



4th Training Seminar

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

The Audouin's Gull *Larus audouinii*. Scientific monitoring



Camilla Gotti
Danae Portolou
Marco Zenatello



Με τη συγχρηματοδότηση
της Ευρωπαϊκής Ένωσης





Why monitoring seabirds?



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

Marine Strategy
Framework Directive
(MSFD)

D1C2 **Abundance**

CI 4 Integrated
Monitoring and
Assessment
Programme (IMAP)

Article 12 reporting

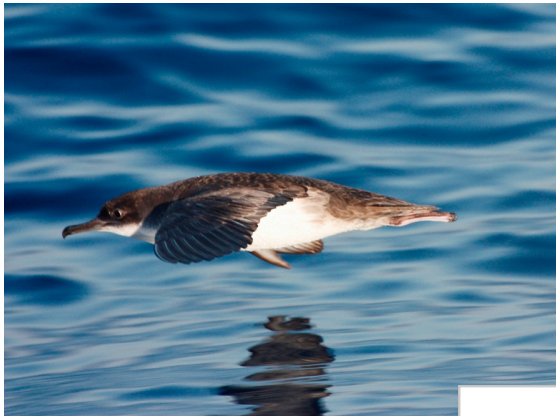
D1C3 **Demography**

Red List Evaluations

(D1C1) **Bycatch**

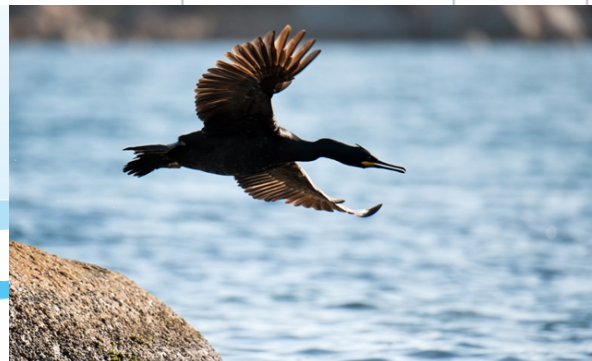
(CI 12)

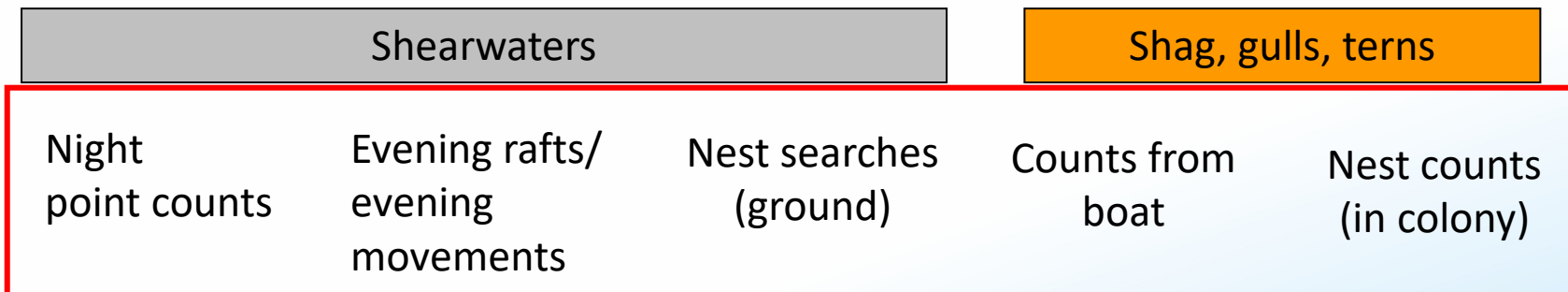




Seabird monitoring

		Point counts	Raft counts	Boat/telescope counts	Nest density	Nest content	After fledging	Ringling	Tagging
Shearwaters	<i>Distribution</i>	X	X					X (nbr)	X (nbr)
	<i>Abundance</i>	X	X		X	X			
	<i>Demography</i>					X	X	X	
Gulls/Terns	<i>Distribution</i>			X				X (nbr)	X (nbr)
	<i>Abundance</i>			X	X	X			
	<i>Demography</i>			X		X	X	X	





nest/burrow
marking

Demography,
Feeding range,
Site fidelity,
Br/Non-br
distribution...

ringing, tagging,
GPS

ringing, tagging,
GPS

Phenology

	March				April				May				June				July			
Breeding stages																				
Census																				
Colony monitoring																				

Adults present in the colony sites from March

By mid to late April, birds have occupied their nesting sites.

Colonies at this stage can be observed from a **distance** in order to avoid disturbing the birds.

Asynchronous

Egg-laying in mid –April (**10 - 20/4**)

Both adults alternate in incubation and lasts ~ 5 weeks

Date of hatching: **13 - 25/5**

Chicks fledge after 2 months – mid July



Greece logistics



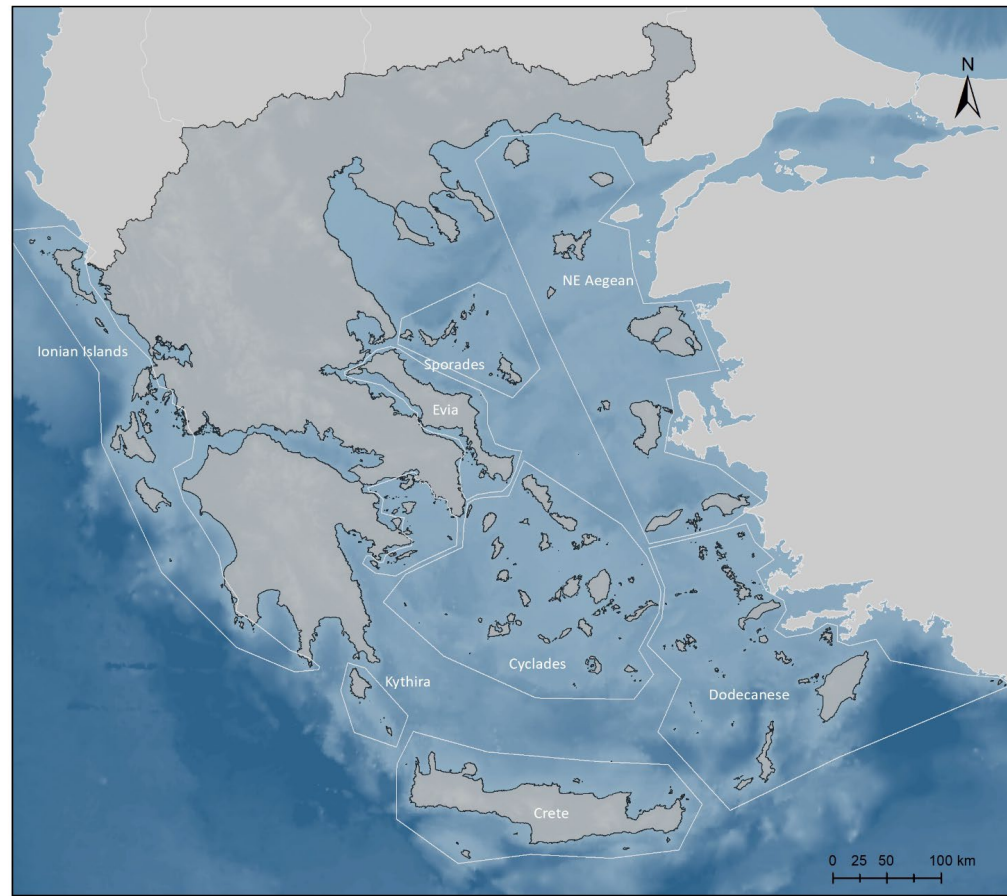
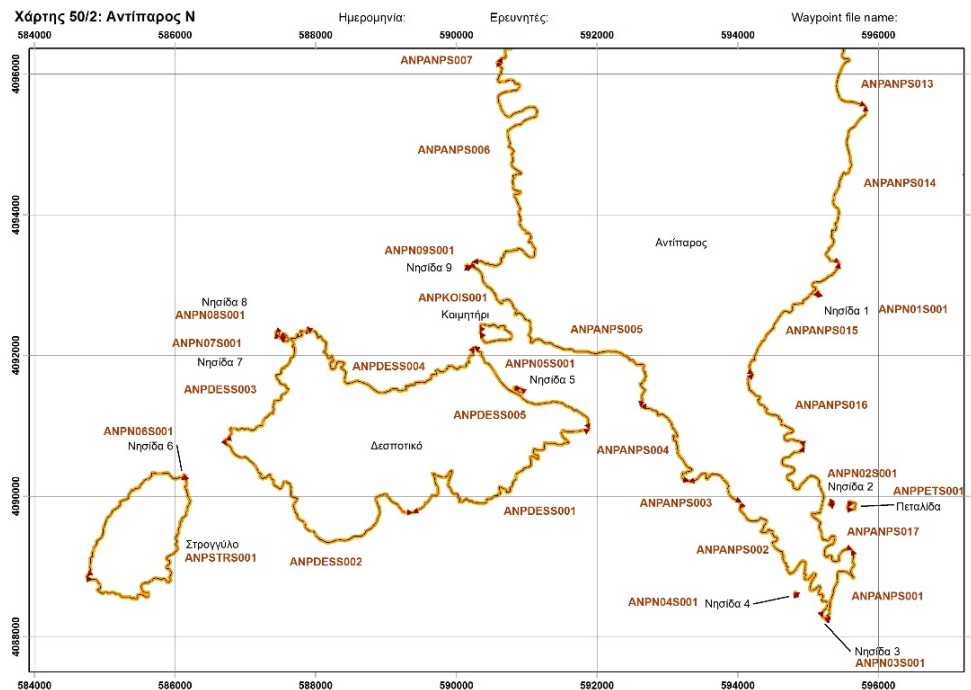
9 greater areas

