FACING THE CONSEQUENCES: IMPACTS OF CLIMATE CHANGE ON THE ANNUAL CYCLE OF EUROPE'S MOST ENDANGERED SEABIRD



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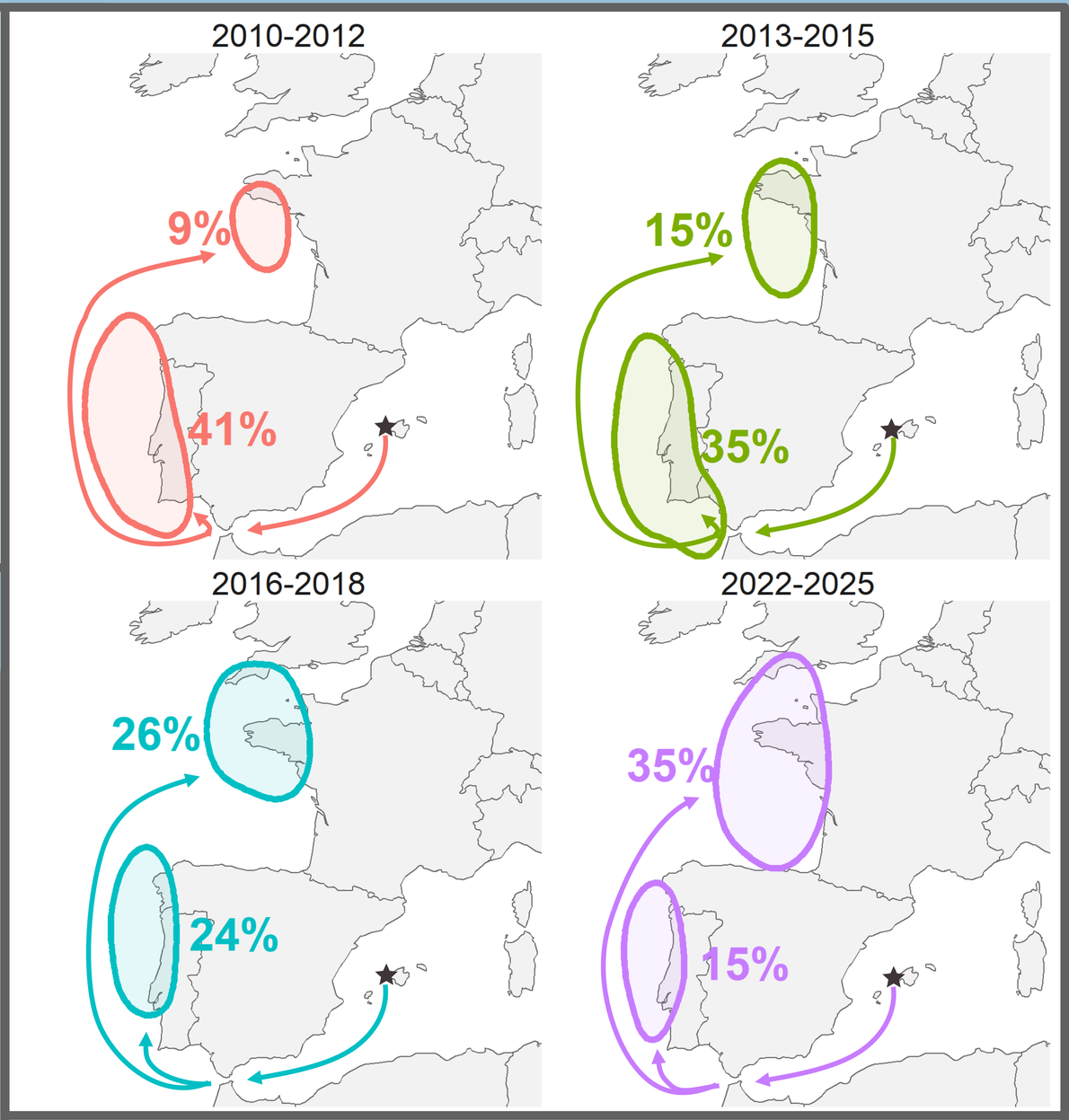
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GOING NORTH

Balearic shearwaters *Puffinus mauretanicus* are a Critically Endangered migratory seabird endemic to the Balearic islands, returning annually to breed.

