**Project title**

Avifauna in Arctic Tundra: Acoustic Monitoring of Birds in Northeast Siberia, Russia

**Summary**

**Background and Relevance**  
*Introduce your project, including the need you want to address. Tell us why the issue is important. Cite relevant literature, media coverage, or previous work where applicable (include citations in the Works Cited section below).*

1. Introduce the environment of Siberia Tundra, connect to birds

Located at the top of northern hemisphere in Asia, Siberian arctic tundra is favored by numerous migratory bird species (cite). Large river deltas support 40 – 60 breeding species each summer (Pearce et al., 1998; Goryachkin et al., 1994). Among the tundra areas, the Indigirka delta (70˚N, 148˚E ) is the most productive location and is the breeding ground for many rare species, such as Siberian Crane (*Leucogeranus leucogeranus*), which is listed critically endangered in the Red List of IUCN (International Union for Conservation of Nature). Other characteristic species include Sandhill Crane (*Grus canadensis*), Yellow-billed Loon (*Gavia adamsii*), Ross’ Gull (*Rhodostethia rosea*), and Steller’s Eider (*Polysticta stelleri*). It is not exaggerate to say that Indigirka delta is one of the most important breeding grounds for migratory birds in the world.

1. The importance of the research but difficult in conduct

Recently, people are concerning about the release of contaminants from mining operations might harm the breeding areas for the birds of Indigirka delta tundra region, but quantitative data is lacking (cite). Even with several bird counting projects dating back to 1990s (cite), the Siberian tundra in is still one of the least explored location due to the harsh natural environment. The arctic tundra has scarce food sources, limited fire fuels, and low temperature. Furthermore, the lack of transportation and the short summer (i.e., 50 to 60 days) significantly constrain the spatio-temporal scale of the bird study. Quantitative description for bird community in Siberian tundra is urgently needed and a new method must be imported to enhance the spatio-temporal scale of monitoring.

1. Proposed solution

We proposed to import automatic recording system, which is a new method for monitoring bird community in the arctic tundra, into Indigirka delta. Autonomous recording system has been applied in diverse ecosystems to remotely and non-invasively monitor bird community (cite). Species richness, abundance, composition, and other quantitative data can be derived. With the recordings, automatic recording systems are proved to have the same or even better detection ability than traditional field survey (cite). Given the progressive vocal activity of the breeding birds in arctic tundra, applying autonomous recordings systems in tundra is promising and will definitely enhance our understanding for the avifauna.

1. Research goals, expected results, significance of the research,

This study will be the first attempt of applying automatic recording system in Siberian tundra for monitoring migratory birds. By setting up the system, we want to examine the bird species richness, abundance and community compositions dynamics in different habitats along the breeding season (i.e., May to July). Large area and Long-term detection of birds in tundra’s harsh environment is not possible with conventional survey methods but can be achieved by the automatic recording system. We are very optimistic in setting up the system. We look forward to exploring the beauty of avifauna in arctic tundra with bioacoustics.

We examined the potential constrains for the research (permit to get into reserve, local collaboration, weather limitation for recordings systems, which will be discussed in the method section)

Even with the harsh constrains, we are optimistic for setting the systems in the tundra, with details in the method part.

In 2019 summer, we proposed to set up the recorders in the tundra for monitoring bird population. We are especially interested in the following target species:

1. Siberian Crane: The rarest species breeding in tundra
2. Rough-legged Buzzard: wintering in south Asia, where people poison rats and mouse and cause the population decline.
3. Sandhill Crane: A competitor of the Siberian Crane
4. Tundra’s Swan: A competitor of the Siberian Crane
5. Ross’s Gull: Not yet well studied in Indigirka river
6. Jack Snipe: The nest hasn’t been found in Yakutia.

The introduction should cover the key elements of your proposal, including a statement of the problem, the purpose of research, research goals or objectives, and significance of the research. The statement of problem should provide a background and rationale for the project and establish the need and relevance of the research. How is your project different from previous research on the same topic? Will you be using new methodologies or covering new theoretical territory? The research goals or objectives should identify the anticipated outcomes of the research and should match up to the needs identified in the statement of problem. List only the principle goal(s) or objective(s) of your research and save sub-objectives for the project narrative.

The introduction should cover the key elements of your proposal, including a statement of the problem, the purpose of research, research goals or objectives, and significance of the research. The statement of problem should provide a background and rationale for the project and establish the need and relevance of the research. How is your project different from previous research on the same topic? Will you be using new methodologies or covering new theoretical territory? The research goals or objectives should identify the anticipated outcomes of the research and should match up to the needs identified in the statement of problem. List only the principle goal(s) or objective(s) of your research and save sub-objectives for the project narrative.

**Goals and Objectives**

*What do you plan to accomplish with this project?*

*\*A goal is a simple, clear, and general statement of the desired outcomes; there may be more than one goal. The objectives should be derived from the goal statement, defining specific, measurable targets; please make clear to which goal the objectives are linked.*

Goal 1: Using automatic recordings in Indigirka delta to monitoring birds activity during the breeding season.

*Monitoring the bird population in Indica river by audio recordings.*

*Understanding the conservation work has been done in Russian area.*

I think the project is very good. No need to hurry, calmly write more details about the method with automatic sound recorder. it's will be new method for monitoring of birds of tundra. You are right not enough researchers because very hard natural conditions and too long distance from Yakutsk. The time for accounting birds too short. I'm plan to back to Yakutsk on 06 July. Need to choice the points for an annual voice recording on the different biotopes.

**Methodology Detail**

*Detail the methods you will use to complete your project and why these are the best methods. Note any special or unusual tools or techniques you plan to employ. List and describe the steps you will take to implement your approach, and provide a timeline for implementation. Indicate which populations, communities, and/or locations you will target with this project. If appropriate, specify the anticipated number of participants/subjects.*

**Study area**

The Indigirka river delta is protected within the Kytalyk Reserve.

Put 4 sets of systems in different location of tundra

**Species list**

**Recording equipment**

Microphone and recording units: Omnidirectional microphone +tripot+recorder (frequency response, direction, sampling rate)

Time coding methods: Recording time (season, day, time of the day), GPS location

**Automatic recording**

How to set the time and location

**Audio interpretation**

Signal classification (Xeno-Canto)

Richness

Abundance

Composition

**Time line**

**Methodology Justification**

*Explain why you believe the activities you have planned will achieve the result(s) you expect. Include any assumptions necessary for this project to succeed (e.g., critical relationships or external factors outside of your control).*

Sergei is the person who studied the Siberian Crane for 27 years and visited Tundra every summer in Indica area locating the nests of Siberian Cranes.

I have visited the tundra in 2017 summer recording the bird sounds and understand the environment of tundra, limitations and restrictions. My personally know how to do audio processing and field recording. Audio research is a new import in Yakutia area but it is doable and will definitely help the scientists working in tundra.

Weather condition for recording systems:

**Summary of Outputs and Results**

*Please describe all relevant outputs you expect to produce (e.g., data, new tool, new method, media). Describe the changes, if any, you expect to result from these outputs and specify who/what will benefit.*

**How do you plan to disseminate your results and to whom?**

Share the data with Russia Academic of Science.

**How will you evaluate your work and results?**

*Please list the indicators you will use to monitor progress toward your goal(s). Include current baselines and expected targets, if applicable.*

**External Capacity Development**  
*If applicable, please describe how your project contributes to the socioeconomic or professional development of local students, community members, collaborators, or other individuals through education, training, mentoring, or other methods.*

**Works Cited**

*As appropriate.*