



MINISTÈRE  
DE LA TRANSITION  
ÉCOLOGIQUE  
ET DE LA COHÉSION  
DES TERRITOIRES

*Liberté  
Égalité  
Fraternité*



# Séminaire du plan national d'actions en faveur du Puffin des Baléares

24 au 26 juin 2024



# Spatial ecology of Balearic shearwaters in French waters

Preliminary results from PNA

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Séminaire du  
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# A new technique to catch birds at-sea



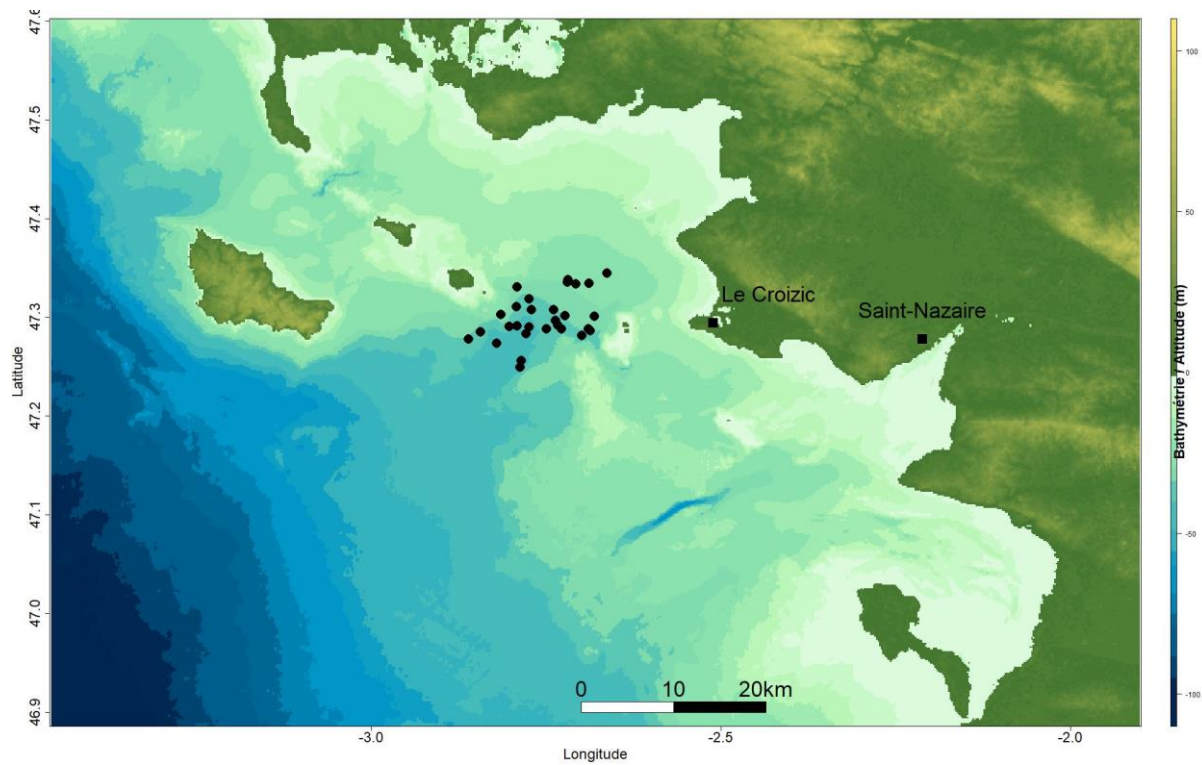
Chris Gaskin



# 61 birds caught at-sea in Mor Braz 2022 and 2023

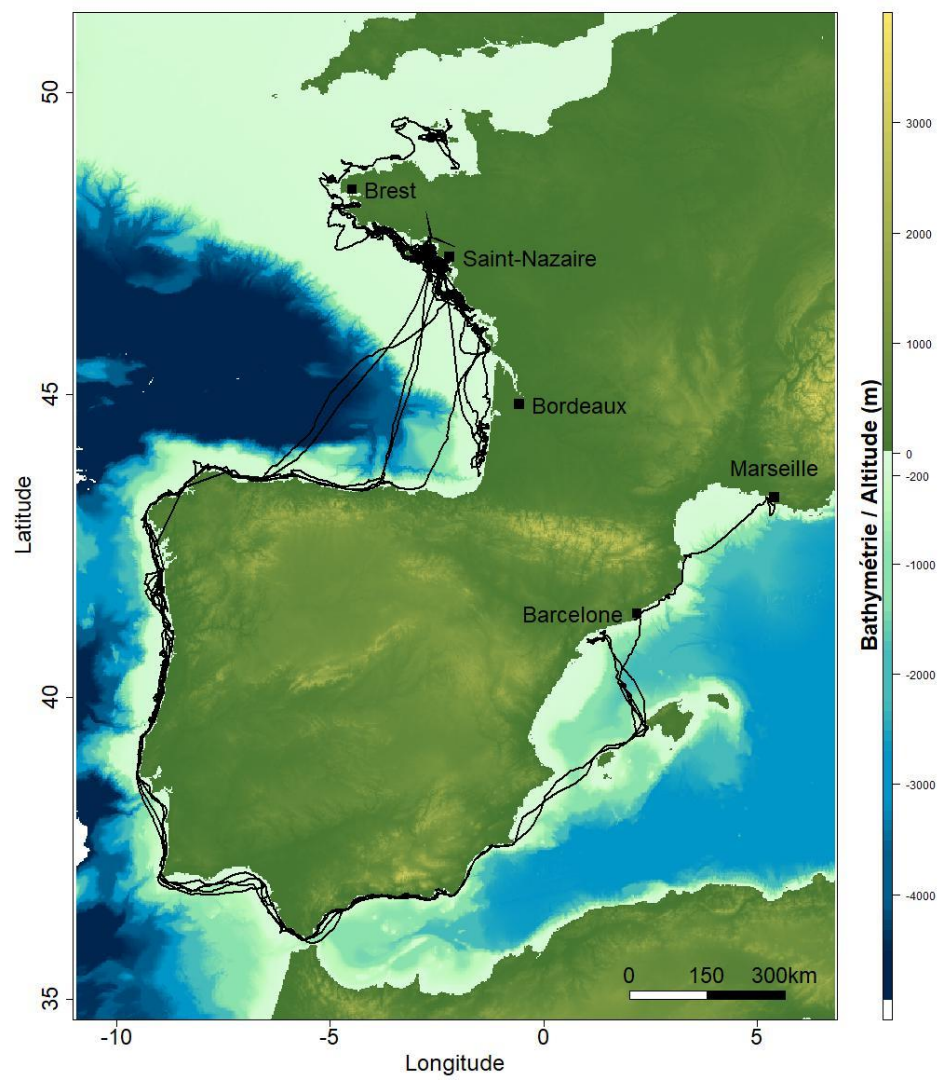
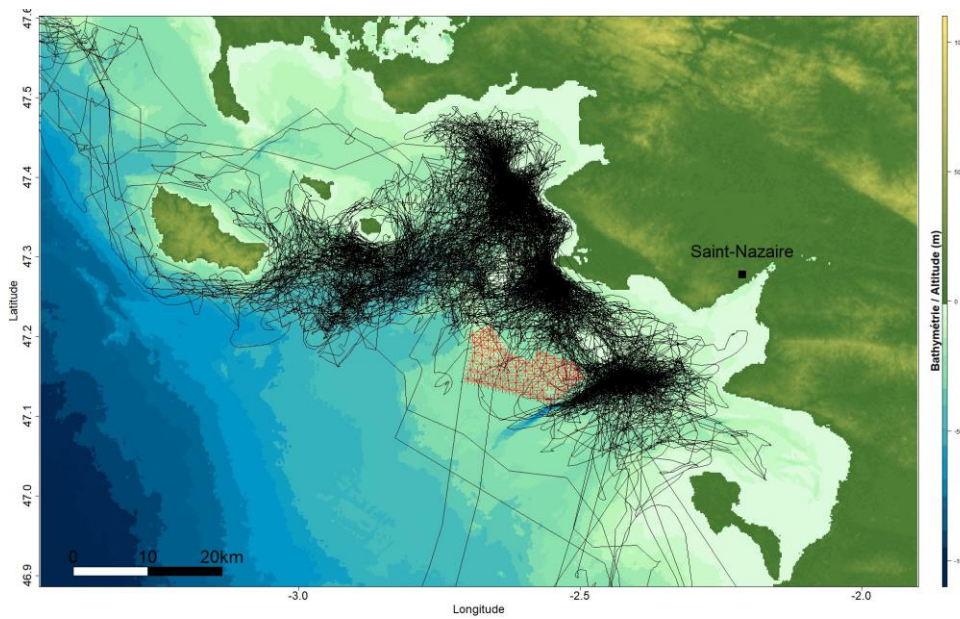


