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REN EM
BIODIVERSIDADE

REN Biodiversity chair: a (Portuguese) successful TSO-Science partnership on bird-power line interactions

Ricardo C. Martins (Post Doc Researcher) & **Francisco Moreira** (Project Coordinator)

CIBIO/InBIO, University of Porto, Portugal

https://cibio.up.pt

REN FCT U.PORTO

OUTLINE

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1. **CONTEXT**
2. **MAIN ACTIVITIES OF REN BIODIVERSITY CHAIR**
3. **CONCLUSIONS**

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CONTEXT

1. CONTEXT

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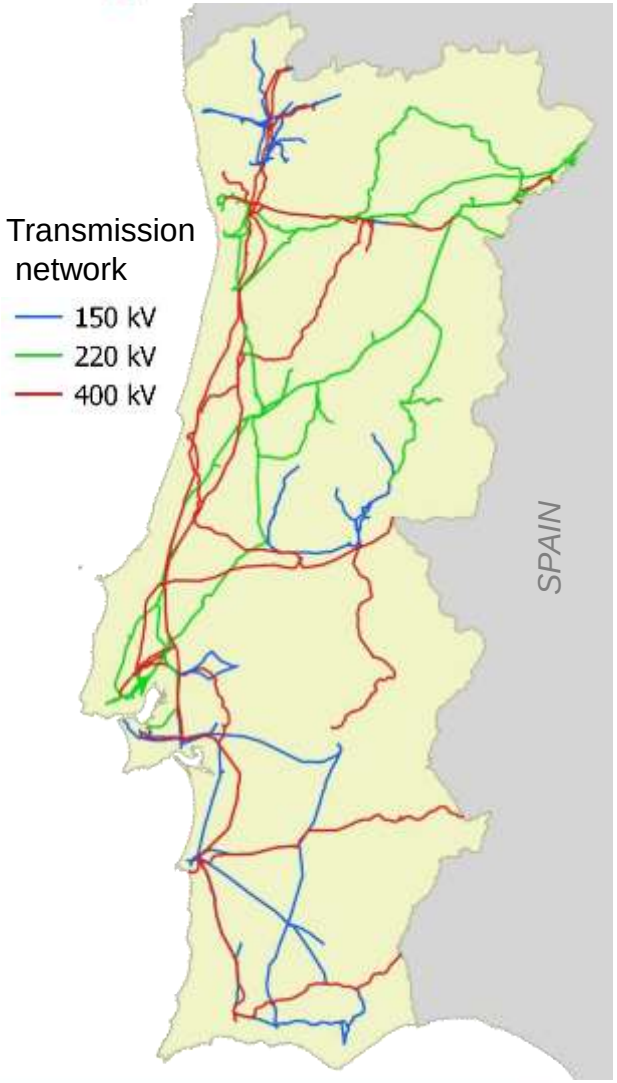
- Transmission System Operator (TSO) in Portugal
  150-400 kV

- Bird - (REN) Power line interactions
  - Negative impacts
    - ⇩ Mortality: Collision with wires
    - ⇩ Displacement
    - ⇩ Habitat fragmentation
    - ⇩ Barrier effects
    - ⇩ Disturbance (constr. phase)
  - (±) Positive effects (for birds)
    - ⇧ Pylon use: - Perching
      - Nesting



1. CONTEXT

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Portuguese/EU environmental laws (new power lines; PL)

- Environmental Impact Assessment (EIA) Process
  - Include most transmission PL (~all >10 km)
  - Regulated by EIA Authority (APA), relevance of biodiversity issues (ICNF)
  - Predicted impacts (pre-construction)
  - Monitoring programme (post-evaluation)
  - Alternative corridors
  - Mitigation measures
  - Compensatory activities

REN policies on environmental responsibility:

- 2 Protocols with NGO's (SPEA & Quercus) & ICNF
- 2003-05 + 2010-11
- Assessment of mortality (collision) in old PL
- Effectiveness of wire-marking devices

White stork nests on pylons: counts & management by REN

Last ~15 years:

- Large amount of information on bird-PL interactions
- Scientific potential
- ~Totally unexplored (until 2015)

1. CONTEXT

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CIBIO (University of Porto):

- Largest biodiversity research center in the country
- Hosts several invited chairs with a strong focus on impact assessment of infrastructures (dams, roads, railways)

U.PORTO

REN (75%)

FCT (25%)

REN Biodiversity Chair
(2015-2020)

- ✓ Conduct **Applied Research** on the interactions between transmission PL and Biodiversity (strong focus on birds)
- ✓ Promote **Knowledge Transfer** to REN and other stakeholders

REN Biodiversity Chair – The Team

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- 1 Coordinator
- 2 (Hired) Post-docs
- 2 (FCT) Post-docs
- 3 PhD Students

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MAIN ACTIVITIES OF REN BIODIVERSITY CHAIR

WORK PROGRAMME (2015-2018)

+

(2018-2020)

Under evaluation

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Pillar 1 – Impacts of PL on Birds: Monitoring, mitigation and compensation

1.1 – Scientific consultancy and collaboration with REN
1.2 – Gathering usable (for scientific evidence) data from REN studies
1.3 – Modelling bird mortality patterns due to collision
1.4 – Improving mortality estimates (carcass persistence)
1.5 – Evaluating effectiveness of wire marking in reducing bird collision
1.6 – Use of power line pylons by nesting white storks
1.7 – Handbook of good practice

Pillar 2 – Bird Population ecology

2.1 – Movements and population parameters
2.2 – Assessing the population-level impacts of mortality caused by power lines

Pillar 3 – Citizen science on Bird-PL interactions

3.1 – Pilot-project: productivity of nesting white storks
3.2 – Review of "citizen science“ projects

