

DRY PATHWAYS AND FLOWING WATER WITHIN CULVERTS JOINTLY PROMOTE CROSSINGS BY CARNIVORE MAMMALS

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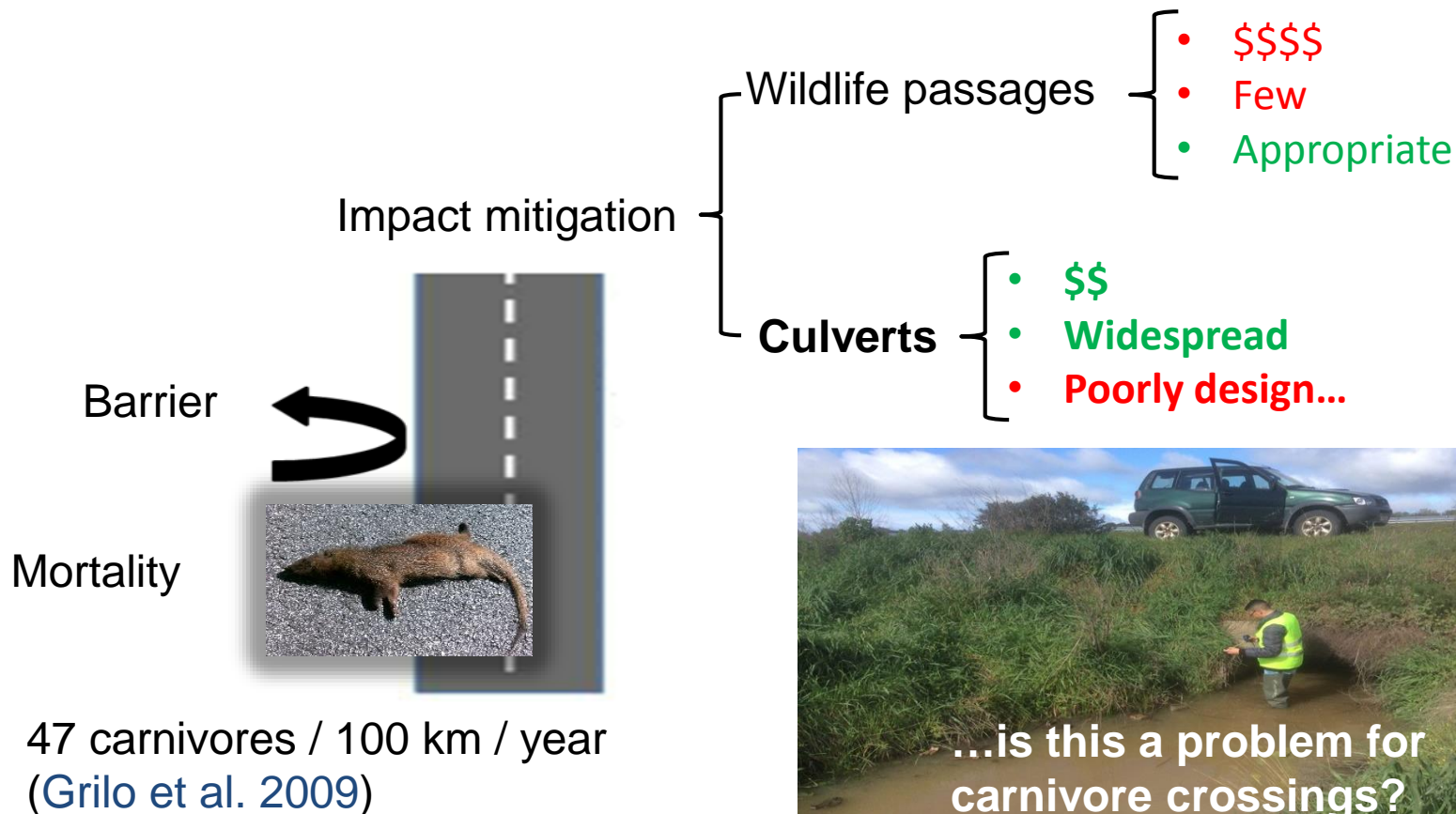
12 – 14 January
Évora
Portugal



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^b CIBIO-InBIO, ^c CEABN-InBIO; ISA, University of Lisbon

So, what's the matter?