Previous analysis has demonstrated individual plasticity in their migration routes, resulting in journeys further north associated with sea surface temperature (SST) increases driven by climate change[1].

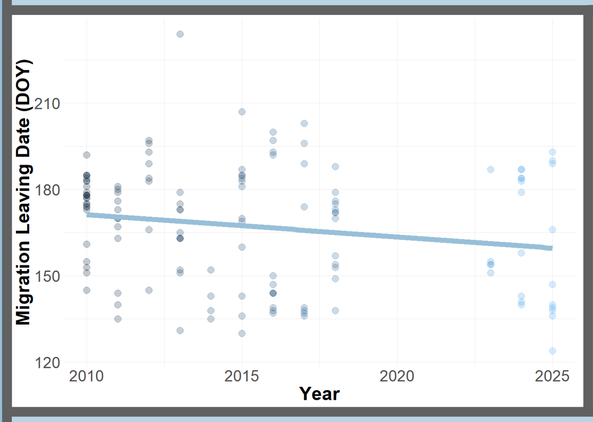
We are using saltwater immersion loggers and light-level geolocator data to quantify drivers and behavioural, phenological and energetic consequences of changing migration.



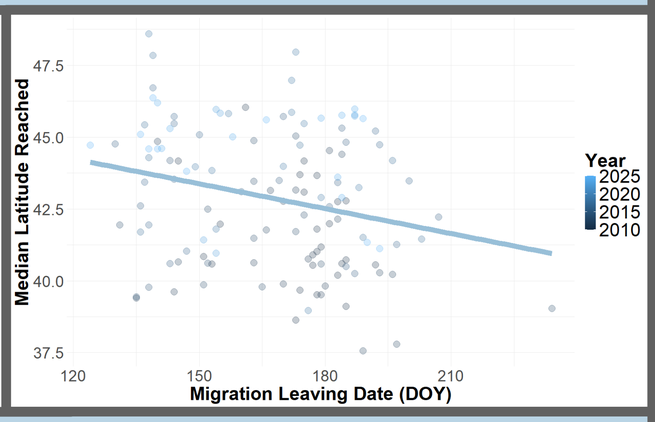
50% kernel density estimates of individuals' migratory GLS locations (n=99, 181 migrations). Since 2010, most birds switch from migrating to the west Portuguese coast to the western French coast. Migration route shown by arrows, breeding colony (Sa Dragonera/Sa Cella) is starred.

