



## 4<sup>th</sup> Training Seminar

"Management and conservation of the species *Larus audouinii* & *Puffinus yelkouan*"

# Scientific monitoring of the Yelkouan shearwater *Puffinus yelkouan* in the field



*Camilla Gotti*  
*Danae Portolou*  
*Marco Zenatello*



Με τη συγχρηματοδότηση  
της Ευρωπαϊκής Ένωσης





Why monitoring seabirds?



**D1C4**      **Distribution (species' range)**      **CI 3**

**D1C2**      **Abundance**      **CI 4**

**D1C3**      **Demography**      **CI 5**

**(D1C1)**      **Bycatch**      **(CI 12)**

Marine Strategy  
Framework Directive  
(MSFD)

Article 12 reporting

Red List Evaluations

Integrated  
Monitoring and  
Assessment  
Programme (IMAP)



Με τη συγχρηματοδότηση  
της Ευρωπαϊκής Ένωσης





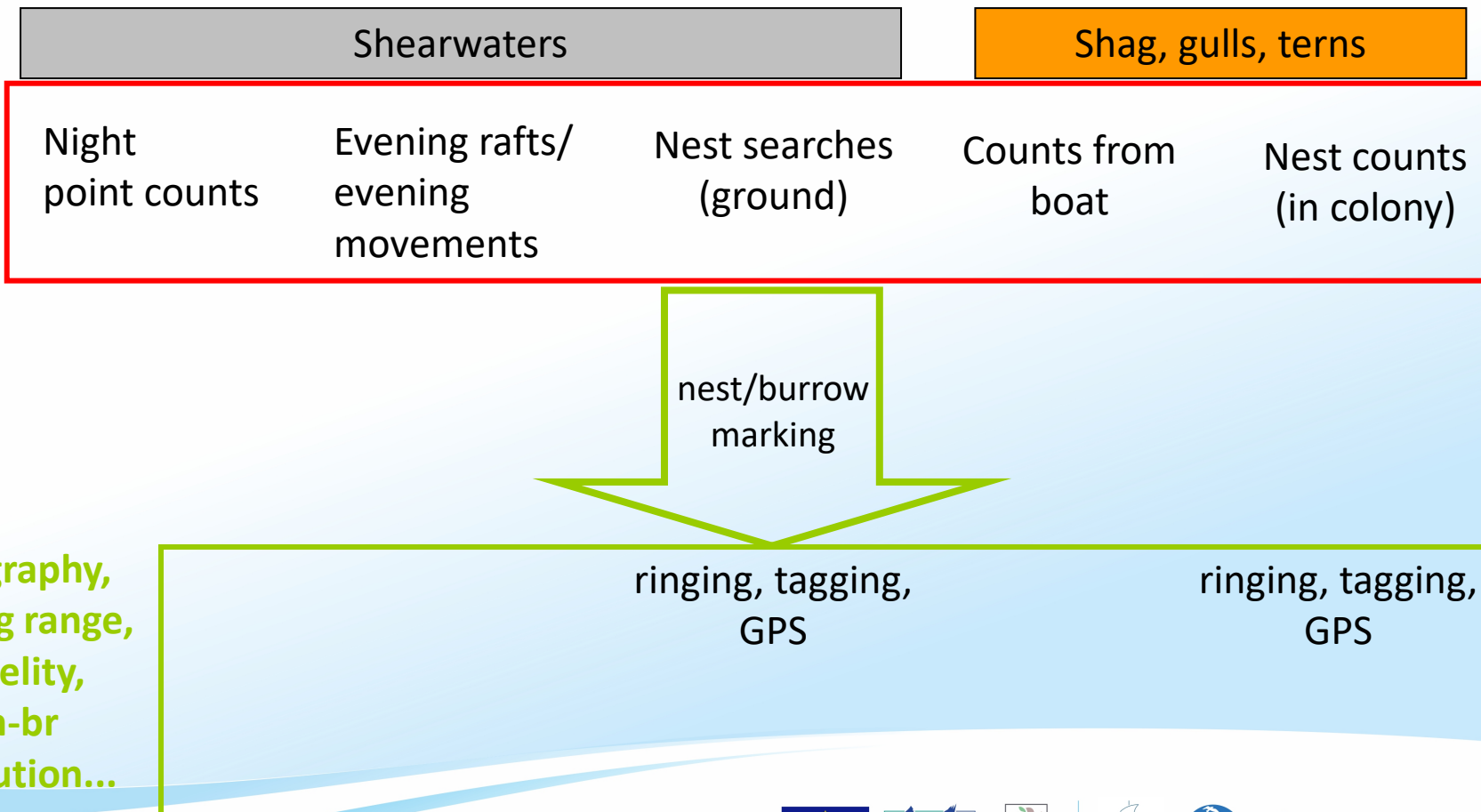
## Seabird monitoring

|             |              | Point counts | Raft counts | Boat/tel<br>escape counts | Nest density | Nest content | After fledging | Ringling | Tagging |
|-------------|--------------|--------------|-------------|---------------------------|--------------|--------------|----------------|----------|---------|
| Shearwaters | Distribution | X            | X           |                           |              |              |                | X (nbr)  | X (nbr) |
|             | Abundance    | X            | X           |                           | X            | X            |                |          |         |
|             | Demography   |              |             |                           |              | X            | X              | X        |         |
| Gulls/Terns | Distribution |              |             | X                         |              |              |                | X (nbr)  | X (nbr) |
|             | Abundance    |              |             | X                         |              | X            |                |          |         |
|             | Demography   |              |             | X                         |              | X            | X              | X        |         |





