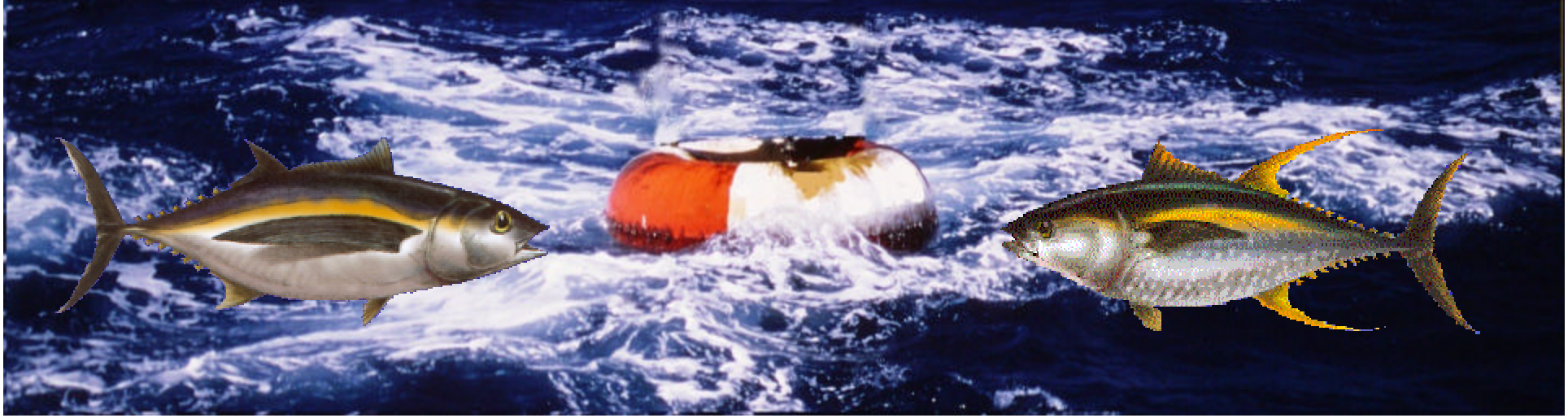
Behavioral features of tuna aggregations around Fish Aggregating Devices: sensory cues, orientation, and residence time

Laurent Dagorn



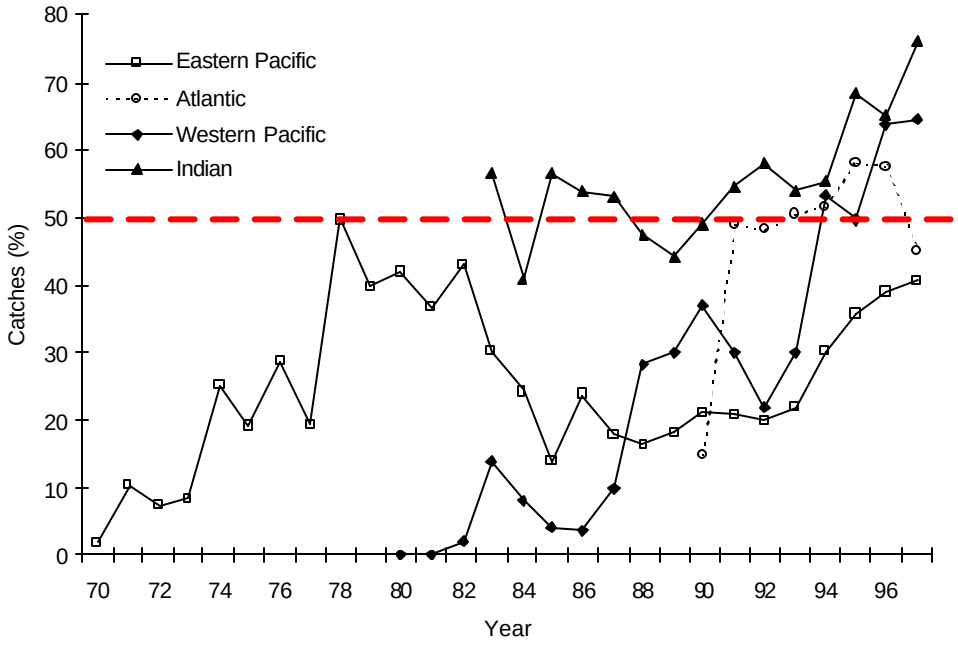
Importance of floating objects on tropical tuna fisheries

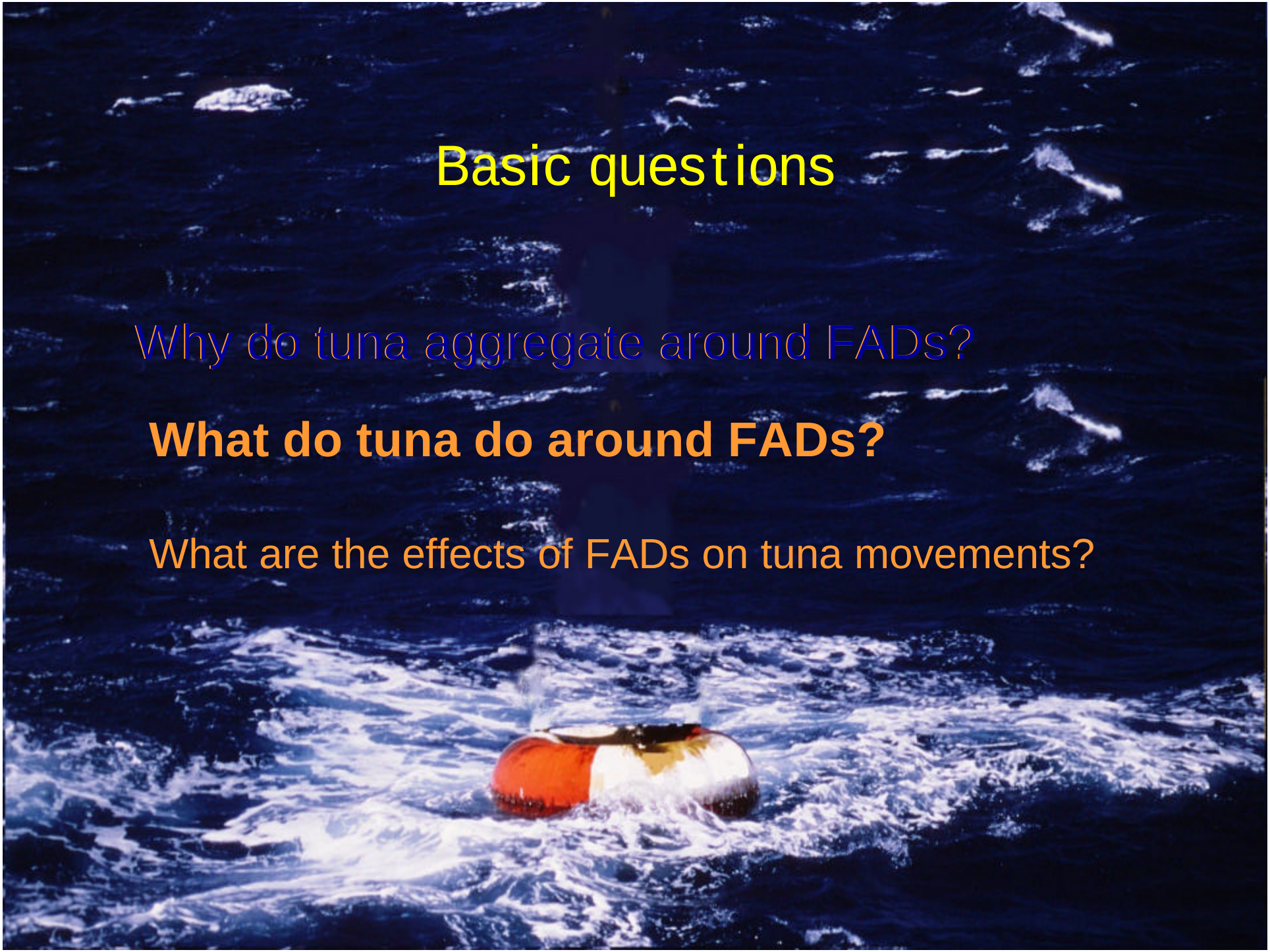
More than 50% of tuna catches made on associated fish

