

Eurasian-African Bird Migration Atlas

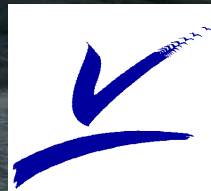
Fernando Spina, Stephen S. Baillie, Franz Bairlein, Wolfgang Fiedler, Kasper Thorup (eds)
on behalf of



2022

Franz Bairlein

Institute of Avian Research
Wilhelmshaven

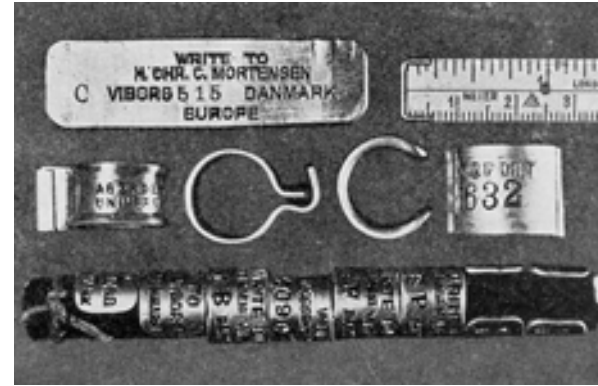


MPI of Animal Behavior
Radolfzell/Konstanz

Photo: R. Nagel

Milestones

1899
bird ringing



Hans Christian Mortensen (1856–1921) [Denmark]

1903



J. Thienemann
(1863-1938)



„Vogelwarte Rossitten“
Rossitten Bird Observatory
Germany

1903: Hungary

1904: Helgoland/Germany
United Kingdom

1911: Netherlands
Russia
Sweden

Switzerland

... 1930: in virtually all European countries

Milestones

Meeting (of all national schemes from the non-Soviet controlled Europe) Paris 1963

proposal for „*common sense*“ in bird ringing by



Albert C. Perdeck
1923-2009



Robert Spencer
1923-1994



Gerhardt Zink
1919-2003

At the beginning of the meeting, the delegates were anything but positive toward the suggestions (Preuss 2001)



<https://www.euring.org/>

Milestones

1966

EURING Code Manual

„to allow easy data transfer
between schemes and
simplified analysis“

1977 The EURING Data Bank (EDB)

hosted by the Dutch ringing scheme, 2005 → BTO

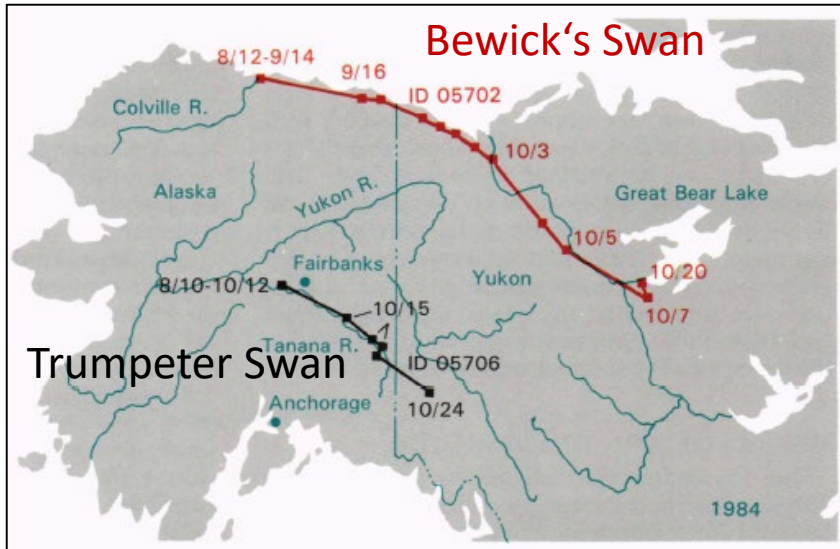
**currently > 47 mio records of >12 mio ringed birds
of > 600 species**



Milestones

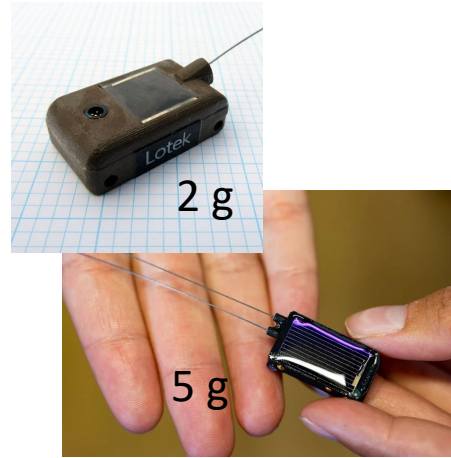
Animal tracking

1984 Satellite-telemetry

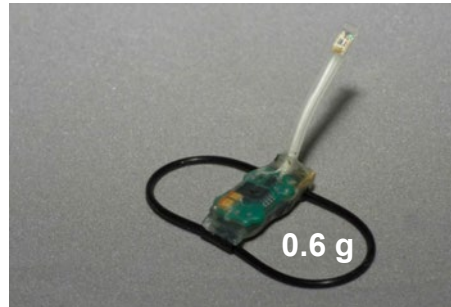


Strikwerda et al. 1985
[PTT 170 g]