Pillar 4 – Other applied research

4.1 – Ecological restoration
4.2 – Biodiversity in farmland and forests

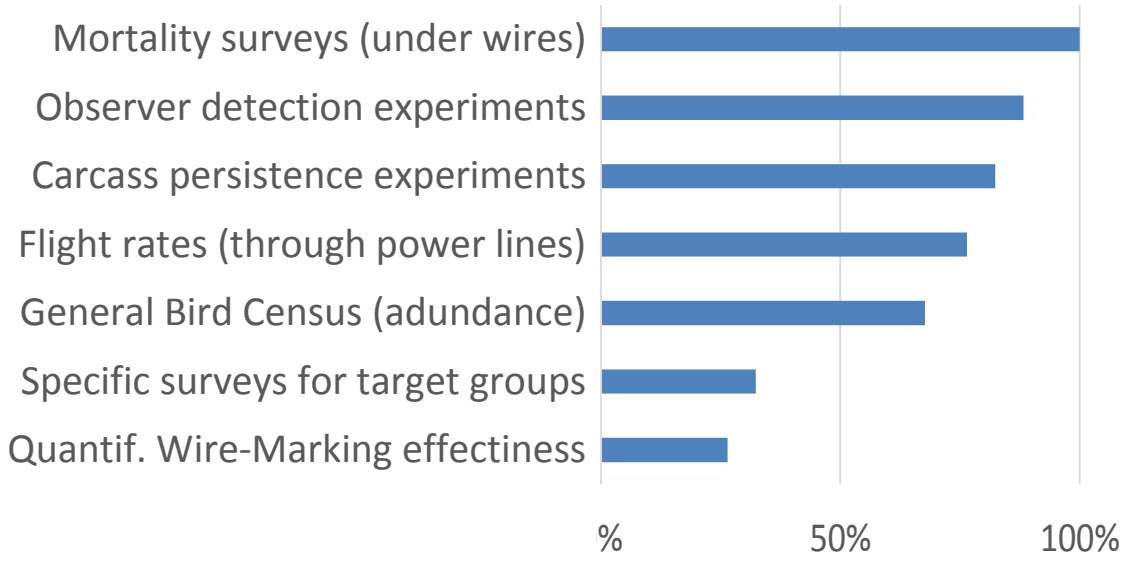
TASK 1.1 – SCIENTIFIC CONSULTANCY AND COLLABORATION WITH REN

- ✓ Provide ***scientific advice for decision making by REN***, in the scope of activities related to biodiversity issues (mainly birds)
- ✓ ***Evaluate (from a scientific perspective) consultant activities and decisions by regulatory institutions*** (environmental impact assessment, monitoring, mitigation and compensatory measures)
- ✓ Application for REN: ***improve methods*** in impact assessment, ***effectiveness of*** mitigation ***and optimize resources***

TASK 1.2 – GATHERING USABLE DATA FROM REN STUDIES

- ✓ Compiling and analysing data on impacts of PL on birds
  - REN Digital Archive; Period 2003-2015
  - 34 studies (31 Monit Prog EIA process + 3 from protocols)
    - Duration: 1 - 5 years; >60 PL; Length: >2000 km

Type of data collected:



Mortality surveys (collis.):
- 700 km of PL sections
- Tot (ac.) effort: 13400 km
- 3410 carcasses
- 130 species

TASK 1.2 – GATHERING USABLE DATA FROM REN STUDIES

✓ Current and potential uses of available information (34 studies):

- Evaluate collision patterns and driving factors (e.g. species, season, habitat, PL-features)
- Analyse the collision susceptibility of different species (to improve predictability of impacts)

⇨ Task 1.3

- Better understanding of carcass detectability and persistence patterns ⇨ Task 1.4
- Meta-Analyses on effectiveness of wire-marking devices to reduce bird collision ⇨ Task 1.5
- Improve the comprehension of indirect impacts of PL on sensitive species (e.g. displacement)

✓ Application for REN: improvements of the current practices on monitoring, mitigation and compensation of PL impacts on birds, as well as on the evaluation of their effectiveness

TASK 1.2 – GATHERING USABLE DATA FROM REN STUDIES

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Review

Bird collisions with power lines: State of the art and priority areas for research

J. Bernardino[a,*], K. Bevanger[b], R. Barrientos[c,d], J.F. Dwyer[e], A.T. Marques[a,d,f], R.C. Martins[a,d], J.M. Shaw[g,h], J.P. Silva[a,d,f], F. Moreira[a,d]

- Review the current knowledge on the influence of different factors on bird collision with PL:
  - Species-specific (e.g. vision, morphology)
  - Site-specific (e.g. topography, light and weather conditions, disturbance)
  - PL-specific (nr of wire levels, wire height and diameter)
- Evaluate existing mitigation measures and their effectiveness to reduce bird collision
- Identification of main knowledge gaps and priorities for future research

TASK 1.3 – MODELLING BIRD MORTALITY PATTERNS DUE TO COLLISION

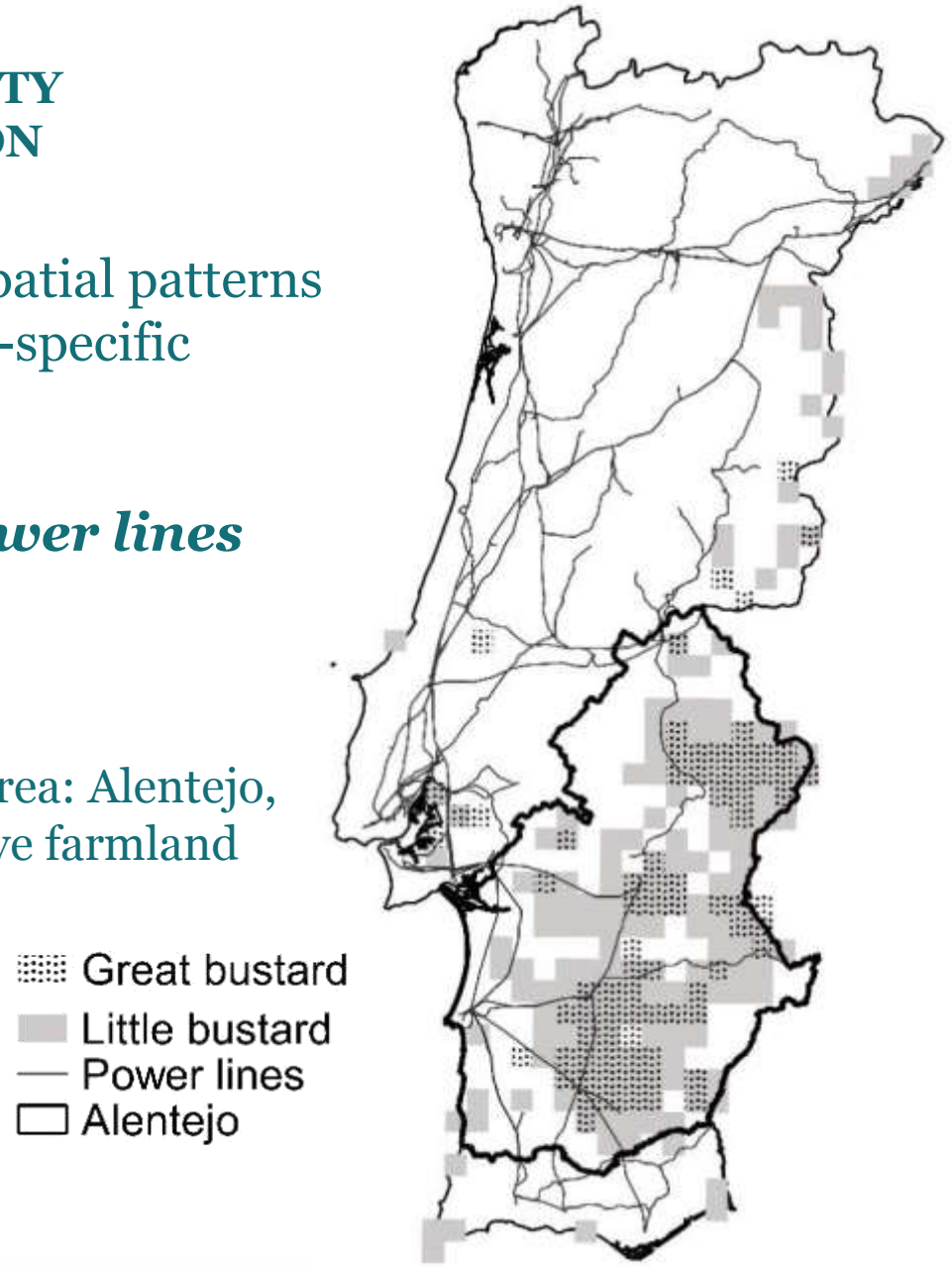
- ✓ Main aim: understand the drivers behind temporal and spatial patterns of bird mortality, ocorrence of mortality hotspots, species-specific susceptibility

