconds. 1-4 bats were passing (most often 1 and 2 specimens). We observed such picture until 2 a.m. Then we stopped the registration, but the intensity of passing flight was not reduced.
2. There were common cranes on the Milk Estuary at Estuary 2 Point, but in a lesser number, because about a hundred or a bit more voices were heard.
3. There are still some nightjars, but they have probably passed to the migratory state because we started to encounter the birds sitting on a road or flying in headlights.

Routes of Bats' Examination for 14 September 2011

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, °C	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
14 Sept. 2011	21:00	20.4	761.0	CLM	0	No clouds	
	18:00	23.8	760.9	SSE	2	No clouds	
	15:00	26.3	761.3	SSE	3	No clouds	
	12:00	24.6	761.3	SSE	3	No clouds	
	9:00	21.6	761.1	CLM	0	No clouds	
	6:00	18.0	760.4	CLM	0	40%.	
	3:00	19.1	760.3	W	2	40%.	
	0:00	20.6	759.5	W	3	No clouds	
15 Sept. 2011	21:00	20.9	760.0	NNE	1	70 – 80%	
	18:00	23.4	760.4	S	2	70 – 80%	
	15:00	25.1	760.6	S	2	70 – 80%	
	12:00	25.1	761.1	SE	2	20 – 30%	
	9:00	23.4	761.0	CLM	0	60%	
	6:00	15.2	761.0	CLM	0	No clouds	
	3:00	16.7	761.0	CLM	0	No clouds	
	0:00	18.0	761.0	CLM	0	No clouds	

Table 11. Materials of Bats' Examination for 23-24 September 2011 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
23 Sept. 2011	**Mordvynivka Forest**	35.413738 46.744717	18.50-19.10			40	-	None
						20	-	None
Transect 1 (Mordvynivka, near the forest)								
23 Sept. 2011	**Station 1**	35.405086 46.745038	19.12-19.22			40		1
						20	-	None
	Station 2	35.405514 46.742903	19.23-19.33			40	File 000	1
						20	-	None
23 Sept. 2011	**Mordvynivka Bar**	35.371171 46.726005	19.42-19.52			40	001-008	9
						20	009	1
23 Sept. 2011	**Estuary 2 (near Mordvynivka Village)**	35.354463 46.670399	20.04-20.14			40	014-017	6
						20	010-013	4
Transect 4 (between the Villages of Dunaivka and Dobrivka)								
23 Sept. 2011	**Station 1 (closer to Nadezhdine)**	35.473850 46.727440	20.40-20.50			40	018-023	7
						20	-	None
	Station 5 (closer to Dobrivka)	35.479869 46.728077	20.52-21.02			40	024-026	6
						20	027, 028	2
23 Sept. 2011	**Nadezhdine Threshing Floor**	35.443862 46.692744	21.13-21.23			40	029, 030	4
						20	-	None
23 Sept. 2011	**Girsivka-North**	35.399419 46.651674	21.42-21.52			40	031	2
						20	-	None
	Girsivka-South	35.397428 46.634750	21.54-22.04			40	-	None
						20	-	None

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Transect 2. Stele								
23 Sept. 2011	Station 1 (near the Stele)	35.415746 46.596439	22.08-22.18			40	032	1
						20	-	None
	Station 5 (remote)	35.422694 46.598390	22.20-22.30			40	033	1
						20	-	None
Transect 3 (8 km to the east of Dunaivka Village)								
23 Sept. 2011	Station 5	35.510416 46.632838	22.47-22.57			40	-	None
						20	-	None
	Station 1	35.514130 46.628667	22.59-23.09			40	-	None
						20	-	None
23 Sept. 2011	**Dunaivka-Garden**	35.420929 46.581172	23.20-23.30			40	034	1
						20	-	None
23 Sept. 2011	**Estuary 1 (near Dunaivka Village)**	35.380800 46.534509	23.43-23.53			40	035-038	4
						20	-	None
24 Sept. 2011	**Stepanivka Persha (seashore, steeps)**		00.22-00.32			40	039-048	18
						20	-	None
TOTAL							**49**	**66**

Routes of Bats' Examination for 23 September 2011

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
23 Sept. 2011	21:00	17.4	758.7	N	1	No clouds	
	18:00	22.0	758.6	ESE	2	No clouds	
	15:00	25.0	758.6	SE	3	40%	
	12:00	24.3	759.4	SE	2	40%	
	9:00	19.1	759.5	NE	2	20–30%	
	6:00	12.1	759.7	N	2	40%	
	3:00	13.3	759.8	N	2	No clouds	
	0:00	13.1	760.1	N	2	No clouds	
24 Sept. 2011	21:00	17.4	759.9	NNW	2	40%	
	18:00	22.1	758.3	NNW	5	40%	
	15:00	27.4	758.2	NNW	1	20–30%	
	12:00	26.2	759.2	N	1	No clouds	
	9:00	18.9	759.2	N	1	No clouds	
	6:00	12.1	758.5	NNW	2	20–30%	
	3:00	12.3	758.5	NNW	2	No clouds	
	0:00	13.5	758.8	NNW	1	No clouds	

Table 12. Materials of Bats' Examination for 29-30 September 2011 in Melitopol and Pryazovske Districts

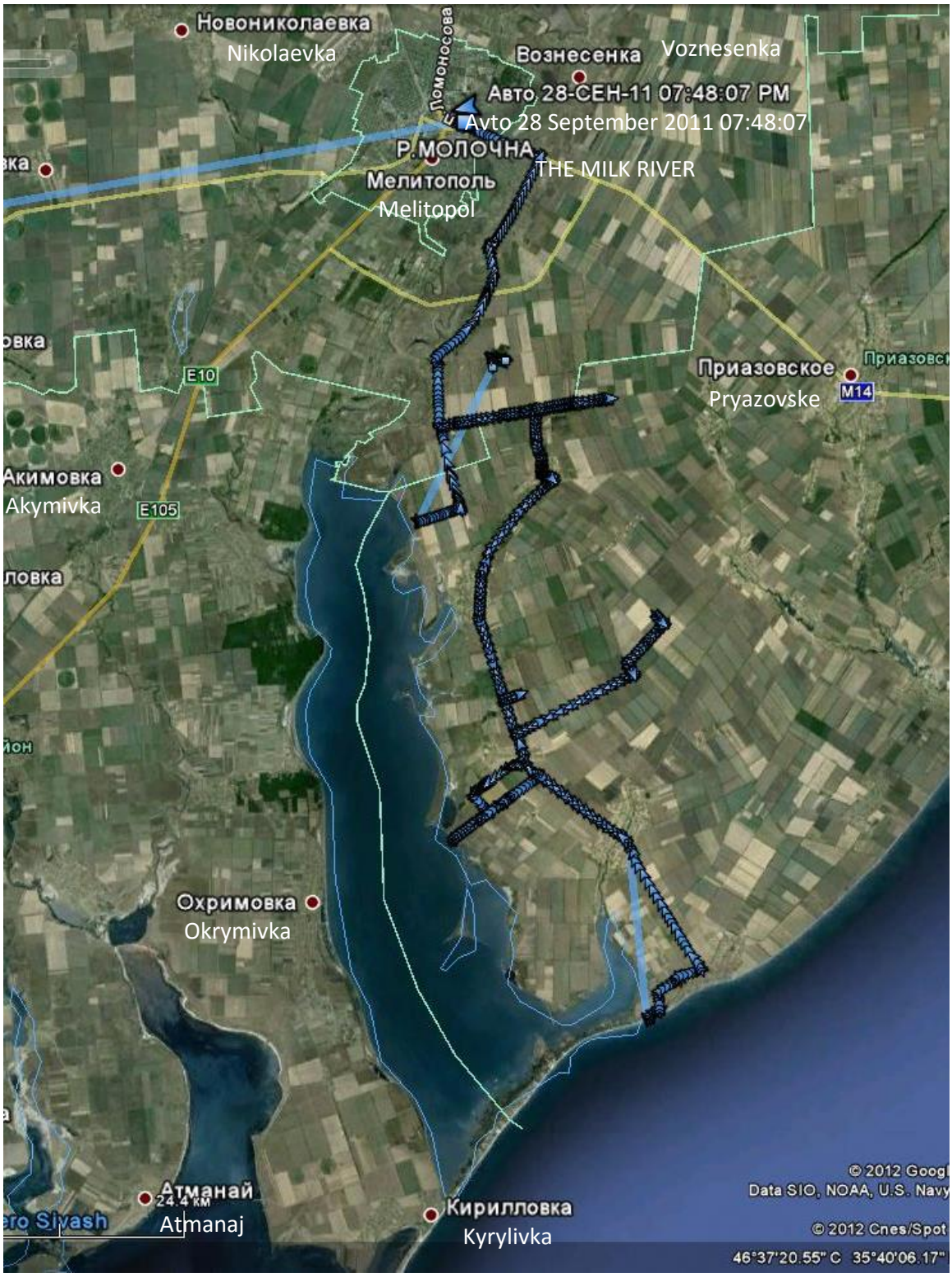
Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
28 Sept. 2011	**Mordvynivka Forest**	35.413738 46.744717	18.50-19.10			40	No record	1
						20	-	None
Transect 1 (Mordvynivka, near the forest)								
28 Sept. 2011	**Station 1**	35.405086 46.745038	19.12-19.22			40	-	None
						20	-	None
	Station 2	35.405514 46.742903	19.24-19.34			40	001	1
						20	-	None
28 Sept. 2011	**Mordvynivka Bar**	35.371171 46.726005	19.42-19.52			40	002-006	6
						20	-	None
	A random stop through a big number of the bats in the headlights light	35°22'26.18 в 46°42'29.59 с	19.54-20.04			40	007-011	8
						20	-	None
	Estuary 2 (near Mordvynivka Village)	35.354463 46.670399	20.12-20.22			40	012	1
						20	-	None
Transect 4 (between the Villages of Dunaivka and Dobrivka)								
28 Sept. 2011	**Station 5 (closer to Dobrivka)**	35.479869 46.728077	20.45-20.55			40	013-015	3
						20	-	None
	Station 1 (closer to Nadezhdine)	35.473850 46.727440	20.56-21.06			40	016-020	5
						20	-	None
28 Sept. 2011	**Nadezhdine Threshing Floor**	35.443862 46.692744	21.30-21.40			40	021, 022	3
						20	-	None
28 Sept. 2011	**Girsivka-North**	35.399419 46.651674	21.52-22.02			40	-	None
						20	-	None
	Girsivka-South	35.397428 46.634750	22.04-22.14			40	023-029	Voice stream without pauses

						20	-	None

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Transect 2. Stele								
28 Sept. 2011	Station 1 (near the Stele)	35.415746 46.596439	22.20-22.30			40	030-035	14 (4 – fly, 10 – feed)
						20	-	
	Station 5 (remote)	35.422694 46.598390	22.31-22.42	Light rain for about 5 minutes		40	036-038	15 (voice stream, feed)
						20	-	
Transect 3 (8 km to the east of Dunaivka Village)								
28 Sept. 2011	Station 5	35.510416 46.632838	22.57-23.07			40	-	None
						20	-	None
	Station 1	35.514130 46.628667	23.09-23.19			40	039-041	5 (fly to the west)
						20	-	None
28 Sept. 2011	**Dunaivka-Garden**	35.420929 46.581172	23.26-23.36			40	042-045	6
						20	-	None
28 Sept. 2011	**Estuary 1 (near Dunaivka Village)**	35.380800 46.534509	23.46-23.56			40	046-050	8
						20	-	None
29 Sept. 2011	**Stepanivka Persha (seashore, steeps)**		00.24-00.44			40	051-055	11
						20	-	None
TOTAL							**55 records**	**87 + voices which were in the flow**

Note:

1. The fortuitous stop was made due to occurrence of the great number of bats in the headlights of the car. Eight voices were registered at that point (see the table above) and then 14 more bats were observed during the movement from that point towards the turn to Estuary 2 (3.7. km).



Routes of Bats' Examination for 28 September 2011

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
29 Sept. 2011	21:00	11.2	760.6	NW	2	100%	0.6
	18:00	11.3	760.4	WSW	1	100%	
	15:00	11.5	761.1	NW	4	100%	0.6
	12:00	16.2	761.7	NW	4	100%	
	9:00	12.6	762.4	NW	4	100%	
	6:00	11.0	762.8	NNW	2	20 –30%	
	3:00	14.2	764.2	NNW	1	60%	
	0:00	16.3	764.2	N	2	100%	
30 Sept. 2011	21:00	10.2	766.0	NW	2	20 – 30%	
	18:00	14.2	764.8	NNW	3	70 – 80%	
	15:00	15.8	764.4	NNE	4	70 – 80%	
	12:00	14.3	764.4	NNW	5	20 – 30%	
	9:00	9.7	763.5	NNW	4	70 – 80%	
	6:00	8.0	762.6	NNW	2	100%	
	3:00	7.9	761.7	CLM	0	No clouds	
	0:00	9.9	761.0	NNW	2	No clouds	

Table 13. Materials of Bats' Examination for 10 October 2011 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
10 October 2011	**Mordvynivka Forest**	35.413738 46.744717	18.30-18.45			40 20	056 -	6 None
Transect 1 (Mordvynivka, near the forest)								
	Station 1	35.405086 46.745038	18.48-18.58			40 20	- -	None None
	Station 2	35.405514 46.742903	19.00-19.10			40 20	057 -	1 None
	Mordvynivka Bar	35.371171 46.726005	19.17-19.27			40 20	058-062 -	6 None
	Estuary 2 (near Mordvynivka Village)	35.354463 46.670399	19.40-19.50			40 20	No record -	1
Transect 4 (between the Villages of Dunaivka and Dobrivka)								
	Station 5 (closer to Dobrivka)	35.479914 46.728009	20.14-20.24			40 20	- -	None None
	Station 1 (closer to Nadezhdine)	35.474048 46.727448	20.26-20.36			40 20	- -	None None
	Nadezhdine Threshing Floor	35.443862 46.692744	20.49-20.59			40 20	- -	None None
	Girsivka-North	35.399419 46.651674	21.04-21.14			40 20	- -	None None
	Girsivka-South	35.397428 46.634750	21.16-21.26			40 20	063 -	1 None

Transect 2. Stele								
	Station 1 (near the Stele)	35.415746 46.596439	21.30-21.40			40	-	None
						20	-	
	Station 5 (remote)	35.422694 46.598390	21.42-21.52			40	-	
						20	-	
Transect 3 (8 km to the east of Dunaivka Village)								
	Station 5	35.510416 46.632838	22.05-22.15			40	-	None
						20	-	
	Station 1	35.514130 46.628667	22.17-22.27			40	-	
						20	-	
	Dunaivka-Garden	35.420929 46.581172	22.35-22.45			40	064	2
						20	-	None
	Estuary 1 (near Dunaivka Village)	35.380800 46.534509	22.54-23.04	Strong breeze, cold (6-8°C)		40	-	None
						20	-	None
	Stepanivka Persha (seashore, steeps)		23.33-23.43			40	065-068	11
						20	-	None
TOTAL							**13 records**	**28 specimens**

Notes:

1. 24 bats were registered visually in the walls (18.24-18.27) along 3.2 km (from the entrance in Mordvynivka Village to the turn to Mordvynivka Forest) within Mordvynivka Village! And from the turn into the forest to Mordvynivka Village Station - 2 bats only. All the bats were feeding and didn't show migratory behaviour.
2. The first night when the goatsuckers were not heard.
3. The first flying by bat was recorded at 19.05 on transect 1 – flied to the south.
4. On the steeps of the Azov Seaside in Stepanivka Persha 11 bats were registered. All of them flied to the south-west along coastline.
5. There were almost no butterflies and other insects.
6. The owls appeared – 6 specimens were registered along the route.

Routes of Bats' Examination for 10-11 October 2011

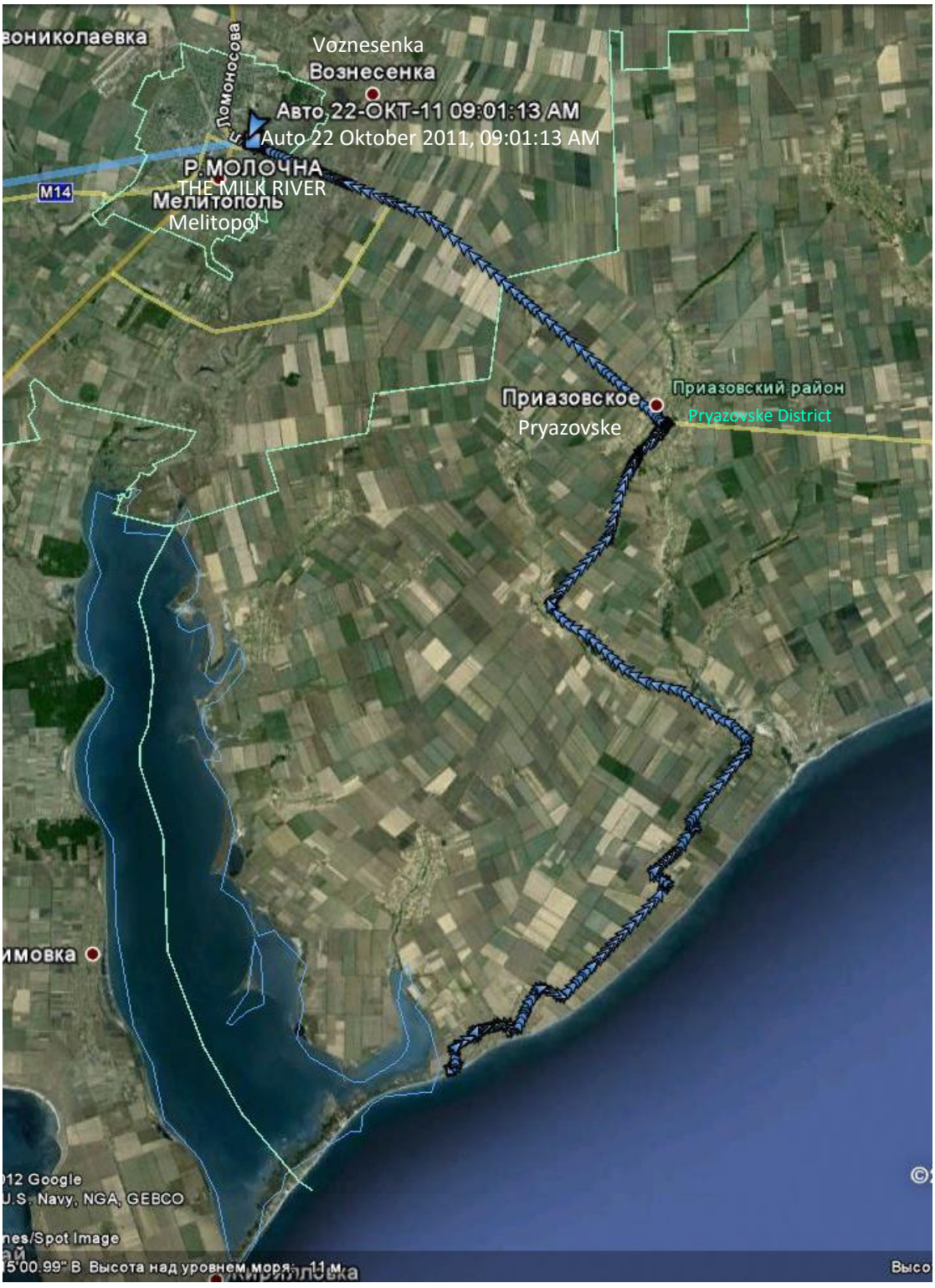
Table 14. Materials of Bats' Examination for 21 Otober 2011 in Pryazovske District (Stepanivka Persha)

Time	Results of observations
17.45	The first visual registration. 11 bats feed actively over the recreation base. All are small in size.
17.46	1 big bat (twice bigger than small ones) flied.
18.05	2 specimens (small) flied to the South-West (in Kyrylivka).
18.05-18.15	14 specimens (small) flied to the South-West (files 009-020 in 40 kHz).
18.15-18.20	3 specimens (small) flied to the South-West and visual observations were finished.
18.20-18.30	Files 021-024 (20 kHz). Total - 4 specimens.
18.30	It finally got dark. Vapour comes out of mouth.
18.30-18.40	Files 025-032 (40 kHz). Total - 15 specimens (voices).
19.00-19.10	Through the whole range of listening – empty.
19.30-19.40	Through the whole range of listening – empty. Single butterflies fly yet in the light of a street lamp.
20.00-20.10	Empty
20.30-20.40	Empty
21.00-21.10	Empty
22.00-22.10	Empty
23.00-23.10	Empty
23.45-24.00	Empty, the end of observations.

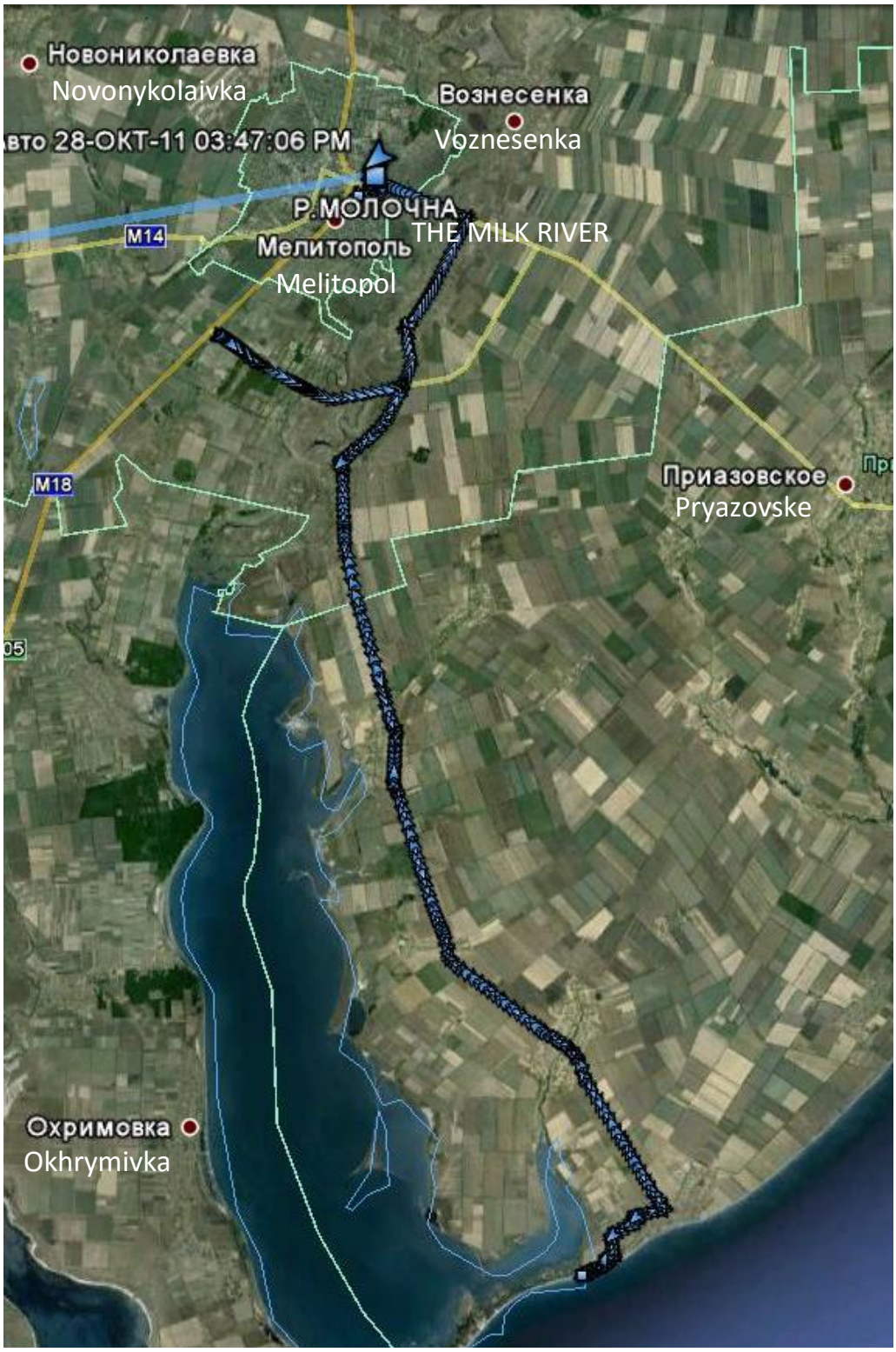
Table 15. Materials of Bats' Examination for 28 October 2011 in Melitopol and Pryazovske Districts

Time	Place of observations	Results of observations
17.30-18.00	Stepanivka Persha 35.553145 / 46.481826	Over all ranges of listening – empty
18.28-18.38	Dunaivka-Garden 35.420929 / 46.581172	
18.45-18.55	Girsivka 35.397428 / 46.634750	
19.04-19.14	Mordvynivka 35.371171 / 46.726005	
20.20-21.00	Melitopol 35.388956 / 46.856144	

Routes of Bats' Examination for 21-29 October 2011



Routes of Bats' Examination for 22 October 2011



Routes of Bats' Examination for 28 October 2011

Characteristics of meteorologic conditions
of October 2011 within the Plot of the Wind Park

Date	Air temperature in the daytime					Air temperature at night				
	Air temp., oC	Mm of Mercury	Cloudiness	Wind	M/sec	Air temp., oC	Mm of Mercury	Cloudiness	Wind	M/sec
1	20	751	50	SW	4	16	751	0	NW	6
2	14	752	50	NW	8	9	754	0	N	2
3	13	756	25	W	3	9	757	0	W	2
4	20	753	25	SW	5	17	752	100	W	1
5	24	754	0	W	2	20	754	25	W	1
6	23	756	25	NW	3	13	755	0	N	1
7	26	752	0	S	5	16	752	0	S	3
8	23	749	0	S	6	16	749	0	SE	4
9	21	749	100	S	8	19	748	100	S	6
10	18	750	0	W	3	11	752	0	W	1
11	18	751	25	NE	1	14	751	25	NW	2
12	16	746	50	NW	2	12	745	100	W	1
13	14	752	50	NW	3	9	755	50	SW	1
14	12	757	50	NW	3	8	759	50	NW	1
15	11	759	25	W	1	8	760	50	NW	1
16	11	761	25	NE	6	7	762	100	NE	5
17	9	760	100	E	8	6	759	50	NE	7
18	5	752	100	N	6	6	751	100	N	5
19	8	755	100	NW	4	7	758	100	N	3
20	9	761	100	NW	1	9	760	100	C	C
21	12	761	50	NE	1	6	762	0	C	C
22	10	763	100	N	3	8	764	100	E	2
23	12	763	25	N	4	7	764	25	N	2
24	11	763	25	NW	4	3	763	0	N	2
25	8	765	50	NE	3	1	765	0	N	2
26	7	765	0	N	5	-1	766	0	NE	1
27	7	767	0	NE	2	2	767	0	NE	2
28	8	768	100	NE	4	6	768	100	NE	3
29	5	767	100	N	2	4	767	100	NE	2
30	7	764	0	N	1	2	762	0	SW	1
31	10	760	0	W	2	2	760	0	SW	1

Characteristics of meteorologic conditions
of November 2011 within the Plot of the Wind Park

Date	Air temperature in the daytime					Air temperature at night				
	Air temp., oC	Mm of Mercury	Cloudiness	Wind	M/sec	Air temp., oC	Mm of Mercury	Cloudiness	Wind	M/sec
1	11	758	0	C	C	5	759	50	SW	1
2	11	759	100	N	3	6	759	50	N	2
3	11	760	50	NE	3	4	760	50	NW	1
4	7	760	100	N	3	6	761	100	N	2
5	9	762	100	N	2	5	763	50	N	2
6	3	769	0	NE	4	-4	771	0	NE	2
7	2	773	0	NE	2	-5	772	0	NE	1
8	6	766	25	SW	2	0	761	100	SW	4
9	4	752	100	NW	3	4	753	100	N	3
10	2	756	100	NE	4	-1	759	50	N	3
11	-1	764	100	N	7	-1	766	100	N	3
12	1	766	100	C	C	0	768	100	C	C
13	3	769	100	N	2	2	769	100	NE	3
14	2	765	100	NW	1	1	763	100	NW	2
15	2	757	50	SW	4	2	756	100	SW	2
16	3	757	50	N	6	-3	760	25	N	4
17	1	762	0	NW	2	0	761	50	W	2
18	5	760	0	W	2	0	759	0	SW	2
19	3	758	100	W	3	-1	759	50	SW	1
20	3	760	100	W	3	2	761	100	C	C
21	5	764	100	C	C	3	764	100	C	C
22	5	761	100	S	1	4	761	50	SW	1
23	1	767	0	NE	6	-6	770	0	NE	1
24	-2	772	0	NE	3	-8	772	0	NE	1
25	0	768	0	C	C	-5	767	0	C	C
26	0	760	50	SW	2	1	758	50	SW	3
27	4	759	0	W	3	0	758	0	SW	1
28	7	752	50	SE	5	5	752	100	SW	4
29	6	759	0	W	6	4	760	100	NW	3
30	6	761	0	N	2	-1	761	0	SW	1

Characteristics of meteorologic conditions
of December 2011 within the Plot of the Wind Park

Date	Air temperature in the daytime					Air temperature at night				
	Air temp., oC	Mm of Mercury	Cloudiness	Wind	M/sec	Air temp., oC	Mm of Mercury	Cloudiness	Wind	M/sec
1	5	757	50	W	4	1	758	100	W	2
2	2	760	50	NW	2	1	761	100	C	C
3	5	761	100	S	5	3	760	100	S	5
4	11	755	0	S	4	7	754	50	S	5
5	14	751	0	S	6	10	750	100	S	5
6	12	749	50	SW	3	10	749	100	S	5
7	5	753	50	N	3	4	754	100	N	2
8	2	751	100	NW	2	0	753	0	C	C
9	2	758	50	N	4	-1	760	100	W	2
10	5	759	50	S	5	5	758	50	S	5
11	6	754	100	W	3	2	759	0	NW	3
12	4	764	0	SW	2	-2	764	0	SE	3
13	2	761	100	SE	6	1	760	100	SE	2
14	7	759	25	SE	4	1	760	0	SE	2
15	5	760	100	S	4	3	759	100	SE	6
16	4	751	50	SE	5	3	749	100	E	7
17	4	748	100	SE	6	6	746	100	SE	4
18	9	749	50	SE	4	5	755	25	W	1
19	5	761	100	NE	3	5	760	100	E	2
20	6	751	50	SE	5	5	750	50	SE	5
21	9	747	50	S	6	5	749	50	S	8
22	3	757	50	NW	5	0	757	50	C	C
23	0	756	25	N	5	-1	756	50	N	4
24	-2	754	100	NE	8	-4	755	100	N	8
25	-2	760	100	NW	4	-3	762	100	N	2
26	-3	765	100	SW	4	0	765	100	W	5
27	5	763	100	W	3	4	761	100	SW	3

Table 16. Materials of Bats' Examination for 17 March 2012 in Melitopol and Pryazovske Districts

Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Stepanivka Persha (seashore, steeps)	35.553145 46.481826	18.00-18.10			40		None
Estuary 1 (near Dunaivka Village)	35.380800 46.534509	18.30-18.40	Wind 7 m/sec, Air temp., +5 oC		40		None
Dunaivka-Garden	35.420929 46.581172	18.55-19.05			40		None
Transect 2. Stele							
Station 1 (near the Stele)	35.415746 46.596439	19.10-19.20			40		None
Girsivka-South	35.397428 46.634750	19.55-20.05			40		None
Girsivka-North	35.399419 46.651674	20.07-20.17			40		None
Nadezhdine Threshing Floor	35.443862 46.692744	21.00-21.10			40		None
Transect 4							
Station 5 (closer to Dobrivka)	35.479914 46.728009	21.32-21.42			40		None
					20		None
Station 1 (closer to Nadezhdine)	35.474048 46.727448	21.44-21.54			40		None
					20		None
Estuary 2 (near Mordvynivka Village)	35.354463 46.670399	22.27-22.37			40, 20		None
Mordvynivka Bar	35.371171 46.726005	22.49-22.59			40		None
TOTAL						-	-

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
17 March 2012	23:00	0.5	768.2	SW	2	No clouds	
	20:00	1.6	768.2	S	2	100%	
	17:00	2.9	768.6	S	3	100%	
	14:00	4.1	769.6	SSE	5	70 – 80%	
	11:00	4.1	770.2	S	3	No clouds	
	8:00	-2.1	770.0	CLM	0	No clouds	
	5:00	-7.4	769.6	CLM	0	No clouds	
	2:00	-4.5	769.6	CLM	0	No clouds	
18 March 2012	23:00	1.7	767.6	N	3	No clouds	
	20:00	3.2	767.6	SSW	5	No clouds	
	17:00	6.3	767.4	SSW	6	No clouds	
	14:00	8.9	767.9	SSW	4	No clouds	
	11:00	7.7	768.1	SSW	2	No clouds	
	8:00	1.3	768.0	SSW	2	The sky is not visible because of the fog and/or other meteorological phenomena	
	5:00	0.7	767.8	SW	2	The sky is not visible because of the fog and/or other meteorological phenomena	
	2:00	2.9	768.1	SW	3	100%	

Table 17. Materials of Bats' Examination for 24 March 2012 in Melitopol and Pryazovske Districts

Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Stepanivka Persha (seashore, steeps)	35.553145 46.481826	18.30-18.40			40		None
Estuary 1 (near Dunaivka Village)	35.380800 46.534509	19.00-19.10			40		None
Dunaivka-Garden	35.420929 46.581172	19.26-19.36			40		None
Transect 2. Stele							
Station 1 (near the Stele)	35.415746 46.596439	19.41-19.51			40		None
Girsivka-South	35.397428 46.634750	20.06-20.16			40		None
Girsivka-North	35.399419 46.651674	20.18-20.28			40		None
Nadezhdine Threshing Floor	35.443862 46.692744	20.58-21.08			40		None
Transect 4							
Station 5 (closer to Dobrivka)	35.479914 46.728009	21.24-21.34			40		None
					20		None
Station 1 (closer to Nadezhdine)	35.474048 46.727448	21.36-21.46			40		None
					20		None
Estuary 2 (near Mordvynivka Village)	35.354463 46.670399	22.09-22.19			40		None
Mordvynivka Bar	35.371171 46.726005	22.38-22.48			40		None
TOTAL						-	-

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
24 March 2012	23:00	1.5	768.2	CLM	0	No clouds	
	20:00	3.5	767.5	N	1	No clouds	
	17:00	10.0	766.0	NNW	3	20 – 30%	
	14:00	10.8	765.7	NNW	4	40%	
	11:00	10.6	765.0	NNW	3	20 – 30%	
	8:00	7.0	764.0	N	4	10% or less, but not 0	
	5:00	6.4	761.8	NW	2	100%	
	2:00	6.8	761.7	WSW	3	100%	
25 March 2012	21:00	4.3	760.4	SSW	5	No clouds	
	18:00	6.7	762.4	S	6	100%	
	15:00	7.8	765.1	S	6	40%	
	12:00	7.9	767.0	S	5	20 – 30%	
	9:00	2.4	768.0	S	1	70 – 80%	
	6:00	-2.3	768.0	CLM	0	10% or less, but not 0	
	2:00	-0.7	768.2	CLM	0	20 – 30%	

Table 18. Materials of Bats' Examination for 1 April 2012 in Melitopol and Pryazovske Districts

Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Stepanivka Persha (seashore, steeps)	35.553145 46.481826	18.00-18.10			40		None
Estuary 1 (near Dunaivka Village)	35.380800 46.534509	19.00-19.10	Wind 6-7 m/sec, Air temp. +5 oC		40		None
Dunaivka-Garden	35.420929 46.581172	19.15-19.20		Rain of the average force	40		None
Transect 2. Stele							
Station 1 (near the Stele)	35.415746 46.596439	19.35-19.40			40		None
Girsivka-South	35.397428 46.634750	19.45-19.55			40		None
Girsivka-North	35.399419 46.651674	19.55-20.05			40		None
Nadezhdine Threshing Floor	35.443862 46.692744	20.20-20.25			40		None
Station 5 (closer to Dobrivka)	35.479914 46.728009	20.42-20.47			40		None
					20		None
Station 1 (closer to Nadezhdine)	35.474048 46.727448	20.47-20.57			40		None
					20		None
Mordvynivka Bar	35.371171 46.726005	21.00-21.10		Rain	40		None
TOTAL						-	-

Routes of Bats' Examination for 31 March – 1 April 2012

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
1 April 2012	21:00	6.1	752.3	W	1	100%	6.0
	18:00	7.6	750.3	WSW	3	100%	
	15:00	7.3	749.0	WSW	4	100%	6.0
	12:00	6.5	747.8	SSW	4	100%	
	9:00	5.2	747.5	SSW	6	100%	
	6:00	5.0	747.4	SSW	7	100%	
	3:00	4.7	748.6	SSW	6	100%	
	0:00	4.8	749.8	SSW	5	100%	
2 April 2012	21:00	4.2	761.6	SW	3	No clouds	
	18:00	8.4	760.5	WSW	5	60%	
	15:00	8.5	760.0	WSW	5	70 – 80%	
	12:00	7.5	759.6	W	4	40%	
	9:00	3.2	757.7	WNW	5	No clouds	
	6:00	0.1	756.6	CLM	0	No clouds	
	3:00	1.6	755.1	W	2	No clouds	
	0:00	4.4	753.4	W	1	70 – 80%	

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
7 April 2012	21:00	8.3	751.0	SSW	4	100%	0.4
	18:00	7.6	750.5	SSW	2	100%	
	15:00	11.5	751.0	WSW	4	100%	
	12:00	9.7	751.1	SE	2	90 or more, but not 100%	
	9:00	10.0	752.0	ESE	1	70 – 80%	0.3
	6:00	7.3	752.4	ENE	1	100%	
	3:00	8.2	753.7	ENE	1		0.3
	0:00	8.2	755.2	NE	1	100%	
8 April 2012	21:00	9.5	750.2	SE	2	70 – 80%	0.3
	18:00	10.4	750.7	SE	1	100%	
	15:00	12.6	751.7	SSE	2	40%	
	12:00	11.3	751.8	SSE	1	70 – 80%	
	9:00	6.4	751.8	SSE	2	100%	
	6:00	5.3	751.8	S	4	The sky is not visible because of the fog and/or other meteorological phenomena	
	3:00	5.9	751.8	SSW	2	100%	
	0:00	9.5	751.4	SW	2	100%	

Table 19. Materials of Bats' Examination for 14 April 2012 in Melitopol and Pryazovske Districts

Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Stepanivka Persha (seashore, steeps)	35.553145 46.481826	19.25-19.35		Light rain	40, 20	-	None
Dunaivka-Garden	35.420929 46.581172	20.00-20.10			40, 20	-	None
Transect 2. Stele							
Station 1 (near the Stele)	35.415746 46.596439	20.16-20.26			40, 20	-	None
Station 2 (remote)	35.422694 46.598390	20.30-20.40			40, 20	F. 044-047	3
Girsivka-South	35.397428 46.634750	20.47-20.55			40, 20	-	None
Girsivka-North	35.399419 46.651674	21.07-21.17		Rain	40, 20	F.048-049	3
Nadezhdine Threshing Floor	35.443862 46.692744	21.27-21.37			40, 20	-	None
Transect 4							
Station 5 (closer to Dobrivka)	35.479914 46.728009	22.08-22.18		Light rain	40	F. 051	Stream, apr. 15 sp.
					20	-	None
Station 1 (closer to Nadezhdine)	35.474048 46.727448	22.20-22.30			40	-	None
					20	-	None
Mordvynivka Bar	35.371171 46.726005	22.37-22.47			40	F. 058	3
					20	-	None
Transect 1							
Station 1	35.405086 46.745038	23.00-23.10			40	F. 059-071	15 migration
					20	F. 068	1
Station 2	35.405514 46.742903	23.13-23.23			40, 20	F. 072-075	4

Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Mordvynivka Forest	35.413738 46.744717	23.27-23.37			40, 20	F. 076	2
TOTAL						-	-

Notes:

1. The mass flight of the may-beetle was observed in Girsivka Village.
2. A lot of butterflies were observed on the territory of Transept 1 in the lights of the headlights and using flashlights.

