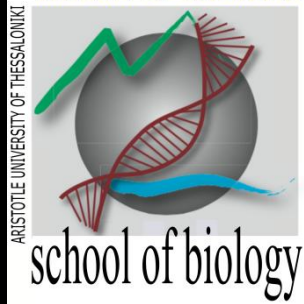




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Marine turtle monitoring protocols

Antonios D Mazaris

**Dpt. Ecology, School of Biology,
Aristotle University of Thessaloniki,
Greece**

Common indicator 3: Species distributional range
(Reptiles) (EO 1)

Common Indicator 4: Population abundance (Reptiles)
(EO 1)

Common indicator 5: Population demographic
characteristics (Reptiles) (EO 1)



Common indicator 3: Species **distributional** range
(Reptiles) (EO 1)

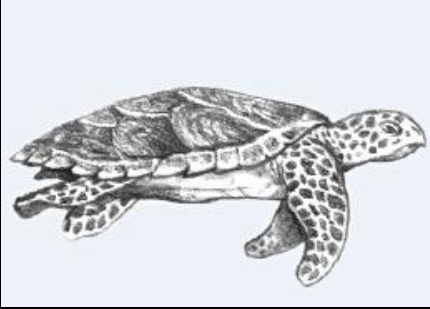
Common Indicator 4: **Population abundance** (Reptiles)
(EO 1)

Common indicator 5: Population **demographic**
characteristics (Reptiles) (EO 1)

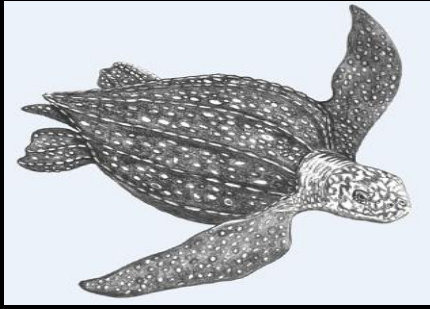
Let's meet this fantastic animal....



Taxonomy



hawksbill turtle
(*Eretmochelys imbricata*)



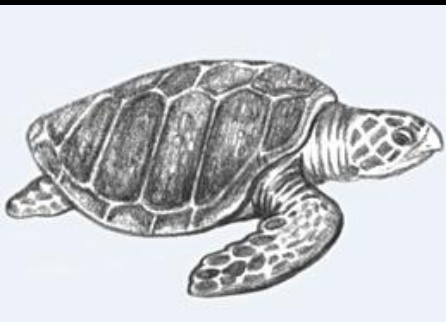
leatherback turtle
(*Dermochelys coriacea*)



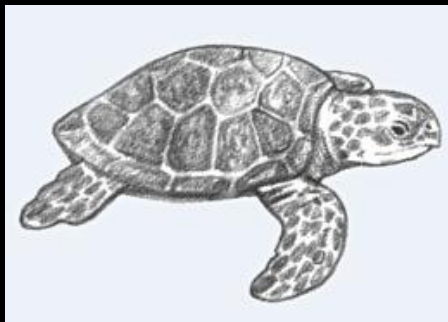
green turtle
(*Chelonia mydas*)



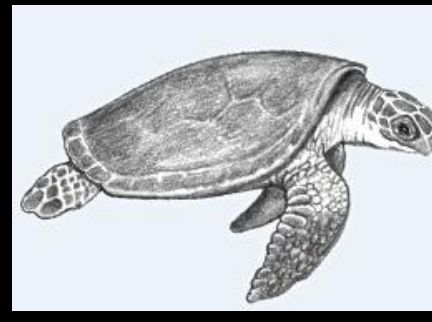
loggerhead turtle
(*Caretta caretta*)



olive ridley turtle
(*Lepidochelys olivacea*)



Kemp's ridley turtle
(*Lepidochelys kempii*)



flatback turtle
(*Natator depressus*)

Source of data: <http://www.seaworld.org>



Global threats

- By-catch
- Marine Debris- plastic bags, plastic rings, fishing line, oil
- Harvest (eggs & adults)
- Coastal development and habitat degradation- noise, light, beach obstructions- affect nesting habitat
- Climate change

Drift nets, gill nets, Shrimp Trawlers





Sea turtle by-catch in the Mediterranean

Paolo Casale^{1,2}

¹Department of Biology and Biotechnologies 'Charles Darwin', University of Rome 'La Sapienza', Viale dell'Università 32, 00185 Roma, Italy; ²WWF Italy, Via Po 25c, 00198 Roma, Italy

Abstract

Sea turtle by-catch data in the Mediterranean were reviewed and analysed with fishing effort. The results indicate over 132 000 captures per year, with probably over 44 000 incidental deaths per year, while many others are killed intentionally. Small vessels using set net, demersal longline or pelagic longline represent most of the Mediterranean fleet and likely cause more incidental or intentional deaths than large vessels typically using bottom trawl or pelagic longline. When interactions, mortality, intentional killing, size (a proxy for reproductive value) and turtle populations are

Correspondence:

Paolo Casale,
Department of
Biology and
Biotechnologies
'Charles Darwin',
University of Rome
'La Sapienza', Viale
dell'Università 32,
00185 Roma, Italy

Marine Debris

- marine litter plastic bags
- sea turtles get confused and eat plastic bags as they look like jellyfish