104 regions

300 inhabited islands

2,100+ islets and many more rocks

12,137 census sectors



Με τη συγχρηματοδότηση
της Ευρωπαϊκής Ένωσης



Estimation of population size

Coastal Census

Very straight forward method but.. changes breeding islet **almost every year**

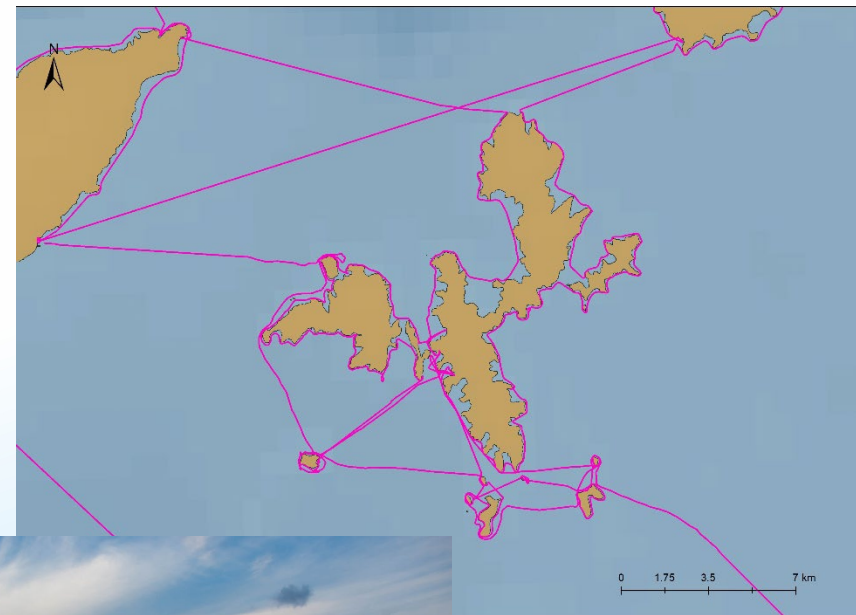
When breeds on same islet on consecutive years, usually on a different location upon it.

Need to **check ALL islets** in each region.

Also, might be moving from one region to neighbouring region.

Thus ideally, National Census every 10 years.

Very time consuming and costly



Area of colony visually identified

Counts from **vessel**:

Total # adults in the colony ($p = \text{correction factor} * 0.75$)

Total # of adults apparently incubating

Counts from colony with telescope (greater accuracy but few islets where this can be done)

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Counts once entered colony by foot

Number of flying adults

Number of nests (separate active and inactive)

Estimation of population size



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National Census Results

GREECE – BREEDING DISTRIBUTION

2 National Censuses

Strongholds during MSFD (2021-23)

-60% in stronghold

94 uninhabited islets have been used for nesting
Colonies identified in 34 breeding regions
Colonies are small (1 - 86 breeding pairs)

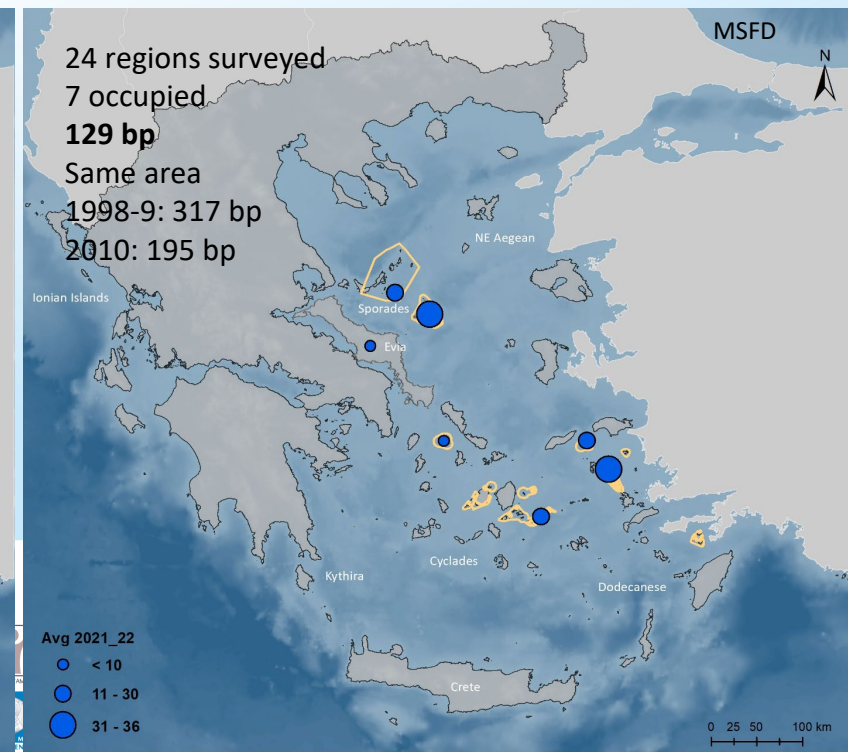
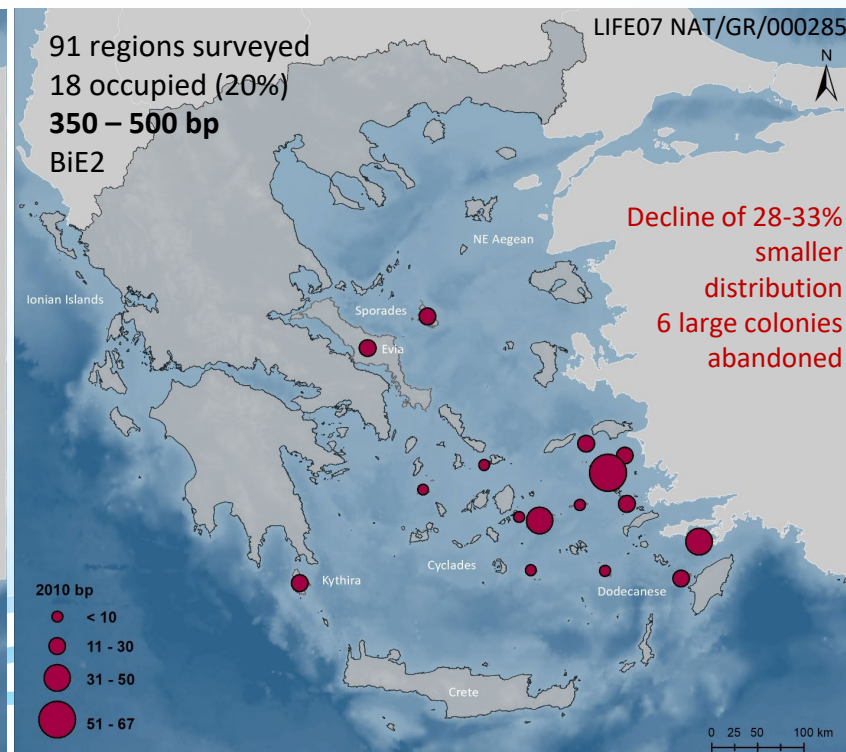
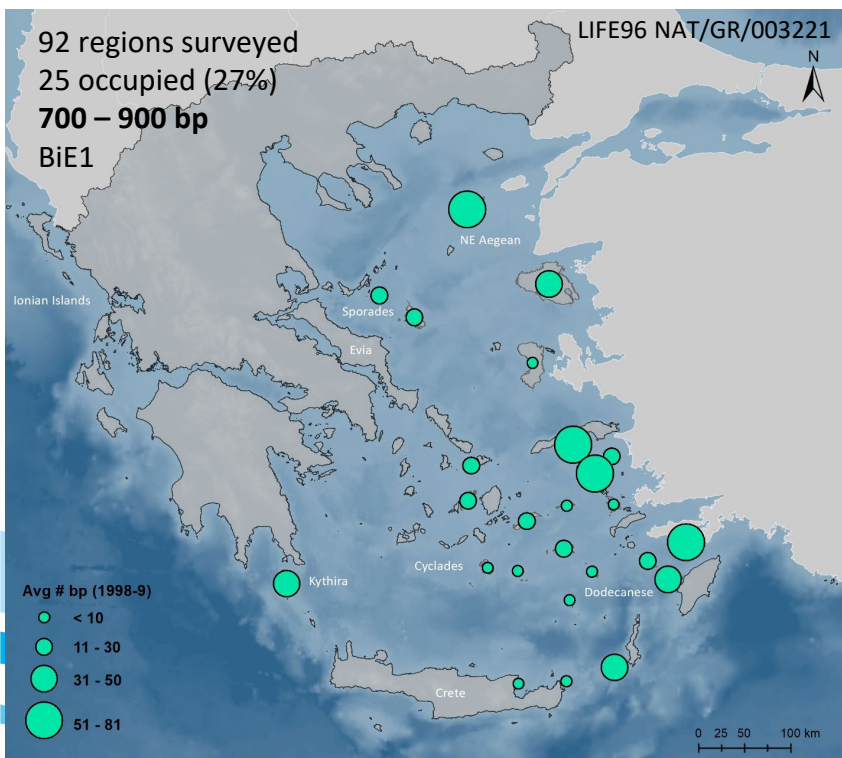
1998-99