today



2003 Light-level geolocation



2007



<https://www.movebank.org/cms/movebank-main>

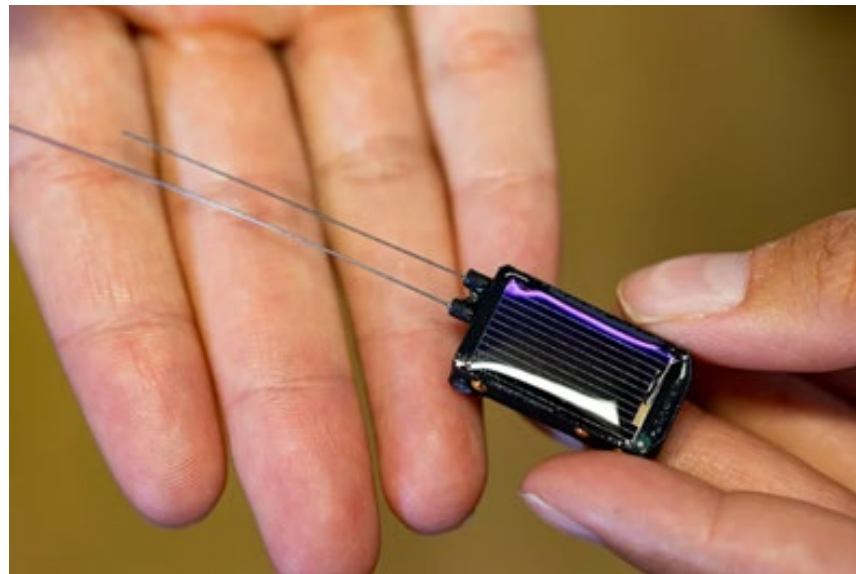
hosted by the

**Max Planck Institute of Animal Behavior,
Germany**

as of August 2026,
11.6 billion animal locations
10,143 studies
1,701 taxa



+



= ***Migration
Atlas***

300 species
with sufficient ringing
data

>100 tracking studies

Thanks
to the
Government of Italy
which granted a pledge of 1 M Euros to **CMS**

The Eurasian African Bird Migration Atlas

Mapping EURING ringing data and Movebank tracking data for 300 species

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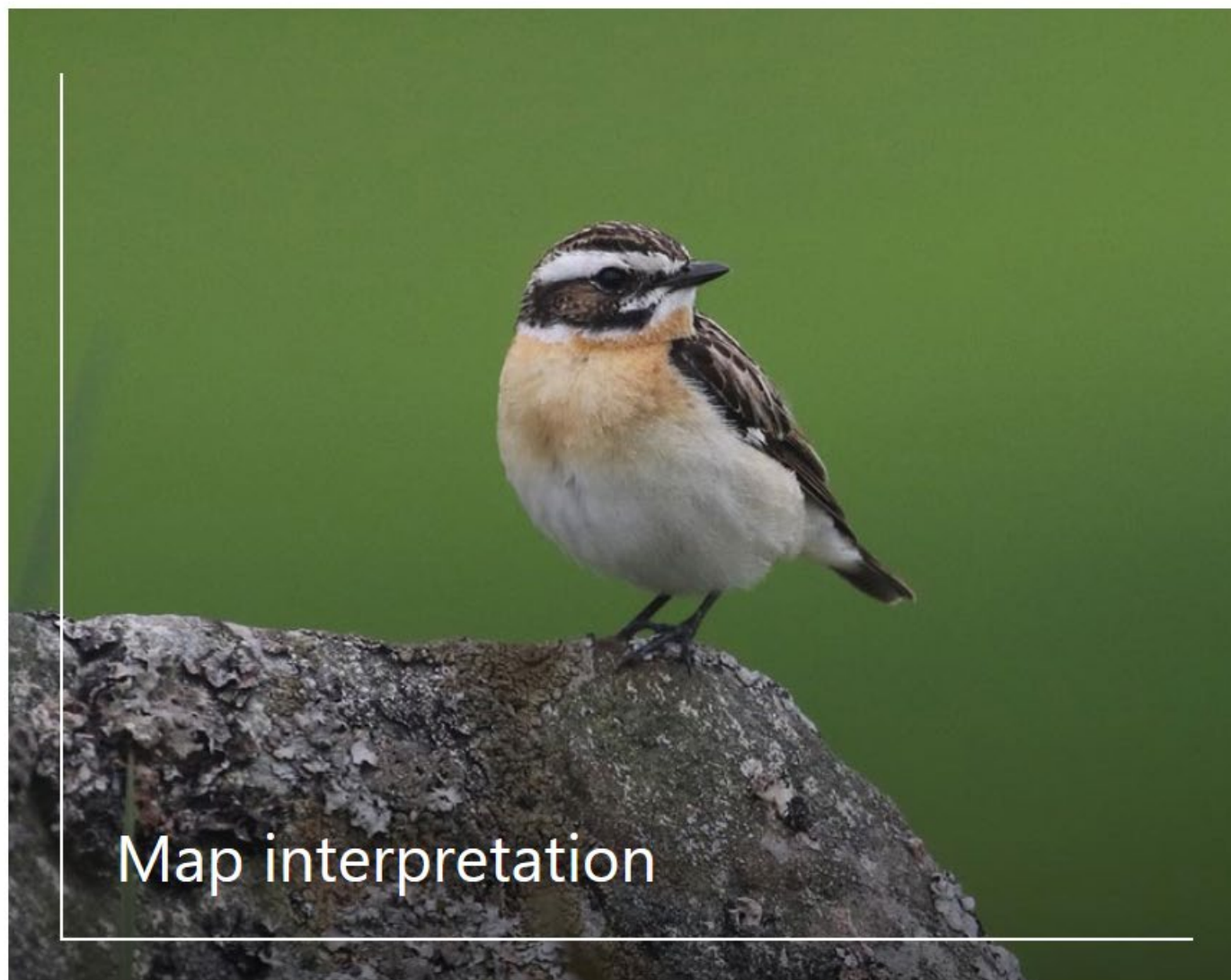
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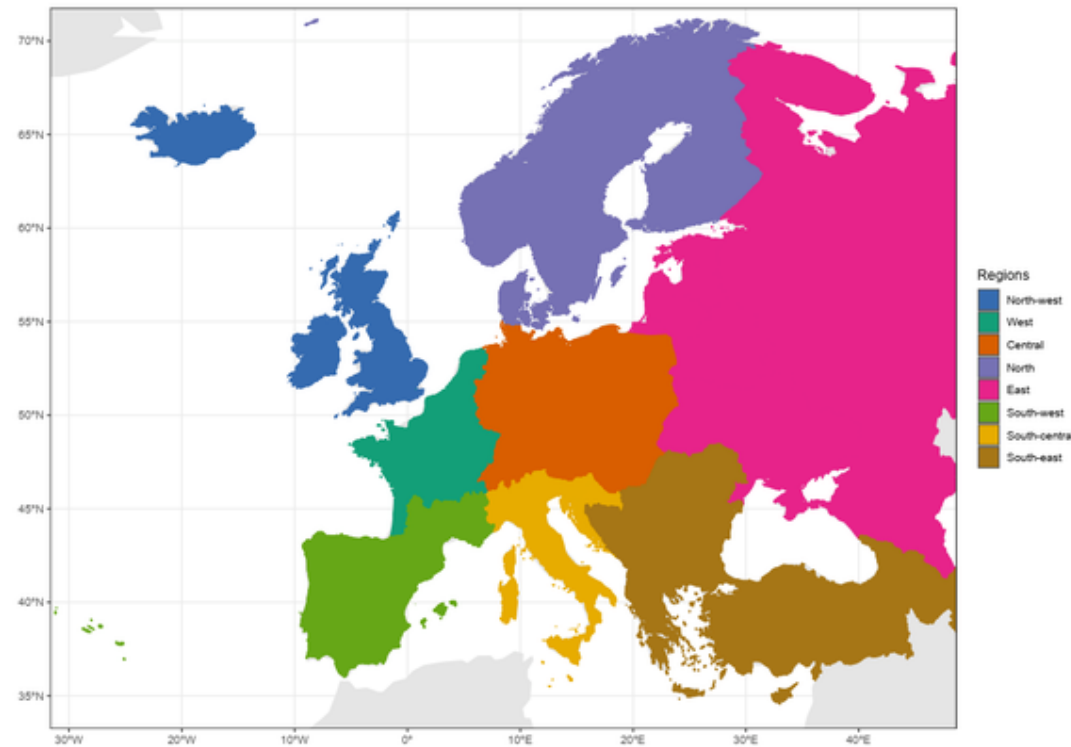
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Geographic regions of Europe