Characteristics of meteorologic conditions in the area of examination

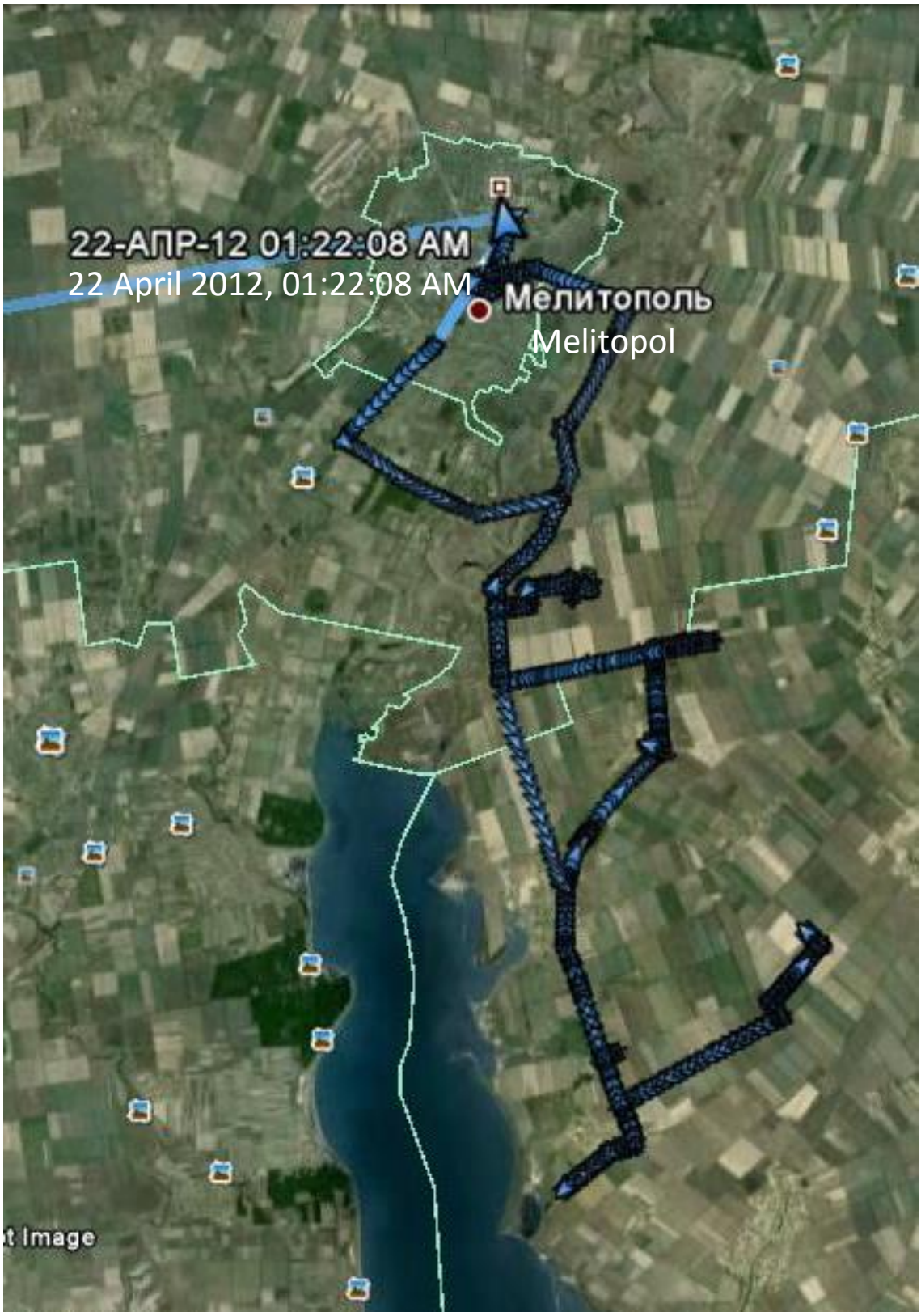
Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
15 April 2012	21:00	10.7	754.1	SW	2	60%	2.0
	18:00	9.1	724.4	SW	2	100%	
	15:00	12.6	753.7	SE	2	100%	2.0
	12:00	11.5	754.3	ENE	5	100%	
	9:00	13.3	754.0	NE	2	100%	0.7
	6:00	11.9	753.3	ESE	2	90 or more, but not 100%	
	3:00	11.4	753.8	ESE	2	20 - 30%	
	0:00	12.0	754.8	ESE	1	60%	

Routes of Bats' Examination for 15 April 2012

Table 20. Materials of Bats' Examination for 21-22 April 2012 in Melitopol and Pryazovske Districts

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
	Stepanivka	35.553145 46.481826				40, 20		None
	Estuary 1 (near Dunaivka Village)	35.380800 46.534509				40	Visually	2
						20		
Transect 3 (8 km to the east of Dunaivka Village)								
	Station 5	35.510416 46.632838				40		None
						20		None
	Station 1	35.514130 46.628667				40	F. 163	1
						20		None
	Dunaivka-Garden	35.420929 46.581172				40		None
Transect 2. Stele								
	Station1 (near the Stele)	35.415746 46.596439				40	F. 165-173	6
						20		None
	Station 5 (remote)	35.422694 46.598390				40, 20	F. 174-183	9
						40, 20		None
	Girsivka-South	35.397428 46.634750					F. 184	1
								None
	Girsivka-North	35.399419 46.651674					F. 185-186	2
								None
	Nadezhdine Threshing Floor	35.443862 46.692744				40		None
						20		None

Date	Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Transect 4 (between the Villages of Dunaivka and Dobrivka)								
	Station 1 (closer to Nadezhdine)	35.473850 46.727440				40	F. 187-188	2
						20		None
	Station 5 (closer to Dobrivka)	35.479869 46.728077				40		None
						20		None
	Mordvynivka Bar	35.371171 46.726005				40	F. 189-195	8
						20		None
Transect 1 (Mordvynivka, near the forest)								
	Station 1	35.405086 46.745038				40	F. 196-202	8
						20		None
	Station 2	35.405514 46.742903				40	F. 203-217	24
						20		None
	Mordvynivka Forest	35.413738 46.744717				40	F. 218-226	27
						20		None
TOTAL								



Routes of Bats' Examination for 22 April 2012

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
22 April 2012	21:00	10.7	758.7	E	3	100%	
	18:00	11.3	758.4	SSE	5	100%.	
	15:00	14.4	758.1	SSE	4	90 or more, but not 100%	
	12:00	13.1	757.8	SSE	1	90 or more, but not 100%	
	9:00	11.3	757.6	ESE	2	100%	4.0
	6:00	10.3	757.4	SSE	1	100%	
	3:00	10.6	757.4	SSE	3	100%	
	0:00	9.0	757.6	ESE	1	No clouds	

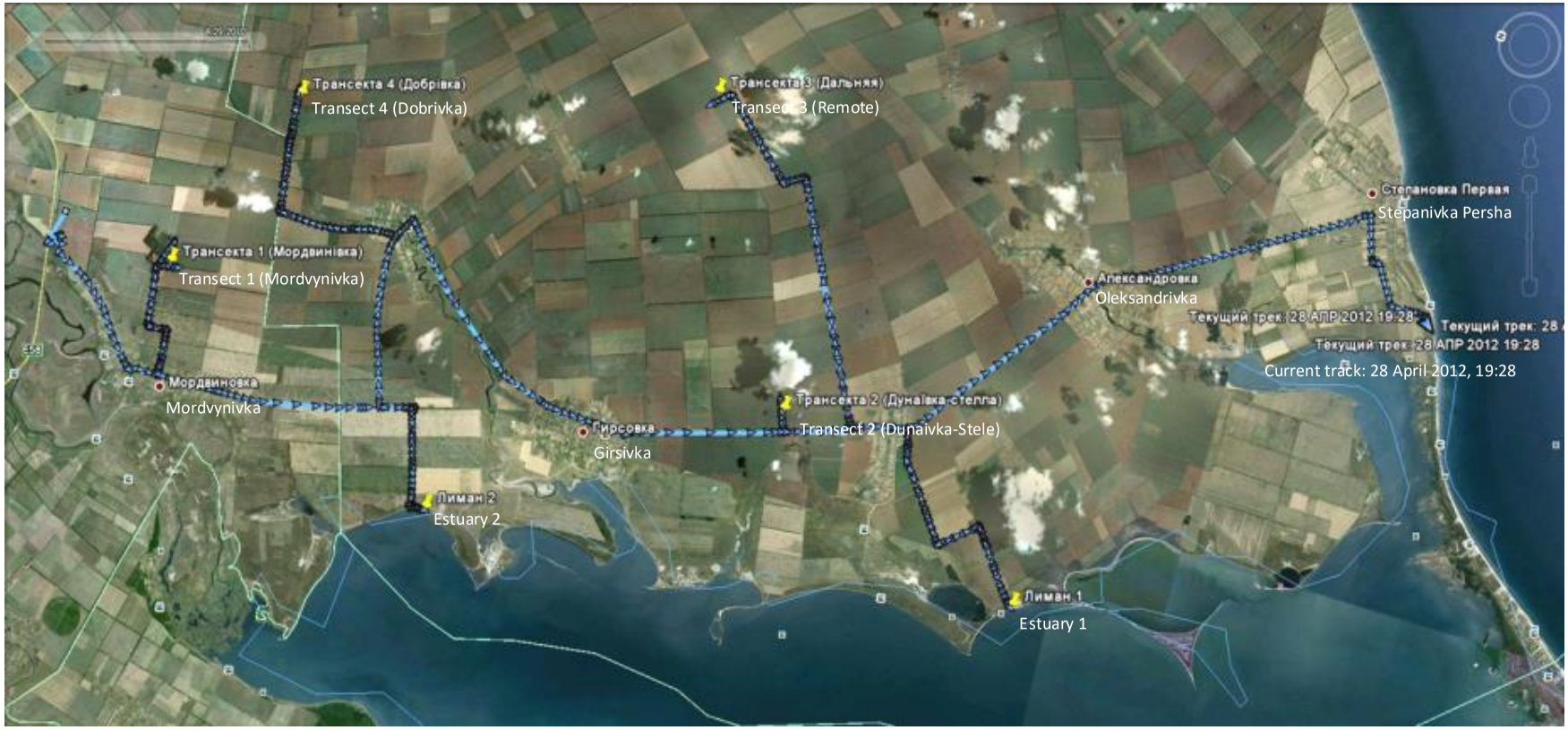
Таблиця 21. Materials of Bats' Examination for 28-29 April 2012 in Melitopol and Pryazovske Districts

Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Mordvynivka Forest	35.413738 46.744717	19.40-20.20			40		None
					20		None
Transect 1 (Morvynivka, near the forest)							
Station 1	35.405086 46.745038	20.22-20.32			40		None
					20		None
Station 5	35.405514 46.742903	20.34-20.44			40		None
					20		1
Mordvynivka Bar	35.371171 46.726005	20.50-21.00			40	F. 000-003	6
					20		None
Estuary 2 (near Mordvynivka Village)	35.354463 46.670399	21.11-21.21			40	F. 005-006	11
					20		None
Transect 4 (between the Villages of Dunaivka and Dobrivka)							
Station 5 (closer to Dobrivka)	35.479914 46.728009	22.18-22.28			40		1
					20		None
Station 1 (closer to Nadezhdine)	35.474048 46.727448	22.30-22.40			40		None
					20		None
Nadezhdine Threshing Floor	35.443862 46.692744	21.50-22.10			40		4
					20		1
Girsivka-North	35.399419 46.651674	22.55-23.05			40		None
					20		None
Girsivka-South	35.397428 46.634750	23.07-23.17			40	F. 008	1
					20		None

Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Transect 2. Stele							
Station 1 (near the Stele)	35.415746 46.596439	23.21-23.31			40 20	F. 009-010	2 None
Station 5 (remote)	35.422694 46.598390	23.33-23.43			40 20	F. 011-012	4 None
Transect 3 (8 km to the east of Dunaivka Village)							
Station 5	35.510416 46.632838	23.58-00.08			40 20		None None
Station 1	35.514130 46.628667	00.10-00.20			40 20		None None
Dunaivka-Garden	35.420929 46.581172	00.30-00.40			40 20		None None
Estuary 1 (near Dunaivka Village)	35.380800 46.534509	00.51-01.01	Strong wind, cold (6-8°C)		40 20		None None
Stepanivka Persha (seashore, steeps)		02.05-02.15			40 20		None None
TOTAL						**11 records**	**31 voice**

Notes:

1. The bats which were registered near upper reaches of the Estuary (Estuary 2) with the number of 11 specimens, probably were local, and not the ones flying by. It was heard from their voices. One did not manage to catch them using the flashlights.
2. After the midnight it became rather cold, but butterflies were still seen in the light of flashlights and headlights (single).
3. The nightingale sang in three points of observations. The owls and goatsuckers are not recorded.
4. The large interval of time after the point of observation Estuary 1 (near Dunaivka) and Stepanivka Persha (more than one hour) appeared because of the problems with the car (the generator went out of order and the battery was fully discharged).



Routes of Bats' Examination for 28-29 April 2012

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
29 April	21:00	18.4	764.3	CLM	0	No clouds	
2012	18:00	22.8	764.8	SSE	2	No clouds	
	15:00	25.2	765.3	SSE	3	No clouds	
	12:00	25.0	765.8	SE	3	No clouds	
	9:00	24.2	766.1	NNW	2	No clouds	
	6:00	14.8	766.1	N	2	No clouds	
	3:00	16.0	766.0	NNW	1	No clouds	
	0:00	16.6	766.0	NNW	1	No clouds	

Table 22. Materials of Bats' Examination for 8-9 May 2012 in Melitopol and Pryazovske Districts

Place of observations	Coordinates	Time	Illumination	Weather	Range	Record	Number of specimens
Estuary 2 (near Mordvynivka Village)	35.354463 46.670399	19.10-20.40			40		None
					20		None
Mordvynivka Bar	35.371171 46.726005	20.50-21.00			40		7
					20		None
Mordvynivka Forest	35.413738 46.744717	21.10-21.20			40	F. 000, 001	4
					20		None
Transect 1 (Mordvynivka, near the forest)							
Station 1	35.405086 46.745038	21.22-21.32			40	F. 002	2
					20		None
Station 5	35.405514 46.742903	21.33-21.43			40	F. 004-007	9
					20		None
Transect 4 (between the Villages of Dunaivka and Dobrivka)							
Station 5 (closer to Dobrivka)	35.479914 46.728009	22.01-22.1			40	F. 008-011	20 (stream)
					20		None
Station 1 (closer to Nadezhdine)	35.474048 46.727448	22.13-22.23			40	F. 012-015	11 (local)
					20		None
Nadezhdine Threshing Floor	35.443862 46.692744	22.33-22.43			40	F. 016-018	11
					20		None
Girsivka-North	35.399419 46.651674	22.50-23.00			40	F. 019	4
					20		None
Girsivka-South	35.397428 46.634750	23.02-23.12			40	F. 020	6
					20		None

Transect 2. Stele							
Station 5 (remote)	35.422694 46.598390	23.17- 23.27			40		2
					20		None
Station 1 (near the Stele)	35.415746 46.596439	23.28- 23.38			40		1
					20		None
Dunaivka-Garden	35.420929 46.581172	23.40- 23.50			40		5
					20		None
Transect 3 (8 km to the east of Dunaivka Village)							
Station 5	35.510416 46.632838	0.02-0.12			40		1
					20		None
Station 1	35.514130 46.628667	0.14-0.24			40	F. 022	7
					20		None
Estuary 1 (near Dunaivka Village)	35.380800 46.534509	0.42-0.58			40	F. 024-030	15 (local)
					20		None
Stepanivka Persha (seashore, steeps)		01.24- 01.34			40		None
					20		None
TOTAL						**26 files**	**105 sounds**

Notes:

1. The bats which were registered on transect 4 (between the Villages of Dunaivka and Dobrivka) in 11 specimens, were probably local, not flying by. It was heard from their voices. One did not manage to catch them using the flashlights.
2. After the midnight it became rather cold, but butterflies were still seen in the light of flashlights and headlights (single).
3. The nightingale sang in three points of observations. The owls and goatsuckers are not recorded.

Routes of Bats' Examination for 8-9 May 2012

Characteristics of meteorologic conditions in the area of examination

Date	Time	Air temperature, oC	Air pressure	Bearing of an apparent wind	Wind velocity	Cloudiness	Precipitation
8 May 2012	21:00	18.4	761.5	CLM	0	70 – 80%	
	18:00	23.1	761.0	S	3	20 – 30%	
	15:00	23.5	761.4	S	3	20 – 30%	
	12:00	23.0	761.6	S	3	20 – 30%	
	9:00	20.4	761.3	SE	1	No clouds	
	6:00	12.1	761.3	NNW	1	The sky is not visible because of the fog and/or other meteorological phenomena	
	3:00	11.5	761.4	NNW	1	The sky is not visible because of the fog and/or other meteorological phenomena	
	0:00	15.6	761.3	SSW	1	No clouds	
9 May 2012	21:00	18.8	764.0	NNW	1	40%	
	18:00	23.4	763.2	SSW	2	70 – 80%	
	15:00	23.7	763.3	SSE	3	60%	
	12:00	23.0	763.0	S	3	40%	
	9:00	21.2	762.8	SSE	1	20 – 30%	
	6:00	12.1	762.0	CLM	0	60%	
	3:00	16.4	761.8	CLM	0	No clouds	
	0:00	17.8	761.8	SSW	2	70 – 80%	

Annex 3

Critical parameters of bats' sound signals and their spectrograms (transcript of audio files with bats' sounds)

7 September 2011

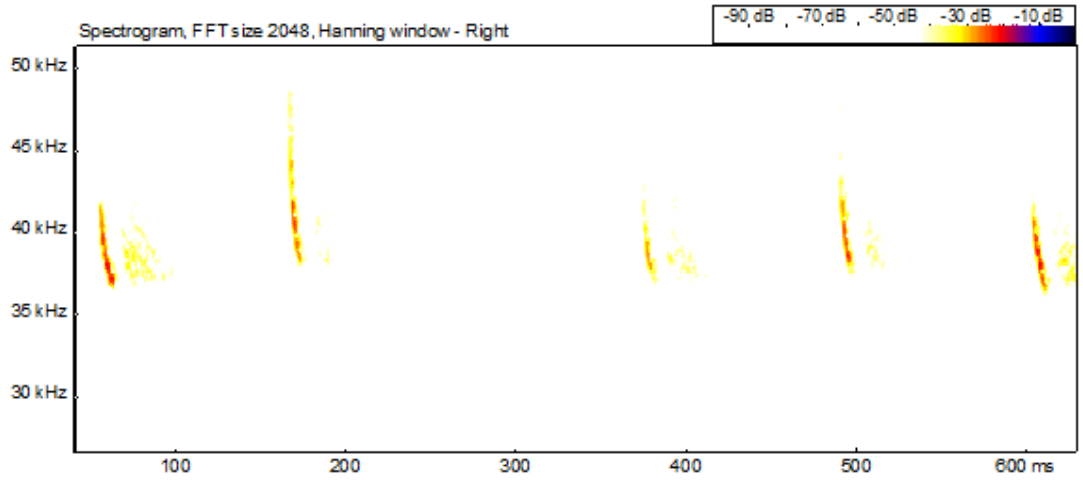
Transect 3 (8 km to the east of Dunaivka Village)

Station 5	35.510873/46.632459	20.20-20.30
Station 1	35.514981/46.629202	20.32-20.42

STE-018.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,74	48,4	40,82	37,8
5,90	43,5	39,2	37,4
7,19	42,3	39,4	36,1
7,27	41,7	38,7	35,7

Average pulse separation 123,4 ms

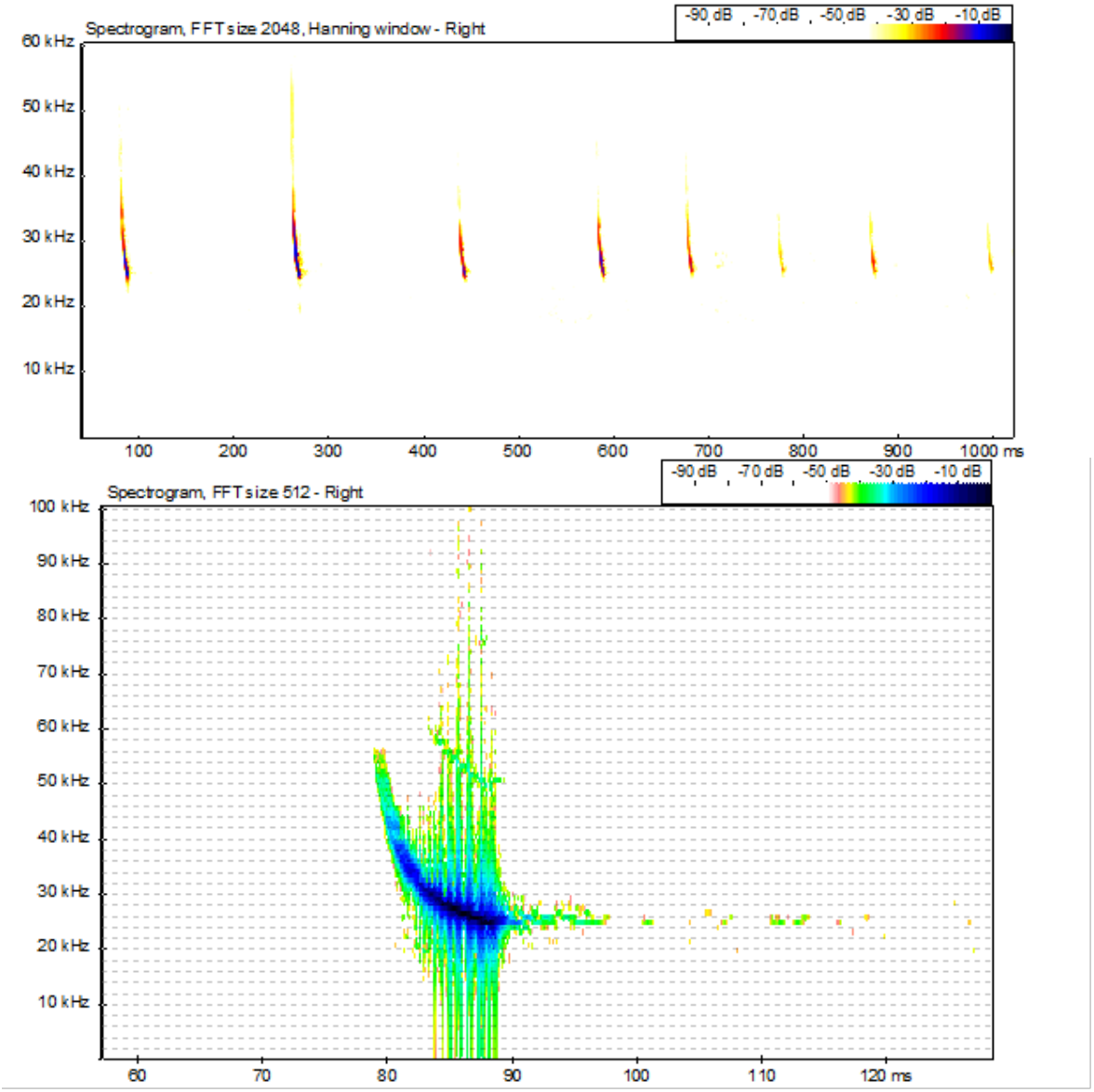


STE-019.wav – Insecta

STE-020.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
9,99	44,2	25,7	23,8
8,43	54,7	25,7	22,7
7,1	33,3	25,7	23,2
6,11	36,6	27,1	23,2
6,92	35,7	26,7	24,1

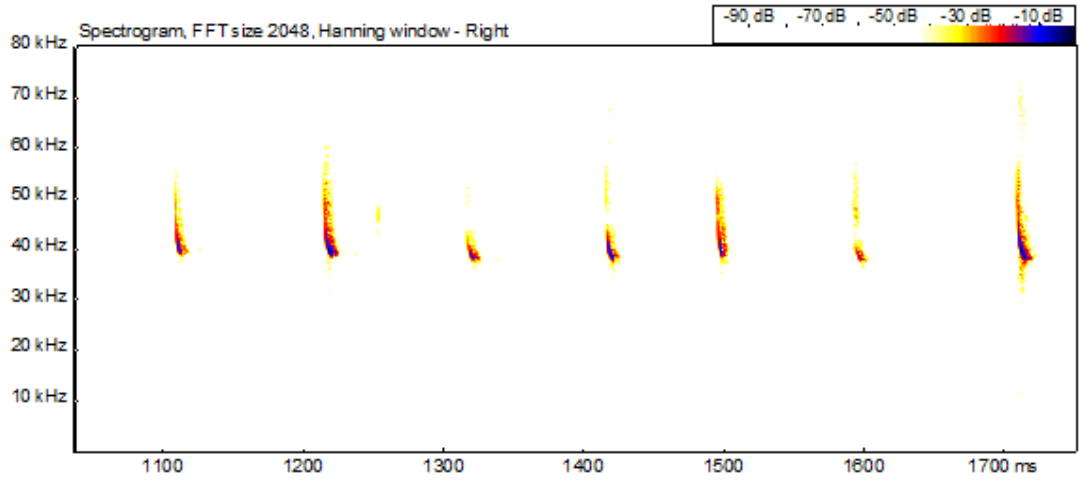
Average pulse separation 149,5 ms



STE-021.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,01	56,0	41,0	38,1
9,44	55,8	40,0	38,6
10,19	60,6	41,0	38,1
7,32	57,6	40,2	37,8
9,92	54,6	40,2	37,6

Average pulse separation 117,4 ms



STE-022.wav – very small signal
STE-023.wav – very small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
		40,8	
		40,7	

Average pulse separation ? ms
STE-024.wav – very small signal

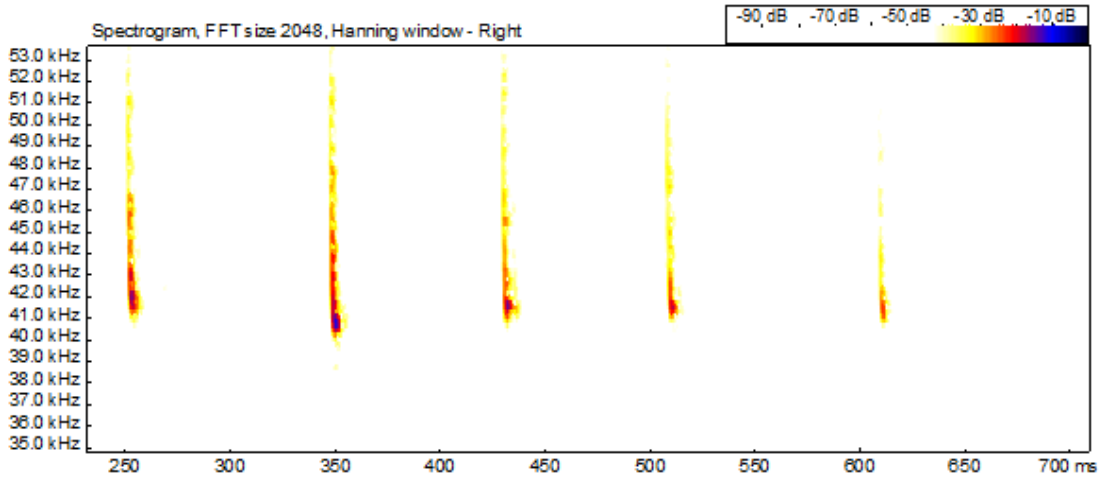
Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
		39,8	

Average pulse separation ? ms

STE-025.wav – small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,66	53,34	42,1	41,02
5,86	52,36	40,0	40,19
5,50	53,23	41,9	40,91
5,46	51,63	42,1	40,97
4,36	47,20	42,3	40,81

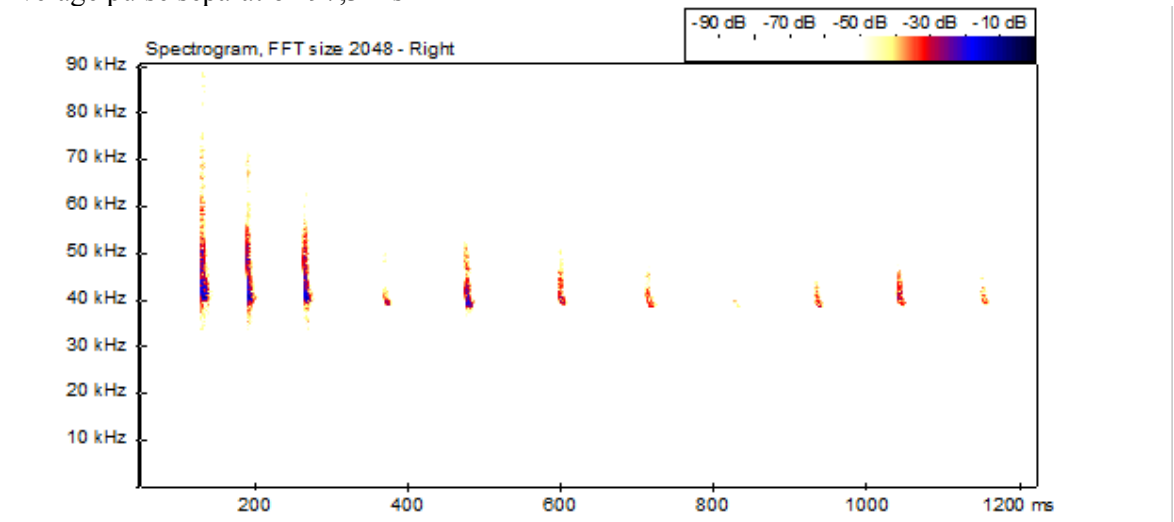
Average pulse separation 89,475 ms



STE-026.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,71	72,1	40,7	39,6
7,89	56,5	40,4	38,8
8,35	57,5	40,3	38,8

Average pulse separation 97,3 ms

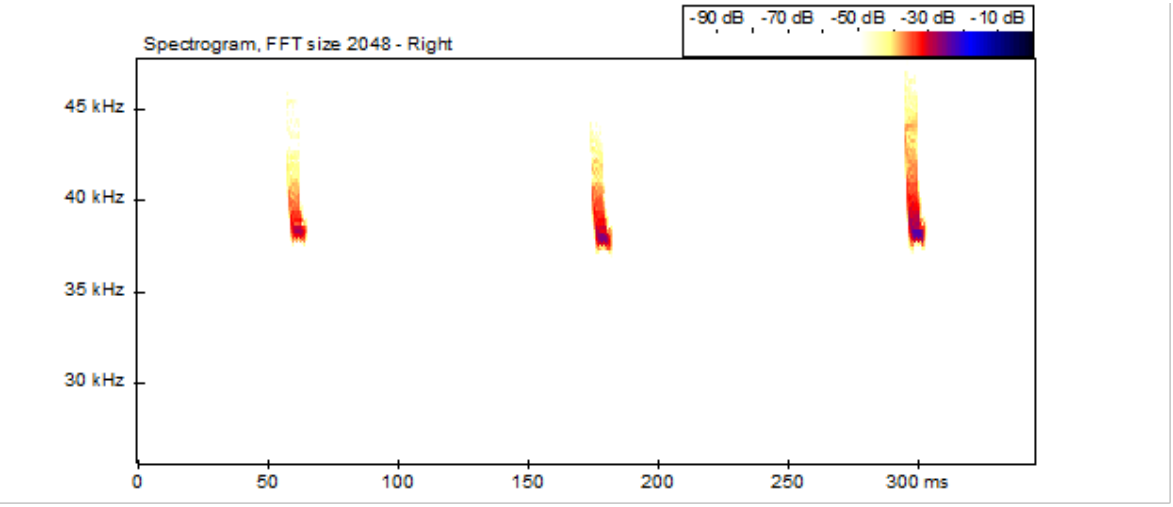


Dunaivka-Garden	35.420929/46.581172	20.50-21.00

STE-027.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,05	42,86	38,5	37,77
5,15	44,05	38,0	37,54
5,12	46,07	38,5	37,67
4,86	–	38,0	–
4,42	–	38,3	–

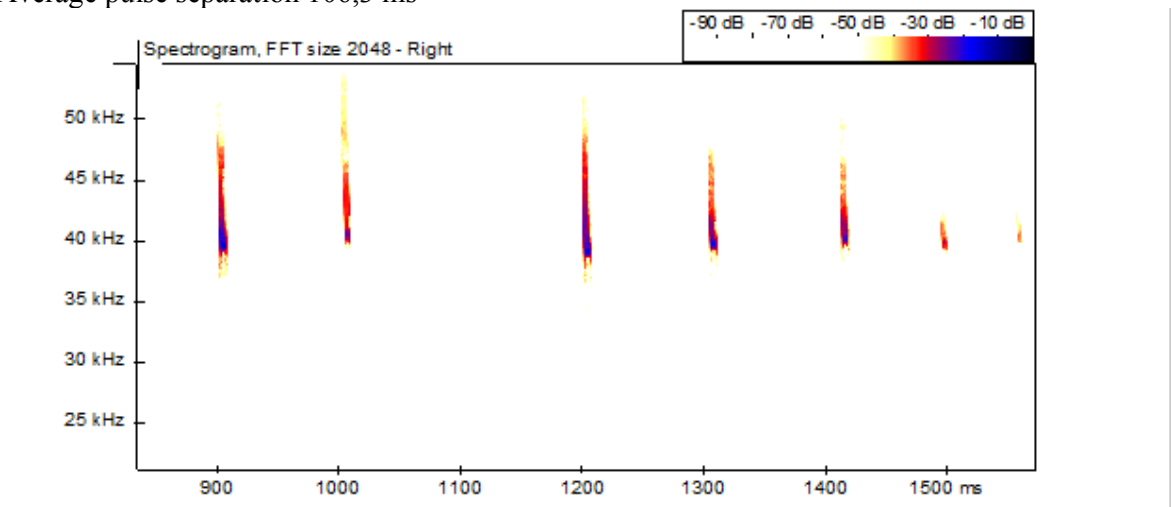
Average pulse separation 141,2 ms



STE-028.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,44	49,5	39,2	38,6
4,47	47,5	39,9	39,1
4,48	46,8	40,3	39,6
4,98	48,8	39,6	38,8
4,34	53,6	40,8	39,7

Average pulse separation 106,3 ms

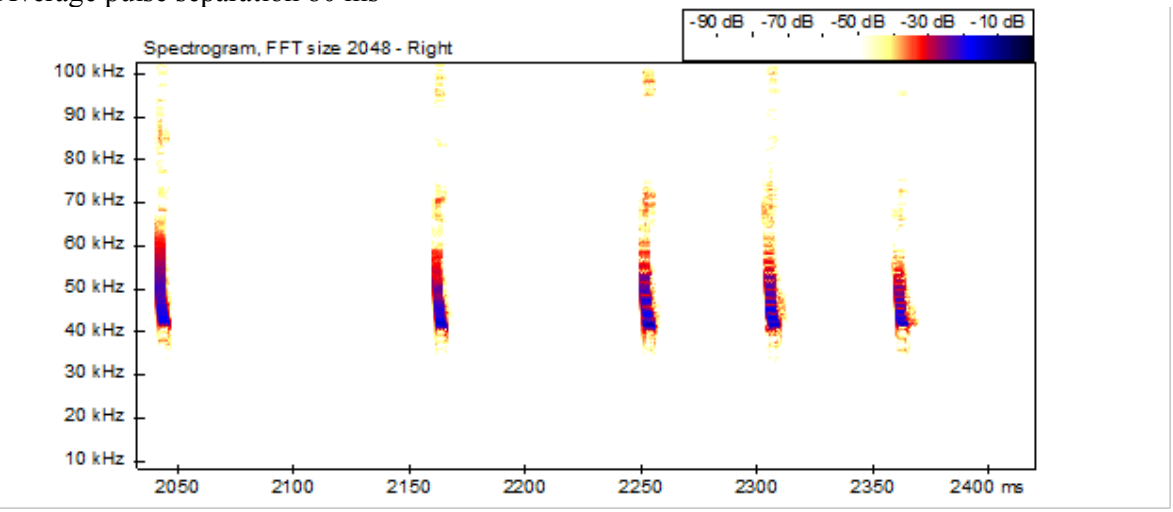


STE-029.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
3,73	66,4	43,3	40,4
4,13	72,7	42,3	40,2
5,24	72,2	41,8	39,9
4,74	74,1	43,5	39,9

5,14	73,0	42,3	41,0

Average pulse separation 80 ms



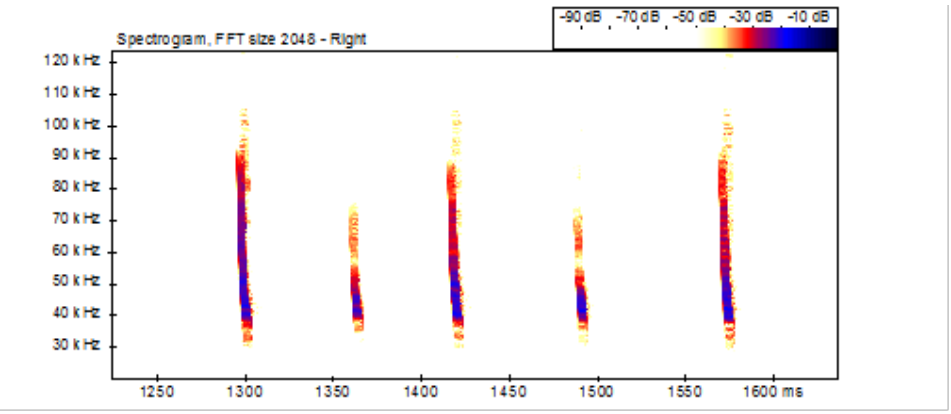
Transect 2. Stele

7 Sept. 2011	Station 5	35.422732 46.598374	21.04-21.14			40	030-035	9
						20	037	1
7 Sept. 2011	Station 1	35.413474 46.595907	21.16-21.26			40	038-040	4

STE-031.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
4,19	92,1	43,5	31,6
4,08	73,3	41,9	35,3
4,75	89,1	40,8	32,8
4,25	72,1	41,8	35,3
4,86	92,5	42,4	32,5

Average pulse separation 68,6 ms

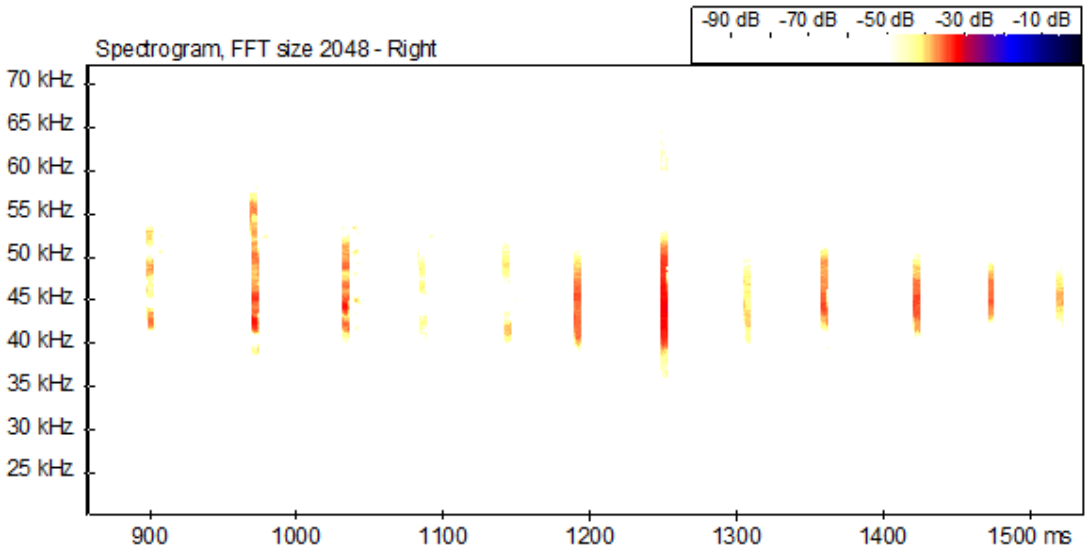


STE-032.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit

2,12	57,4	42,6	41,2
2,15	52,5	44,8	41,3
2,18	50,2	45,7	39,7
2,24	52,9	44,3	38,6
1,99	51,0	44,6	41,6

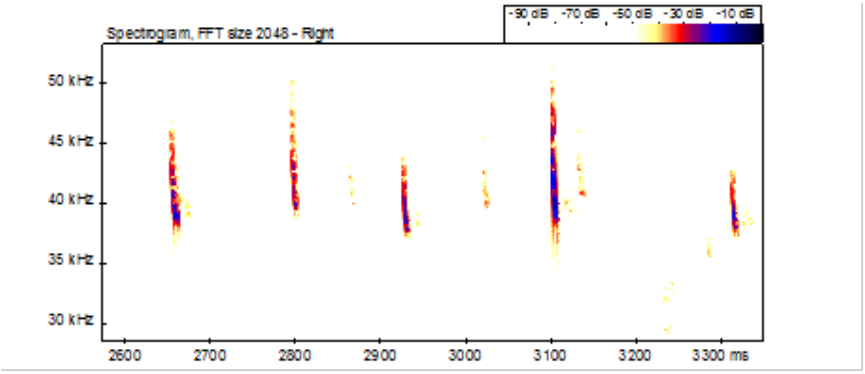
Average pulse separation 57,4 ms



STE-033.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,50		39,1	
6,47		39,8	
7,70		39,3	
7,50		39,8	
7,3		39,3	

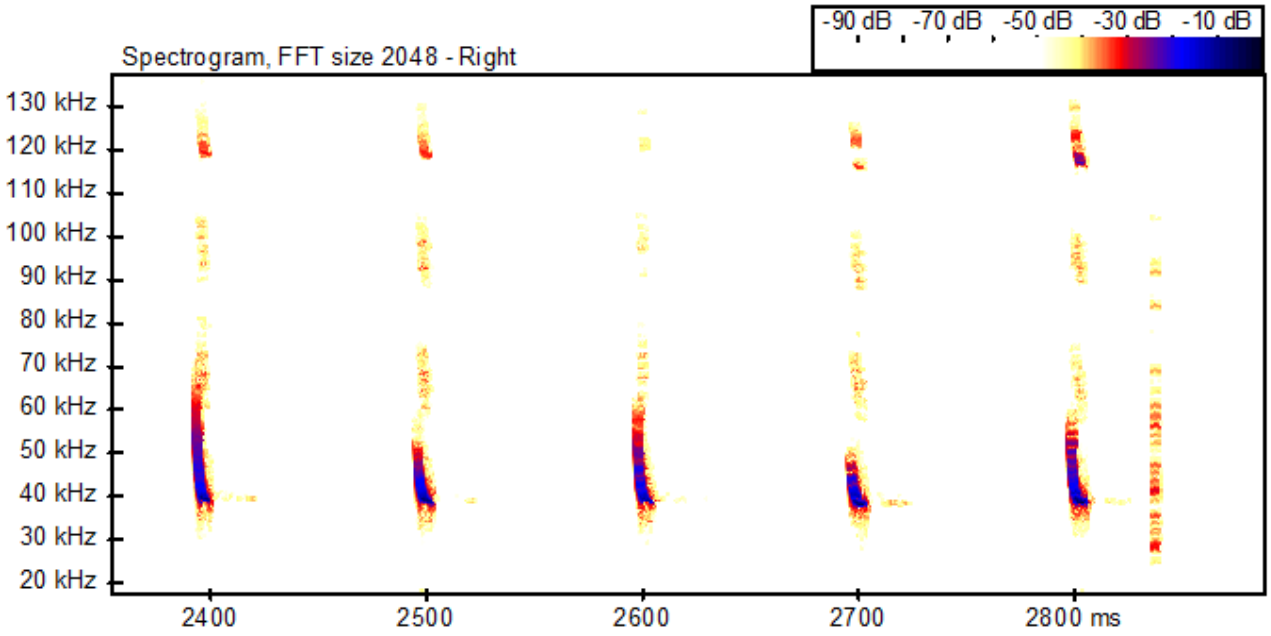
Average pulse separation 164,5 ms. Upper and lower limits are inexpressive.



