

Drones as tools in nature conservation

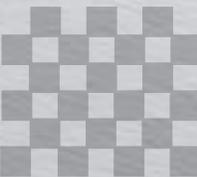
Behaviour, Acoustics, Nutrition and Bycatch trials

Master Thesis of

Ann-Kristin Craul, Leon Rostock, Sophie Tuchscherer



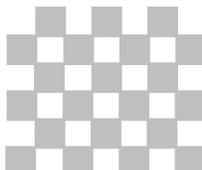
CetTrack
Melania Cosentino
Michael Dähne



Results of three master thesis



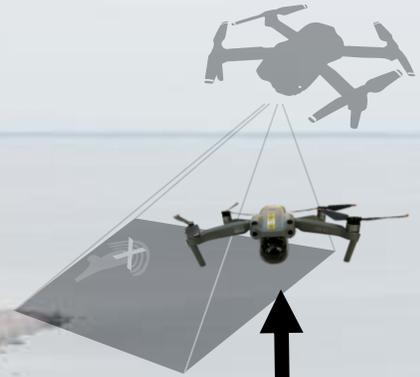
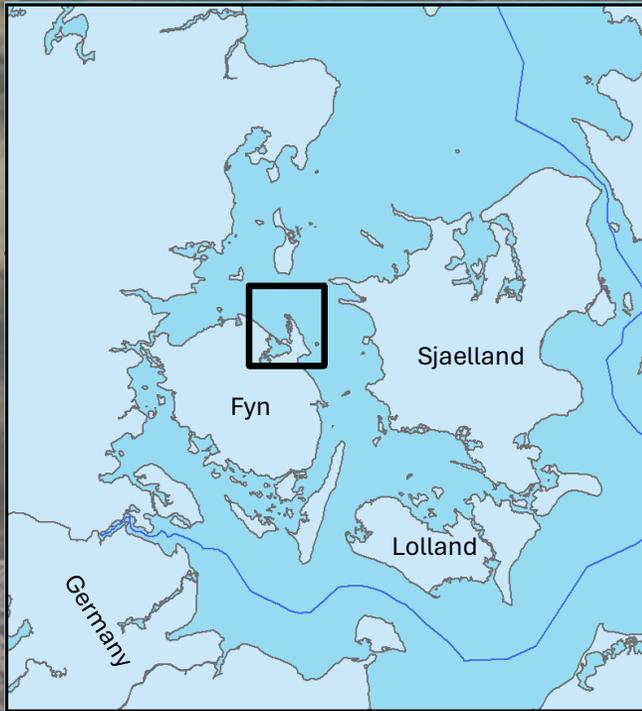
- Stereotypic behavioural patterns (Ann-Kristin Craul, University Rostock)
- Click communication and simultaneous detections in harbour porpoises (Léon Rostock)
- Body measurements of harbour porpoises (Sophie Tuchscherer, ongoing)





Work pattern

Fyns Hoved, DK

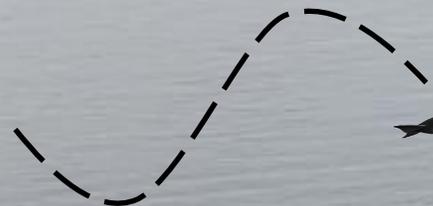


Air2s
Ground resolution:
2 cm/px

Mini 2
Ground resolution:
0.5 - 1 cm/px

100 m

10 - 40 m



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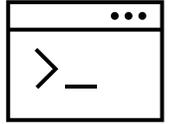
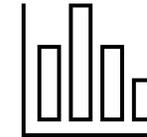
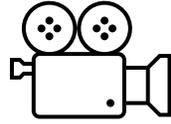
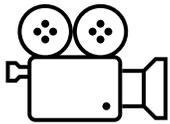


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Data analysis



1. Screening

- First classification

280 h videos

2. Screening

- Pre-selection of useful videos

300 h work

Analysis

- Behaviours
- OACs
- Measurements

~ 6 hours
~ 1000 h work

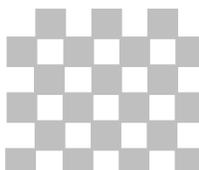
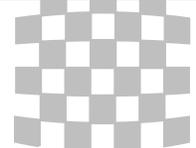
Statistics

- Statistics
- Method development

CetTrack

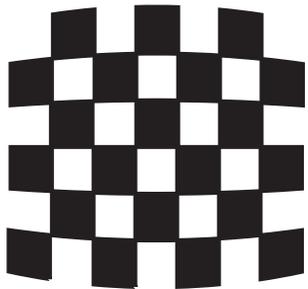
- Connection of behaviour with georeferenced position

~ 2 hours work for
= 10 min video

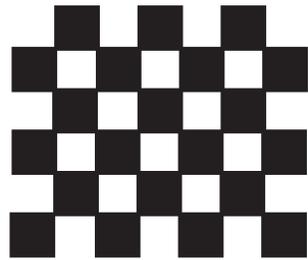


CetTrack

1) Lens calibration

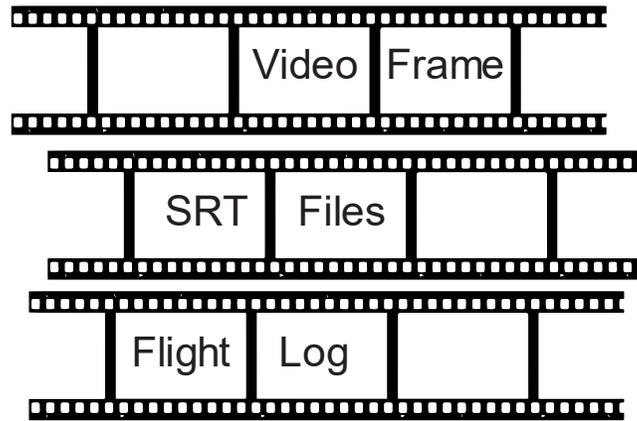


uncalibrated



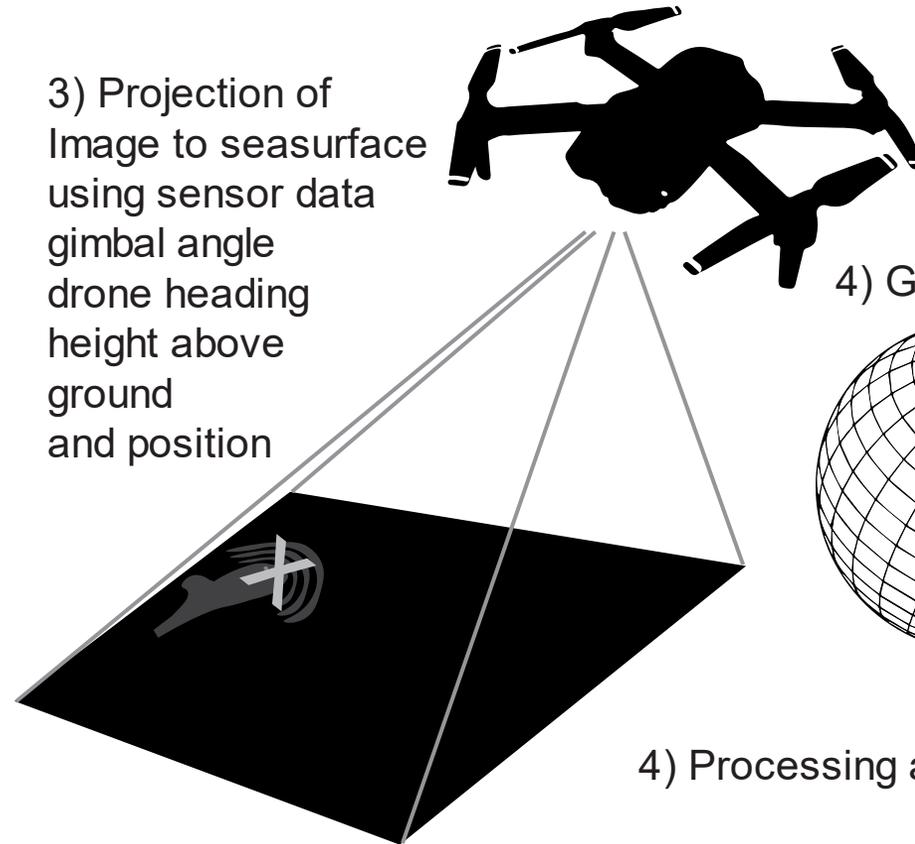
calibrated

2) Synchronization

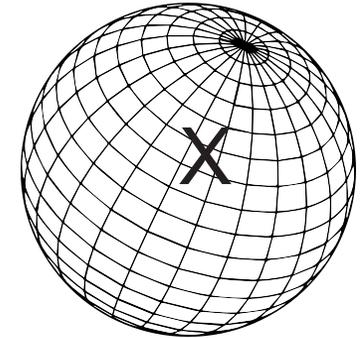


GPS Time

3) Projection of Image to seasurface using sensor data
gimbal angle
drone heading
height above ground
and position

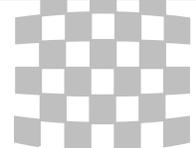


4) Georeferencing



4) Processing and Export

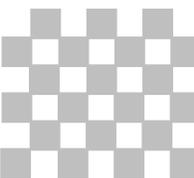
Dähne & Cosentino (in prep)



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Info

Calf Photo-id
 Juvenile Length

Net Feeding
 Surface Mating
 Bottom WTF?

