Carl von Ossietzky
Universität
Oldenburg

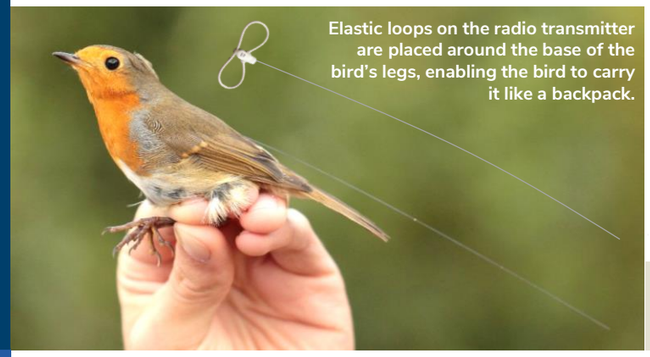
Radio telemetry

for bird migration research

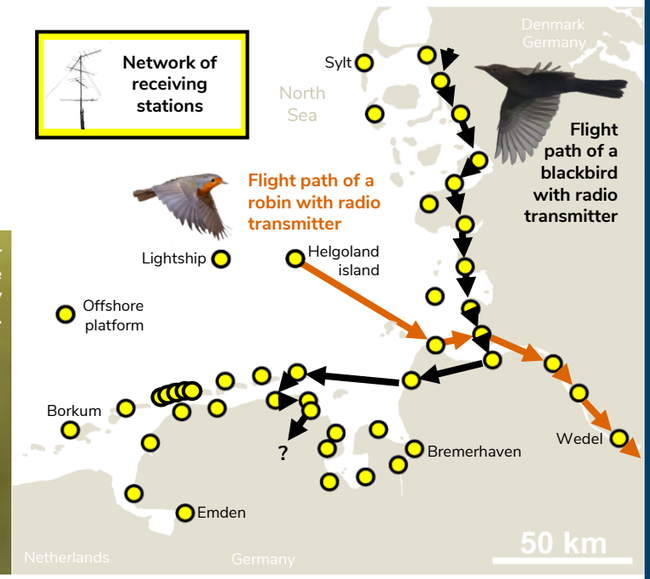
Information for site owners

Why bird migration research?

Billions of birds migrate between their breeding and wintering grounds around the world every year. Studying migration routes is important for species and nature conservation, basic research and to understand the ecosystem functions of migratory birds.



Elastic loops on the radio transmitter are placed around the base of the bird's legs, enabling the bird to carry it like a backpack.



Why radio telemetry?

While large birds such as storks, birds of prey or waterfowl can be tracked using satellite or cellular-based GPS transmitters, songbirds are too small and too light to be able to carry such devices without their behaviour being affected. Radio transmitters, on the other hand, have become so small that very light animals, such as bats, songbirds or even insects, can be outfitted with them and then tracked.

How does radio telemetry work?

The transmitters emit an individual radio signal that resembles a short 'click' every few seconds. This signal is picked up by a radio receiver. To increase the range of detection, directional Yagi antennas, such as those found on rooftops for TV reception, are used. Until a few years ago, the animals were tracked on foot with hand-held receivers, but nowadays, permanently installed, fully automated receiving stations have been established for detection.

Network effect

The individual antennas of a receiving station have a range of up to 20 km. Outside of this range, the flight path of the bird remains unknown. In order to record longer flight paths, several receiving stations are set up along suspected migration routes. International cooperation and standardisation allow for the creation of a global network. This means that not only one scientific team benefits from each station set up, but the entire community of bird researchers. More information, public data (including your future station) and current maps are available at: www.motus.org/dashboard

You too can contribute to this network and support bird migration research by providing a strategic location!

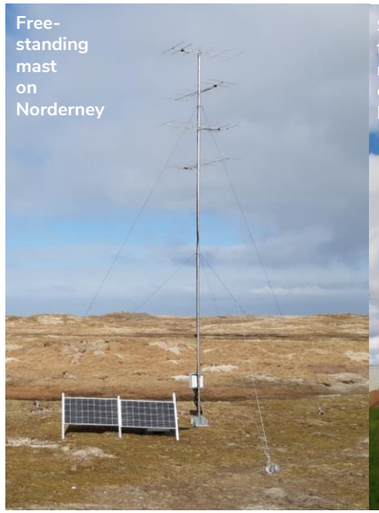
Motus
Wildlife Tracking System

"The more detailed our understanding of songbird migration over the sea gets, the better we will be able to judge the risks migrating birds are facing when en route conditions are altered, for example by artificial obstacles."