LIFELINES

Action: Flooding effects on mammal crossings



<https://lifelines.uevora.pt>



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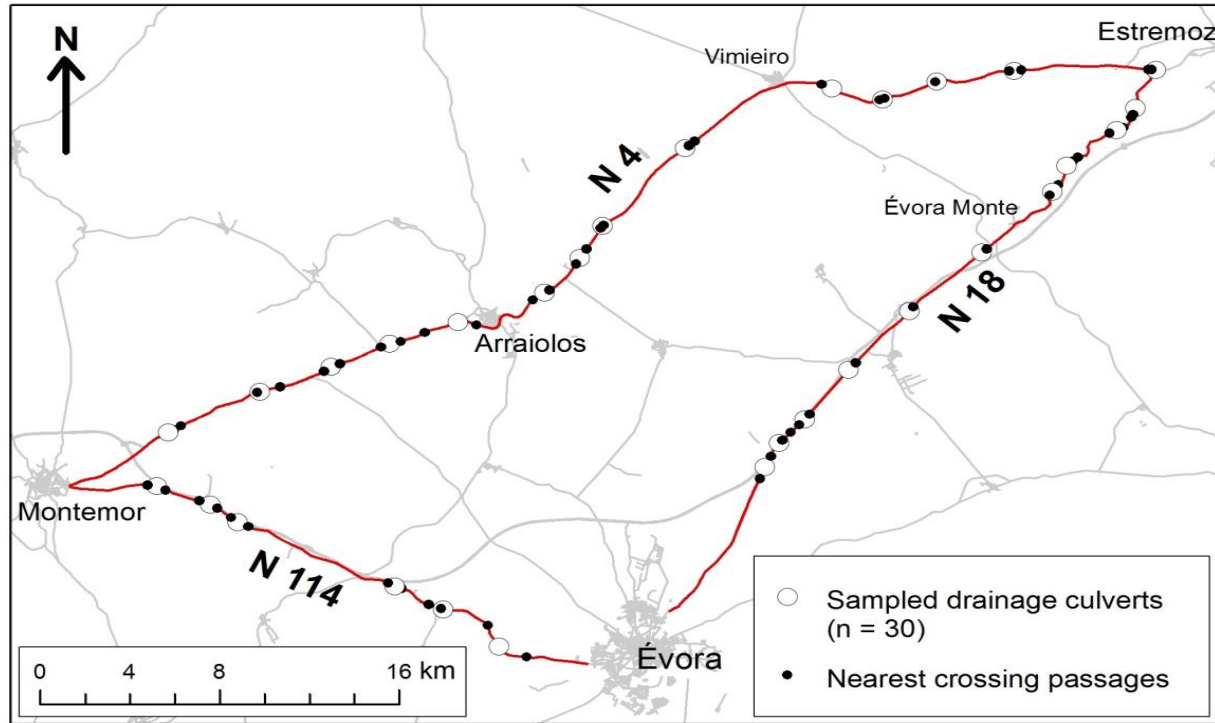
<https://www.facebook.com/lifelinesconservation/>

Hypothesis

Carnivores are less likely to cross and cross less often if the culvert had more water (e.g., narrower dry width).



Study area and design



Study seasons (2016):

Wet: March – May; Dry: August – not addressed here

How we did it?