-38%

2010

-34%

2021-23



Estimation of reproductive success



Colony visits (ideally 3+):
Early morning or late afternoon – max 30 minutes

Visit 1 (end April – 1st week of May)

- Coastal Census
- Mark & count total # of nests
- Record nest content – Clutch size (full clutches)

Visit 2 (mid May – early June)

- Record nest content: # eggs, # alive and dead chicks, age of chicks
- Predation
- Evidence of nest use (if no eggs or chicks present)

Visit 1 & 2 close to each other to estimate hatching success

Estimation of reproductive success

Colony visits:

Visit 3 (mid June – early July)

- Productivity: max number of fledglings per used nest
- Max # fledglings per colony (/# used nests)
- Ringing / Morphometrics

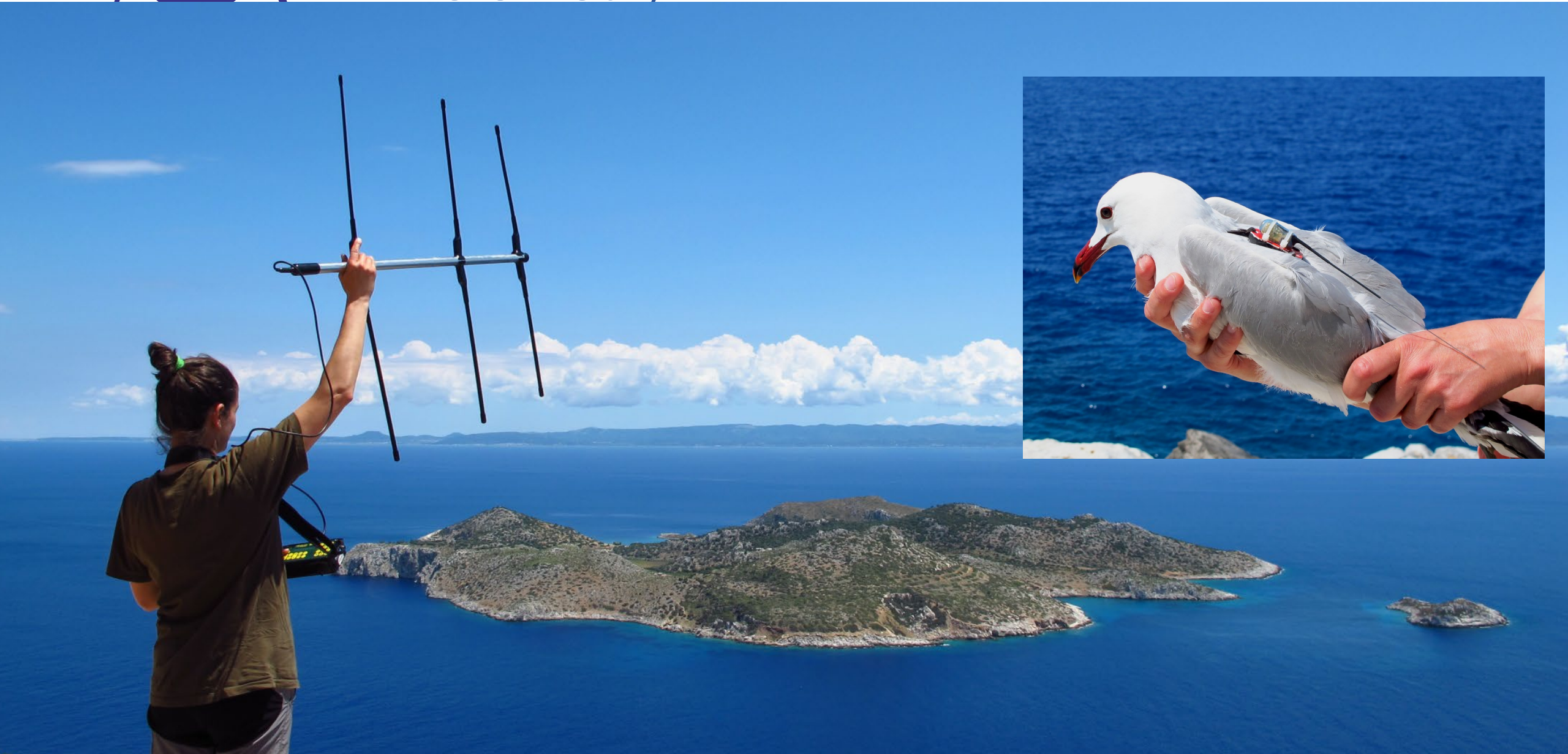


- Ringing of fledglings since 1997, mostly in the North Dodecanese and Cyclades
- In total 620 individuals ringed (604 fledglings)
- 434 also ringed with a red DARVIC ring
- Very few recoveries (15)

Wing length (mm)	Bill length (mm)	Tarsus length (mm)
405 - 430	30.4 - 52.6	55.5 - 63.3



Telemetry



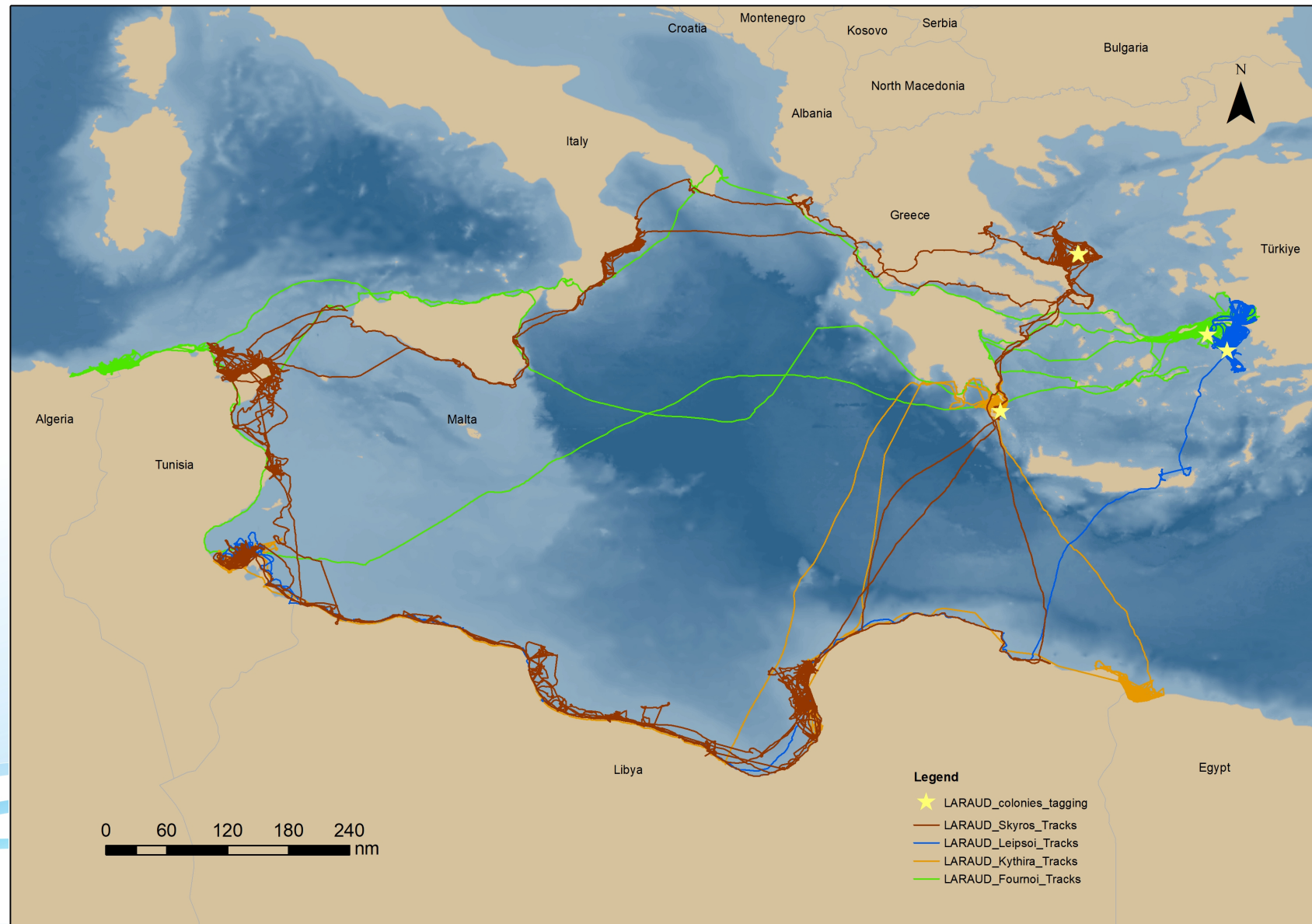
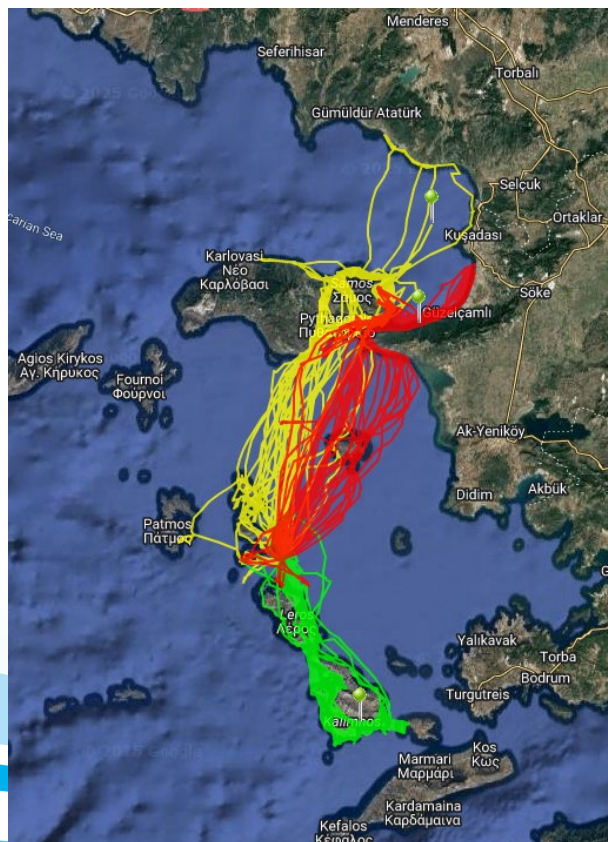
Telemetry