## Seabird (breeding) monitoring - summary



Με τη συγχρηματοδότηση  
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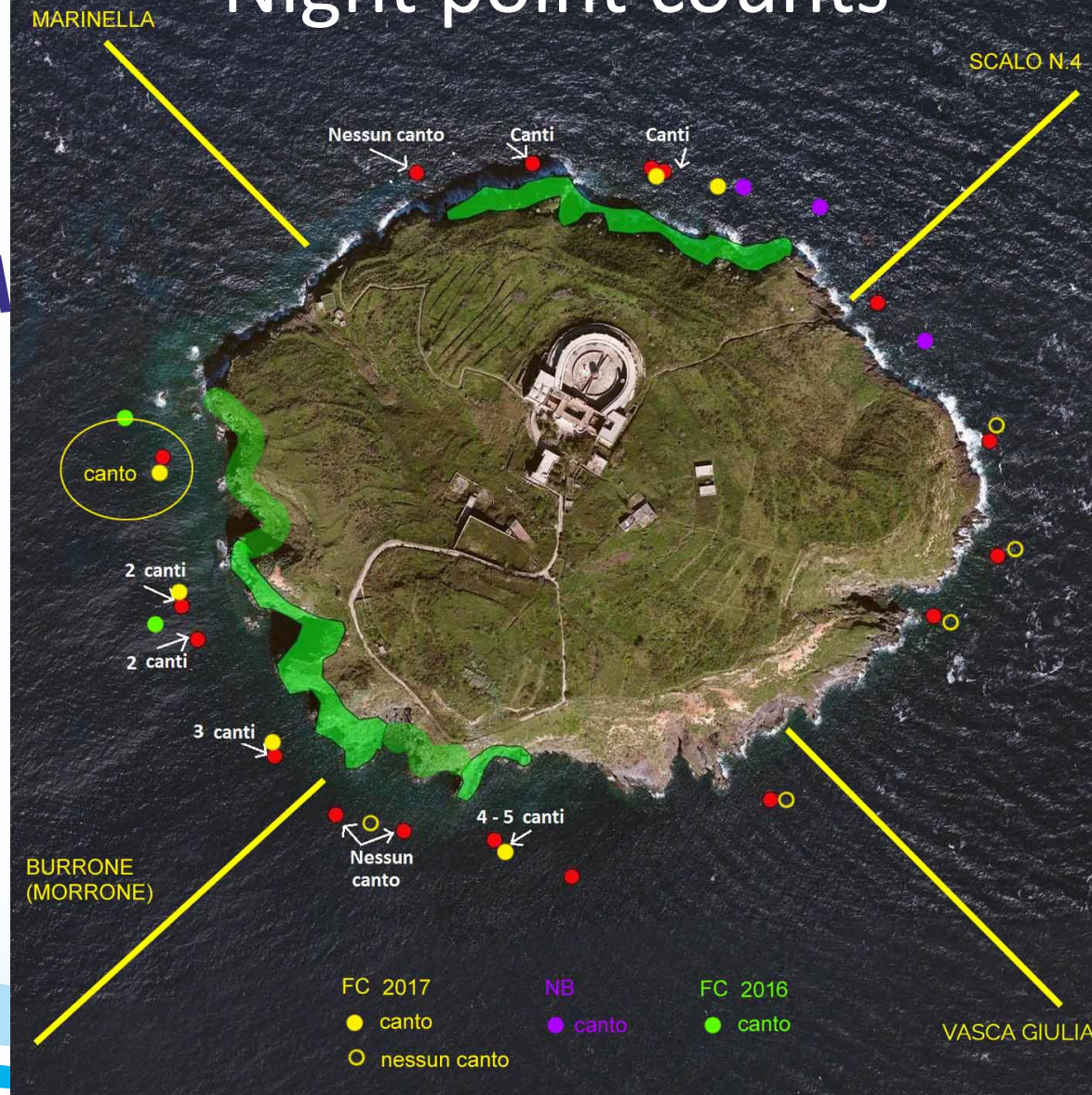


## Methods for monitoring presence

- Acoustic signs (night monitoring)
- Visual signs
  - At sea (rafts, individuals returning to colonies etc.)
  - On land (alive or dead ind., aos, nests, predated eggs, biological signs -feathers, scats, smell etc.)



# Night point counts



**When:** early night after total darkness until moonrise (ideally 5-8 days after full moon)

**Where:** coastal rocky areas, with sparse vegetation and boulders/debris, cliffs, caves and (as a rule) no artificial lights.

**Season:** early Feb to early June for YS

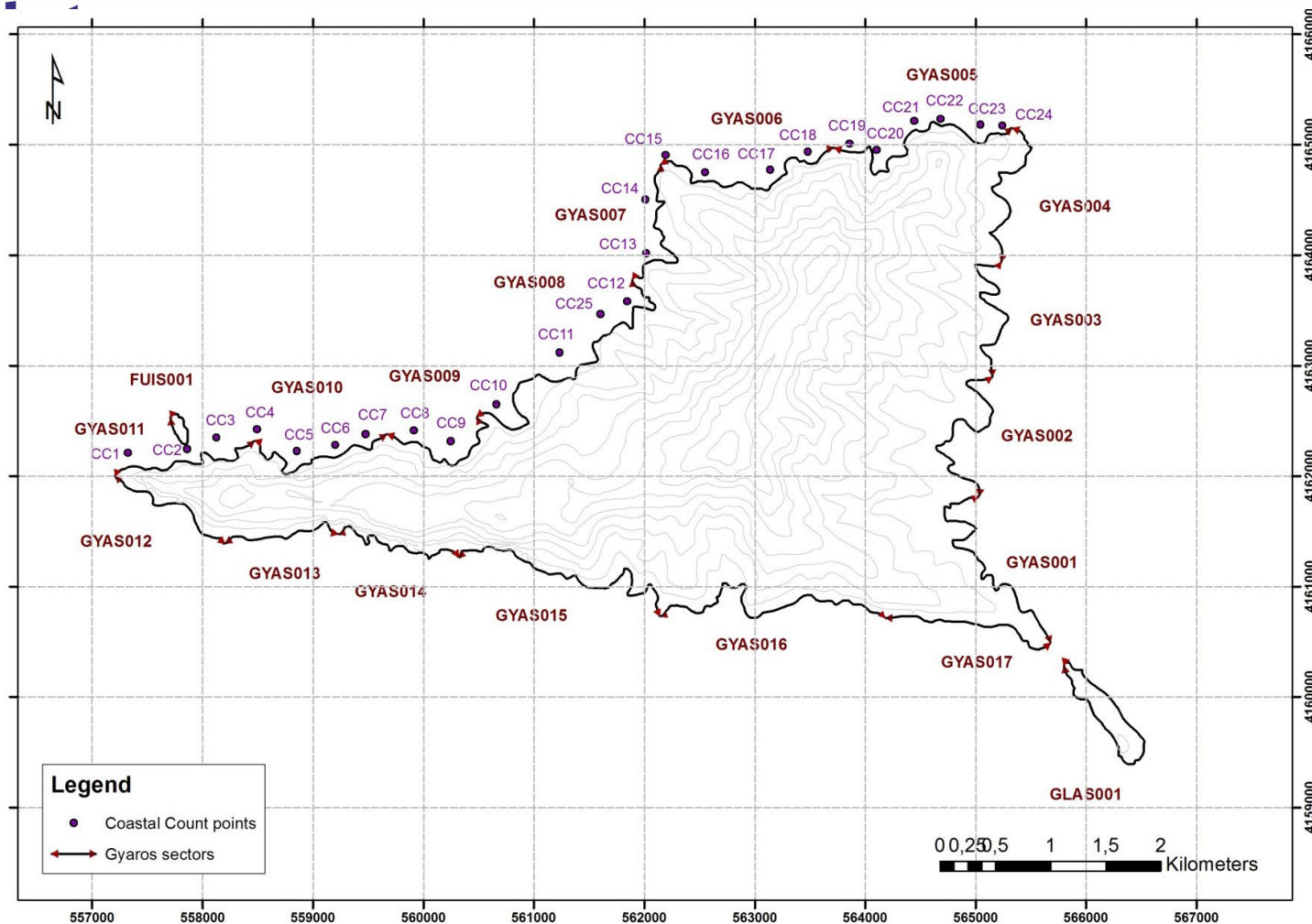
**Tools:** map, gps, M & F recordings, form / (or: Songmeters on land)