Porpoise

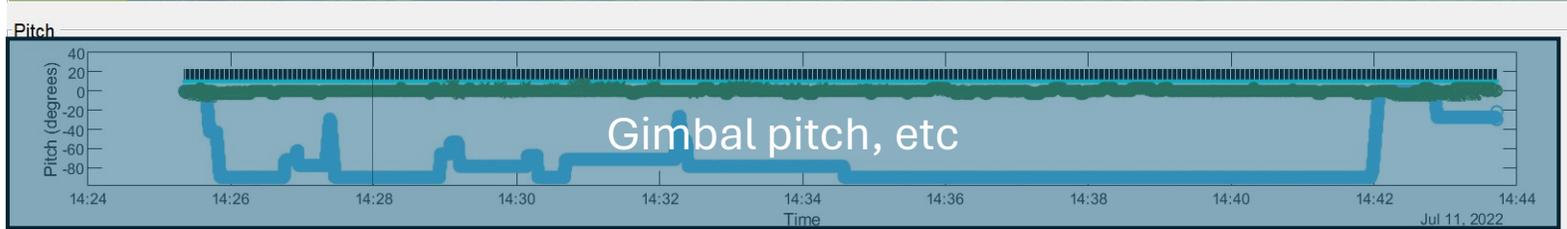
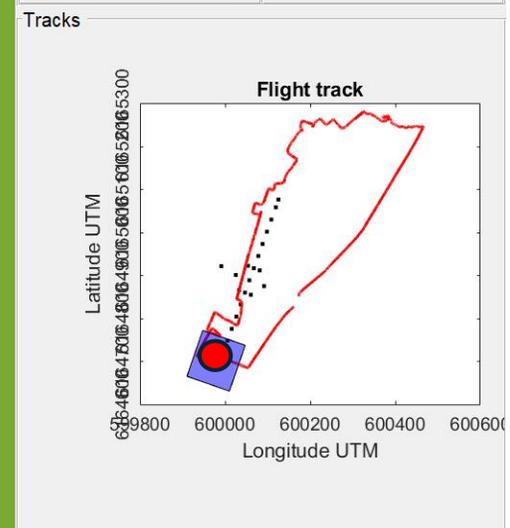
P1	P2
P3	P4
P5	P6
C7	C8
C9	J10

Frames

-1 +1
 -15 +15
 -30 +30
 -100 +100

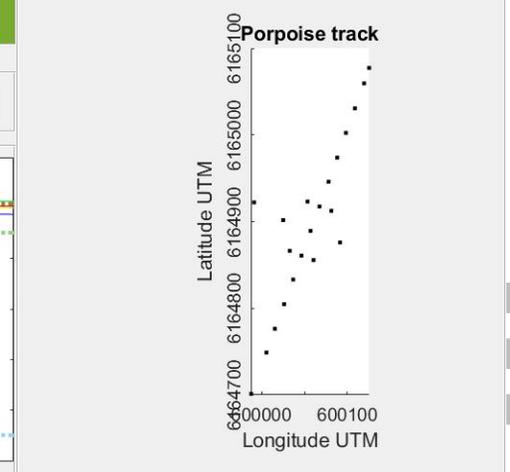
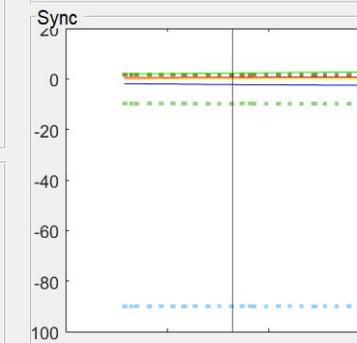
Other

Flag
 Add note



Sync interactively

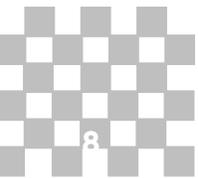
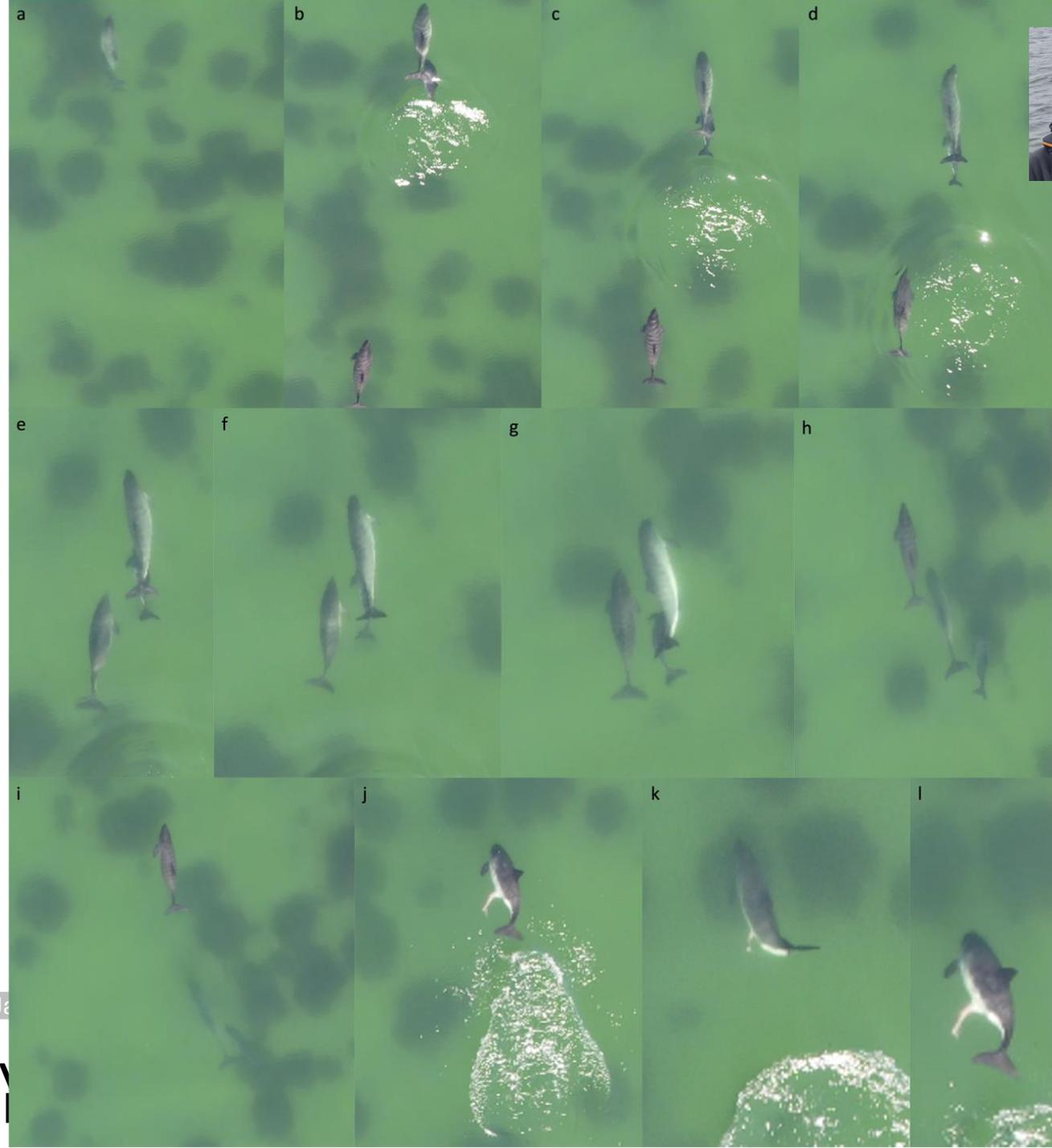
0 Sync now