Audouin's Gulls 2024-25 → **10 tags** (OT-11 4G) 1 fix/ 5 min

Region	2024		2025	
Skyros	2	25/4/2024	1	11/5/2025
Kythira	2	6/5/2024		
Fournoi	2	16/5/2024		
Leipsoi			3	5/5/2025



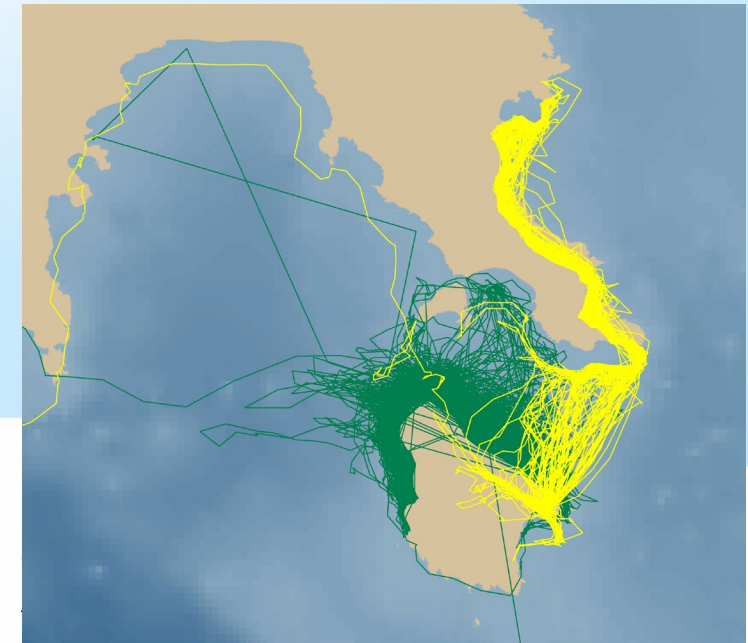
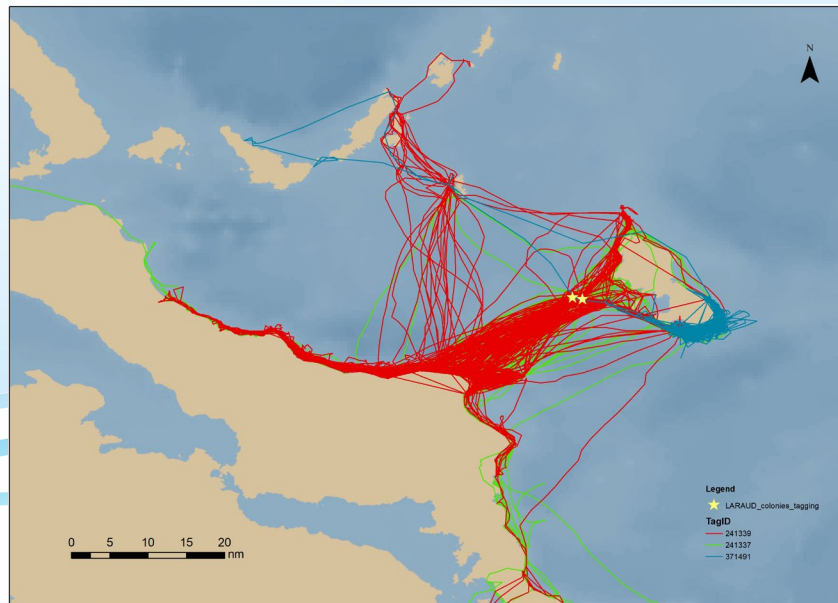
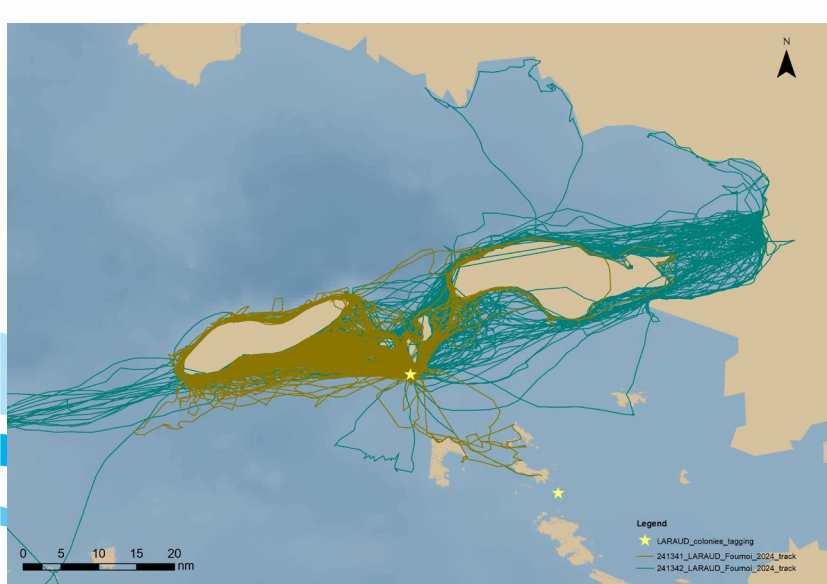
Telemetry



Telemetry

- Foraging trips during breeding season 20-50 nm
- Very coastal and repetitive trips daily

- Migration 1-2 days till North Africa (1 inds 133 days in Italy)
- Migration route either straight south or westwards through Italy
- Average 170 days in wintering grounds (Gulf of Tunis & Gabes, Libyan coast, Saloum Egypt & E coast Algeria)
- Start Return trip between 27/2 – 25/3 (1-7 days)



Estimation of population size

- A lot of islands to be checked every year, far more than the actual number of colonies, preference given to Audouins' sites
- Boat surveys is the usual techniques: circum-navigation of up to 15-20 islands in one day, observation from land wherever possible
- Fast boat (aluminium) + trailer + car + 2-3 observers



With a good knowledge of roads, viewpoints, ports (and with average weather) => 10 days to cover Sardinia

Estimation of population size

- The MSFD protocol: no walking in the colonies, unless for particular reasons and in few colonies => few data on clutch size from recent decades
- Three levels of accuracy: counts of incubating adults (AOS), total count, flush count (multiplied by 0.7 factor), nest counts
- Post-breeding nest counts, mortality, productivity (n. of fledglings in July)