- ✓ Application for REN: better predict ***impacts of new power lines***

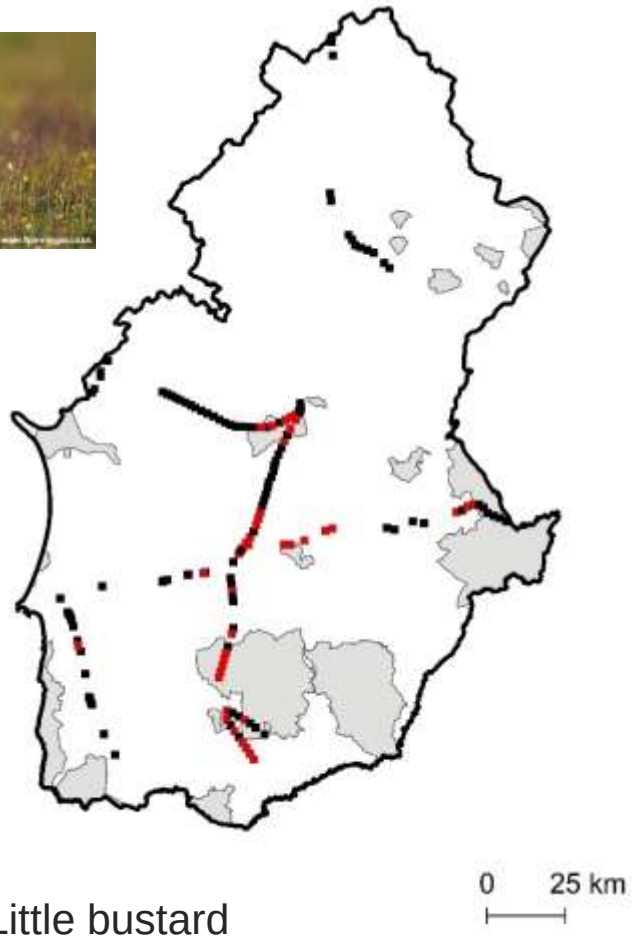
"Contrasting patterns and drivers of collisions with power lines in two sympatric threatened bustard species"