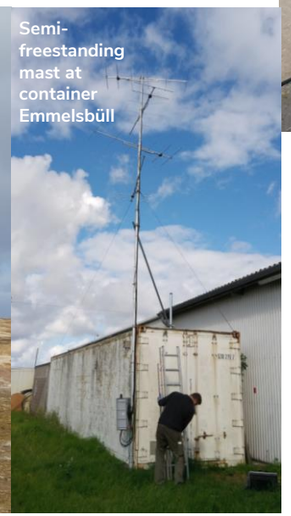
adopted from
Brust et al. 2019
Movement Ecology

Location

The location of new sites for radio receiving stations depends on the current research. As a general rule, the higher the station, the better (e.g. on lighthouses). In addition, a clear 'view' without structures such as dykes or buildings is necessary for optimum radio-reception.



Free-standing mast on Norderney



Semi-freestanding mast at container Emmelsbüll

Support structure

Various options are available as support structure for mounting the receiving antennas

(Semi-) Free-standing. We erect an aluminium mast up to 10 m high on a flat surface, which is stabilised with up to 6 guy ropes at 3 attachment points at a distance of around 4 m. Approx. 1 m long ground anchors (large pegs, similar to tent guy ropes) are sufficient for fixing to the ground. A semi-freestanding construction with attachment to existing structures (containers, house walls, etc.) is also possible.

Roof stand. On flat roofs, several (2-4) small roof stands approx. 2.5 m high can be erected, stabilised with paving slabs as weights, without damaging the roof (see photo).

Existing structures. Antennas can also be attached to existing structures such as railings or existing poles.

Individually tailored. Experience has shown that a suitable solution can be found for almost any location.

Roof stand Emssperrwerk

Antennas

As a rule, four 6-element ('cross struts') Yagi antennas are used per location (approx. 1 m wide, 2 m long), which point in 4 different directions. The distance between the antennas on a vertical mast must be 1 m, otherwise the reception performance will be impaired. The antennas can also be built as shorter 4- or 5-element versions, with the attachment at the beginning of the antenna (so-called 'foremast position') instead of in the middle (as with the free-standing masts). The antennas should not have any obstacles in front of them in the direction of reception. The antennas, as well as the entire structure, do not transmit any radio signals themselves, and are instead merely a passive receiver.

Data processing

The antennas are connected to a flexibly placeable box (approx. 20*30*40 cm) in which the electronics for data recording are installed. It contains a radio receiver, a GPS antenna and a cellular router for data transmission and remote maintenance.

In order to utilize the existing structure in the form of a railing on an offshore platform, antennas shortened to 5 elements were installed in the foremast position.

Power supply

Depending on the location, either a permanent power supply is available (a normal socket is sufficient) or or the station can be operated independently using a solar system (two panels, each 0.8 x 2 m, + aluminum box with buffer battery). The electricity consumption is less than 100 kWh per year.

Costs & contracts

Any electricity costs incurred (approx. <50 €/year) can be billed to us. Costs for materials, construction, installation, maintenance and dismantling are borne by us. Cooperation can be legally secured by means of a license/user agreement and, if necessary, a usage fee can be agreed upon.

Installation

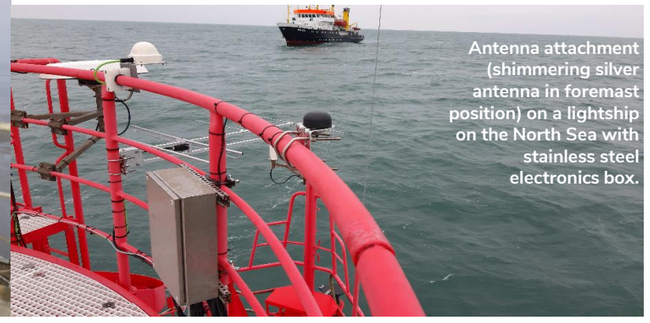
The construction of a receiving station is prepared on the basis of an on-site inspection or photos, so that the installation on site only takes a few hours and can be carried out by two people.

Maintenance

Our nearly 10 years of experience show that the receiving stations require very little maintenance. As a rule of thumb, the stations are checked every 2 years. From the software perspective, digital remote maintenance is carried out via cellular connection. A responsible electronics engineer from the University of Oldenburg accompanies the entire process from a technical perspective, from planning to construction and maintenance.

Dismantling

The receiving stations are to remain installed for an indefinite period, as no better system for songbird migration research is expected in the next 10 years. Should dismantling nevertheless be necessary, we will of course take care of it.



Antenna attachment (shimmering silver antenna in foremast position) on a lightship on the North Sea with stainless steel electronics box.

Carl von Ossietzky Universität Oldenburg
Institute of Biology and Environmental Sciences
Group Migration Ecology
Prof. Dr. Heiko Schmaljohann

Ammerländer Heerstr. 114 – 118
26129 Oldenburg
Phone +49 441 798 – 3332
Room A1 3-314
heiko.schmaljohann@uni-oldenburg.de
www. uol.de/en/migration-ecology

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DFG Deutsche Forschungsgemeinschaft

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Niedersachsen