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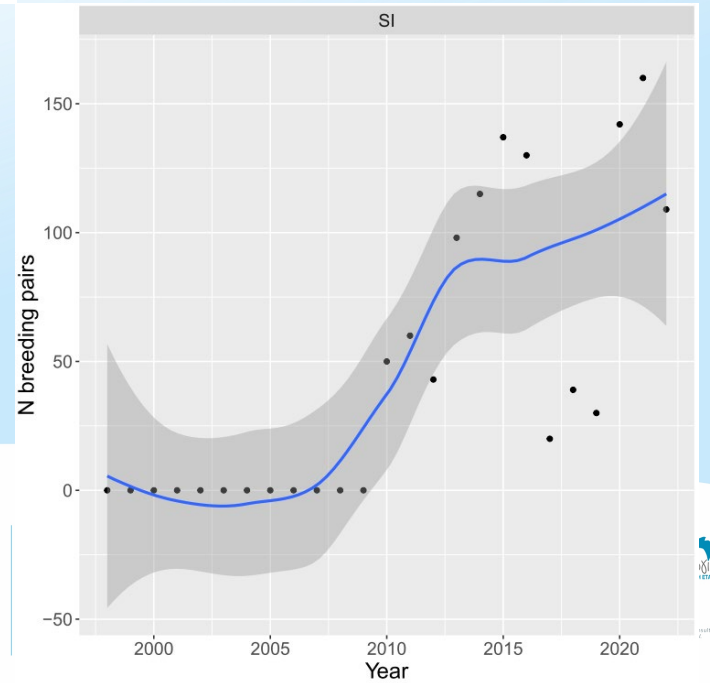
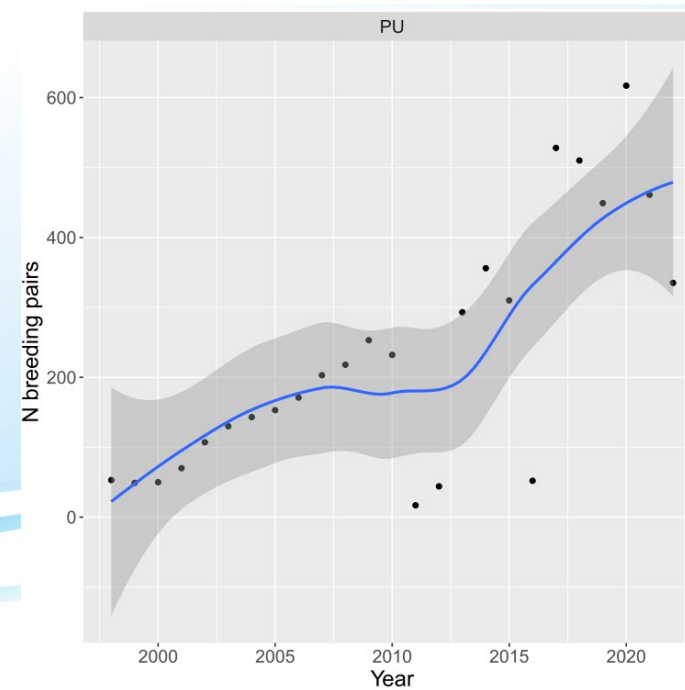
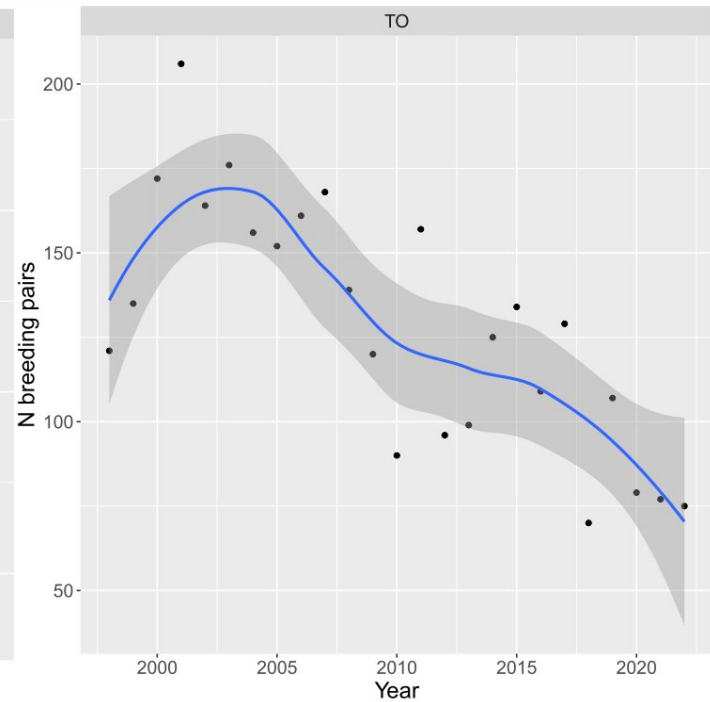
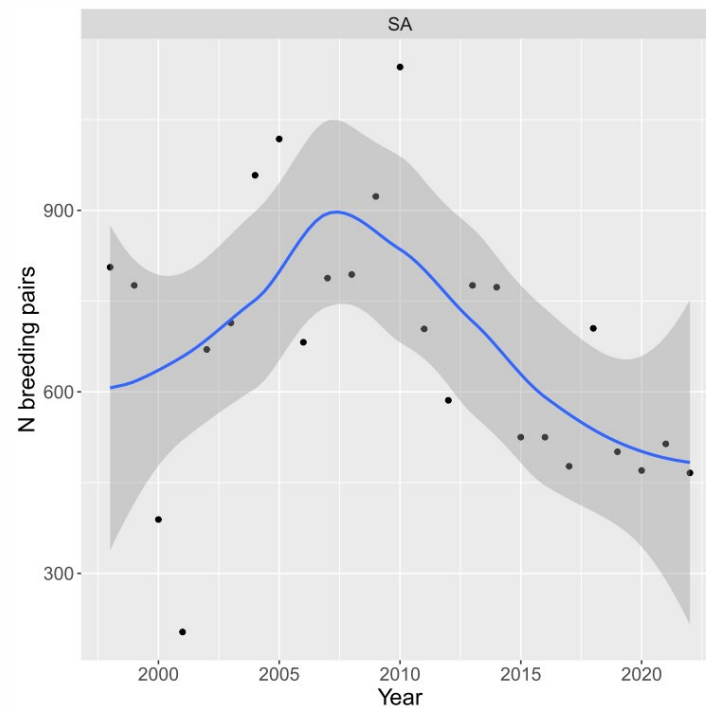
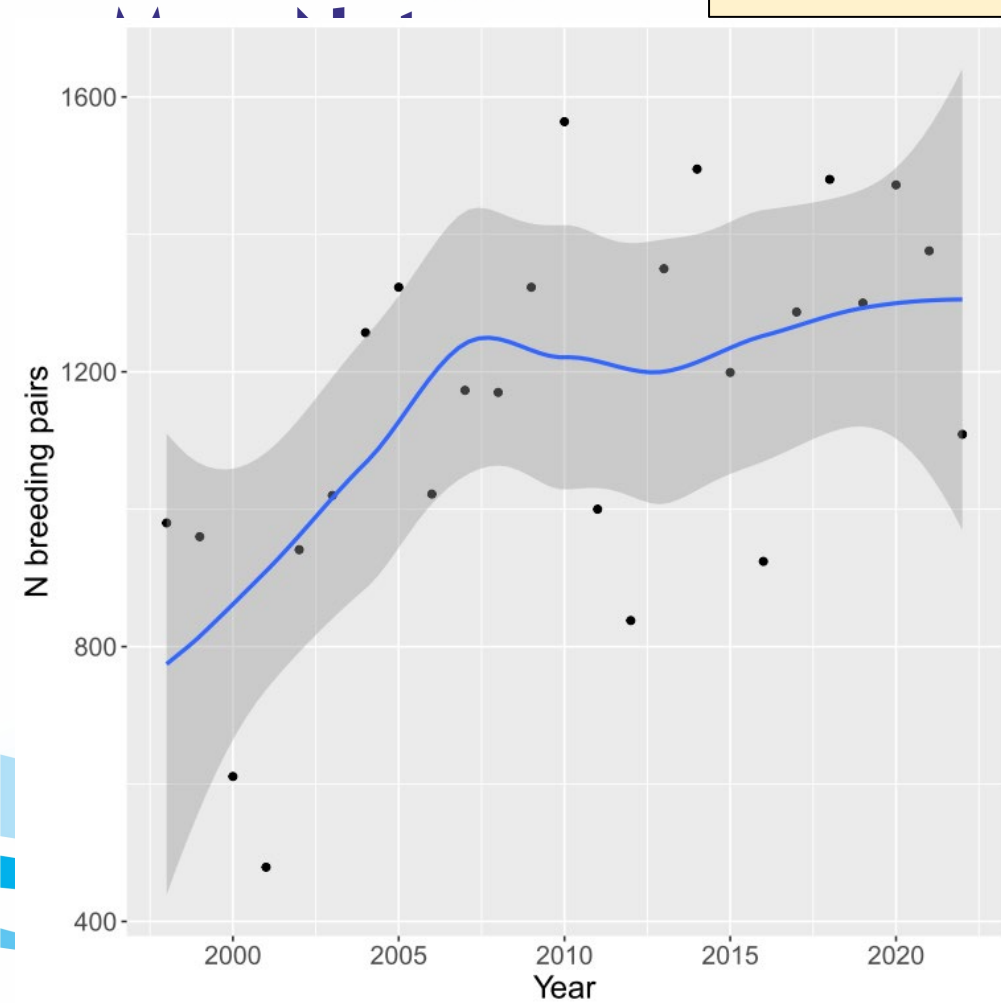
Estimation of reproductive success

- Ringing and ring control of adults, Lincoln-Pedersen on fledglings
- Critical issues: a) the weather, b) safety, c) authorizations





ITALY





Audouin's gull PRODUCTIVITY

PORTO CESAREO



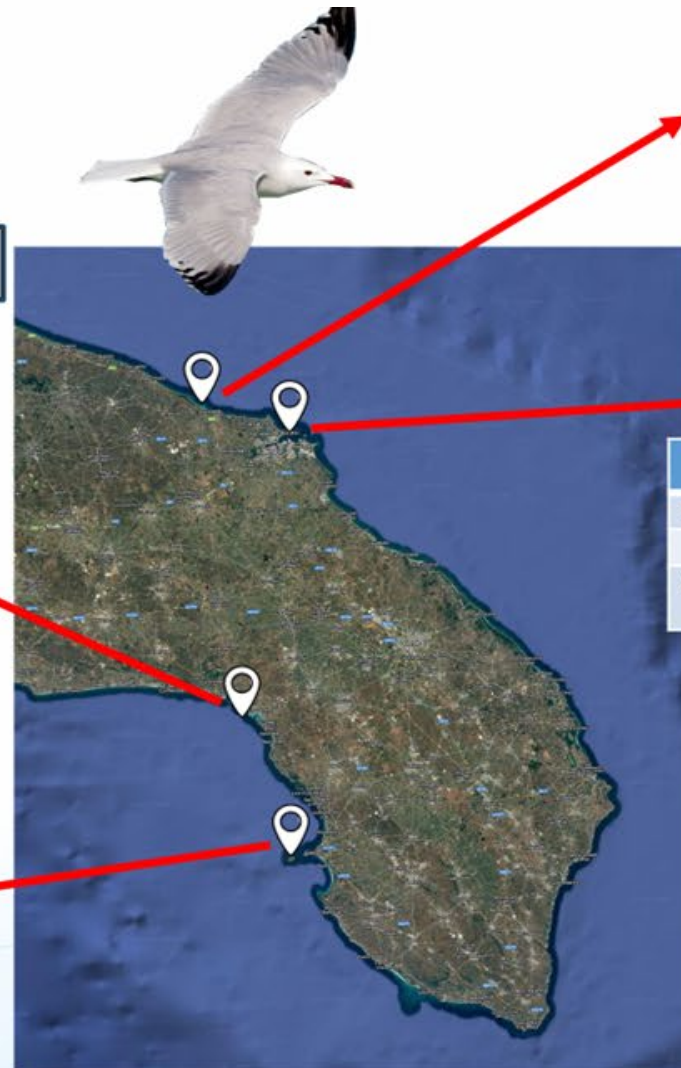
MSFD
MARINE STRATEGY
FRAMEWORK DIRECTIVE