Countries are grouped into the geographic regions shown below. Regional groupings generally fall along geopolitical boundaries, apart from 28 EURING regions in southern France which are grouped into the South-west region with Iberia; and Corsica which is grouped in the South-central region. On the overall connectivity map, ringing and recovery encounters originating from these geographic regions are coloured according to the palette shown below. Any recoveries of individuals ringed outside of these regions are categorised as 'Other', coloured in dark grey.



Geographic regions of Europe, as grouped for the Migration Atlas.

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Data validation and filtering

Data validation

There are over 24 million ringing encounter records (where encounter = either a ringing or recovery event) in the EURING Databank (EDB). Data presented include records submitted up to January 2020. Not all EURING schemes submit ringing-only records of an individual, and so the data presented in the Atlas visualisations and statistics comprise only those individuals which have one or more recoveries in addition to the ringing event. The first data validation step was a geographic check to match the geographic coordinates of a record against its four digit place code indicating the country and region. The database was then searched for duplicate records where the same ring is recorded more than once by different ringing schemes. Records were then processed through a series of checks on a scheme-by-scheme basis. Validation checks looked for invalid codes in each field according to the [EURING Exchange Code 2020 manual \(v201\)](#). Logic checks generally examined the encounter history of individual rings and looked for cases where:

- Only a single encounter of a ring was present in the database;
- The ringing event was missing;
- More than one encounter of a ring was recorded as the ringing event;
- The species code as recorded by the ringing scheme changed between encounters;
- The ringing event was not recorded as chronologically first in the encounter history;
- An individual was recorded as alive after it was recorded dead;
- An individual was recorded as a chick in more than one year;
- An individual was recorded as dead on more than one encounter.

Data filtering

Data were subsequently filtered for inclusion in the Atlas. Records were excluded if:

- Coordinate accuracy could not be specified to a radius of less than 500 km;
- Coordinates did not match a given place code to within 50 km of either the region or the country specified by the place code; or, the geographic check matching coordinates to place codes did not return any information;
- Any invalid EURING codes in the fields: date, geographical coordinates, metal ring information,
- It was a same-day recapture of the same bird;
- It was the only encounter of that ring present in the database.

Entire encounter histories of an individual ring were excluded if:

- The ringing event was missing;
- More than one encounter of a ring was recorded as the ringing event;
- The species code as recorded by the ringing scheme changed between encounters;
- The ringing event was not recorded as chronologically first in the encounter history;
- An individual was recorded as alive after it was recorded dead;
- An individual was recorded as a chick in more than one year.

Data-rich individuals and species

Certain species were particularly data-rich and required randomised sampling to further reduce the number of records displayed. Randomised sampling was conducted at two levels:

- **Individuals** - For certain species, especially those where colour-marking is prevalent, individuals may have data-rich encounter histories if they have been resighted many times. Furthermore, many of these resighting encounters may be from the same or nearby locations week after week within a season, which contribute little additional information on overall migratory movements. We randomly selected one encounter per month for an individual with clusters of three or more locations within 50 km of one another. Despite this subsampling approach, some individuals with very rich encounter histories are still apparent on maps as heavily demarcated lines between locations.
- **Species** - To further reduce the number of records for data-rich species, species with > 10,000 recoveries were subject to further randomised sampling. Sampling reduced the dataset by removing an individual's entire encounter history at random, weighted proportionally towards those European regions which contribute the most records to the dataset. The default map view loads 10,000 recoveries (density filter = 0), with users able to load additional records in 10% increments using the density filter, to a maximum of +100%.