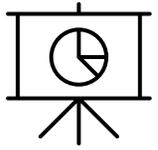




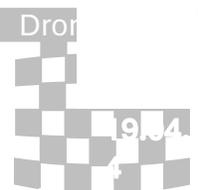
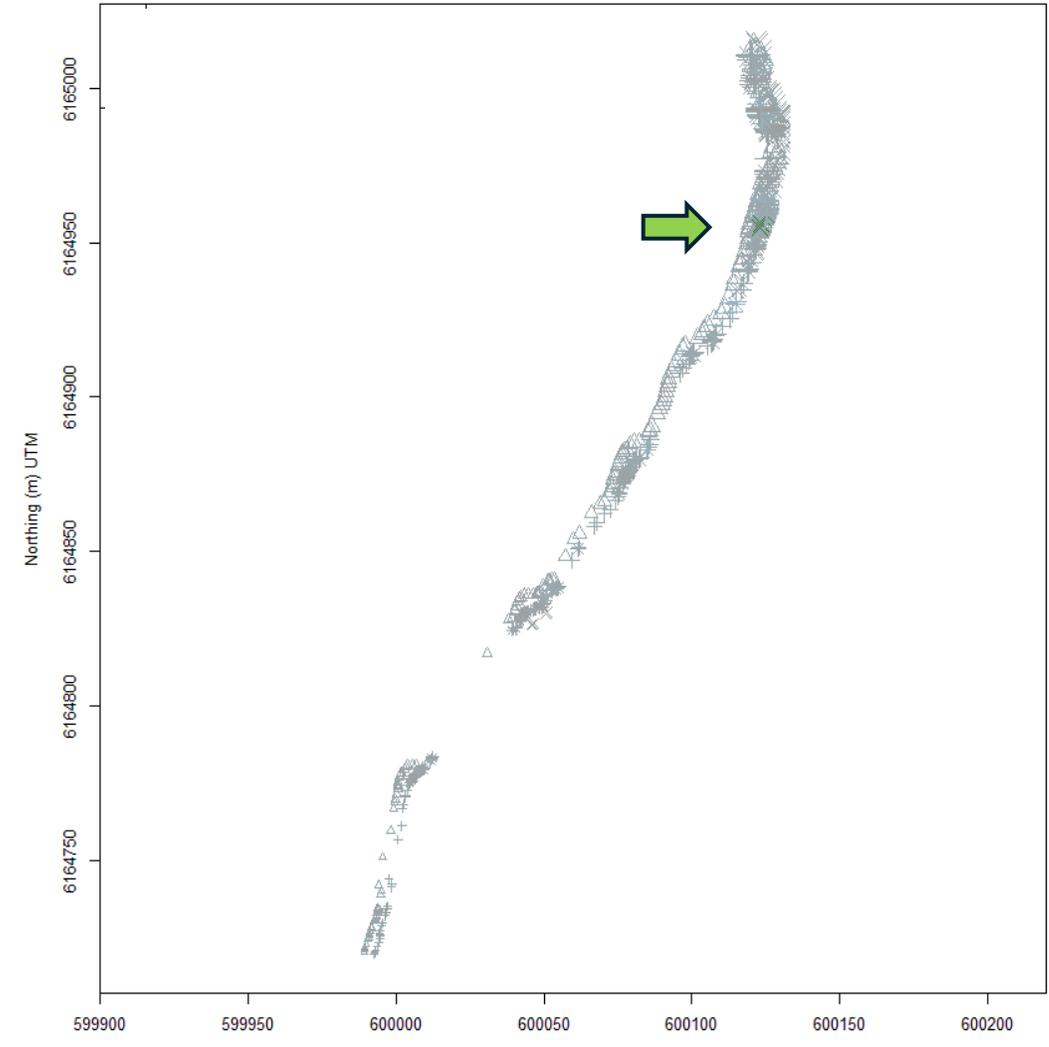
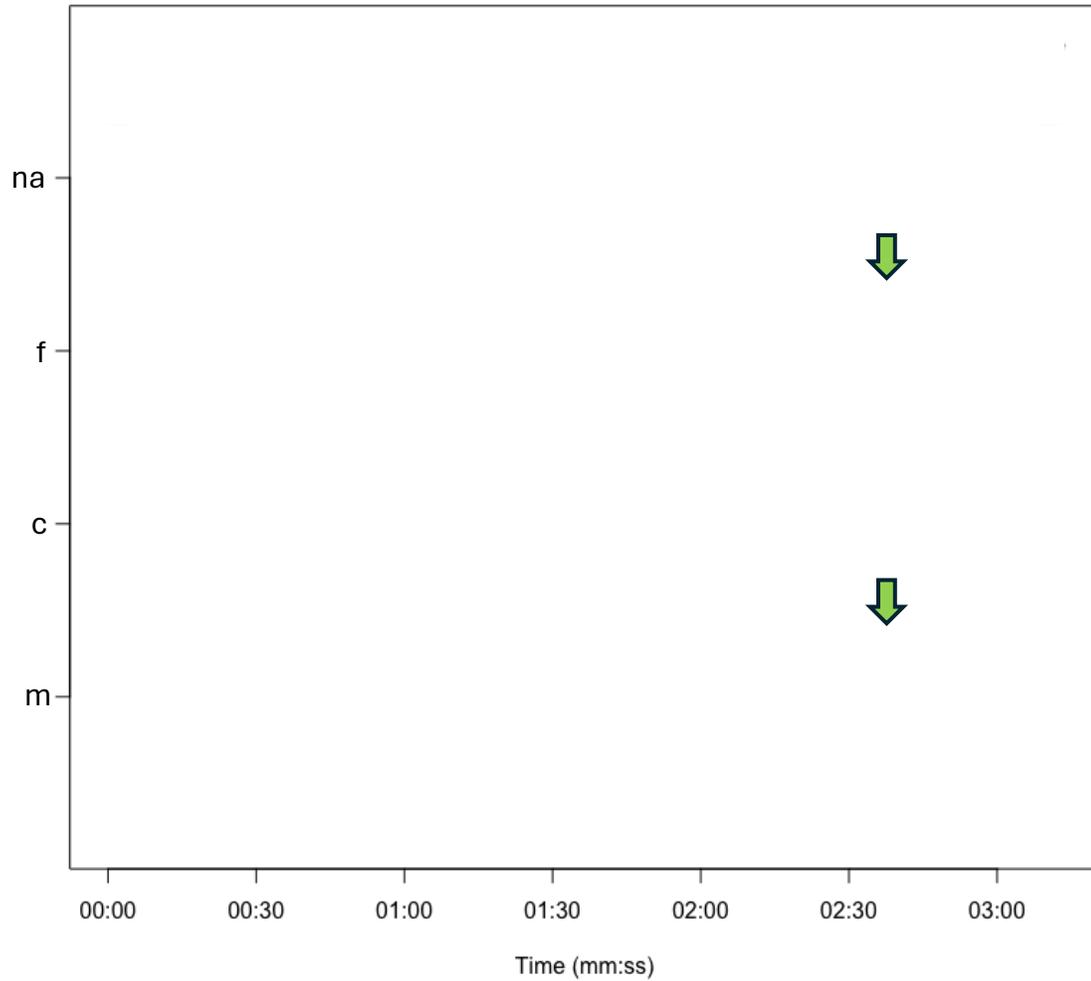
Mating

- Male follows female
- Male accelerates
- Change of body position
- Attempted insemination
- Female turns its body away
- Dives down and flees





