



What are marine  
mammals?

Why important to  
study?

How to study  
them?

Field trip  
tomorrow

Data  
processing

# Marine Mammals Monitoring in the framework of EcAp Common Indicators

*Ibrahim Ben Amer*



**What are marine mammals?**

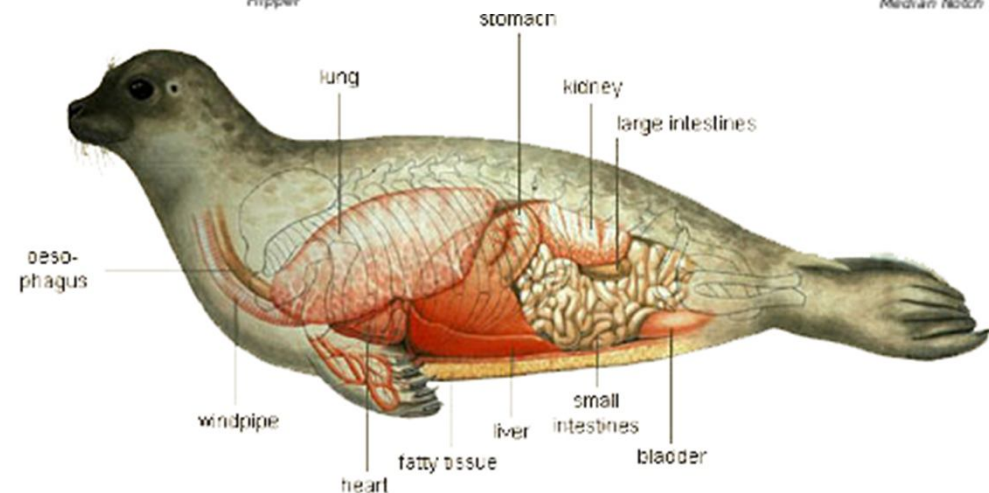
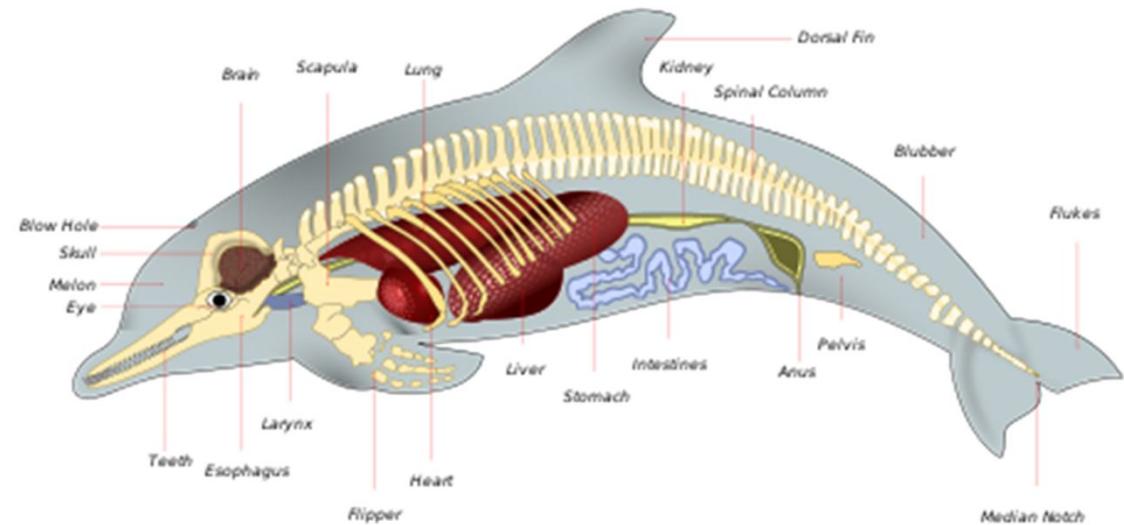
**Why important to study?**

**How to study them?**

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**Data processing**

- Mammals living in the sea, orders: Cetacea, Carnivora and Sirenia.
- 70± species of cetaceans and 30± of seals worldwide.
- In the Mediterranean, there are 8 (regular) species of cetaceans and 1 species of seals.