**SKRAVIK**



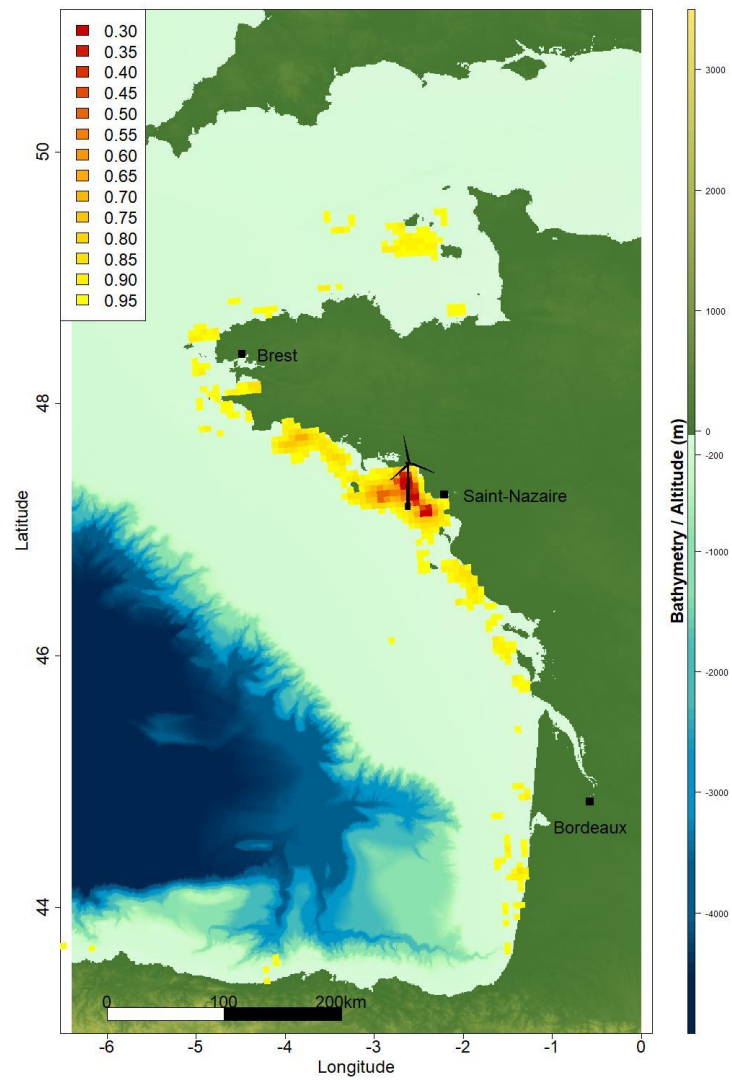
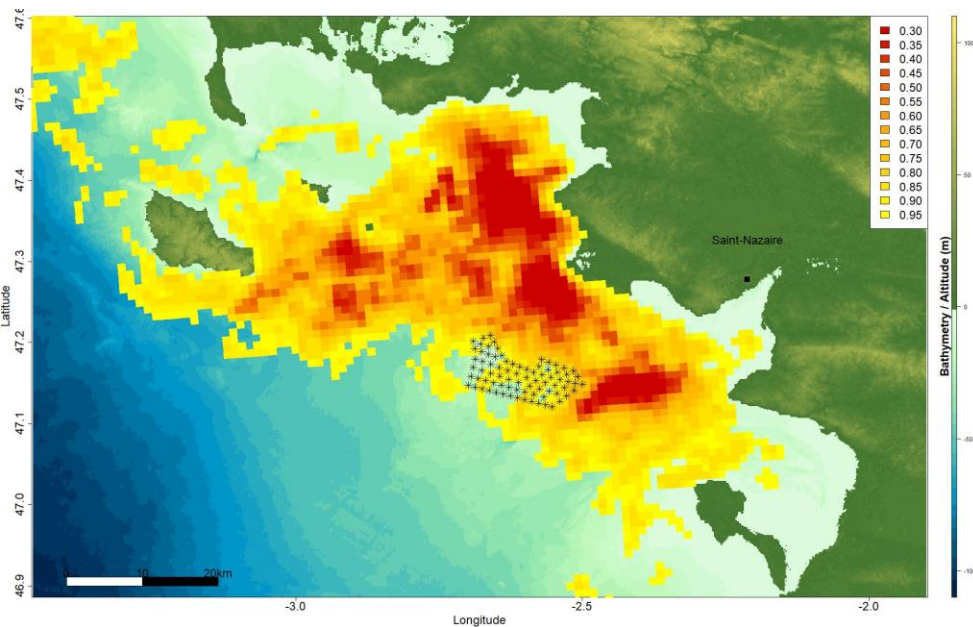
# GPS monitoring