Harvest of eggs & adults
Eggs- meet (delicates)
Jewelry
Skin



In the Mediterranean the biggest reported
problem is in Egypt

- Coastal development

Reduction of available nesting habitat

Degradation of nesting conditions

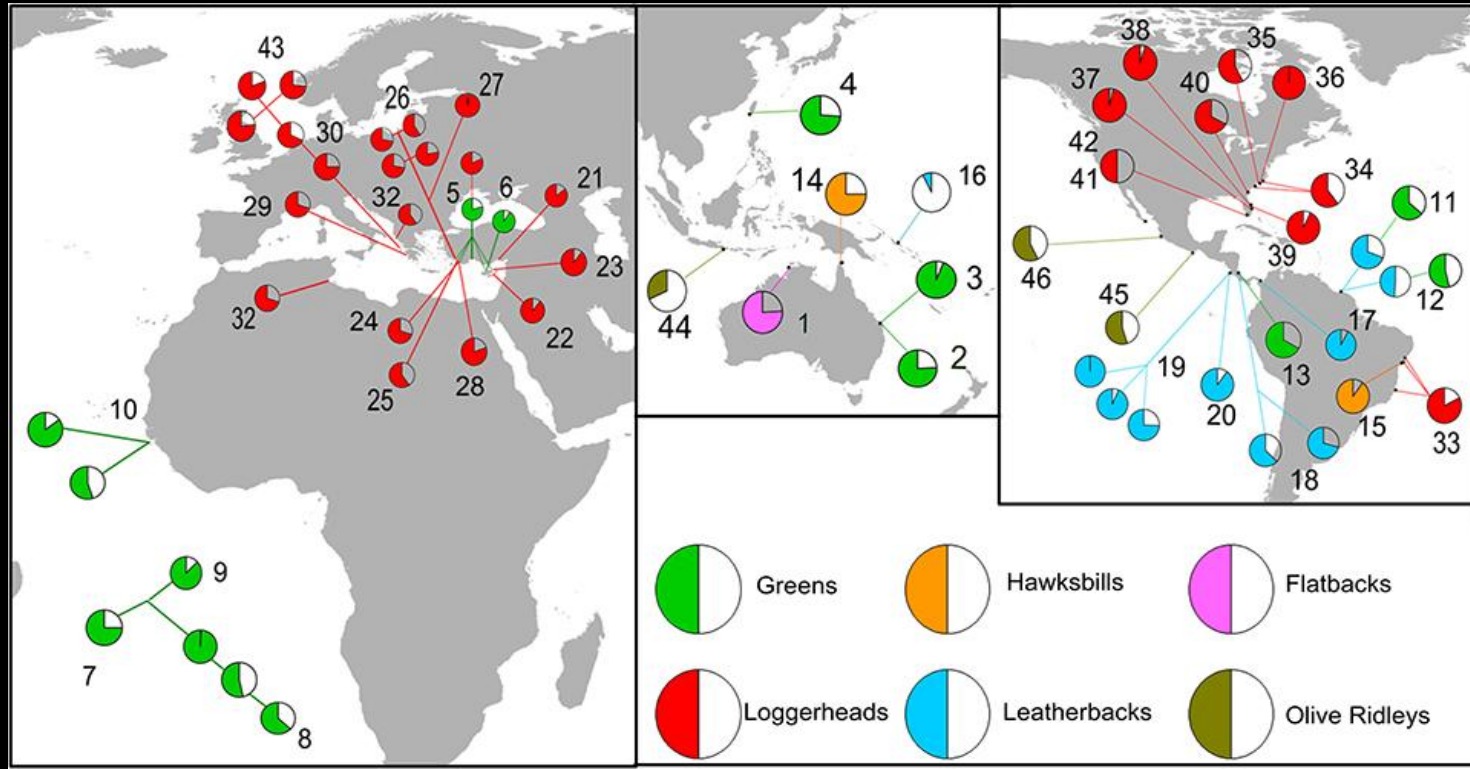
Artificial light pollution – could disorientate hatchlings

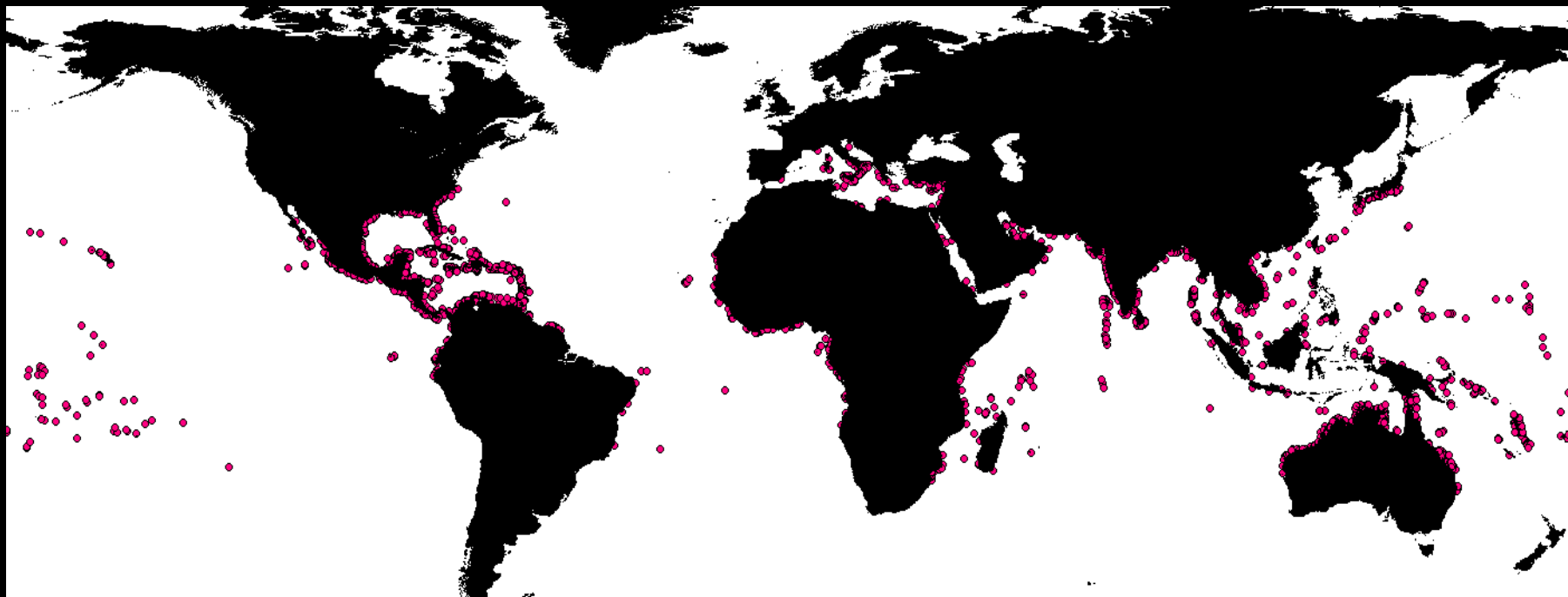
- Climate change

Sea turtle exhibit temperature sex determination so there is evident for female biased sex ratio – still, biggest problem will arise due to extreme/lethal temperatures