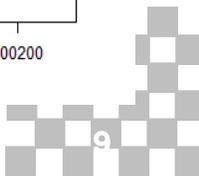
Time plot and track



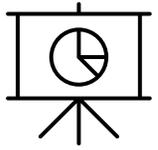
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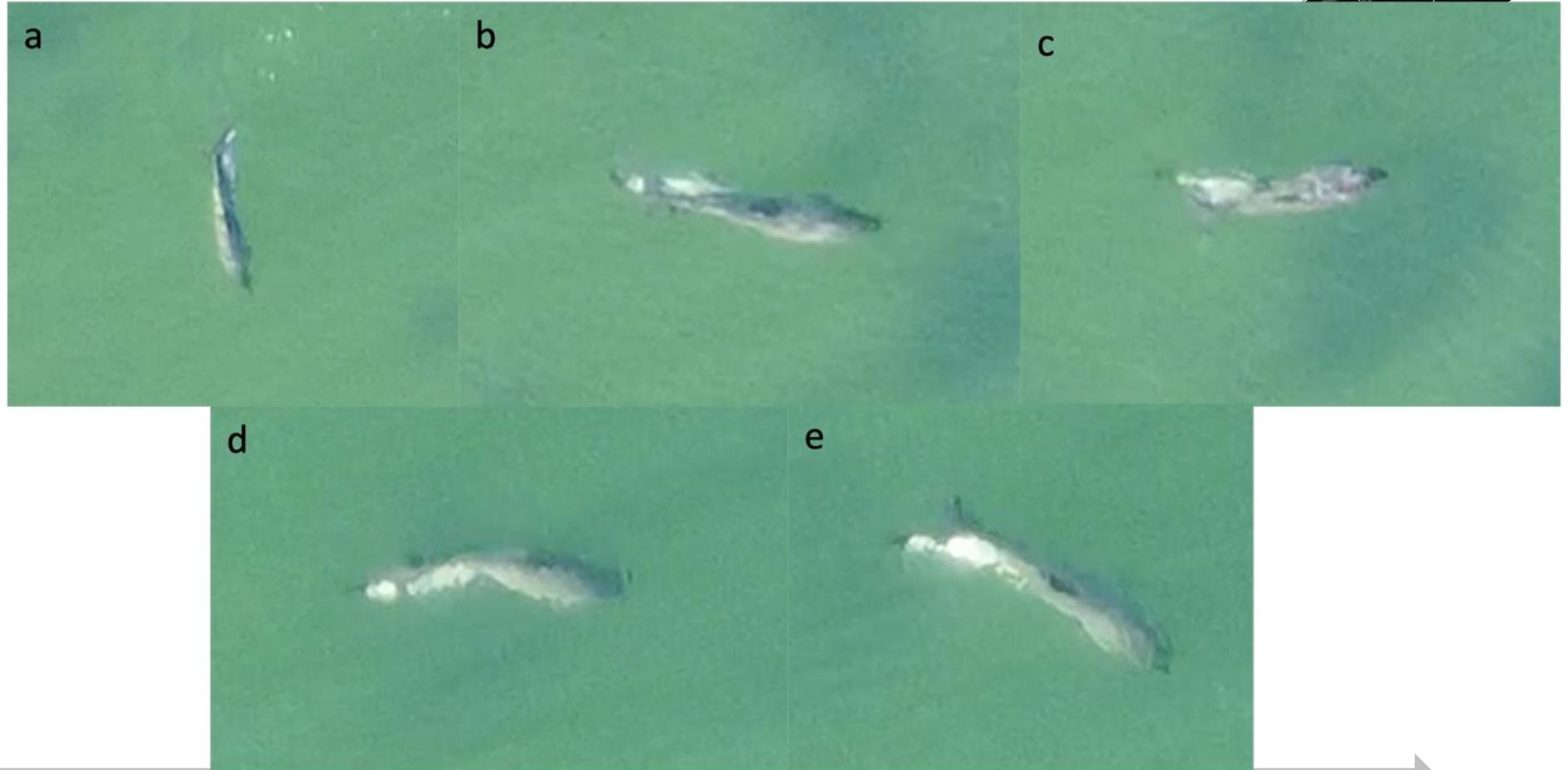




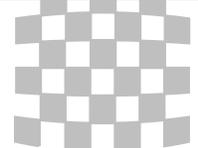
Nursing/Suckling



- Decreased body movement
- Calf underneath mother
- Calf's beak in the later third of the body length of mother



Drones – Michael Dähne - ASCOBANS North Sea and Jastarnia Group – Joint Session, 13.03.2024



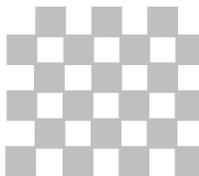
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What can drones do for acoustics?

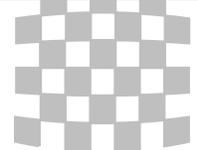
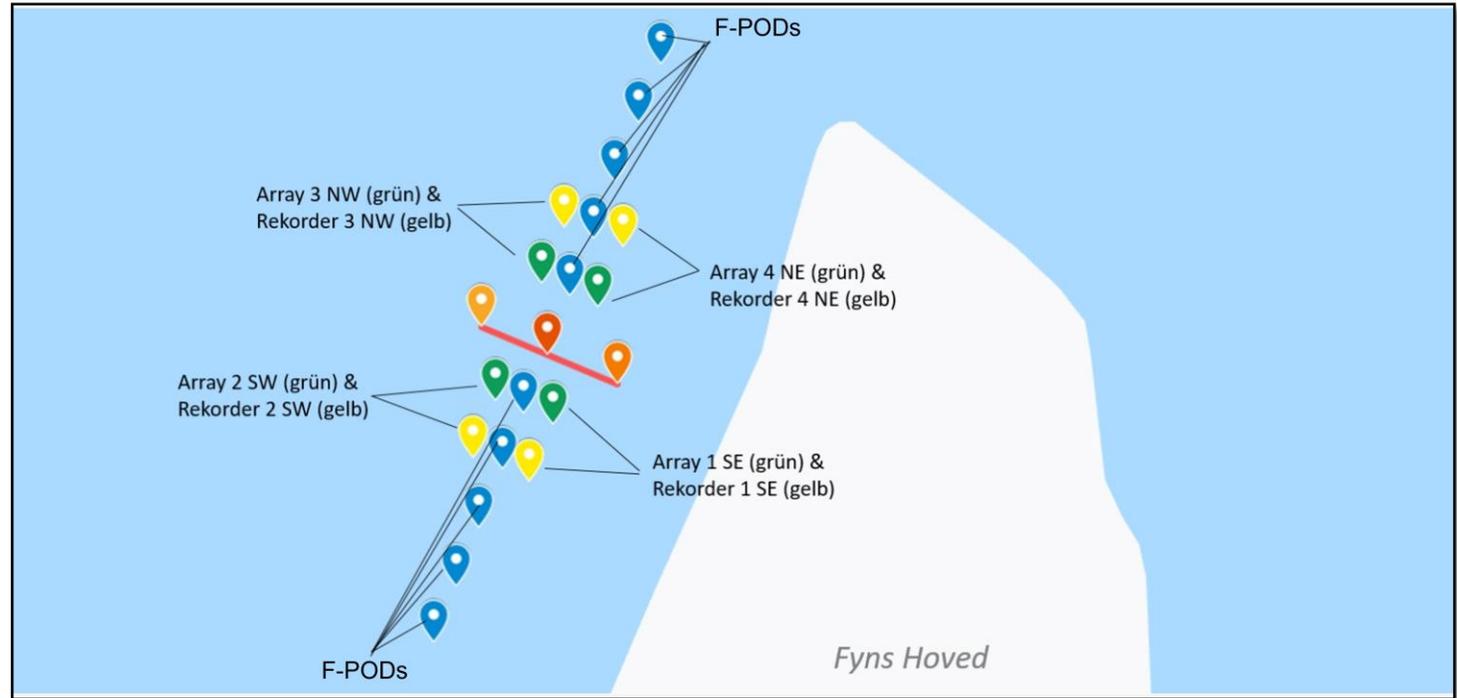
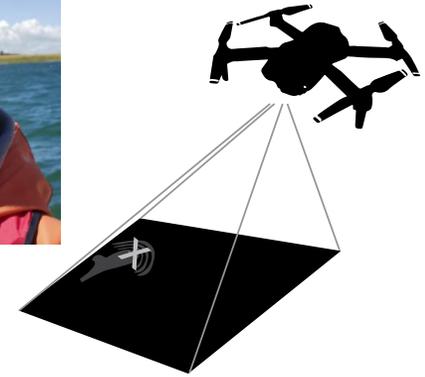