What are marine mammals?

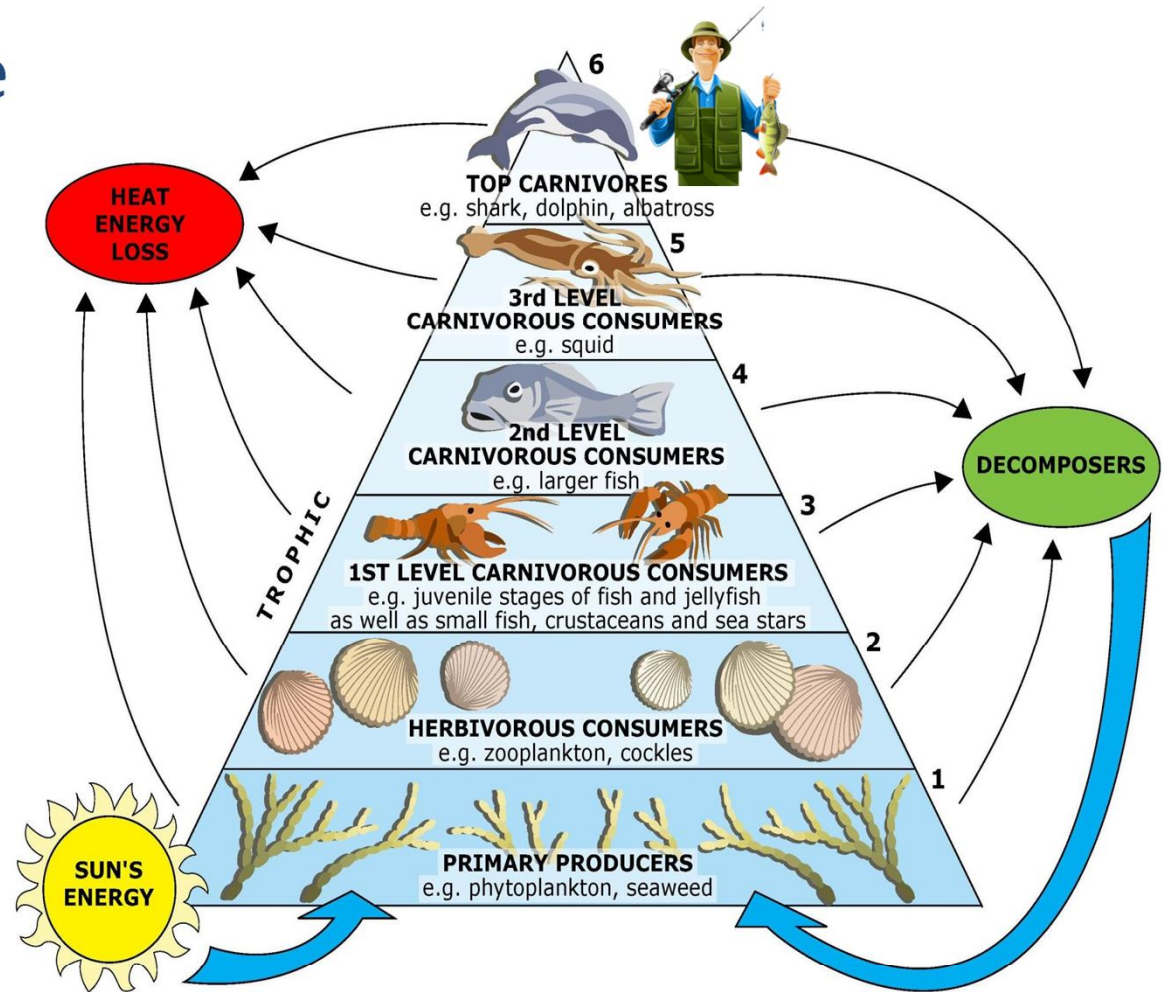
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- top predators in the marine food webs , which leads to Competition.
- Bioaccumulation indicators.
- “Flag Ship” species.



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- Under several threats from human activities:
  - Interaction with fisheries.
  - Ship strikes.
  - Noise.
  - Pollution.
  - Disturbance.