(Marques *et al.*, ms submitted to *Oecologia)*

- Study area: Alentejo, extensive farmland

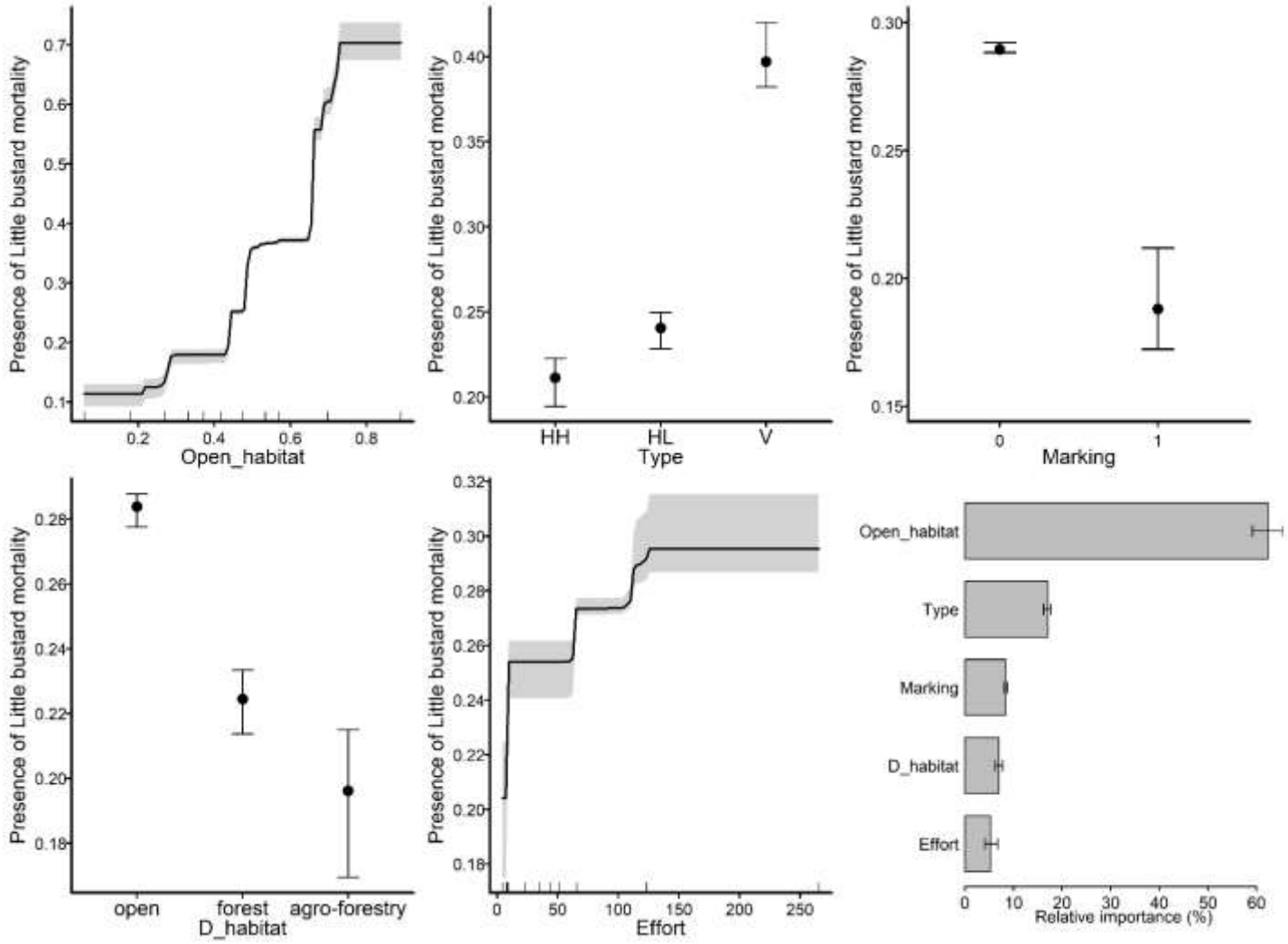


TASK 1.3 – MODELLING BIRD MORTALITY PATTERNS DUE TO COLLISION



Little bustard

Presence/absence of collision



TASK 1.3 – MODELLING BIRD MORTALITY PATTERNS DUE TO COLLISION

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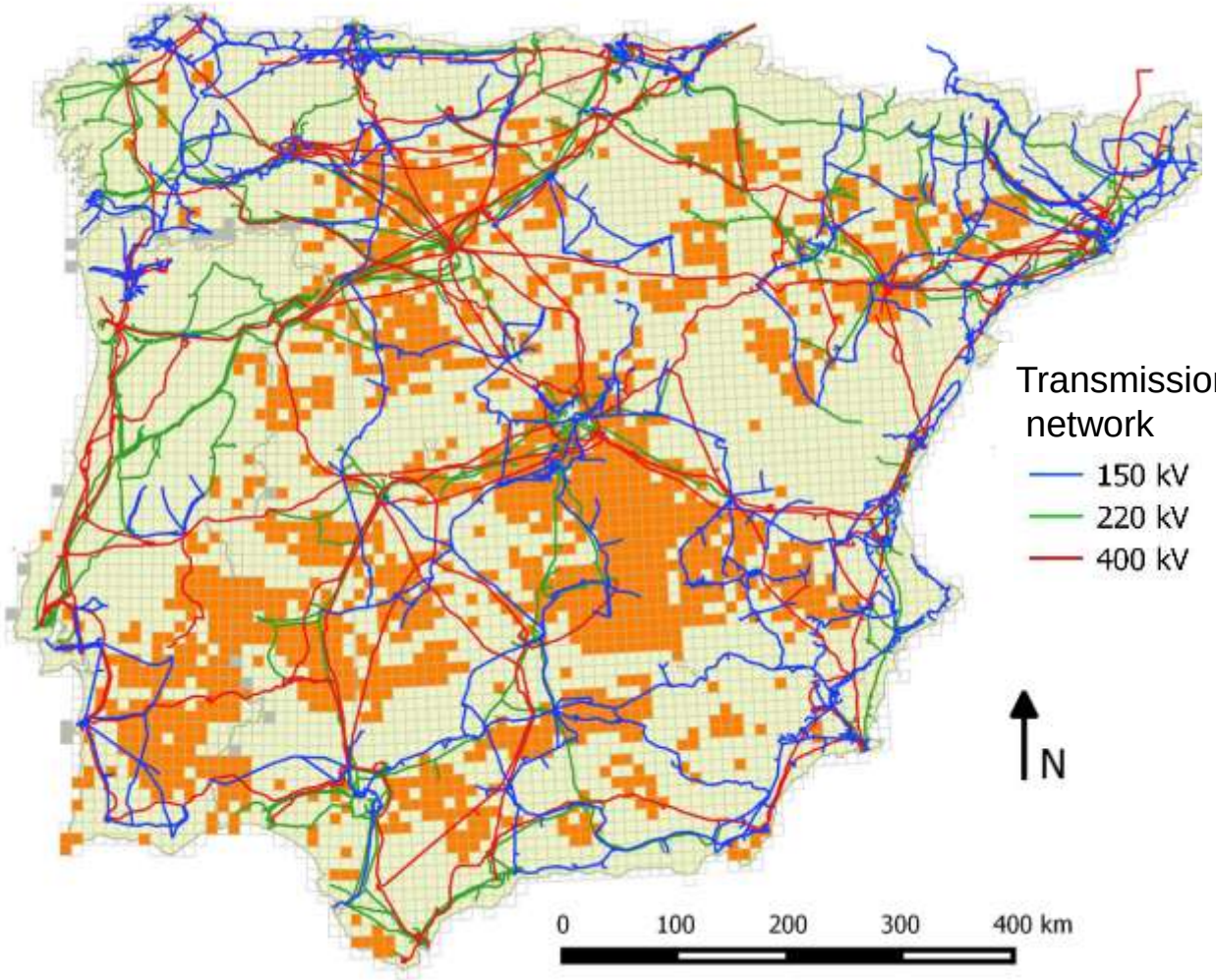
"Bird collisions with power lines: prioritizing species and areas by estimating potential population-level impacts"

(D'Amico *et al., ms in prep.)*

- Morphologic features (intrinsic collision risk)
- Overlap distribution with (transm.) PL network
- Life-history traits related to breeding strategy
- Habitat specialization
- Conservation status

Type of results:
- Rank of species
- Maps of sensitiveness



TASK 1.4 – IMPROVING MORTALITY ESTIMATES

- ✓ Carcass surveys involves different types of bias that need to be assessed when estimating the "real" mortality rates (crippling bias, scavenger bias, searching bias)

- ✓ Application for REN: improved accuracy in evaluating the impact of mortality caused by power lines

Assessing carcass removal patterns through camera trap experiments to quantify carcass persistence time and predator identity