Visual data



FPOD

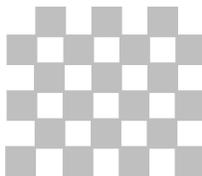
Acoustic data



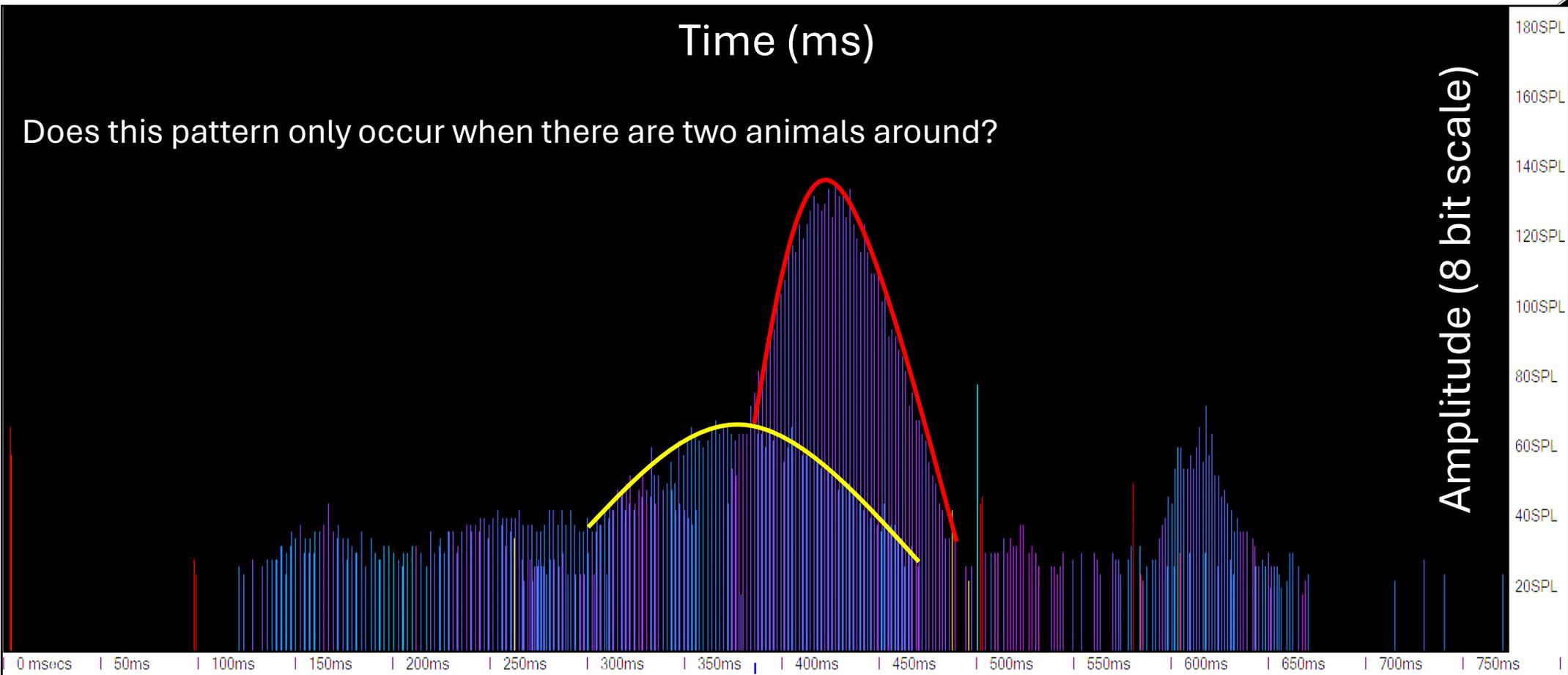
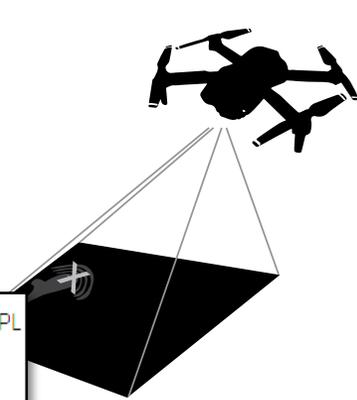
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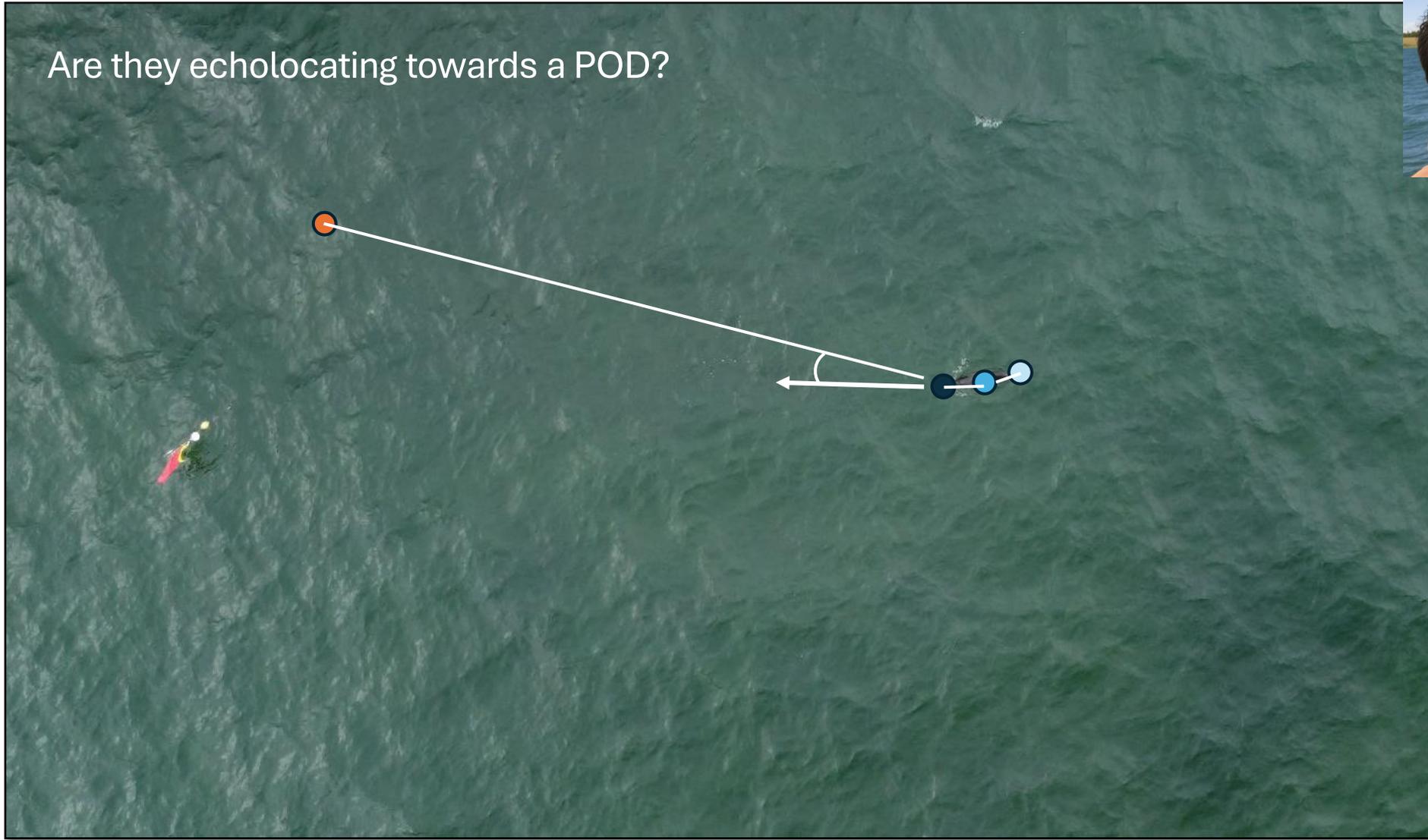
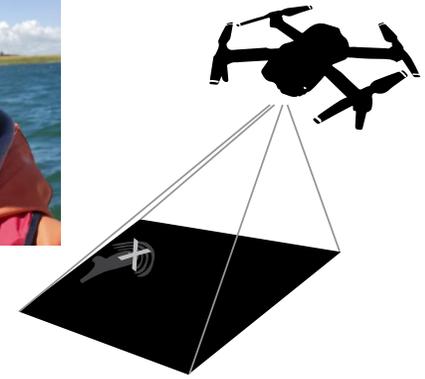


Can we detect how many porpoises are around acoustic recorders?



Drones – Michael Dähne - ASCOBANS North Sea and Jastarnia Group – Joint Session, 13.03.2024

Are they echolocating towards a FPOD?



