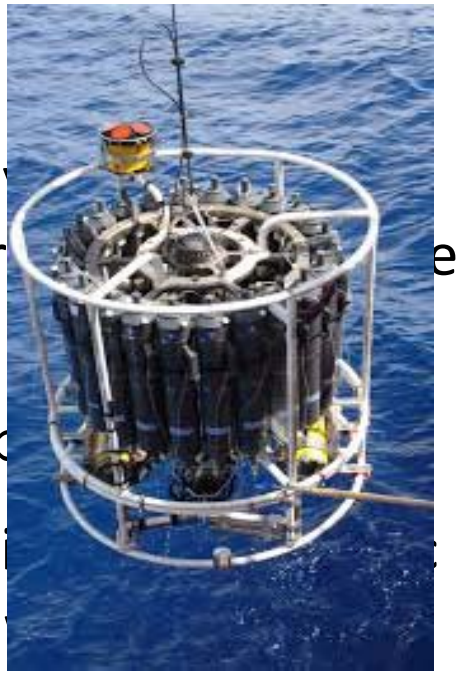
# Abundance of the Common dolphin *(Delphinus delphis)* in the north of the Iberian Peninsula.

**Camilo Saavedra,** Tim Gerrodette, Maite Louzao, Julio Valeiras, Salvador García, José Luis Murcia, Santiago Cerviño, Graham J. Pierce, M. Begoña Santos

## PELACUS Surveys

# PELACUS survey



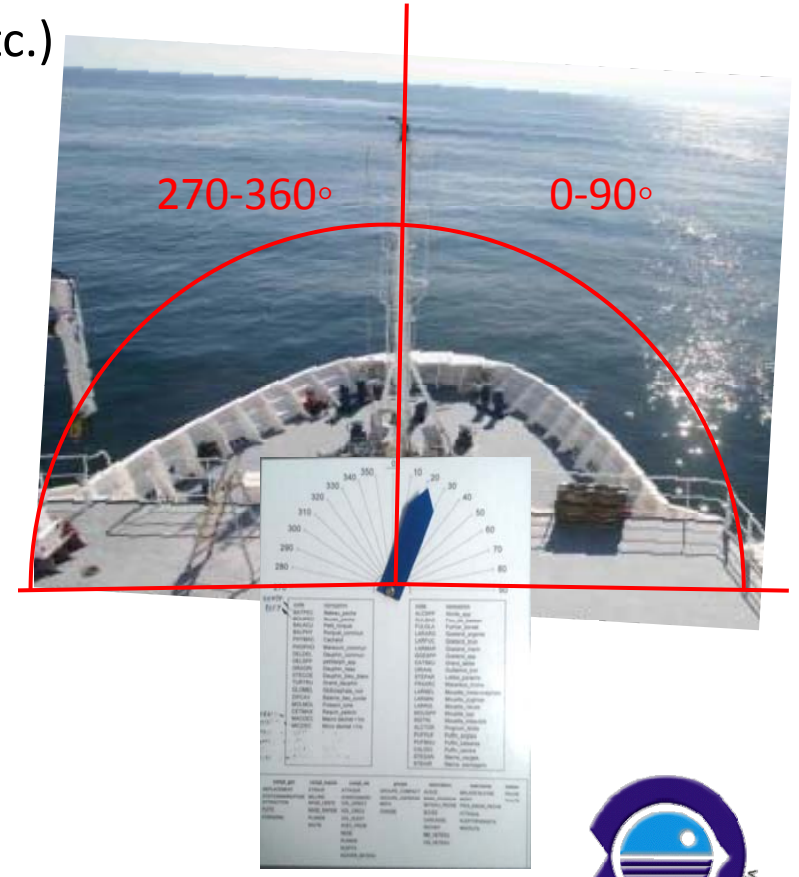
- Scanning parallel transects (perpendicular to the coast ) with an echosounder
- Fishing stations with a pelagic trawl (estimate length and species composition)
- Oceanographic stations during the night (CTD, Bongo net)