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- **Biology, anatomy and physiological.**
- **Pathology and disease.**
- **Population Ecology.**



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- Population Ecology:

- What species we have?



Biodiversity

- How many we have?



Density and abundance

- What are they doing?



Feeding and breeding grounds

- Are they doing well?



Threats, human impacts

**Mark-recapture (photo-Identification).**

**Distance Sampling (Line Transects).**

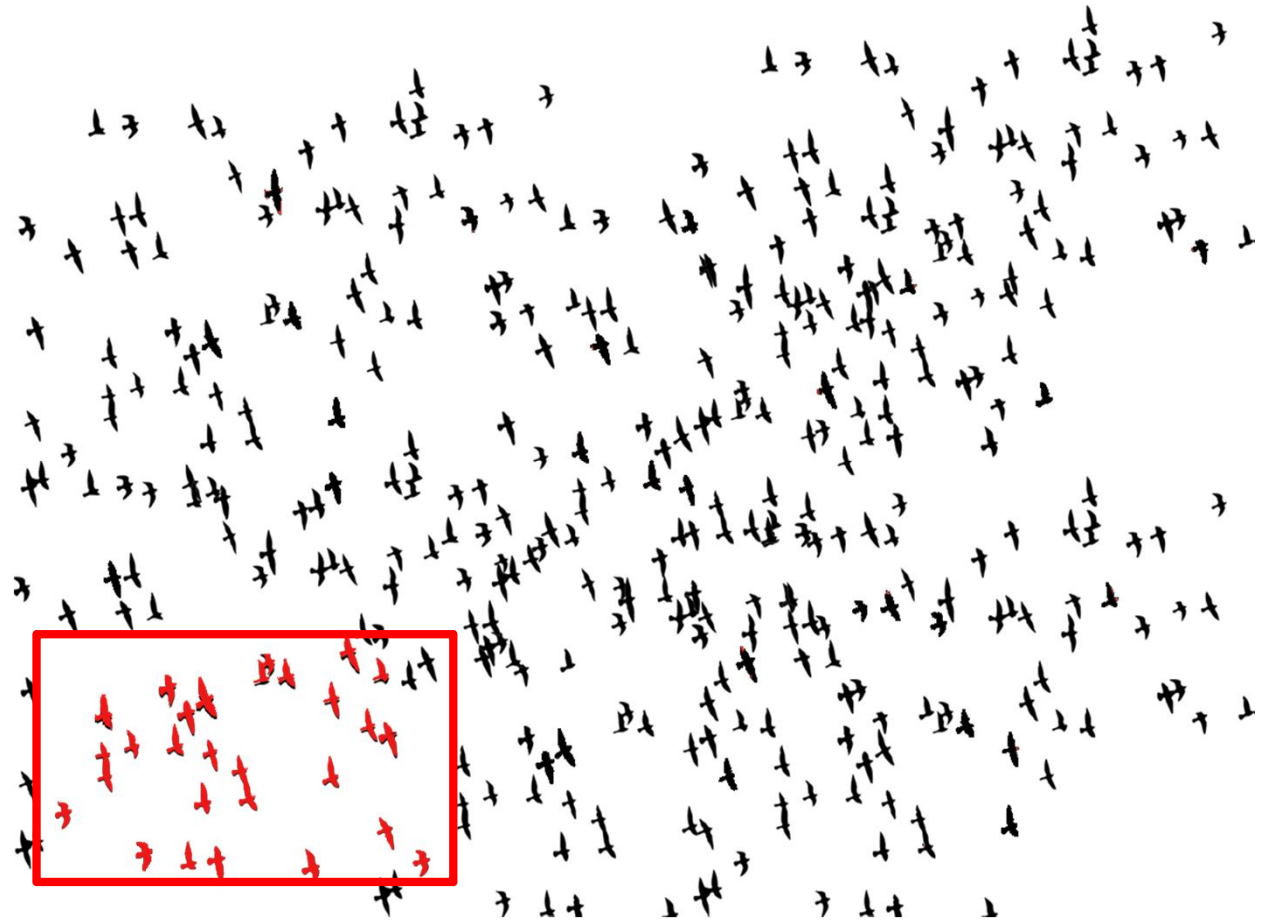


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## Mark Stage:

$D_{total}$  = total abundance (?)