TASK 1.5 – EVALUATING EFFECTIVENESS OF WIRE MARKING TO REDUCE BIRD COLLISIONS

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cigré
21, rue d'Artois, F-75008 PARIS
http : //www.cigre.org

C3-104

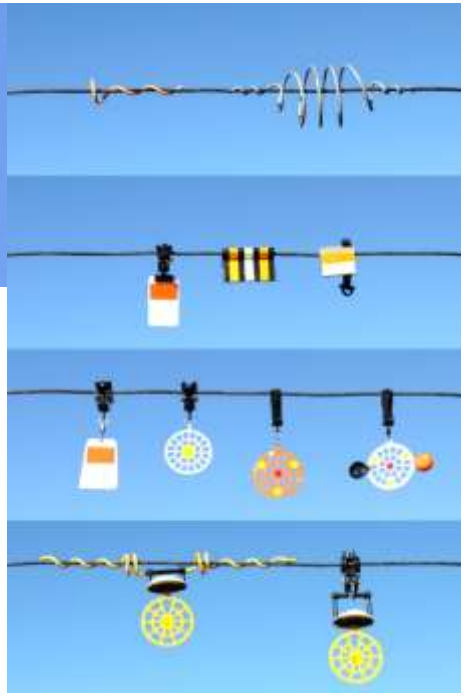
CIGRE 2018

Assessing the effectiveness of wire marking to reduce bird collisions: a critical evaluation of current practices and priorities for scientific research

F. MOREIRA, R. MARTINS, J. BERNARDINO
REN Biodiversity Chair, CIBIO/InBIO, University of Porto
Portugal

P. FERNANDES*, F. PARADA, M. HALL
Rede Eléctrica Nacional
Portugal

C. SAINT-SIMON
Réseau de Transport d'Electricité
France



Results (preliminary):

- Average effectiveness: 52%
- Large variation: -79 to 100%

Compilation & reanalysis:

- 40 W-M studies
- 124 Trials

Explanatory variables:

- PL features
- Season
- Habitat
- Target species
- Type of device

Variable influence:

- Some (near) significant results
  - Flappers slightly better than spirals
- Model had low statist. power
- Many studies of low quality

Next steps:

- Weight trials by sampling effort and type of approach

TASK 1.5 – EVALUATING EFFECTIVENESS OF WIRE MARKING TO REDUCE BIRD COLLISIONS

Recommendations for future Wire-Marking studies

- ✓ Account for the difficulties in obtaining mortality rates (MR)
  - ✓ Considerable effort is needed for robust analysis
- ✓ Be aware of the limitations of methods to correct/weight observed MR (survey bias and flight rates through PL)
- ✓ Use BACI approach:
  - Less fragile assumptions as compared with CI or BA
  - Fine-scale spatial intercalation of CI avoid potential errors with corrections (e.g. carcass removal by scavengers)
- ✓ Avoid testing many variables at the same time

✓ Application for REN: clarifying what types of devices are more effective, and under which context should they be used