	2024	2025
NESTING PAIRS	98	52
FLEDGELINGS	65	31
REPRODUCTIVE SUCCESS	0.66	0.60



SANT'ANDREA

	2024	2025
NESTING PAIRS	181	161
FLEDGELINGS	15	2
REPRODUCTIVE SUCCESS	0.08	0.01



APANI COLONY

	2025
NESTING PAIRS	56
FLEDGELINGS	27
REPRODUCTIVE SUCCESS	0.48

PEDAGNE COLONY

	2024	2025
NESTING PAIRS	71	44
FLEDGELINGS	5	11
REPRODUCTIVE SUCCESS	0.07	0.25



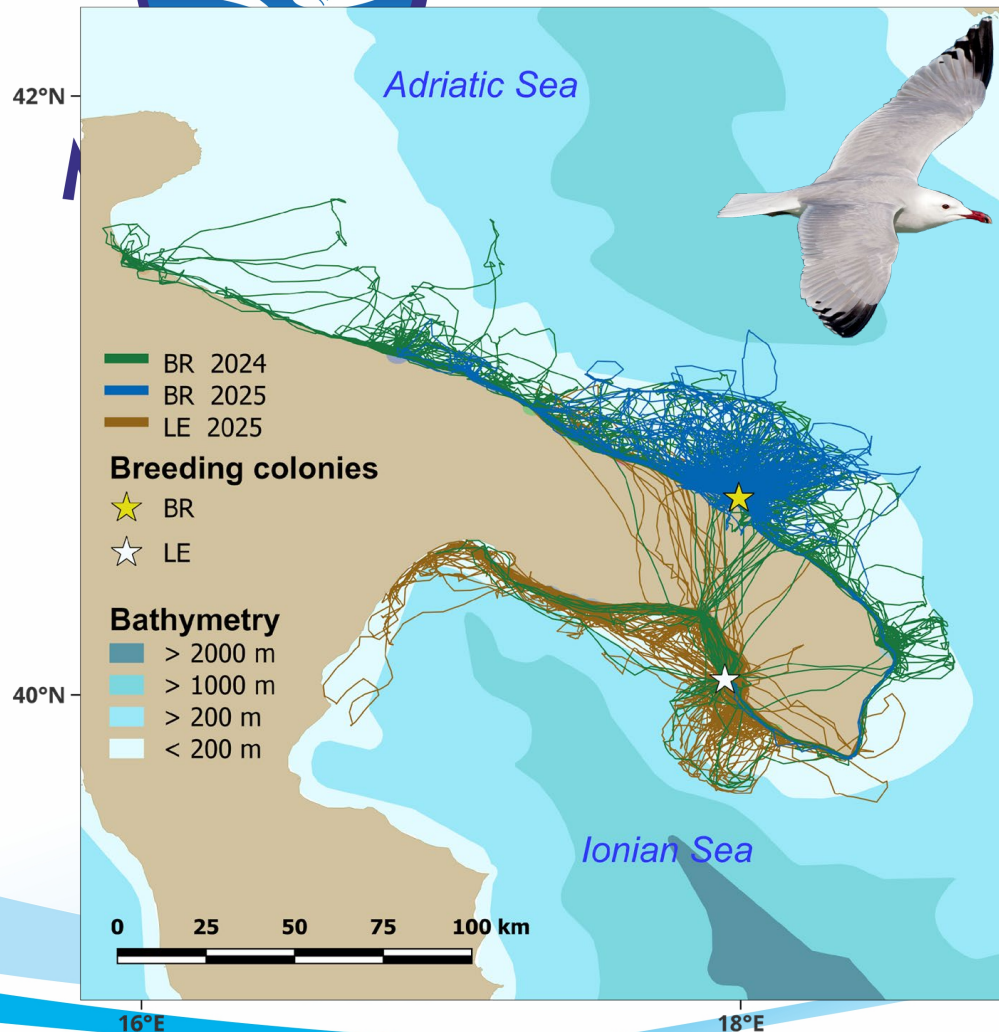
Co-funded by
the European Union





WP2 Telemetry of seabirds

Analyses performed & expected outputs



Analyses performed on locations recorded during breeding season (May – 15 July)

- Identification of the breeding colony for each ID (gulls were tagged at Brindisi harbour – roosting/resting site)
- A lot of locations (tracks) on land!
- Identification of individual foraging trips

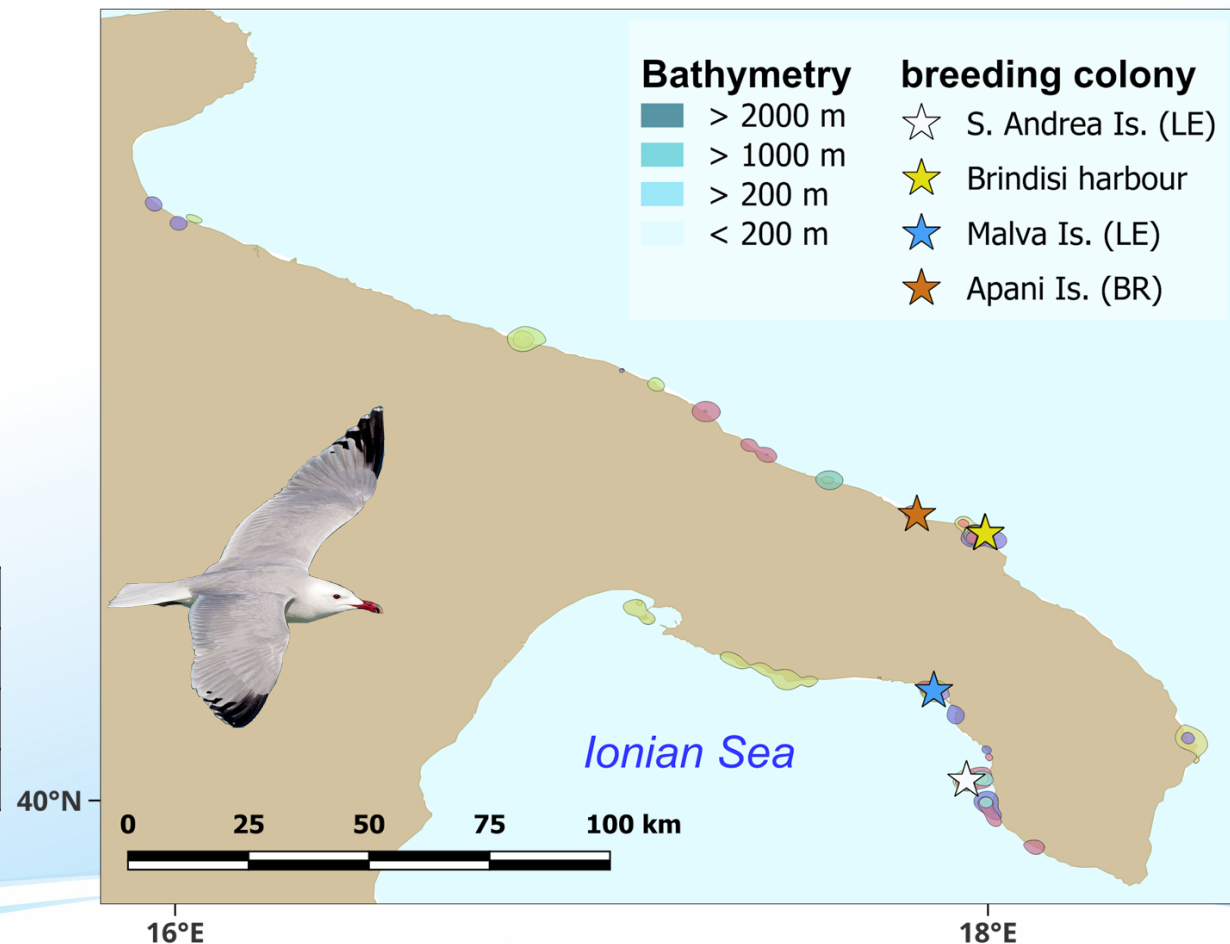
Tagged gulls bred in 4 colonies

1 new breeding colony found (Apani Is.)!