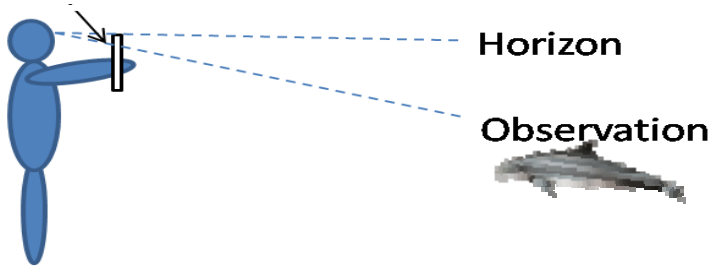
# PELACUS observers team

- Team of three observers of top predators since 2007
- Distance Sampling methodology:
  - Searching effort: Line-transects during the acoustic scanning (passing mode)
  - Search and record marine mammals, seabirds and others (fish, boats, floating debris, etc.)
  - 2 observers on-duty searching with naked eyes (7x50 binoculars used only for species identification)

# PELACUS methodology

- Environmental conditions (each transect)
  - Oceanographic conditions (Beaufort, wind, swell, etc.)
  - Search conditions (visibility, sun glare, etc.)
- Distance sampling data
  - Distance to the sighting (stick method)
  - Angle (angleboard)
  - Group size (best estimate)
  - Behaviour (e.g. ATTRACTION)