STE-034.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
4,54	73,3	41,3	36,4
5,13	71,9	40,8	38,2
5,60	72,3	40,2	37,5
5,57	73,6	40,1	36,4
5,71	73,9	39,7	36,7

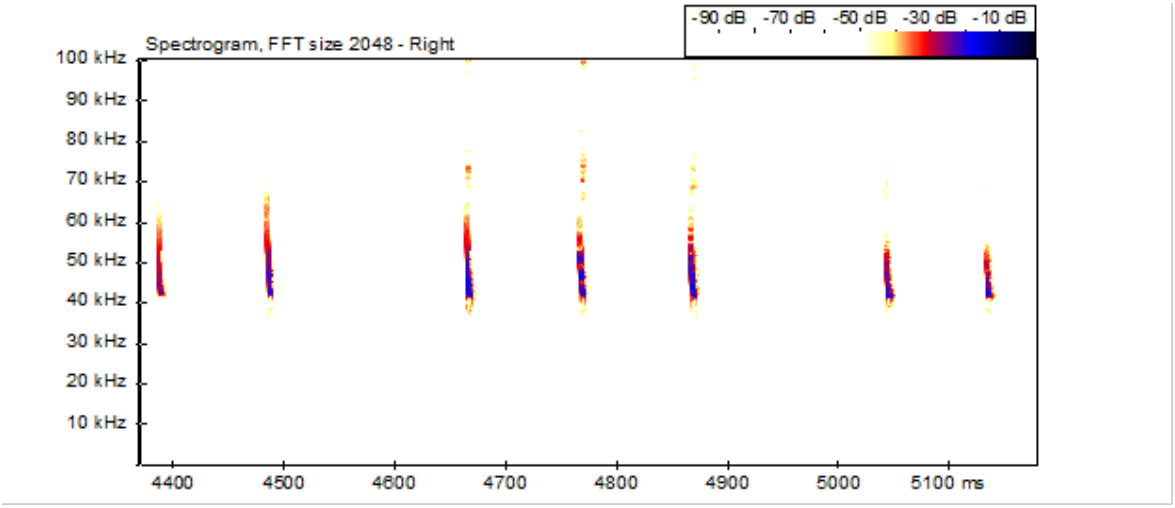
Average pulse separation 101,4 ms



STE-035.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
4,19		43,0	
4,06		43,0	
4,48		42,6	
3,76		42,8	
5,09		42,2	

Average pulse separation 128,5 ms

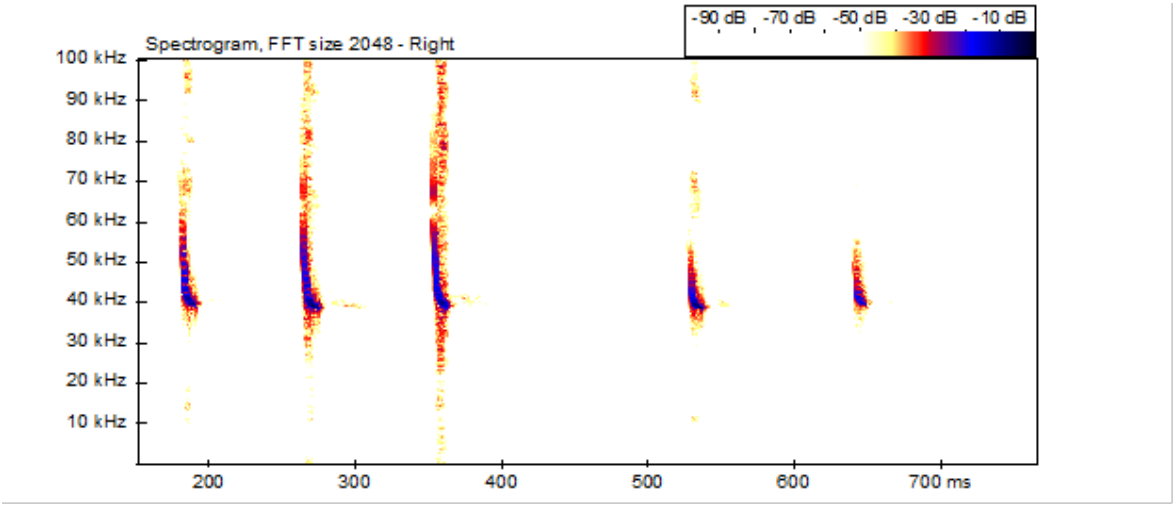


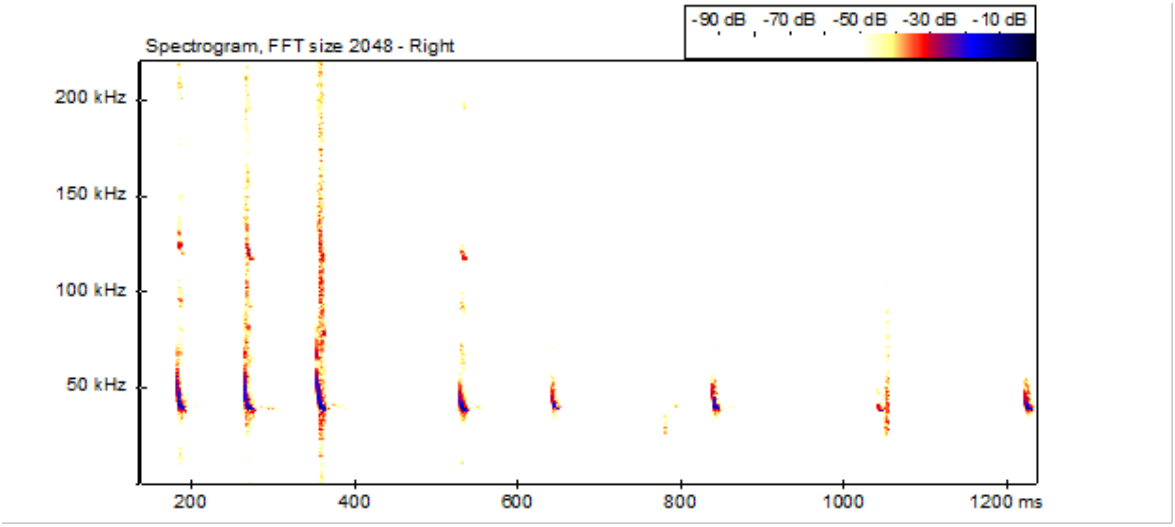
STE-036.wav – small signal
STE-037.wav – insects

STE-038.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
11,95		40,1	
12,74		39,5	
12,20		40,4	
9,7		39,2	
7,6		41,1	

Average pulse separation 115,15 ms

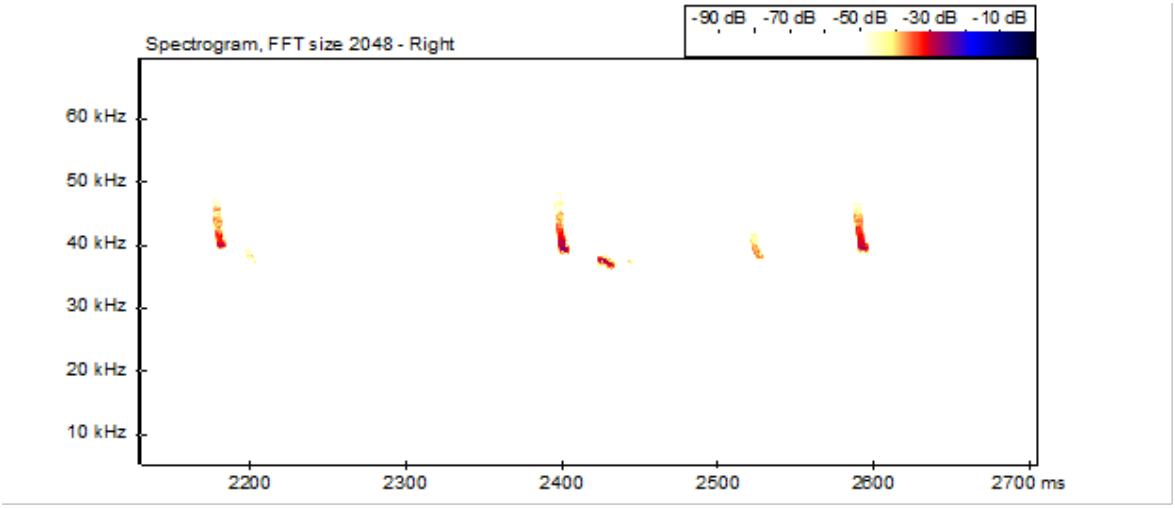




STE-039.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,60	46,24	40,2	39,68
5,66	45,4	39,7	39,00
6,20	45,7	39,9	39,10
5,55	45,6	40,6	39,90
4,20	45,3	40,6	40,00

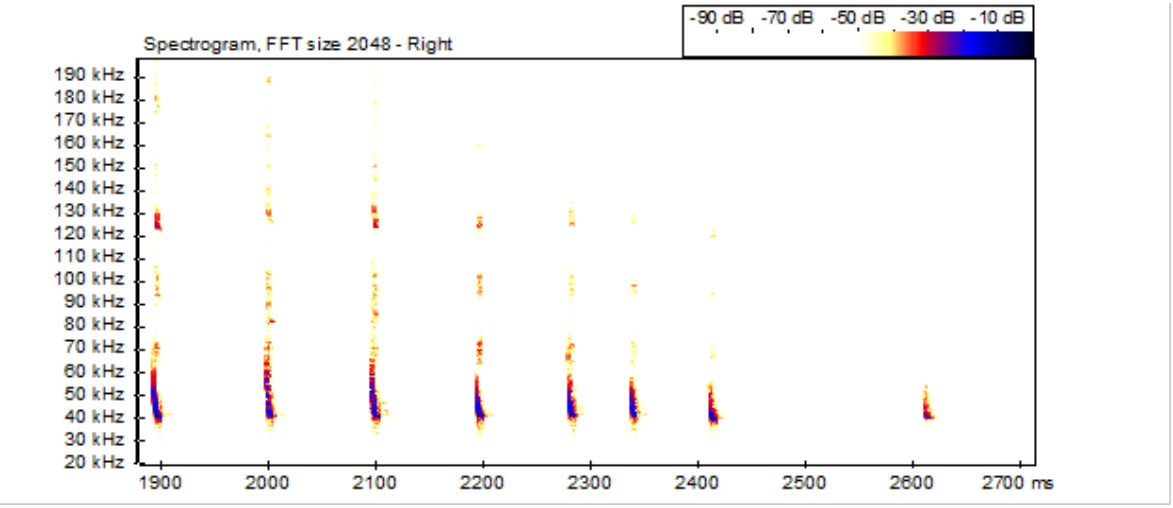
Average pulse separation ms



STE-040.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,20	77,2	41,8	38,80
5,67	93,4	42,6	38,50
5,92	89,4	41,9	38,80
6,14	70,3	41,7	37,60
5,80	74,9	41,9	38,70

Average pulse separation 86,5 ms

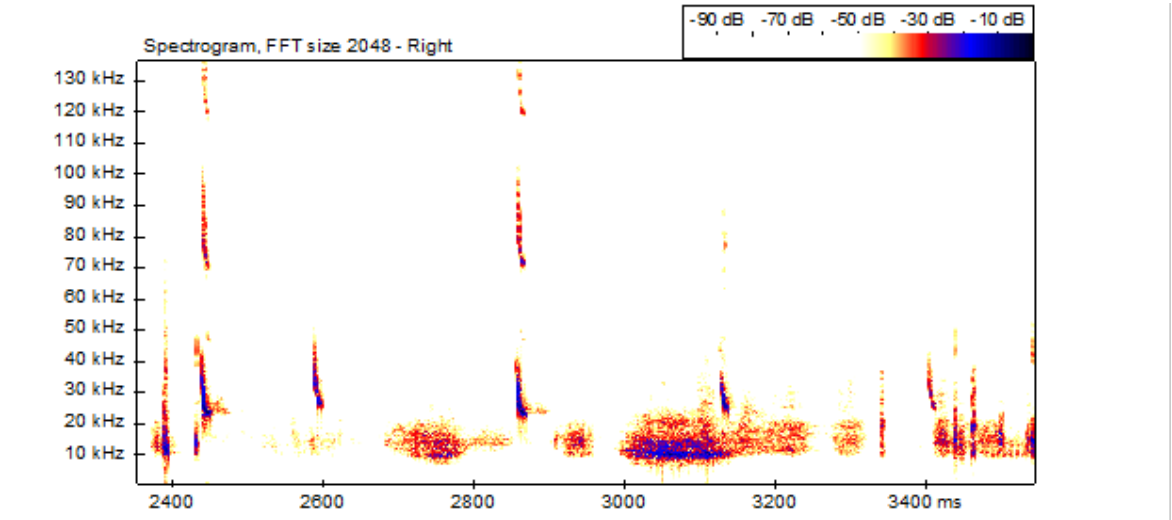


7 Sept. 2011	**Girsivka-South**	35.397 428 46.634 750	21.30-21.40			40	No record	2
						20	041	1
	Girsivka-North	35.399 419 46.651 674	21.42-21.52			40	042-044	4
						20	-	None

STE-041.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
12,10	44,0	23,8	22,7
10,91	48,4	27,1	25,9
12,7	36,8	26,5	24,5

Average pulse separation ms



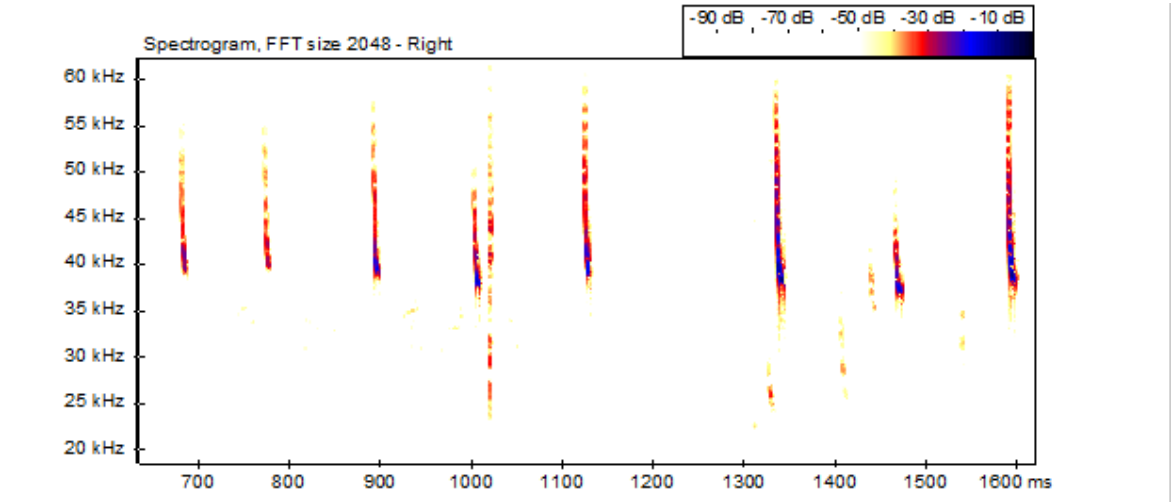
STE-042.wav – small signal
STE-043.wav – small signal

7 Sept. 2011	**Nadezhdine Village – Threshing Floor**	35.443 862 46.692 744	21.57-22.07			40	045-048	6

STE-045.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,89	58,6	38,6	37,9
6,44	57,3	39,5	38,7
7,41	60,6	39,1	37,8

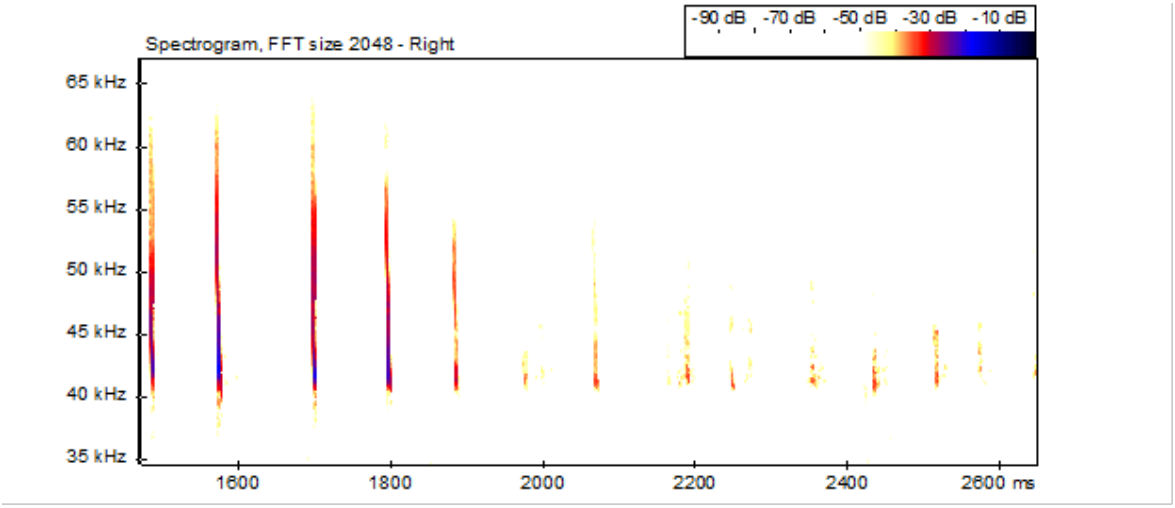
Average pulse separation ms



STE-046.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
3,18	61,7	43,7	40,4
3,56	62,8	42,6	40,3
3,97	63,4	42,4	40,4
4,06	57,9	41,9	40,6

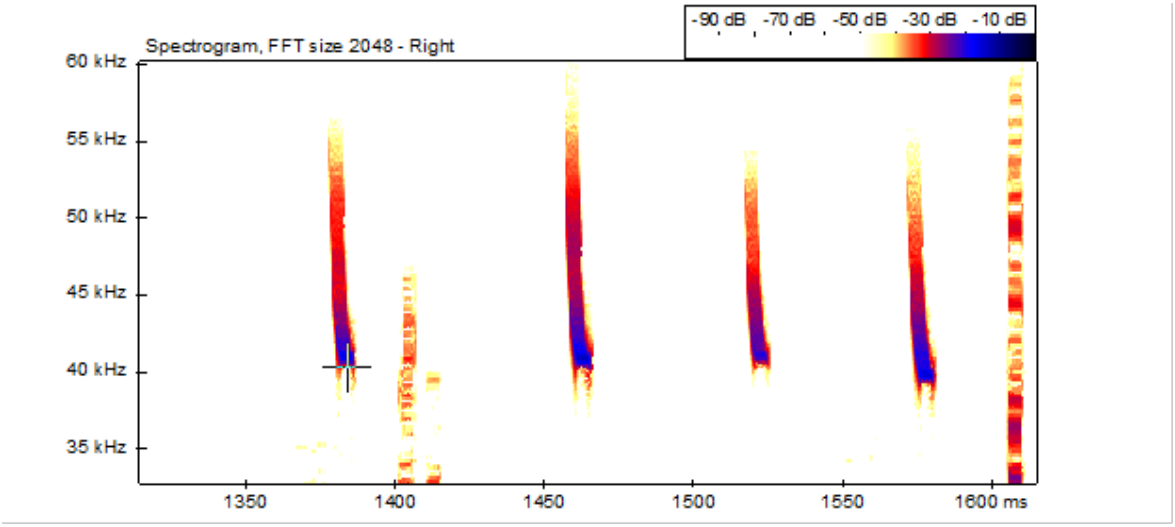
Average pulse separation 95,0 ms



STE-047.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,20		41,1	
5,41		41,1	
5,52		41,5	
6,00		40,1	

Average pulse separation 95,0 ms



STE-048.wav – small signal
STE-049.wav – small signal

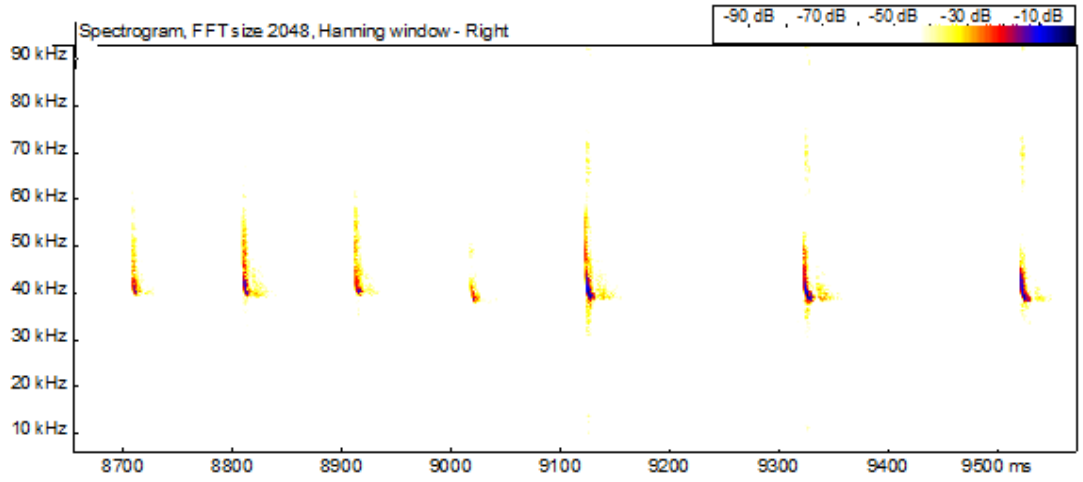
Transect 4 (between Dunaivka and Dobrivka Villages)							
Station 1	35.473 574 46.727 404	22.20-22.30			40	049-051	4
					20	052, 053	2
Station 5	35.467 110	22.31-22.41			40	055, 056	3

	46.726 778				20	054	1

STE-050.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,58	55,2	41,2	39,4
5,80	58,4	42,4	39,0
6,39	58,7	41,2	39,3
6,37	58,8	41,0	39,2
8,17	59,0	39,8	38,6

Average pulse separation 171,0 ms

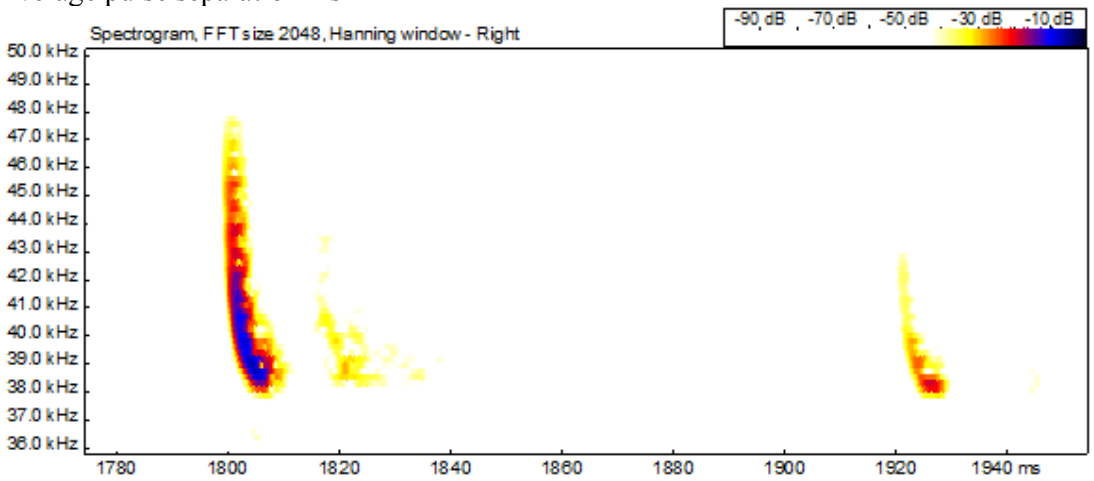


STE-051.wav – small signal

STE-052.wav – small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,21	47,92	39,2	37,66

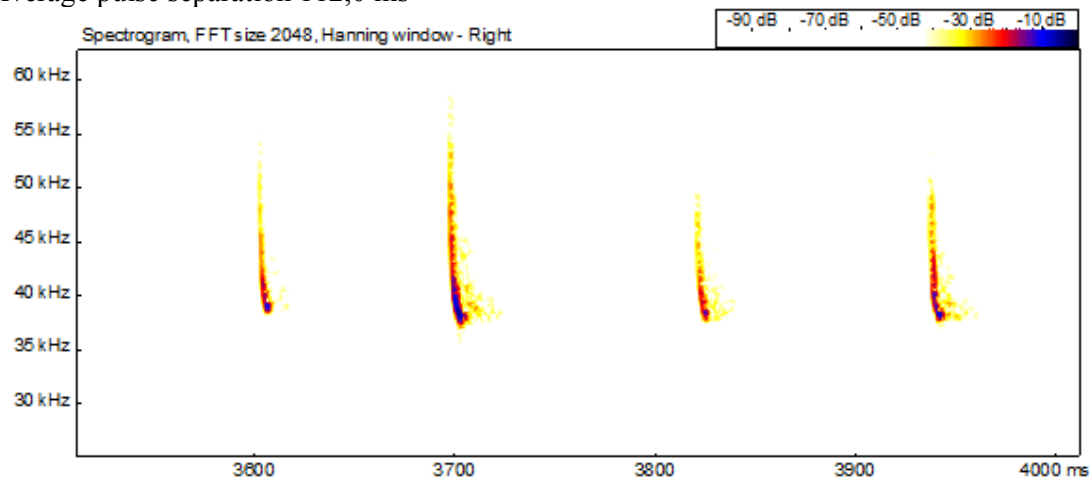
Average pulse separation ms



STE-053.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,07		40,0	
6,5		38,6	
6,34		38,6	
7,4		38,9	

Average pulse separation 112,0 ms



STE-054.wav – small signal

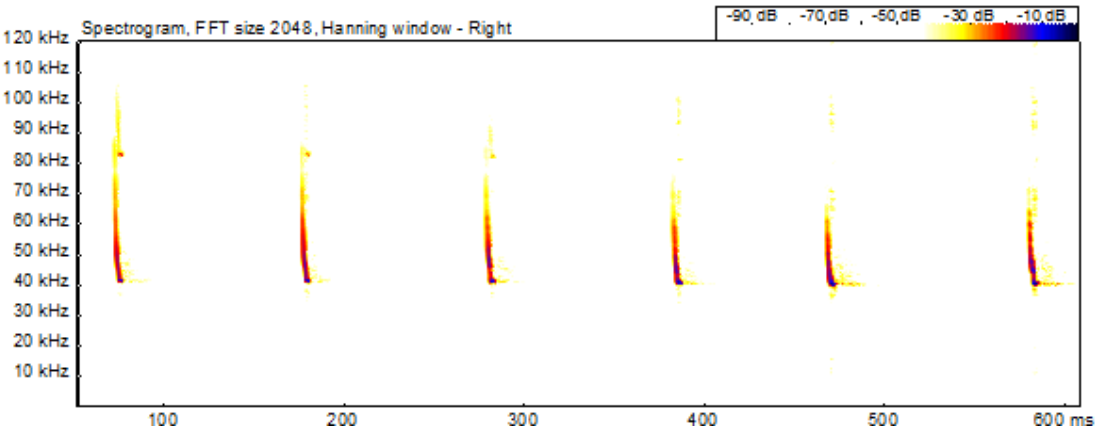
Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
10,1	37,2	26,5	23,02

Average pulse separation ms

STE-055.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
4,75	76,9	41,7	40,1
5,07	71,3	41,0	39,7
4,50	66,9	41,0	39,1
5,17	71,4	40,8	39,1
5,30	65,9	40,8	38,5

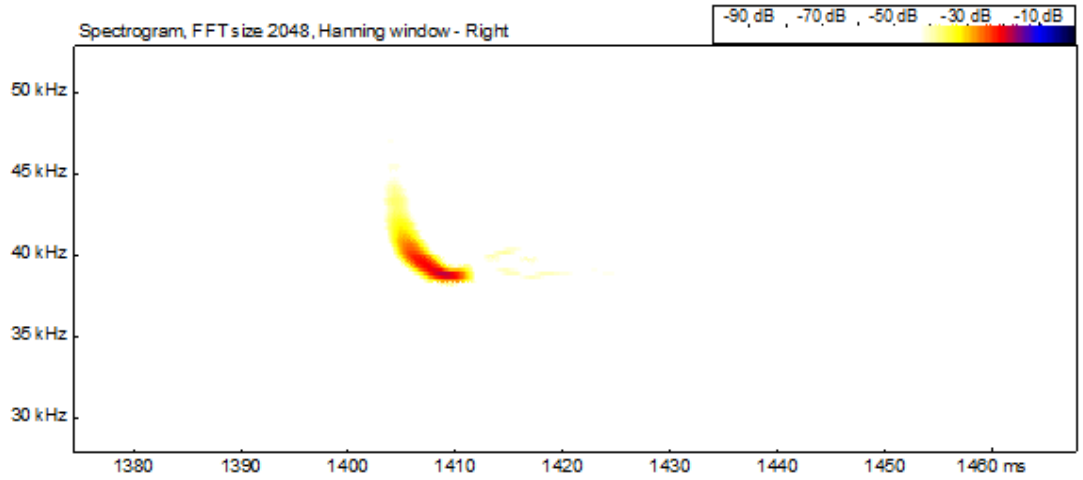
Average pulse separation 103,87 ms



STE-056.wav – small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,9	44,6	39,5	38,2

Average pulse separation ms

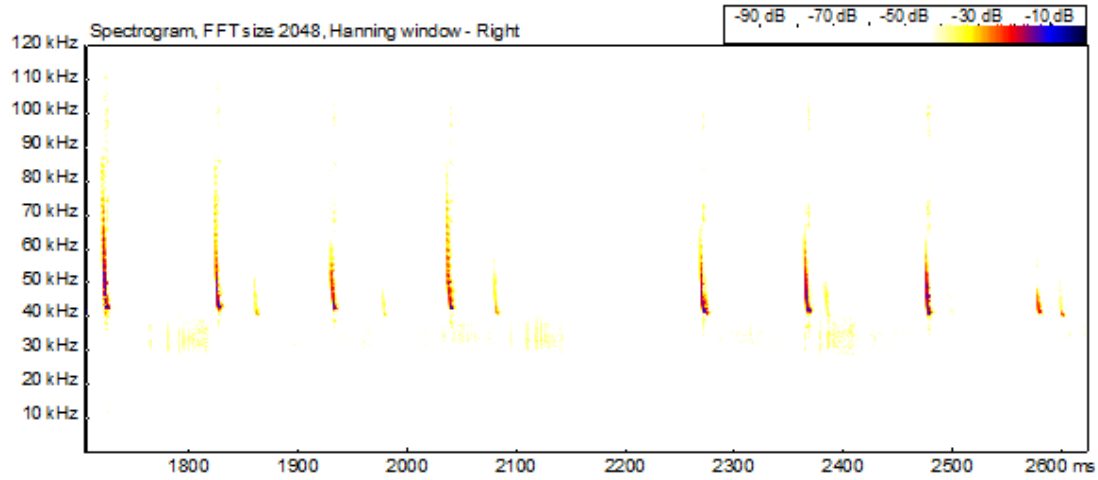


7 Sept. 2011	**Estuary 2 (near Mordvynivka Village)**	35.354463 46.670399	23.03-23.13	40	057, 058	2

STE-057.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
4,74	67,3	42,5	40,7
4,24	65,3	42,8	40,7
4,94	66,7	42,1	41,0
5,10	70,4	42,1	40,8
3,89	52,58	43,3	42,37
4,32	60,5	43,2	41,90
5,48	87,5	43,2	40,2
5,44	87,9	43,2	41,7

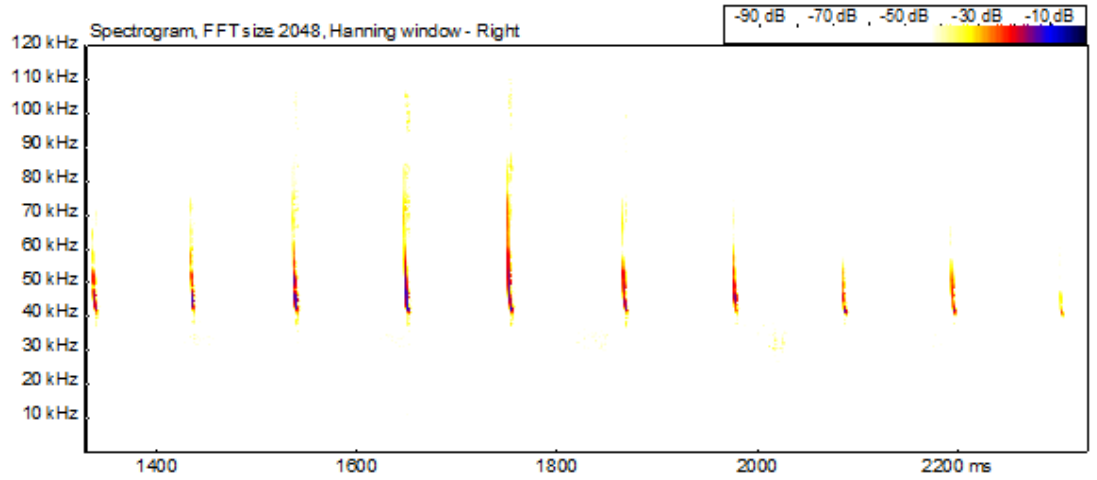
Average pulse separation ms

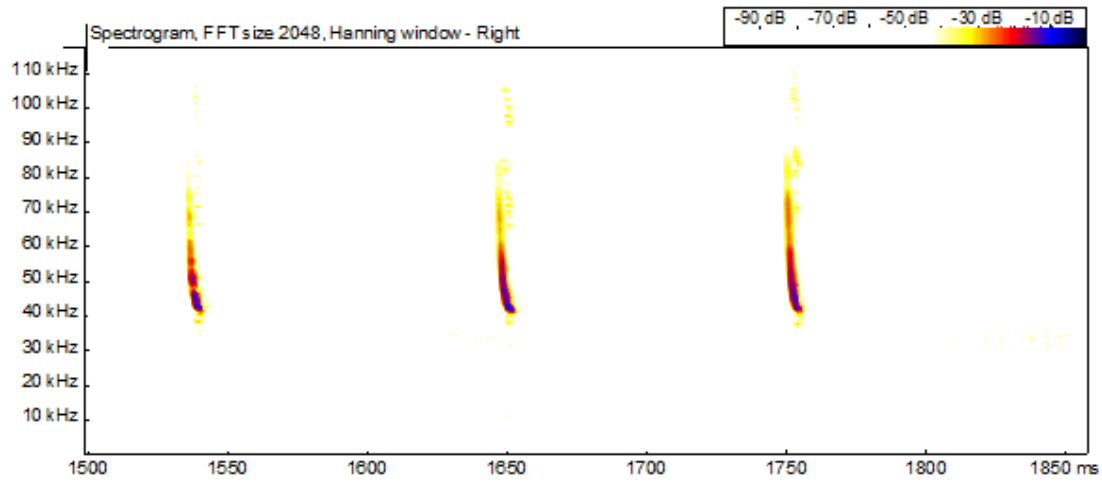


STE-058.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,30	78,2	43,0	40,9
5,63	85,8	44,3	40,3
4,83	87,6	45,6	40,7

Average pulse separation 107,55 ms





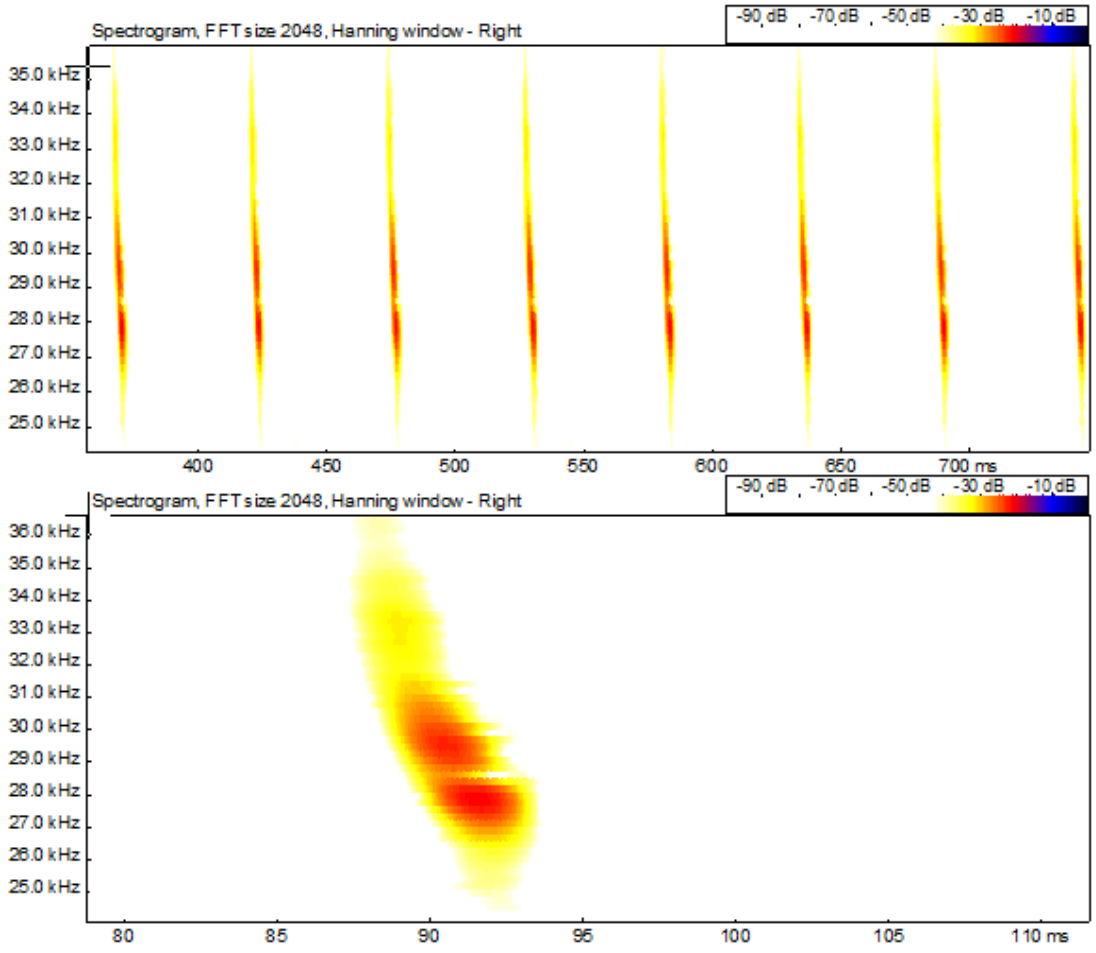
7 Sept. 2011	**Mordvynivka Bar**	35.371171 46.726005	23.26-23.36

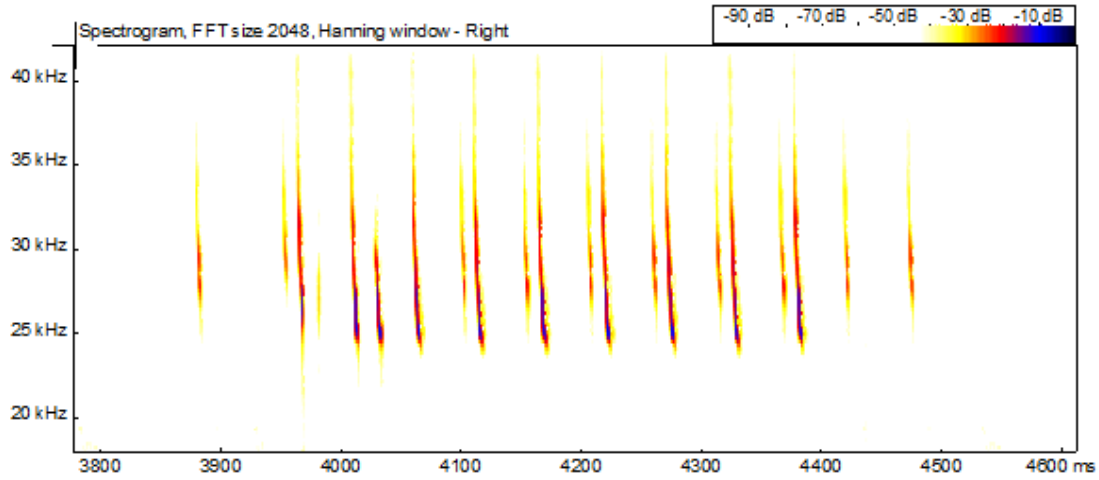
STE-059.wav – mechanical sound
STE-060.wav – small signal

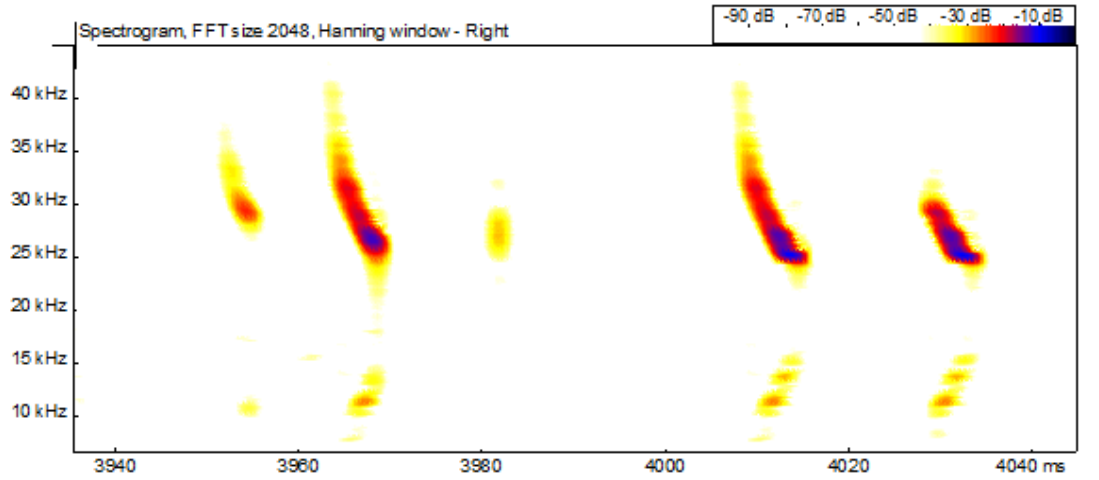
STE-061.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
3,99	37,2	28,1	24,9
3,88	37,1	29,5	24,9
3,89	37,5	27,9	24,5
3,92	37,2	28,4	24,5
3,96	37,4	28,4	24,8

Average pulse separation 53,22 ms; 155,6 ms. Synthetic sound?