Summary statistics of individual trips

Foraging Trip Parameters	Median (Interquartile Range)
Duration (hours)	3 (1,2 – 9,5)
Total distance travelled (km)	11 (6,3 – 43)
Maximum distance from colony (km)	3,3 (2,7 – 12,5)

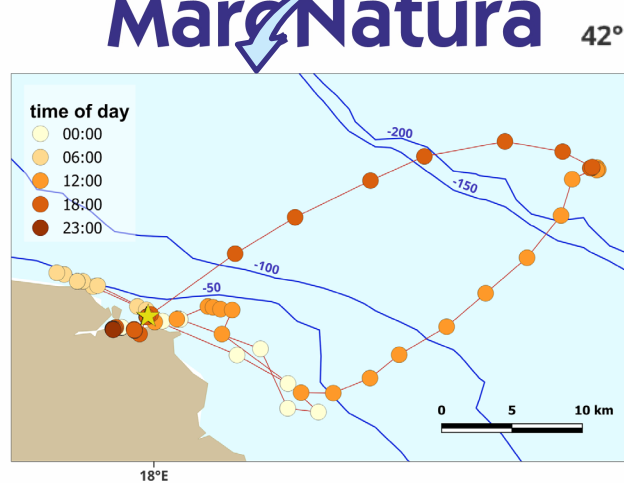
Individual KDE 50%



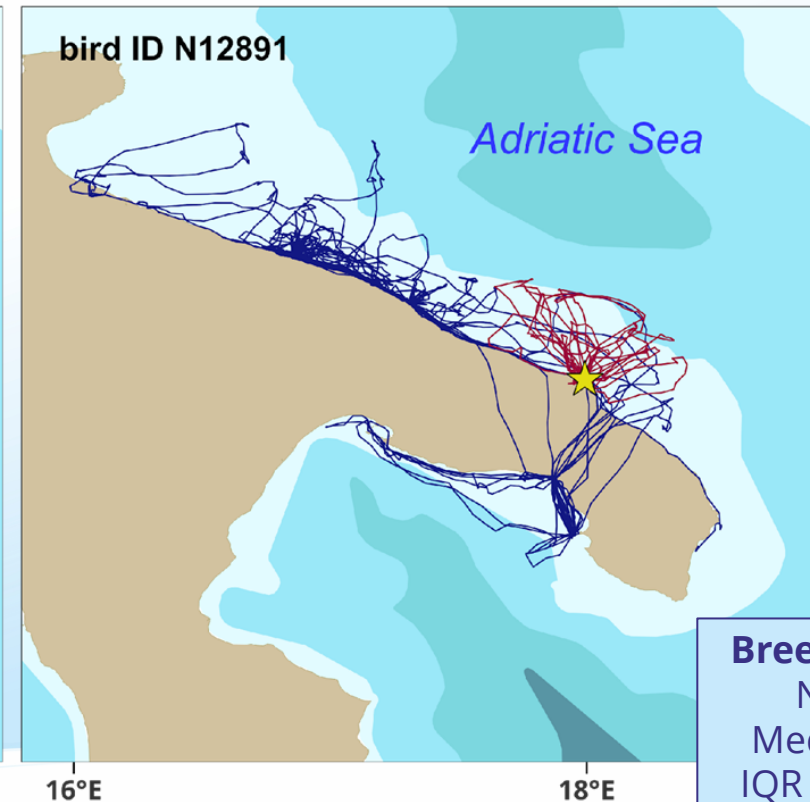
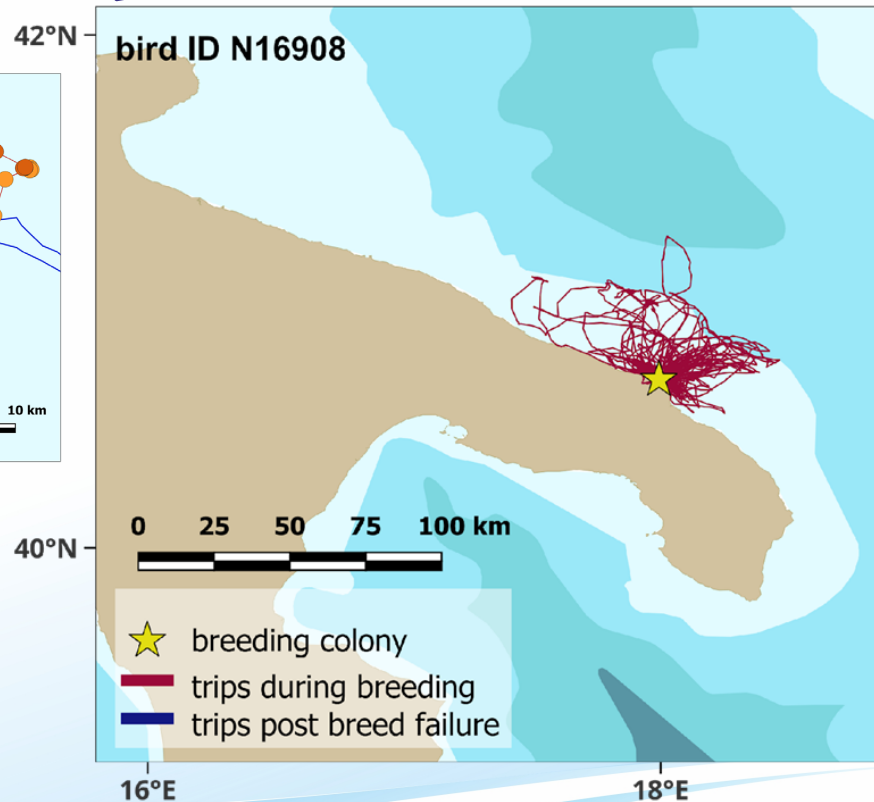
WP2 Telemetry of seabirds

Results

Different movement pattern when breeding or not (e.g., failure or immature)



Example of movements
performed in one day of
tracking

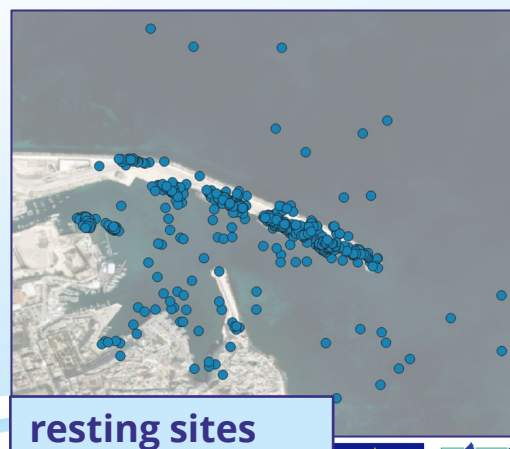
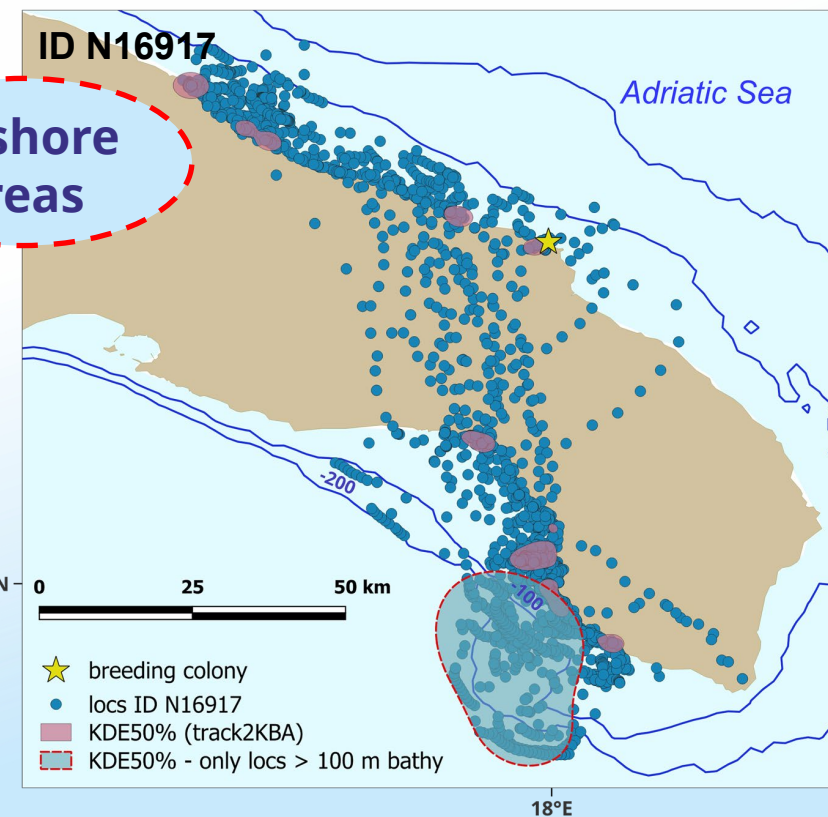
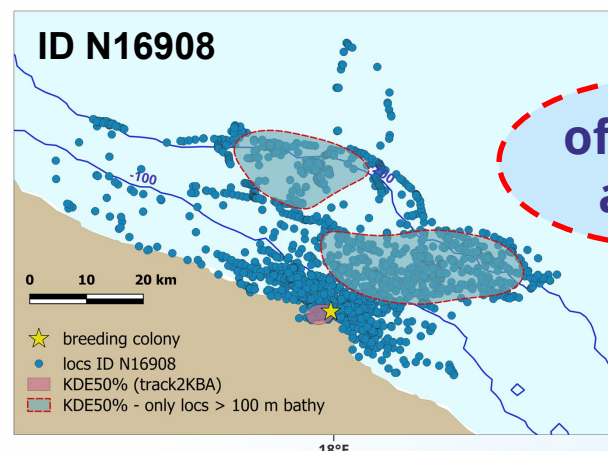