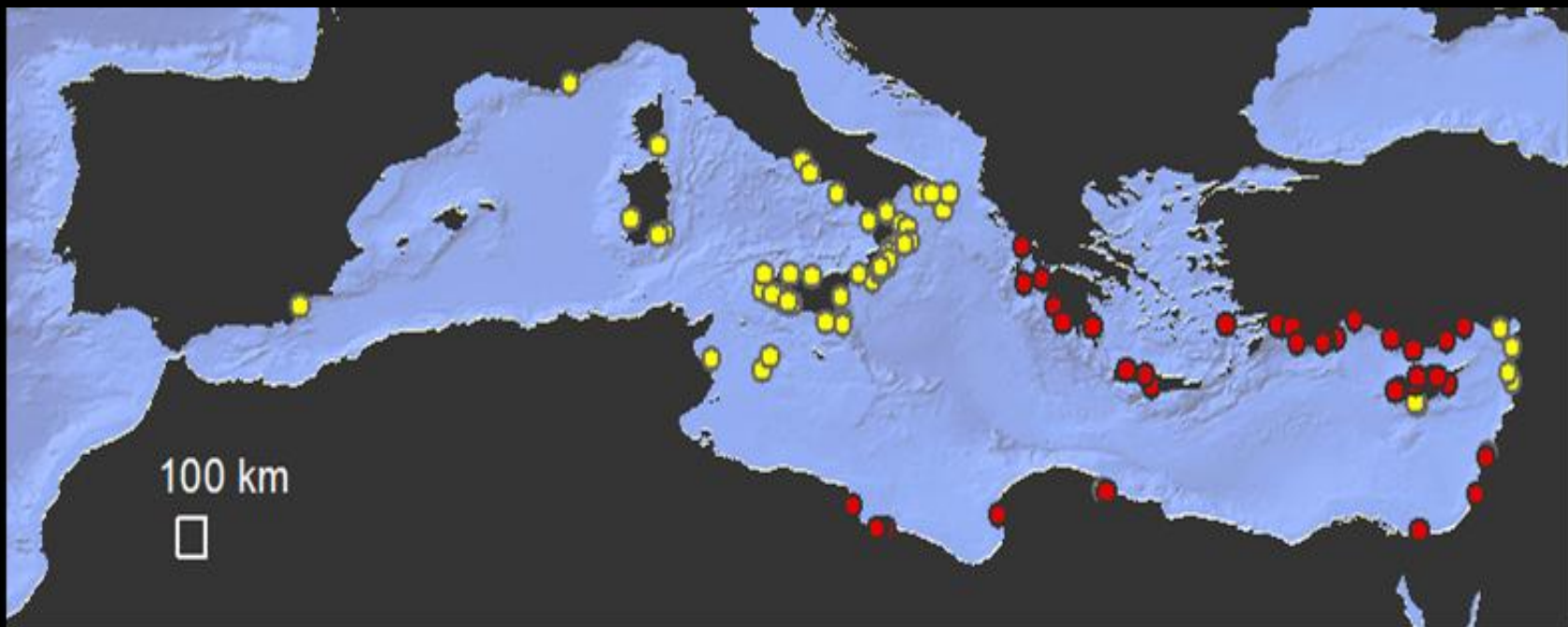
Filed circles indicate higher female %

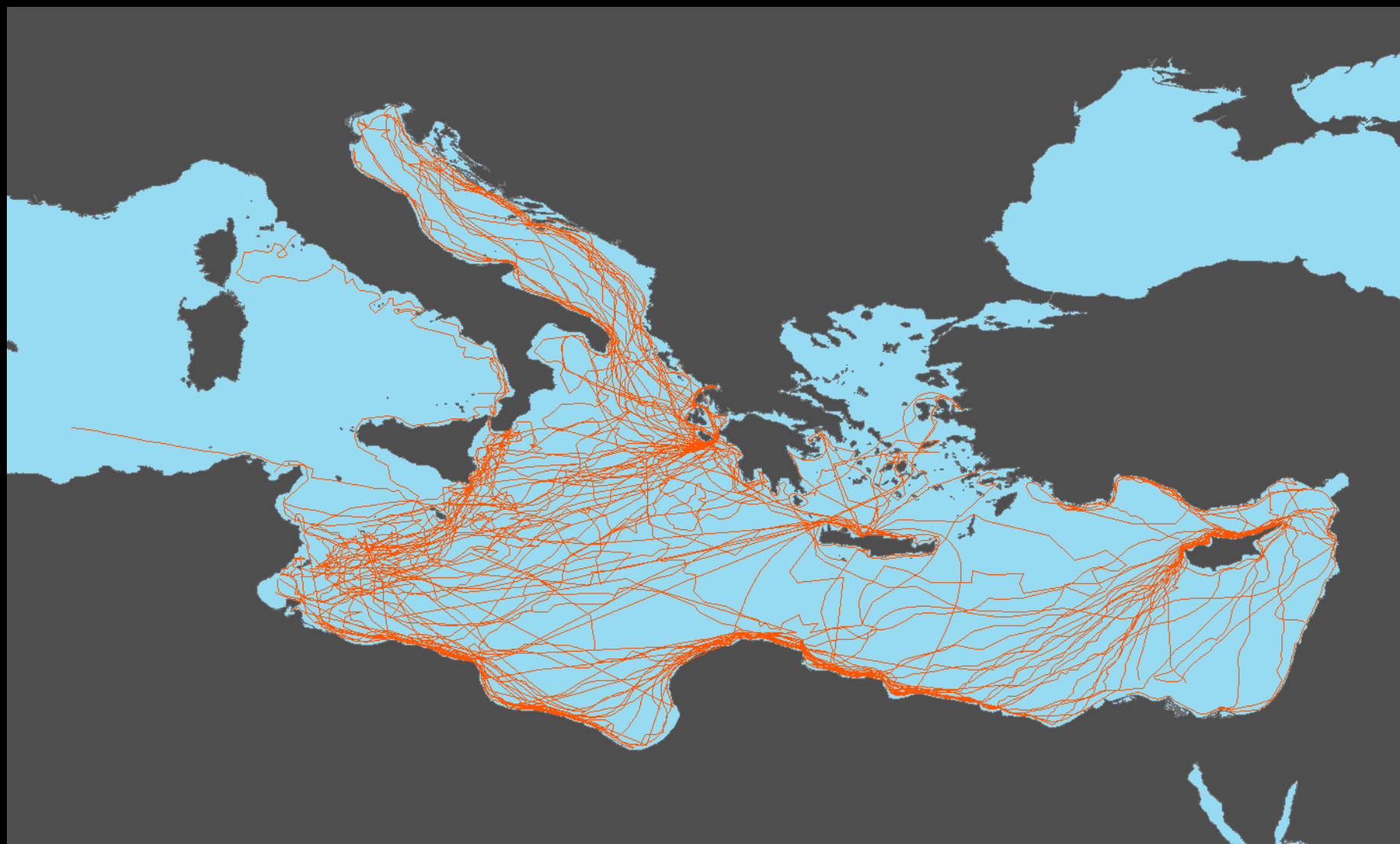
Hays et al., 2014. Frontiers Mar Sci







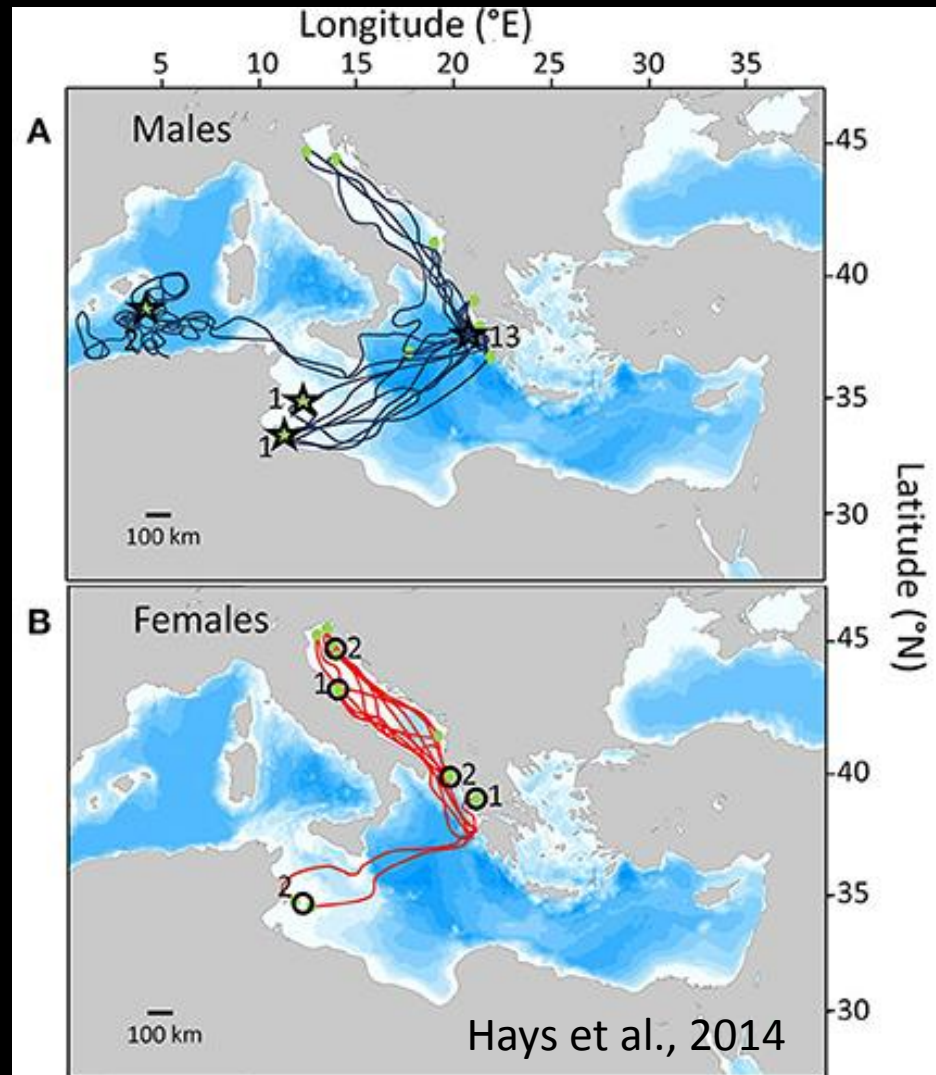




Indicator: Species distributional range

Species distributional range

1. Breeding habitats
2. Marine habitats
 1. Migration routes
 2. Foraging areas
 3. Foraging/Developmental
 4. Wintering areas