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The Eurasian African Bird Migration Atlas

Mapping EURING ringing data and Movebank tracking data for 300 species

Barn Swallow |

Arctic Redpoll
Arctic Skua
Arctic Tern
Atlantic Puffin
Audouin's Gull
Bar-tailed Godwit
Barn Swallow

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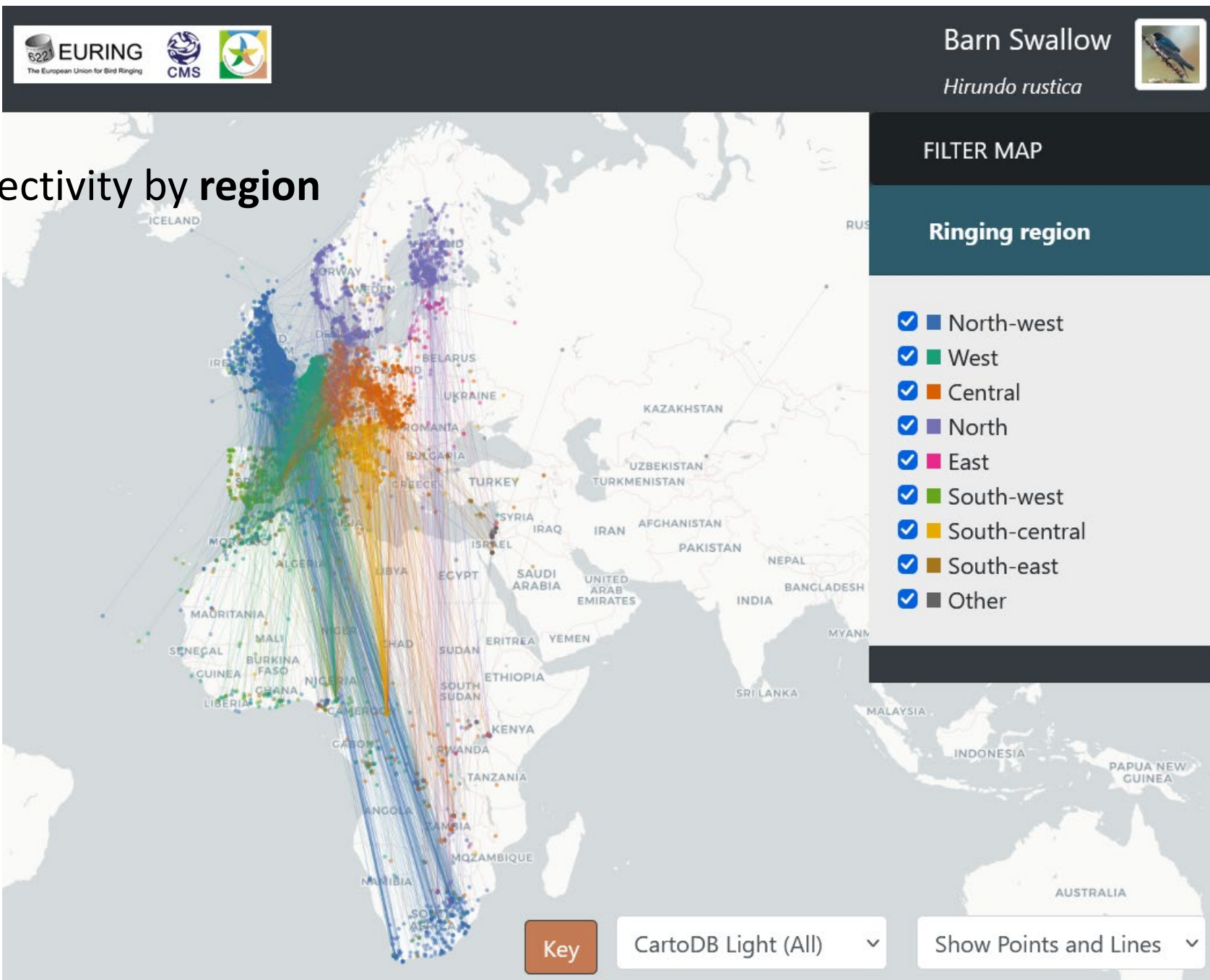
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Overall connectivity by **region**

Statistics

	N records	N individuals	N recoveries
Mapped data*	33643	16682	16961
Total available data	233110	105223	127887

*Mapped data include only distant (>= 50 km) recoveries

data thinning
by randomized sampling

Pie chart of recovery categories
Histogram showing distance moved by region (>= 50 km)
Number of encounters by region
Number of encounters, by 10-day period/month
No. of encounters by 10-day period/month by sex
No. of encounters by 10-day period/month by age
Number of encounters, by year