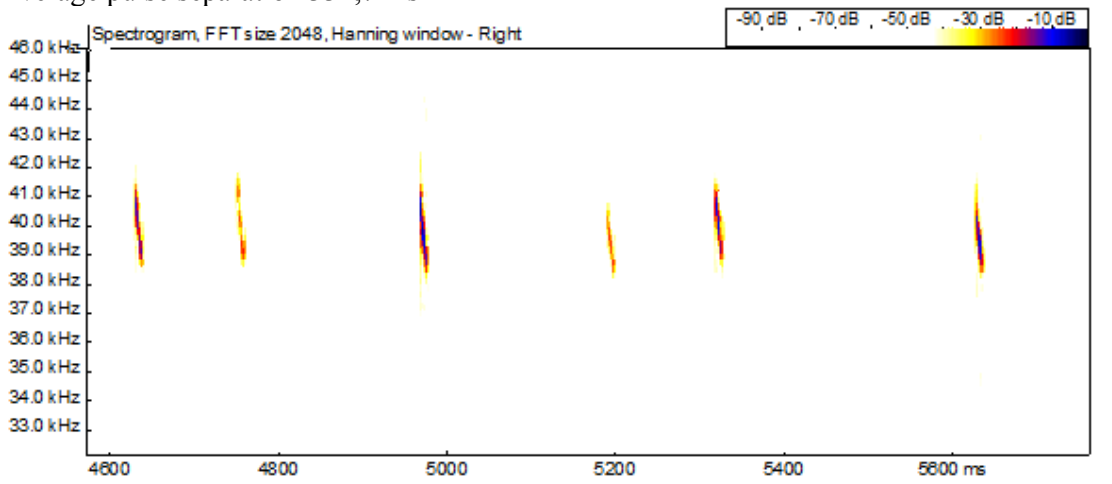




STE-064.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
8,7	41,48	40,6	38,38
8,5	41,45	40,8	38,81
9,58	41,02	39,9	38,38

Average pulse separation 332,7 ms

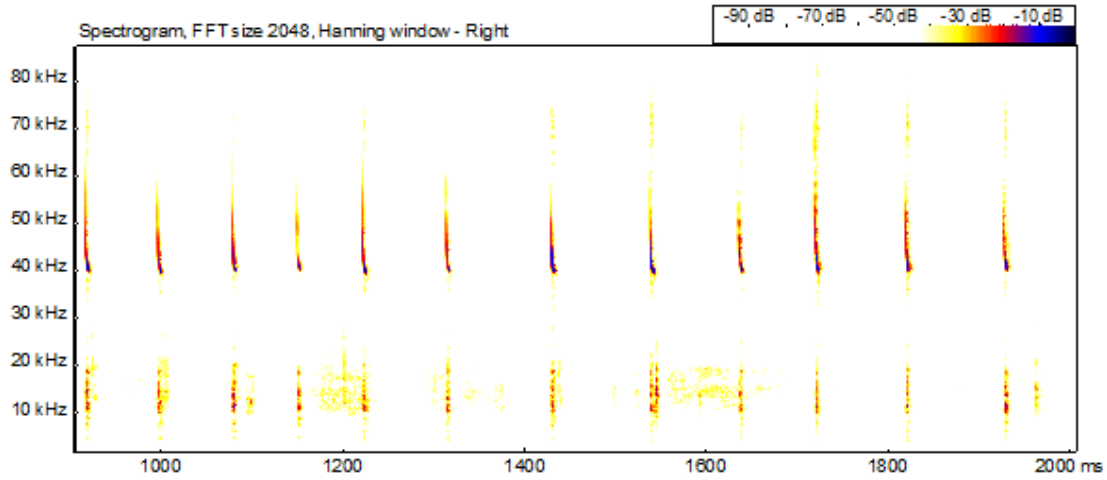


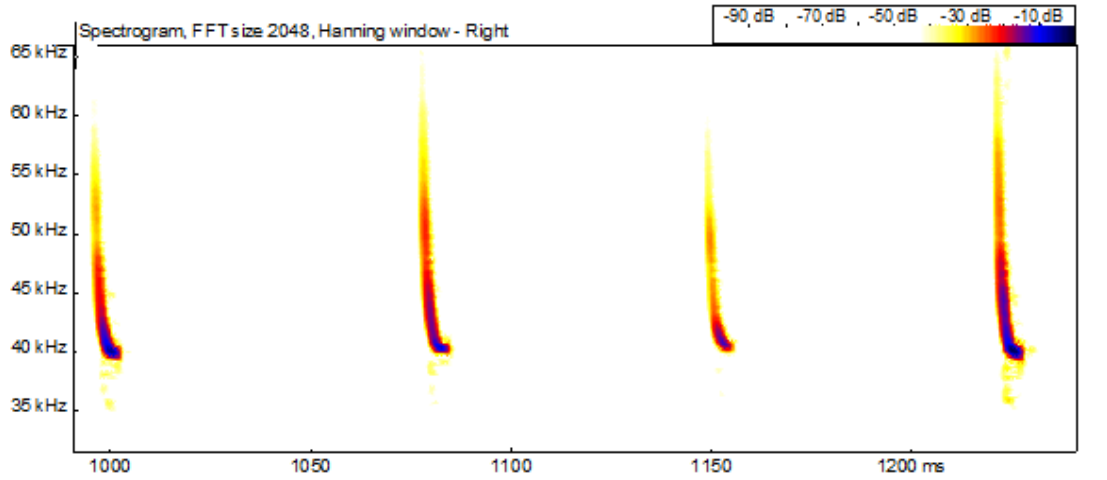
7 Sept. 2011	**Mordvynivka – Forest**	35.413 738 46.744 717	23.45-23.55			40	065-068	4

STE-065.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,9	61,9	40,6	39,5
6,78	58,9	40,4	39,0
6,95	60,7	40,8	39,5
6,04	58,2	41,2	39,7
5,88	63,7	40,6	39,0

Average pulse separation 90,3 ms





STE-066.wav – small signal

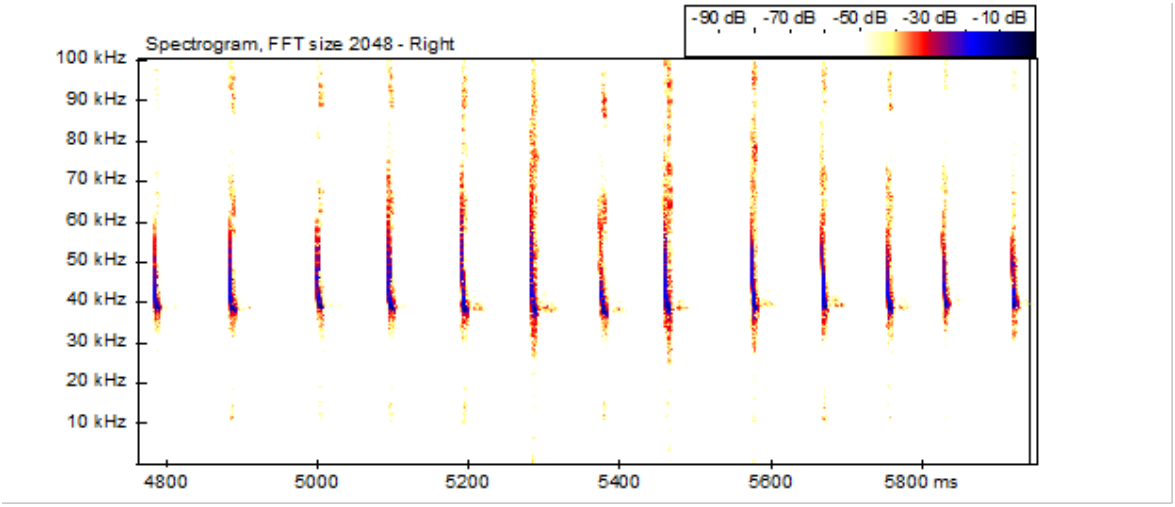
Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,30	47,29	42,4	41,18
4,86	47,92	42,4	41,38
4,64	47,92	41,7	41,18

Average pulse separation 118,7 ms

STE-068.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,05	75,4	39,1	37,5
8,10	74,4	38,4	37,3
9,57	75,8	38,3	36,8
9,56	66,5	38,0	36,6
9,24	76,7	39,0	35,5

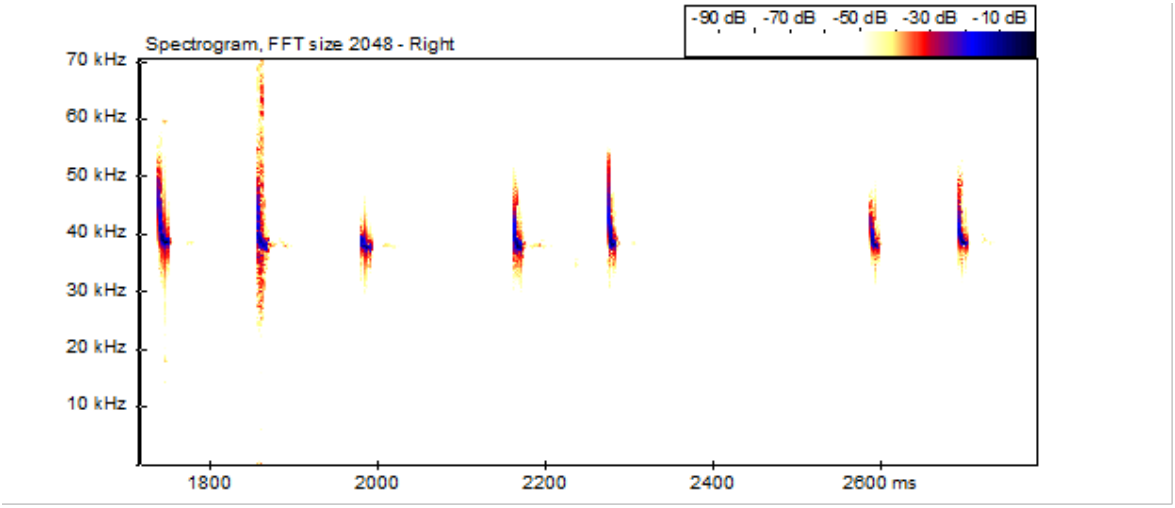
Average pulse separation 97,2 ms



STE-069.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
11,22		39,1	
11,70		38,8	
11,50		38,0	
9,20		38,2	
7,50		38,4	

Average pulse separation 129,2 ms

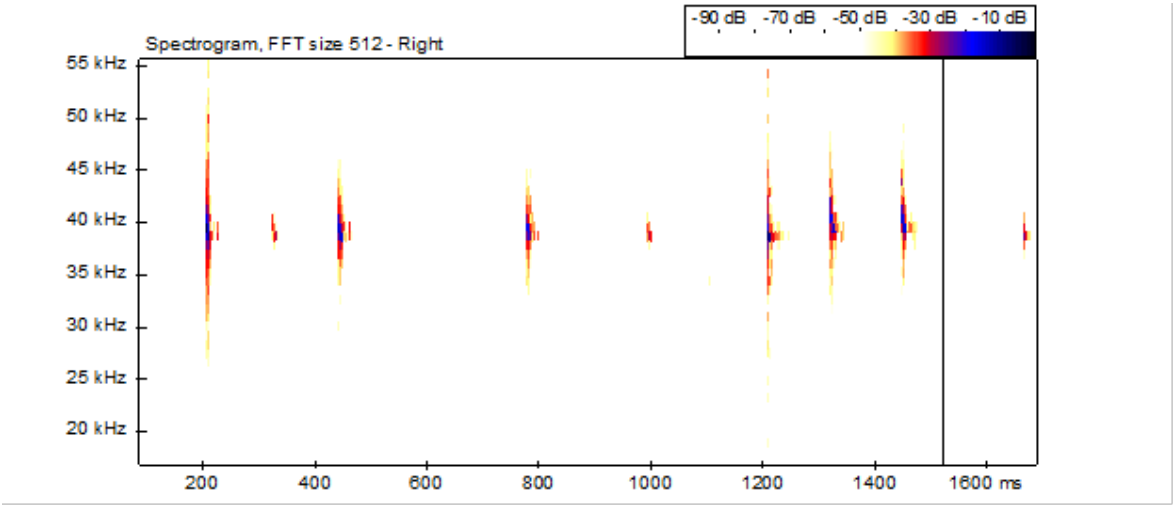


Transect 1 (Mordvynivka, near the forest)						
7-8 Sept. 2011	**Station 1**	35.405086/46.745038	23.57-00.07	40	070-072	3
				20	-	None
8 Sept. 2011	**Station 2**	35.405514/46.742903	00.09-0019	40	-	None

STE-070.wav – small signal
STE-071.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
8,1		39,4	
8,2		39,3	
7,9		39,3	
9,4		39,3	
–		39,8	

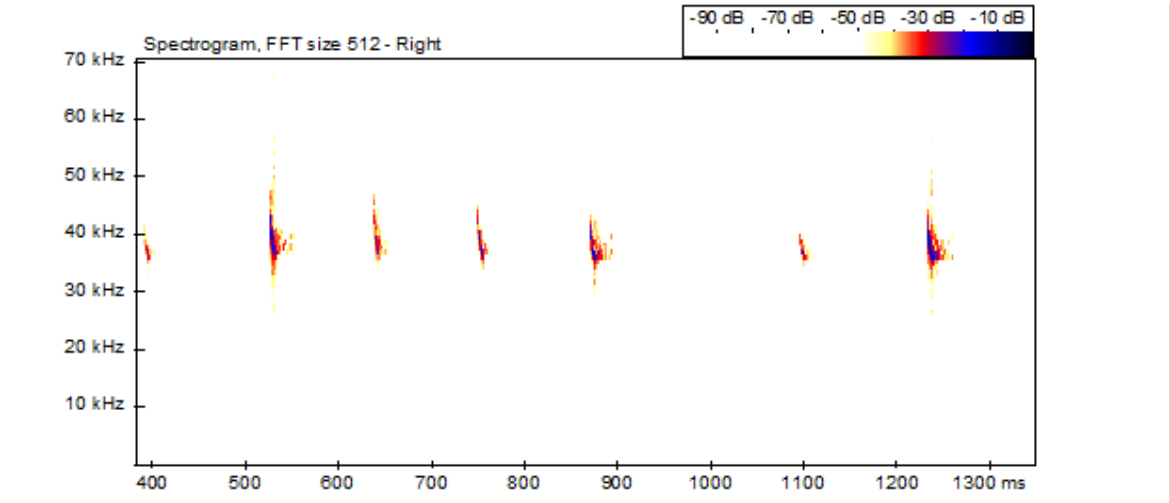
Average pulse separation ms



STE-072.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,59		38,0	
5,90		38,6	
6,10		37,9	
7,30		36,6	
7,1		36,6	

Average pulse separation 115,03 ms



Critical parameters of bats' sound signals and their spectrograms

14-15 September 2011

Transect 1 (Mordvynivka, near the forest)

Station 1	35.405086 46.745038	19.37-19.47

STE-073 – small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
		38,7	
		37,7	
		40,2	
		37,8	

Average pulse separation ms

STE-074 – small signal

Station 2	35.405514/46.742903	19.49-19.59

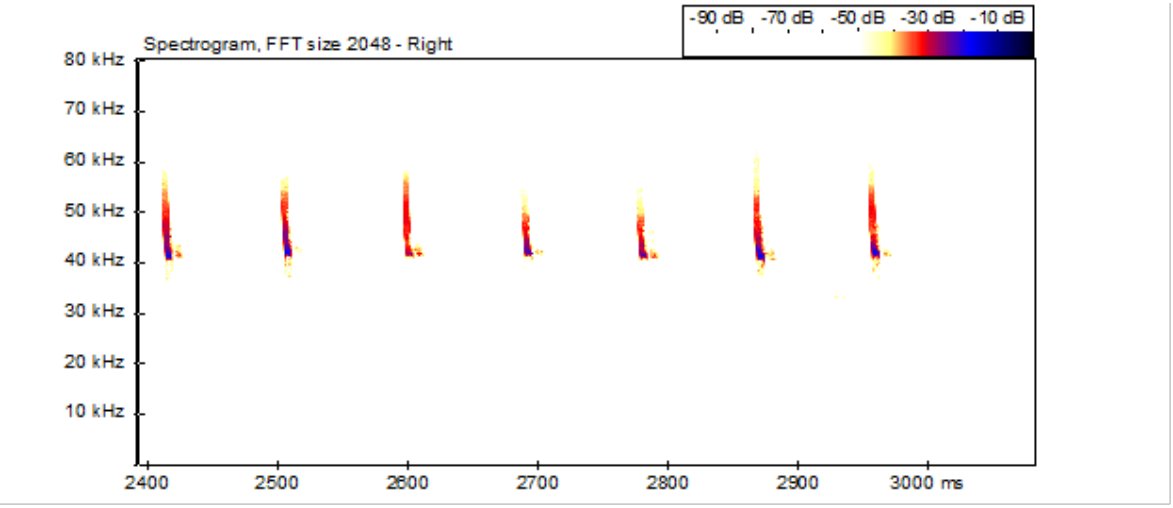
STE-075 – insects

14 Sept. 2011	**Mordvynivka Bar**	35.371171/46.726005	20.08-20.18

STE-076

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,14	55,8	41,6	40,9
4,98	55,2	42,3	41,3
5,26	57,8	42,1	41,4
5,56	51,5	42,3	41,4
5,2	51,4	41,6	41,1

Average pulse separation 90,7 ms



STE-077 – small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
		38,0	
		38,1	
		38,7	
		38,8	
		38,8	

Average pulse separation ms

STE-078 – small signal

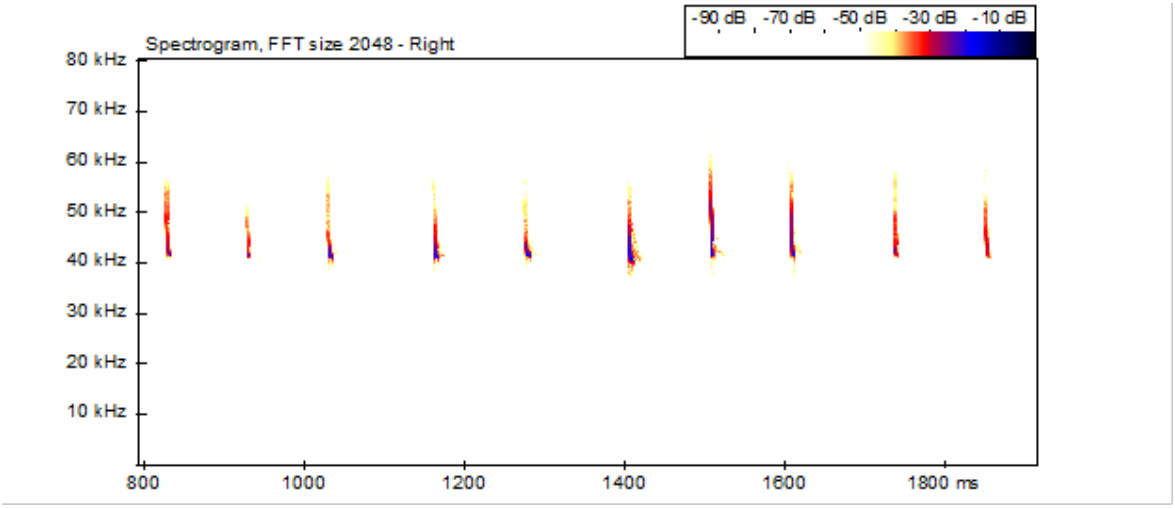
Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
9,7	40,9	38,5	37,5
11,0	40,6	37,8	37,1
8,0	40,3	38,5	37,8
10,6	40,8	38,6	38,0
9,55	41,6	38,8	37,5

Average pulse separation 311,0 ms

STE-079

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,27	54,9	41,6	40,8
5,51	51,2	41,9	40,9
5,36	54,9	41,0	40,0
4.16	57,8	42.4	41,4
3.74	52.9	42.3	41,2

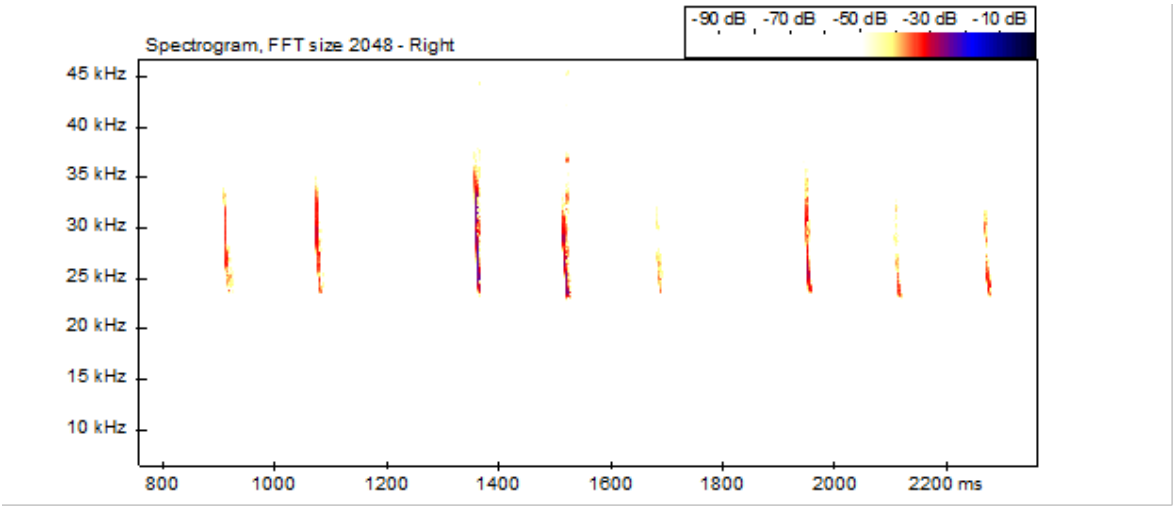
Average pulse separation 109,0 ms



STE-080

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,1	33,26	27,1	24,56
9,7	34,40	29,8	23,59
9,9	35,46	27,3	23,71
8,8	34,98	26,2	23,75

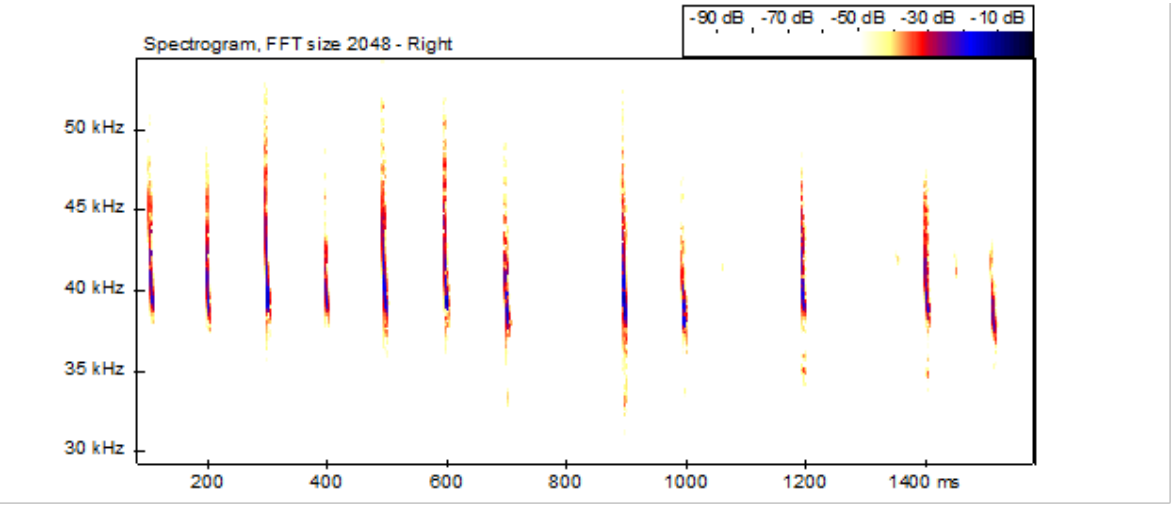
Average pulse separation 191,4 ms



STE-081

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,5	48,05	39,7	38,76
6,8	48,77	39,5	38,14
6,2	51,13	39,3	38,55
7,2	47,74	39,5	38,45
7,0	49,38	39,3	38,71

Average pulse separation 129,7 ms



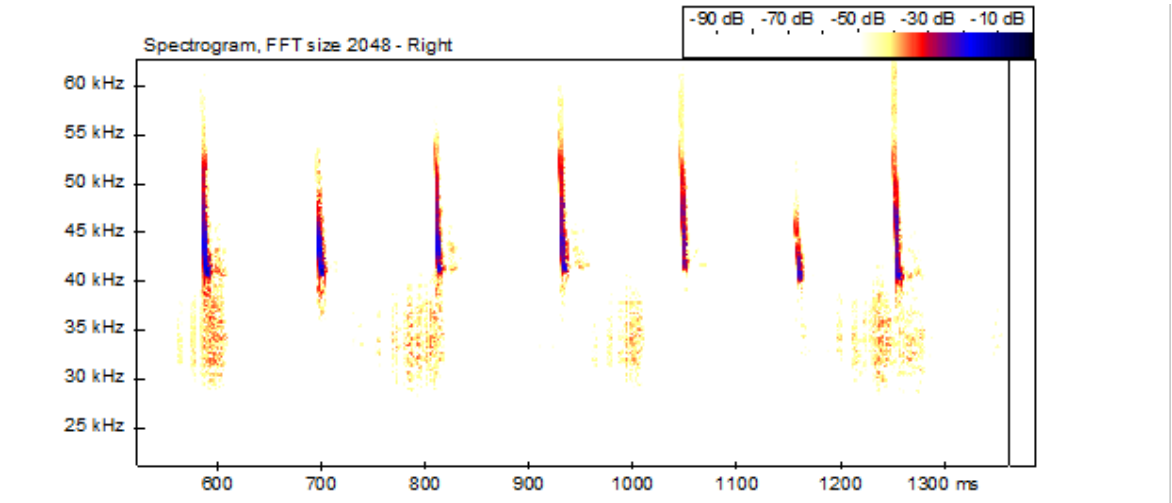
14 Sept. 2011	**Estuary 2 (near Mordvynivka Village)**	35.354463/46.670399	20.31-20.41

STE-082 – insects

STE-083

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,17	56,31	41,3	40,05
6,03	52,56	41,8	40,52
5,65	54,86	41,5	40,58
6,7	56,38	41,8	40,81
4,84	53,38	41,9	41,05

Average pulse separation 111,0 ms

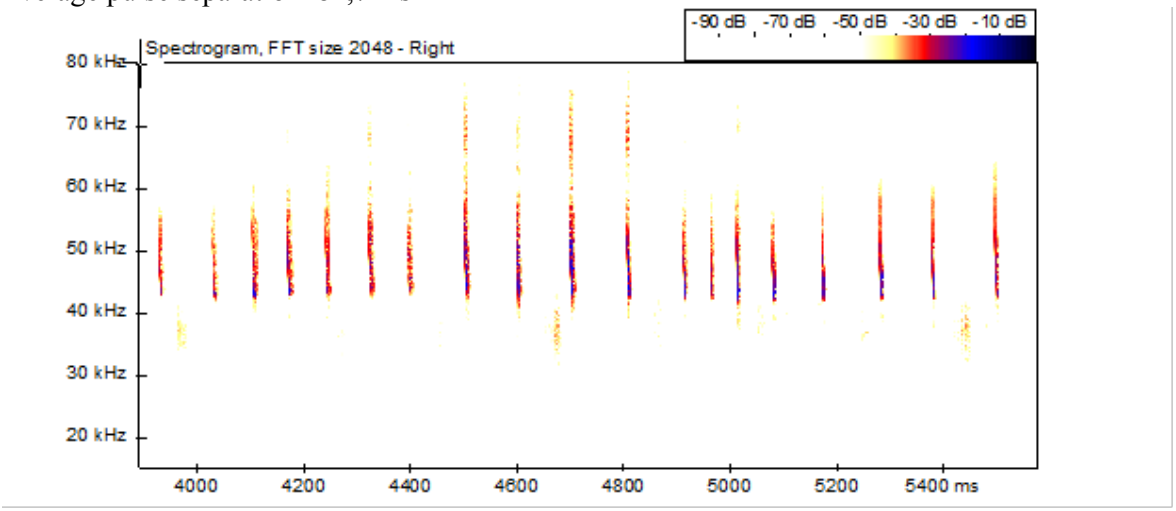


STE-084

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,11	56,2	43,3	42,0
4,30	56,9	44,3	42,9

4,88	57,1	43,5	42,6
4,40	57,4	43,9	42,5
4,31	58,8	44,1	42,6

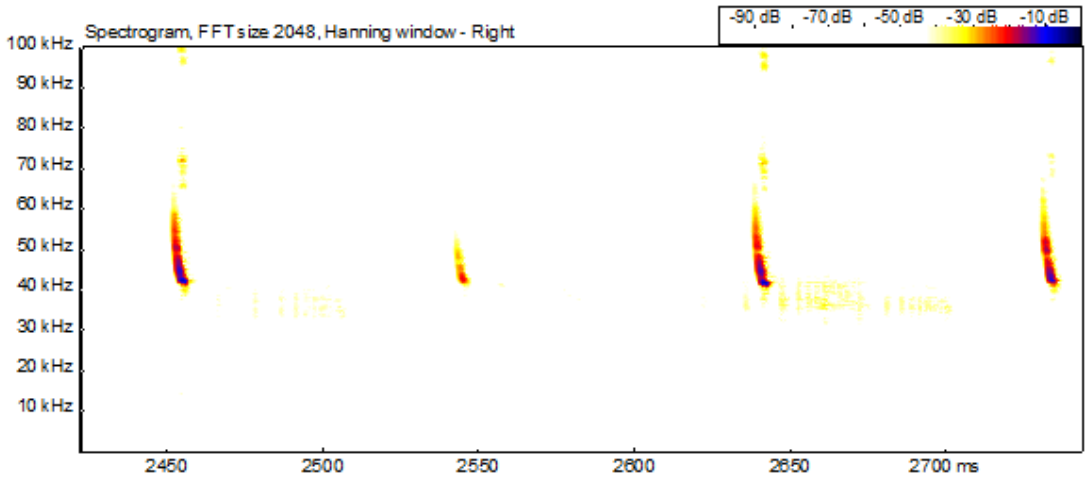
Average pulse separation 81,7 ms



STE-085

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
3,94	64,2	45,7	40,9
4,09	67,2	42,8	40,5
3,94	65,4	42,8	40,9
3,51		42,8	
3,25		43,2	

Average pulse separation 81,9 ms



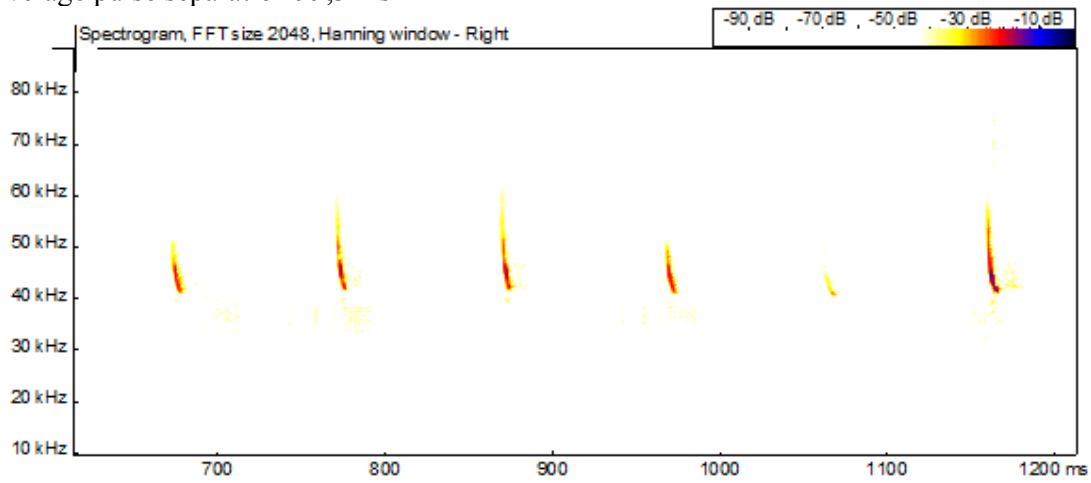
STE-086 – small signal ~ 33 kHz

STE-087

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,10	61,8	44,7	41,2
5,80	61,7	45,9	41,4

7,11	60,4	44,6	40,4

Average pulse separation 99,3 ms



Transect 4 (between Dunaivka and Dobrivka Villages)

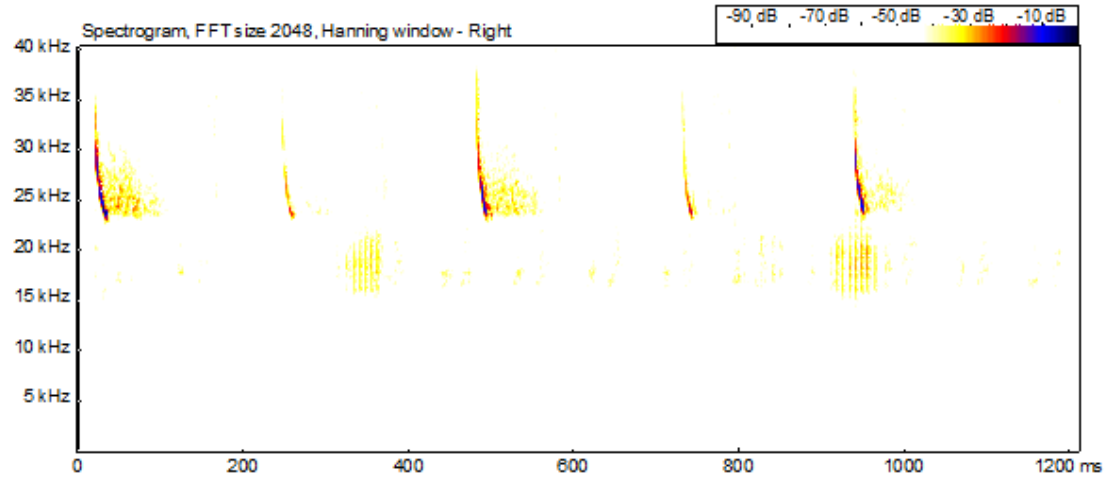
14 Sept. 2011	**Station 5 (closer to Dobrivka)**	35.479869 46.728077	21.04-21.14
	Station 1 (closer to Nadezhdine)	35.473850 46.727440	21.16-21.26

Station 5 (closer to Dobrivka)	35.479869 46.728077	21.04-21.14

STE-088

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
16,0	35,0	24,7	23,1
14,5	38,1	25,1	23,1
13,9	36,5	25,2	23,4
13,4	34,0	23,9	22,9

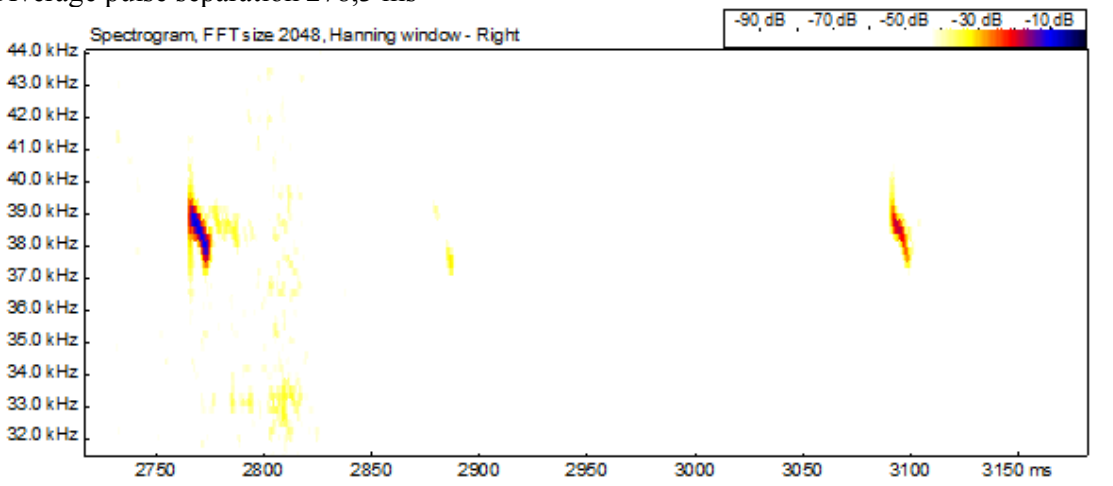
Average pulse separation 474,2 ms



STE-089 – small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
8,85	40,59	39,1	37,35
8,63	40,59	38,9	37,19
8,40	40,3	38,9	37,31

Average pulse separation 278,3 ms



STE-090 – small signal

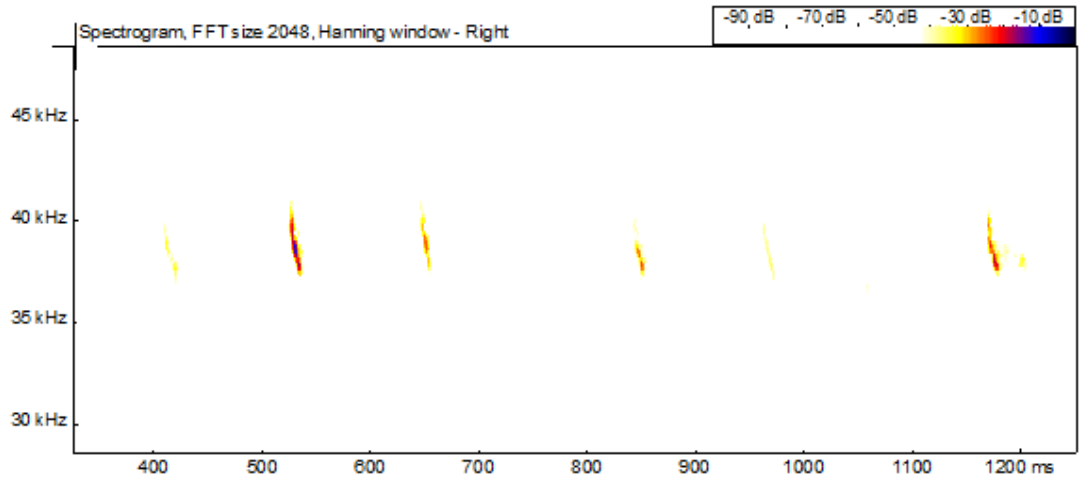
Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
		39,5	
		40,2	
		39,5	
		39,9	
		39,5	

Average pulse separation ms

STE-091 – small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
9,4		38,9	
10,8		38,4	
–		38,4	

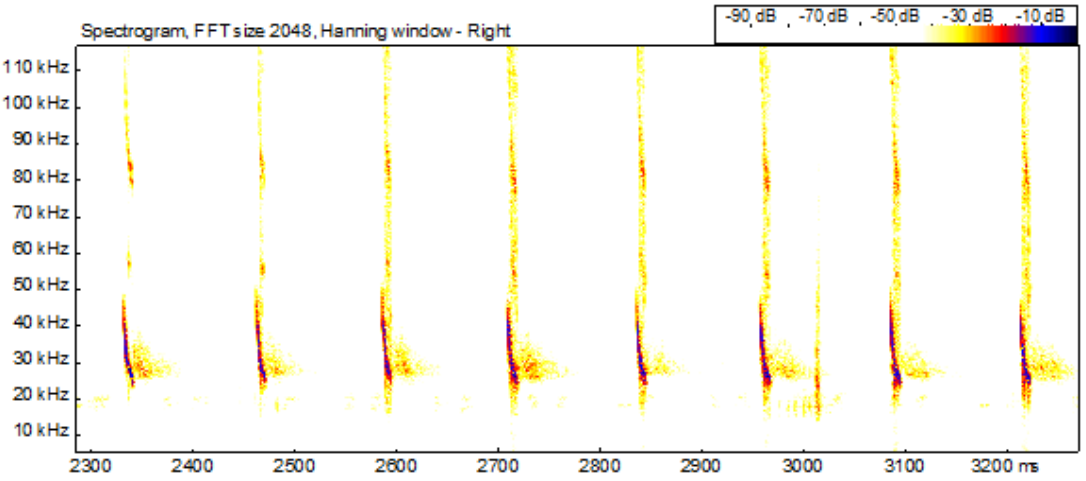
Average pulse separation ms



STE-092

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
9,6	47,7	27,8	23,3
9,7	50,4	27,3	23,6
9,1	51,0	27,6	23,9
9,8	46,8	26,5	23,6
9,83	49,8	27,6	23,6

Average pulse separation 126,14 ms



Station 1 (closer to Nadezhdine Village)	35.473850 46.727440	21.16-21.26

STE-093 – small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
8,4	45,54	39,3	38,41
8,7	48,89	40,2	38,79
8,1	48,90	39,7	37,6
8,7	–	39,0	–
8,1	–	40,4	–