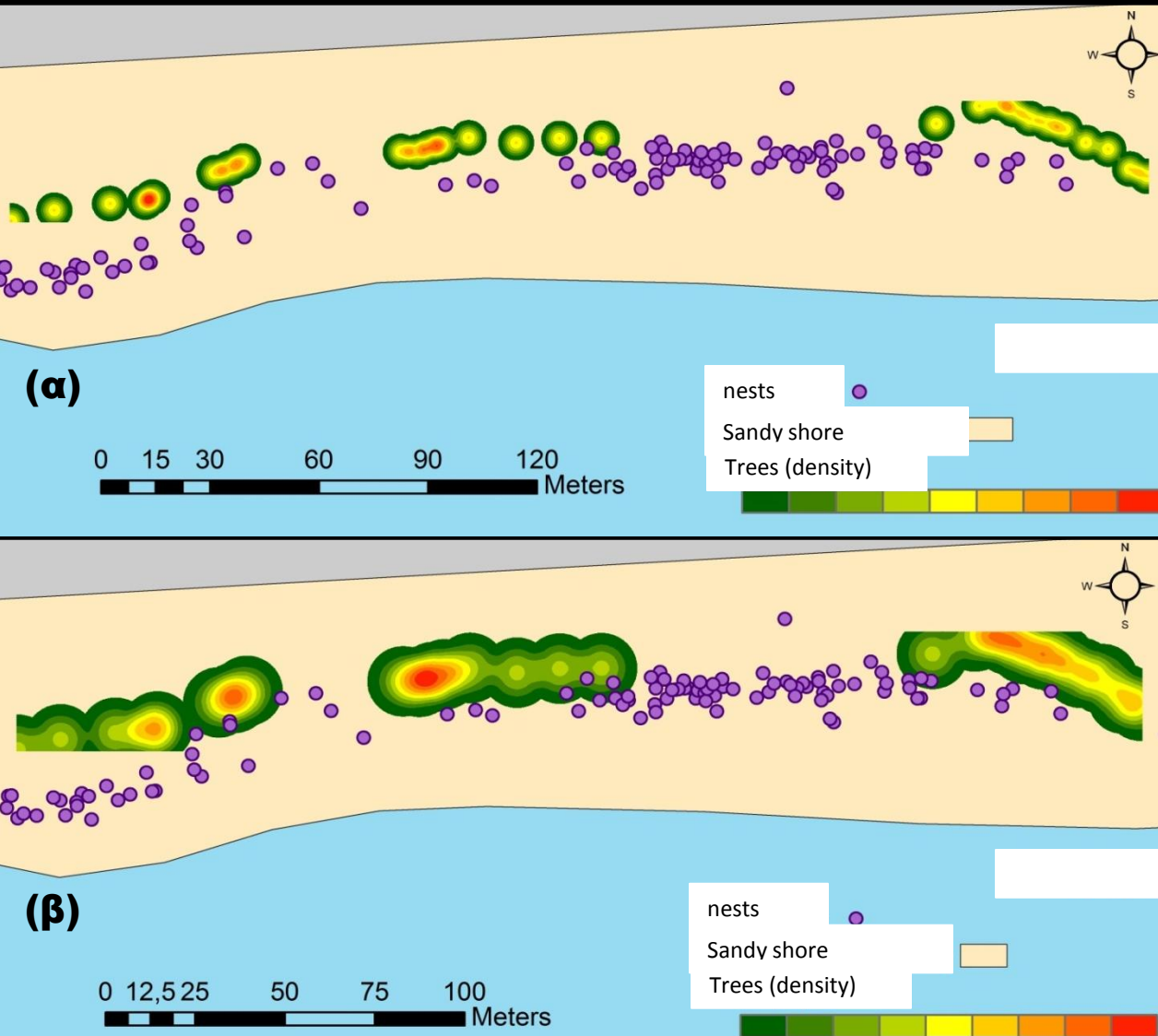


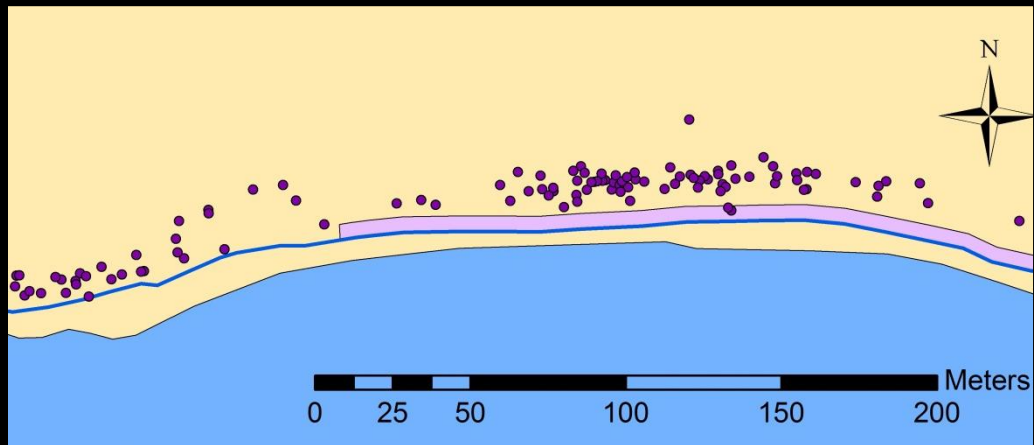
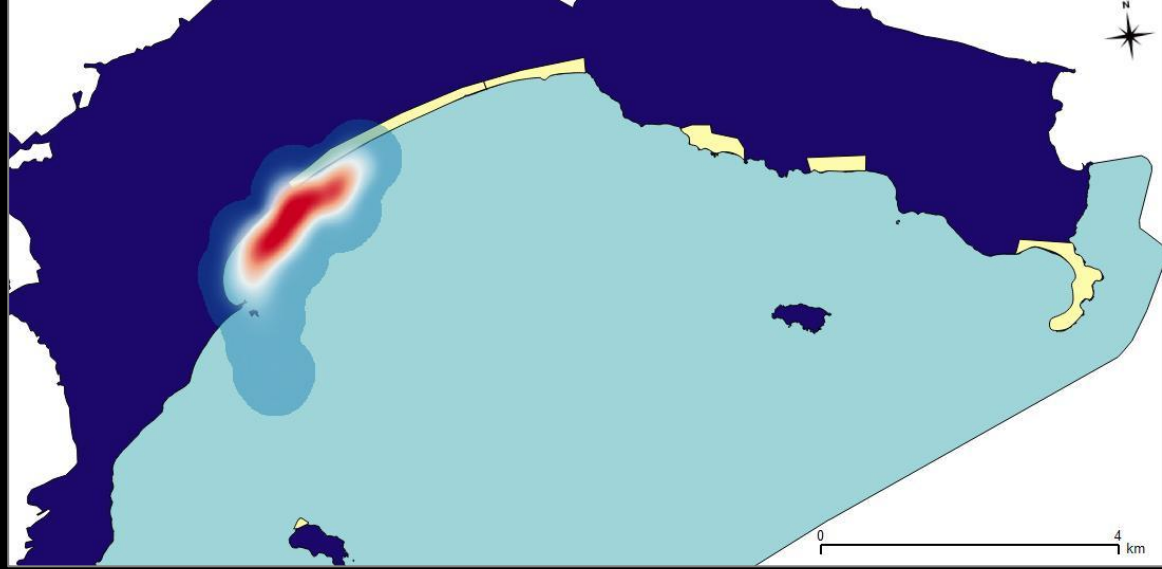
Indicator: Species distributional range