$T_{total}$  = total number of tagged birds





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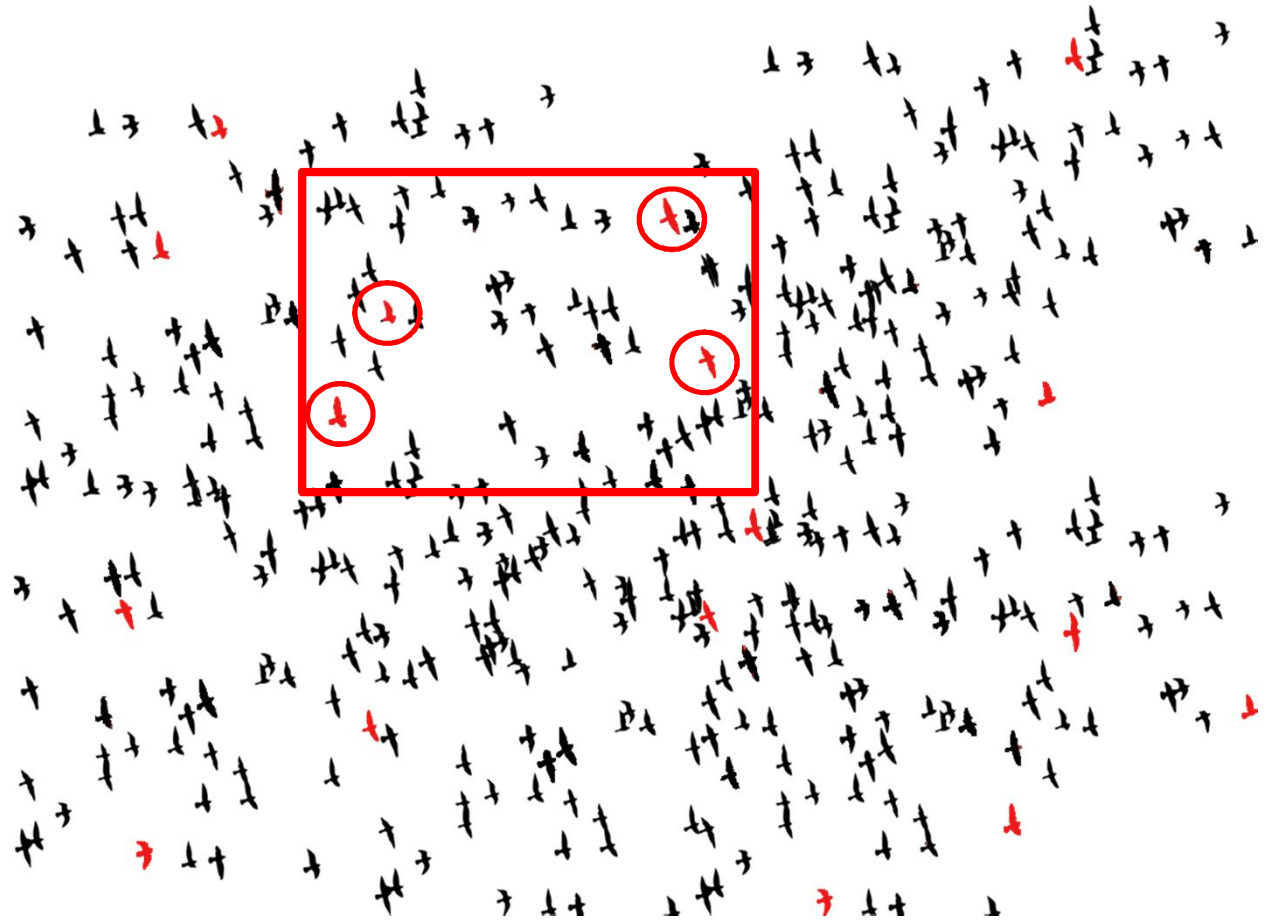
### Capture Stage:

$D_{total}$  = total abundance (?)

