



MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2023

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

MARE-NOVA, NOVA School of Science and Technology, NOVA University Lisbon

RESEARCH GROUP AND URL

Environmental Risk

Technological Tools for Exploration and Monitoring

<https://www.mare-centre.pt/en/user/25178>

<https://www.ab.mpg.de/person/98273/2736>

SUPERVISOR (NAME AND E-MAIL)

Carlos David Santos

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SHORT CV OF THE SUPERVISOR

Carlos David Santos

NOVA School of Science and Technology

Universidade NOVA de Lisboa

Education

PhD, Ecology, University of Lisbon, 2009

BSc, Biology, University of Lisbon, 2001

Academic appointments

2023-present: Assistant Professor. Universidade Nova de Lisboa.

2014-present: Affiliated Scientist. Max Planck Institute of Animal Behavior

2021-2023: Researcher. Faculdade de Ciências, Universidade de Lisboa.

2017-2022: Assistant Professor. NTPC, Federal University of Pará.

2014-2017: Visiting Professor. Biology Dept. Federal University of Maranhão

2010-2014: Post-doctoral fellow. Max Planck Institute for Ornithology

Academic quantitative indicators

Peer-reviewed articles: 41

WOS citations: 689

WOS h-index: 17

Students Supervised: 22

Peer-reviewed journal articles

- Nourani, E., Safi, K., de Grissac, S., Anderson, D.J., Cole, N.C., Fell, A., Grémillet, D., Lerma, M., McKee, J. L., Pichegru, L., Provost, P., Rattenborg, N.C., Ryan, P.G., **Santos, C.D.**, Schoombie, S., Tatayah, V., Weimerskirch, H., Wikelski, M., Shepard, E.L.C. (2023). Seabird morphology determines operational wind speeds, tolerable maxima and responses to extremes. *Current Biology* 33: p1179–1184.e3. <https://doi.org/10.1016/j.cub.2023.01.068>
- Merchant, D., Lathrop, R.G., **Santos, C.D.**, Paludo, D., Niles, L., Smith, J.A.M., Feigin, S., Dey, A. (2023). Distribution Modeling and Gap Analysis of Shorebird Conservation in Northern Brazil. *Remote Sensing*. 15: 452. <https://doi.org/10.3390/rs15020452>
- Santos, C.D.**, Catry, T., Dias, M.P., Granadeiro, JP. (2023). Global changes in coastal wetlands of importance for non-breeding shorebirds. *Science of The Total Environment* 858: 159707. <http://dx.doi.org/10.1016/j.scitotenv.2022.159707>.
- Lathrop, R.G., Merchant, D., Niles, L., Paludo, D., **Santos, C.D.**, Larrain, C.E., Feigin, S., Smith, J., Dey, A. (2022). Multi-Sensor Remote Sensing of Intertidal Flat Habitats for Migratory Shorebird Conservation. *Remote Sensing*. 14: 5016. <https://doi.org/10.3390/rs14195016>
- Visschers, L.L.B., **Santos, C.D.**, Franco, A.M.A. (2022). Accelerated migration of mangroves indicate large-scale saltwater intrusion in Amazon coastal wetlands. *Science of the Total Environment* 836:155679. <https://doi.org/10.1016/j.scitotenv.2022.155679>.
- Santos, C.D.**, Ramesh, H., Ferraz, R., Franco, A.M.A., Wikelski, M. (2022). Factors influencing wind turbine avoidance behaviour of a migrating soaring bird. *Scientific Reports* 12, 6441. <https://doi.org/10.1038/s41598-022-10295-9>.
- Santos, L.H., **Santos, C.D.**, Silva, M.L. (2022) The limits of olfactory perception in black vultures: A field experiment. *Ethology Ecology & Evolution* 35: 340-347. <https://doi.org/10.1080/03949370.2022.2062617>.
- Serra, R.T., **Santos, C.D.**, Rousseau, G.X., Triana, S.P., Gutiérrez, J.A.M., Guerrero, J.E.B. (2021) Fast recovery of soil macrofauna in regenerating forests of the Amazon. *Journal of Animal Ecology* 90: 2094-2108. <https://doi.org/10.1111/1365-2656.13506>.
- Santos, C.D.**, Ferraz, R., Muñoz, A.R., Onrubia, A., Wikelski, M. (2021) Black kites of different age and sex show similar avoidance responses to wind turbines during migration. *Royal Society Open Science*, 8: 201933. <https://doi.org/10.1098/rsos.201933>
- Catry, T., Ventura, F., Dias, M., **Santos, C.D.**, Martins, R., Palmeirim, J., Granadeiro, J.P. (2021) Estimating the conservation cost of the projected new international Lisbon airport for migratory shorebirds of the Tagus estuary, Portugal. *Bird Conservation International*, 1-14. <https://doi.org/10.1017/S0959270921000125>
- Costa, T.D., **Santos, C.D.**, Rainho, A., Abedi-Lartey, M., Fahr, J., Wikelski, M., Dechmann, D.K.N. (2020) Assessing roost disturbance of straw-coloured fruit bats (*Eidolon helvum*) through tri-axial acceleration. *Plos One*. <https://doi.org/10.1371/journal.pone.0242662>.
- Santos, C.D.**, Silva, J.P., Muñoz, A.-R., Onrubia, A., Wikelski, M. (2020) The gateway to Africa: what determines sea crossing performance of a migratory soaring bird at the strait of Gibraltar? *Journal of Animal Ecology*. <https://doi.org/10.1111/1365-2656.13201>
- Santos, C.D.**, Marques, A.T., May, R. (2020) Recovery of raptors from displacement by windfarms – a response. *Frontiers in Ecology and the Environment*. <https://doi.org/10.1002/FEE.2180>