Crossing assessment



Track stations: marble dust on hardboard panels;

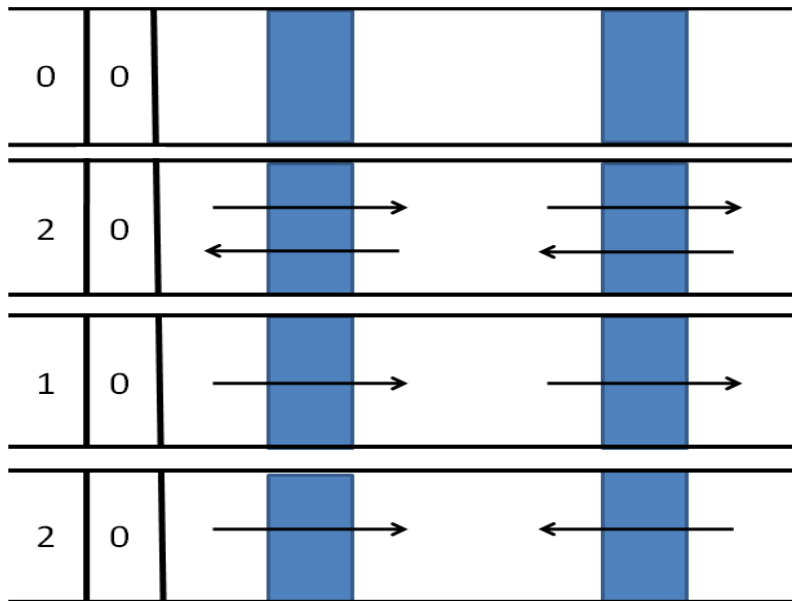
Raised using wood pieces and roof tiles;

Removed whenever water depth > 10 cm;

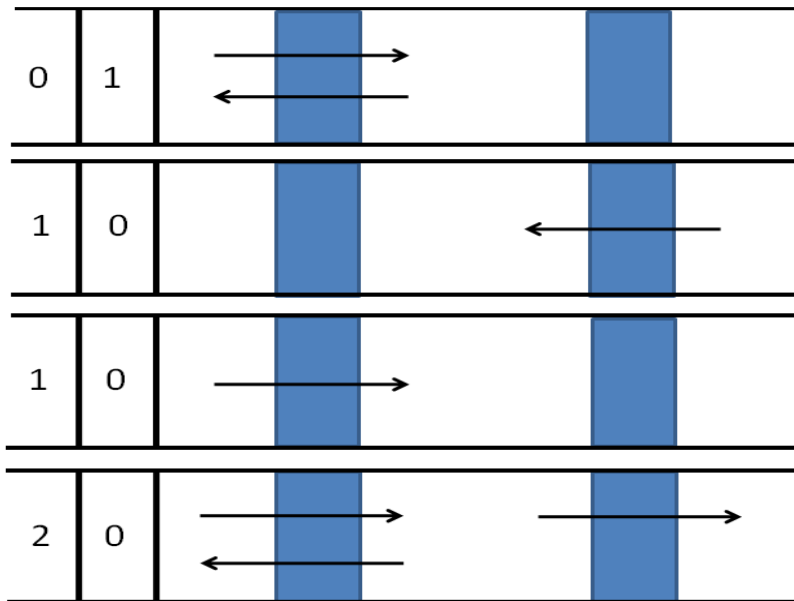
How we did it?

Assigning crossings

Crossing
Visit



Crossing
Visit



How we did it?