$T_{total}$  = total number of tagged birds

$D_i$  = number of untagged birds sighted

$T_i$  = number of tagged birds sighted





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### Capture Stage:

$D_{total}$  = total abundance (?)

$T_{total}$  = total number of tagged birds

$D_i$  = number of untagged birds sighted

$T_i$  = number of tagged birds sighted

$$\frac{D_{total}}{T_{total}} = \frac{D_i}{T_i} \quad \Rightarrow \quad D_{total} = \frac{T_{total} \times D_i}{T_i}$$

Jolly-Seber model:

Mark©

$$\hat{\alpha}_t = \frac{m_t + 1}{n_t + 1}$$

$$\hat{M}_t = \frac{(s_t + 1)Z_t}{R_t + 1} + m_t$$

$$\hat{N}_t = \frac{\hat{M}_t}{\hat{\alpha}_t}$$



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## In marine mammals?

- Marine mammals are sensitive and difficult to catch and tag.
- Difficult to detect (deep divers, long migrations, caves).

*Solution: Natural marks on visible parts of the body*



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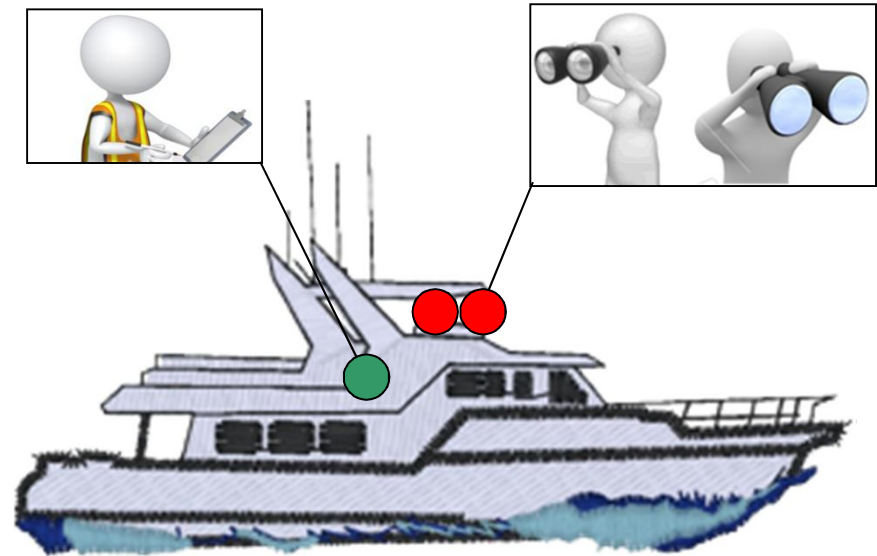
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- How is it done?





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- How is it done? Monk Seals?
  - Camera traps in resting caves



- Line Transects (distance Sampling) assumptions:
  - estimates the Relative Density (n of animals /sq.km).
  - Survey vessel moves on the trackline and effort is calculated (time and distance).
  - The presence of Senior Independent Expert to estimate error in detection (recommended).
  - Survey vessel or vintage point should be  $> 3\text{m}$  from sea surface (the higher the better).
  - Pre-designed trackline (software, e.g. Distance©).