Development or persistence of artisanal fisheries around tropical islands

Stars: artisanal fisheries on anchored FADs

Industrial fis

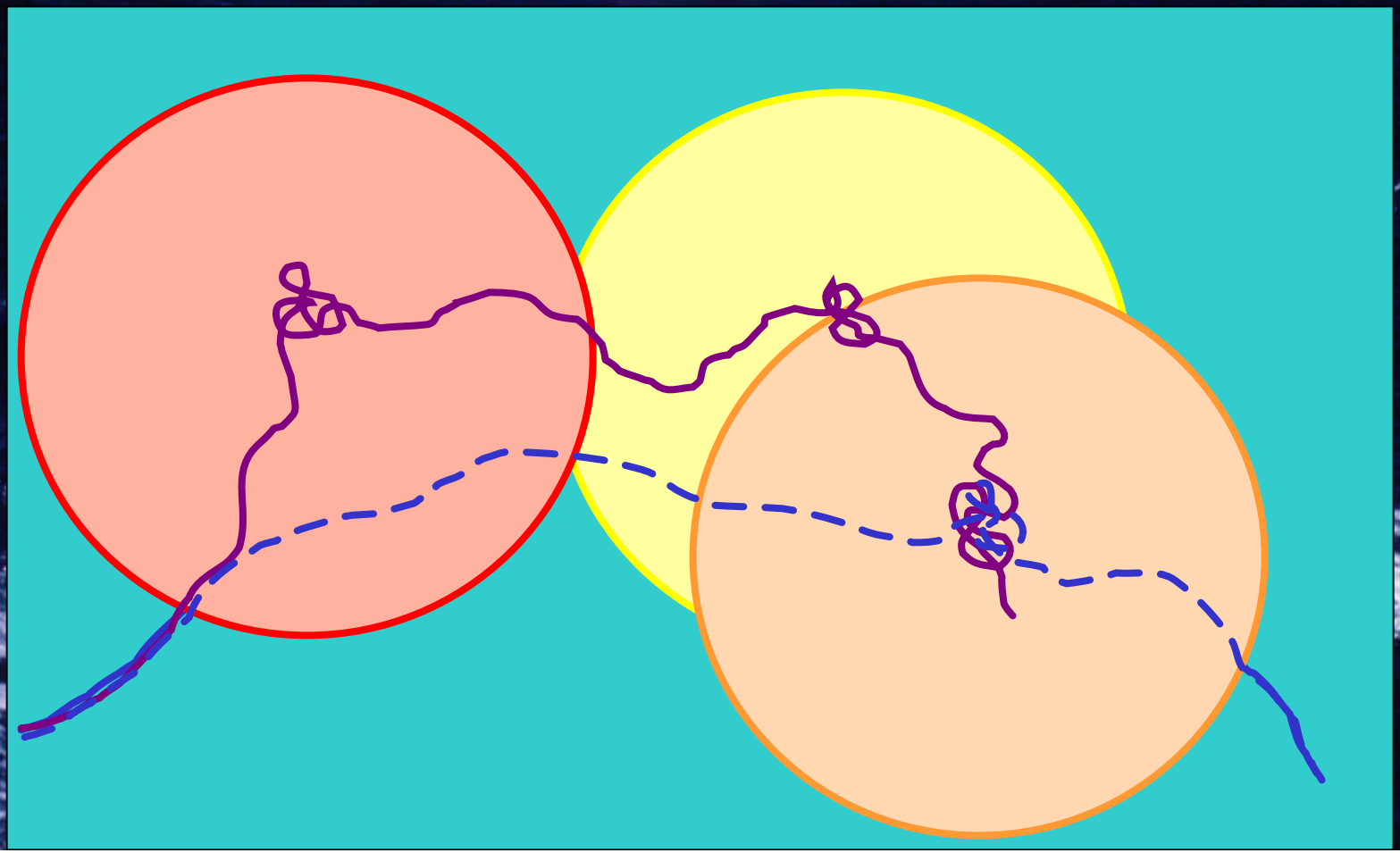



Basic questions
Why do tuna aggregate around FADs?
What do tuna do around FADs?
What are the effects of FADs on tuna movements?

Range of influence, Residence time

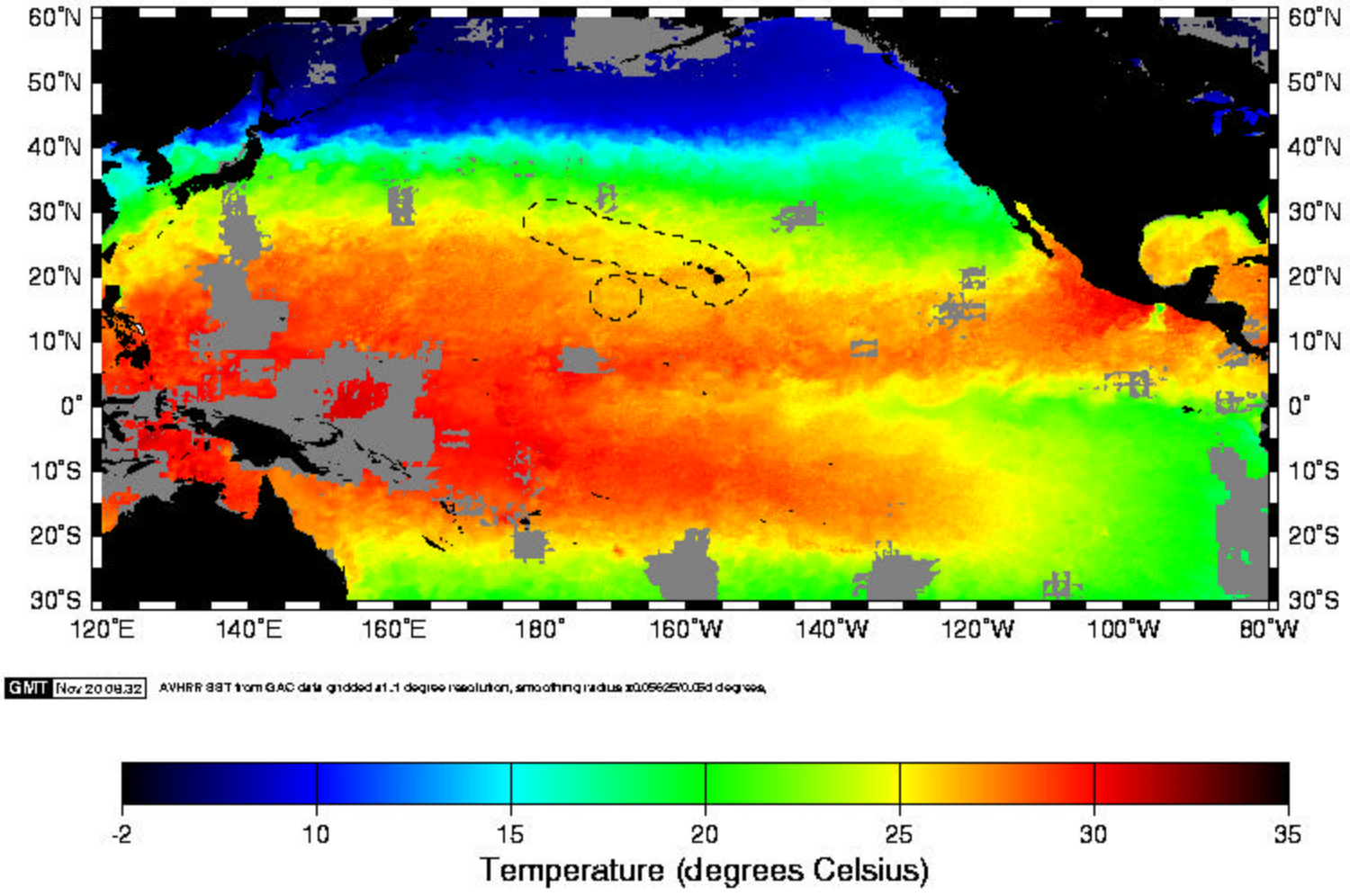
Spatial

Temporal



Small- to large-scale consequences

Respective roles of sea temperature (etc.), prey, FADs, on tuna movements



Orientation, Attraction

Aggregation

Population level
Density

Individual level
Reduce the spatio-temporal diffusion of the movement

Attraction/Orientation

Population level
Flow

Individual level
Higher probability of approaching the goal than that of moving away from the goal