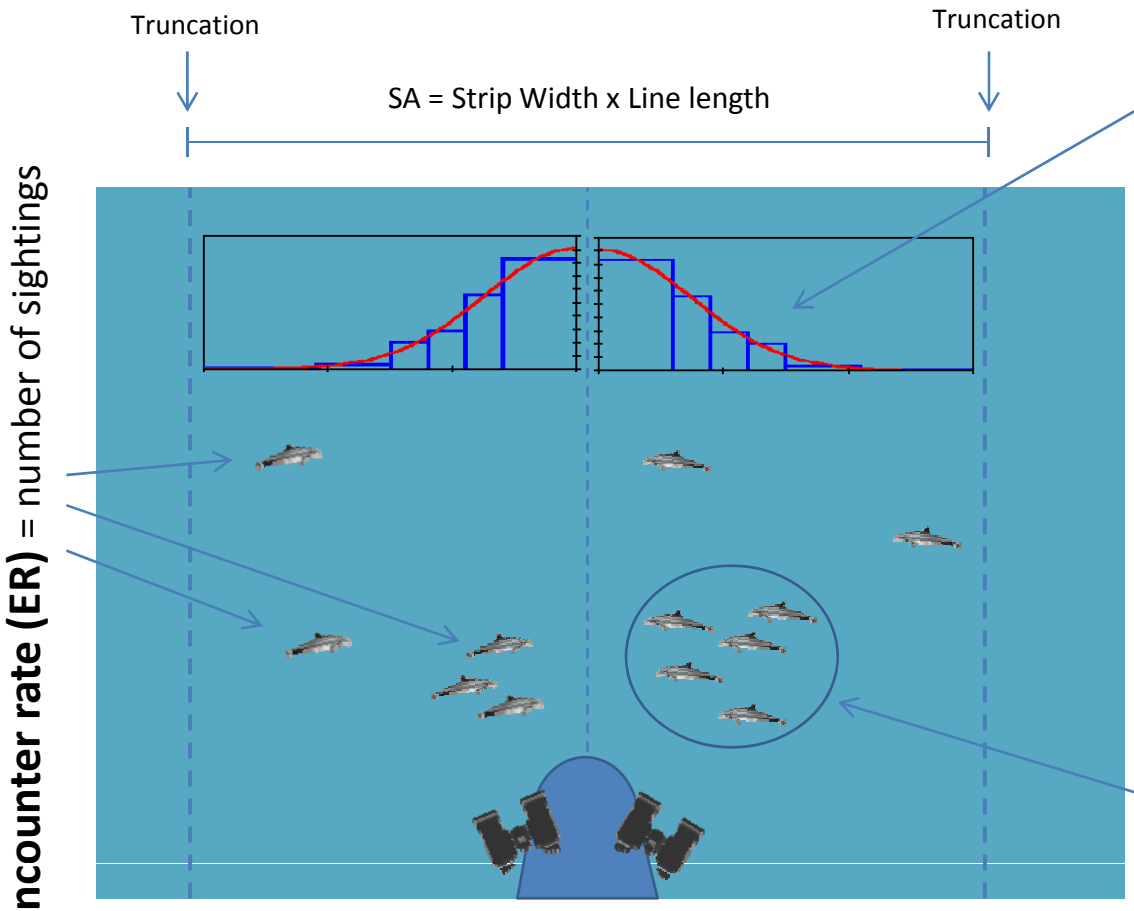



# Sightings summary

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Total |
|---|---|---|---|---|---|---|---|---|---|
| ***Small cetaceans*** | | | | | | | | | |
| Common dolphin | 12 | 18 | 17 | 27 | 17 | 20 | 22 | 25 | 158 |
| Striped dolphin | | 6 | | | | | 1 | | 7 |
| Bottlenose dolphin | 10 | 13 | 8 | 11 | 1 | 4 | 2 | 21 | 75 |
| Long-finned pilot whale | 6 | 10 | 17 | 9 | | 1 | 7 | 26 | 76 |
| Risso's dolphin | | 2 | 1 | | | 2 | | | 5 |
| Harbour porpoise | 1 | | | | | | 1 | | 2 |
| Unidentified dolphin | 5 | 2 | 12 | 4 | 2 | | 3 | 8 | 36 |
| ***Big whales*** | | | | | | | | | |
| Minke whale | | | | | | 1 | | 2 | 3 |
| Fin whale | | | | | | 1 | | | 1 |
| Sperm whale | | | 1 | | | | | | 1 |
| False killer whale | | 1 | | | | | | | 1 |
| Beaked whale1 | | 1 | | 1 | | | | | 2 |
| Beaked whale2 | | | | | 1 | | | | 1 |
| Baleen whale | 1 | | 1 | | | | | | 2 |
| Cetacean | | | | | | 1 | | 1 | 2 |
| ***Turtles*** | | | | | | | | | |
| Leatherback turtle | | | | | | 1 | | | 1 |
| ***Bone fish*** | | | | | | | | | |
| Sun fish | 15 | 14 | 5 | 2 | 12 | 25 | 15 | 13 | 101 |
| ***Sharks*** | | | | | | | | | |
| Blue shark | | | | | | | | 1 | |

# Distance sampling

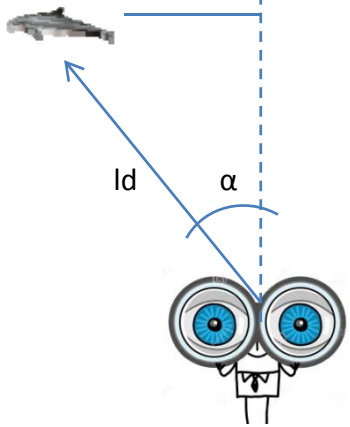
**Density (ER, GS, DF)** $\hat{D} = \frac{n \cdot \hat{E}_{(s)}}{c \cdot a \cdot \hat{P}_a \cdot \hat{g}_0}$ **Abundance (D, A)**




**Detection function (DF)**

- Perpendicular distance
- Other covariates

Beaufort (sea state)
Group size
Swell
Visibility
Sun glare
…




**Group size (GS)**

Estimated number of animals

# Attraction (I)

• **Distance Sampling methodology** assumes that animals do not respond to the searching platform (neither attraction nor avoidance movements)