- N = 30 birds in 2022 & 2023, 28 days on average (4 to 51 days)
- solar GPS-GSM with 1 loc / 10 min + diving sensor 5Hz
- Use of several sites by the same individual
- Transit within the windfarm.



## Utilization distribution 2022/2023

Biased Random Bridge method (Benhamou 2011)



# Activity budget

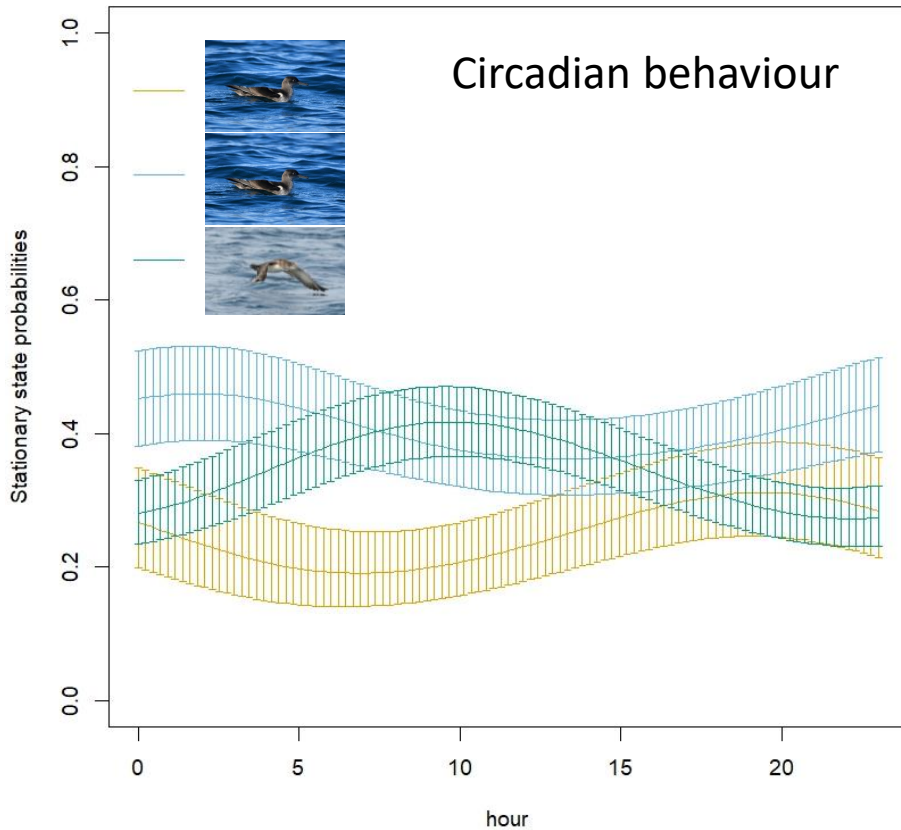
Hidden Markov model (Morales et al. 2004,  
McClintock & Michelot 2018)

3-states based on speed & directionality  
+ covars on state transitions

36% in flight



67% in drift  
(resting / foraging)