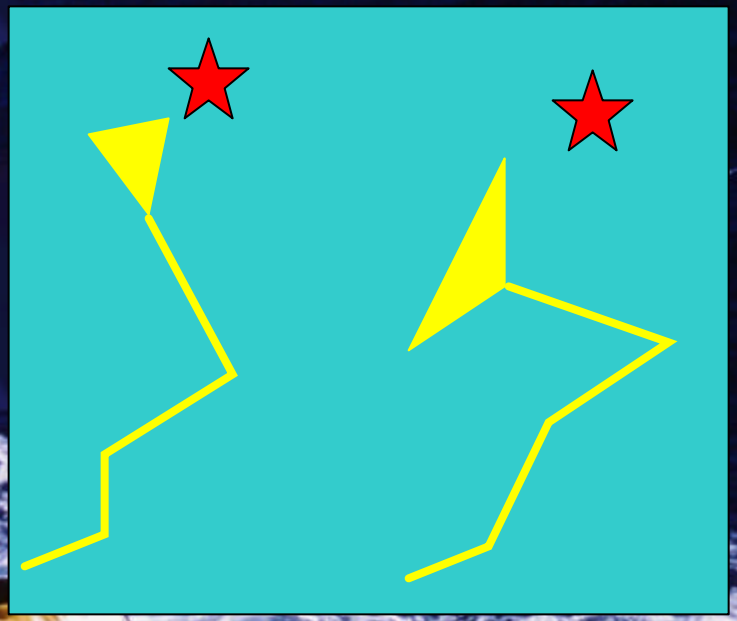
1. Orientation

New analyses of tracking data of yellowfin tuna at FADs (Charlotte Girard)