- Gudka, M., **Santos, C.D.**, Dolman, P.M., Abad-Gómez, J.M., Silva, J.P. (2019) Feeling the heat: Elevated temperature affects male display activity of a lekking grassland bird. *Plos One*, 14, e0221999. <https://doi.org/10.1371/journal.pone.0221999>
- Marques, A.T., **Santos, C.D.**, Hanssen, F., Muñoz, A.-R., Onrubia, A., Wikelski, M., Moreira, F., Palmeirim, J.M., Silva, J.P. (2019) Wind turbines cause functional habitat loss for migratory soaring birds. *Journal of Animal Ecology*, 1-11. <https://doi.org/10.1111/1365-2656.12961>.
- Santos, C.D.**, Campos, L., Efe, M.A. (2019) Foraging habitat choice of White-tailed Tropicbirds revealed by fine-scale GPS tracking and remote sensing. *PeerJ*, 7, e6261. <https://doi.org/10.7717/peerj.6261>.
- Santos, C.D.**, Rocha, T.M.S., Nascimento, A.W.B., Oliveira, V., Martinez, C. (2019) Prey Choice by Declining Atlantic Flyway Semipalmated Sandpipers (*Calidris pusilla*) at a Major Wintering Area in Brazil. *Waterbirds*, 42, 198-204. <https://doi.org/10.1675/063.042.0206>
- Lourenço, P., Alonso, H., Alves, J., Carvalho, A., Catry, T., Costa, H., Costa, J., Dias, M., Encarnação, V., Fernandes, P., Leal, A., Martins, R., Moniz, F., Pardal, S., Rocha, A., **Santos, C.D.** (2018) Monitoring waterbird populations in the Tejo estuary, Portugal: report for the decade 2007-2016. *Airo*, 25, 3-31.
- Veríssimo, A., Gante, H., **Santos, C.D.**, Cheoo, G., Oliveira, J., Cereja, R., Ribeiro, F. (2018) Distribution and demography of the critically endangered Lisbon arched-mouth nase, *Iberochondrostoma olisiponense*. *Fishes in Mediterranean Environments*, 1-13. <https://doi.org/10.29094/FISHMED.2018.002>
- Santos, C.D.**, Hanssen, F., Munoz, A.R., Onrubia, A., Wikelski, M., May, R., Silva, J.P. (2017) Match between soaring modes of black kites and the fine-scale distribution of updrafts. *Scientific Reports*, 7, 6421. <https://doi.org/10.1038/s41598-017-05319-8>
- Santos, C.D.**, Przybyzin, S., Wikelski, M., Dechmann, D.K.N. (2016) Collective Decision-Making in Homing Pigeons: Larger Flocks Take Longer to Decide but Do Not Make Better Decisions. *Plos One*, 11, e0147497. <https://doi.org/10.1371/journal.pone.0147497>
- Santos, C.D.**, Cramer, J.F., Parau, L.G., Miranda, A.C., Wikelski, M., Dechmann, D.K.N. (2015) Personality and morphological traits affect pigeon survival from raptor attacks. *Scientific Reports*, 5, 15490. <https://doi.org/10.1038/srep15490>
- Gagliardo, A., Pollonara, E., Coppola, V.J., **Santos, C.D.**, Wikelski, M., Bingman, V.P. (2014) Evidence for perceptual neglect of environmental features in hippocampal-lesioned pigeons during homing. *European Journal of Neuroscience*, 40, 3102-3110. <https://doi.org/10.1111/ejn.12680>
- Santos, C.D.**, Neupert, S., Lipp, H.-P., Wikelski, M., Dechmann, D.K.N. (2014) Temporal and contextual consistency of leadership in homing pigeon flocks. *Plos One*, 9, e102771. <https://doi.org/10.1371/journal.pone.0102771>
- Marques, J.T., Pereira, M.J.R., Marques, T.A., **Santos, C.D.**, Santana, J., Beja, P., Palmeirim, J.M. (2013) Optimizing Sampling Design to Deal with Mist-Net Avoidance in Amazonian Birds and Bats. *Plos One*, 8, e74505. <https://doi.org/10.1371/journal.pone.0074505>
- Martins, R.C., Catry, T., **Santos, C.D.**, Palmeirim, J.M., Granadeiro, J.P. (2013) Seasonal Variations in the Diet and Foraging Behaviour of Dunlins *Calidris alpina* in a South European Estuary: Improved Feeding Conditions for Northward Migrants. *Plos One*, 8, e81174. <https://doi.org/10.1371/journal.pone.0081174>
- Catry, T., Alves, J.A., Andrade, J., Costa, H., Dias, M.P., Fernandes, P., Leal, A., Lourenco, P.M., Martins, R.C., Moniz, F., Pardal, S., Rocha, A., **Santos, C.D.**, Encarnação, V., Granadeiro, J.P. (2011) Long-term declines of wader populations at the Tagus estuary, Portugal: a response to global or local factors? *Bird Conservation International*, 21, 438-453. <https://doi.org/10.1017/s0959270910000626>
- Beja, P., **Santos, C.D.**, Santana, J., Pereira, M.J., Marques, J.T., Queiroz, H.L., Palmeirim, J.M. (2010) Seasonal patterns of spatial variation in understory bird assemblages across a mosaic of flooded and unflooded