Working at the beach

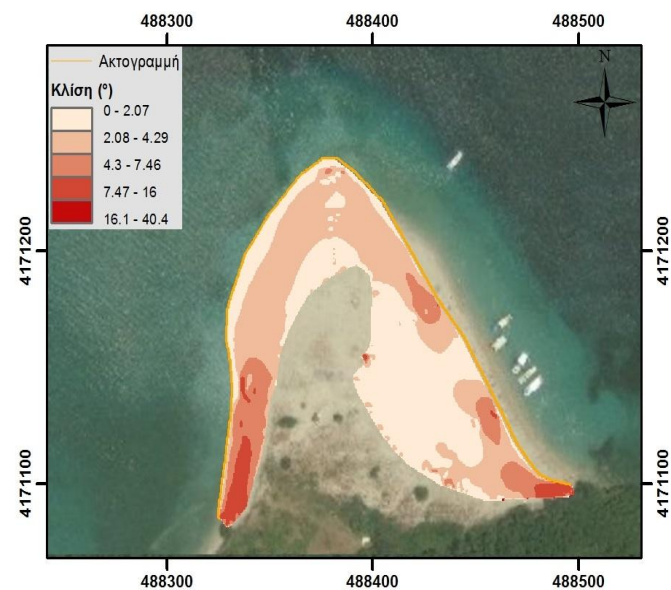
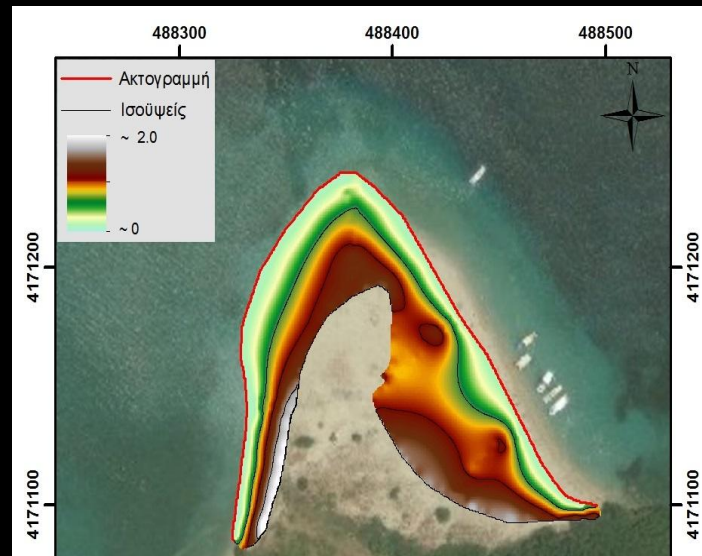
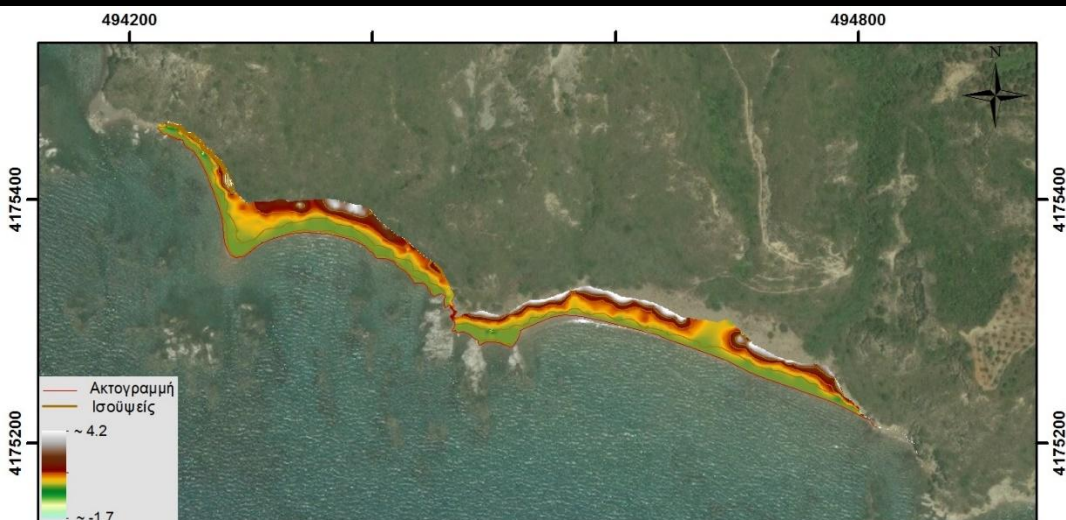