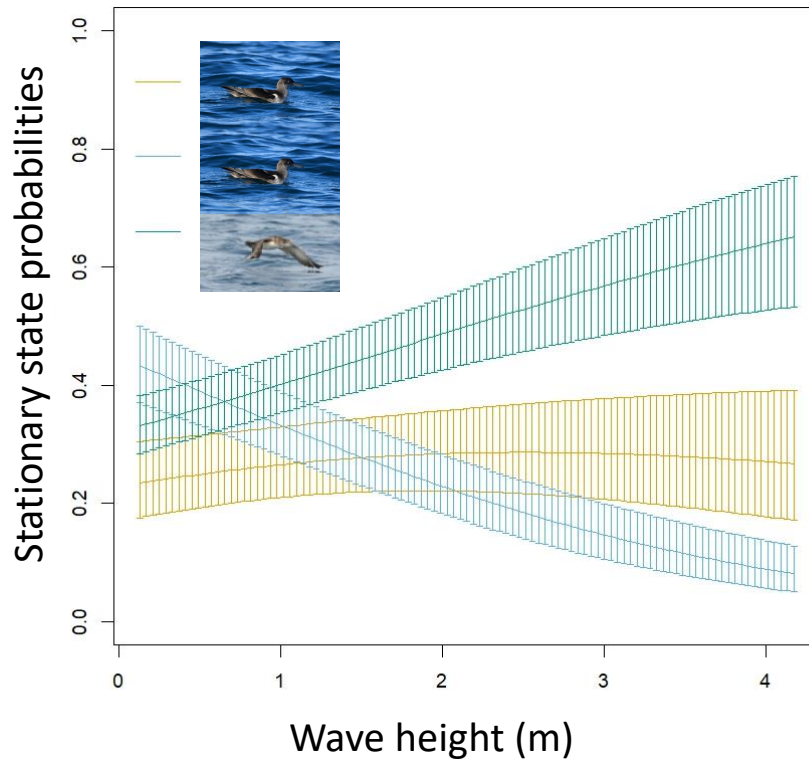


**Influence of at-sea conditions on flight behaviour**

**→ Probability of flight + Flight height**

# At-sea conditions & flight probabilities

Hidden Markov model (as previously)

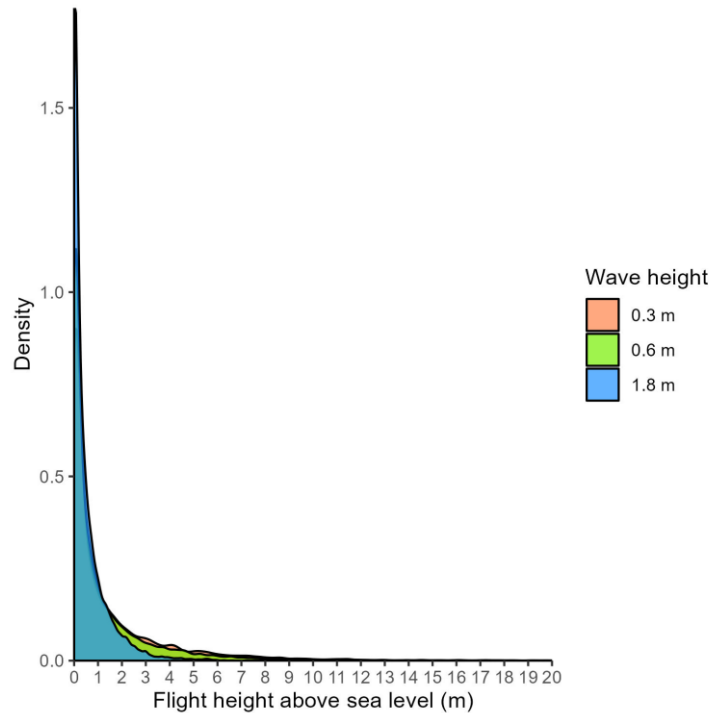
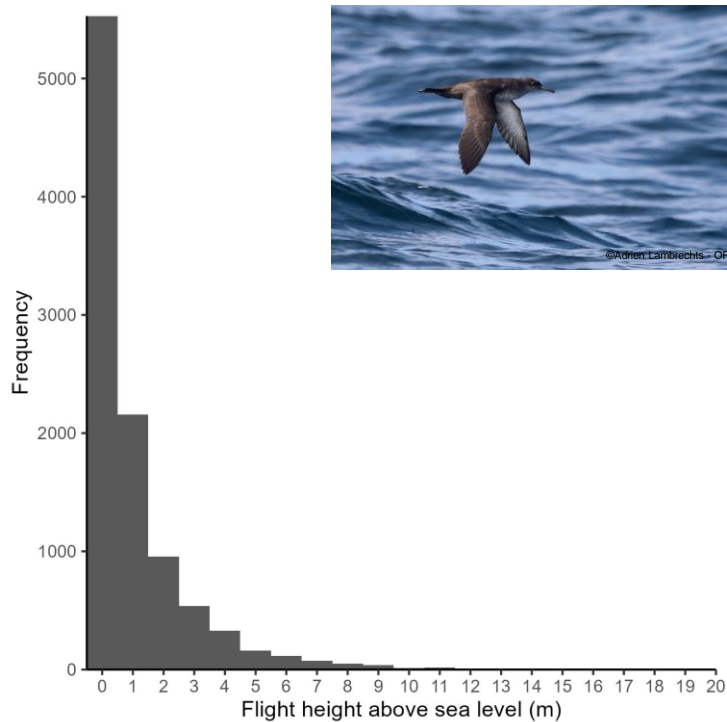