**Results:** presence/absence, approx colony location ; calls/time unit (e.g. 10min)

## Methods for monitoring presence

### Gyaros case

- Coastal Acoustic Counts
- Number of calls per point
- High concentration areas verified with use of vessel radar and with Thermal Camera
- Aerial photographs to produce digital terrain models of most important parts





## Evening rafts

**When:** from 2-3 h before sunset until darkness (ideally 5-8 days after full moon)

**Where:** close to known/suspected breeding colonies

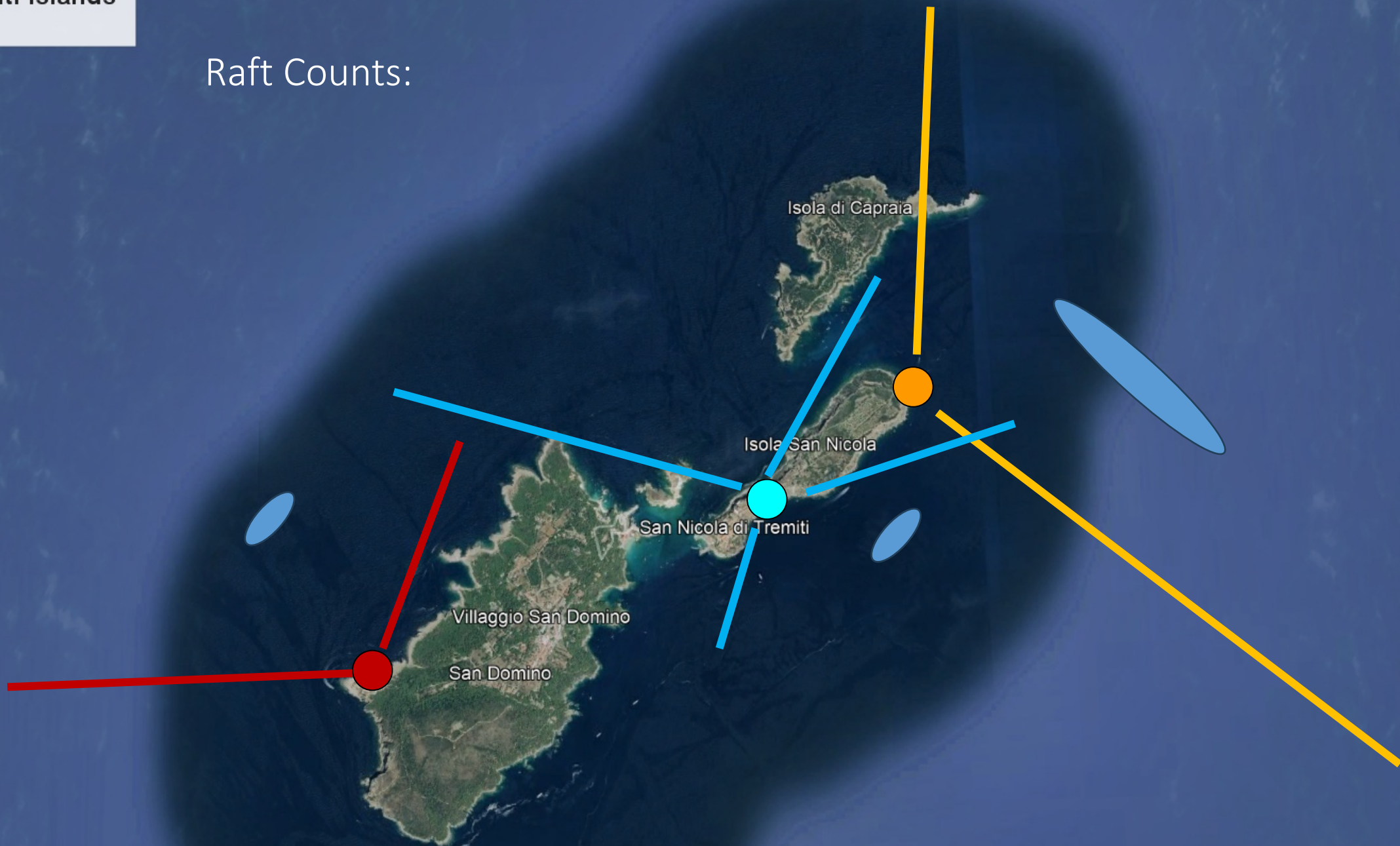
**Season:** soon before egg laying AND/OR close to the end of incubation: Feb or April for YS

**Tools:** map, gps, telescope, binocular, (compass), form

**Results:** n birds, approx location of colonies

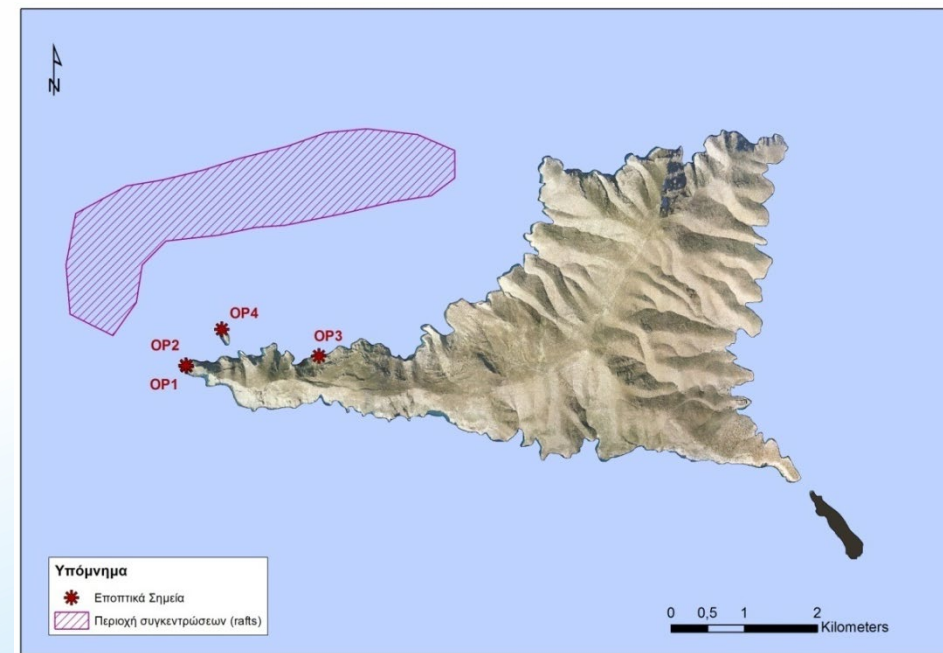


Raft Counts:

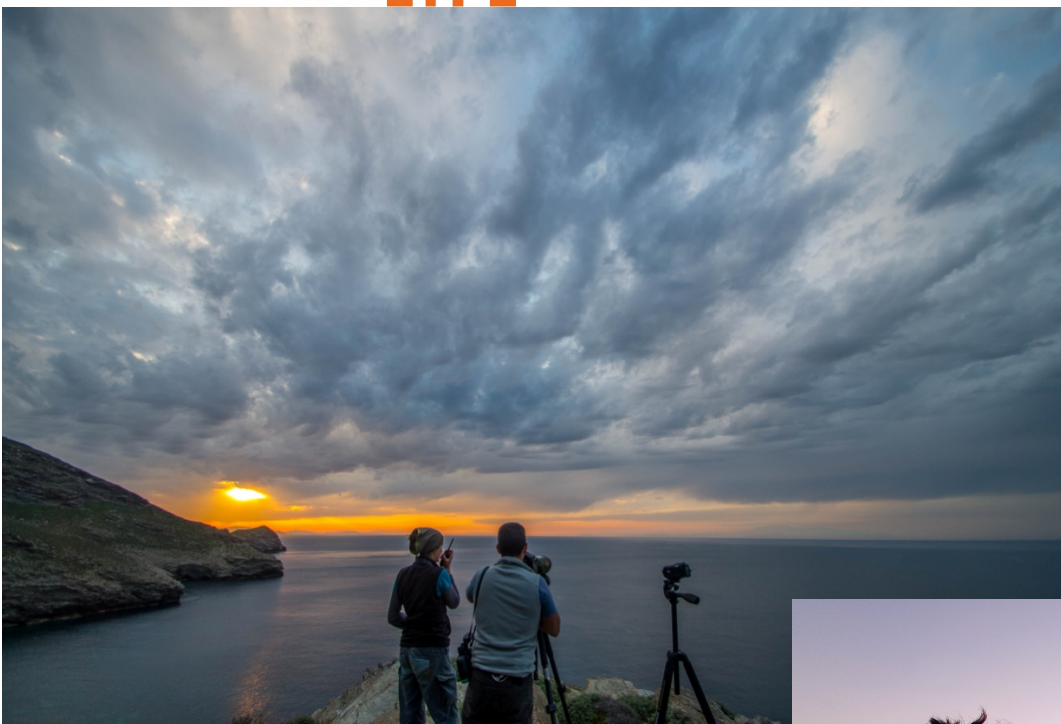




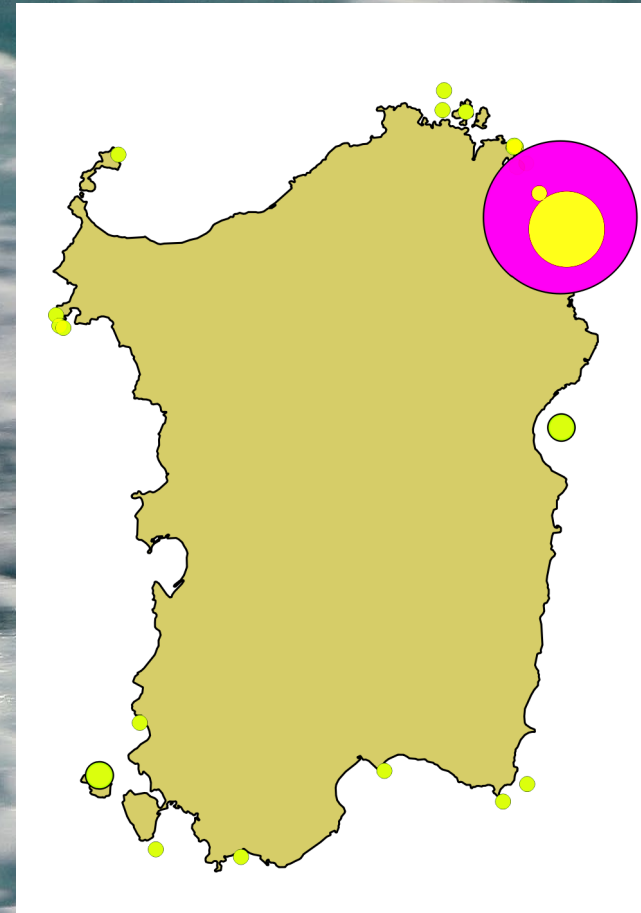
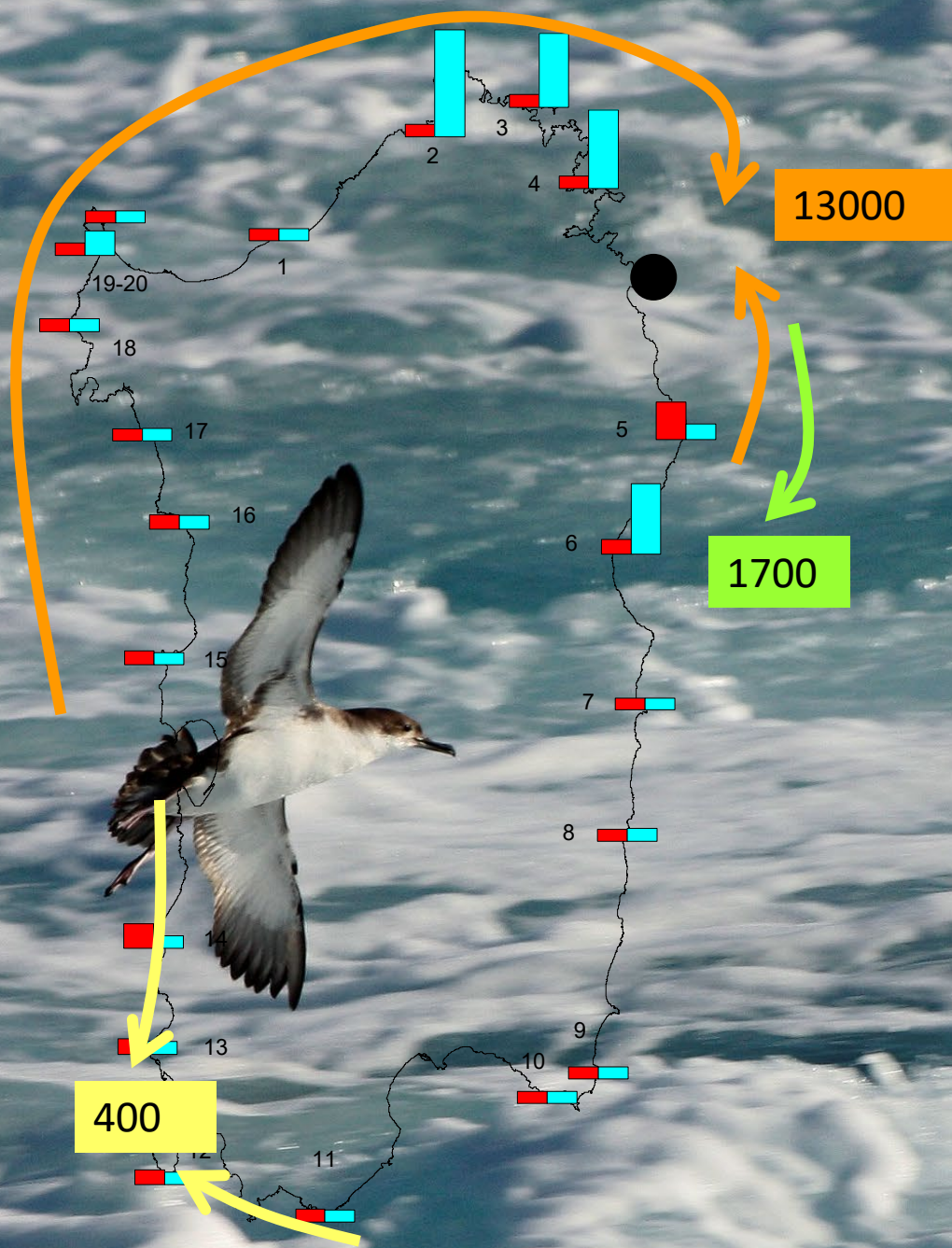
## Evening rafts