Validating crossing assessment in marble dust

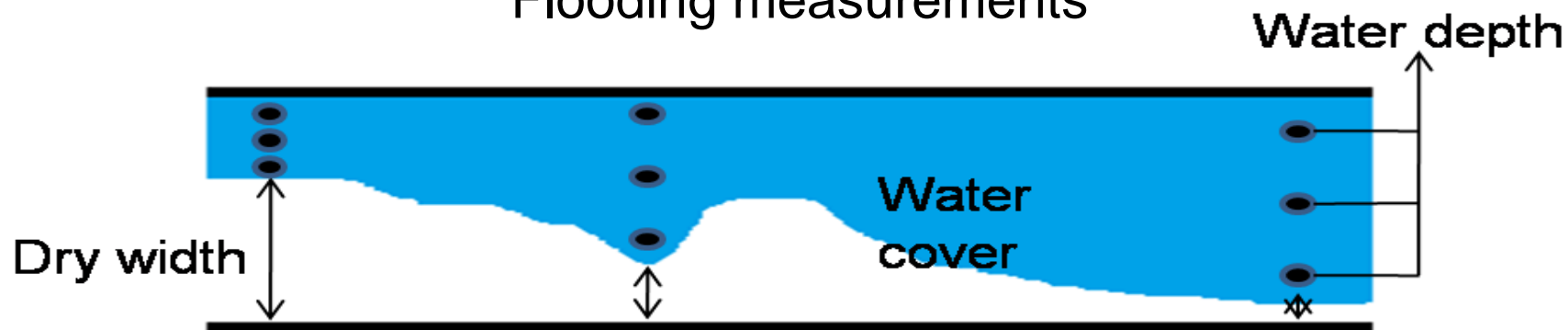


Infrared
cameras



How we did it?

Flooding measurements



Introduction

Materials and
Methods

Results

Results

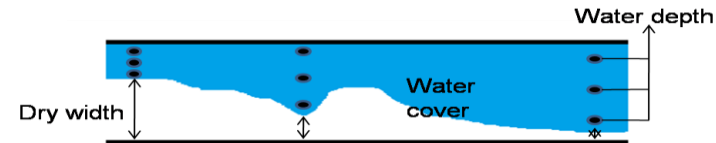
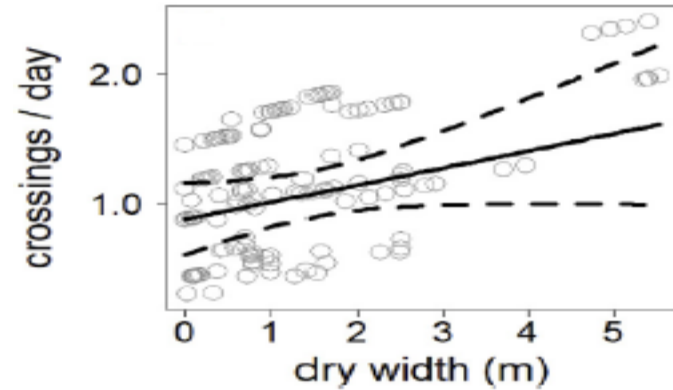
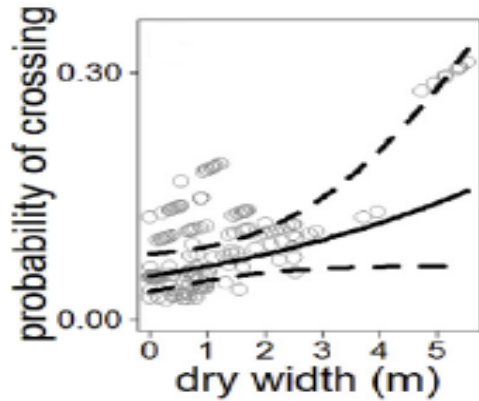
Wet season: 794 crossings (0.96 / culvert / day)



Results

How did water influence crossings?