- Amazonian forests. *Biodiversity and Conservation*, 19, 129-152. <https://doi.org/10.1007/s10531-009-9711-6>
- Gante, H.F., **Santos, C.D.**, Alves, M.J. (2010) Phylogenetic relationships of the newly described species *Chondrostoma olisiponensis* (Teleostei: Cyprinidae). *Journal of Fish Biology*, 76, 965-974. <https://doi.org/10.1111/j.1095-8649.2010.02536.x>
- Santos, C.D.**, Miranda, A.C., Granadeiro, J.P., Lourenco, P.M., Saraiva, S., Palmeirim, J.M. (2010) Effects of artificial illumination on the nocturnal foraging of waders. *Acta Oecologica*, 36, 166-172. <https://doi.org/10.1016/j.actao.2009.11.008>
- Santos, C.D.**, Palmeirim, J.M., Granadeiro, J.P. (2010) Choosing the best foraging microhabitats: individual skills constrain the choices of dunlins *Calidris alpina*. *Journal of Avian Biology*, 41, 18-24. <https://doi.org/10.1111/j.1600-048X.2009.04860.x>
- Pereira, M.J.R., Marques, J.T., Santana, J., **Santos, C.D.**, Valsecchi, J., de Queiroz, H.L., Beja, P., Palmeirim, J.M. (2009) Structuring of Amazonian bat assemblages: the roles of flooding patterns and floodwater nutrient load. *Journal of Animal Ecology*, 78, 1163-1171. <https://doi.org/10.1111/j.1365-2656.2009.01591.x>
- Santos, C.D.**, Saraiva, S., Palmeirim, J.M., Granadeiro, J.P. (2009) How do waders perceive buried prey with patchy distributions? The role of prey density and size of patch. *Journal of Experimental Marine Biology and Ecology*, 372, 43-48. <https://doi.org/10.1016/j.jembe.2009.02.005>
- Lourenco, P.M., Silva, A., **Santos, C.D.**, Miranda, A.C., Granadeiro, J.P., Palmeirim, J.M. (2008) The energetic importance of night foraging for waders wintering in a temperate estuary. *Acta Oecologica*, 34, 122-129. <https://doi.org/10.1016/j.actao.2008.04.005>
- Santos, C.D.**, Lourenco, P.M., Miranda, A.C., Granadeiro, J.P., Palmeirim, J.M. (2008) Birds after dark: an efficient and inexpensive system for making long-range observations at night. *Journal of Field Ornithology*, 79, 329-335. <https://doi.org/10.1111/j.1557-9263.2008.00168.x>
- Gante, H.F., **Santos, C.D.**, Alves, M.J. (2007) A new species of *Chondrostoma* Agassiz, 1832 (Cypriniformes: Cyprinidae) with sexual dimorphism from the lower Rio Tejo Basin, Portugal. *Zootaxa*, 23-35.
- Granadeiro, J.P., **Santos, C.D.**, Dias, M.P., Palmeirim, J.M. (2007) Environmental factors drive habitat partitioning in birds feeding in intertidal flats: implications for conservation. *Hydrobiologia*, 587, 291-302. <https://doi.org/10.1007/s10750-007-0692-8>
- Dias, M.P., Granadeiro, J.P., Lecoq, M., **Santos, C.D.**, Palmeirim, J.M. (2006) Distance to high-tide roosts constrains the use of foraging areas by dunlins: Implications for the management of estuarine wetlands. *Biological Conservation*, 131, 446-452. <https://doi.org/10.1016/j.biocon.2006.02.020>
- Granadeiro, J.P., Dias, M.P., Rebelo, R., **Santos, C.D.**, Catry, P. (2006) Numbers and population trends of Cory's Shearwater *Calonectris diomedea* at Selvagem Grande, Northeast Atlantic. *Waterbirds*, 29, 56-60. [https://doi.org/10.1675/1524-4695\(2006\)29\[56:naptoc\]2.0.co;2](https://doi.org/10.1675/1524-4695(2006)29[56:naptoc]2.0.co;2)
- Santos, C.D.**, Granadeiro, J.P., Palmeirim, J.M. (2005) Feeding ecology of Dunlin *Calidris alpina* in a southern European estuary. *Ardeola*, 52, 235-252.
- Gante, H.F., **Santos, C.D.** (2002) First records of the North American catfish *Ameiurus melas* in Portugal. *Journal of Fish Biology*, 61, 1643-1646. <https://doi.org/10.1006/jfbi.2002.2166>