Raft Counts:  
Small groups 30-100 inds  
Max 2000 inds (7/2014)



In specific situations: simultaneous  
afternoon counts from vantage points  
around Sardinia during incubation  
(alternative to raft counts close to  
colony)







## *Nest searches*

Nests are not always easily accessible

And in order to access them you need proper equipment...

Ορνιθολογική

ISPRA  
Istituto Superiore per la Protezione  
e la Ricerca Ambientale





## *Nest searches*

Indispensable tools: Flashlight and  
burrowscope  
Nest marking, protective gear etc.





## *Nest searches*



Με τη συγχρηματοδότηση  
της Ευρωπαϊκής Ένωσης



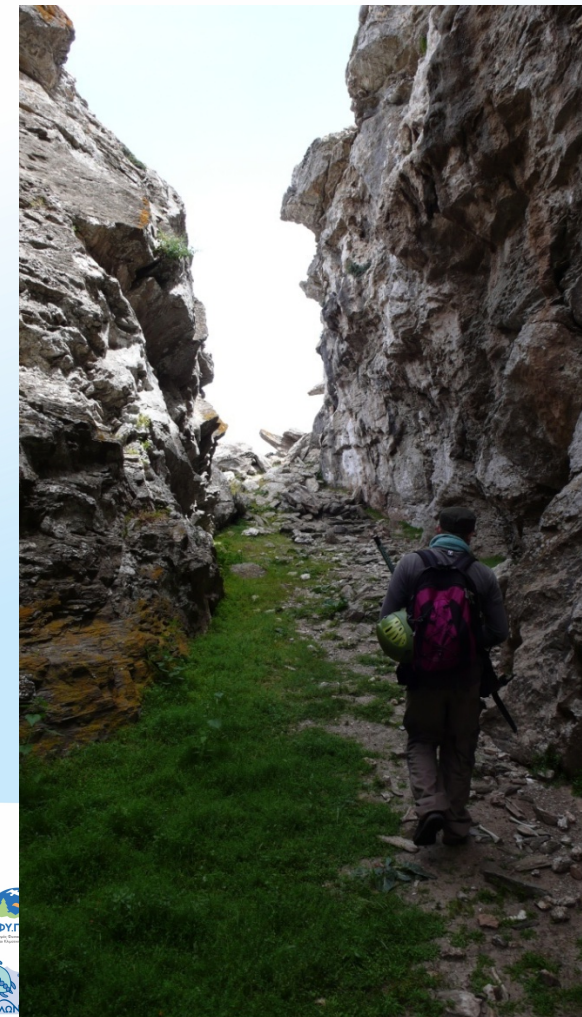
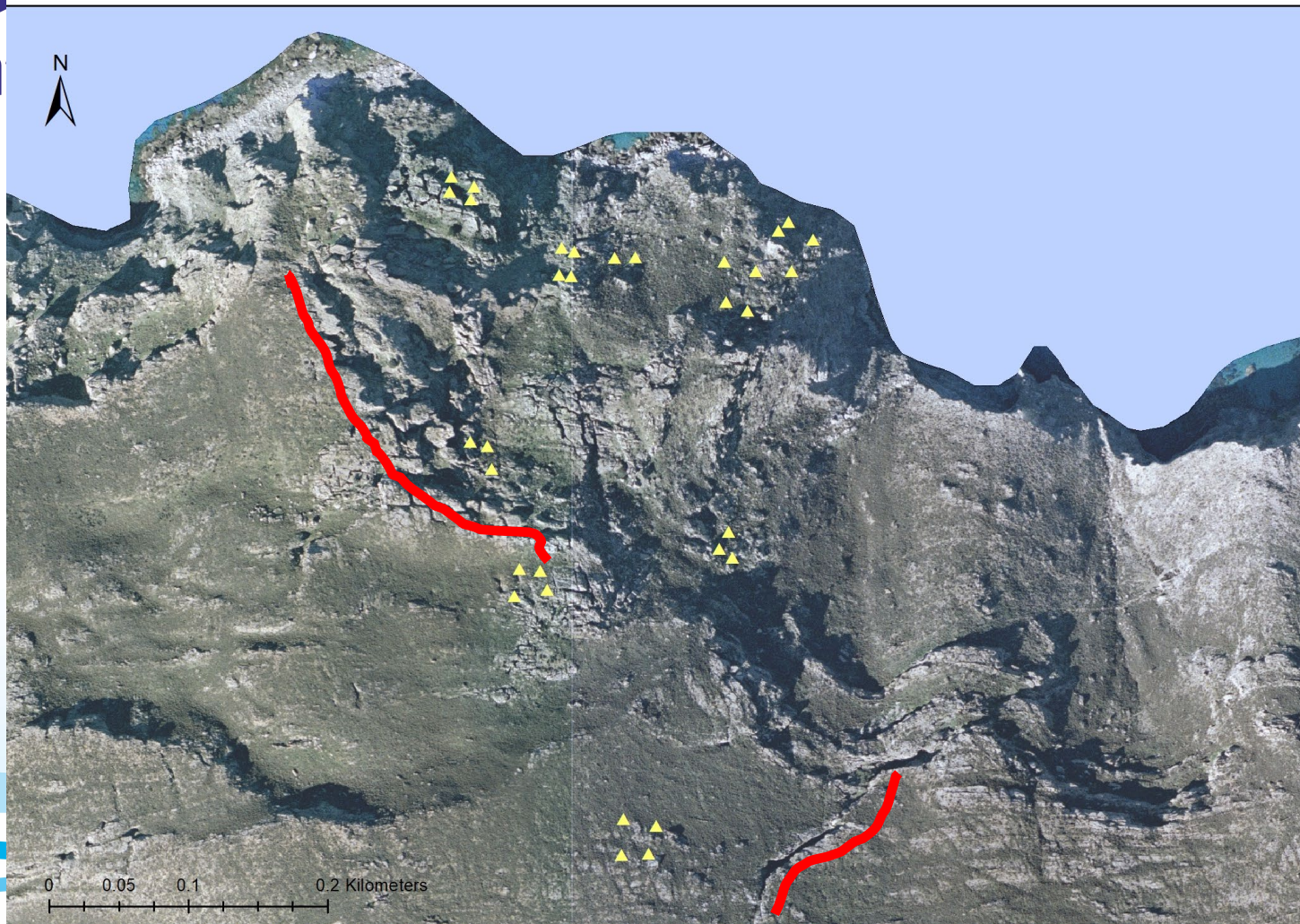