TASK 1.6 – USE OF POWER LINE PYLONS BY NESTING WHITE STORKS

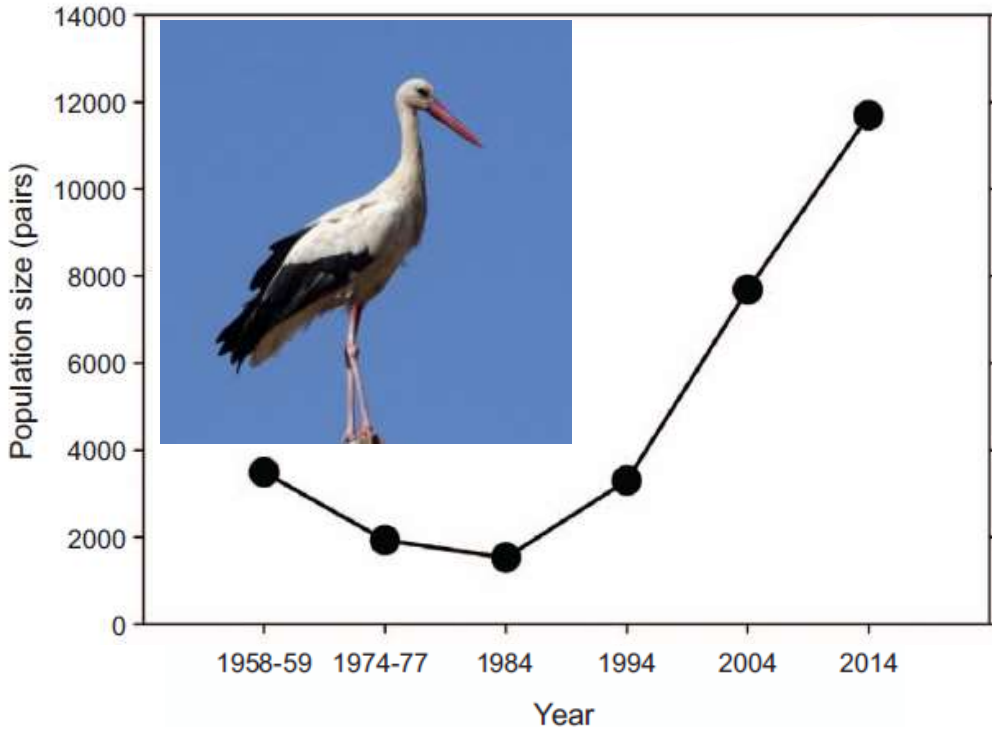
Environmental Research Letters

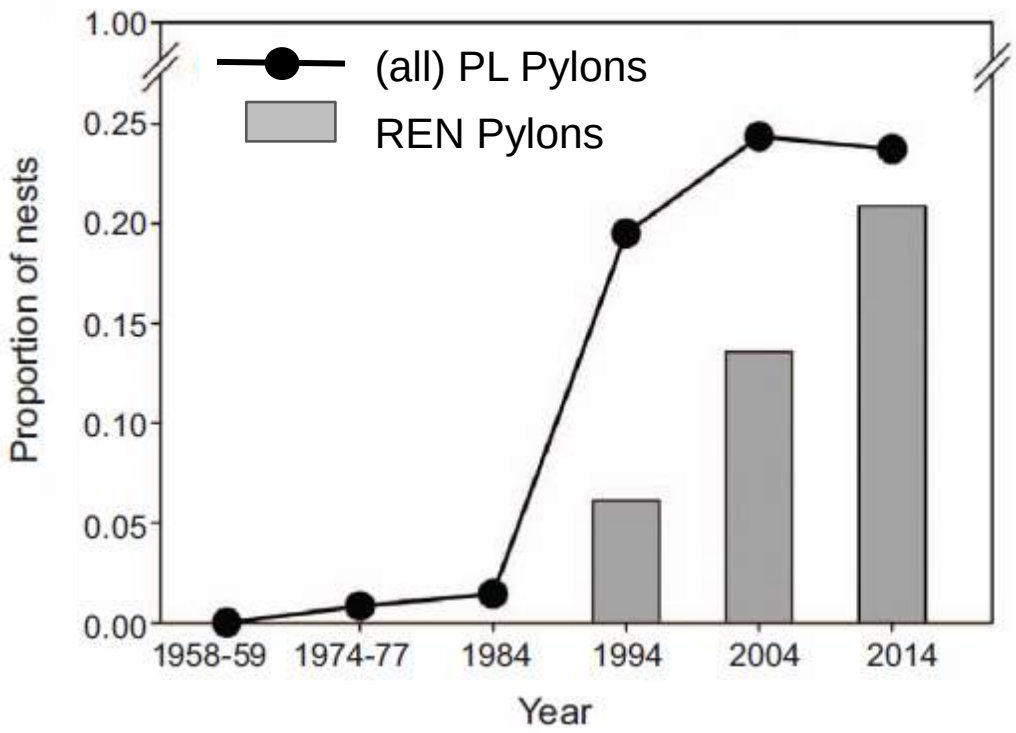
LETTER

Wired: impacts of increasing power line use by a growing bird population

Francisco Moreira[1,2,8], Vitor Encarnação[3], Gonçalo Rosa[4], Nathalie Gilbert[5], Samuel Infante[6], Julieta Costa[7], Marcello D'Amico[1,2], Ricardo C Martins[1,2] and Inês Catry[1,2,5]

TASK 1.6 – USE OF POWER LINE PYLONS BY NESTING WHITE STORKS





✓ Mitigation of power outages on REN network:

- Annual counts of nests on pylons to identify nests in risk (e.g. above conductors)
- Nest translocations for dedicated platforms on safe places of the pylons
- Implementation of anti-nesting devices in dangerous locations of pylons

TASK 1.6 – USE OF POWER LINE PYLONS BY NESTING WHITE STORKS

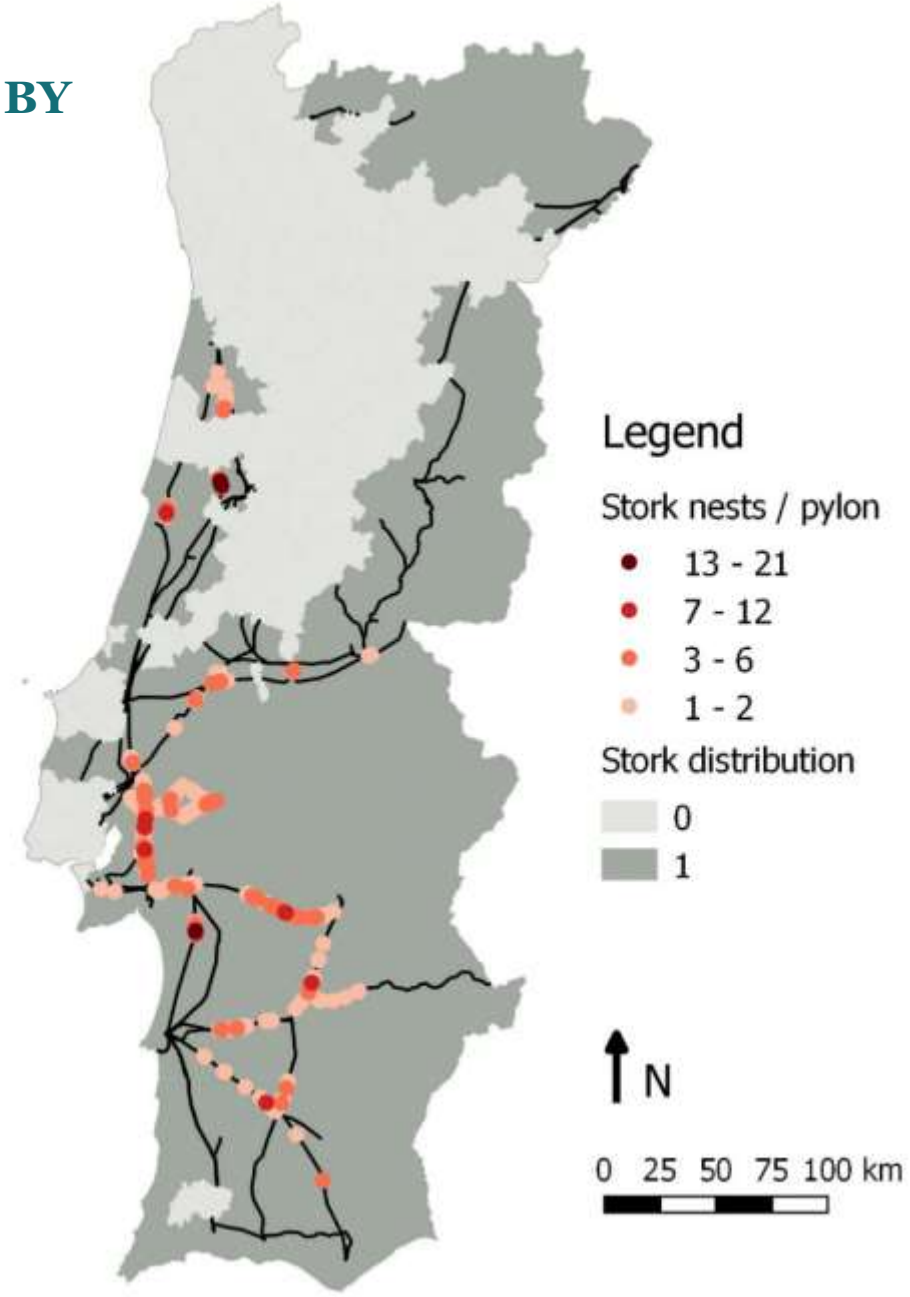
Received: 21 December 2017 | Accepted: 1 March 2018
DOI: 10.1111/1365-2664.13149

RESEARCH ARTICLE

Journal of Applied Ecology

Drivers of power line use by white storks: A case study of birds nesting on anthropogenic structures