- -> head
- -> fin
- -> fluke
- -> FPOD



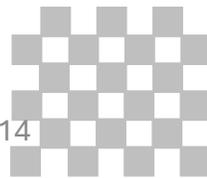
Universität Rostock



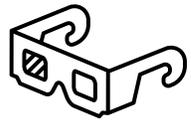
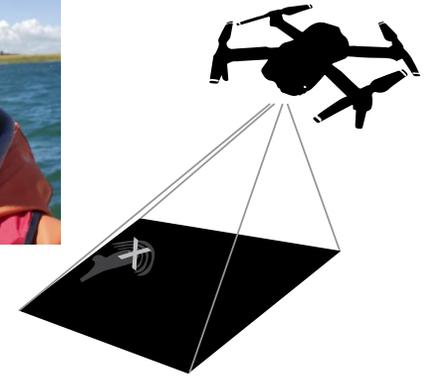
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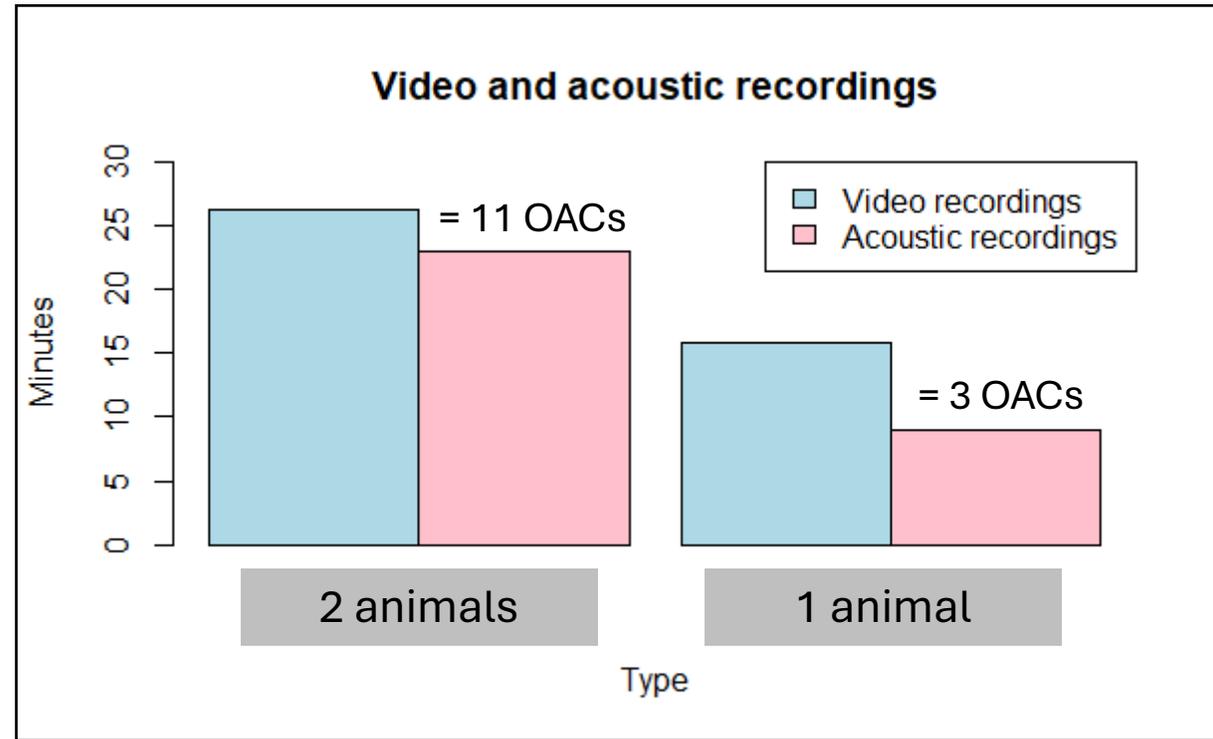


Do OACs only occur when there are multiple animals around?



Drone footage

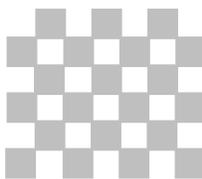
FPODs



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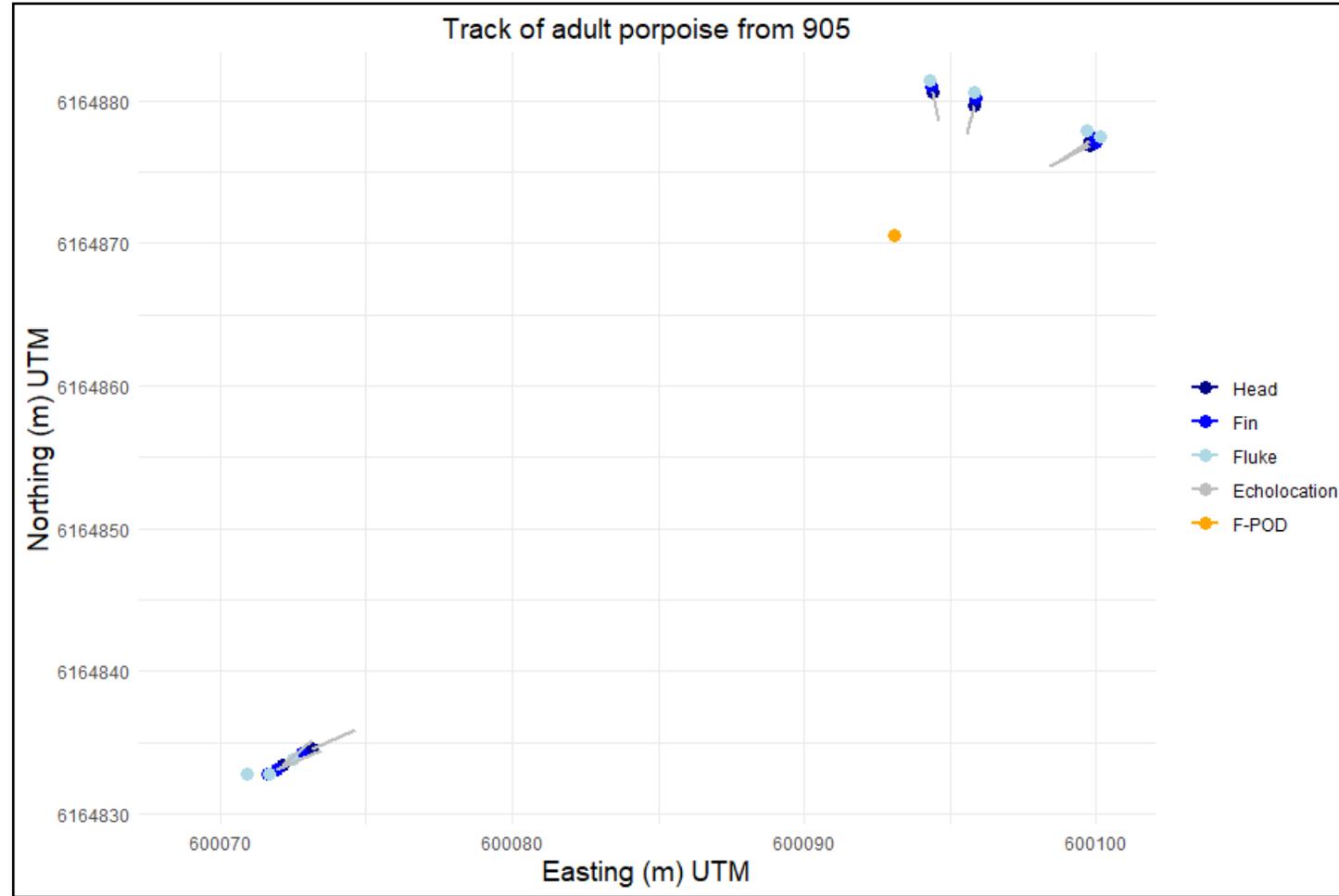


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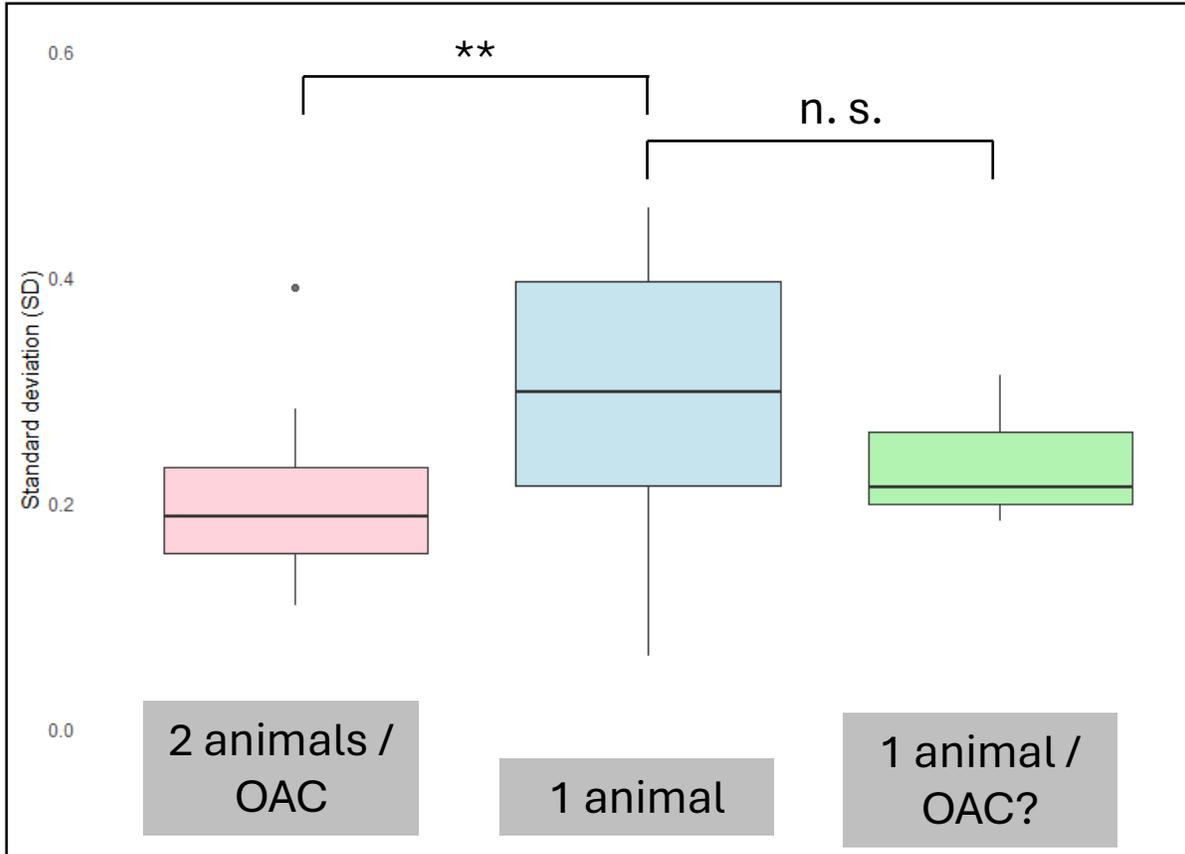


Echolocation model: results

- No data for simultaneous echolocation

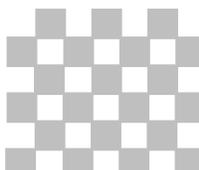
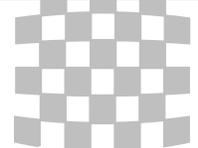


Amplitude differences



- Single click trains
- Single OACs
- Double OACs

Difference in amplitude differences for Double OACs



Can we use drones to monitor resilience in porpoises?



