

## **Efforts to enhance the economic value of bio-pest control by migratory birds in desert agriculture**

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### Introduction

Migratory songbirds may offer substantial pest-control services to the agriculture (Kross et al., 2016), for example to farmers of vegetable and fruit crops in the southern Arava region. However, as habitat quality for the migrants likely differs between farming practices and crops, we expect that the pest-control service will vary accordingly (Dänhardt et al., 2010; Blount et al., 2021). To understand these differences and measure the provided service, we will use radio-telemetry to study movements and quantify the (foraging) activity in agricultural and natural habitats.

In cooperation and exchange with other researchers with high experience in radio-tracking, we gathered a detailed list of equipment needed for a receiver station. This equipment was ordered from the different providers and arrived mostly in Eilat. Unfortunately, due to the start of the war in October, the delivery of the necessary equipment was delayed, and we were not able to meet a technician from the University of Oldenburg (Germany) to help us installing the receiver station. Therefore, we are installing the station now during the winter and will start the data collection fieldwork in the following spring. While Daniel Bloche was in Europe, he visited researchers working with the Motus radio-telemetry system on Öland (Sweden), where he learned technical and practical details. He gained knowledge on the installation and maintenance as well as on the data handling and tag deployment. This prepared us with the required expertise setting up and maintaining the receiver station at the IBRCE.

### Preparing the fieldwork Installation of a radio-telemetry receiver station in Eilat

We studied the southern Arava region thoroughly to find a suitable location for the radio-telemetry receiver station. To cover different habitat types, i.e. semi-natural and agricultural sites, we will place the antennas of the receiver station towards patches of each dominant habitat type. Placing the antennas in this way will allow us to study birds' stopover habitat selection and use after releasing the tagged birds at the receiver station. By analysing maps of the area and using our local knowledge, we selected and compared potential sites. For each potential site we investigated the expected coverage by the antennas due to the topographic setting of the present landscape. We selected the northern part of the IBRCE (International Birding and Research Center) as it is the most suitable site to answer our research questions. Here, the antenna facing towards the northern direction will cover agricultural dominated areas, the Elot Date plantations as well as several agricultural fields of various crop types. Meanwhile, the antenna facing towards the southern direction covers the restored area of the IBRCE bird sanctuary and the semi-natural surrounding area. The proximity to the IBRCE also allows us to tag birds at the ringing site and therefore take advantage of their standardized ringing efforts during spring and autumn migration seasons.

In the past month we did an intense literature review, identifying major knowledge gaps in the current state of art. Based on these knowledge gaps we developed research objectives to understand songbirds' habitat use in relation to agriculture better and answer further questions regarding their stopover ecology. More specifically we will study the habitat selection and use of migrants after releasing tagged individuals to understand their habitat preferences in relation to agricultural habitats. Furthermore, we will use the signal strength, as done in other studies on breeding songbirds (Morbey et al., 2018), to quantify (foraging) activity in the different habitats. During the literature review we compared potential study species that are both predominantly insectivorous and commonly occurring

at our study site. We selected 12 different study species, of insectivorous songbirds occurring at our study site in high numbers during both spring and autumn migration. These species will be tagged with the radio-telemetry tags (Nano Tags, NTQB2, Lotek). Now, we are preparing a detailed plan for the tag deployment during the fieldwork in the spring migration season of 2024 (March to May). In cooperation with the IBRCE we will deploy the 50 tags, that we ordered for this season. Noteworthy, this is only the first season of data collection within a larger research project planned for the coming 3 years covering both spring and autumn migration. Next summer, after the fieldwork, we will begin the radio-telemetry data analysis.