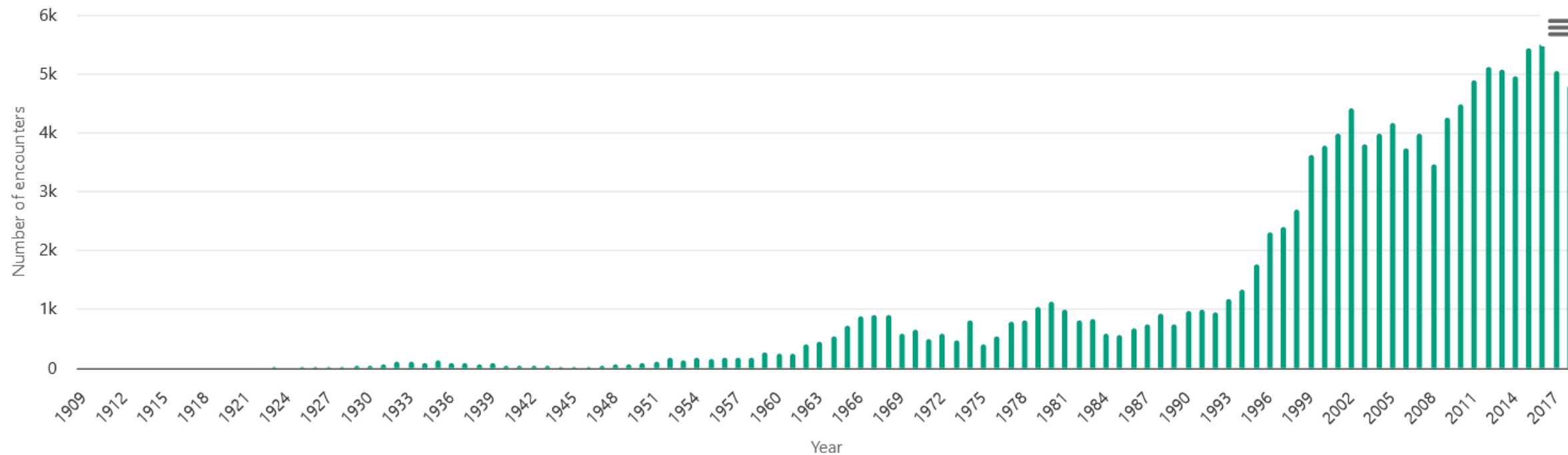
Statistics

Barn Swallow

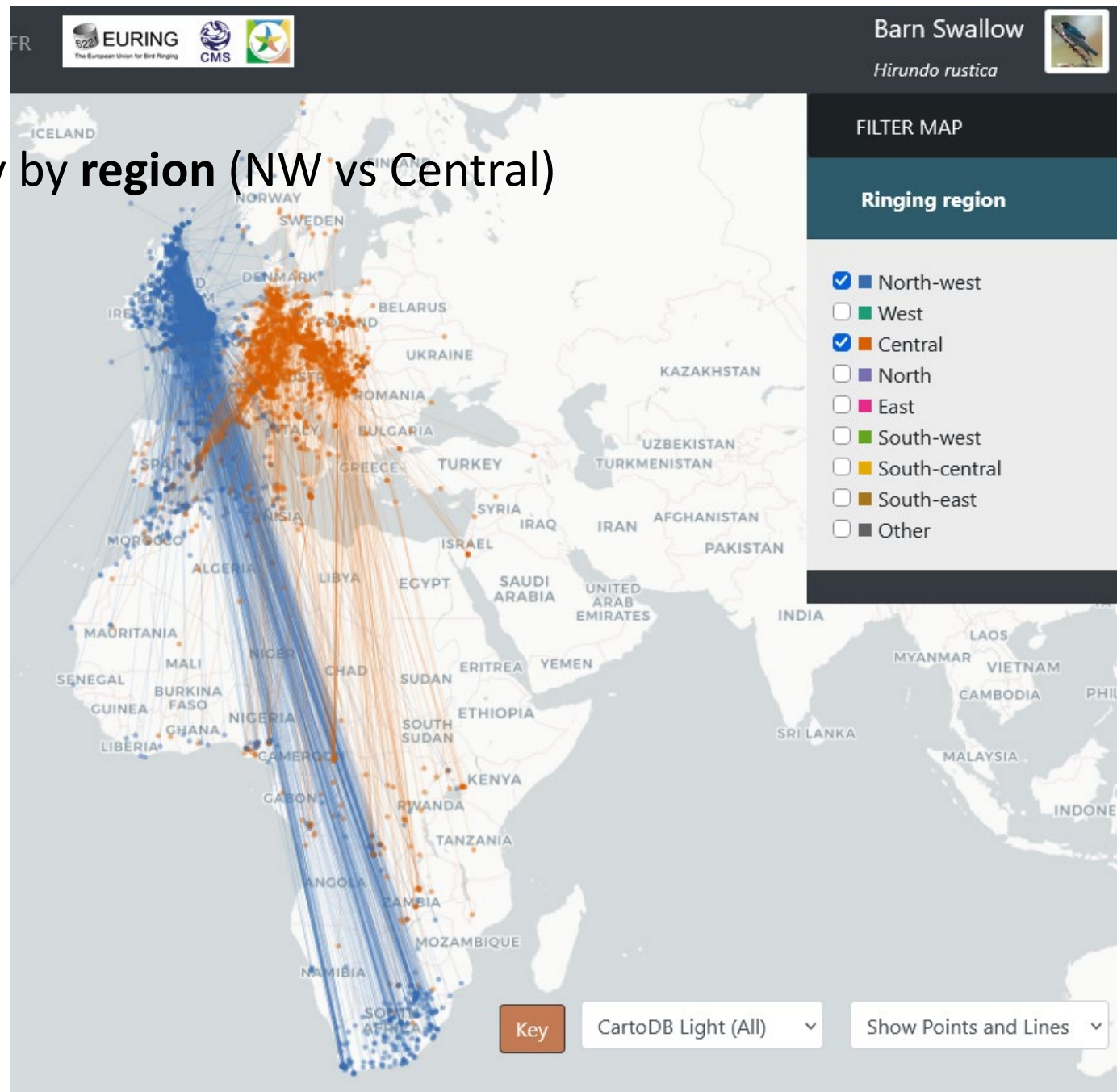
Hirundo rustica

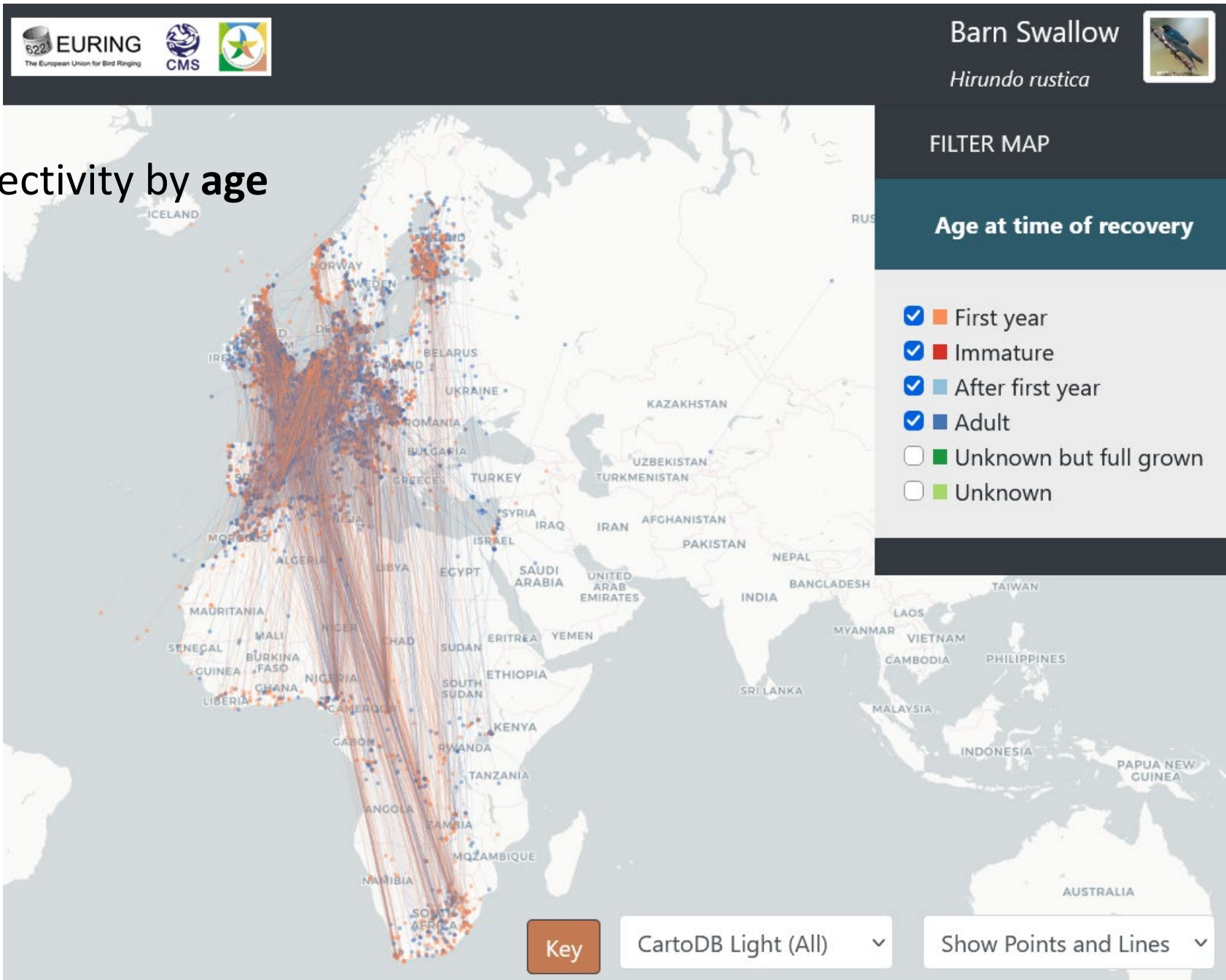


Number of encounters, by year



Overall connectivity by region (NW vs Central)





Overall connectivity by age



Overall connectivity by month & by region

Central region

FILTER MAP

Month

- ☒ January
- ☒ February
- ☒ March
- ☒ April
- ☒ May
- ☒ June
- ☒ July
- ☒ August
- ☒ September
- ☒ October
- ☒ November
- ☒ December