Average pulse separation 146,3 ms

14 Sept. 2011	**Nadezhdine Village – Threshing Floor**	35.443862 46.692744	21.40-21.50			40	095	1

STE-094 – small signal

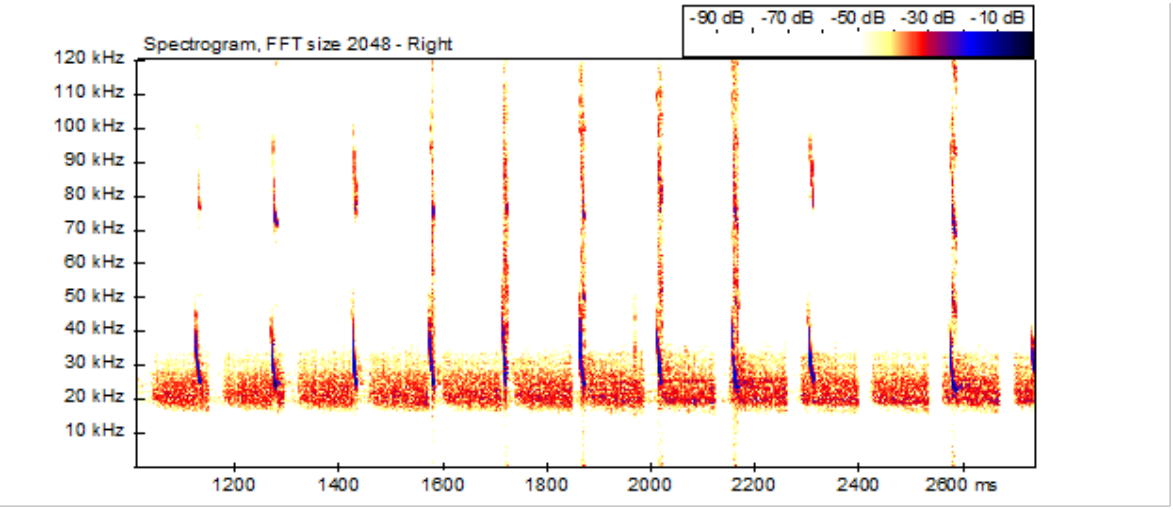
Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
9,28	40,9	39,0	37,3
7,77	40,2	39,2	37,5
–	–	38,0	–
8,10	–	38,2	–

Average pulse separation – ms

STE-095 –

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
9,20	51,1	26,0	19,1
9,12	55,9	27,6	18,9
11,80	46,6	25,8	19,4
10,38	47,0	28,1	19,4
11,84	46,0	23,7	19,17

Average pulse separation 148,4 ms

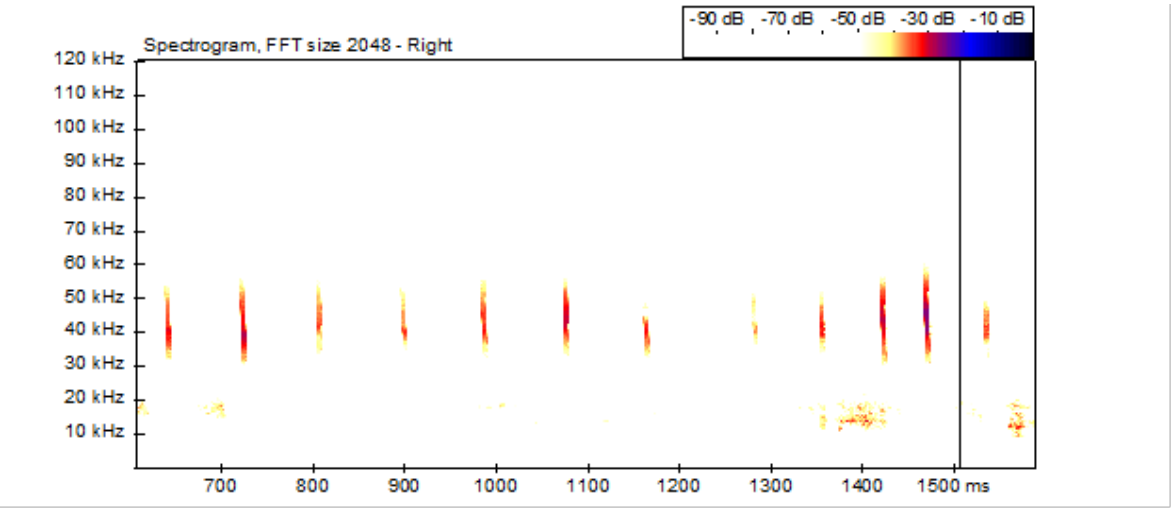


14 Sept. 2011	**Girsivka-North**	35.399419 46.651674	21.57-22.07
	Girsivka-South	35.397428 46.634750	22.10-22.20

STE-096 – small signal ~ 39,1 kHz when sound power is maximum.
STE-097

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
2,64	53,4	40,9	32,5
2,79	55,5	39,3	30,7
2,70	54,4	41,8	34,6
2,90	55,6	40,9	34,4
3,00	55,4	42,9	34,2

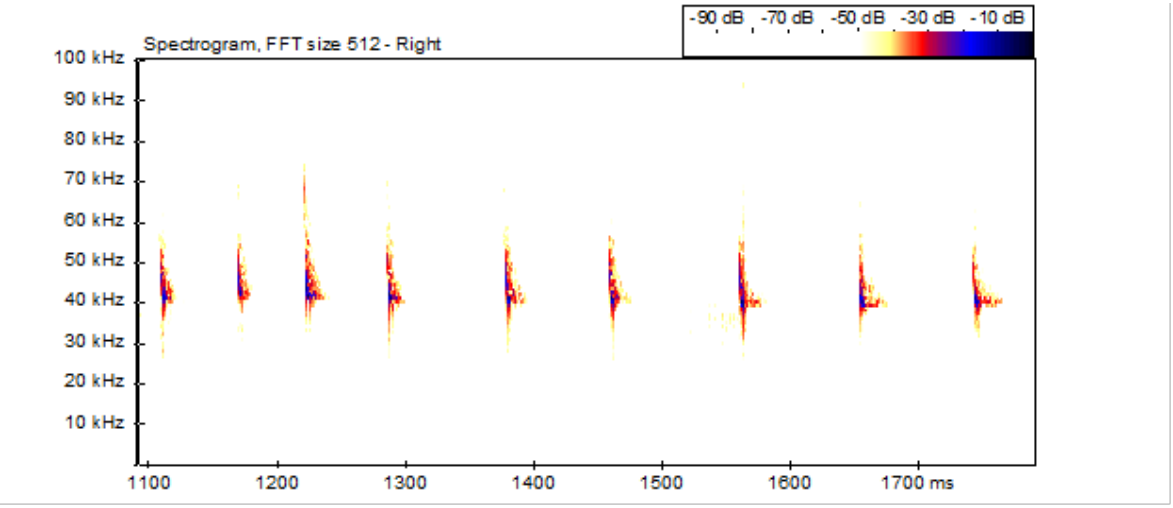
Average pulse separation 87,3 ms



STE-098

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
4,81	54,7	41,9	39,9
4,65	58,4	42,8	40,8
3,82	75,1	42,3	40,0
4,5	55,6	41,5	38,5
4,4	57,1	41,1	38,0

Average pulse separation 79,625 ms



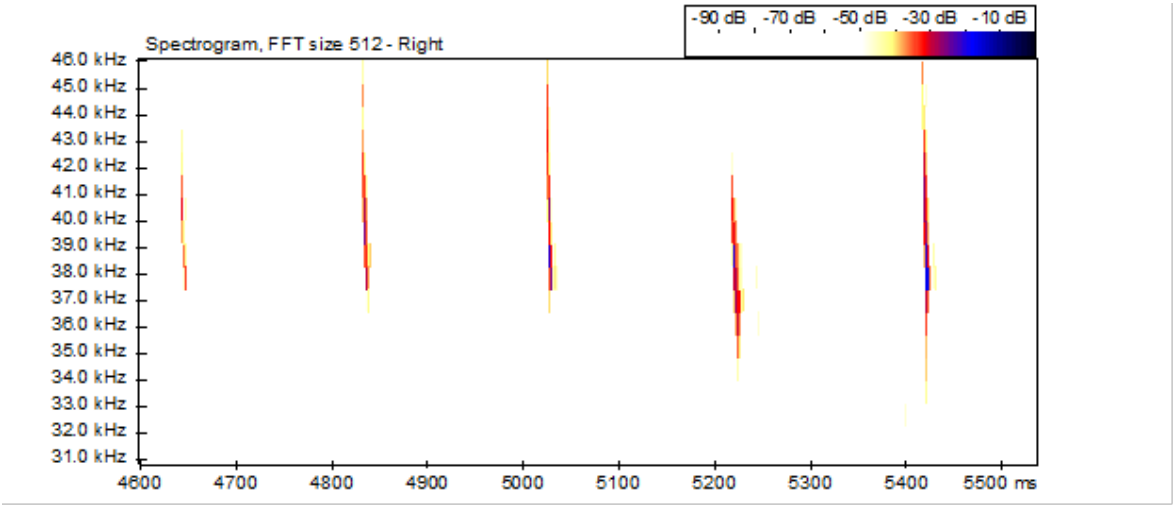
Transect 3 (8 km to the east of Dunaivka Village)

Station 5	35.510416 46.632838	23.10-23.20

STE-099

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
8,20	40,0	37,9	37,7
6,20	41,9	38,2	35,6
6,10	46,9	37,5	36,4
6,31	46,0	38,4	35,9
6,19	46,7	37,3	35,8

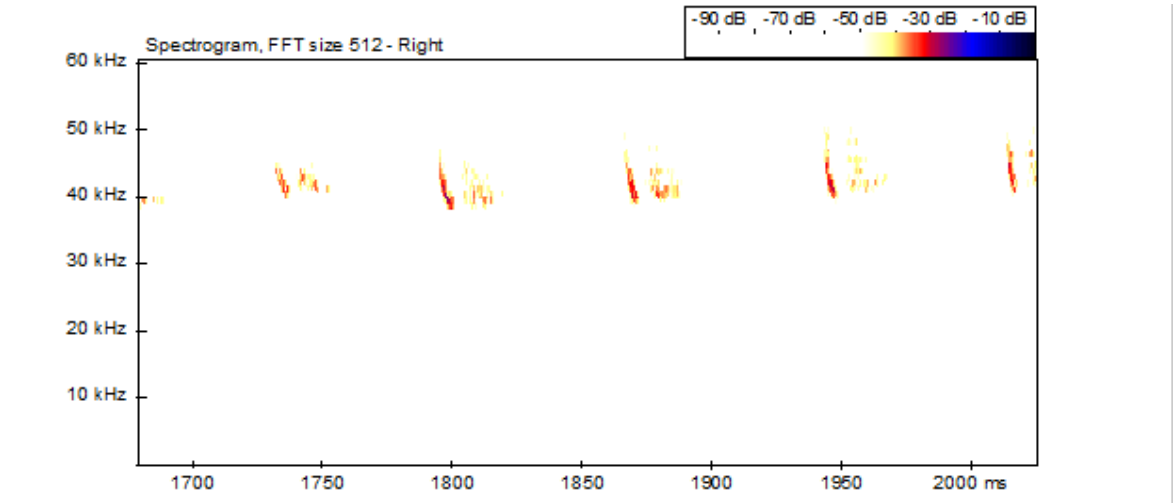
Average pulse separation 215,0 ms



STE-100

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
–	45,3	42,7	39,8
–	45,4	42,7	38,2
–	45,3	42,9	38,9
–	46,2	42,3	39,8
–	47,4	42,6	40,7

Average pulse separation 70,4 ms



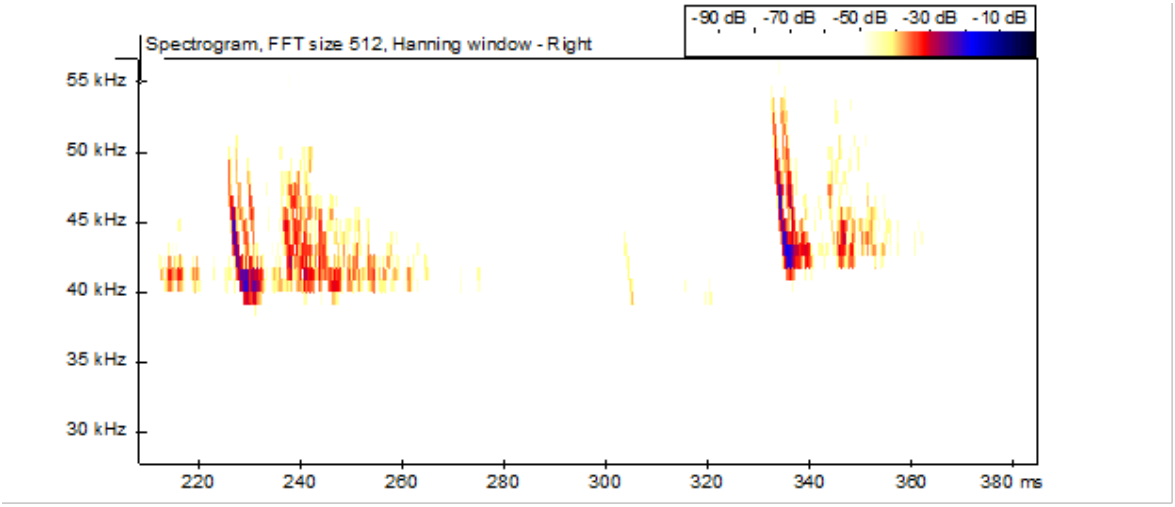
Station 1	**35.514130/46.628667**	**23.22-23.32**

STE-101

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
		40,8	
		43,0	
		41,9	

		41,1	
		41,0	

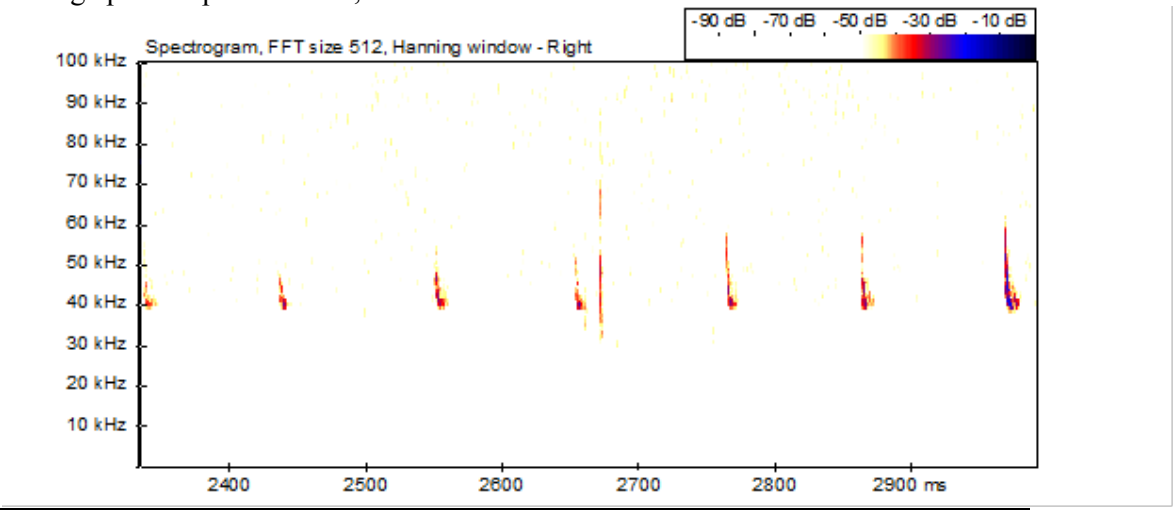
Average pulse separation ms



STE-102

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
	48,9	40,6	39,4
	52,2	40,8	38,7
	58,0	40,8	38,7
	57,7	40,4	38,7
	60,2	40,8	38,4

Average pulse separation 106,6 ms



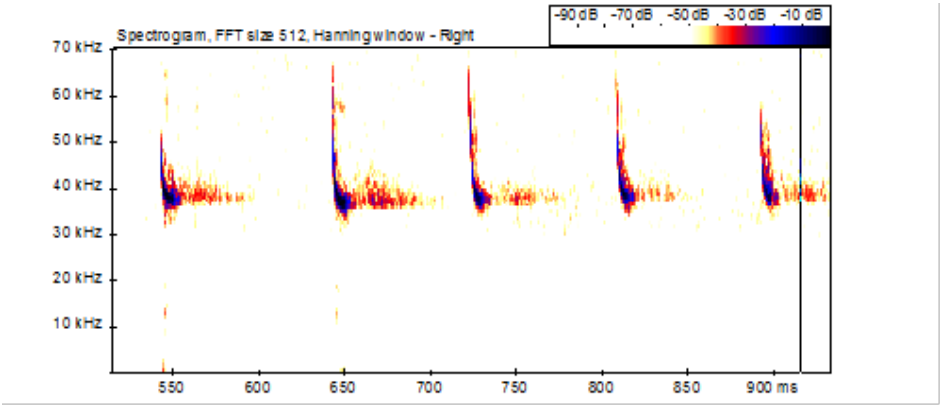
14 Sept. 2011	**Dunaivka-Garden**	35.420929 46.581172	23.41-23.51

STE-103

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit

7,0	52,3	37,8	36,5
9,2	67,0	37,0	34,6
7,8	66,8	37,9	35,6
7,88	64,7	38,4	36,3
6,58	57,3	38,4	36,5

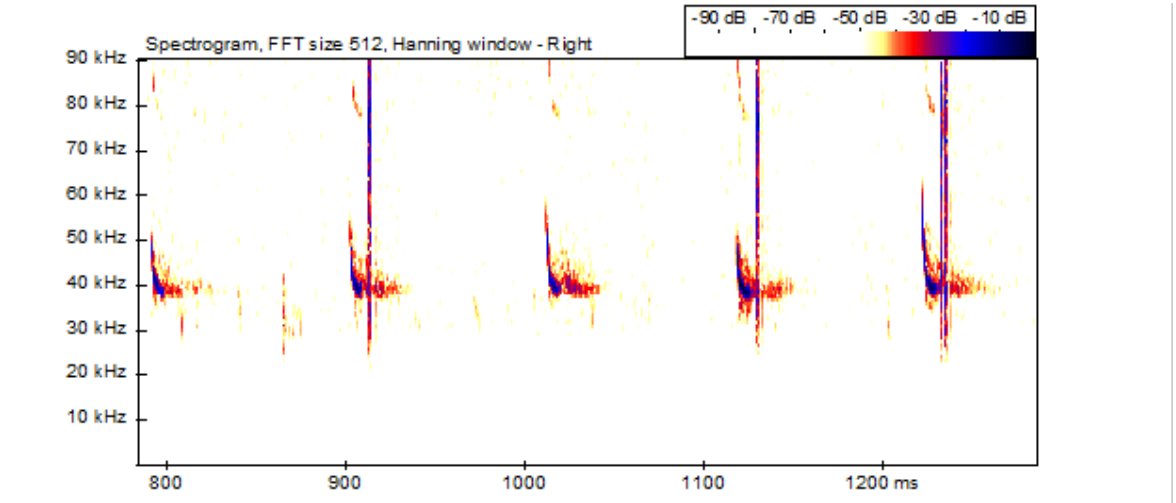
Average pulse separation 86,2 ms



STE-104

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,29	52,1	40,4	38,1
7,35	54,5	39,5	37,3
7,04	58,7	39,5	37,3
7,73	52,1	39,0	37,0
7,44	63,2	39,9	37,8

Average pulse separation 107,4 ms

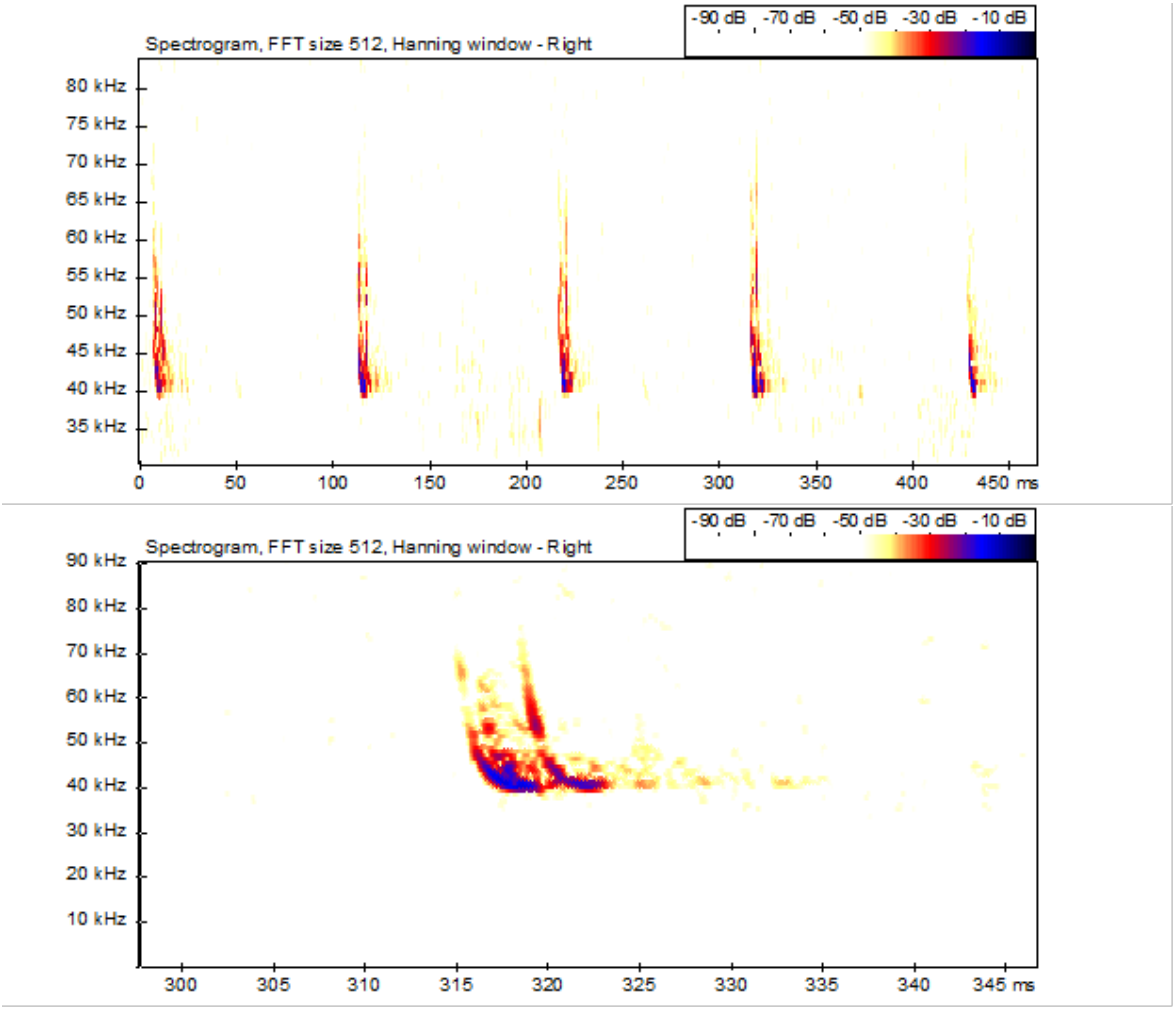


STE-105

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,60	61,5	41,0	39,0
5,72	60,9	41,0	39,1

5,24	63,4	40,8	39,7
4,07	67,6	41,0	39,1
4,4	59,7	41,1	39,1

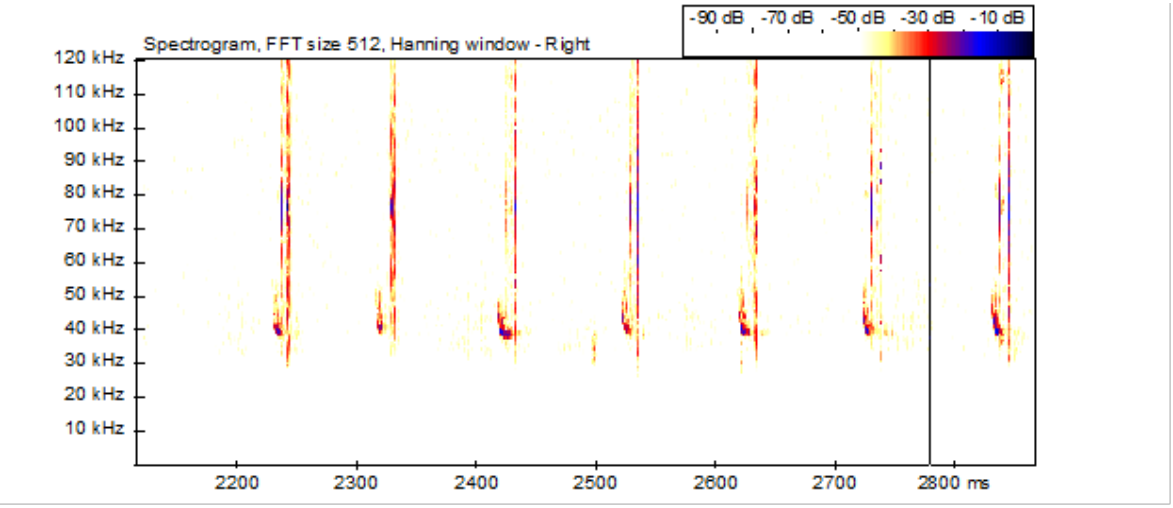
Average pulse separation 105,4 ms

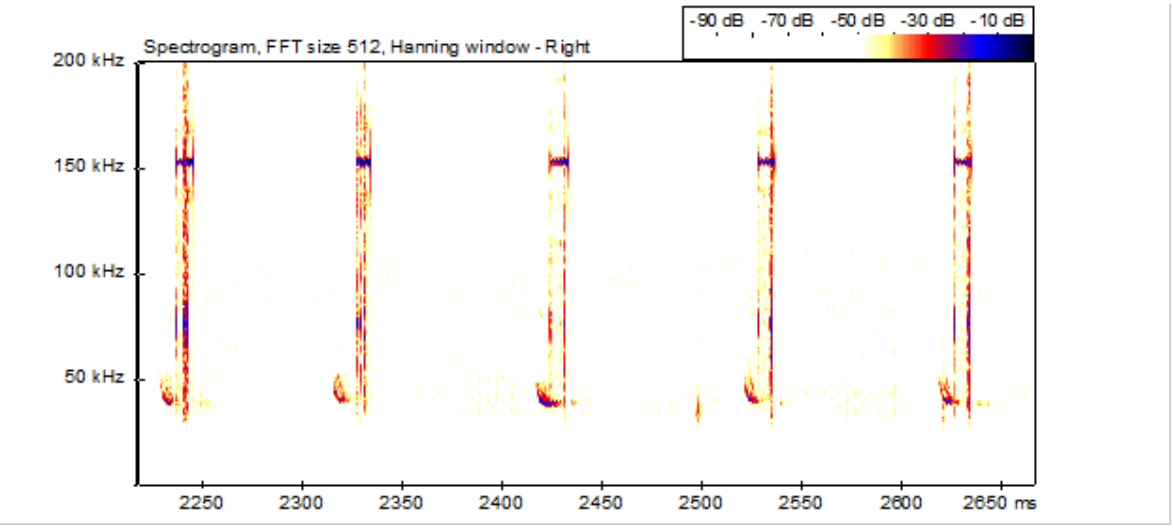


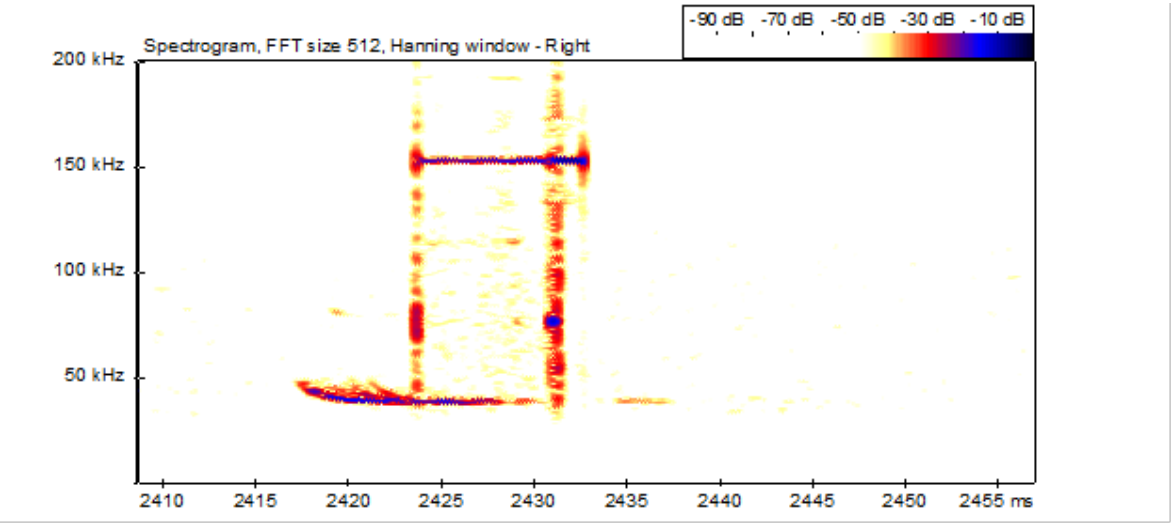
STE-106

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
		39,8	
		40,8	
		39,7	
		40,2	
		40,2	

Average pulse separation 101,0 ms





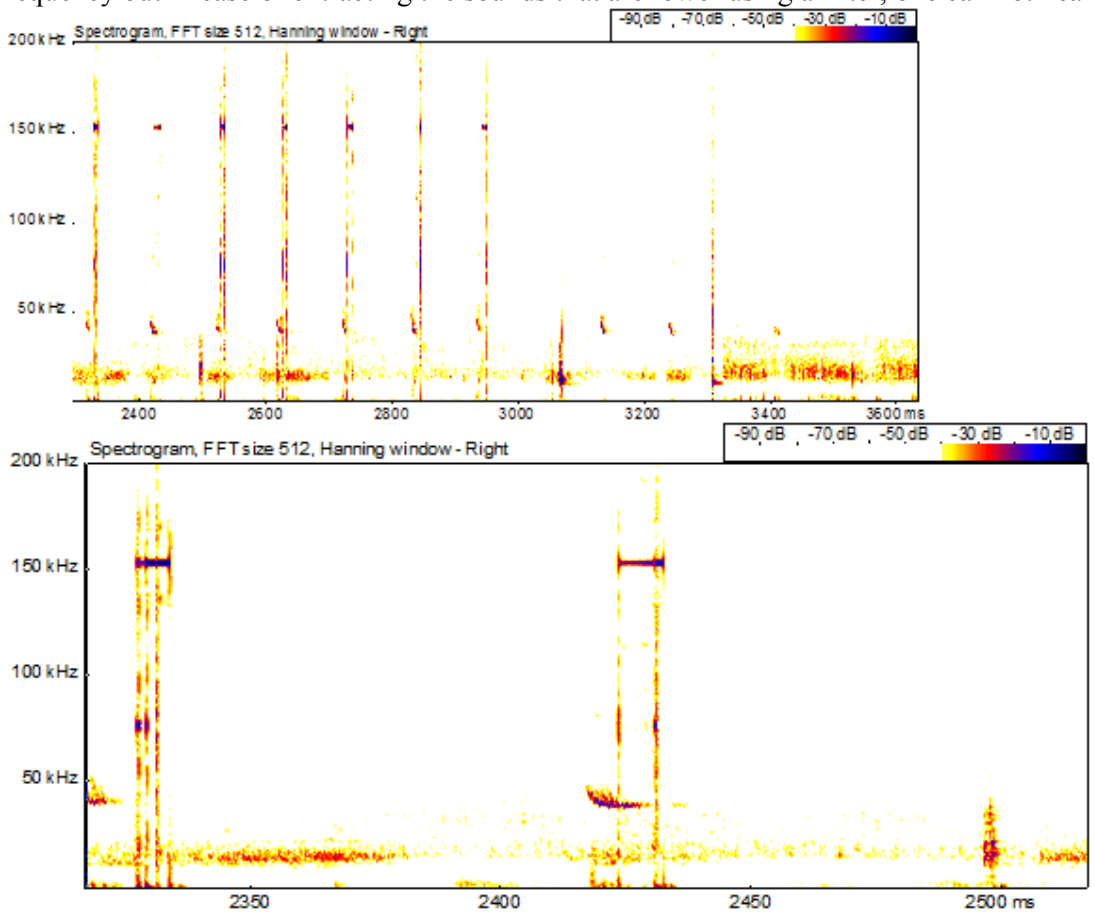


STE-107

Pulse duration,	Frequency, kHz

ms	Upper limit	When sound power is maximum	Lower limit
		40,5	

Average pulse separation ms. "Sonogram" at the level 150 kHz is observed with constant frequency but in case of extracting the sounds that are lower using a filter, one can not hear it!

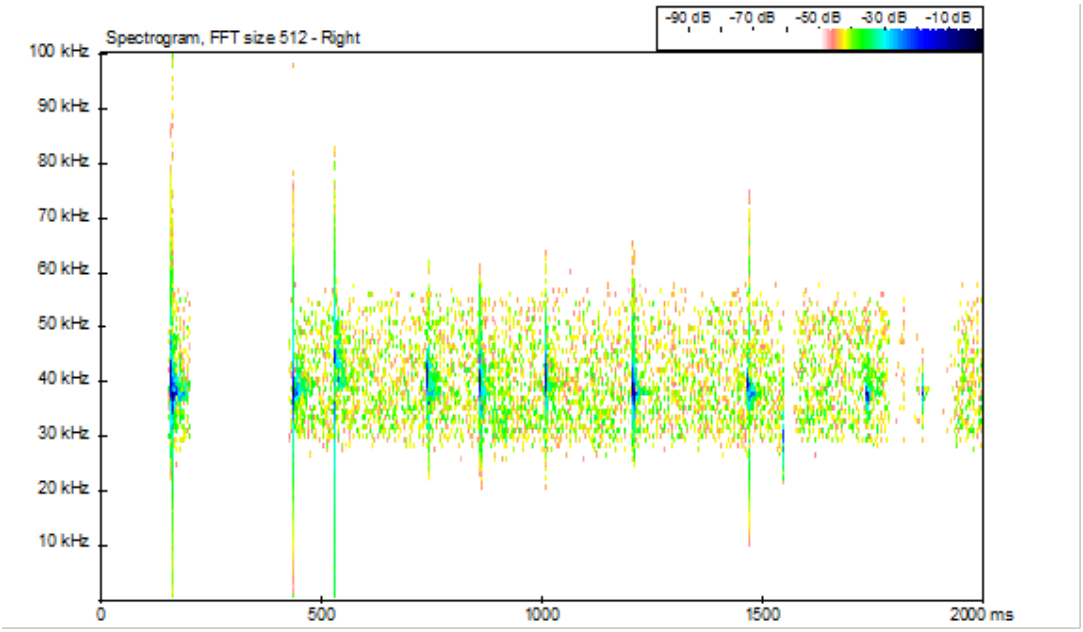


Critical parameters of bats' sound signals and their spectrograms

Transect A
40-29.08.11.A-023.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,70	45,0	38,2	37,0
5,30	47,5	38,7	37,6
3,97	62,3	41,0	38,7
5,11	44,8	38,5	37,0
4,94	49,9	39,0	38,7

Average pulse separation 187,14 ms. Minimum pulse separation 94,1 ms, maximal – 274,3 ms. Uneven spacing indicates that the recorded signals, at least of two bats, belong to Pipistrellus kuhlii.

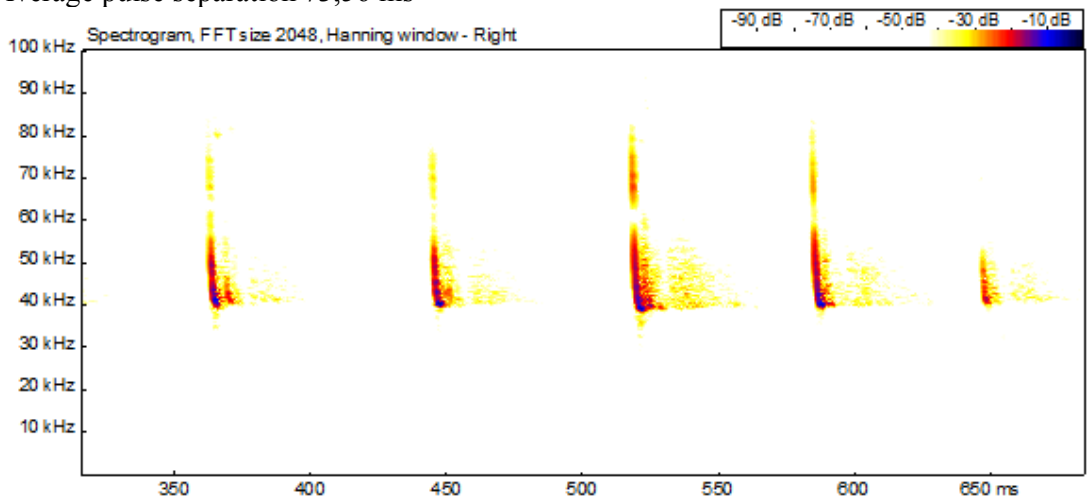


40-29.08.11.A-024.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
4,98	76,3	43,9	38,7

4,21	76,3	41,4	39,0
5,2	81,0	39,7	37,9
6,13	82,1	40,9	37,9

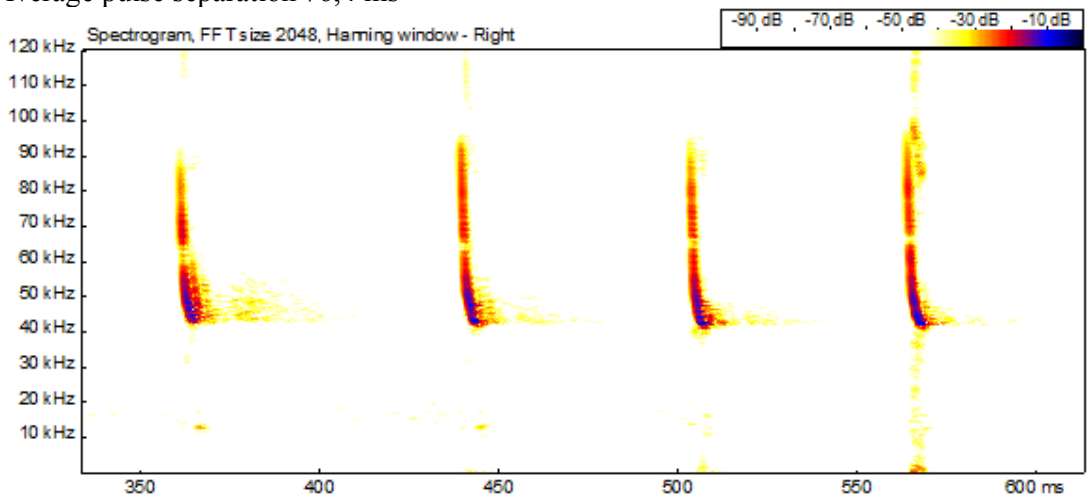
Average pulse separation 73,56 ms



40-29.08.11.A-025.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
9,2	93,8	47,4	41,8
8,9	92,5	45,0	41,5
9,7	94,2	44,0	40,8
6,2	94,8	44,5	40,5
5,4	98,4	43,0	40,5

Average pulse separation 76,4 ms



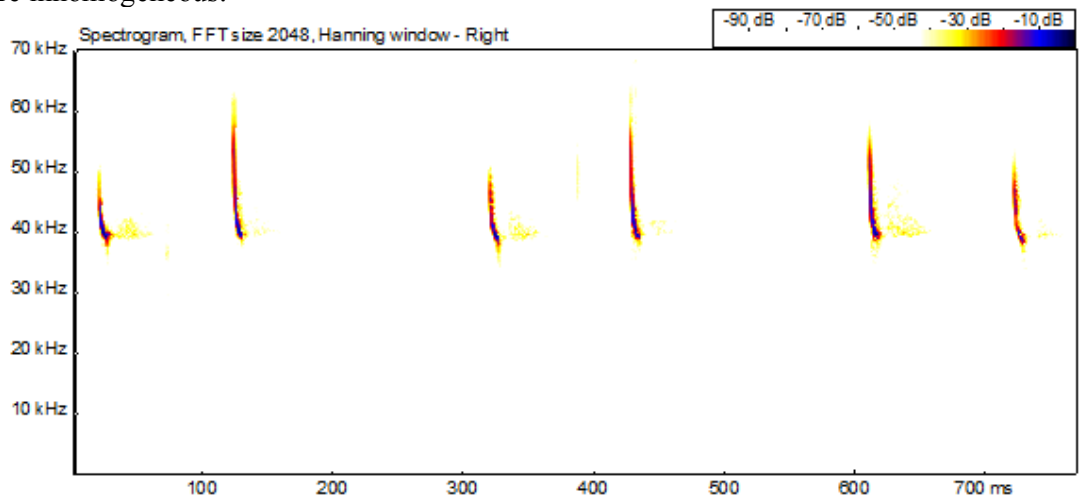
Lesser Noctule

40-29.08.11.A-026.wav

Pulse duration,	Frequency, kHz

ms	Upper limit	When sound power is maximum	Lower limit
6,68	50,9	40,3	37,4
7,57	51,0	40,3	37,4
7,39	52,8	40,2	37,6
6,99	47,2	39,2	37,2
6,53	62,5	40,7	38,8
6,69	59,3	40,7	38,3
6,30	56,3	40,0	38,3
7,35	53,8	39,5	37,8

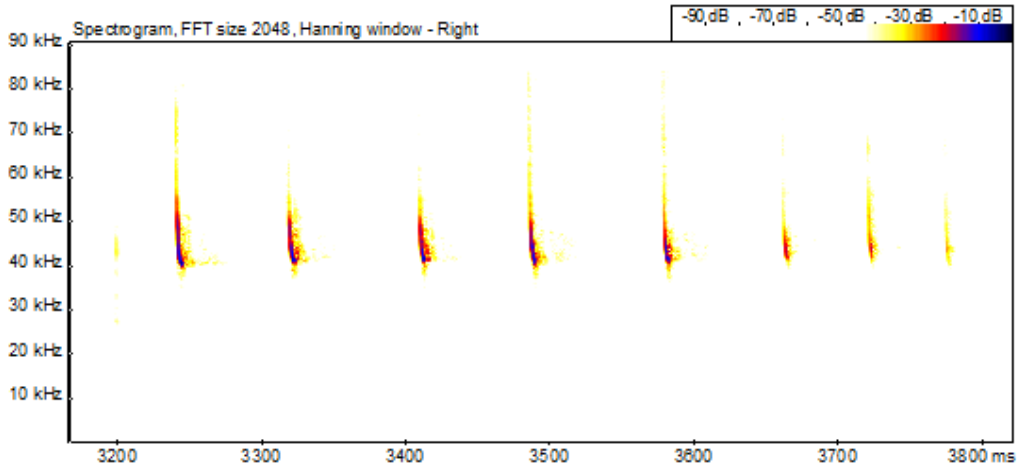
Average pulse separation 143,3 ms. The spectrogram seems to indicate 2 bats. Pulse separations are inhomogeneous.