- Allow Zoom
- Zoom reset
- Pan
- Play
- Pause

Info

<input type="checkbox"/> Calf	<input type="checkbox"/> Photo-id
<input type="checkbox"/> Juvenile	<input type="checkbox"/> Length
<input type="checkbox"/> Net	<input type="checkbox"/> Feeding
<input type="checkbox"/> Surface	<input type="checkbox"/> Mating
<input type="checkbox"/> Bottom	<input type="checkbox"/> WTF?

Porpoise

P1	P2
P3	P4
P5	P6
C7	C8
C9	J10



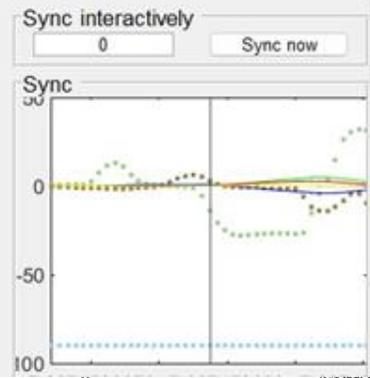
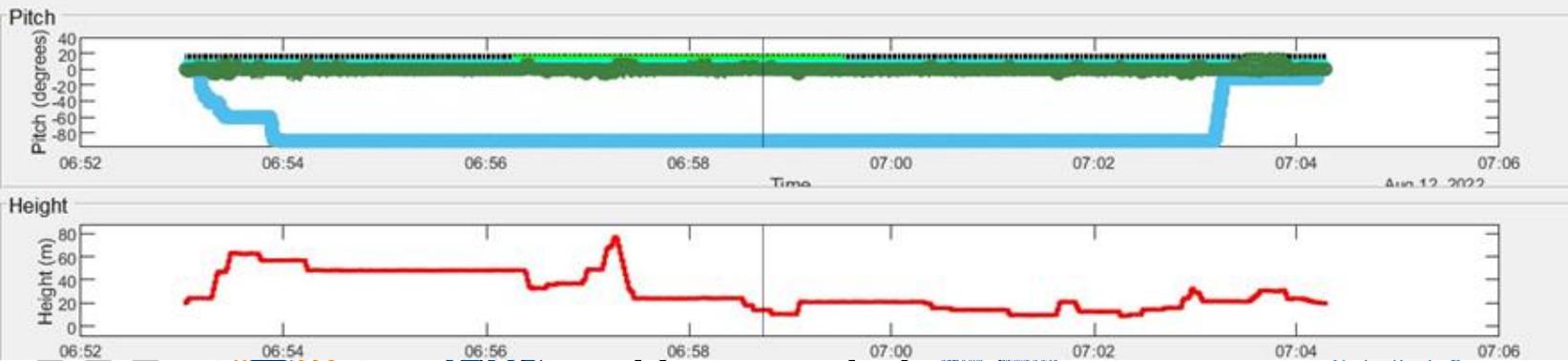
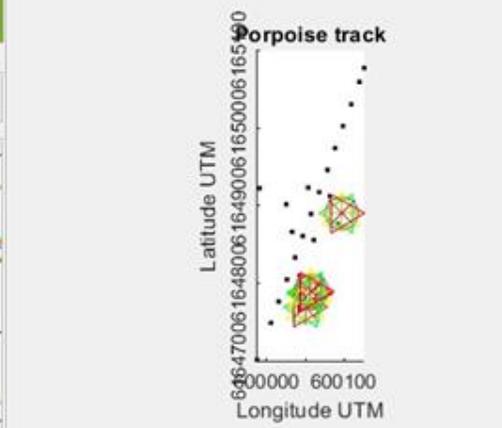
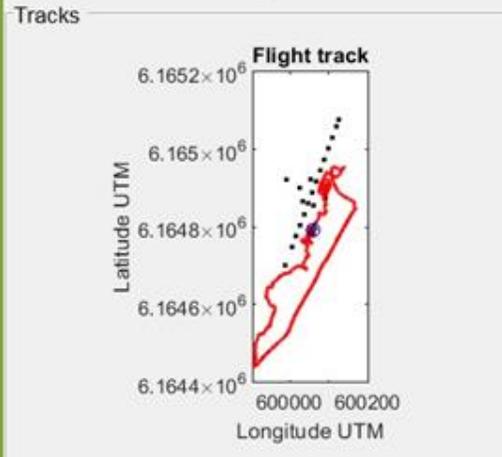
Frames