Orientation mechanisms

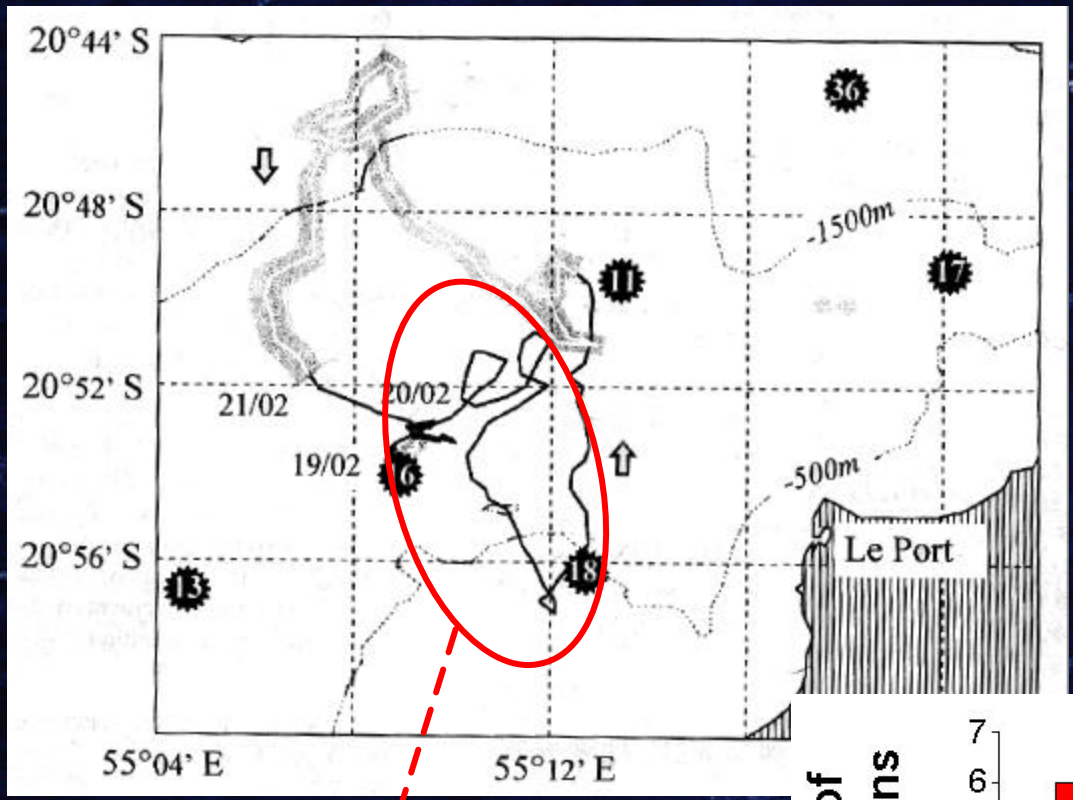
Taxis

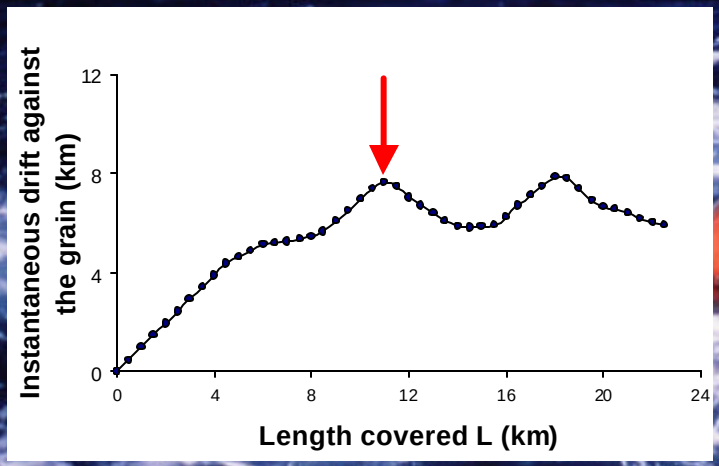
Differential klinokinesis

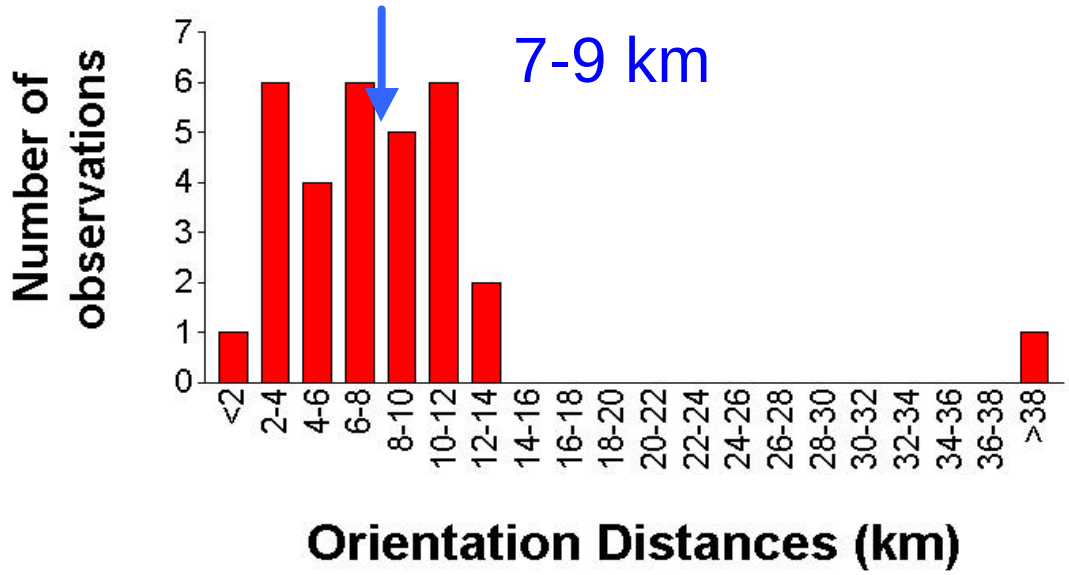


Oriented movement

Orientation distances

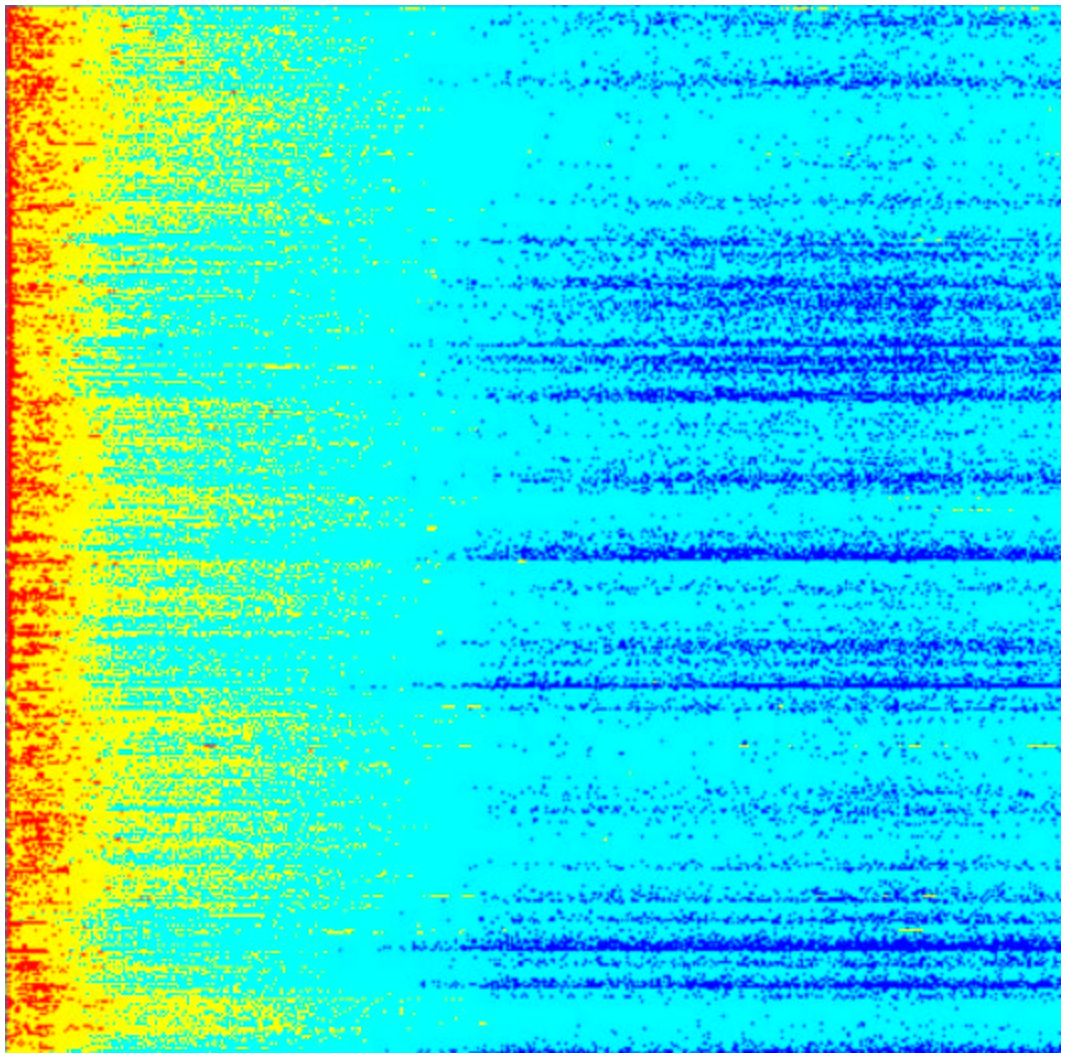






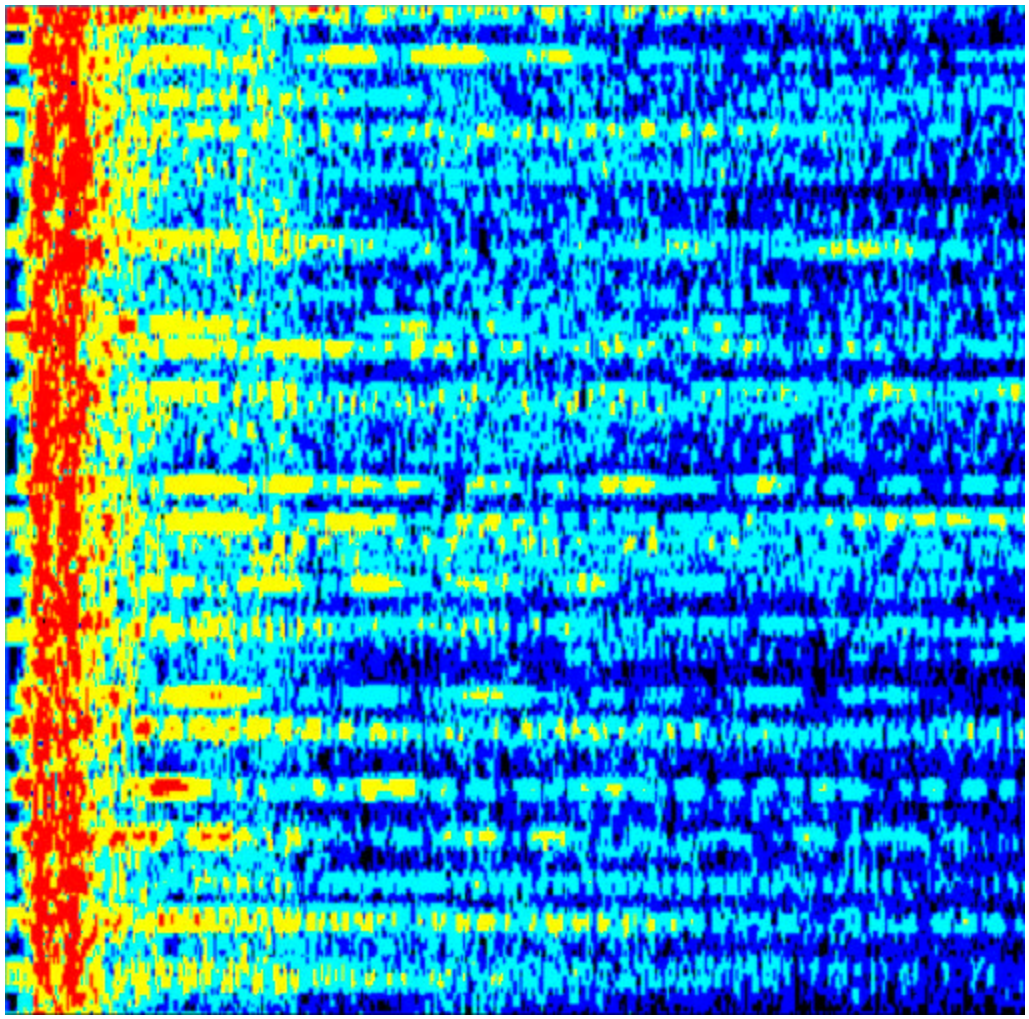
2. Sensory cues: sounds

Acoustic signature of a FAD



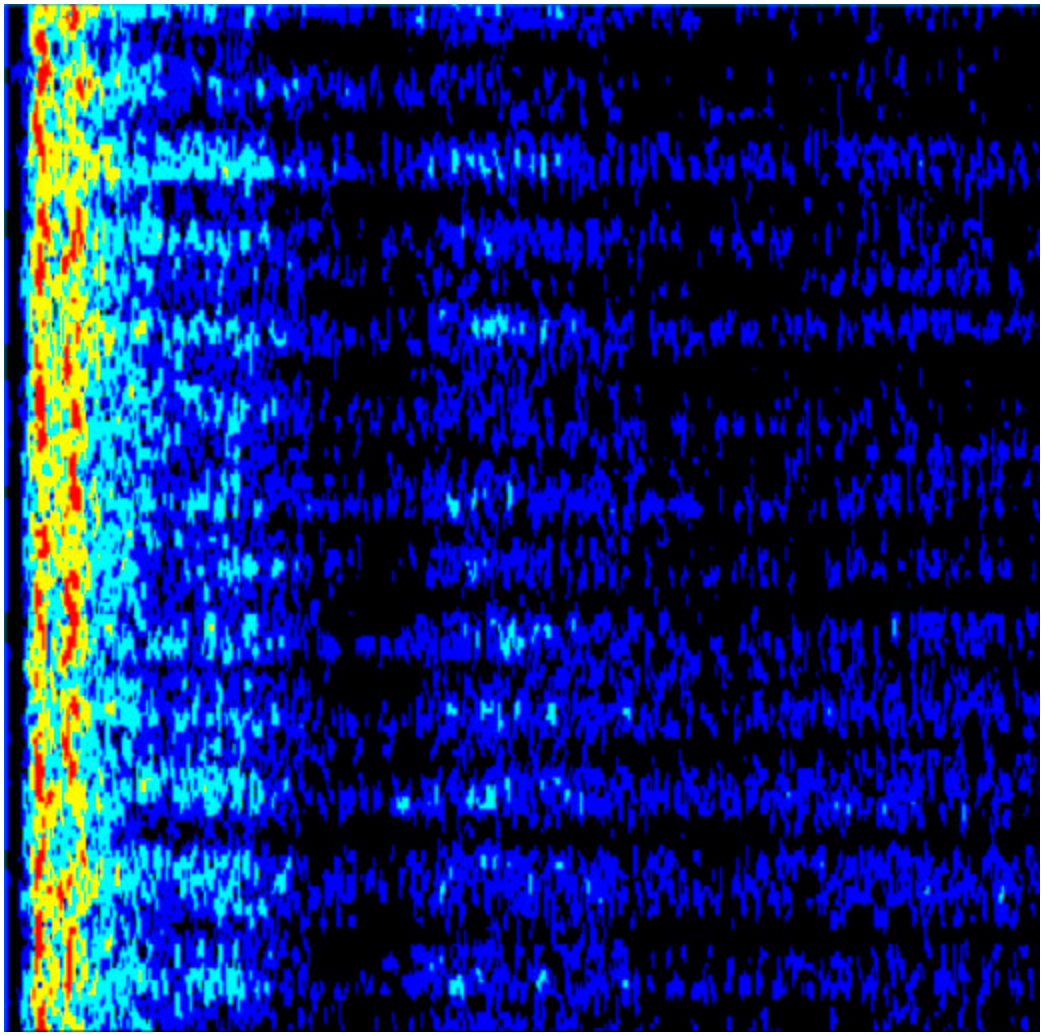
17 kHz