LEAVING EARLIER

Gibraltar Strait crossing timings show changes in leaving date

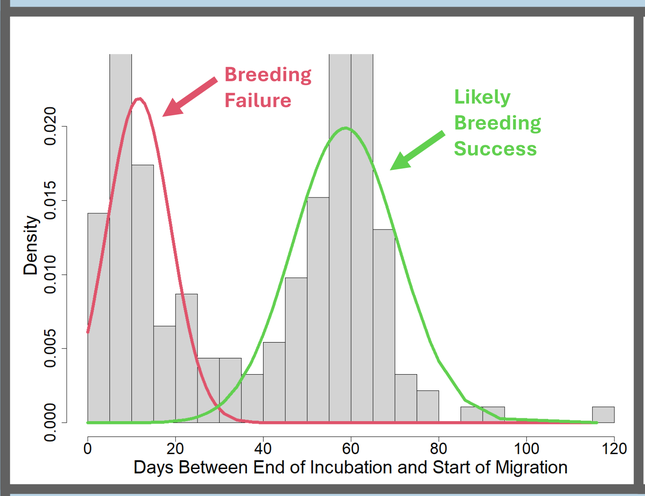


Birds leave earlier in later years



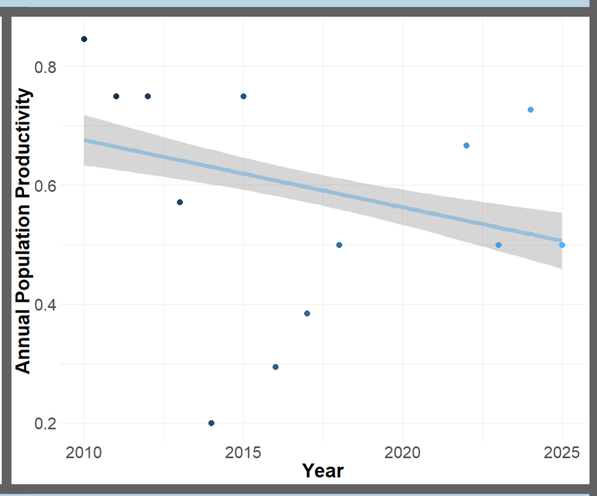
Birds that leave earlier go further north

EVERYTHING IS CONNECTED



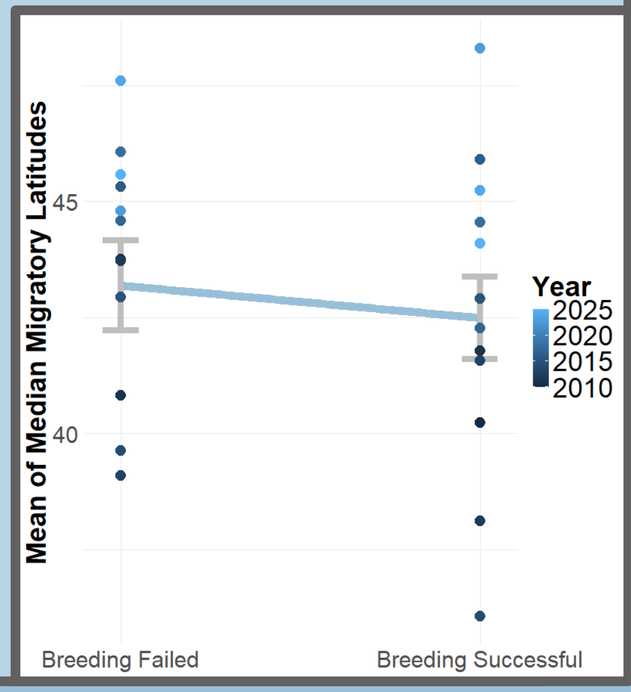
Chick rearing period length shows a clear bimodal distribution

Transition dates derived from light data indicate whether birds are likely to have failed or had successful breeding outcomes

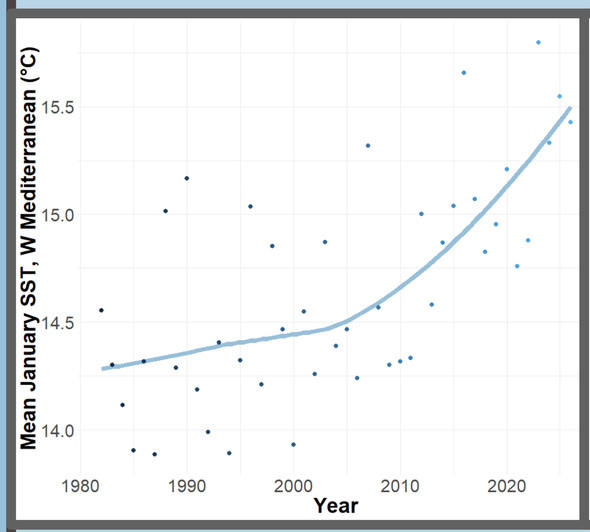


Increasingly early departures possibly linked to early signs of declining breeding success

