Data Management in Movement Ecology - 2020

PROGRAM

1. **Introduction to Data Management in Animal Ecology** (Urbano & Cagnacci - 3 hours)
   1.1 Animal ecology data: challenges and opportunities
   1.2 Data Management and Spatial Database in Animal Ecology
   1.3 Installation of PostgreSQL/PostGIS and pgAdmin
   1.4 Connection to the database tracking_db
   1.5 Exploration of the main Database Features through pgAdmin Interface

2. **SQL and Spatial SQL** (Urbano - 16 hours)
   2.1 Introduction to SQL
   2.2 Overview of the database used for the exercises
   2.3 Schemas, tables, data types
   2.4 SELECT, FROM, WHERE
   2.5 AND, OR, IN, !=, NULL
   2.6 ORDER BY, LIMIT, DISTINCT, CASE, CAST, COALESCE
   2.7 LIKE
   2.8 GROUP BY (COUNT, SUM, MIN, MAX, AVG, STDDEV)
   2.9 HAVING
   2.10 Joining multiple tables
   2.11 LEFT JOIN
   2.12 Subqueries used in FROM and WHERE statements, WITH
   2.13 WINDOW functions
   2.14 INSERT, UPDATE, DELETE
   2.15 Temporal data (date, time, timezone), EXTRACT
   2.16 Spatial objects in PostGIS
   2.17 Create a point from coordinates
   2.18 Reference systems and projections
   2.19 Visualize spatial data in QGIS
   2.20 Create a line from ordered points (trajectory)
   2.21 Calculate distance between points and length of a trajectory
   2.22 Create a polygon from points (convex hull)
   2.23 Views
   2.24 Data export
   2.25 Roles and permissions
   2.26 Database backup and restore

3. **Cleaning and Storing an Ecological Dataset into a Database** (Urbano - 6 hours)
   3.1 Exploring a typical spreadsheet with ecological data collected in the field
   3.2 Identification and resolution of problems
   3.3 Creation of a table structure in the Database
   3.4 Import of dataset
   3.5 Consolidation of data and creation of constraints
   3.6 Use of SQL to retrieve information

3.7 Creation of views to assemble data for final users
3.8 Make a picture of the database data model with DBeaver

4. **Movement Ecology Data Management in PostgreSQL/PostGIS** (Urbano - 6 hours)
   4.1 Introduction to the goals and the datasets
   4.2 Create a database and import sensor data
   4.3 Create acquisition timestamps, indexes and permissions
   4.4 Managing and modelling information on animals and sensors
   4.5 From data to information: associating locations to animals
   4.6 Manage the location data in a spatial database
   4.7 From locations to trajectories and home ranges
   4.8 Integrating spatial ancillary information
   4.9 Data quality: how to detect and manage outliers
   4.10 Recap exercises
   4.11 Raster Data in PostGIS (demo)
   4.12 Functions and triggers (supplementary material)

5. **Movement Ecology Data Analysis in R** (van Loon - 6 hours)