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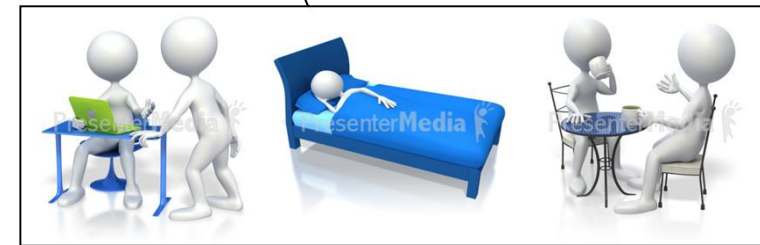
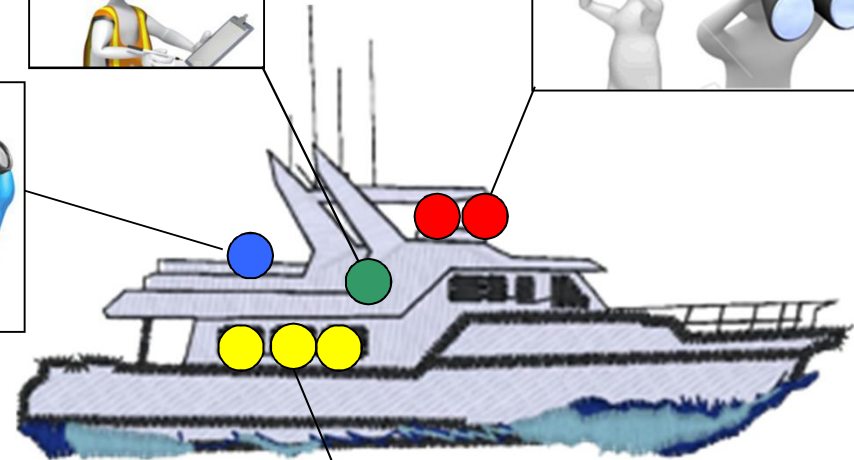
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1. Bring your hat, camera, sun lotion, sun glasses.
2. Drink plenty of water and keep hydrated.
3. Sea sickness? Remedy pills
4. Be aware of your movements and surroundings in the boat.