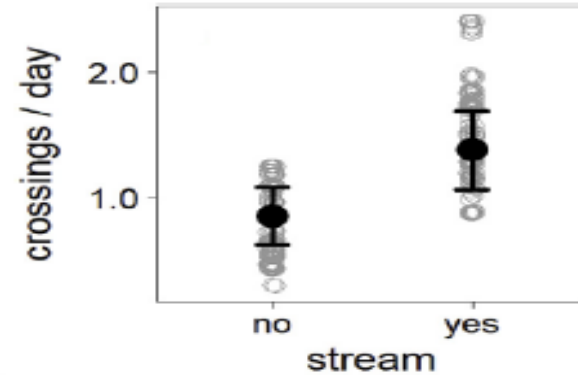
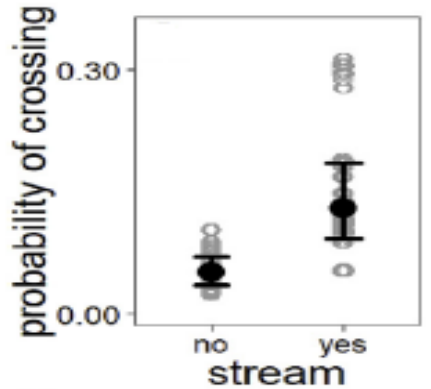
All species combined



Results

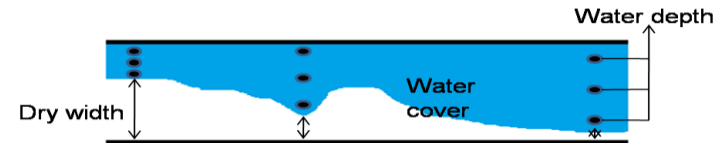
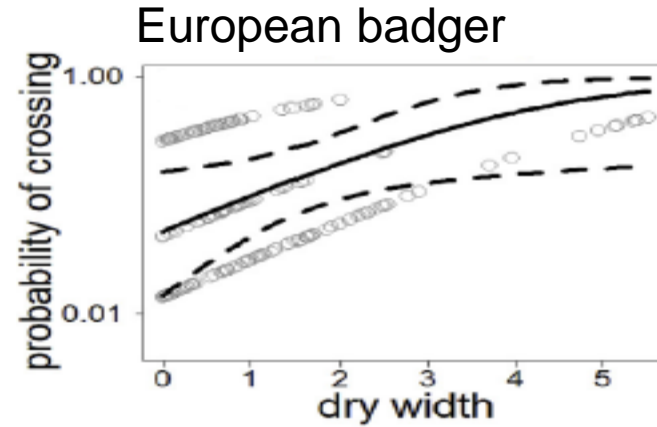
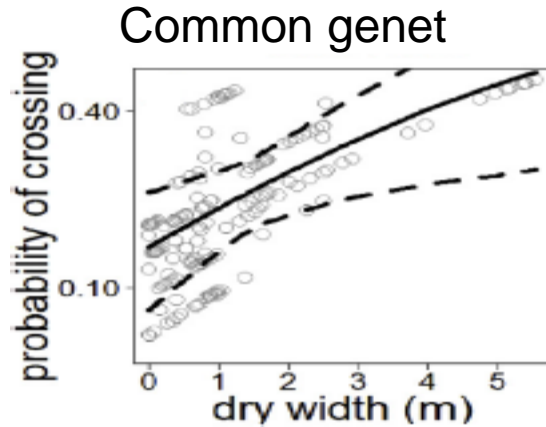
How did water influence crossings?

All species combined



Results

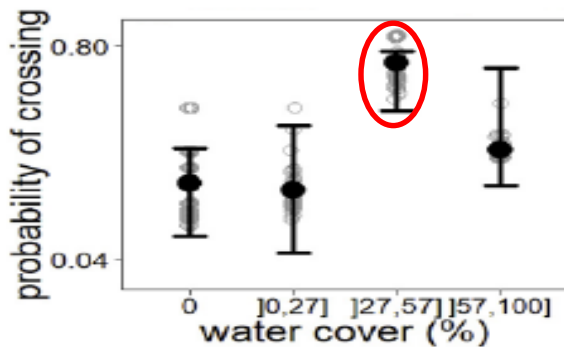
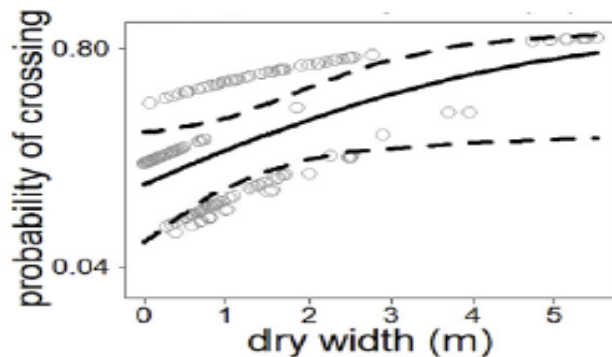
How did water influence crossings?



