

# Migratory connectivity analysis

by EURING Migration Atlas

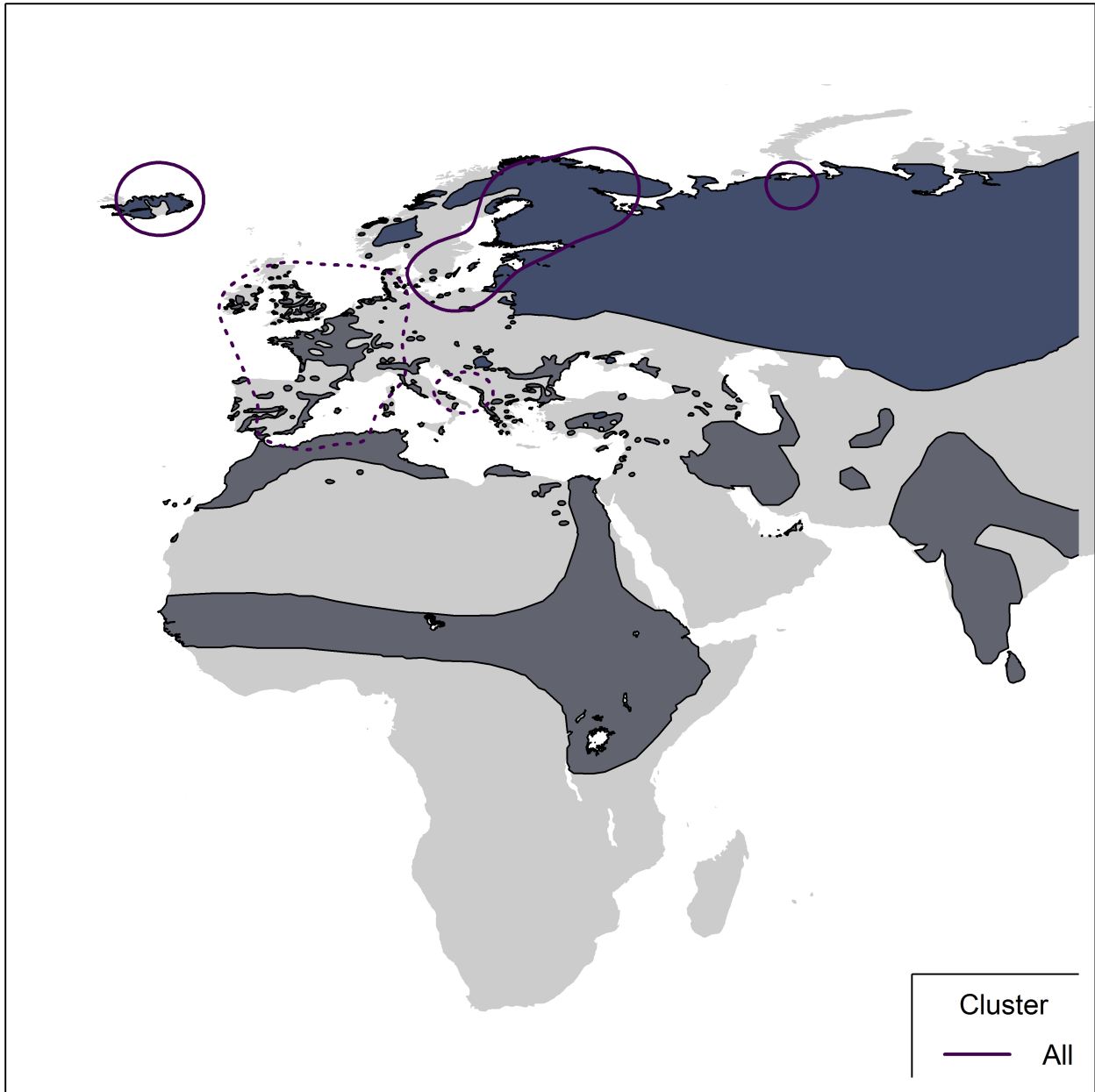
*Anas acuta* (EURING code 01890)

## 1.1 Connectivity between individuals

The analysis evaluated 34 individuals (68 encounters) filtered from a total of 18359 records in the EURING databank which were considered for the Atlas. The species does not show a significant connectivity (Table 01890-1; Figure 01890-1).

**Table 01890-1.** Results from the migratory connectivity analysis. For each cluster, the degree of connectivity ( $r_M$ ), its statistical significance (p-value) and 95% confidence interval limits are shown. When the p-value is less than or equal to 0.1, the degree of clustering structure (oasw) and the best number of clusters identified are reported.