MareNa

## *Nest density*



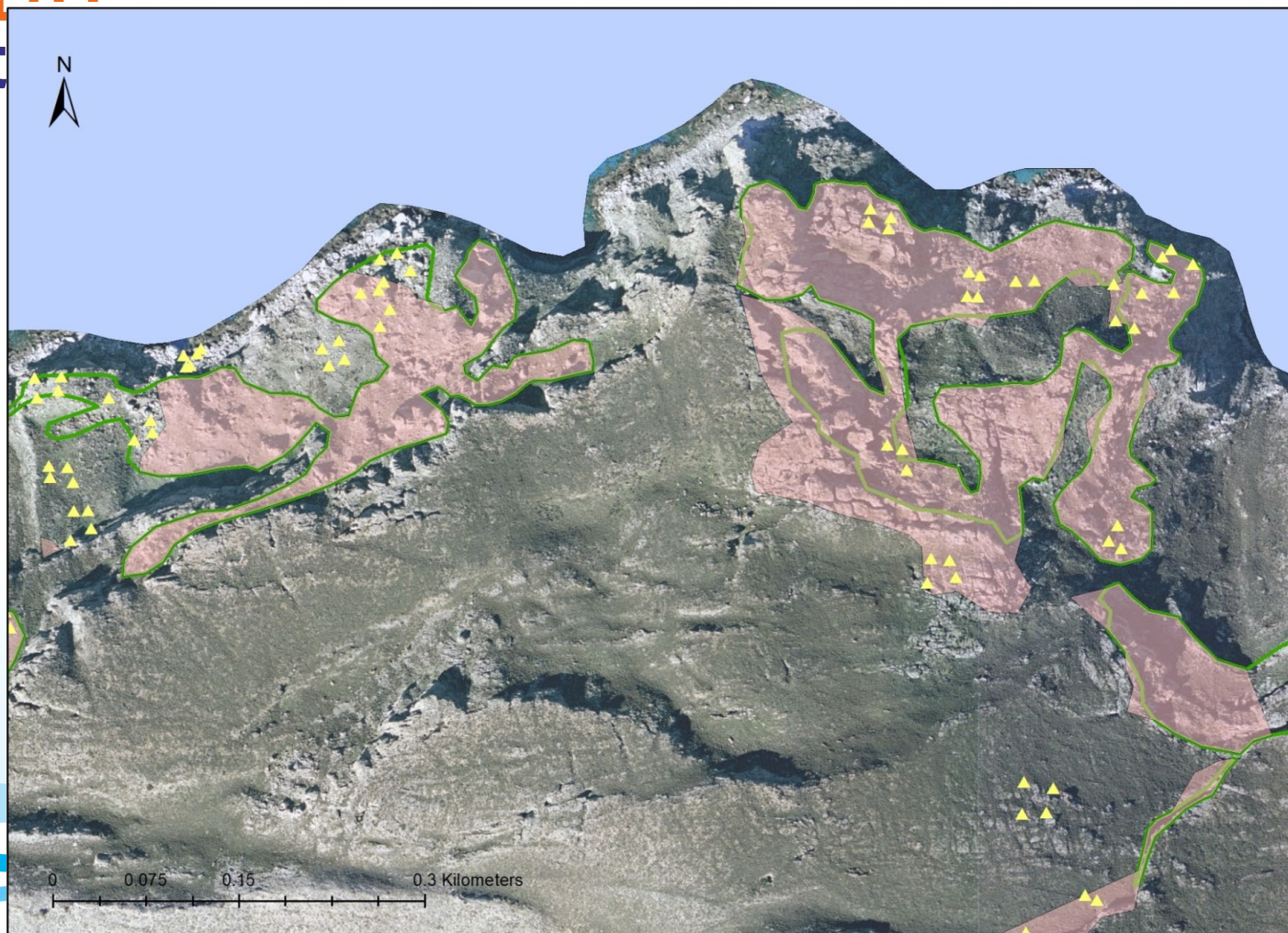
Gyaros case



# *Nest density*

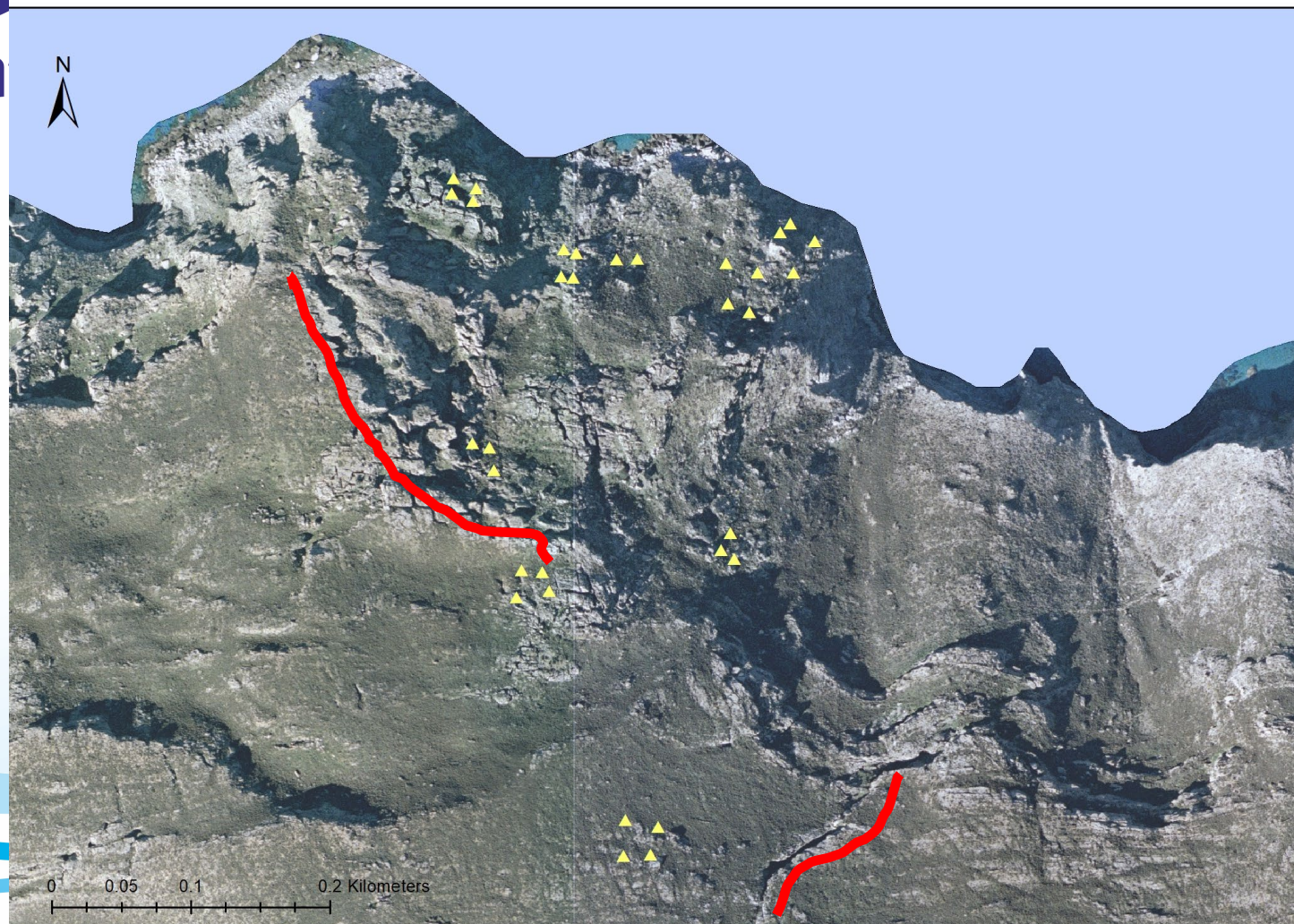
Gyaros case

34 sample plots  
in suitable  
habitat



# *Nest density*

Gyaros case



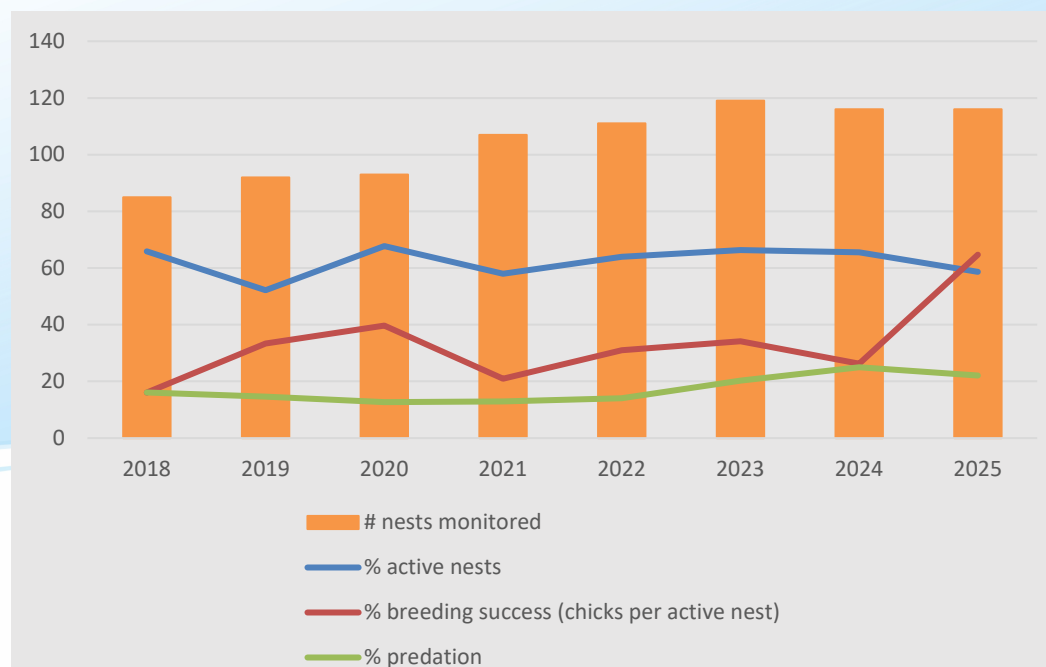
## Breeding parameters

| Year | # nests monitored | % active nests | % breeding success (chicks per active nest) | % predation |
|------|-------------------|----------------|---------------------------------------------|-------------|
| 2018 | 85                | 65.88          | 16.07                                       | 16.07       |
| 2019 | 92                | 52.17          | 33.33                                       | 14.58       |
| 2020 | 93                | 67.74          | 39.68                                       | 12.70       |
| 2021 | 107               | 57.94          | 20.97                                       | 12.90       |
| 2022 | 111               | 63.96          | 30.99                                       | 14.08       |
| 2023 | 119               | 66.39          | 34.18                                       | 20.25       |
| 2024 | 116               | 65.52          | 26.32                                       | 25.00       |
| 2025 | 116               | 58.62          | 64.71                                       | 22.06       |

- 158 accessible nests located and marked (2015-2025); Many more possible nests.
- 3 visits per season (incubation, hatching and fledging)
- Occupancy, Breeding success



Mean % occupied nests → 62%  
Breeding success (fledglings per nest) → 5-30%  
Nests with predation signs → 20%



## Estimate of Tavolara is. YS population: Nest density

- years 2008-today
- 10 plots of ca. 0.4 Ha
- 0.6% of the island (flat 600, real 900 Ha)
- 1.3% of suitable area (flat 317 Ha)

*groups of 4-6 people each  
2 with gps at 50-80m distance, 1 writing, others searching plots  
along parallel lines*





occupied

empty and  
suitable



## Tavolara: pop estimate

Very large interval of the  
estimate: more samples  
are required!