Species distributional range





Species distributional range

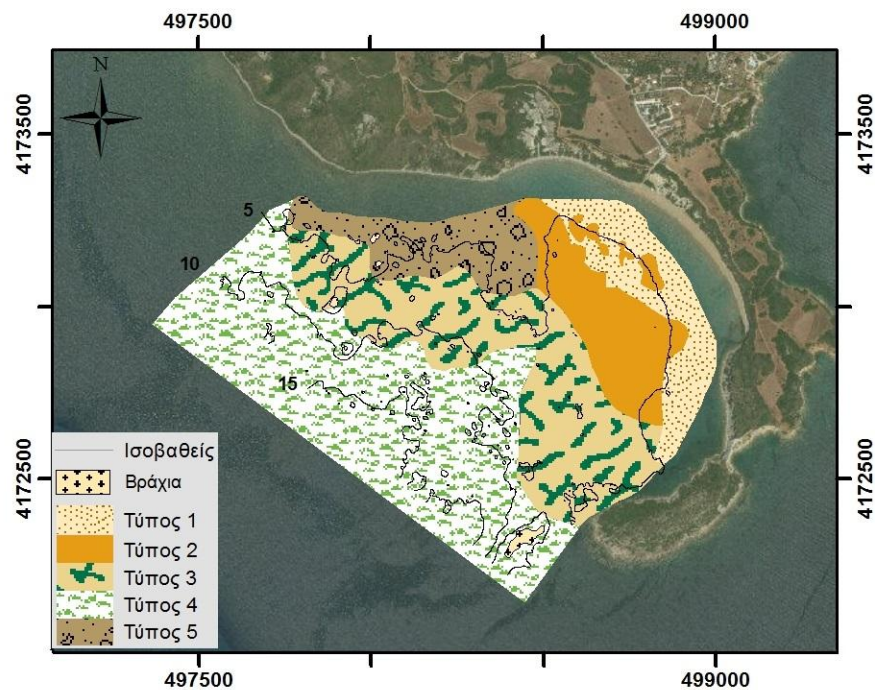
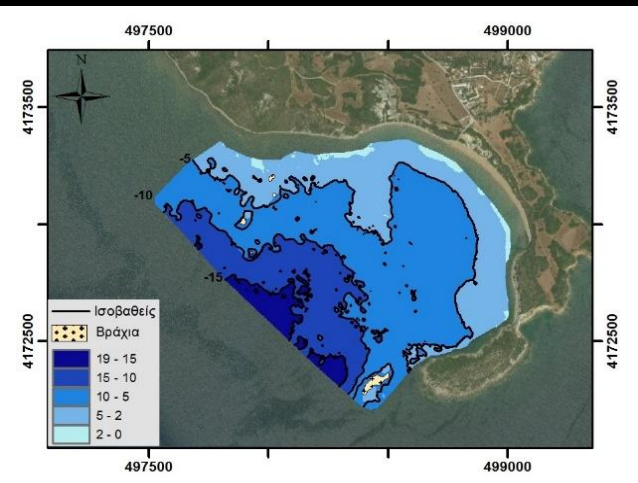


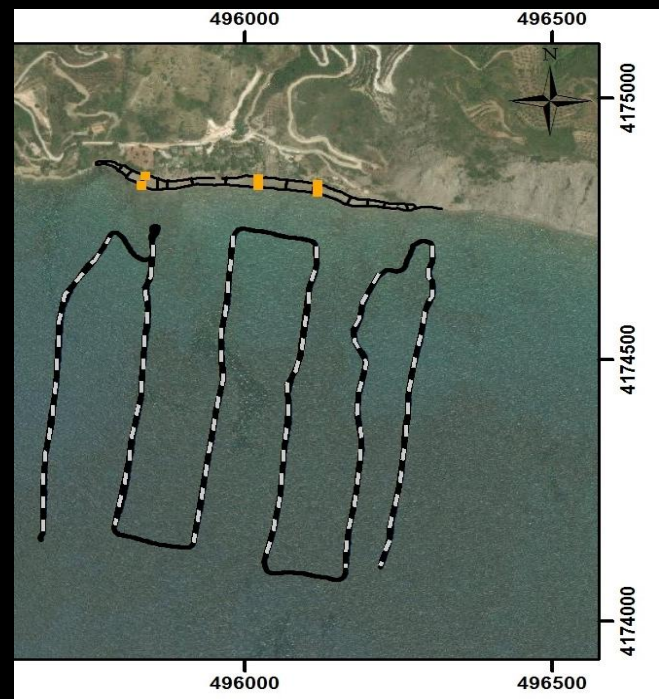
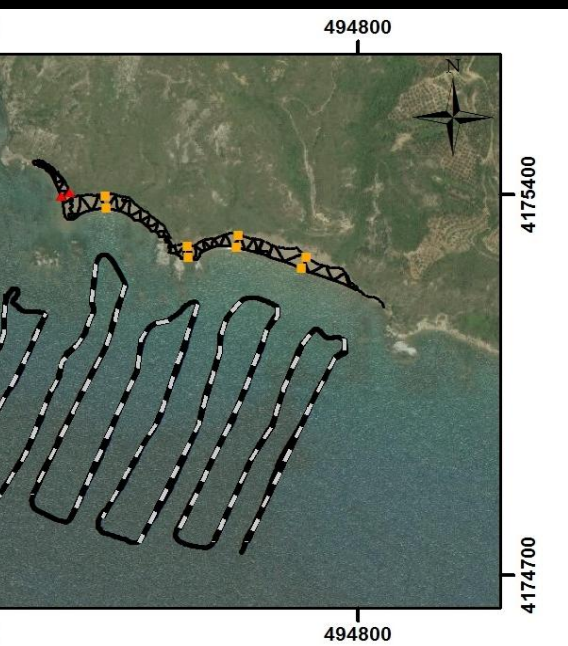
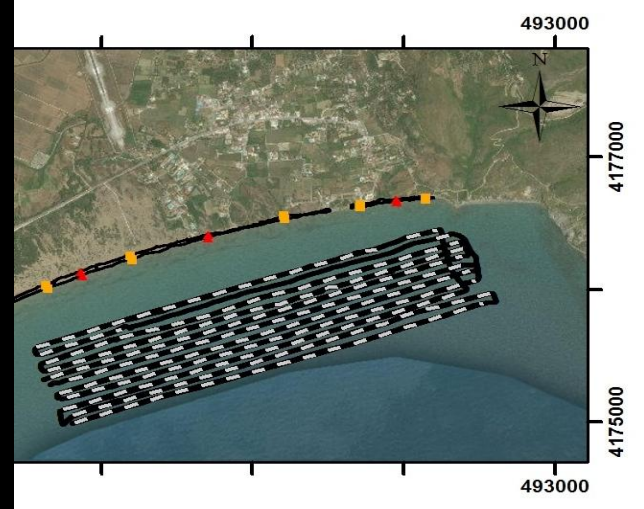
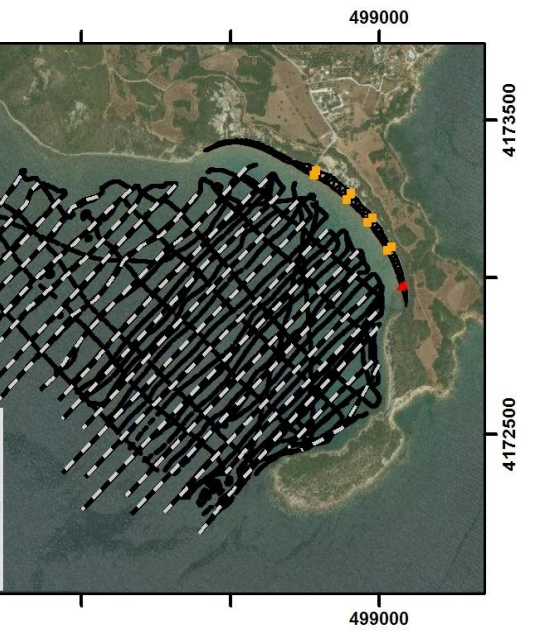
Species distributional range