Cluster name	Level of clustering	N individuals	Migratory connectivity ( $r_M$ )	p-value	Lower 95% confidence limit	Upper 95% confidence limit	Best number of clusters	oasw
0	0	34	0.04	0.336	-0.044	0.307	-	-

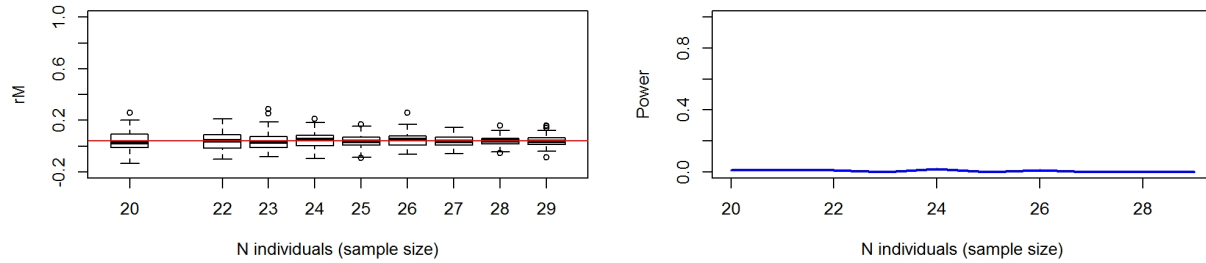


**Figure 01890-1.** Map showing 95% kernel contours of of first-level clusters identified by the migratory connectivity analysis, if any, or 95% kernel contours of all encounters, in case of no clustering structure. Solid lines indicate the clusters in the breeding range, dotted lines those in the non-breeding range. Different contour colours correspond to different clusters, as reported in legend. The species distribution range is also shown (breeding range: blue; non-breeding range: dark grey; resident range: beige; from BirdLife International, 2019).

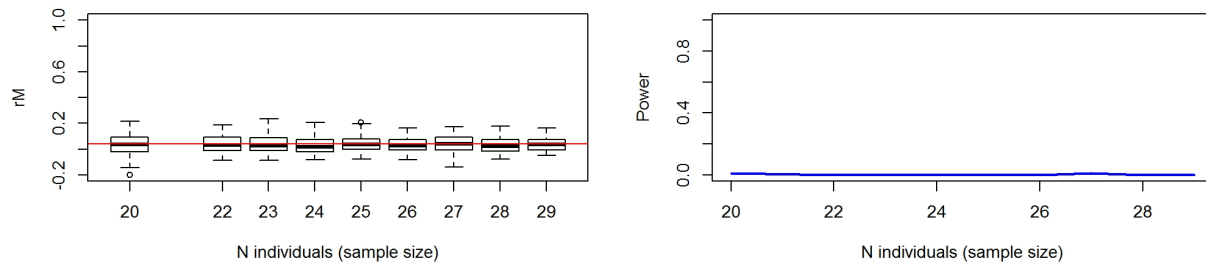
## 1.2 Sensitivity analysis

Results of power analysis and validation. Analyses at the species level were re-run on subsamples of individuals of decreasing size (100 repetitions per subsample size), according to simple random sampling of individuals (Figure 01890-2) and stratified sampling of individuals within the breeding range (Figure 01890-3) and the non breeding range (Figure 01890-4). For stratified sampling, we selected individuals with a

probability inversely proportional to the number of observation in each country. Figures below report the results of the procedure.

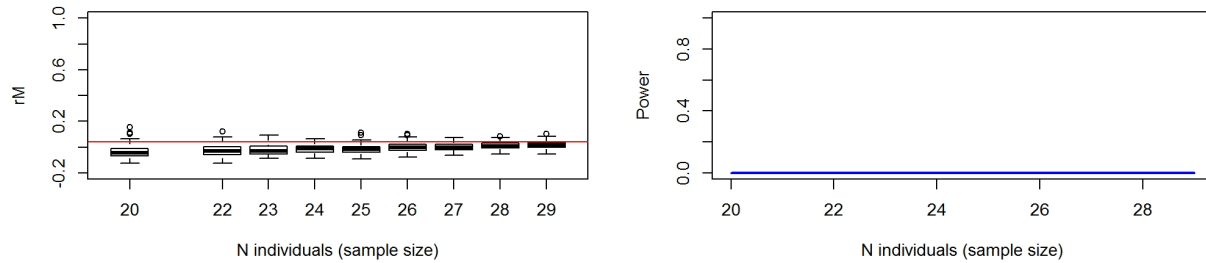


**Figure 01890-2.** Top left: simulated distribution (boxplots) and observed value (red line) of connectivity. Top right: Simulated power of the analysis (i.e. proportion of times the analyses on the subset of individuals was significant). Bottom left: Proportion of times the analysis provides the observed best number of cluster. Bottom right: simulated distribution (boxplots) and observed value (red line) of clustering intensity.