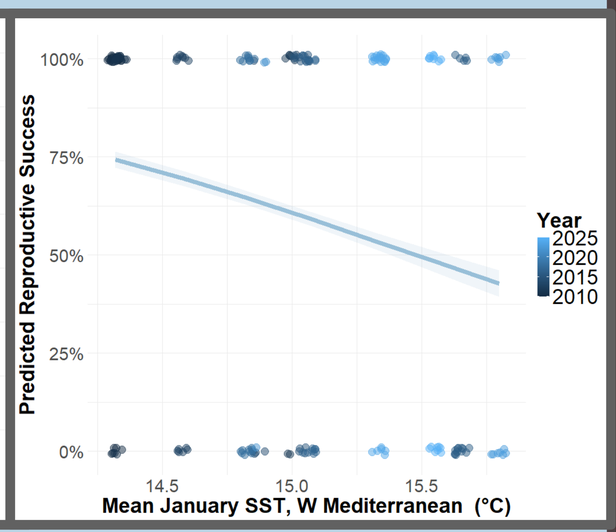
Migratory latitude correlates with breeding success, year and SST but causation pathways not yet clear



MARINE HEATWAVES AND BREEDING SUCCESS: A RECIPE FOR FAILURE?

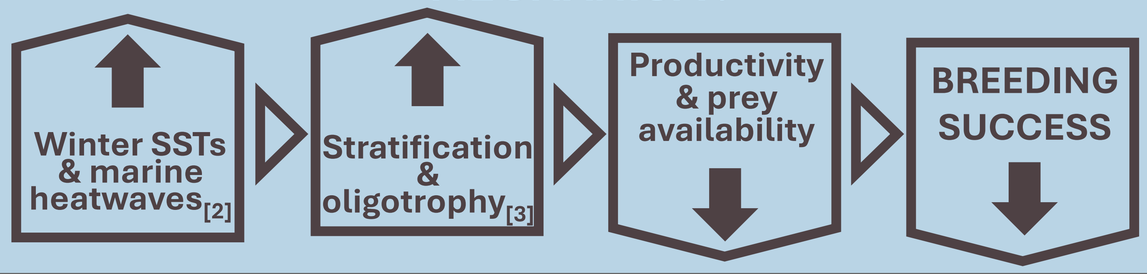


January SST in the Western Mediterranean is rapidly increasing



Pre-breeding period SST strongly predicts reproductive outcome

MECHANISM?



If Balearic shearwaters can plastically change their migration in response to climate change, do we also observe behavioural changes outside of migration to mitigate impacts?

[1]LEWIN, P. J., WYNN, J., ARCOS, J. M., AUSTIN, R. E., BLAGROVE, J., BOND, S., CARRASCO, G., DELORD, K., FISHER-REEVES, L., GARCÍA, D., GILLIES, N., GUILFORD, T., HAWKINS, I., JAGGERS, P., KIRK, C., LOUZAO, M., MAURICE, L., MCMINN, M., MICOL, T., MORFORD, J., MORGAN, G., MOSS, J., RIERA, E. M., RODRIGUEZ, A., SIDDIQI-DAVIES, K., WEIMERSKIRCH, H., WYNN, R. B. & PADGET, O. 2024. Climate change drives migratory range shift via individual plasticity in shearwaters. *Proceedings of the National Academy of Sciences,* 121. [2]ARTANA, C., KAPLAN, A., RAMÍREZ, F., ORTEGA, M., STEENBEEK, J. G., COLL, M., ARTANA, C., KAPLAN, A., RAMÍREZ, F., ORTEGA, M., STEENBEEK, J. G. & COLL, M. 2026–01–20. Marine heatwaves are transforming Western mediterranean marine ecosystems. *Scientific Reports 2026 16:1,* 16. [3]MACIAS, D. M., GARCIA-GORRIZ, E. & STIPS, A. 2015. Productivity changes in the Mediterranean Sea for the twenty-first century in response to changes in the regional atmospheric forcing. *Frontiers in Marine Science,* 2.

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