40-29.08.11.A-027.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,24	78,8	41,5	39,0
4,32	63,5	42,0	40,0
4,26	58,3	42,4	40,3
4,62	80,9	41,9	39,6
4,51	74,9	42,4	40,1

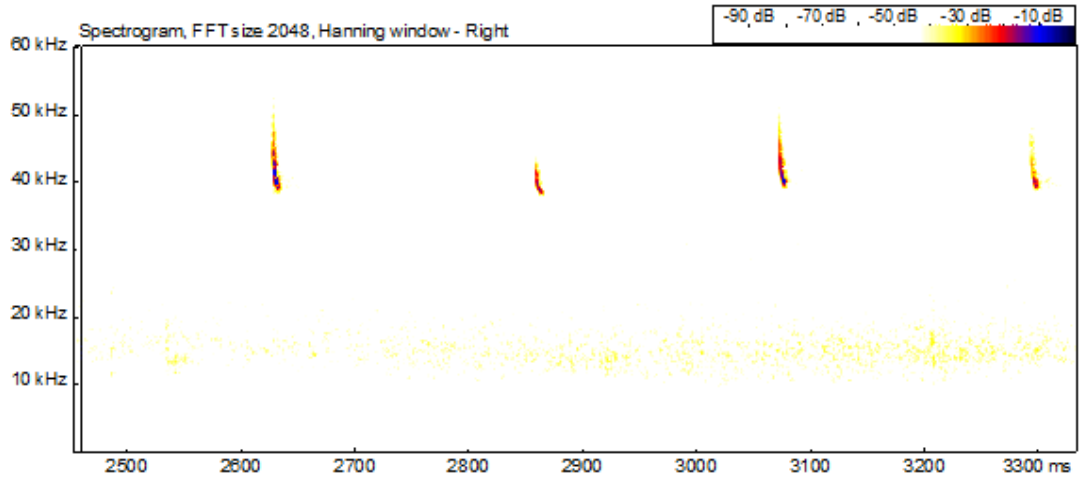
Average pulse separation 80,17 ms



40-29.08.11.A-029.wav - very small signals

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,0	50,26	41,0	38,79
6,2	43,4	39,3	38,1
5,0	49,6	41,4	39,1
5,35	–	40,5	–

Average pulse separation 222,7 ms

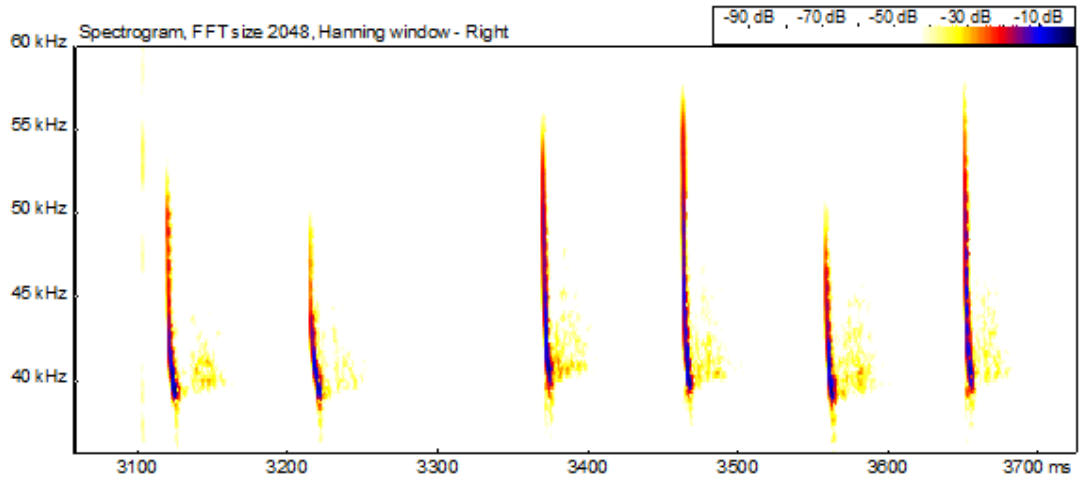


40-29.08.11.A-030.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,27	53,5	40,5	38,8
7,18	50,0	40,3	38,8
6,27	55,9	42,0	39,4
6,43	57,5	41,7	39,2

6,24	50,7	41,2	38,5

Average pulse separation 106,4 ms

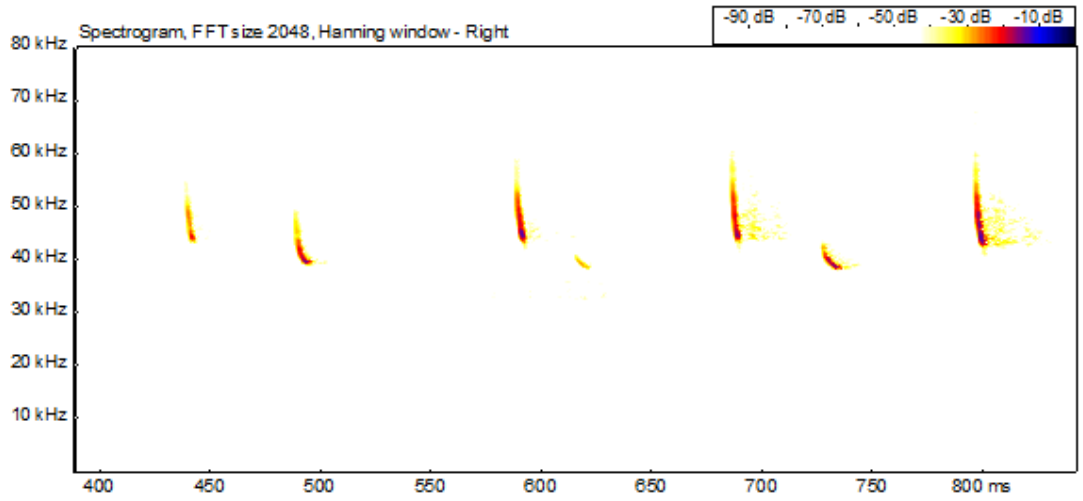


Transect B

40-29.08.11.B-000.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,84	49,31	40,3	39,14
8,53	43,23	39,5	38,18
8,07	42,08	39,5	38,16
Average pulse separation 138,25 ms			
4,02	55,4	45,0	43,2
4,20	59,2	45,0	43,9
4,40	59,3	45,4	42,6

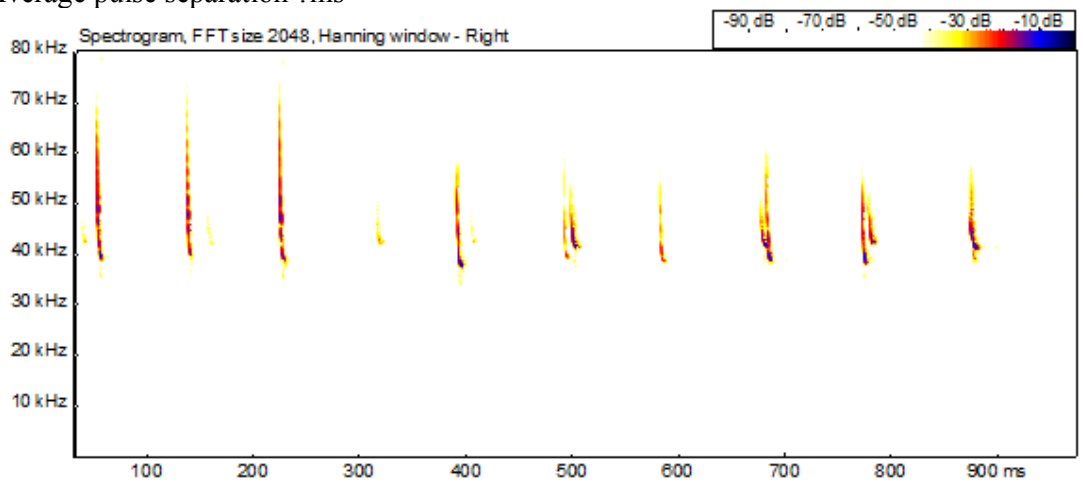
Average pulse separation 129,25 ms



40-29.08.11.B-001.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,67	69,6	40,5	38,7
5,47	73,6	41,0	39,2
5,68	73,6	40,9	38,3
Average pulse separation 102,87 ms			
9,53	53,99	42,4	40,97
8,83	51,40	42,2	40,70
8,63	50,20	41,5	40,30

Average pulse separation ?ms



40-29.08.11.B-002.wav

Average pulse separation is indeterminate

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
8,57	52,2	38,7	37,2
6,83	47,6	39,2	37,9
6,98	47,2	39,3	37,6
	–	39,7	–

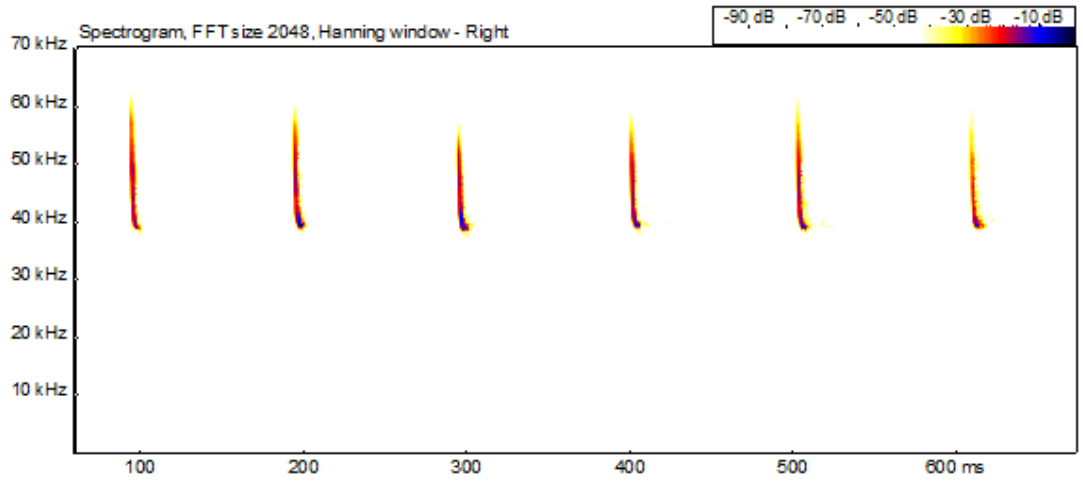
Average pulse separation 255,28 ms. Spectrogram is inexpressive.

40-29.08.11.B-004.wav

Pulse duration,	Frequency, kHz

ms	Upper limit	When sound power is maximum	Lower limit
4,69	62,0	40,0	38,4
5,70	60,0	40,5	38,7
5,29	56,5	40,7	38,3
5,25	58,7	40,5	38,7
5,20	59,6	39,8	38,8

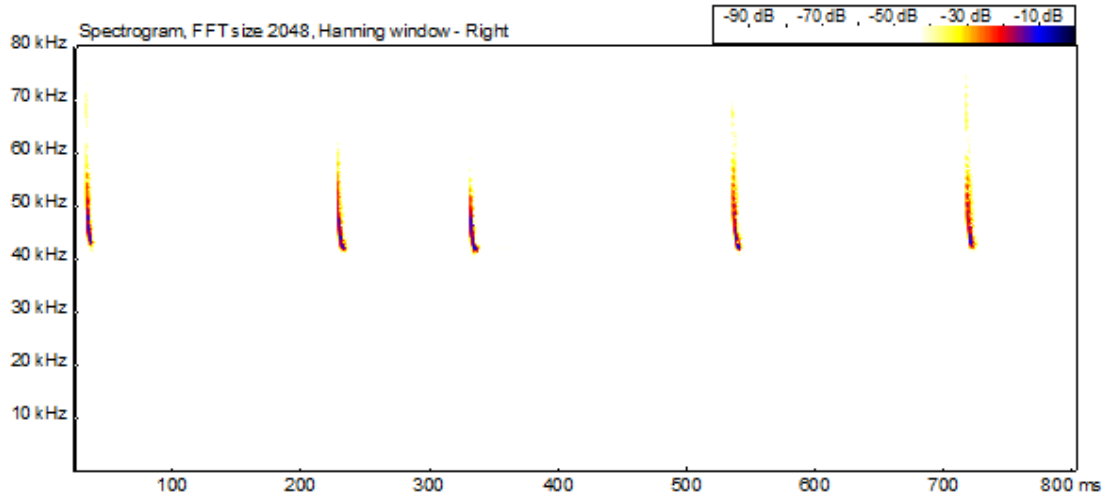
Average pulse separation 103,2 ms



STE-003.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,31	62,4	44,0	42,4
7,02	62,2	47,6	41,4
6,3	55,7	42,5	41,2
6,36	60,4	44,2	41,7
5,94	59,6	43,8	41,8

Average pulse separation edge is inhomogeneous ms

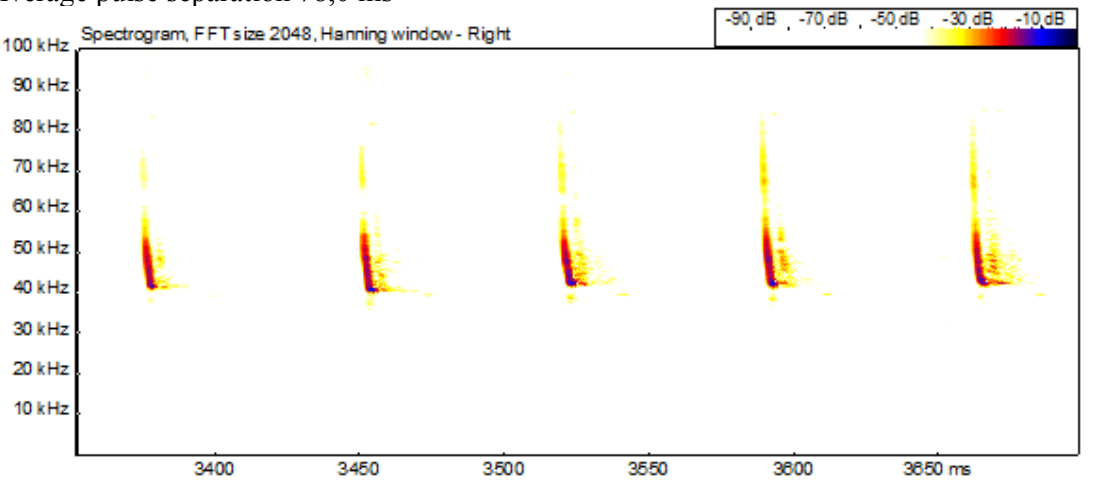


Transect E

40-29.08.11.E-011.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
4,36	58,5	42,4	40,8
5,21	61,8	42,2	40,9
4,73	60,1	42,2	40,7
4,58	59,6	43,0	40,7
4,77	60,4	41,2	40,0

Average pulse separation 78,0 ms

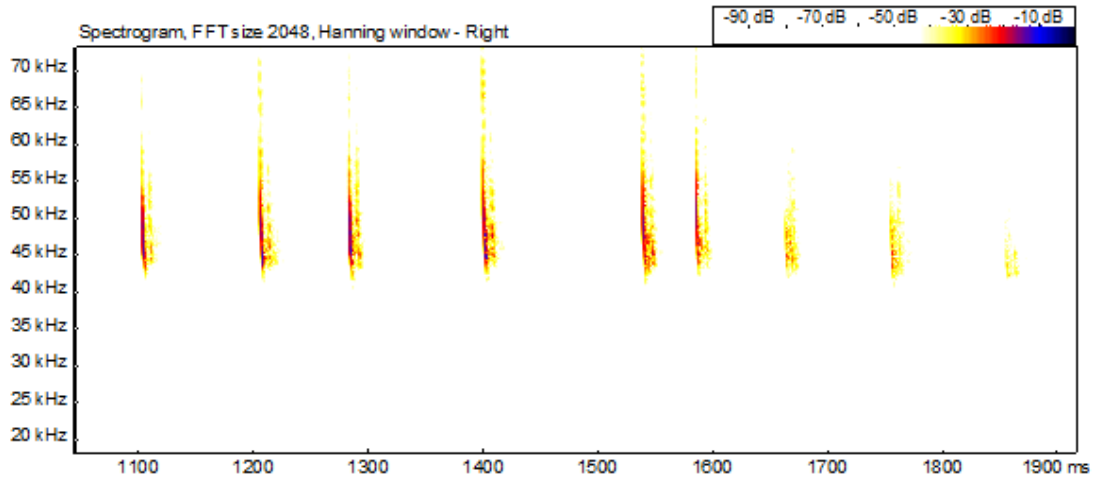


40-29.08.11.E-012.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
3,92	60,5	45,7	43,8
3,22	61,5	47,1	42,8

3,98	67,8	46,0	43,0
3,11	62,4	46,4	42,2
3,33	75,1	45,5	42,5

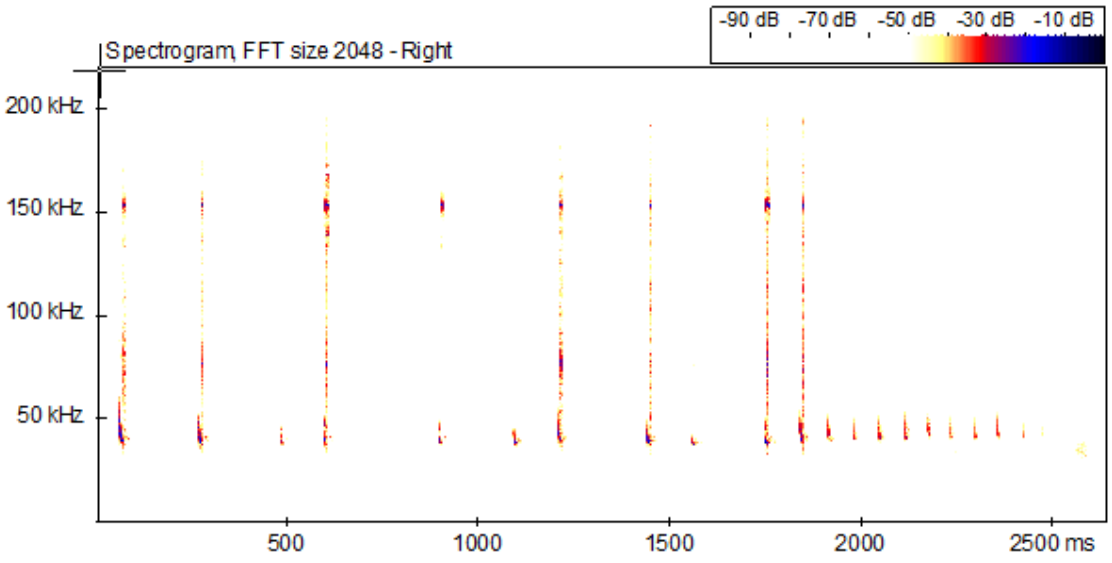
Average pulse separation 108,14 ms

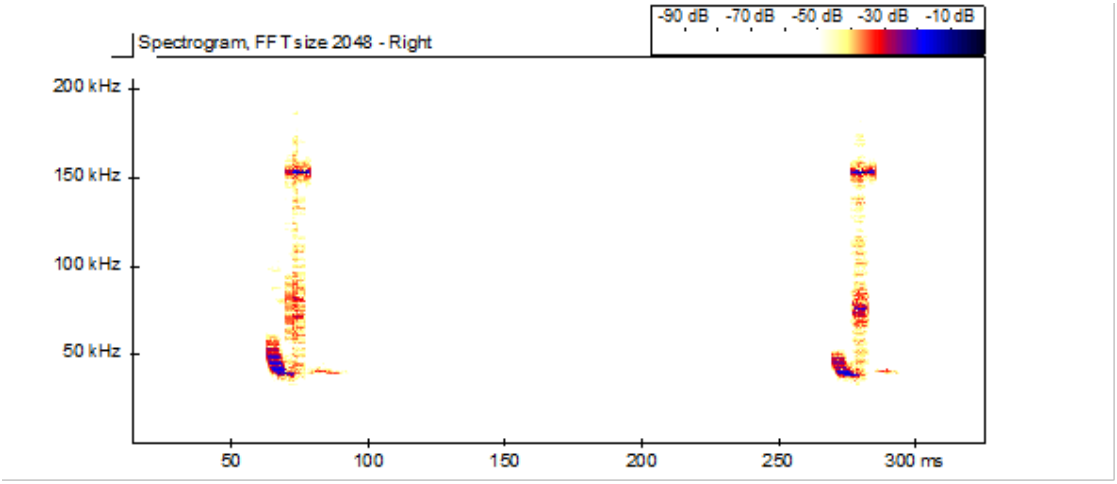


40-29.08.11.E-014.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,41	55,3	40,4	39,4
6,78	49,1	39,0	38,2
6,73	49,7	38,8	37,8
5,86	53,5	40,6	38,8

Average pulse separation ms. Sounds with 150 kHz of incomprehensible origin with constant frequency.

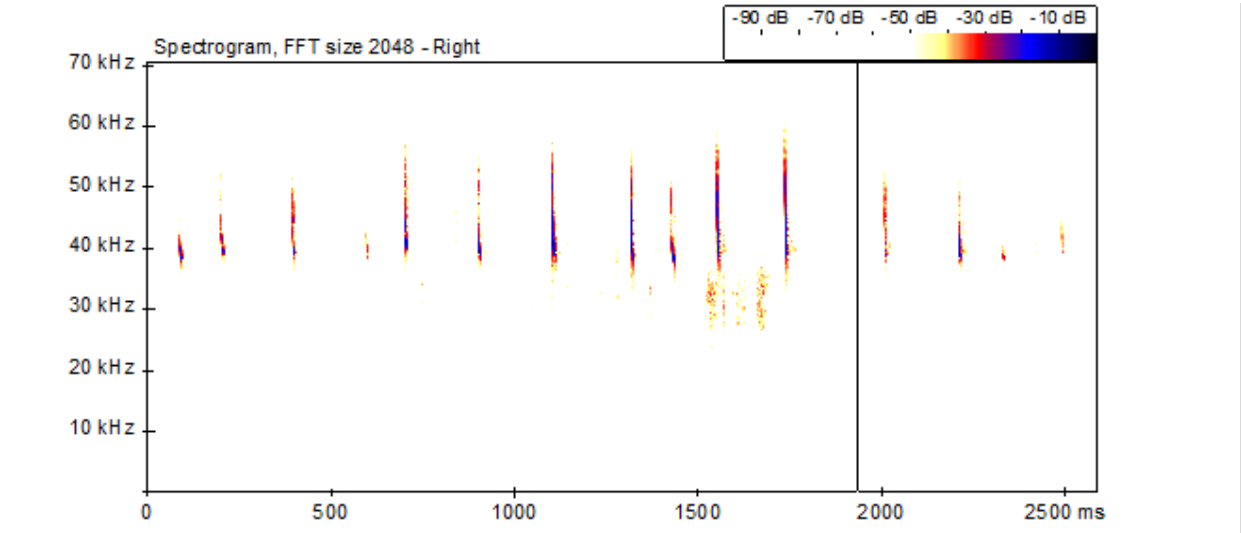


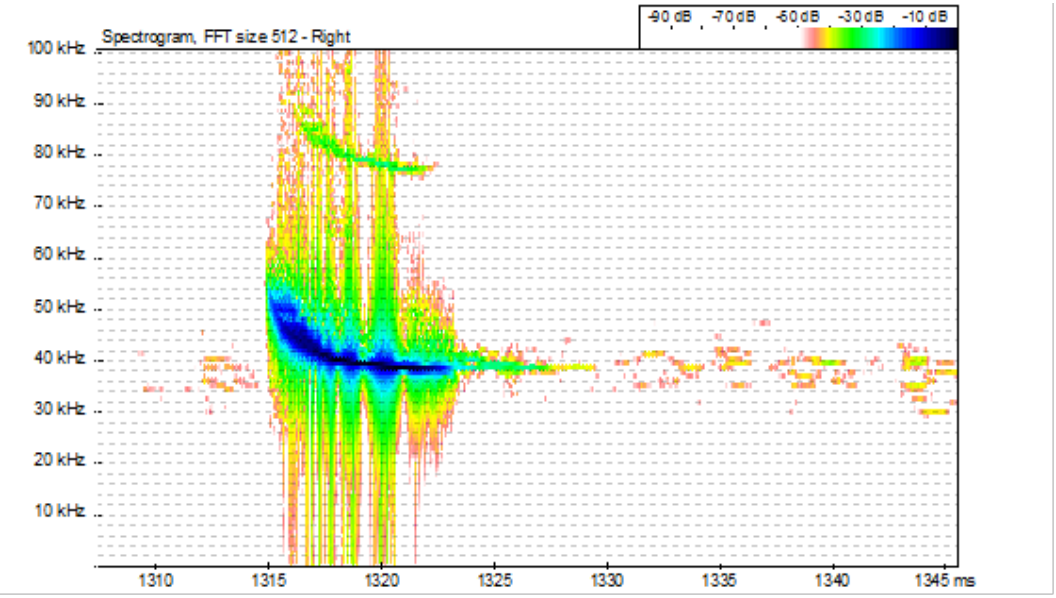


40-29.08.11.E-015.wav
Average pulse separation 188,9 ms

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,13	57,0	40,8	39,8
7,49	55,8	39,7	38,8
7,72	55,9	39,7	38,8
7,29	57,3	39,5	38,8
7,42	59,4	39,3	38,7

Average pulse separation 207,0 ms

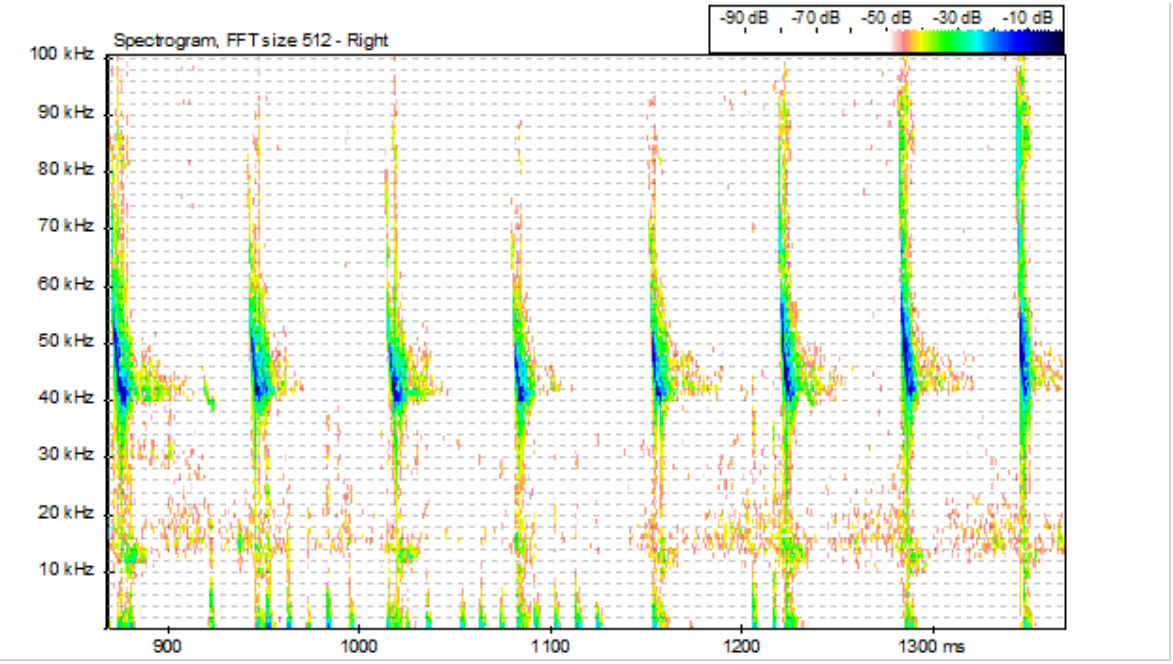


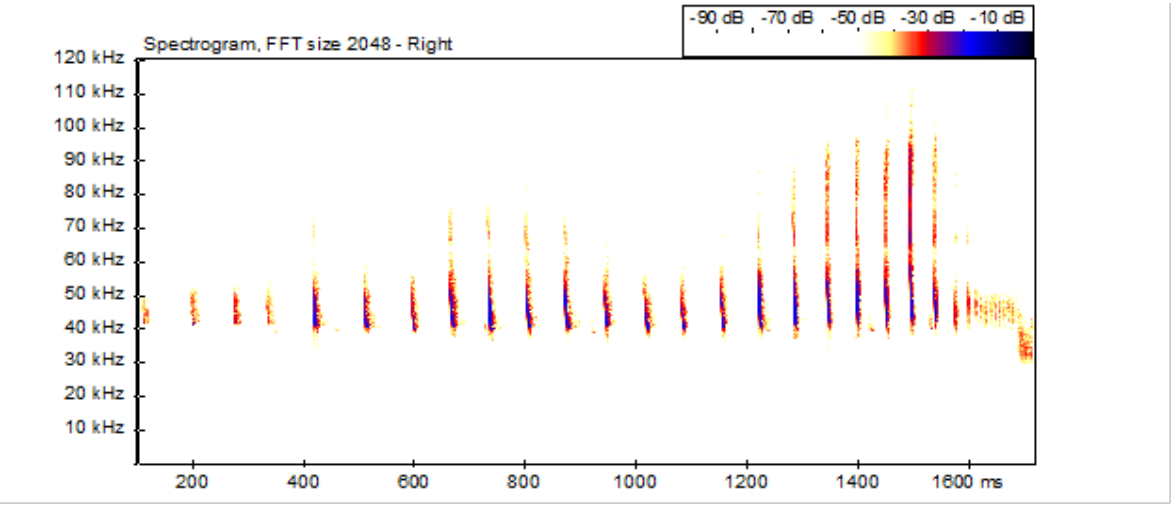


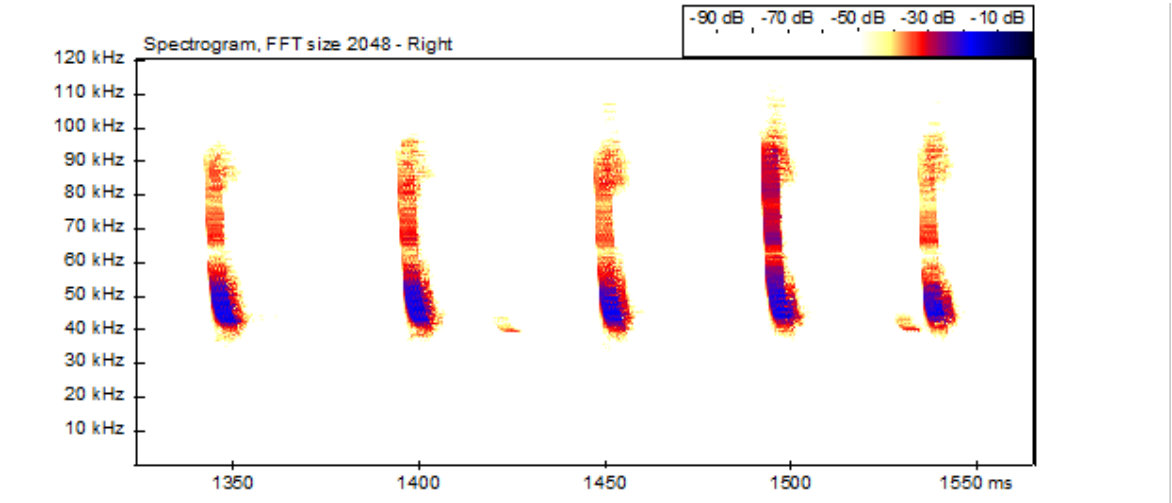
40-29.08.11.E-016.wav

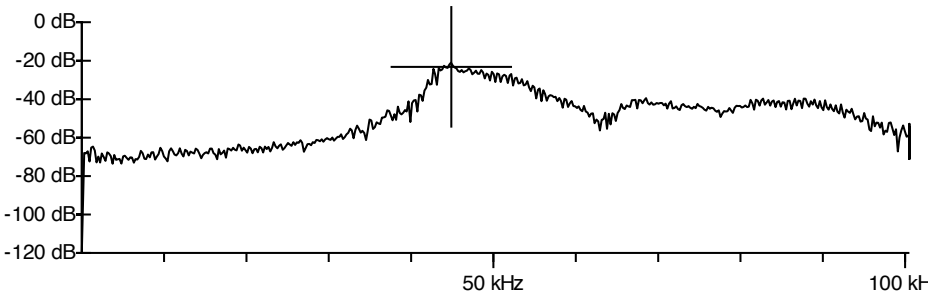
Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
9,41	73,6	41,9	38,3
9,86	84,6	42,6	39,0
6,45	93,0	44,0	40,2
8,79	97,1	46,8	39,9
6,66	93,8	48,5	39,5
7,22	98,5	46,0	40,6

Average pulse separation 73,5 ms. Approaching the insects, the frequency of the maximum power of sound increased.

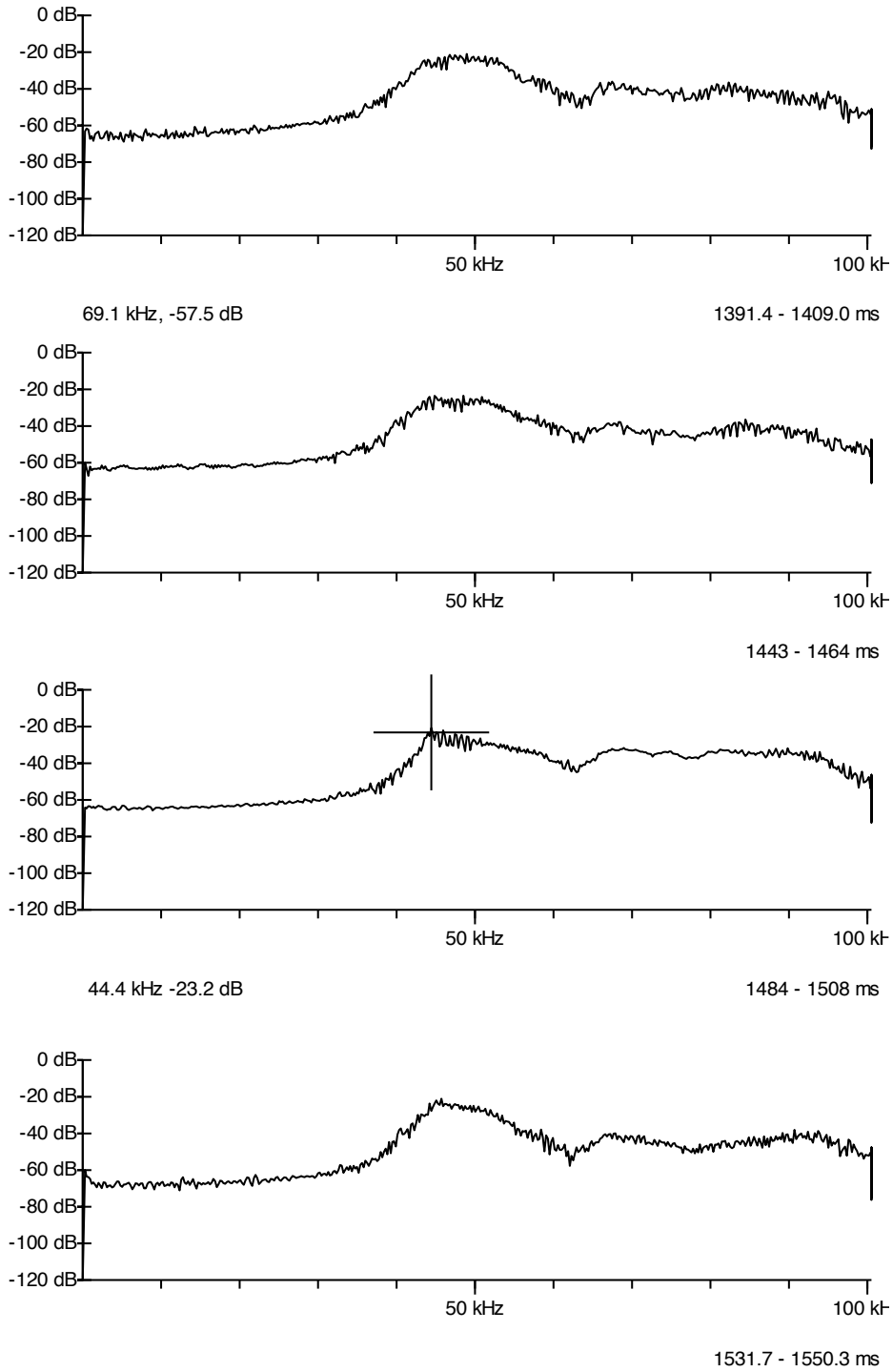




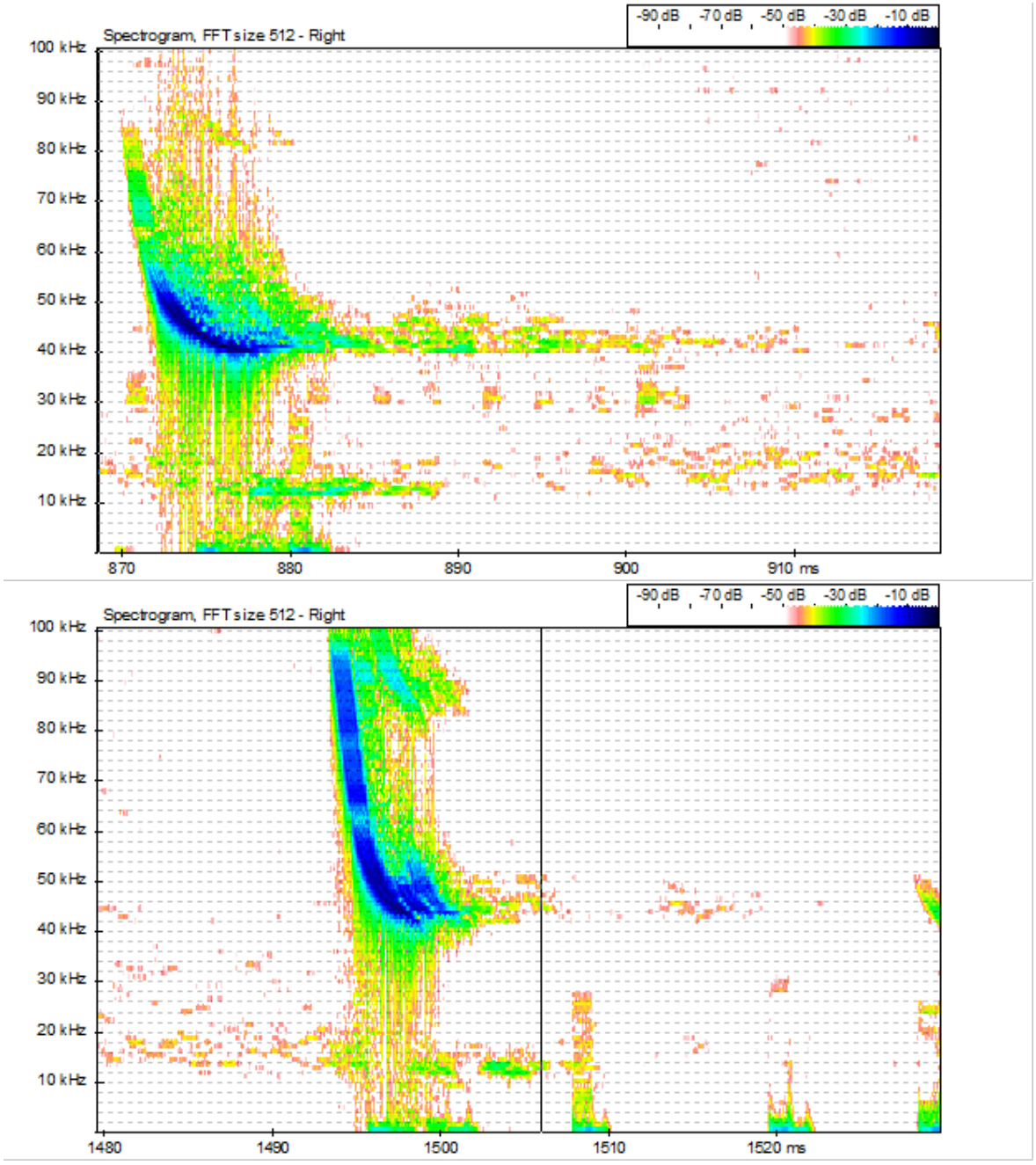


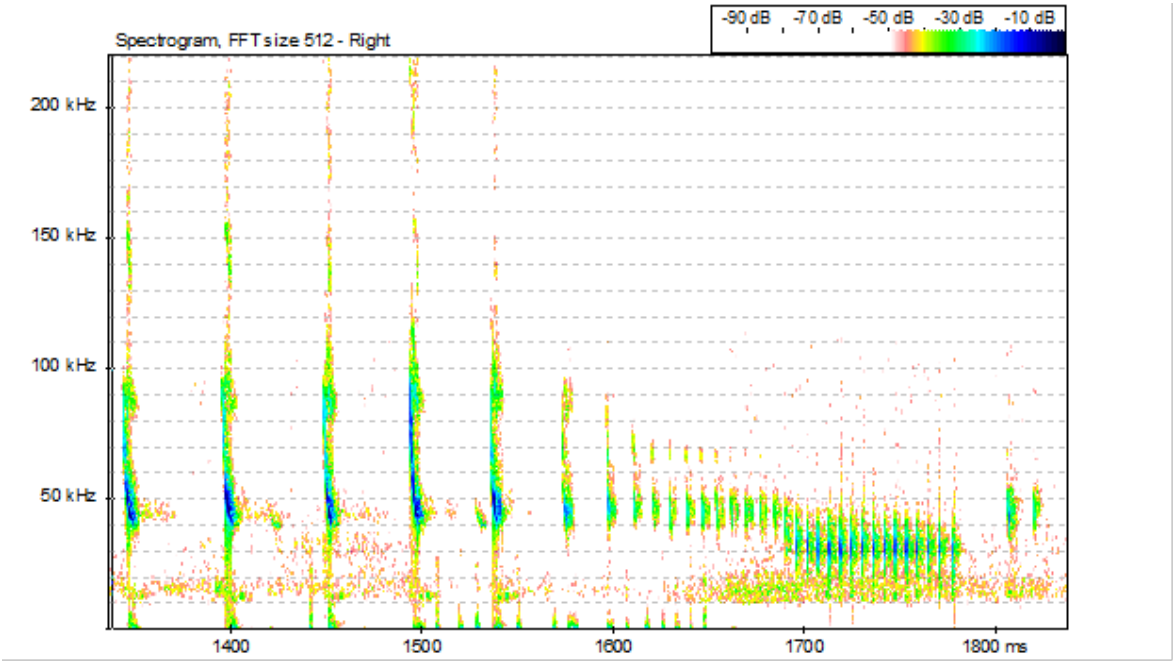


44.9 kHz, -23.2 dB Distance: 0.0 kHz, 0.0 dB 1337 - 1359 ms

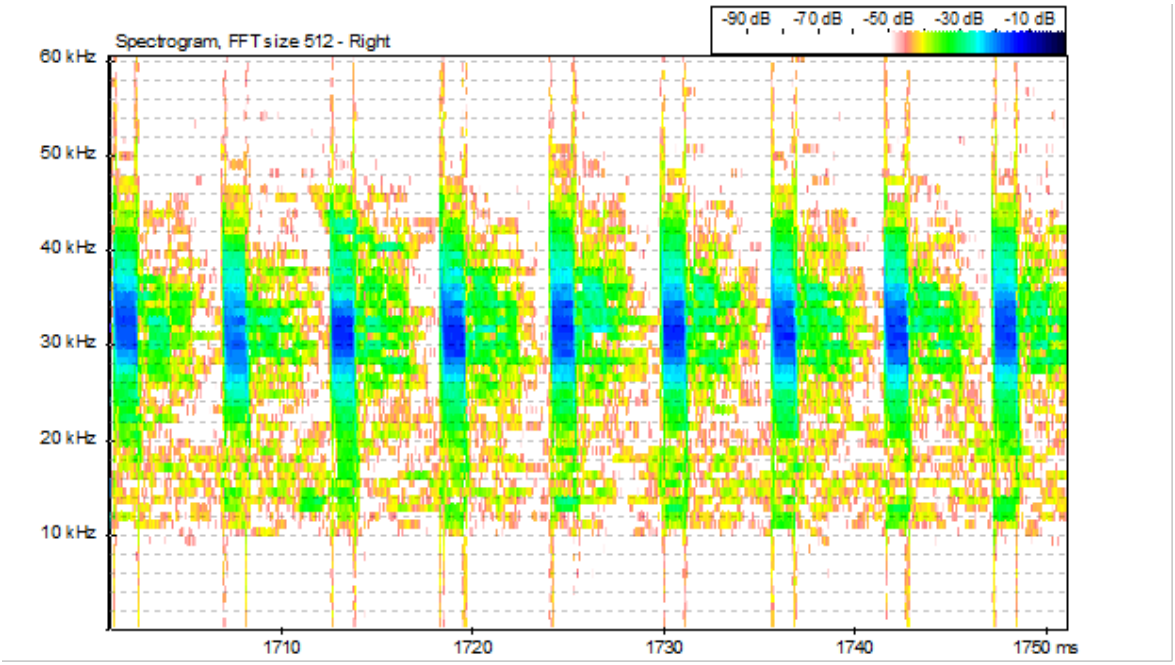


When determining the frequency at maximum sound power in a number of spectrograms, the peak value was not clearly identified (the sequence of graphs corresponds to a sequence of the spectrogram at the figure above).