**Figure 01890-3.** Top left: simulated distribution (boxplots) and observed value (red line) of connectivity. Top right: Simulated power of the analysis. Bottom left: Proportion of times the analysis provides the

observed best number of cluster. Bottom right: simulated distribution (boxplots) and observed value (red line) of clustering intensity.



**Figure 01890-4.** Top left: simulated distribution (boxplots) and observed value (red line) of connectivity. Top right: Simulated power of the analysis. Bottom left: Proportion of times the analysis provides the observed best number of cluster. Bottom right: simulated distribution (boxplots) and observed value (red line) of clustering intensity.

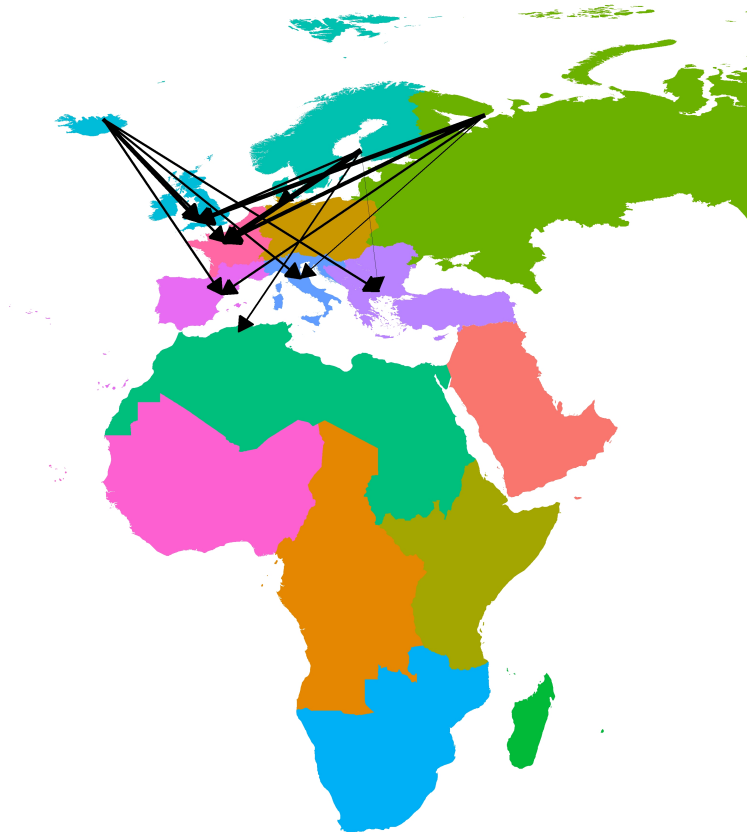
## 2. Connectivity between pre-defined regions

The species shows low connectivity ( $MC = 0.081$ ;  $MC = 0.071$  when adjusted for absolute abundance) between 3 breeding regions and 7 non breeding regions (Table 01890-2; Figure 01890-6).

**Table 01890-2.** Transition probabilities between pre-defined regions. Estimated abundance (number of individuals) in each breeding region is also reported.

Breeding region	Abundance	Non breeding region	Transition probability
East Europe	451498	North-west Europe	0.417
East Europe	451498	South-central Europe	0.083
East Europe	451498	South-west Europe	0.167
East Europe	451498	West Europe	0.333
North Europe	26405	Central Europe	0.062
North Europe	26405	North Africa	0.125
North Europe	26405	North-west Europe	0.188
North Europe	26405	South-east Europe	0.062
North Europe	26405	West Europe	0.562
North-west Europe	942	North-west Europe	0.333
North-west Europe	942	South-central Europe	0.167
North-west Europe	942	South-east Europe	0.167
North-west Europe	942	South-west Europe	0.167

Breeding region	Abundance	Non breeding region	Transition probability
North-west Europe	942	West Europe	0.167



**Figure 01890-6.** Map showing pre-defined regions in different colours, with black arrows linking centroids of individual encounters in different regions. Arrow width is proportional to transition probability.

## Reference

BirdLife International and Handbook of the Birds of the World (2019). Bird species distribution maps of the world. Version 2019.1. Available at <http://datazone.birdlife.org/species/requestdis>.