-1	+1
-15	+15
-30	+30
-100	+100

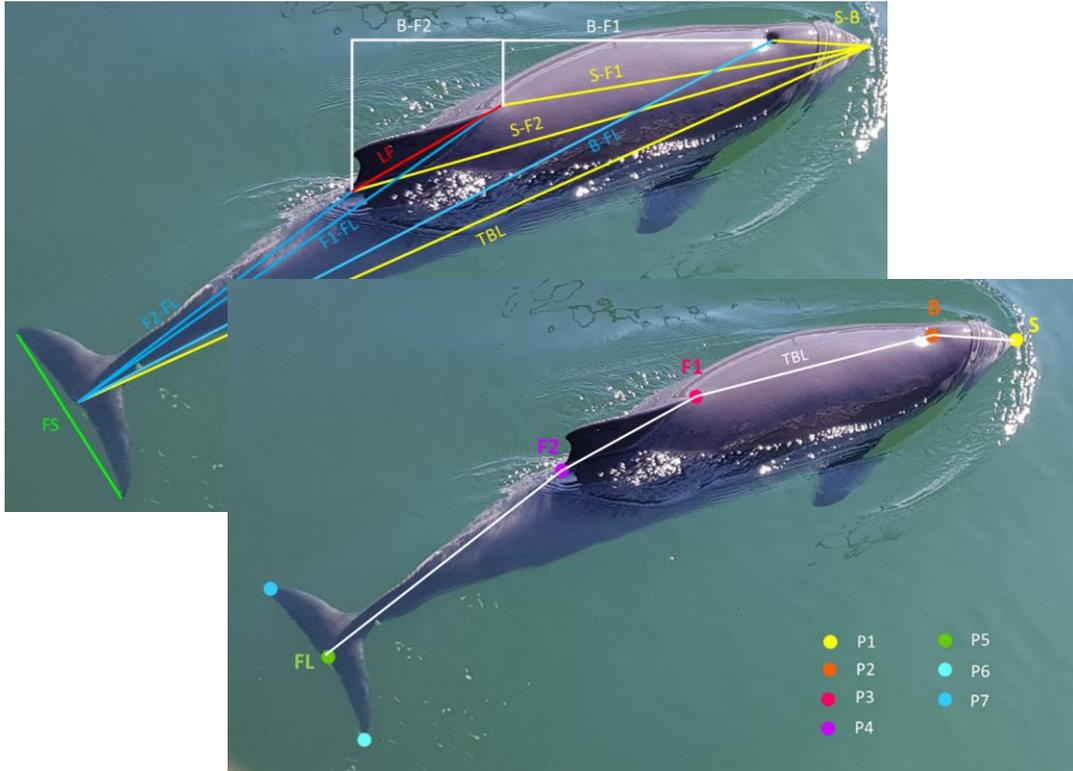
Other

Flag

Add note

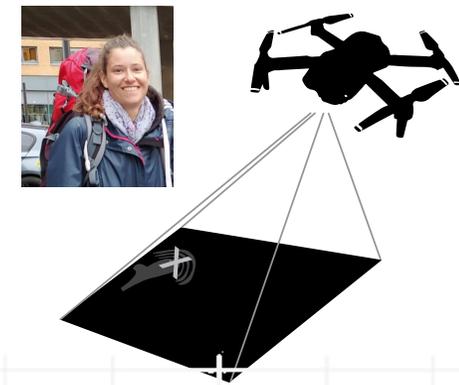


Morphometrics and Resilience

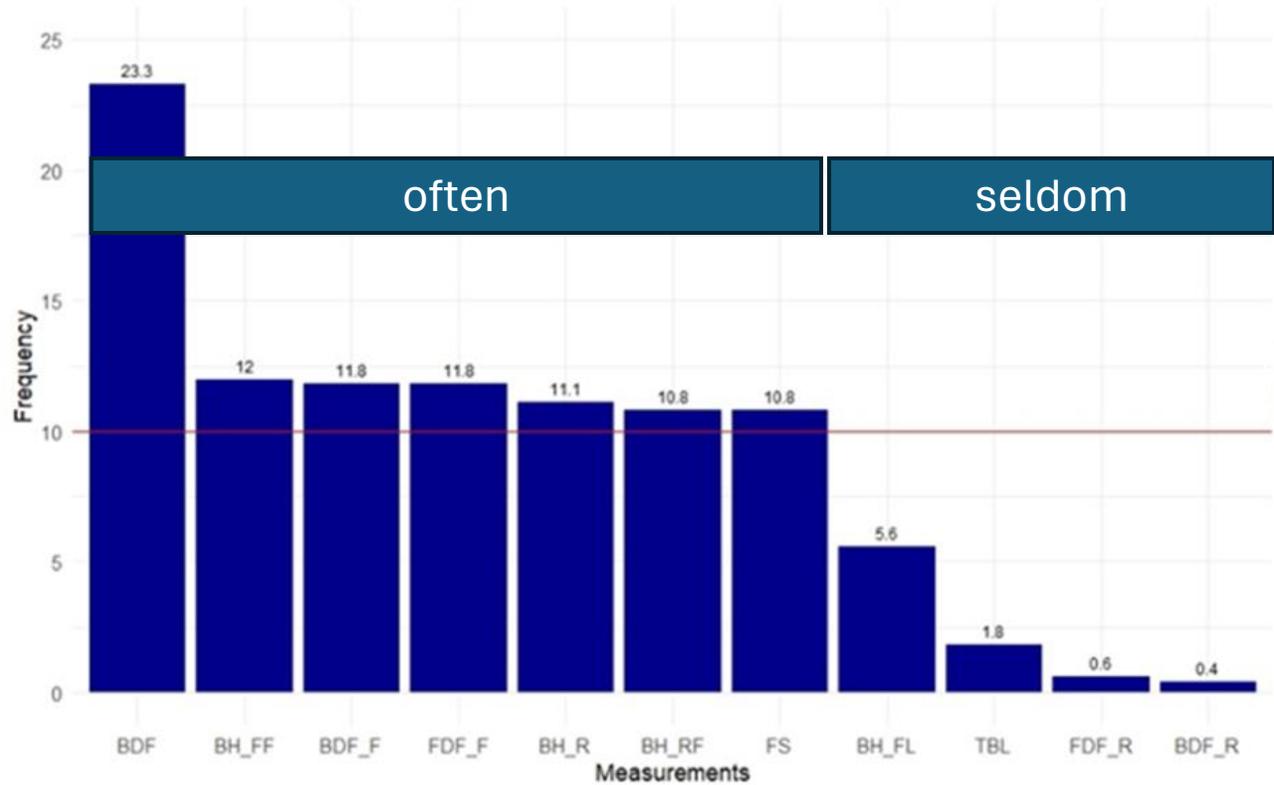


morphometrics ↔ width/circumference as a potential indicator of resilience

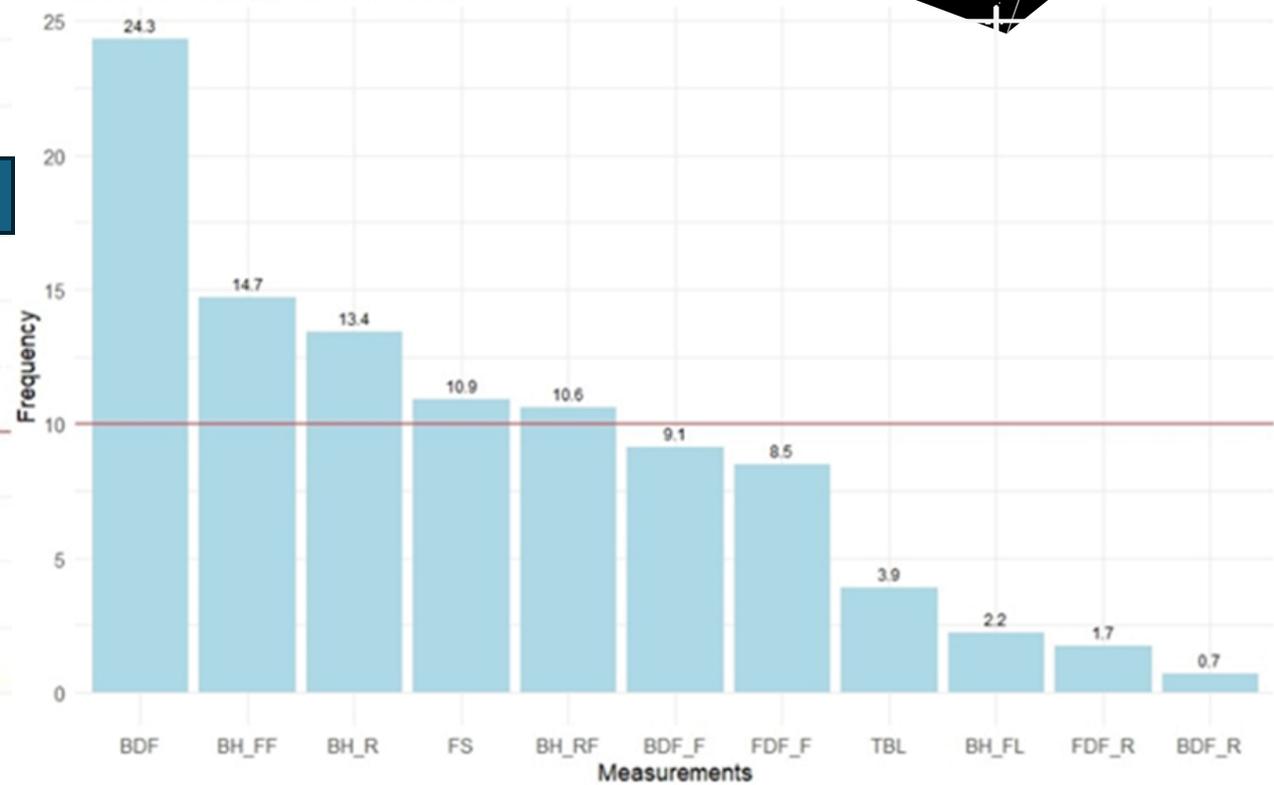
Useful measurements can be taken often



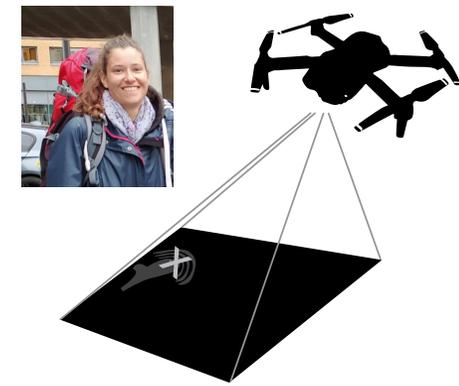
Frequency of Measurements Adult



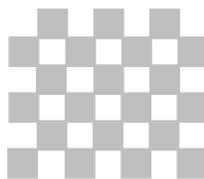
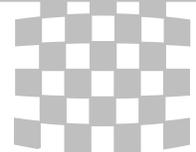
Frequency of Measurements Calf



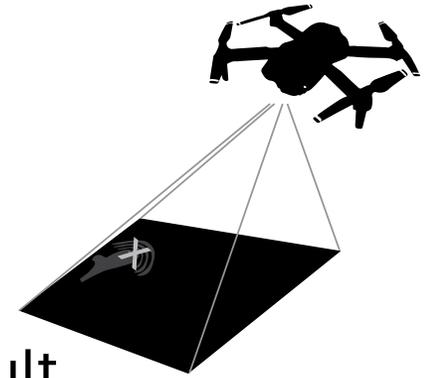
Work in progress



- Compare to strandings database measures
- Identify missing measures
- Calculate body weight from length and width, connect to strandings data
- Estimate which circumference of strandings can be compared to which body measurement
- ...



Take home message(s)



- Drones are extremely useful for clarifying things that have been difficult to observe in the past
- The behaviour of porpoises is much more diverse than assumed at present
- Potentially OACs can be used to find the presence of two animals acoustically but more work is necessary
- For nutrition a connection of strandings monitoring and drone observations are necessary
- For bycatch trials the assumptions that we currently use may not be true