5. Briefing on the boat for further instructions.





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## Data Processing and Field Errors





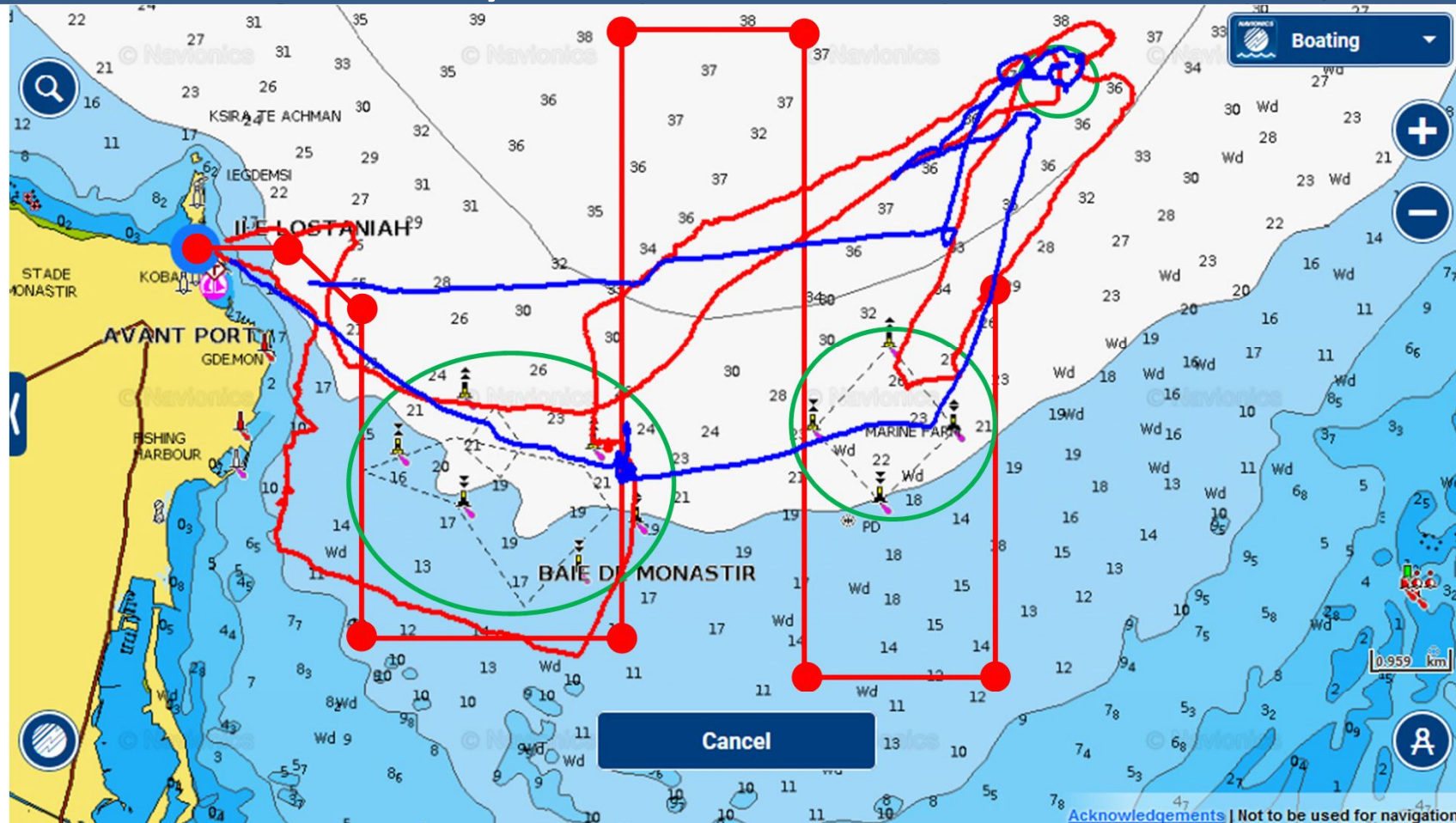
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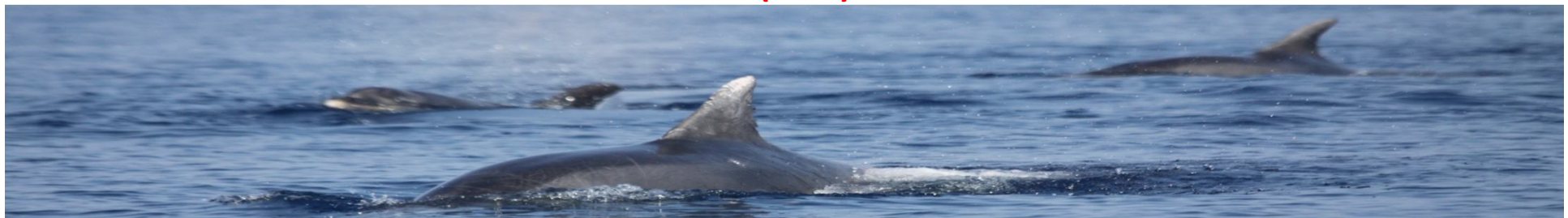
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Aquaculture