Spectrogram, FFT size 512 - Right
-90 dB -70 dB -50 dB -30 dB -10 dB
100 kHz
90 kHz
80 kHz
70 kHz
60 kHz
50 kHz
40 kHz
30 kHz
20 kHz
10 kHz
870
880
890
900
910 ms
Spectrogram, FFT size 512 - Right
-90 dB -70 dB -50 dB -30 dB -10 dB
100 kHz
90 kHz
80 kHz
70 kHz
60 kHz
50 kHz
40 kHz
30 kHz
20 kHz
10 kHz
1480
1490
1500
1510
1520 ms



Average pulse separation from the beginning of attack 8,275 ms and at the end of 5,79 ms – with maximum frequency 31,8 kHz with pulse duration 0,3–0,4 ms.

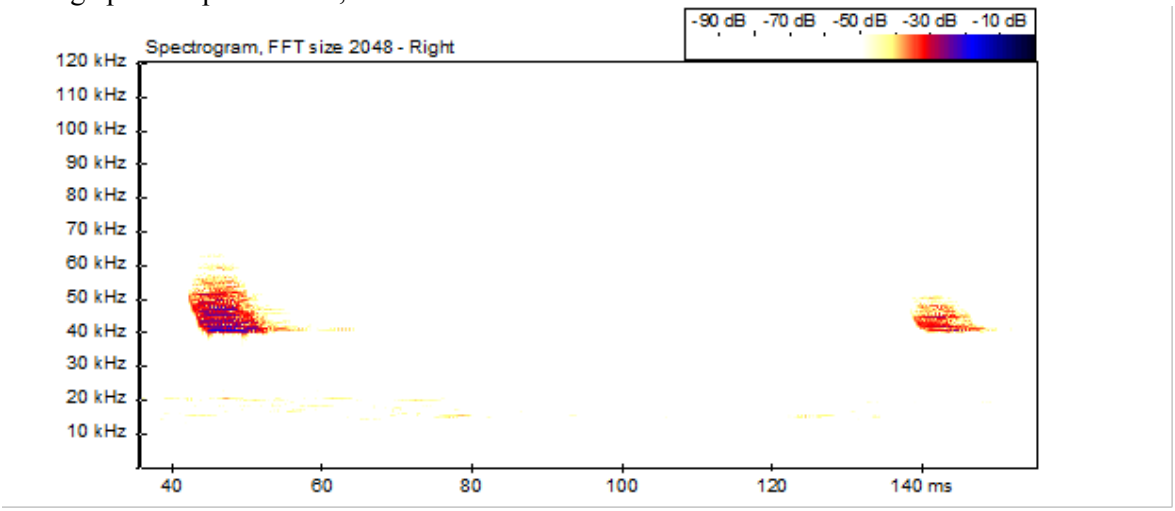


Girsivka

40-29.08.11.Girsiv-005.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,33	55,6	41,5	40,0
6,46	–	41,0	–

Average pulse separation 95,8 ms

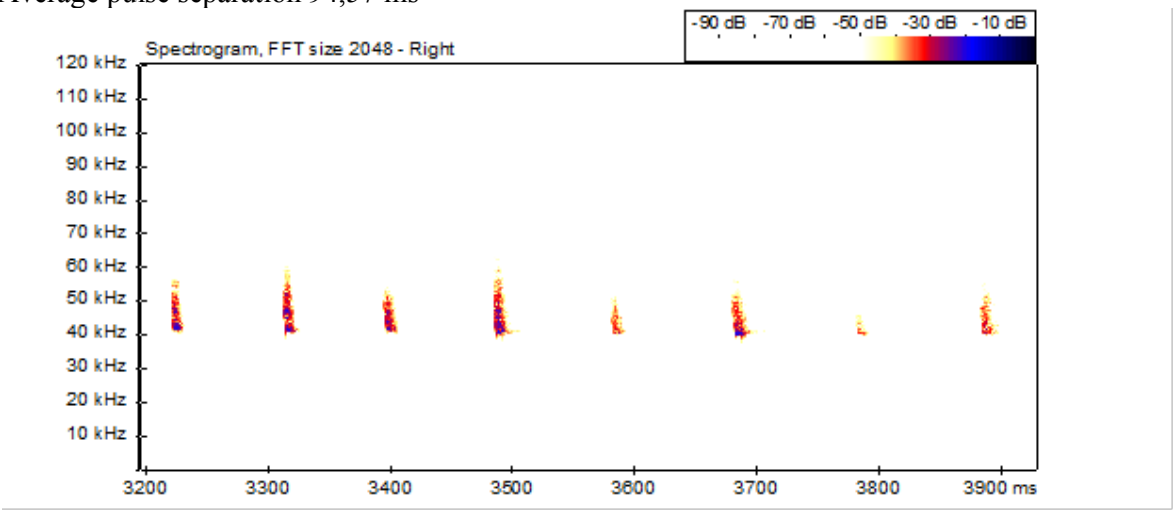


40-29.08.11.Girsiv-006.wav

Average pulse separation 119,8 ms

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,34	56,1	42,5	41,2
7,51	57,7	42,1	40,8
6,7	56,6	41,5	40,1
6,79	52,0	42,4	40,9
7,70	52,4	40,6	40,0

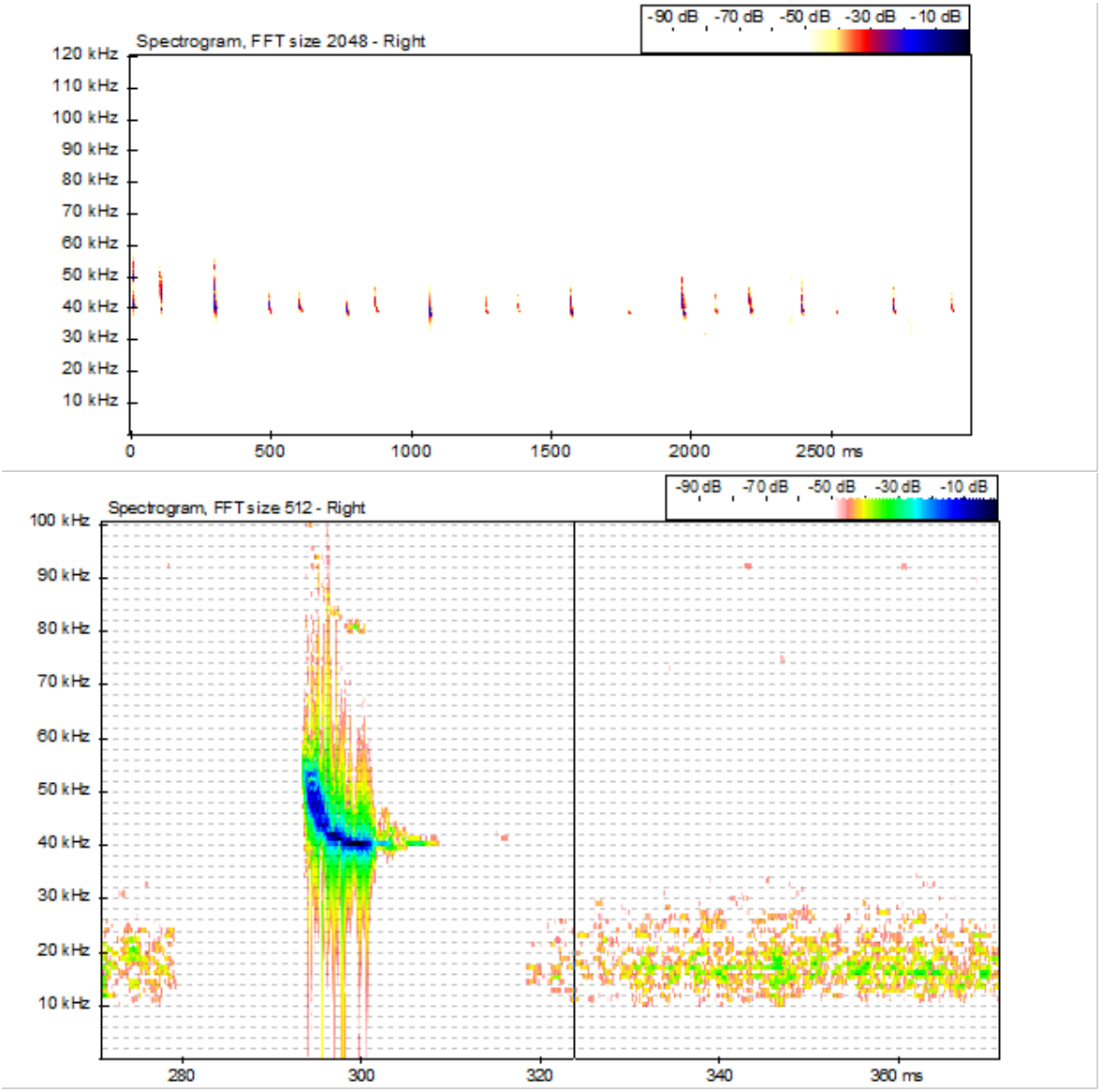
Average pulse separation 94,57 ms



40-29.08.11.Girsiv-007.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,67	53,5	39,9	38,9
7,30	56,2	40,5	39,7
8,64	46,5	42,1	38,6
9,21	45,6	40,5	38,8
9,94	43,0	38,6	38,2

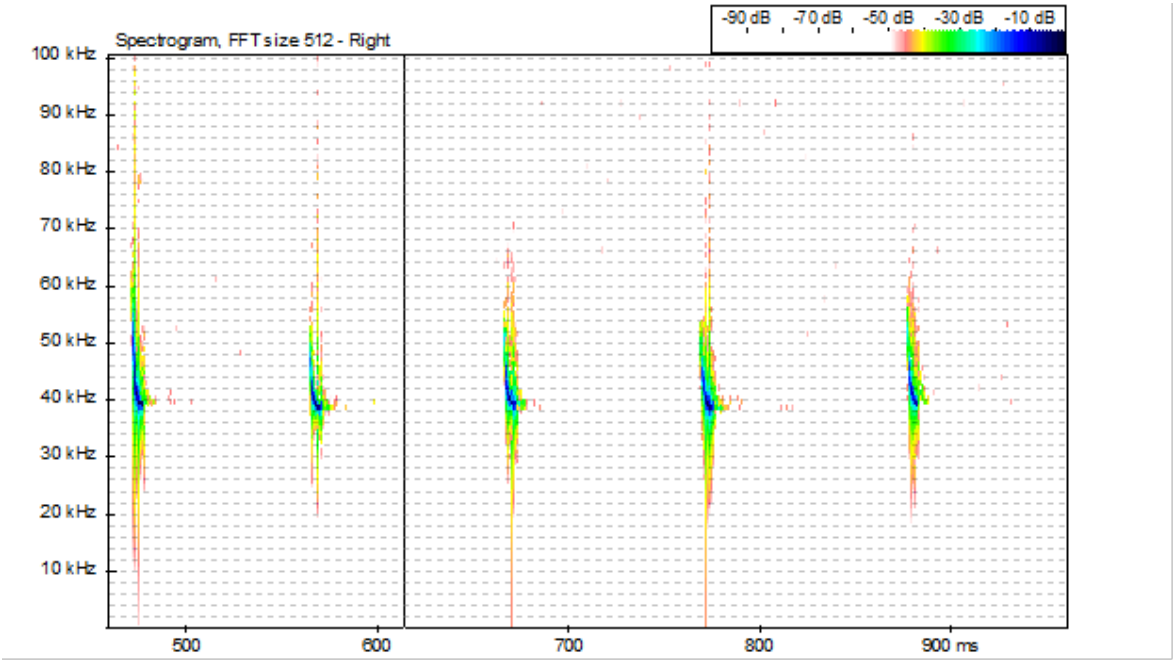
Average pulse separation 469,73 ms

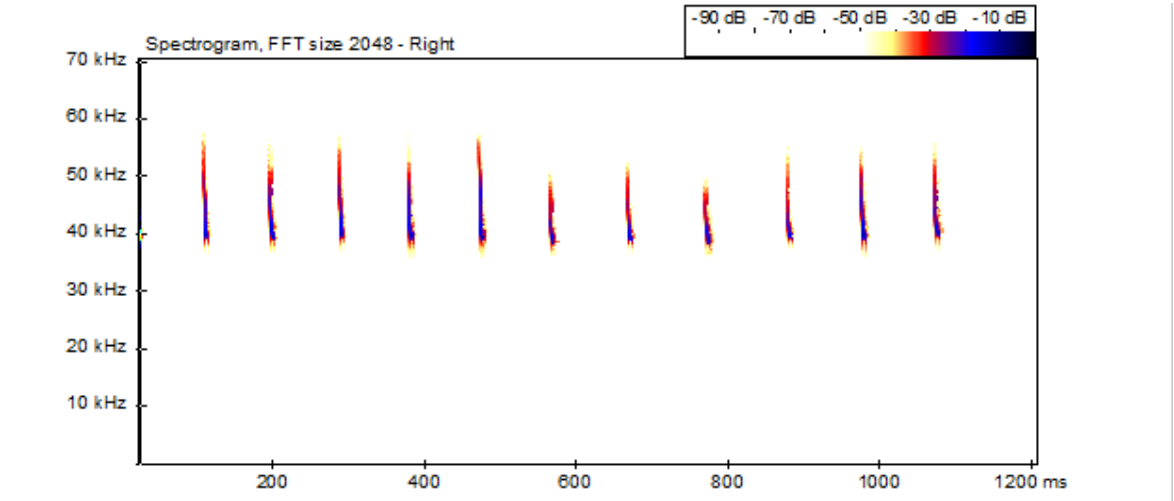


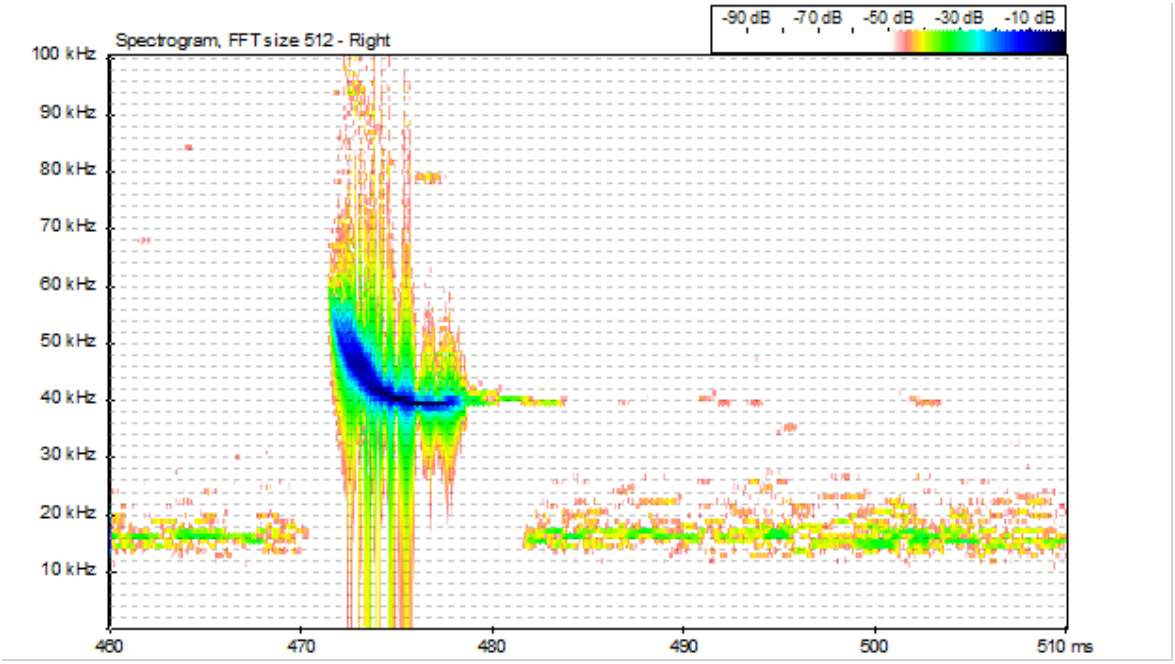
40-29.08.11.Girsiv-008.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,33	58,0	39,9	38,9
5,73	57,7	39,9	38,8
5,55	55,2	39,9	38,7
5,42	57,7	40,1	38,8
5,97	55,2	39,9	38,5

Average pulse separation 95,8 ms



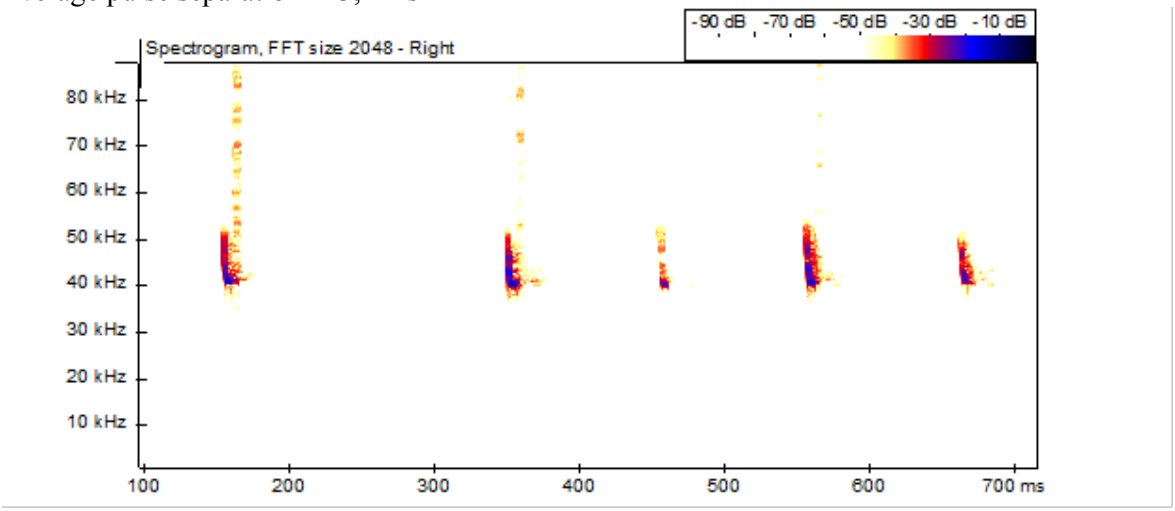


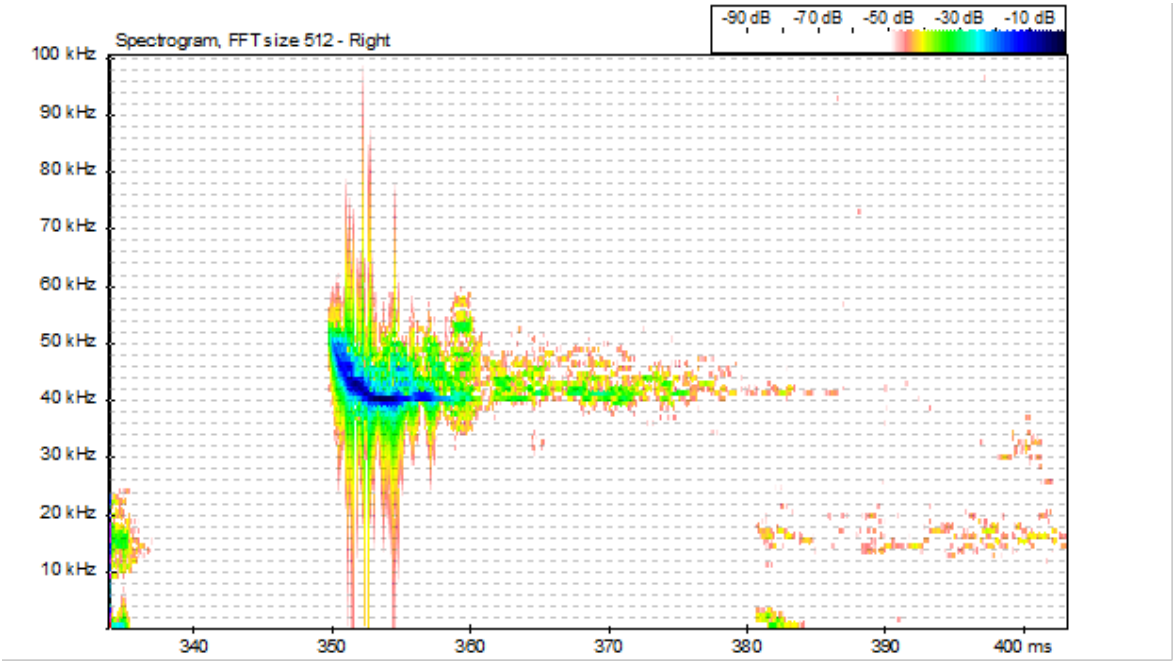


40-29.08.11.Girsiv-009.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
3,98	53,1	41,2	40,4
5,99	52,3	40,3	39,0
5,32	53,9	41,0	38,8
3,34	51,0	43,3	40,3
5,77	49,0	42,6	39,6

Average pulse separation 123,4 ms

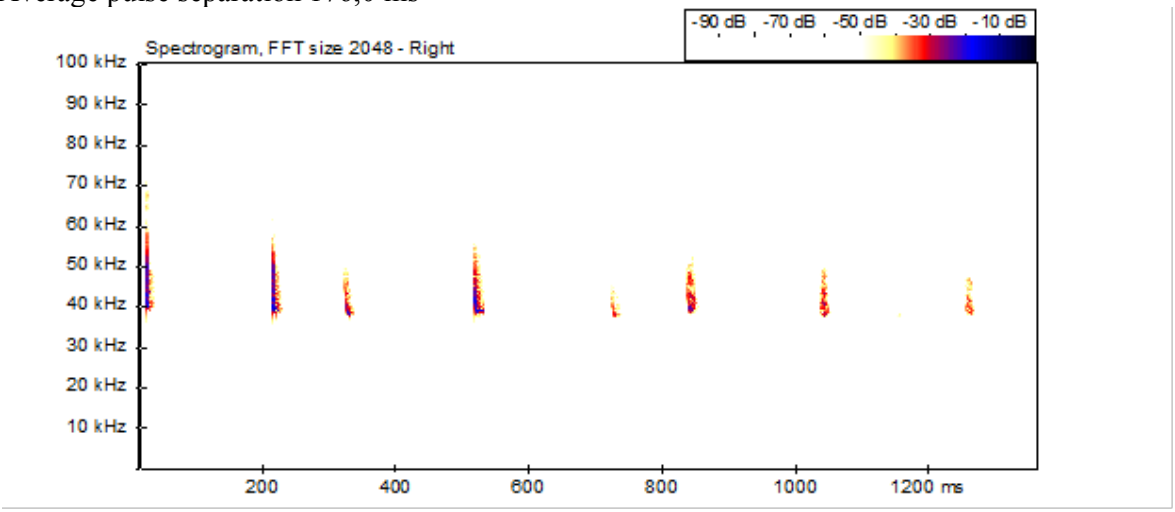




40-29.08.11.Girsiv-010.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
4,43	57,8	41,0	39,9
5,7	59,7	40,3	39,2
5,0	60,7	40,8	39,5
5,25	57,4	39,6	38,8

Average pulse separation 176,0 ms

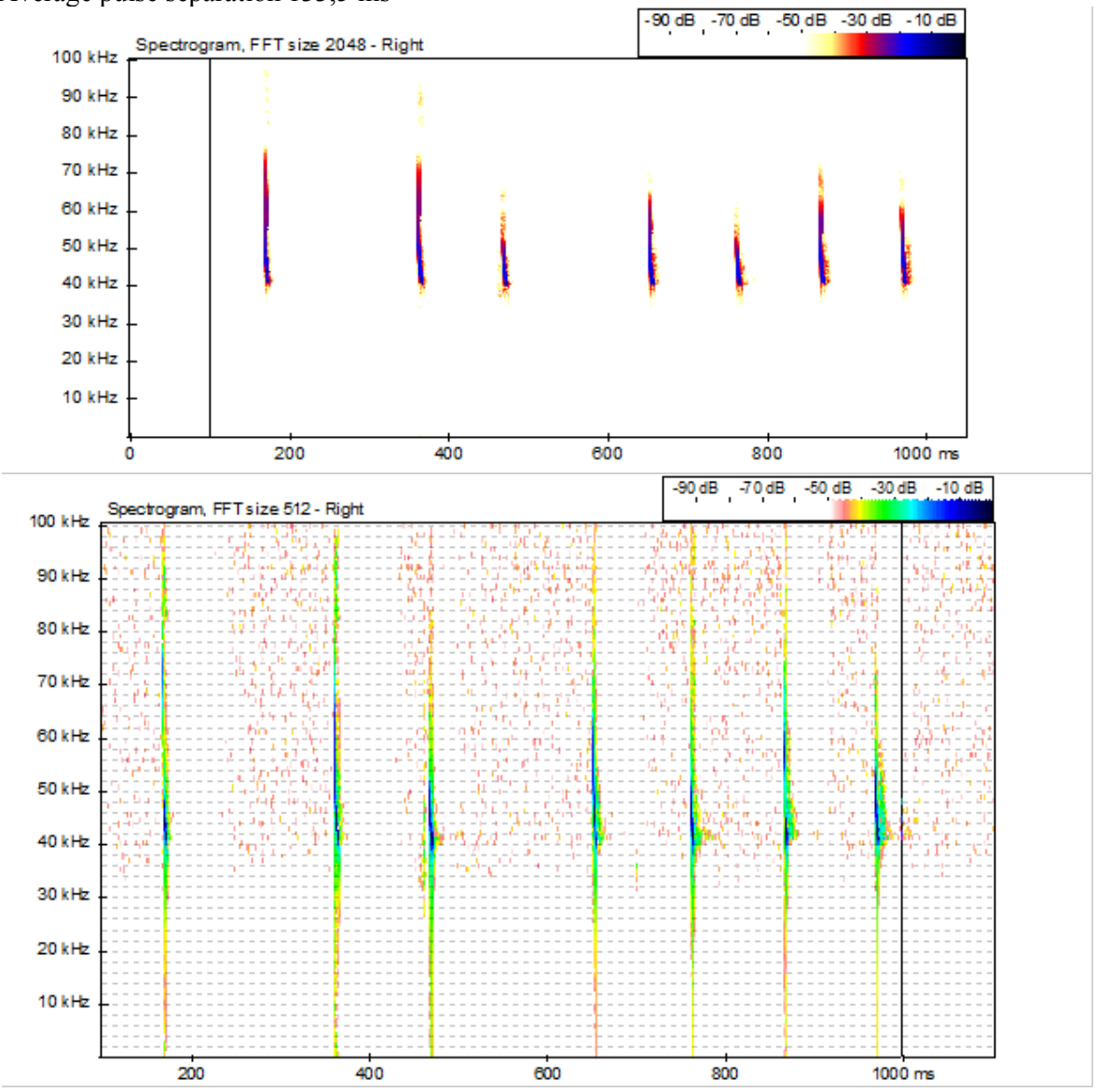


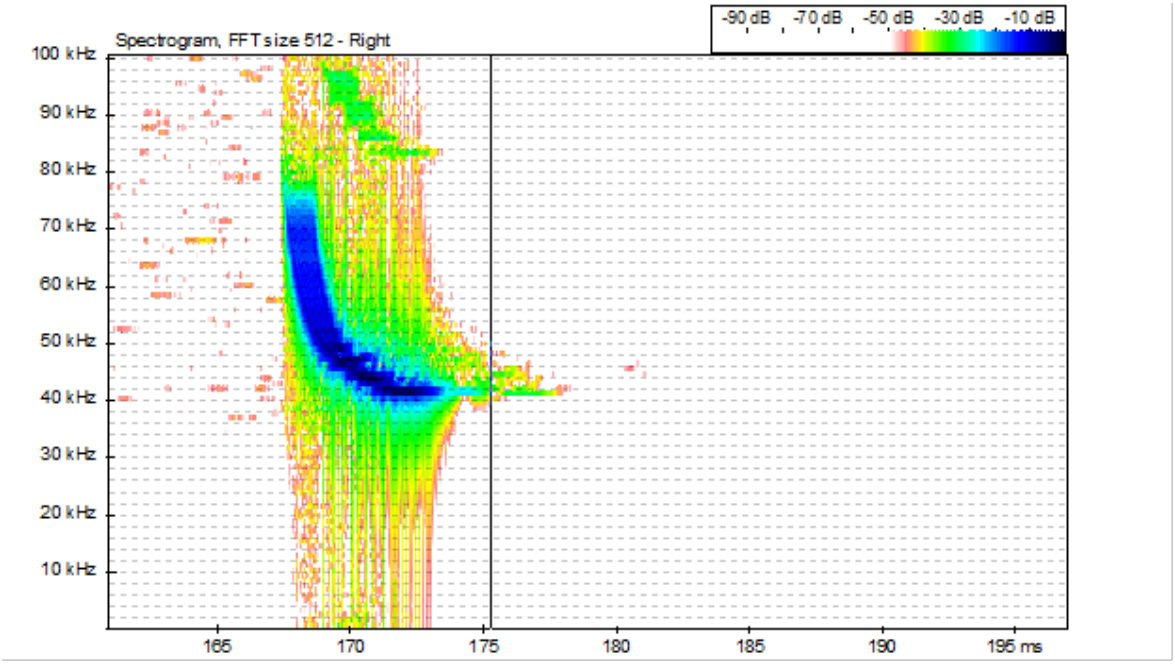
Lis

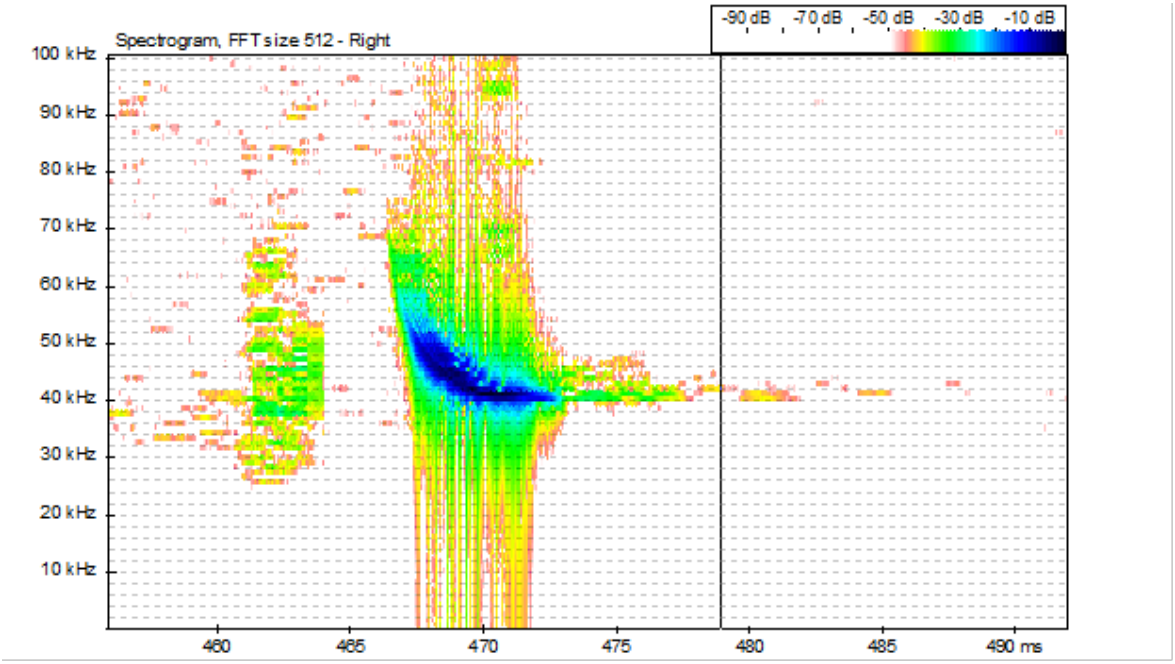
40-29.08.11.Lis-020.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,90	76,7	41,9	40,6
6,06	74,6	41,5	40,6
4,60	57,1	41,5	40,2
4,38	72,1	41,9	40,7
5,39	62,0	41,5	40,4

Average pulse separation 133,5 ms





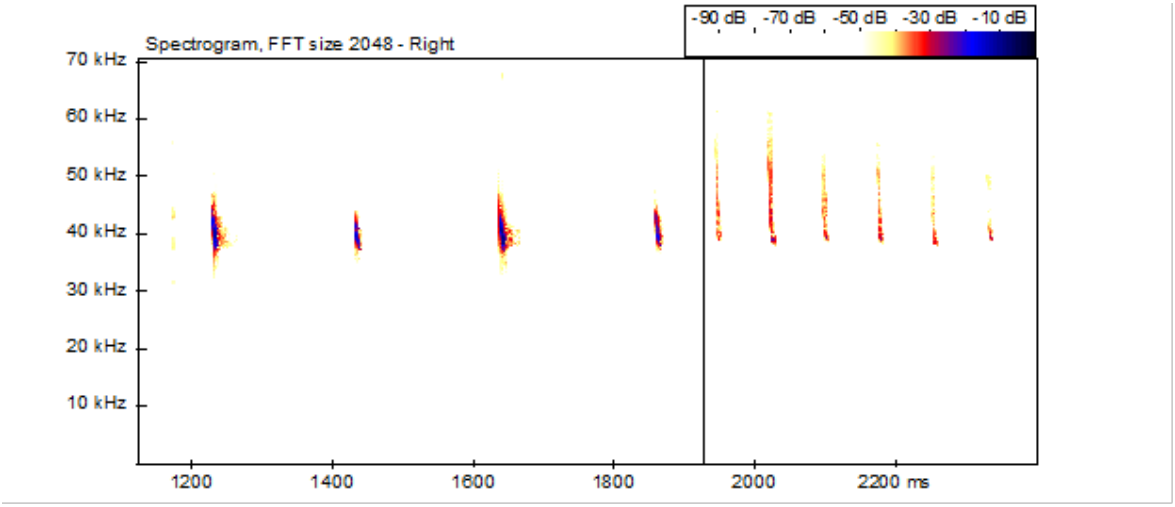


40-29.08.11.Lis-021.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
8,42	46,6	40,4	37,0
8,22	43,9	39,7	37,2
7,60	47,1	40,5	36,9
6,71	45,3	39,6	37,2
Average pulse separation 210 ms			
5,32	56,3	43,7	38,7
6,40	61,1	38,9	38,4

	53,3	39,4	38,9
	52,9	39,2	38,6

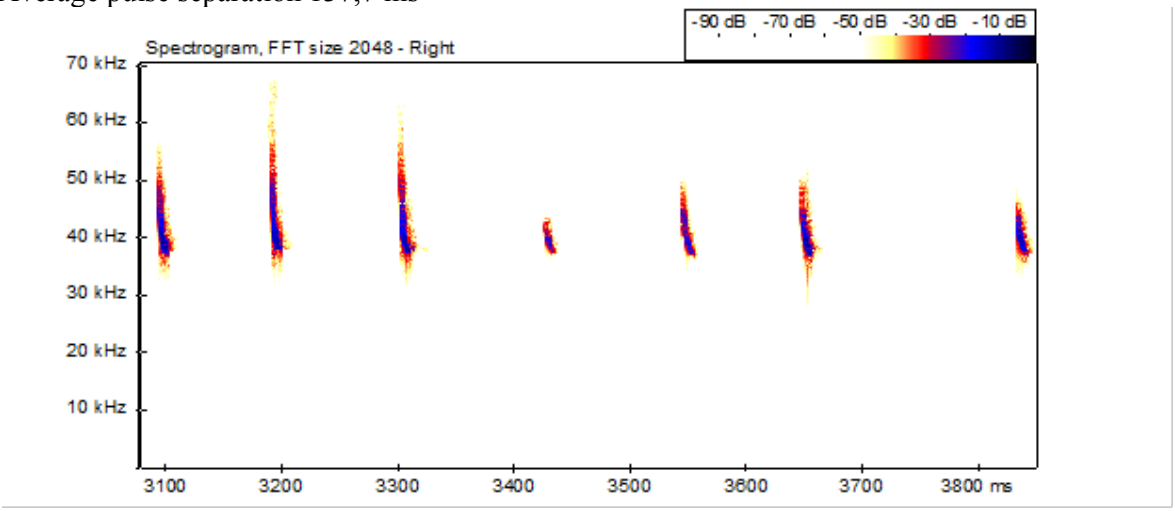
Average pulse separation 77,0 ms

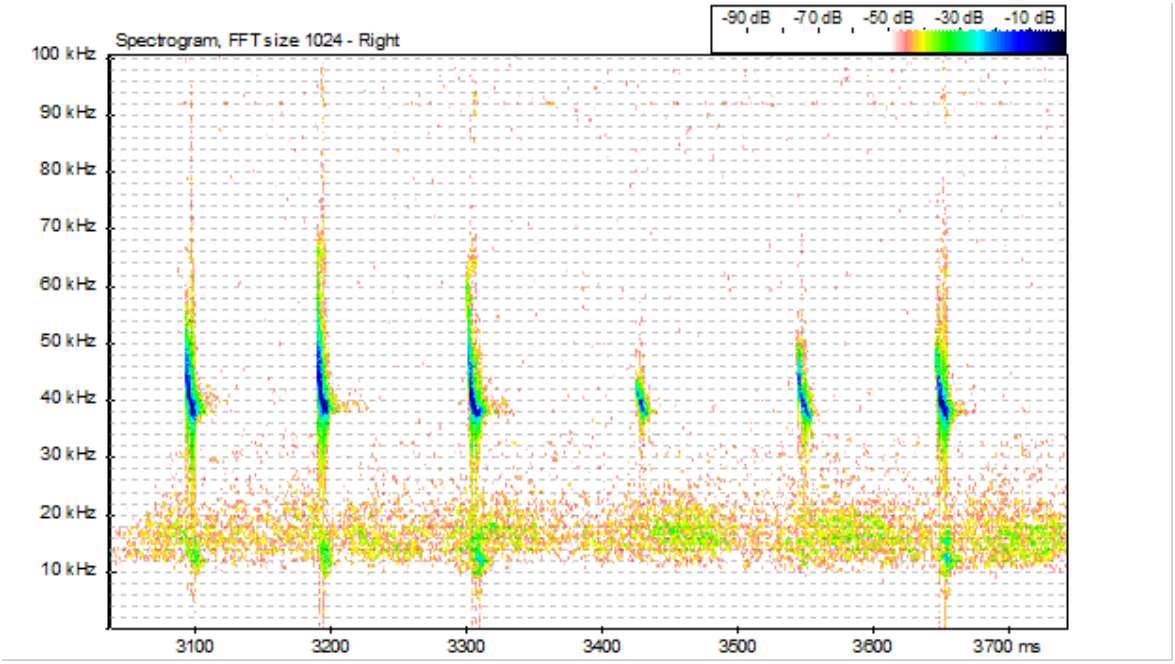


40-29.08.11.Lis-022.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,79	56,0	38,6	35,8
7,55	62,5	38,6	36,2
8,60	61,0	38,1	35,8
Average pulse separation 104,4 ms			
8,17	43,0	40,0	37,2
10,13	48,9	39,2	36,7
7,90	50,1	38,8	35,3
7,46	46,2	40,3	36,3

