Homework 7 – Analyzing animal movements

Handout 21 November 2022

Due Friday 5 December 2022

Adult female leatherback turtles were Argos satellite tagged off Playa Grande, Costa Rica, in the Pacific Ocean. These tracks have been filtered to remove spurious locations and regularized to give daily positions as latitudes and longitudes (decimal degrees). In the Week 13 homework folder on the Google drive you will find these daily position data files for each of five tracked leatherback turtles (ID 1, 2, 6, 7, and 8) named in the format "LeatherbackTurtle_ID1_DataForStudents.csv". Use these data to complete the following tasks and questions for each individual tracked turtle:

1. Map the track of each leatherback turtle.

It can be five separate maps for each individual or all five tracks plotted on one map with a legend.

2. Plot step length versus frequency on logarithmic scales for each leatherback turtle track.

3. For each turtle ID, does the distribution of step lengths fit a Lévy flight model distribution?

4. Calculate the median and maximum speeds for each turtle track (where speeds>0).

5. Plot the net squared displacement for each turtle track (solid black line), the expected net squared displacement for a correlated random walk (CRW, black dashed line), and for a biased random walk (BRW, gray dashed line) using the step lengths, turning angles and bearing from each track's distribution. There should be one graph for each track (five graphs total).

6. For each turtle ID, did they fit a correlated random walk, a biased random walk model, or neither?

7. What do these results suggest about the turtles' behavior during this tracking period? (A couple of sentences is fine)