Line Transect = 47km (3:06)

Mark-Recapture = 36km (2:45)



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Herman Melville's Moby Dick (1851)





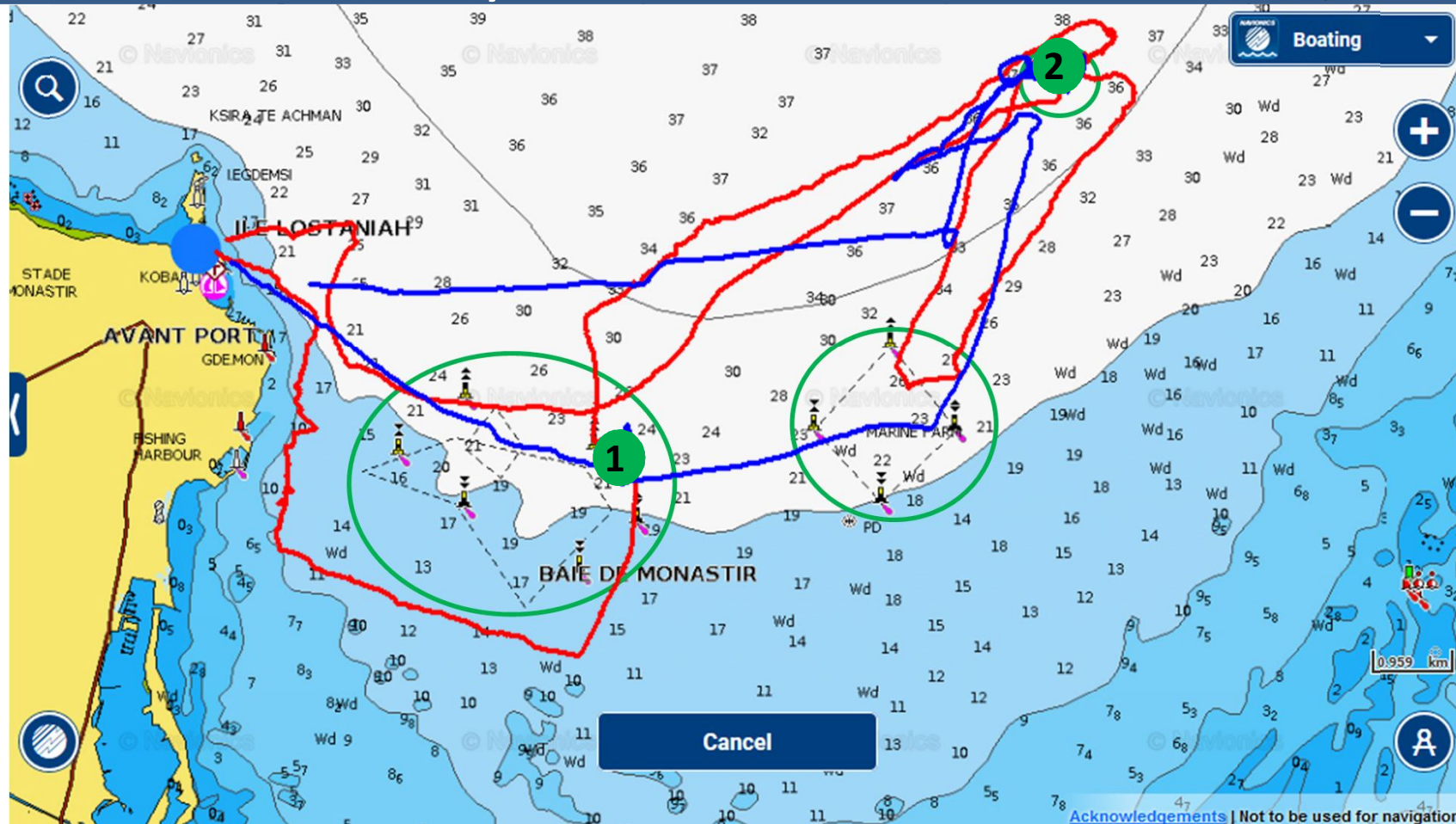
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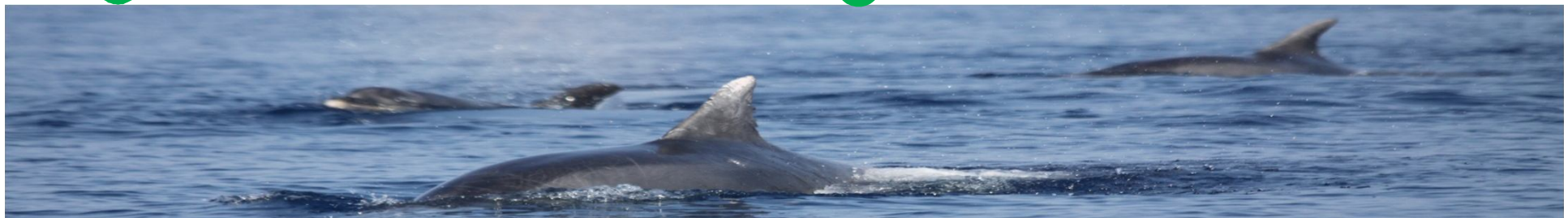
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1 5 Adults, 2 Calves, ~5 Marked

2 3 Adults, 2 Calves, ~5 Marked





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## Individual Marks:

### Sighting 1



Mon\_17072017\_01\_001



Mon\_17072017\_01\_002



Mon\_17072017\_01\_003



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## Individual Marks:

### Sighting 1



Mon\_17072017\_01\_004



Mon\_17072017\_01\_005



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## Individual Marks:

### Sighting 2



Mon\_17072017\_02\_001



Mon\_17072017\_02\_002



Mon\_17072017\_02\_003





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## Individual Marks:

## Sighting 2



Mon\_17072017\_02\_004



Mon\_17072017\_02\_005

(female)?





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**Thank you**

**Questions?**