Distance to FAD 20 m



345 Hz

Distance to FAD: 5000 m



345 Hz

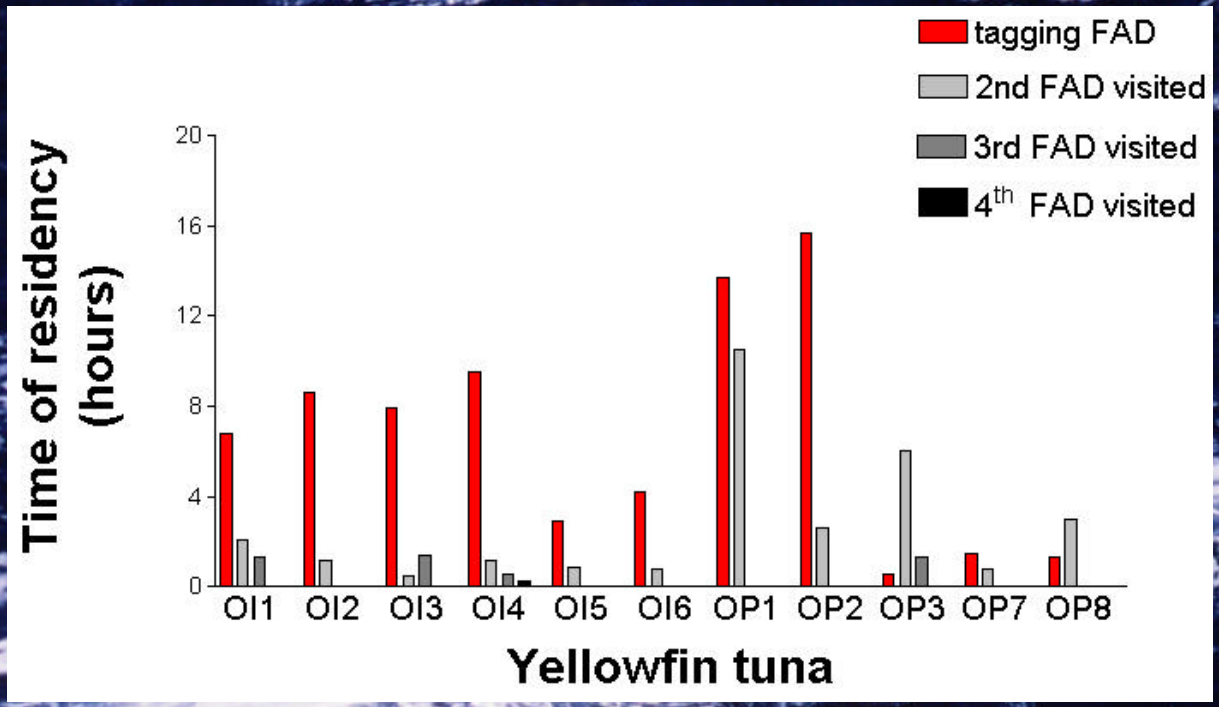
3. Aggregation and Residence time

Aggregation

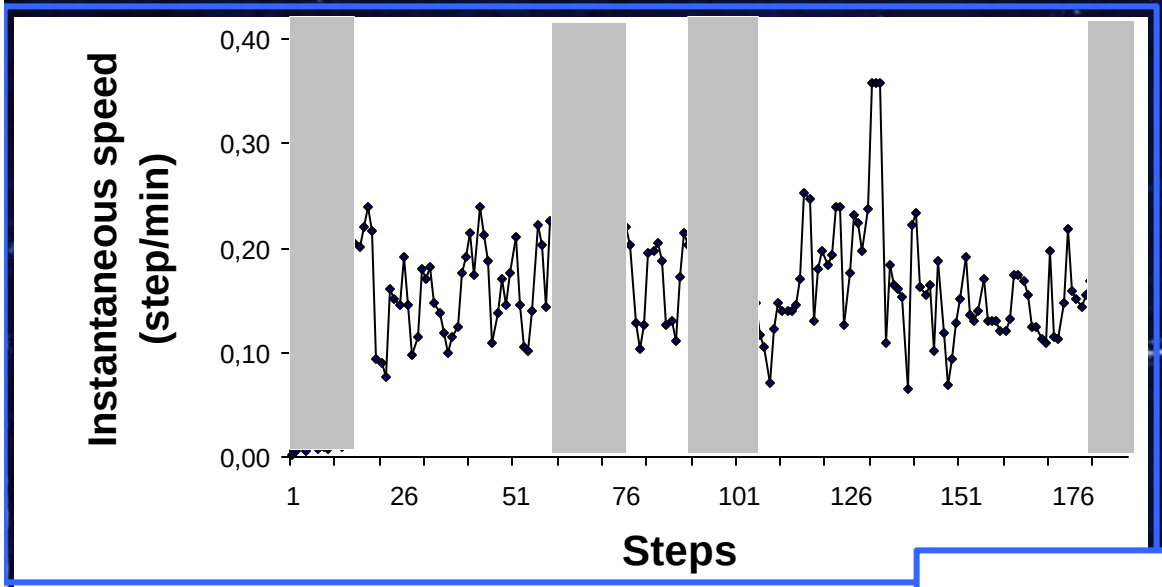
Population level
Density

Individual level
Reduce the spatio-temporal diffusion of the movement

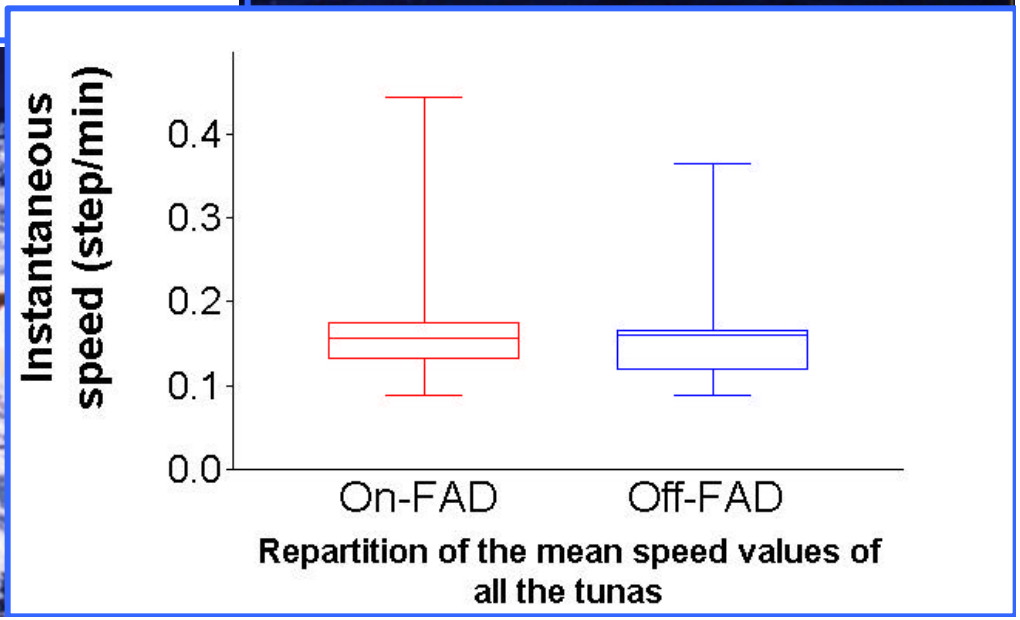
Residence time from tracking studies



On- vs. Off-FAD movements