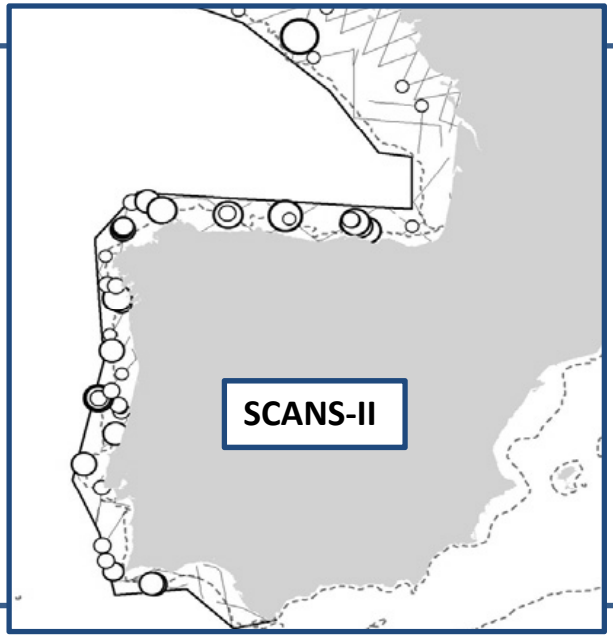
• **Common dolphin** -> High attraction rate -> Overestimate abundance

**SCANS-II**

• Only absolute abundance estimate on the shelf Atlantic waters of the Iberian Peninsula

• Common dolphin abundance estimates

- Conventional analysis (no attract. correction)
- Mark and recapture (double platform)



# Attraction (II)

SCANS-II correction factor (0.36):
- Mark recapture abundance estimate (corrected for attraction) is 36% of the abundance estimated with the conventional method

Recorded behaviour:
- Attraction
- No attraction

| | Total | Attract. | No attract. | Prop.Attract. |
|---|---|---|---|---|
| **Common dolphin** | 158 | 64 | 94 | 40.50% |
| **Bottlenose dolphin** | 36 | 6 | 73 | 7.60% |
| **Long-finned pilot whale** | 79 | 6 | 70 | 7.90% |

We removed these observations assuming that those “attracted” dolphins should not have been seen:

- Some would have been sighted even if they had not approached the boat. They were already close to the track line. Negative bias ?

- Some would have approached the boat (from far away) but not enough to have appreciated signs of attraction. Positive bias ?

# Distance sampling analysis

## Bayesian approach

**Tomoharu Eguchi and Tim Gerrodette, 2009**

- Allows us to combine previous knowledge of data :

  - Attraction correction factor (SCANS)

  - Known distributions to some parameters (work with the scarcity and uncertainty of the data) -> Small sample sizes

## Half-normal Detection Function

**Truncation = 500 m** ⟶ Proportion within = 92% ⟶ g(500) =0.8

**Covariates = Beaufort + log(group size)** ⟶ DIC criteria

# Results and comparison with SCANS-II

## Our estimates

mean abundance between 2007-14

| | All sightings | SCANS correction | No attraction |
|---|---|---|---|
| **Abundance (N)** | 6257(0.07) | 2255(0.21) | 2665(0.08) |
| **δ / Km²** | 0.310(0.07) | 0.112(0.21) | 0.132(0.08) |