|                      | densities |            | estimated totals |         |         |
|----------------------|-----------|------------|------------------|---------|---------|
|                      | mean/Ha   | range      | mean TOT         | min TOT | max TOT |
| occupied sites       | 43,3      | 5,7-95     | <b>13726</b>     | 1806    | 30105   |
| empty suitable sites | 103,3     | 17,6-223,6 | 32746            | 5582    | 70881   |



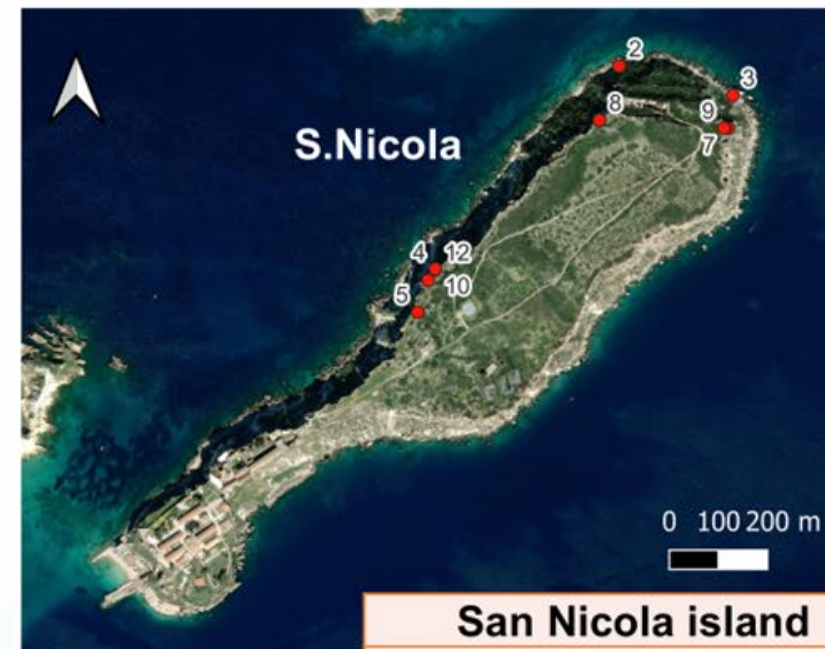
## Yelkouan shearwater monitoring in Tremiti



**Few accessible nests to  
check for productivity and  
for telemetry activities**



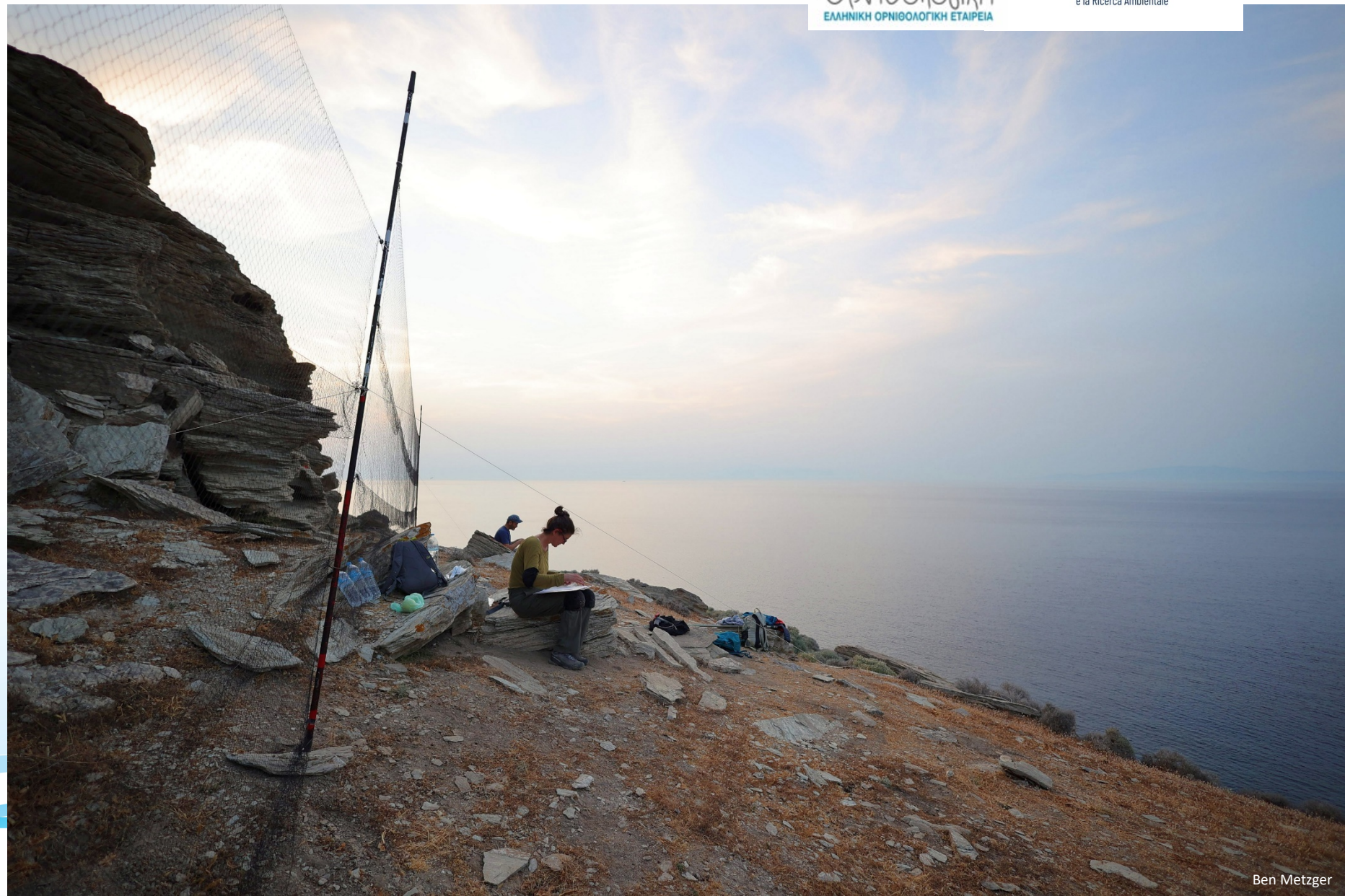
**3 YS artificial nests  
deployed!**



| San Nicola island                  |                   |
|------------------------------------|-------------------|
| Total nests found                  | 10                |
| Sample used for productivity       | 9                 |
| Successful nests                   | 7                 |
| Failed nests                       | 2                 |
| <b><u>Reproductive Success</u></b> | <b><u>0.8</u></b> |



## Mist-netting for data collection





## Ringling – morphometrics & blood samples



## Telemetry 2017-2025:

- CatTrack Data loggers
- Pathtrack GPS loggers
- AxyTrek Data loggers
- Ornitela GPS/GSM loggers