Francisco Moreira[1,2] | Ricardo C. Martins[1,2] | Inês Catry[1,2,3] | Marcello D'Amico[1,2]



- ✓ Aim: to model the influence of pylon type, surrounding habitats and distance to feeding areas on the likelihood of pylon use (and nr of nests) by white storks in REN pylons

TASK 1.6 – USE OF POWER LINE PYLONS BY NESTING WHITE STORKS

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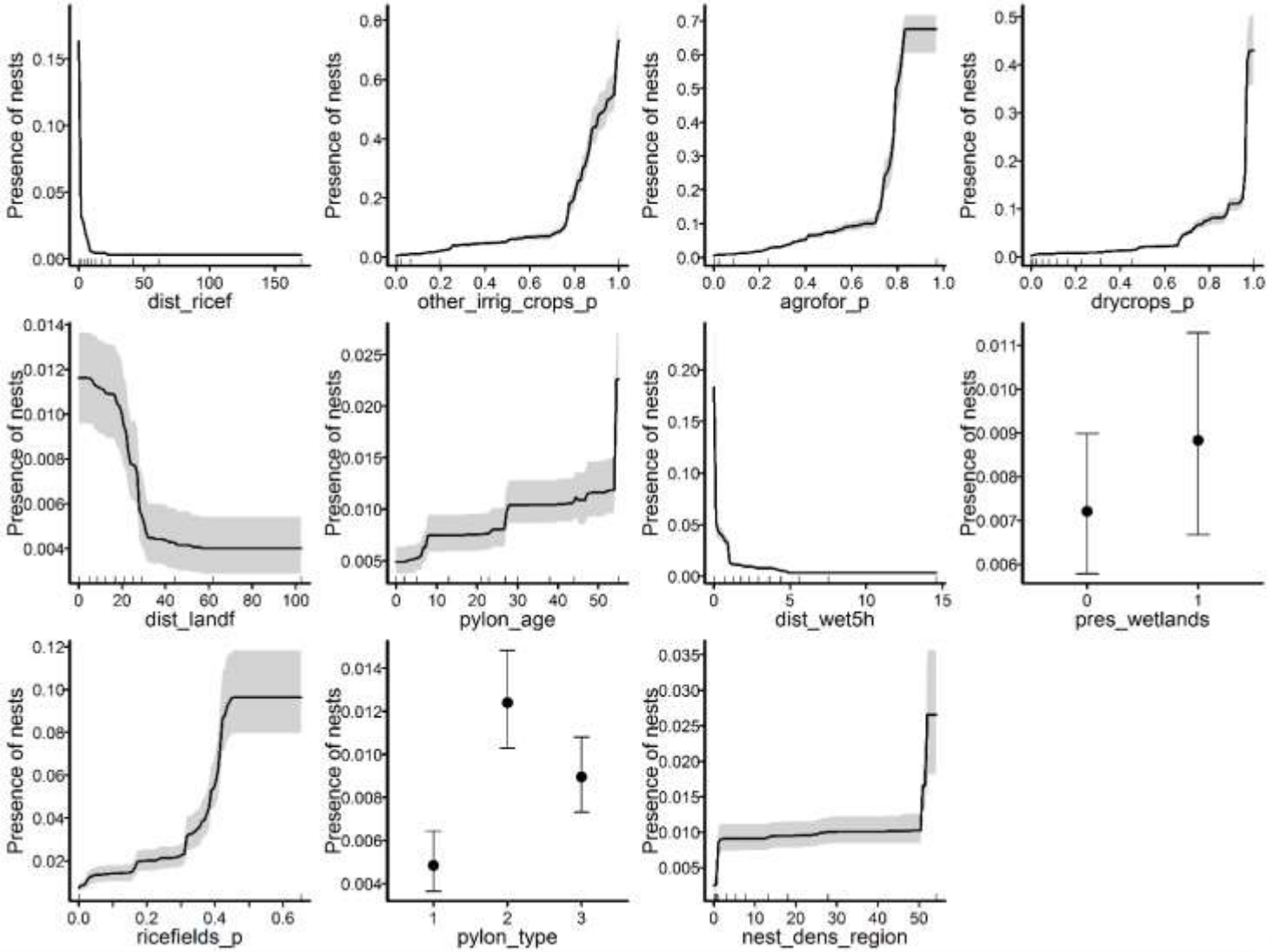
Pylon use depends on distance to feeding grounds, surrounding land use, pylon structure and stork population density in the region

✓ Application for REN: to predict pylon use in new power lines, and the need for mitigation measures



TASK 1.7 – HANDBOOK OF GOOD PRACTICES

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- ✓ Draft a ***Handbook of good practices*** for monitoring, mitigation and compensation of power line impacts on birds in Portugal
- ✓ Relevant stakeholders on impact assessment (APA, CCDR, ICNF) are involved (***consulting pannel***)
- ✓ Application for REN: improve and standardize EIA procedures

TASK 2.1 + 2.2 – ASSESSING THE POPULATION-LEVEL IMPACTS OF MORTALITY CAUSED BY POWER LINES

- ✓ Aims: ***simulate population dynamics and evaluate the impact of different sources of mortality*** (little bustard, white stork):
  - population estimates
  - mortality causes
  - productivity
  - migratory movements

- ✓ Application for REN: to determine under which circunstances mortality from power lines can have significant impacts on species populations' viability, in order to define adequate mitigation or compensation measures