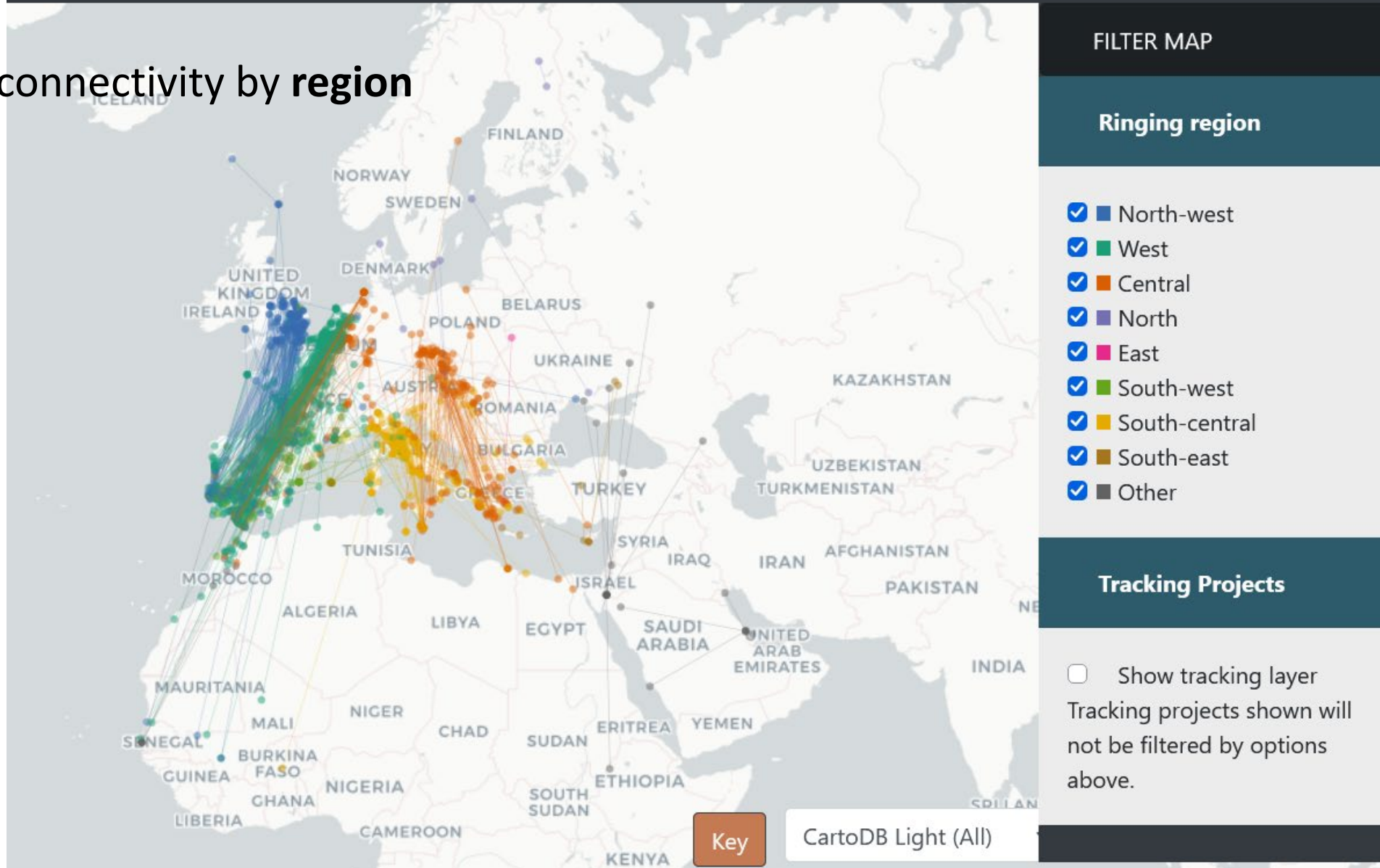
Key

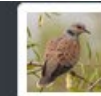
CartoDB Light (All) ▾

Show Points and Lines ▾

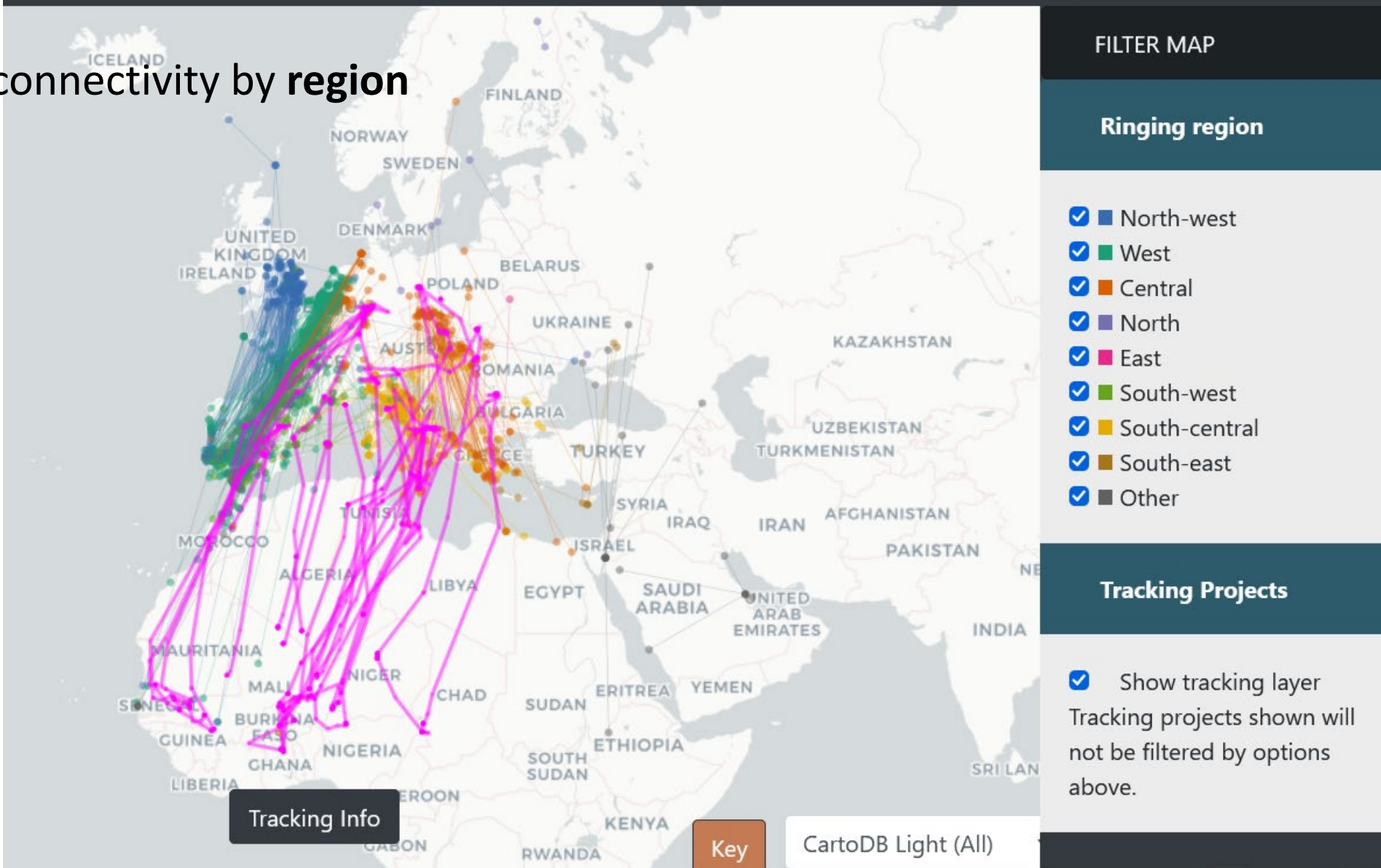


Overall connectivity by region





Overall connectivity by region



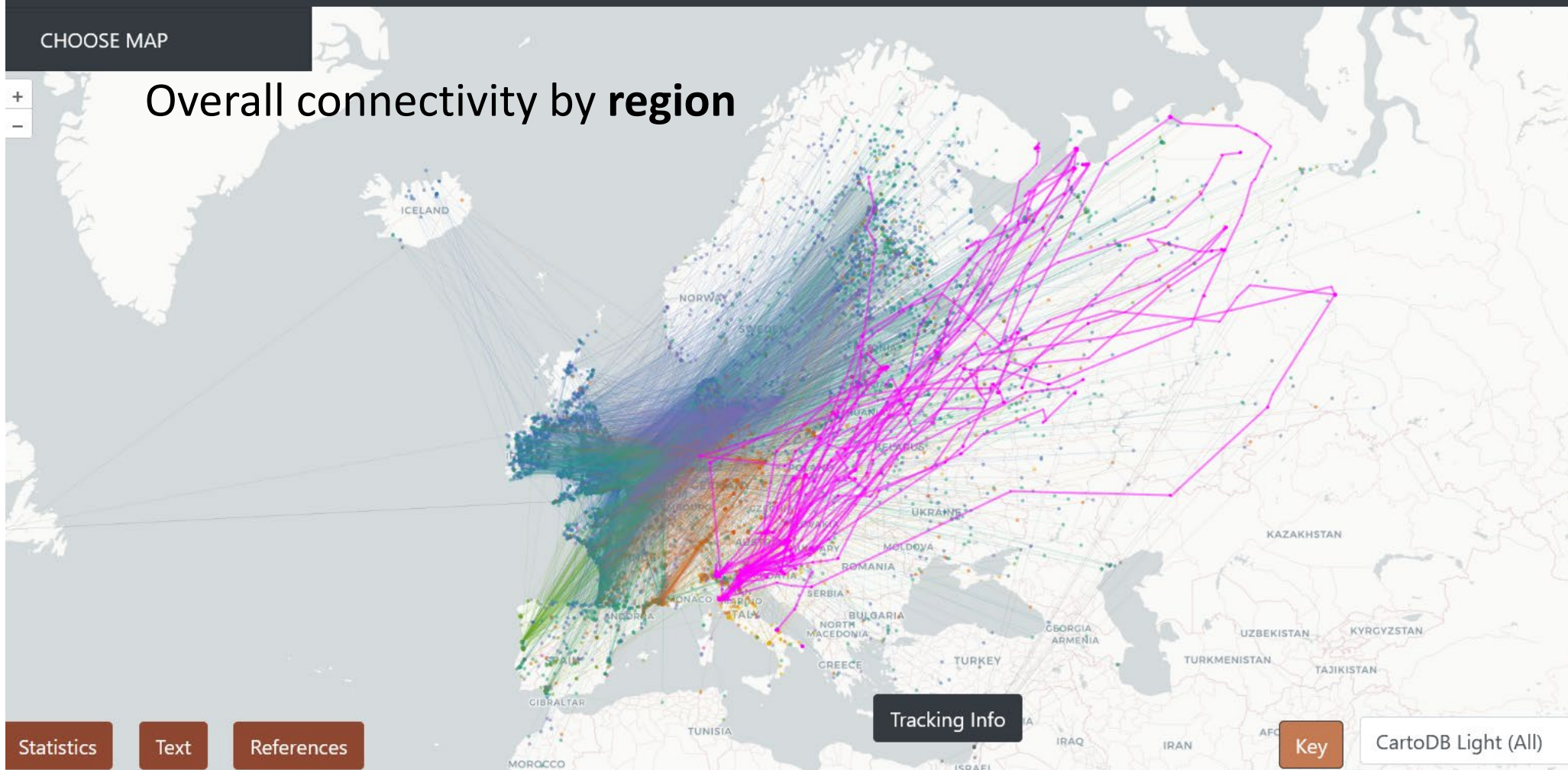


CHOOSE MAP

Overall connectivity by region

+

-



Statistics

Text

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Tracking Info

Key

CartoDB Light (All)

FILTER MAP

Ringing region

- ☒ North-west
- ☒ West
- ☒ Central
- ☒ North
- ☒ East
- ☒ South-west
- ☒ South-central
- ☒ South-east
- ☒ Other

Tracking Projects

- ☒ Show tracking layer
- Tracking projects shown will not be filtered by options above.

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Historical changes in migration patterns

Monitoring changes in movement patterns is important for the conservation and management of bird populations. Such changes might affect the seasonal distributions of populations and might lead to increases or decreases in population sizes.

[Read more](#)

Intentional killing of birds by man

The demographic effect of the taking of individuals from a population by man varies in relation to numbers, sex- and age-class of the individuals taken, as well as the stage of the annual cycle when the killing or trapping takes place.

[Read more](#)

Migration seasons of hunted species

Proper knowledge of the timing of prenuptial migration is essential and data of individually marked birds can provide this information.

[Read more](#)

Migratory Connectivity within the European African Migration System

Migratory connectivity is defined as the linkage among individuals between the periods and areas where they spend different phases of their annual cycle. The strength of migratory connectivity thus represents the extent to which individuals mix in different seasons.

[Read more](#)



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