No effect of:

- wave period
- wind speed
- direction

# At-sea conditions & flight height

Bayesian state-space model to account for GPS bias (Ross-Smith et al. 2016)



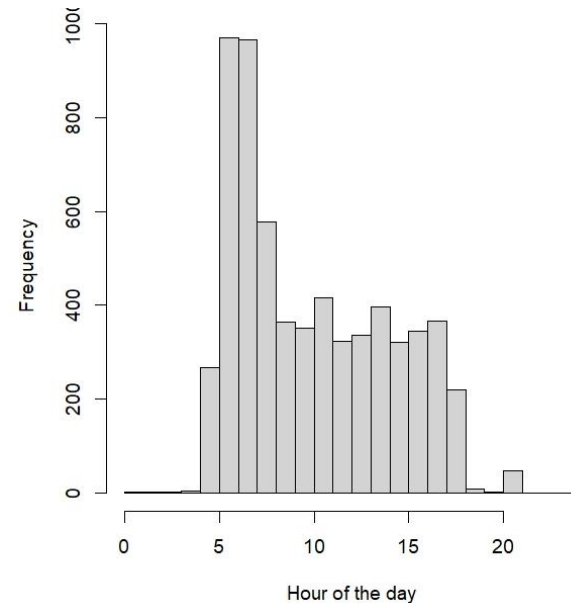
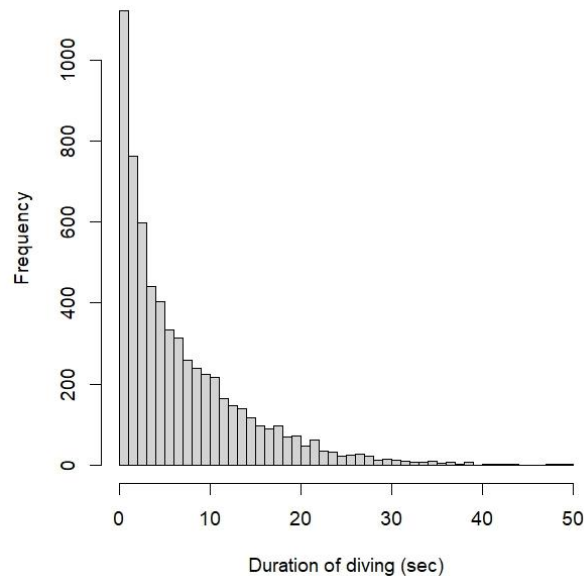
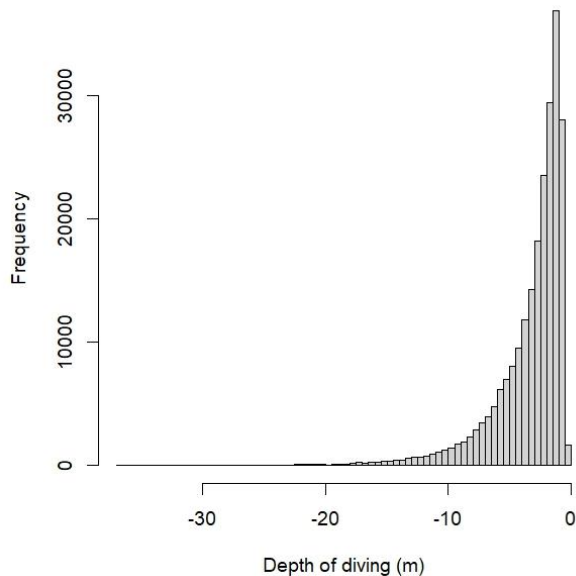
- Slight increase with longer wave period
- No effect of wind speed