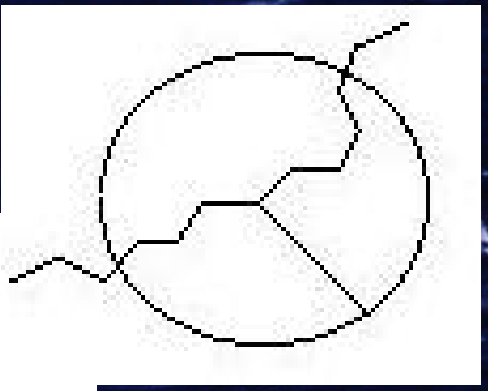


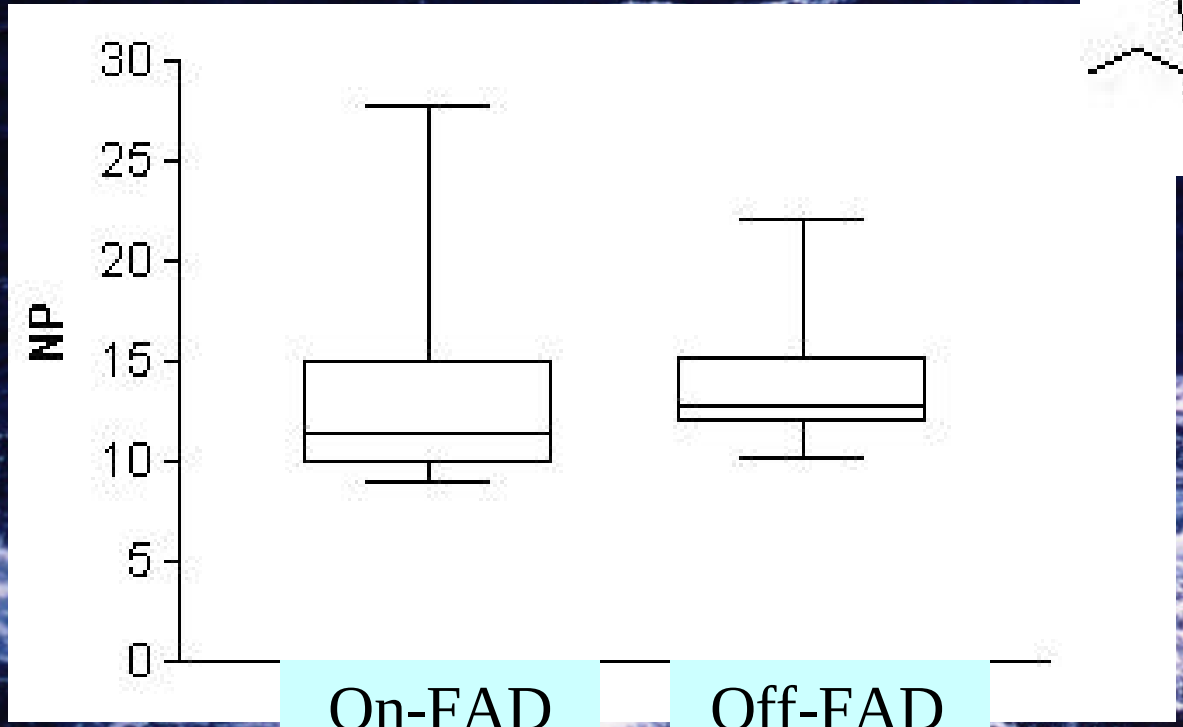
No difference in speed



On- vs. Off-FAD movements

No difference in tortuosity





No difference in changes of directions (mean + SD)

Results on Orientation/Aggregation

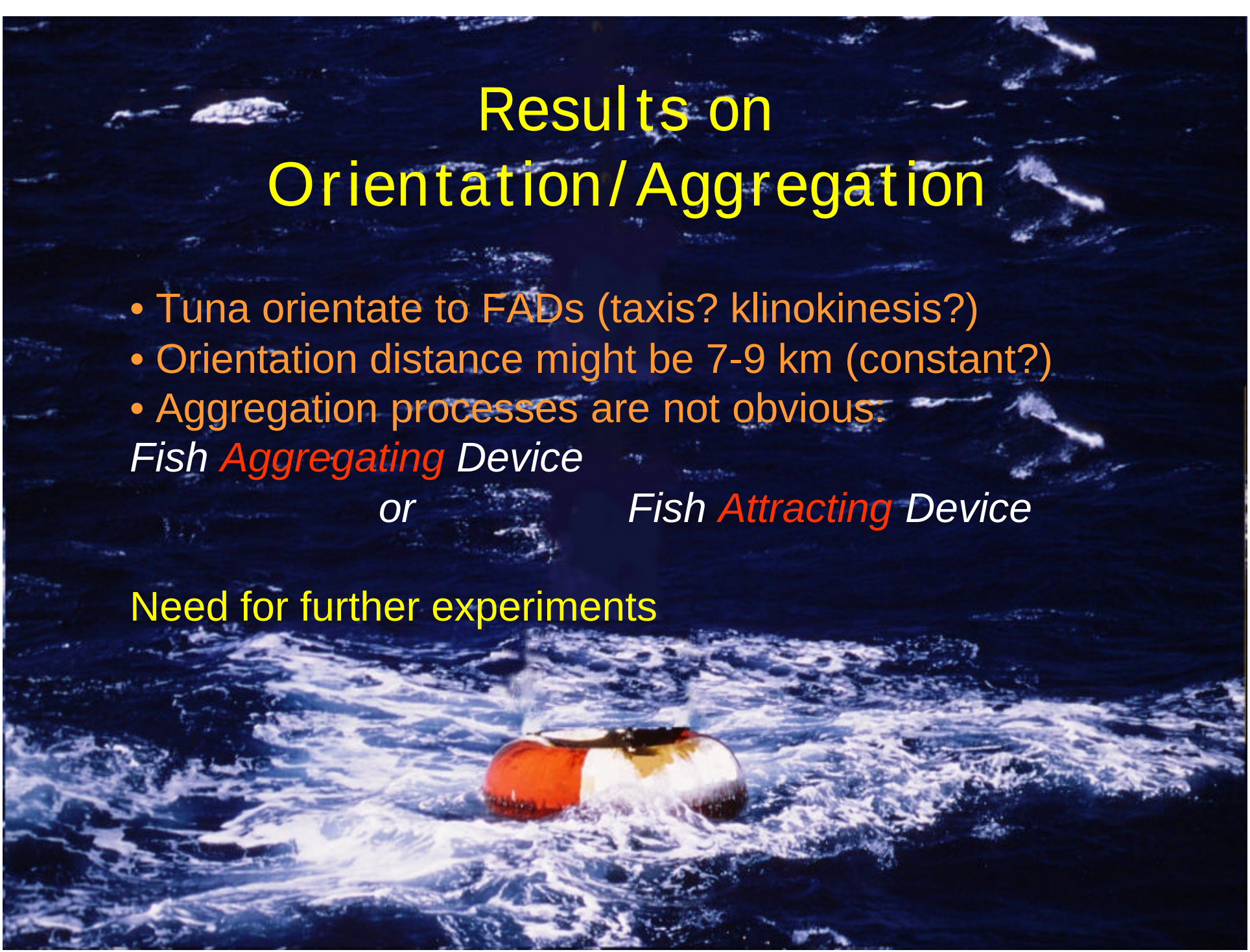
- Tuna orientate to FADs (taxis? klinokinesis?)
- Orientation distance might be 7-9 km (constant?)
- Aggregation processes are not obvious:

Fish Aggregating Device

or

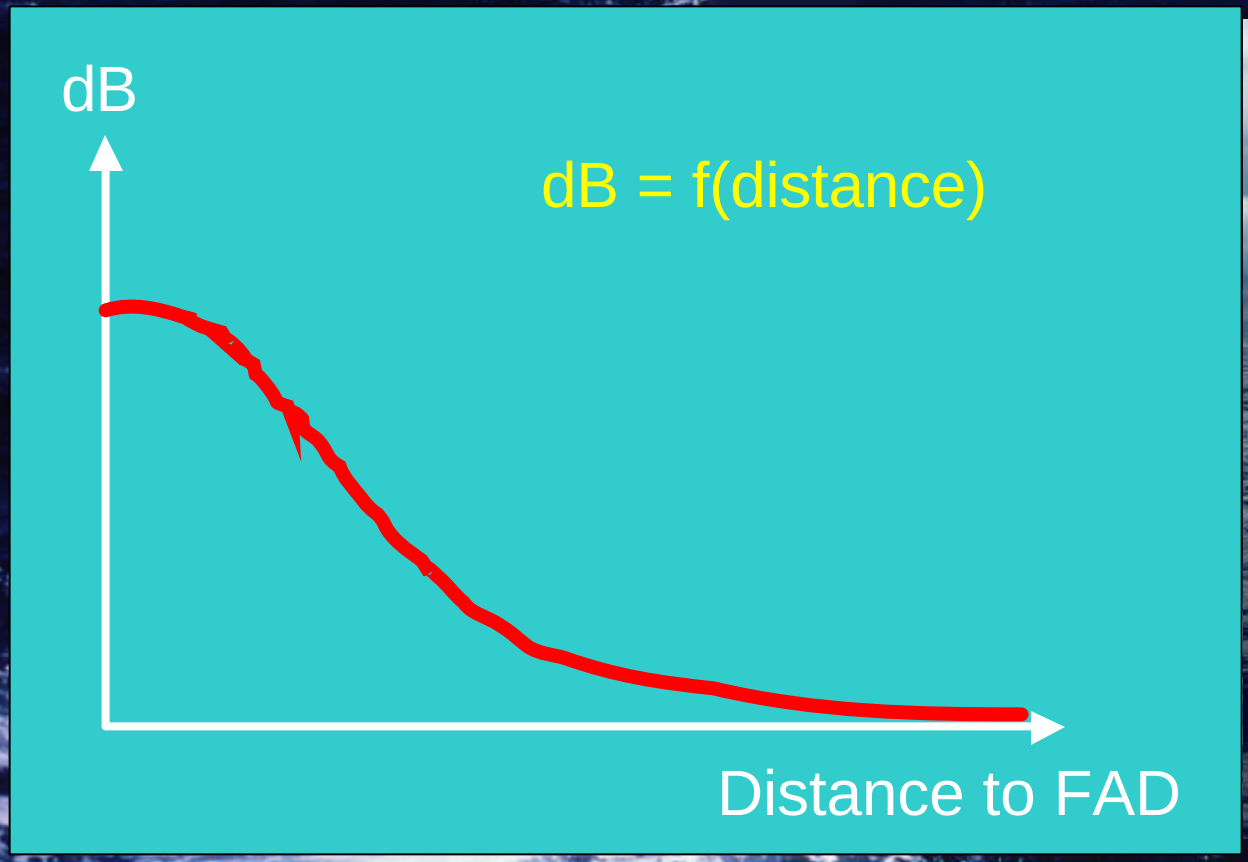
Fish Attracting Device

Need for further experiments

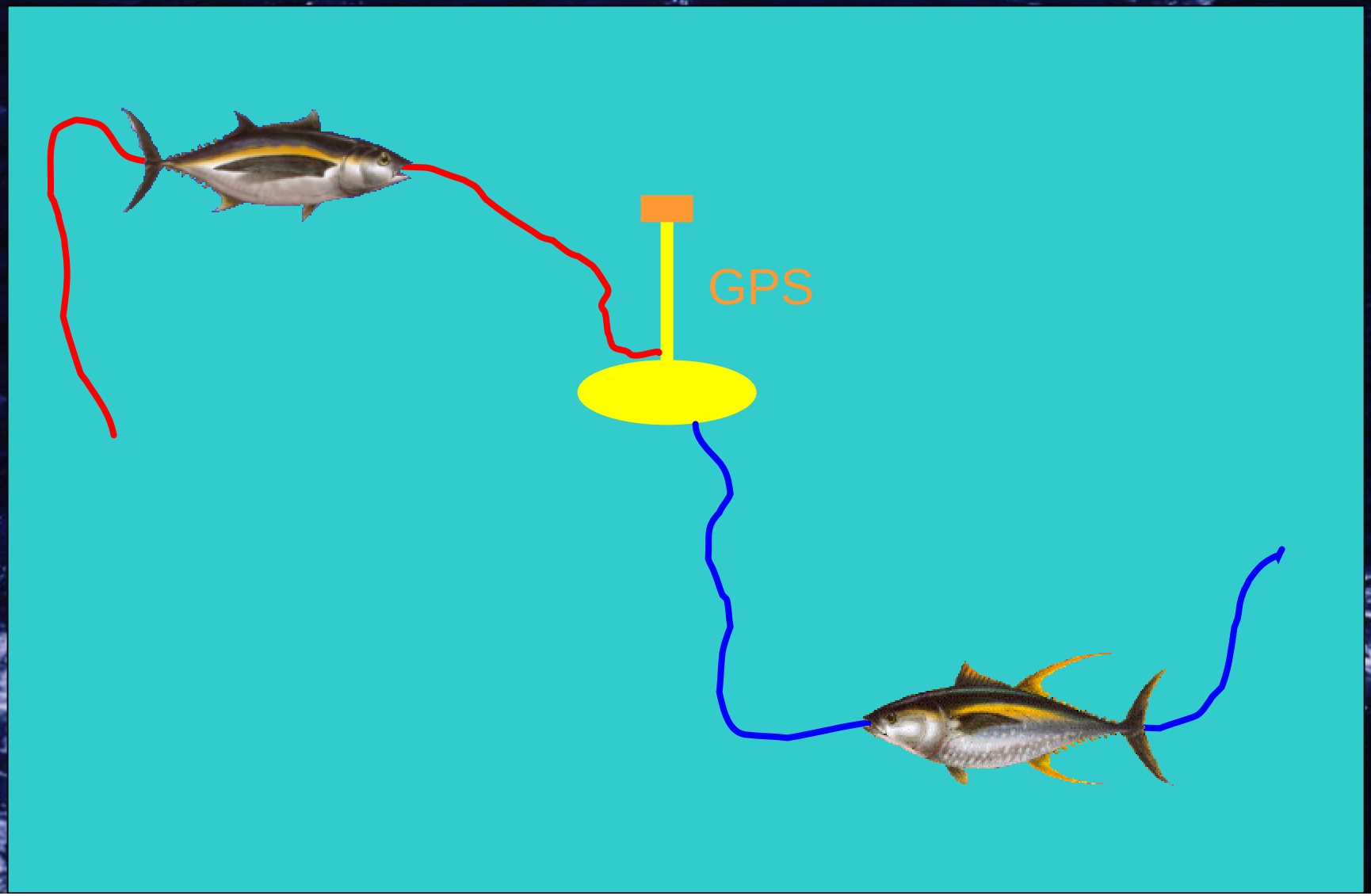


4. Future researches