Research grants

2020-present: Applying new bio-logging and analytical tools to study the movement ecology and conservation of birds in the Caatinga biome, Fundação de Amparo à Pesquisa do Estado de São Paulo (Brasil) grant 2018/19389-9. Role: Co-I. Funding: R\$300,632 + \$229,796



2019-present: Bird telemetry monitoring to evaluate loss of habitat in mining area in the northeastern Amazon, Norsk Hydro Brasil Role: Co-I. Funding: R\$390,225

2018-2022: ENVMETAGENOMICS - eDNA: from rare species detection to whole-community diversity using high-throughput sequencing, Fundação para a Ciência e a Tecnologia (Portugal) grant 031644-02/SAICT/2017. Role: Co-I. Funding: €239,955.

2018-2019: Optimizing conservation outcomes and investments for semipalmated sandpiper using full life cycle migratory network models, U.S Fish and Wildlife Service, and National Fish and Wildlife Foundation. Role: Co-I. Funding: \$207,000

2015-2017: The mechanisms of social navigation in Scarlet Ibis *Eudocimus ruber*, FAPEMA (Brazil) grant 00060/15. Role: PI. Funding: R\$38,599.

2015-2016: Evaluation of population trends and genetic diversity of the critically endangered Lisbon Arched-mouth Nase *Iberochondrostoma olisiponensis*, Mohamed Bin Zayed - Species Conservation Fund. Role: Co-I. Funding: \$12,000.

2012-2016: The gateway to Africa: How do soaring birds overcome the Strait of Gibraltar? Max Planck Institute for Ornithology (Germany). Role: PI. Funding: €10,000.