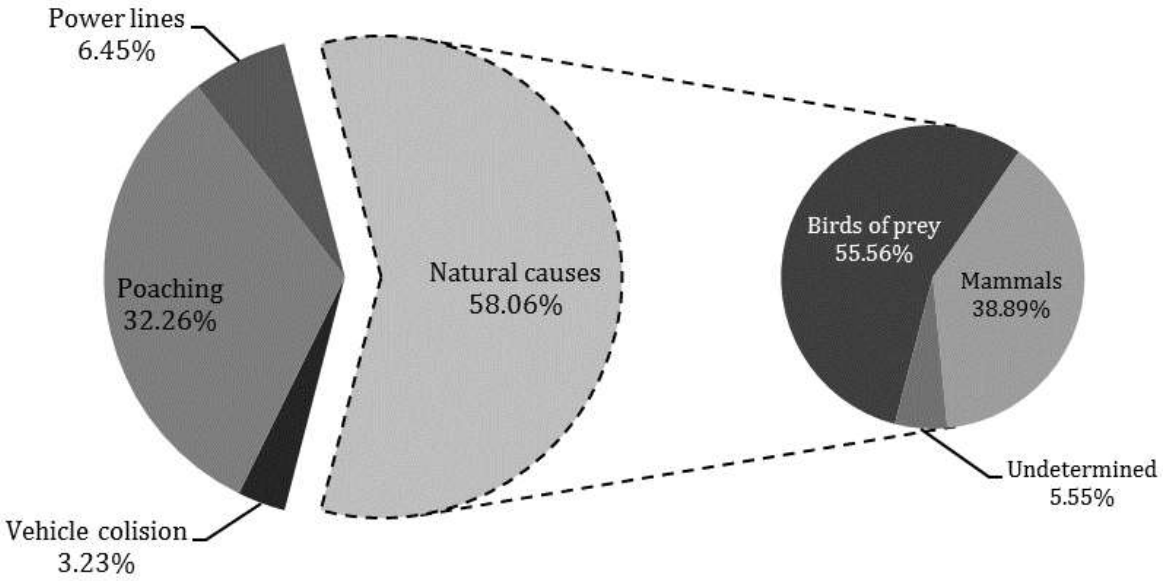
TASK 2.1 – MOVEMENTS AND POPULATION PARAMETERS

Bird Conservation International, page 1 of 12. © BirdLife International, 2017
doi:10.1017/S095927091700051X

Tracking data of the Little Bustard *Tetrax tetrax* in Iberia shows high anthropogenic mortality

JOANA MARCELINO, FRANCISCO MOREIRA, SANTI MAÑOSA, FRANCESC CUSCÓ, MANUEL B. MORALES, ELADIO L. GARCÍA DE LA MORENA, GERARD BOTA, JORGE M. PALMEIRIM and JOÃO P. SILVA

Evaluating mortality causes in little bustards followed by telemetry



TASK 3.1 – PILOT-PROJECT: PRODUCTIVITY OF NESTING WHITE STORKS

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✓ Increasing importance of anthropogenic infrastructures for breeding storks: Is there any advange?

✓ ***Citizen (corporate) science initiative:***

- Workers of the 2 electricity companies in Portugal (REN and EDP)
- Field work to count stork chicks in nests set on different structures

✓ Expected outcomes:

- Analyse influence of nest substrate on stork productivity
- modelling population dynamics

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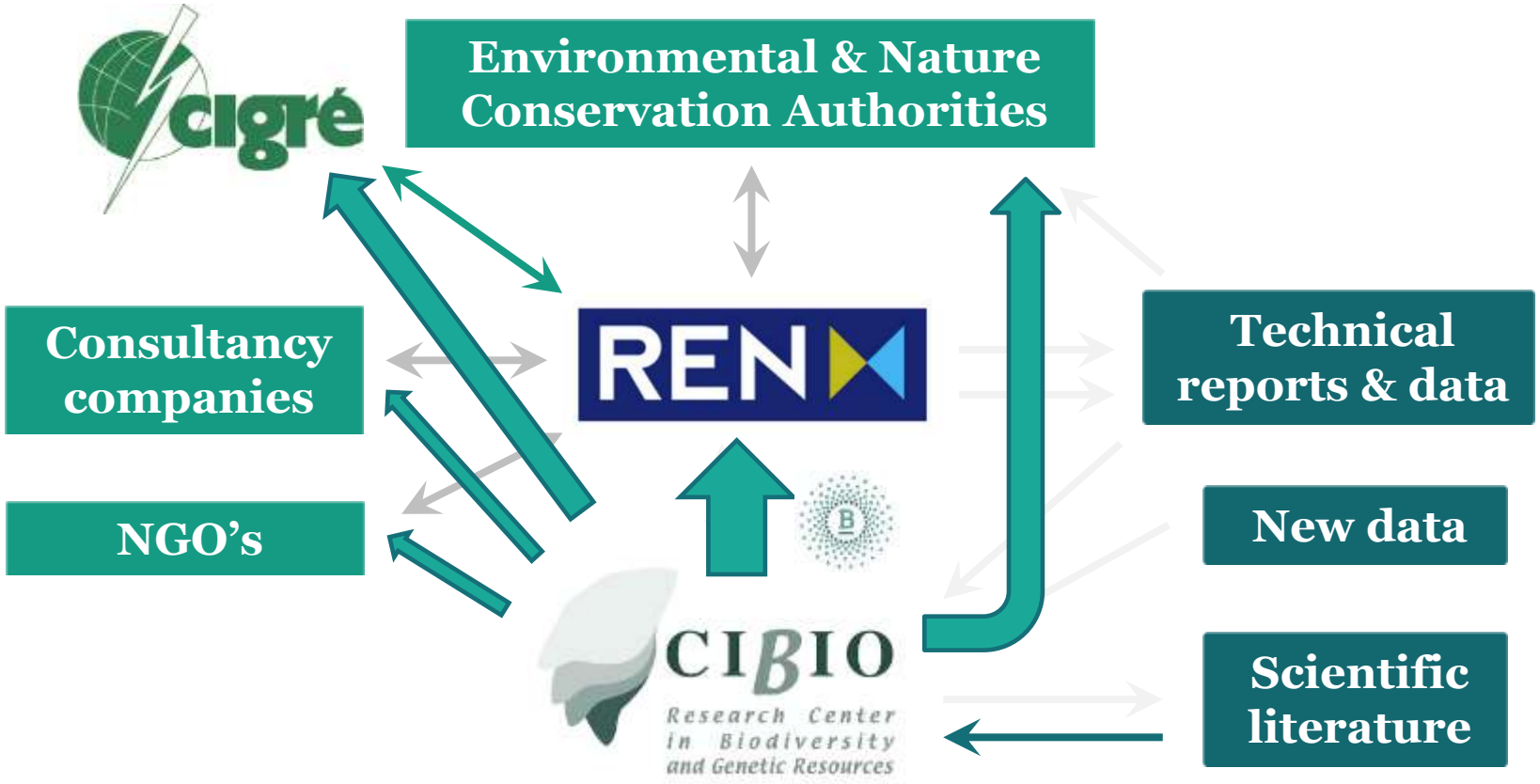
3 CONCLUSIONS

3. CONCLUSIONS

Knowledge flow on PL Impacts & other interactions with Birds

3. CONCLUSIONS

Knowledge flow on PL Impacts & other interactions with Birds



Thanks !

Ricardo C. Martins
Email: *rcmartins@cibio.up.pt*