Breeding failures
N birds = 8
Median: 18 May
IQR : 17 – 22 May

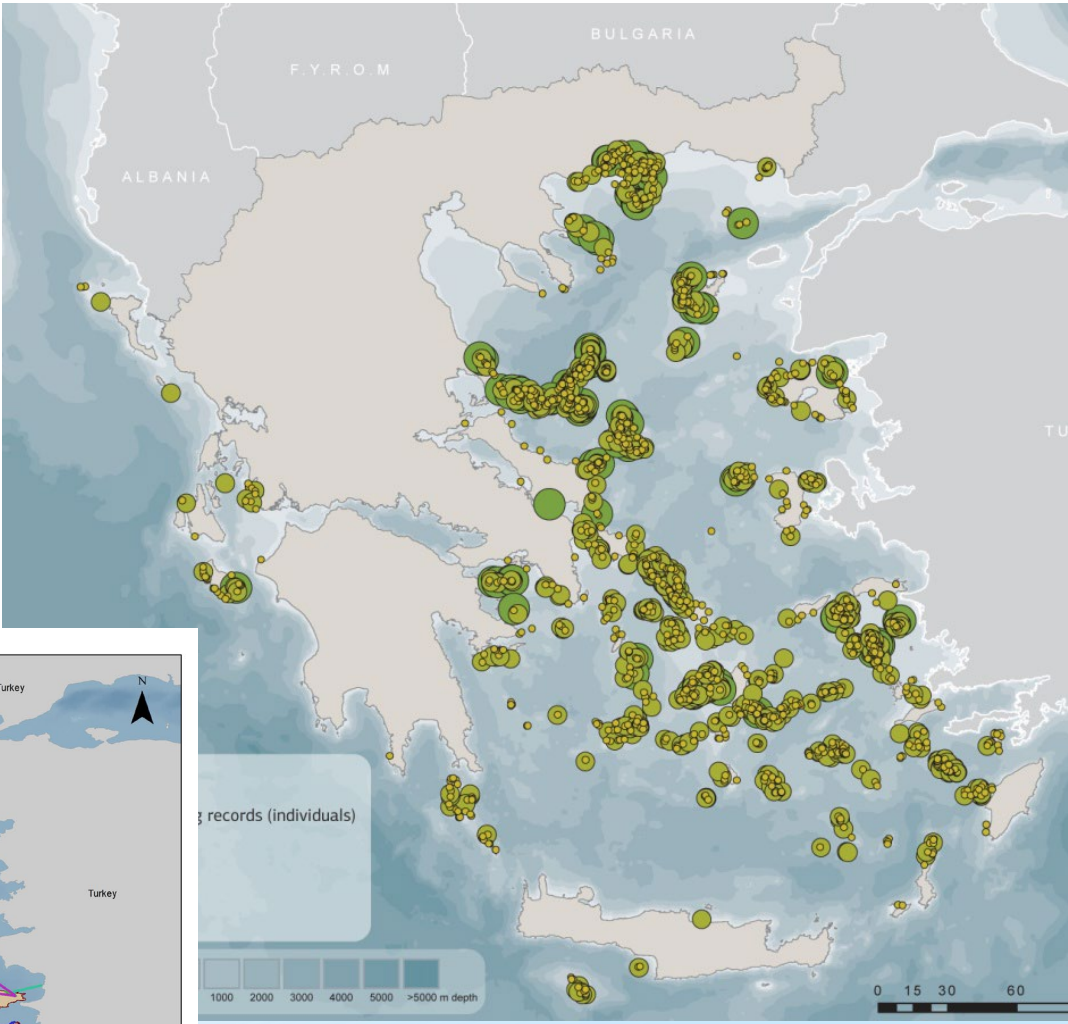
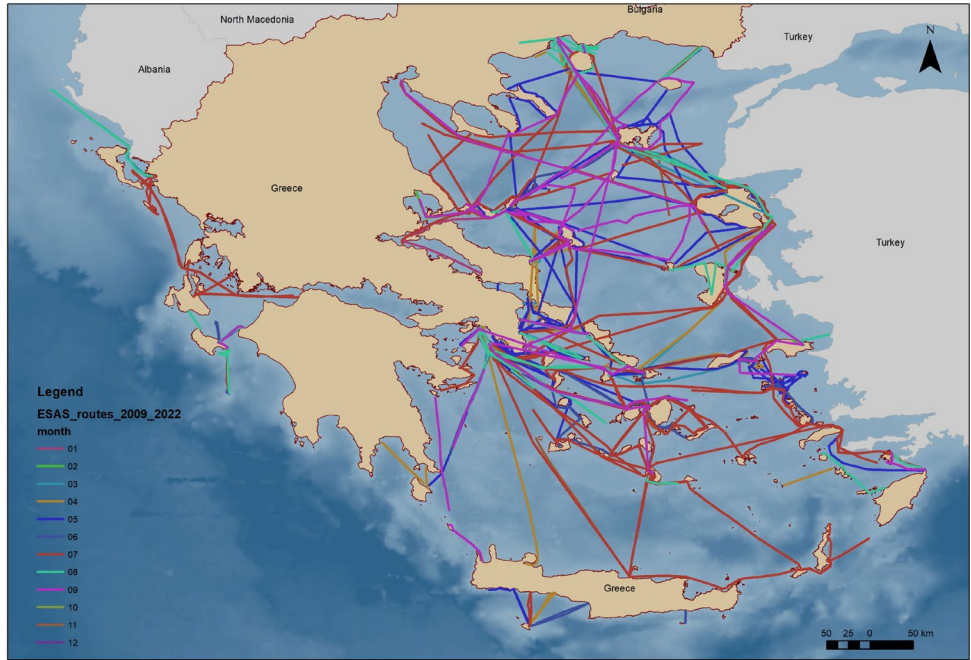
Movements performed until July 15

Very coastal: ongoing analyses to properly identify important offshore feeding areas during breeding

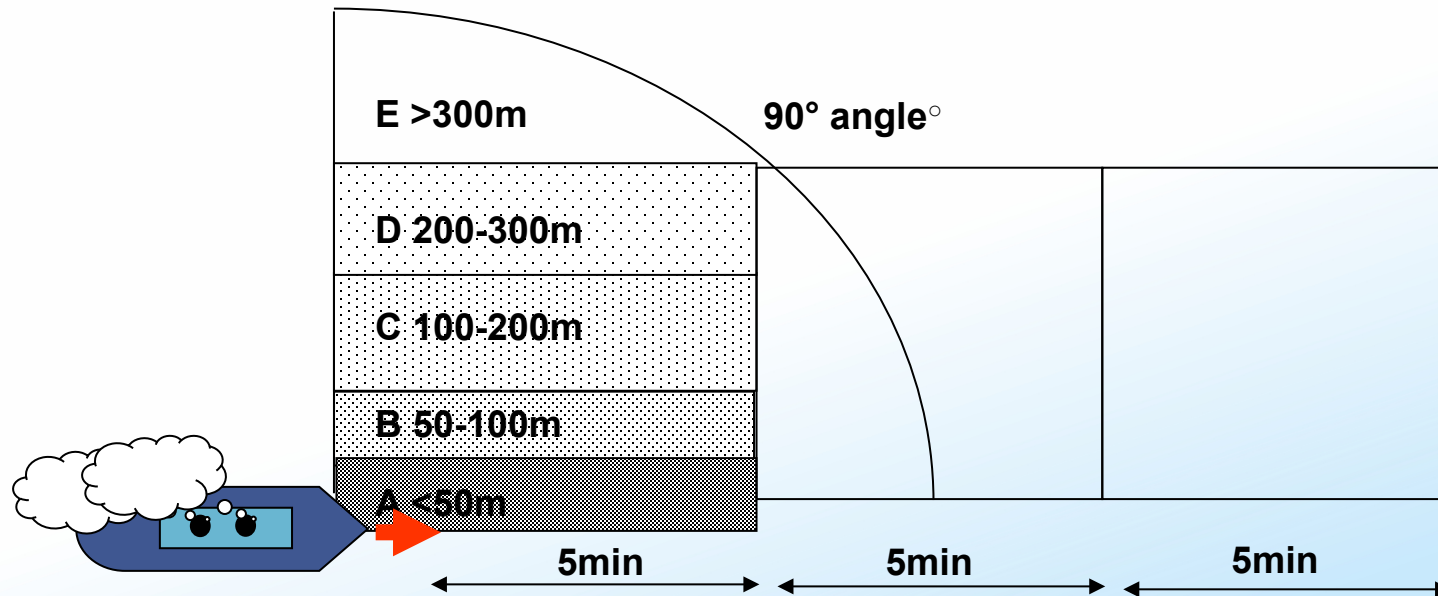
First steps of analysis



European Seabirds At Sea (ESAS)



- Assessment of spatial and temporal seabird distribution and behaviour
- Records expressed in density (birds/km²)
- All seasons to include breeding, non-breeding and migration periods of each seabird species







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