# Diving ecology

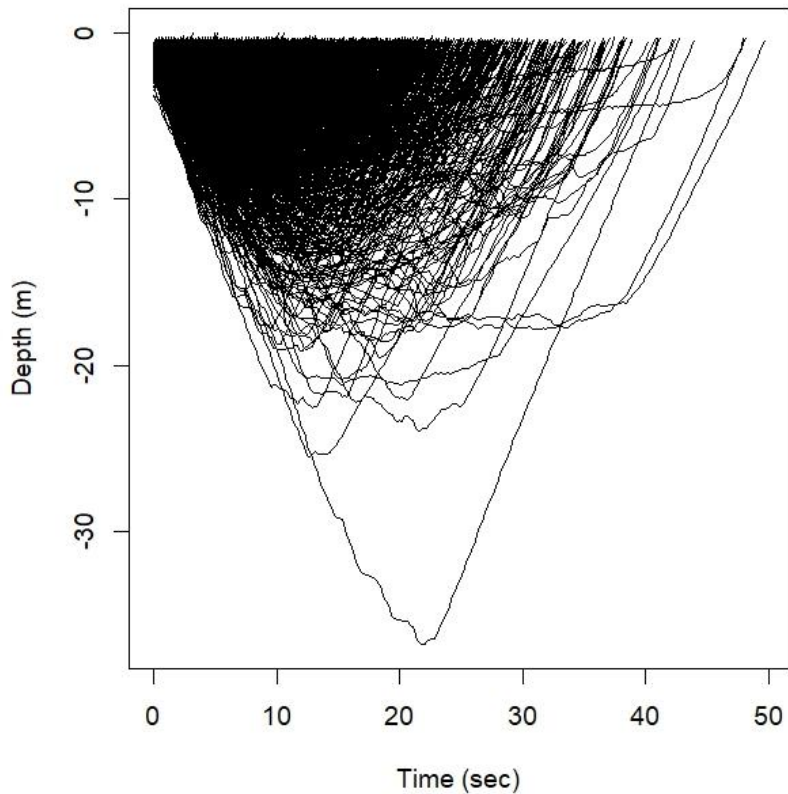
N = 6279 diving events

**Diving depth:** median = -2.3 m, maximum = -36.8 m

**Diving duration:** median = 4.6 s, maximum = 49.72 s



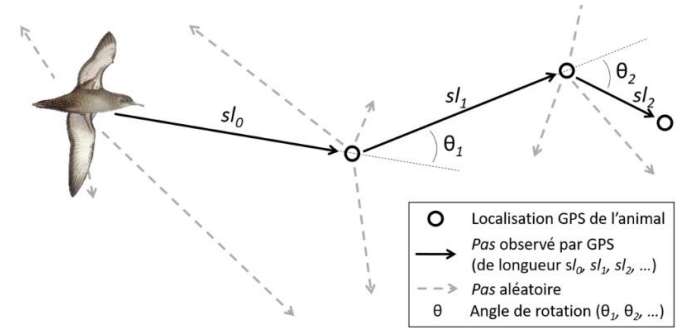
# Diving ecology



# Fine-scale habitat selection

Step Selection Function (Fortin et al. 2005, Avgar et al. 2015)

$$\hat{w}(x) = \exp \left( \beta_1 sl + \beta_2 \log(sl) + \beta_3 \cos(\theta) + \beta_4 \text{substrat} + \beta_5 \text{bathy} + \beta_6 \text{pente} + \beta_7 \text{sst} + \beta_8 \text{chla} \right)$$



- Weak evidence for selection at the scale of 1h step
- Need to assess selection at a larger scale (RSF)