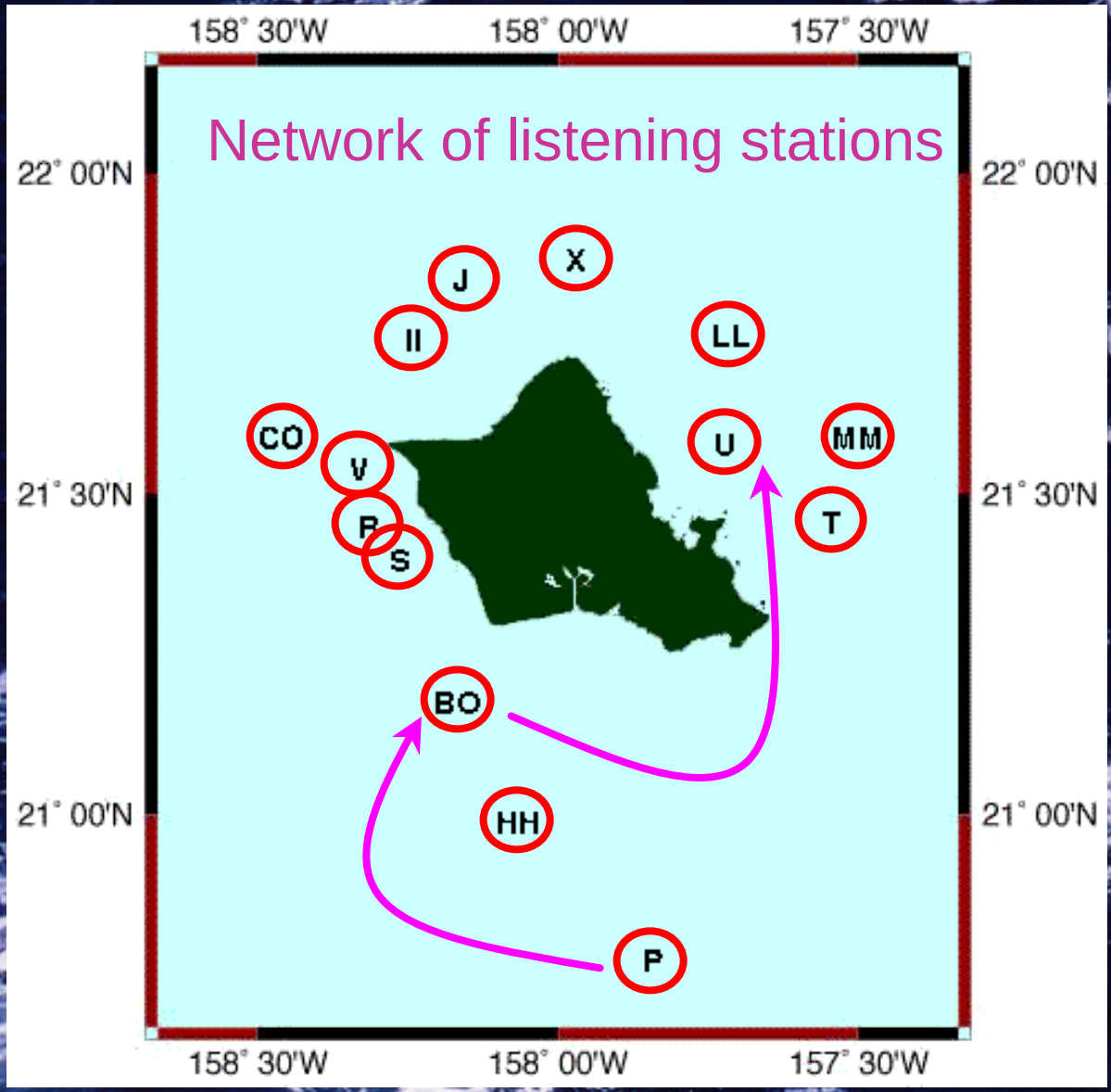
Sensory cues



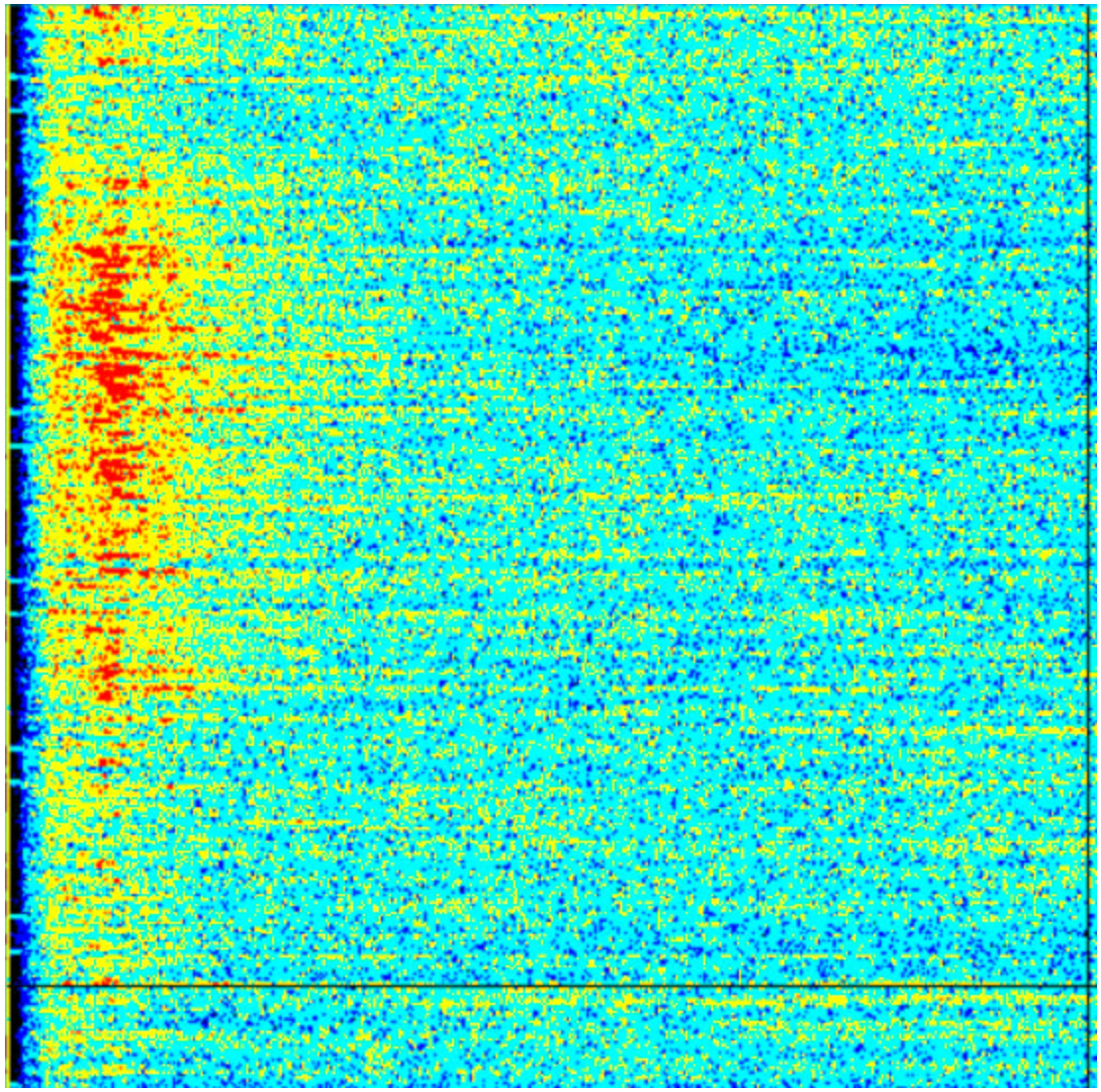
Multiple tracking



Residence time at FADs
Movements between FADs



Distance to FAD: 50 m



345 Hz