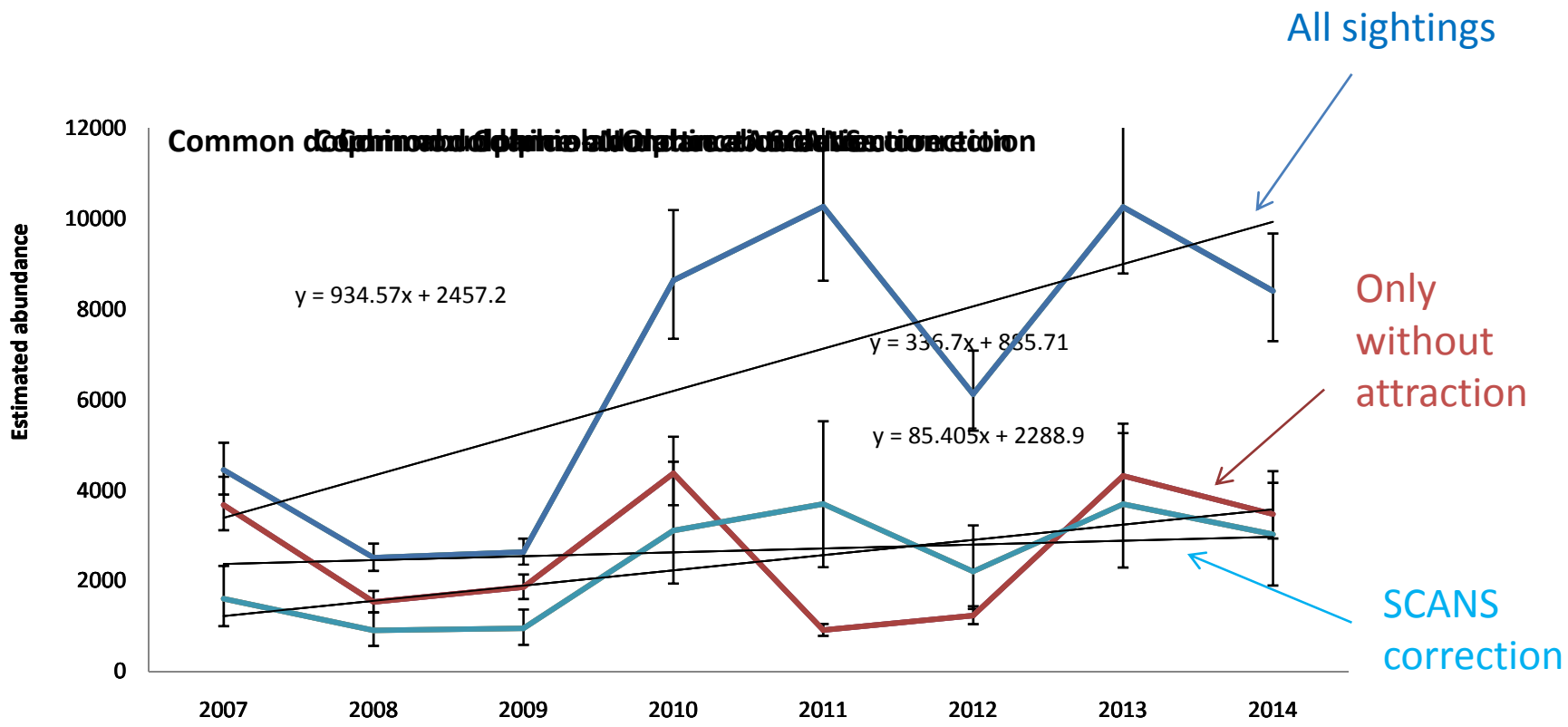
## SCANS (rescaled)

abundance in 2005

| | SCANS-II conventional | SCANS-II mark-recapture |
|---|---|---|
| **Abundance (N)** | 7064(0.25) | 2597(0.22) |
| **δ / Km²** | 0.352(0.25) | 0.129(0.22) |

Study Area = 20200 km² — **6.9 times smaller** — SCANS-II (BLOCK W) = 138600 km²

# Annual abundance



# Conclusions

- Non-dedicated surveys have some limitations. Good way to collect information that otherwise we would not get
- Using relative estimates we can analyse trends in the abundance (attraction correction methods affect)
- Absolute abundance estimates are roughly consistent with other studies (although do not cover the entire population)
- For absolute abundance need to improve the attraction correction method or data collection (double platform)


**Acknowledgements to all observers who participated in the survey**

**Thank you for your attention!**

Camilo Saavedra