Average pulse separation 137,7 ms



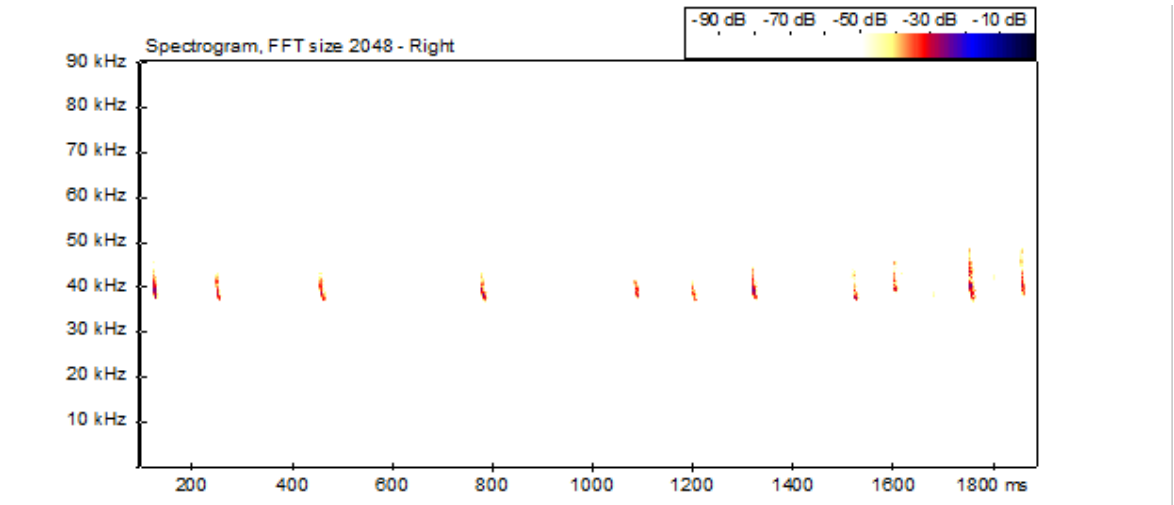


29.08.11.Mordvynivka

40-29.08.11.Mord-017.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,02	44,02	38,5	37,59
7,04	42,90	38,7	37,20
8,13	42,80	37,8	37,30
7,29	43,4	38,5	37,50
6,11	41,68	38,7	37,28

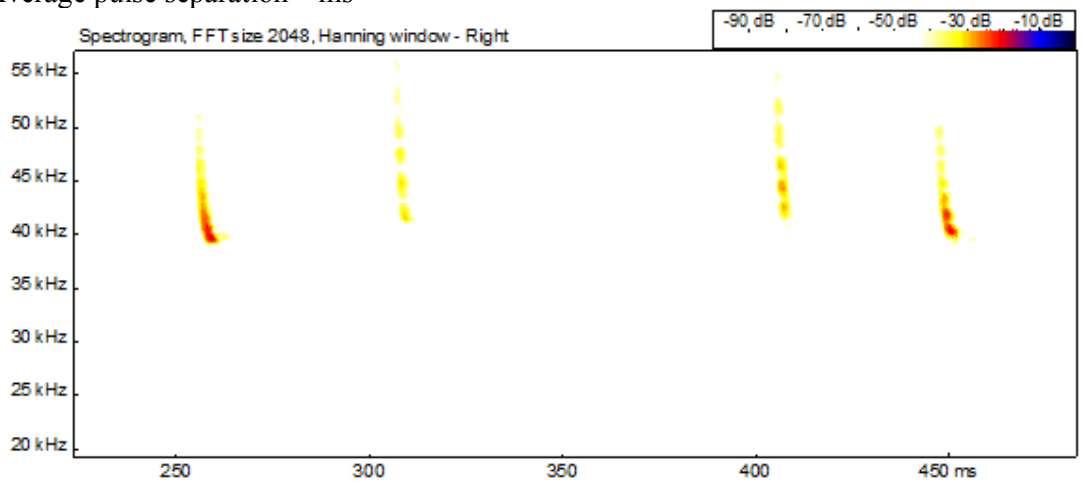
Average pulse separation 173,2 ms



40-29.08.11.Mord-018wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
5,10	51,37	41,20	38,89
4,51	50,05	41,00	39,00
4,82	52,60	41,90	39,50
5,12	51,30	40,30	38,90

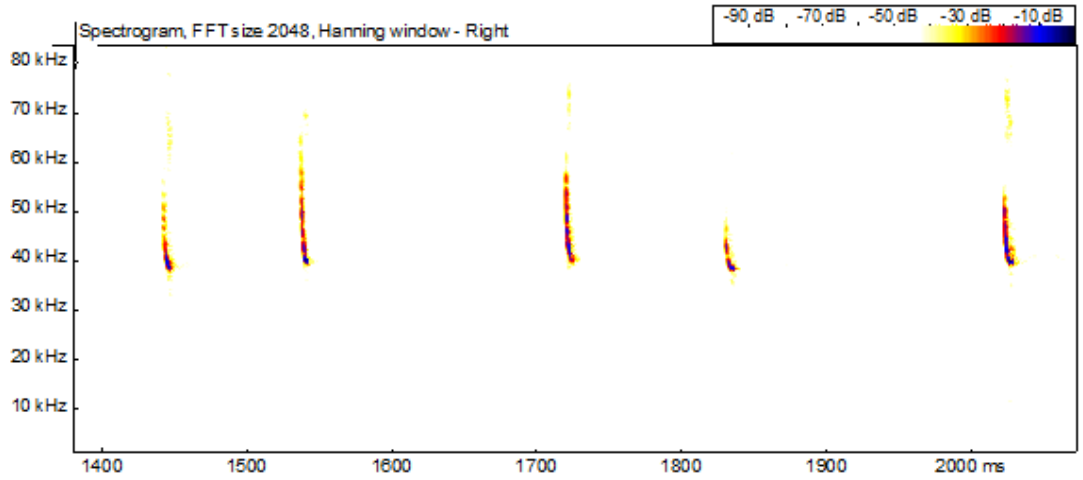
Average pulse separation – ms

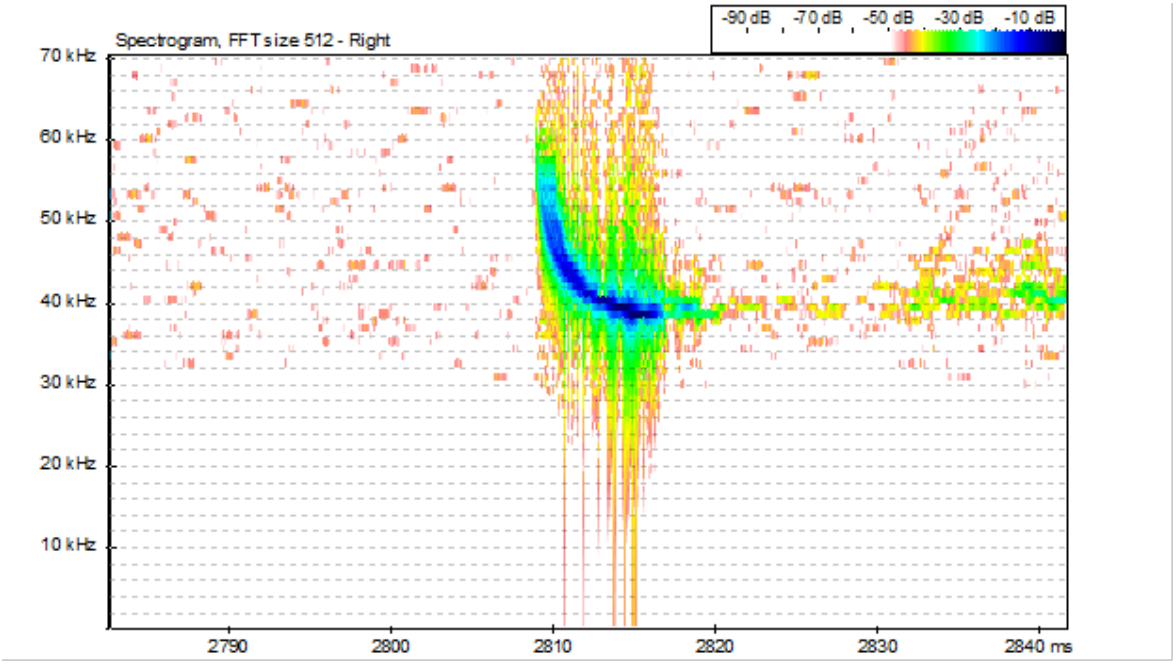


40-29.08.11.Mord-019wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
6,31	52,41	39,70	38,54
5,54	54,10	41,40	38,00
5,65	64,60	41,00	39,30
4,76	58,50	43,80	39,10

Average pulse separation ms



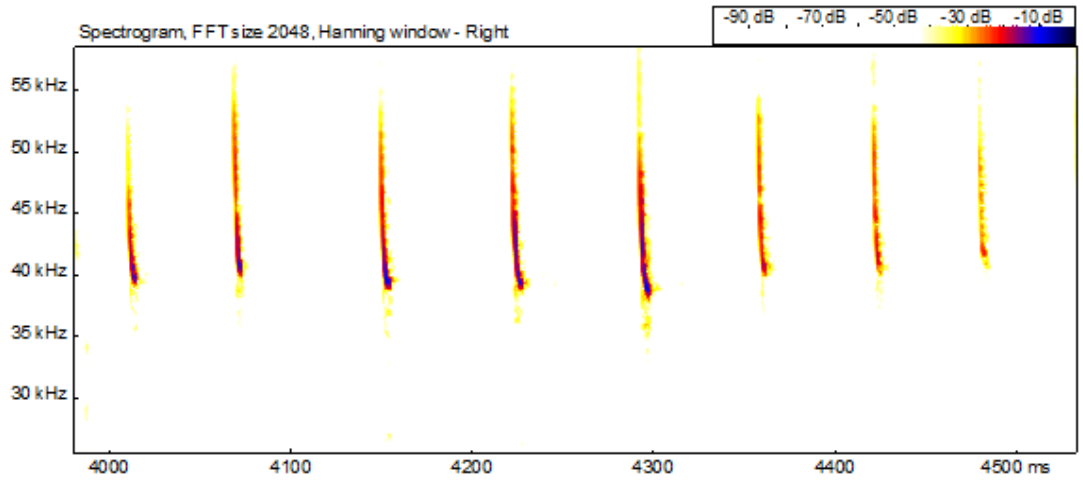


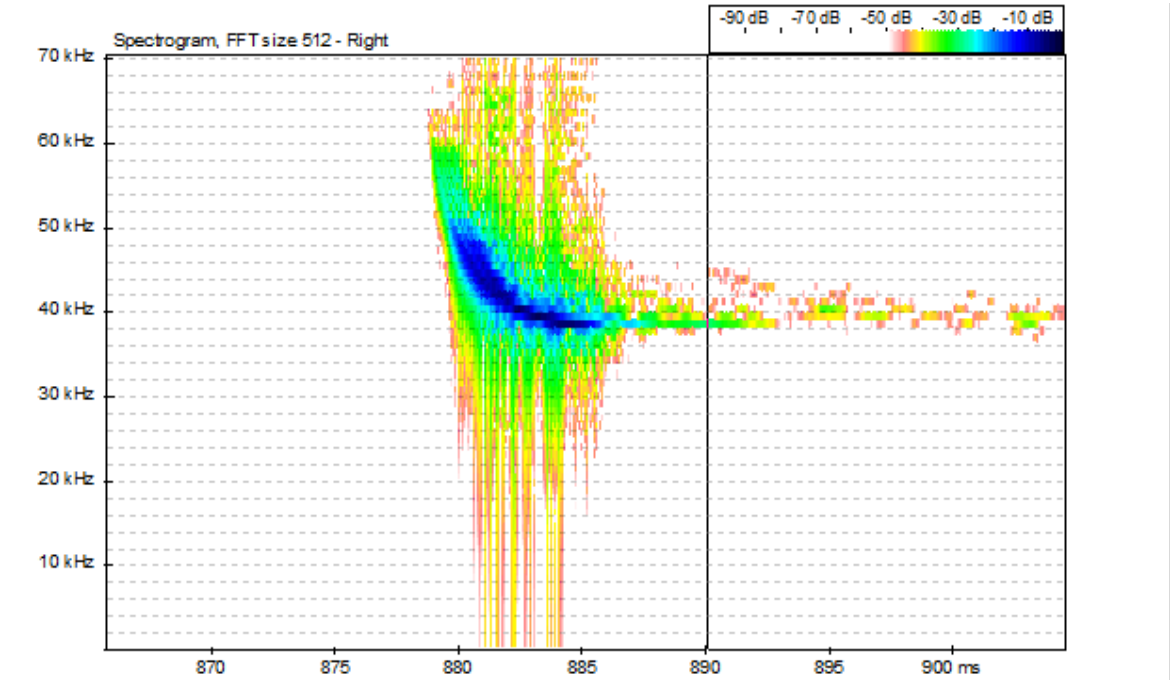
29.08.11 Estuary 1

40-29.08.11-000.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
4,91	53,73	40,00	38,84
5,63	57,20	42,00	39,7
5,68	54,20	39,90	38,70
6,29	56,30	39,90	38,70
6,68	58,20	39,30	37,90

Average pulse separation 67,2 ms



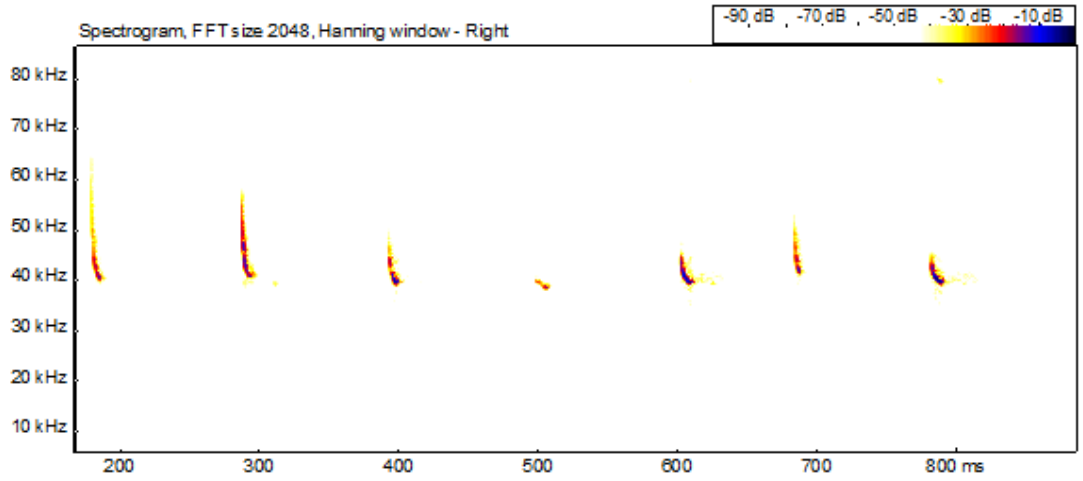


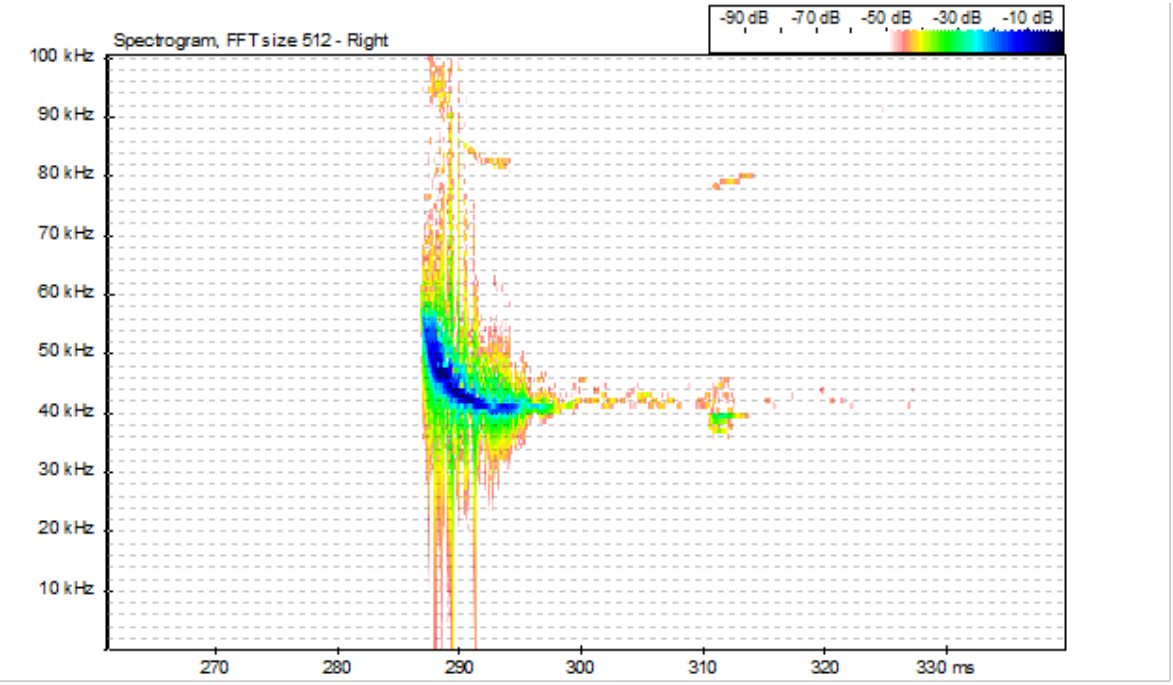
29.08.11 Tr-C

40-29.08.11.C-000.wav

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,30	64,60	41,00	39,90
7,78	57,70	43,20	40,20
7,91	47,80	40,20	38,90
9,58	45,72	40,20	39,04

Average pulse separation 102,25 ms





40-29.08.11.C-001 - small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
8,51	41,66	39,3	37,74
6,97	43,84	39,1	38,09
6,73	43,18	39,9	38,11
6,46	39,72	38,9	37,53
7,09	41,87	39,5	37,96

Average pulse separation ? ms

40-29.08.11.C-002 small signal

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
7,8	46,3	39,8	37,2
8,9	46.3	40,6	38,1
8,3	46,5	38,6	36,2

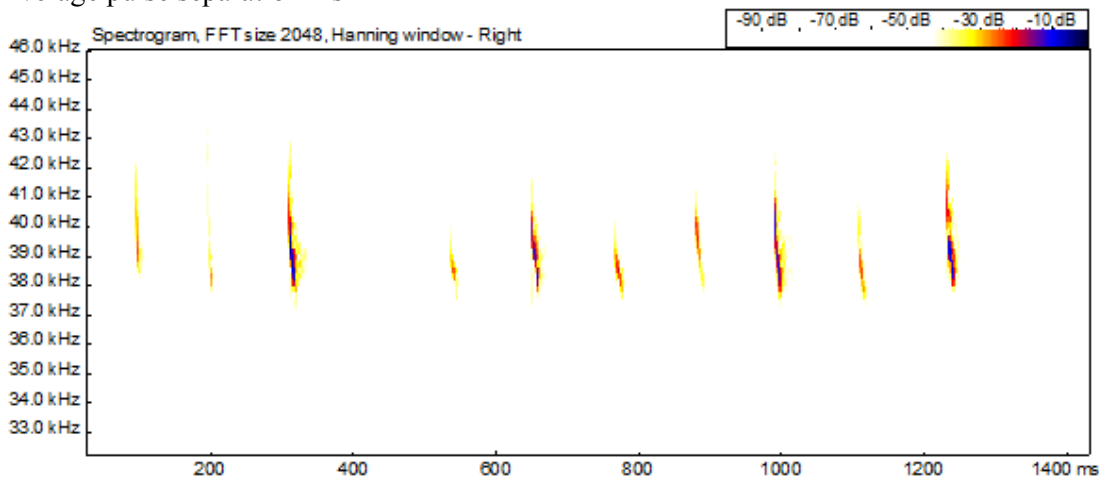
Average pulse separation ?ms

40-29.08.11.C-003

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
10,19	42,97	39,3	37,73
11,46	40,81	39,7	37,73
9,71	42,26	38,6	37,54

9,22	42,35	39,3	37,96
8,85	42,27	39,7	37,94

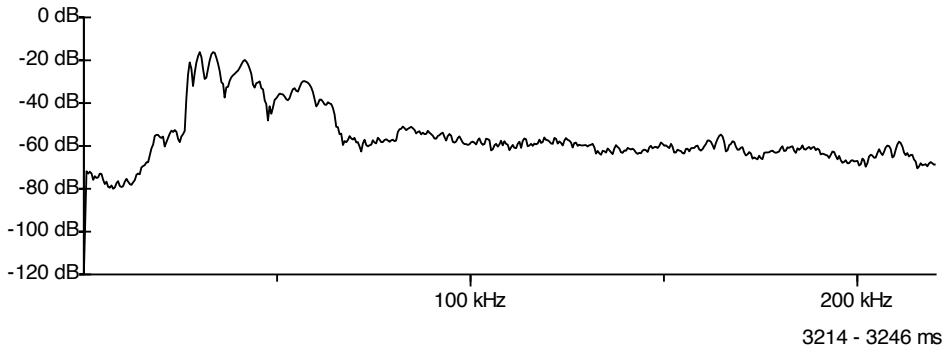
Average pulse separation ms

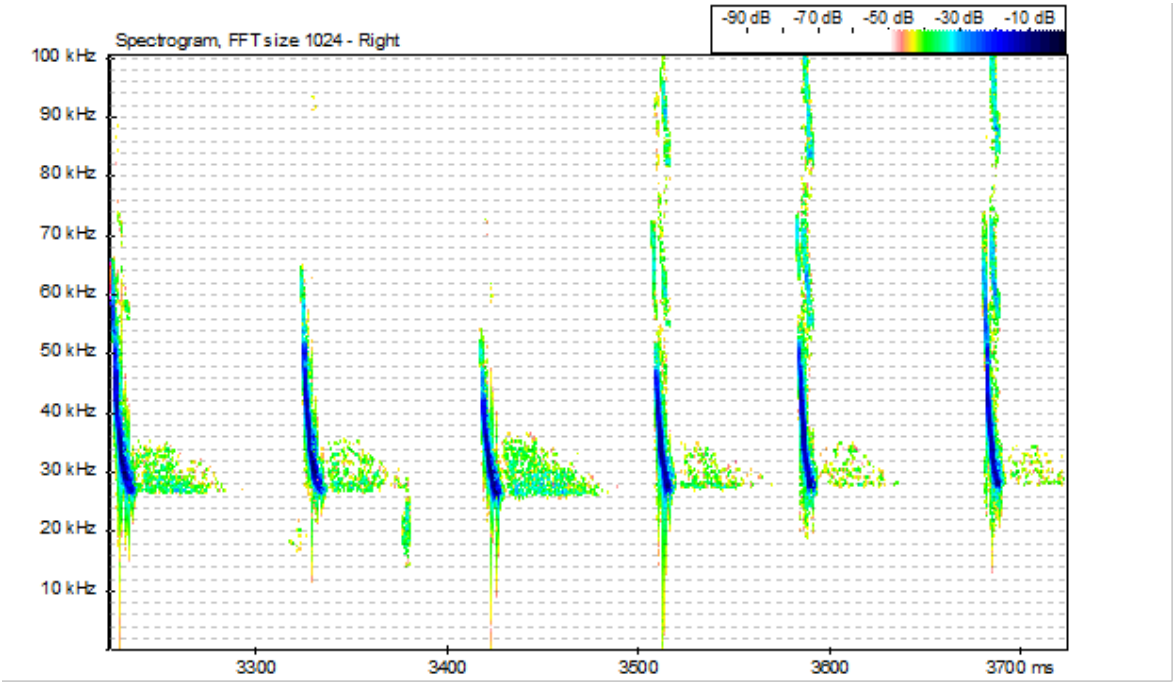


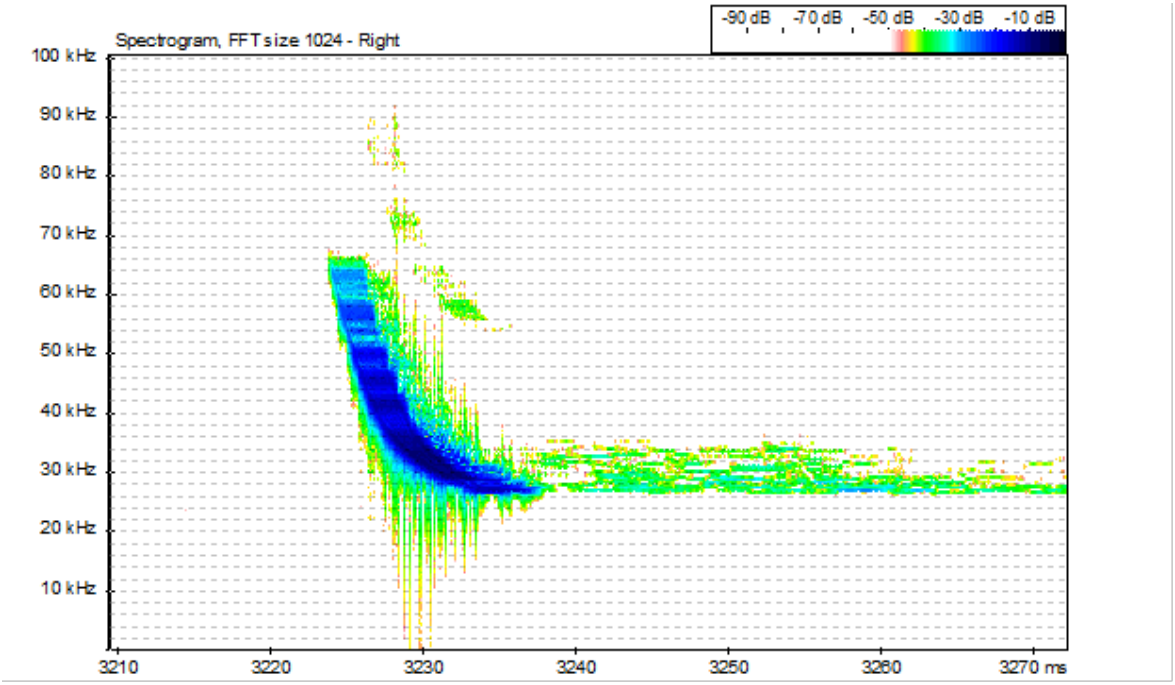
40-29.08.11.C-004

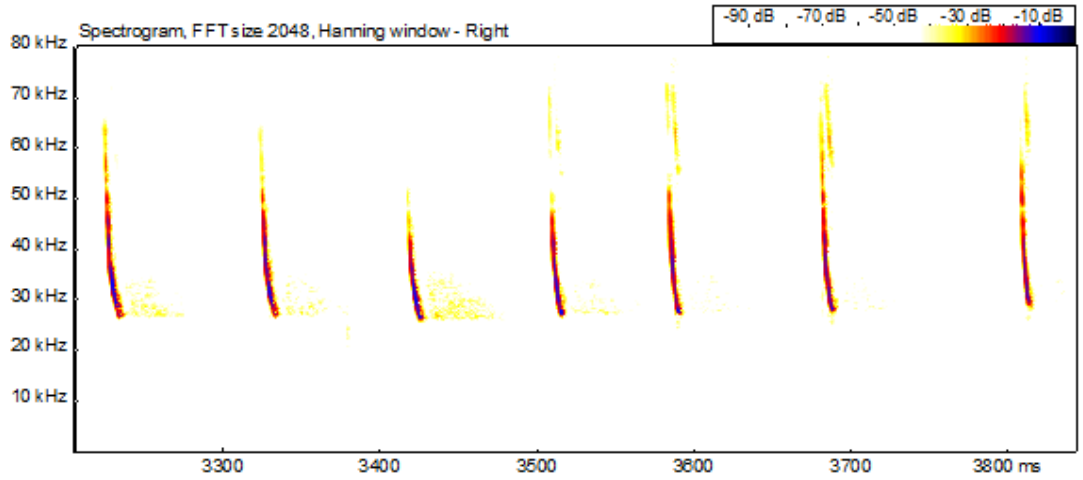
Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
10,08	66,1	32,29	26,3
12,31	64,5	32,91	26,1
10,37	51,8	30,98	25,5
10,85	51,6	27,88	26,2
10,49	52,8	29,87	26,8

Average pulse separation 101,57 ms

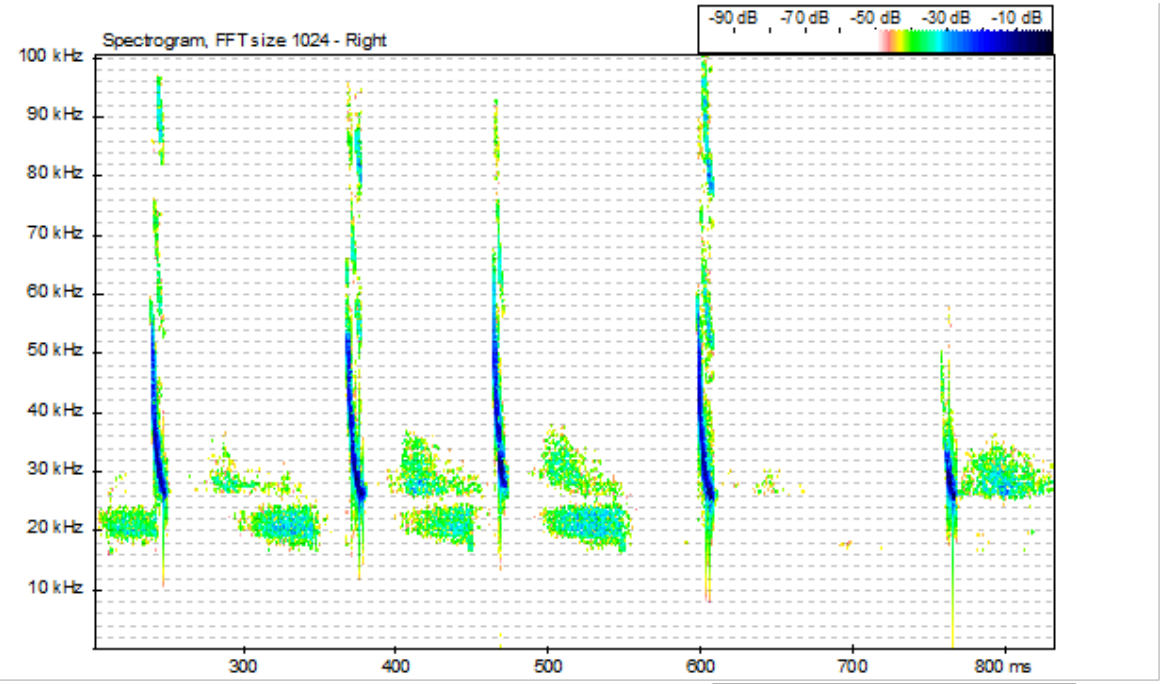


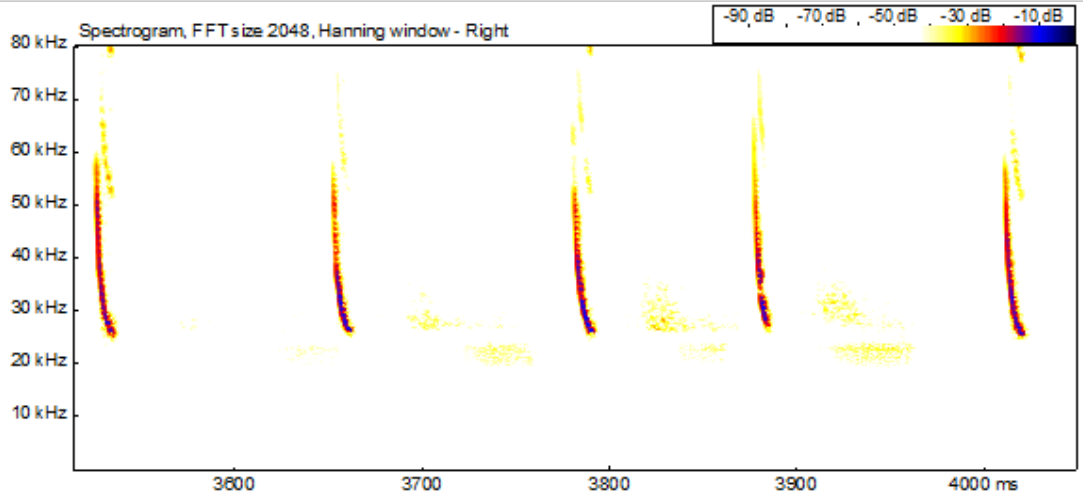

Spectrogram, FFT size 1024 - Right
-90 dB -70 dB -50 dB -30 dB -10 dB
100 kHz
90 kHz
80 kHz
70 kHz
60 kHz
50 kHz
40 kHz
30 kHz
20 kHz
10 kHz
3300
3400
3500
3600
3700 ms

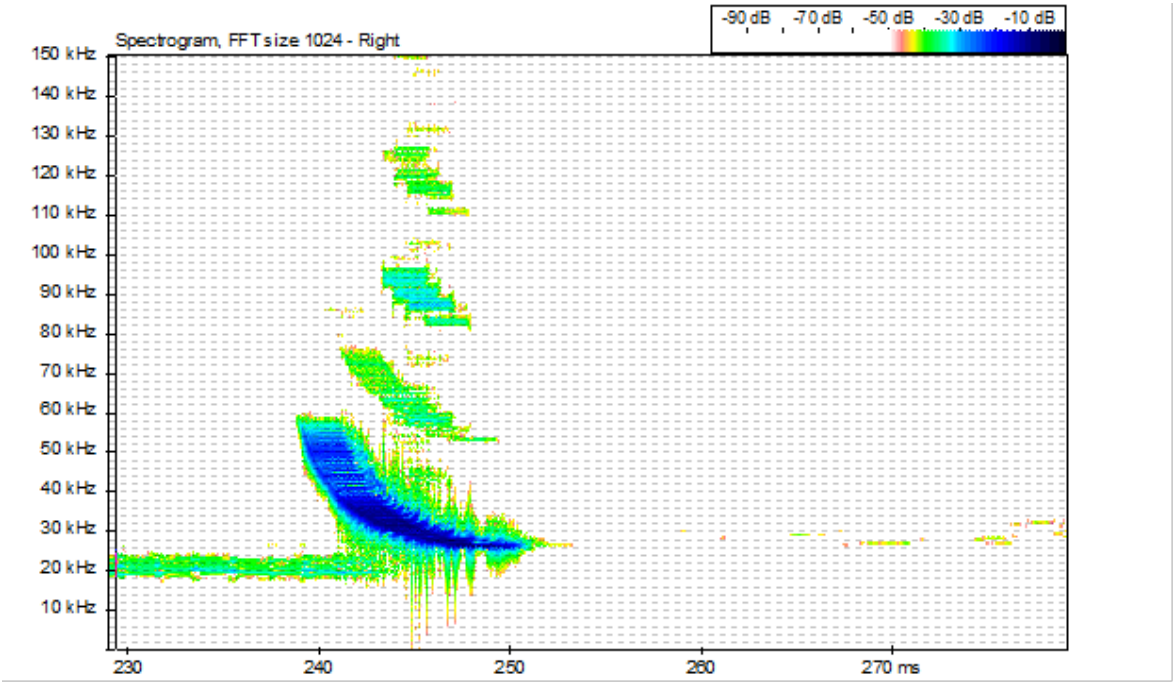

Spectrogram, FFT size 1024 - Right
-90 dB -70 dB -50 dB -30 dB -10 dB
100 kHz
90 kHz
80 kHz
70 kHz
60 kHz
50 kHz
40 kHz
30 kHz
20 kHz
10 kHz
3210
3220
3230
3240
3250
3260
3270 ms



40-29.08.11.C-005



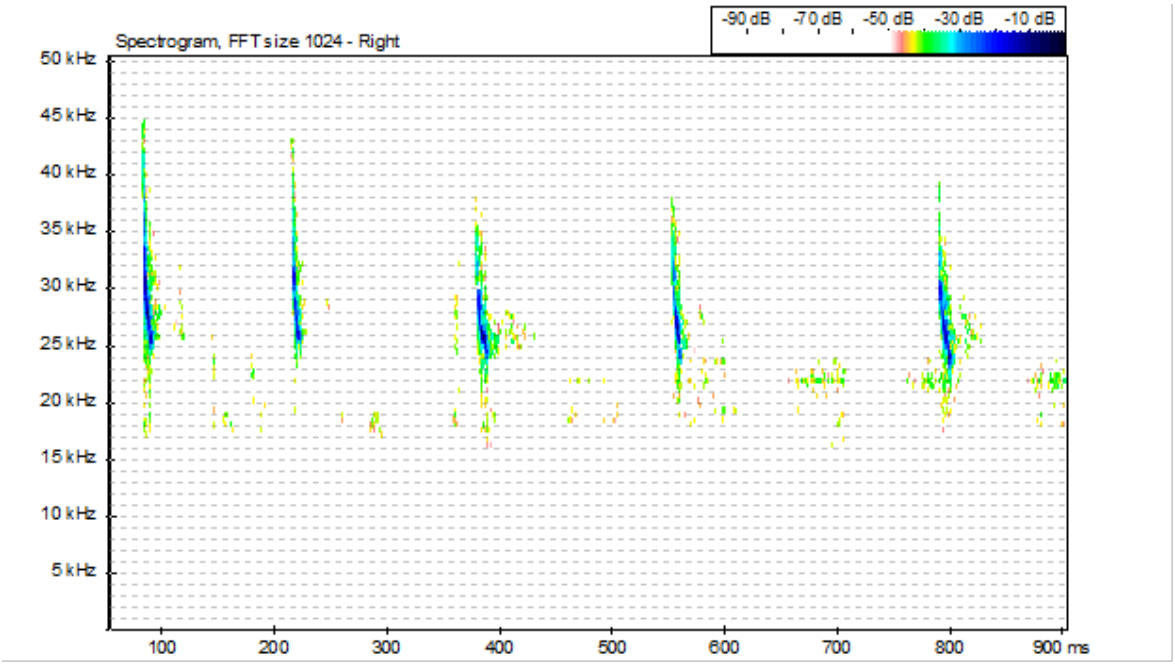


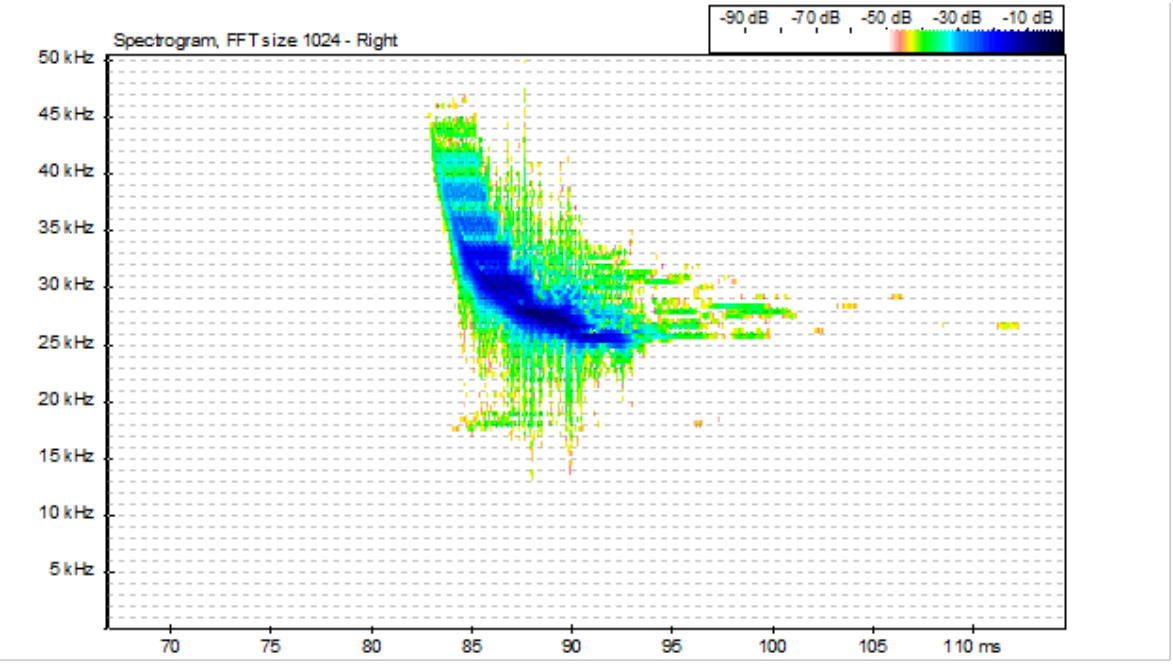


40-29.08.11.C-006

Pulse duration, ms	Frequency, kHz		
	Upper limit	When sound power is maximum	Lower limit
8,14	48,2	27,6	23,6
7,64	46,2	29,1	24,5
9,7	39,4	26,2	22,6
10,2	39,9	27,6	22,6

Average pulse separation 283,0 ms




Spectrogram, FFT size 1024 - Right
-90 dB
-70 dB
-50 dB
-30 dB
-10 dB
50 kHz
45 kHz
40 kHz
35 kHz
30 kHz
25 kHz
20 kHz
15 kHz
10 kHz
5 kHz
70
75
80
85
90
95
100
105
110 ms