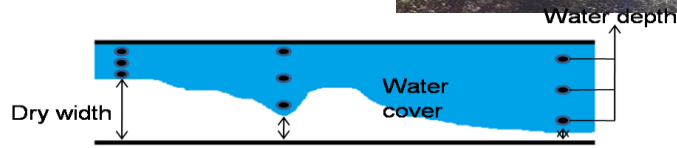
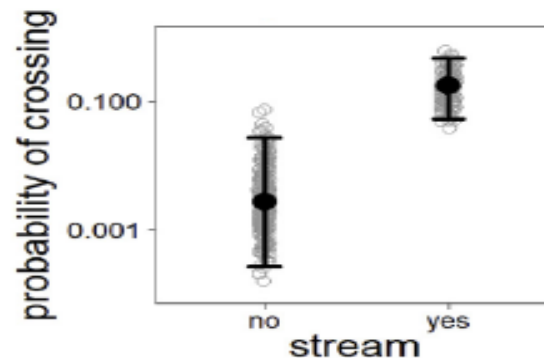
Results

How did water influence crossings?

Egyptian mongoose



Euroasian otter



Introduction

Materials and
Methods

Results

Results

How did water influence crossings?



Introduction

Materials and
Methods

Results

Discussion

Discussion and Conclusions



Dry pathway \Rightarrow \uparrow probability &
No. of crossings

50 cm to 1 or 2 m \Rightarrow \uparrow probability
by ~11 to ~35 %



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Dry ledges in culverts

Discussion and Conclusions

Stream inside culvert \Rightarrow \uparrow probability & number of crossings / day for all species; \Rightarrow perhaps a continuity in riparian habitats?



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So...

We refined the paradigm of water effects in culverts
with direct implications to management





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Research article

Impact of culvert flooding on carnivore crossings

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ABSTRACT

Along many roads worldwide, drainage culverts are the only structures wildlife can safely use to cross. However, culverts inundate and can become unavailable to terrestrial fauna during rainy periods. We conducted a field study over wet and dry seasons in southern Portugal to assess the effect of culvert flooding on crossings by medium-sized carnivores. We set up track stations inside 30 culverts along intermediate-level traffic roads to evaluate complete crossings ($n = 1211$) and used mixed-effects models to quantify the effects. Carnivores were more likely to cross and crossed more frequently if the culvert had a natural dry pathway at the time of the crossing. Carnivores were also more likely to cross culverts with streams running through them. Moreover, culverts with flowing streams during the wet season were still more likely to be crossed during the dry season when the streams were dry. The significance of the difference in crossing rates between wet and dry seasons was species-specific. Our study reveals that flowing water and dry pathways jointly contribute to promoting crossings by this carnivore community. Culverts including streams may act as a continuation of riparian corridors, being incorporated into carnivores' movement routes. Our results lend empirical support to recommendations advising the implementation of dry pathways to provide crossing paths. Interventions to offset the transient impacts of water flooding in new or existing culverts can be a cost-effective solution promoting connectivity across roads allowing movement of individuals.

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**LIFE
LINES**

Linear Infrastructure Networks
with Ecological Solutions



LIFE LINES (LIFE14 NAT/PT/001081)

Linear Infrastructure Networks with Ecological Solutions
60% co-financed project by the LIFE - Nature and
Biodiversity Program of the European Commission



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