2008-2012: Migra-Tagis - Wintering and migrating shorebirds as indicators of the quality of estuarine environments, Fundação para a Ciência e Tecnologia (Portugal) grant PTDC/MAR/66319/2006. Role: Co-I. Funding: €163,000

2007-2009: Spatial variation in Amazonian bat and bird assemblages under contrasting flooding regimes: implications for nature reserve management, Fundação para a Ciência e Tecnologia (Portugal) grant POCI/BIA-BDE/60710/2004. Role: Co-I. Funding: €50,000

2003-2006: Pred-Tagis - Birds as predators of invertebrates in intertidal habitats: role in estuarine environments and scale-dependent processes, Fundação para a Ciência e Tecnologia (Portugal) grant POCTI/BSE/47569/2002. Role: Co-I. Funding: €63,000

2000-2004: Sat-Tagis - Modelling the habitats of primary producers, invertebrates and birds in intertidal flats of the Tagus estuary, using satellite images and GIS, Fundação para a Ciência e Tecnologia (Portugal) grant POCTI/BSE/47569/2002. Role: Co-I. Funding: €360,000

5 SELECTED PUBLICATIONS

Merchant, D., Lathrop, R.G., **Santos, C.D.**, Paludo, D., Niles, L., Smith, J.A.M., Feigin, S., Dey, A. (2023). Distribution Modeling and Gap Analysis of Shorebird Conservation in Northern Brazil. Remote Sensing. 15: 452. <https://doi.org/10.3390/rs15020452>

Santos, C.D., Catry, T., Dias, M.P., Granadeiro, JP. (2023). Global changes in coastal wetlands of importance for non-breeding shorebirds. Science of The Total Environment 858: 159707. <http://dx.doi.org/10.1016/j.scitotenv.2022.159707>.

Lathrop, R.G., Merchant, D., Niles, L., Paludo, D., **Santos, C.D.**, Larrain, C.E., Feigin, S., Smith, J., Dey, A. (2022). Multi-Sensor Remote Sensing of Intertidal Flat Habitats for Migratory Shorebird Conservation. Remote Sensing. 14: 5016. <https://doi.org/10.3390/rs14195016>

Visschers, L.L.B., **Santos, C.D.**, Franco, A.M.A. (2022). Accelerated migration of mangroves indicate large-scale saltwater intrusion in Amazon coastal wetlands. Science of the Total Environment 836:155679. <https://doi.org/10.1016/j.scitotenv.2022.155679>.

PROJECT TITLE AND SHORT DESCRIPTION

Tracing the consequences of sea level rise on Amazon coastal wetlands

Sea level rise is among the most dramatic consequences of global warming. Over the last three decades sea level has increased at a rate of 3.3 mm per year and showing signs of acceleration. While coastal defences, such as dikes, embankments and sea walls may help to mitigate the consequences of sea level rise on coastal cities and other populated areas, large remote coastal areas are expected to suffer major transformations with important environmental and socioeconomic impacts. Coastal erosion and saltwater intrusion are among the most important and immediate effects of sea level rise on unprotected coastal areas. The Amazon River delta comprises among the most extensive conserved wetlands in the world. This region holds an exuberant biodiversity, with unique wetland habitats, the largest continuous mangrove forest in the world, large populations of waterbirds and 40 threatened vertebrate species, and it is a world's hotspot of peat soils, stocking large amounts of carbon. However, this region is highly vulnerable to sea level rise due to its low elevation. Evidence of large-scale saltwater intrusion have been documented and associated to drastic transformations of freshwater wetlands and biodiversity loss. Coastal erosion has been persistent over the last decades, possibly with relevant impacts on carbon stocks. This project aims to (1) quantify environmental transformations caused by coastal erosion and saltwater intrusion in Amazon coastal wetlands over the last four decades; (2) understand how these transformations are propagating in wetland ecosystems and impacting carbon stocks; (3) develop methods for the monitoring of environmental changes and ecosystem responses of coastal areas in large remote regions. Historical changes of coastal erosion and saltwater intrusion will be quantified from time-series analysis of Landsat imagery and new algorithms will be developed for Sentinel multispectral and radar data to identify tidal surges. Waterbird responses to environmental changes will be investigated from population data of long-term aerial surveys and through the monitoring of bird movement using state-of-the-art telemetry. The impacts of environmental changes on benthic macroinvertebrates and carbon stocks will be evaluated from field inventories combined with remote sensing inference. This project relies on ongoing collaborations with the Audubon Society and AQUASIS, for waterbird aerial surveys and fieldwork; the University of East Anglia, for bird GPS telemetry; and the State University of Maranhão for blue carbon quantification and benthic macroinvertebrates identification.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Environment and Geosciences (ENV) or Life Sciences (LIF)

***Scientific Area where the project fits best** – Please select/indicate the scientific area according to the panel evaluation areas: Chemistry (CHE) • Social Sciences and Humanities (SOC) • Economic Sciences (ECO) • Information Science and Engineering (ENG) • Environment and Geosciences (ENV) • Life Sciences (LIF) • Mathematics (MAT) • Physics (PHY)