Working at the breeding rockery

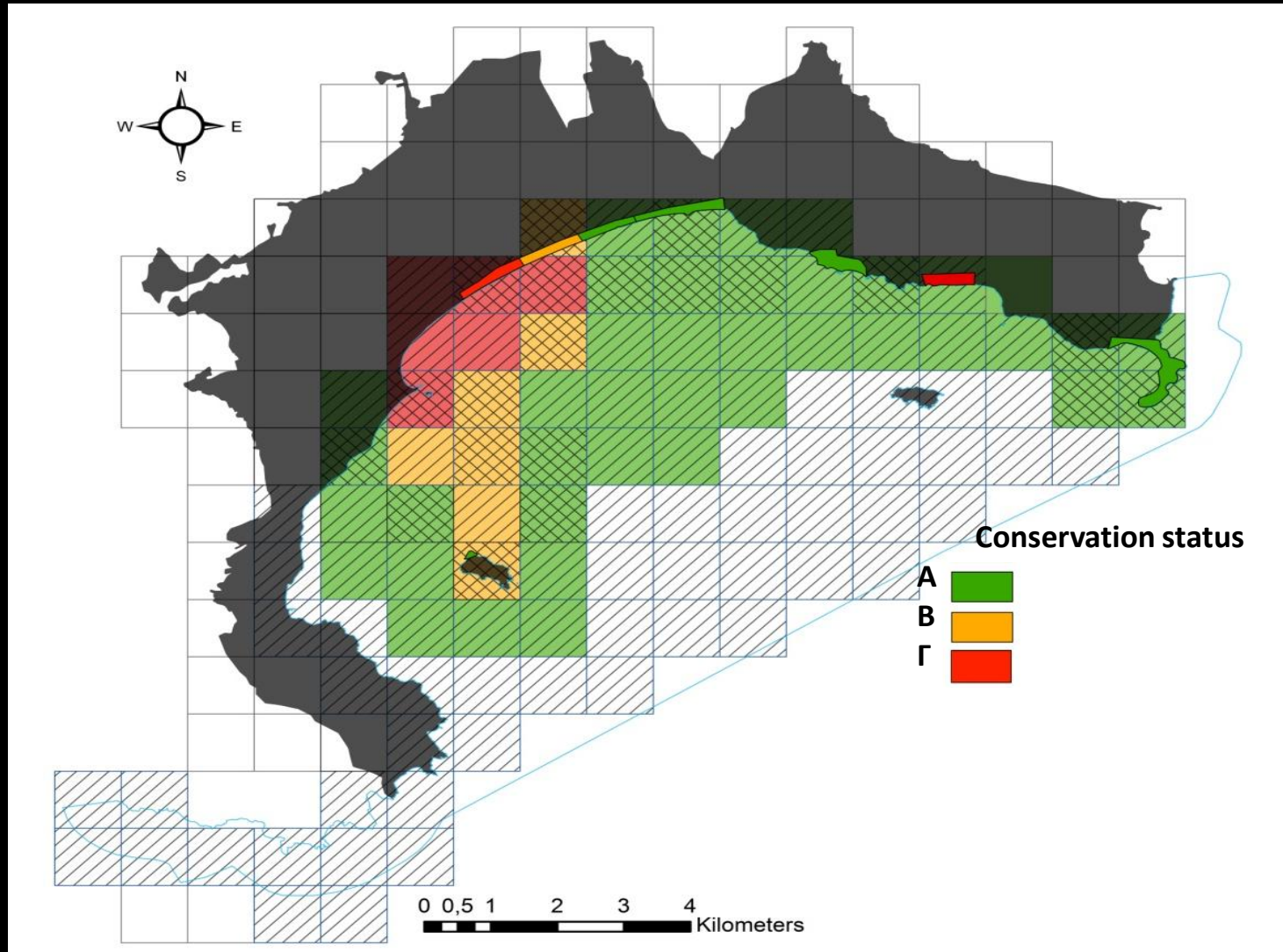


Species distributional range





Species distributional range



Species distributional range

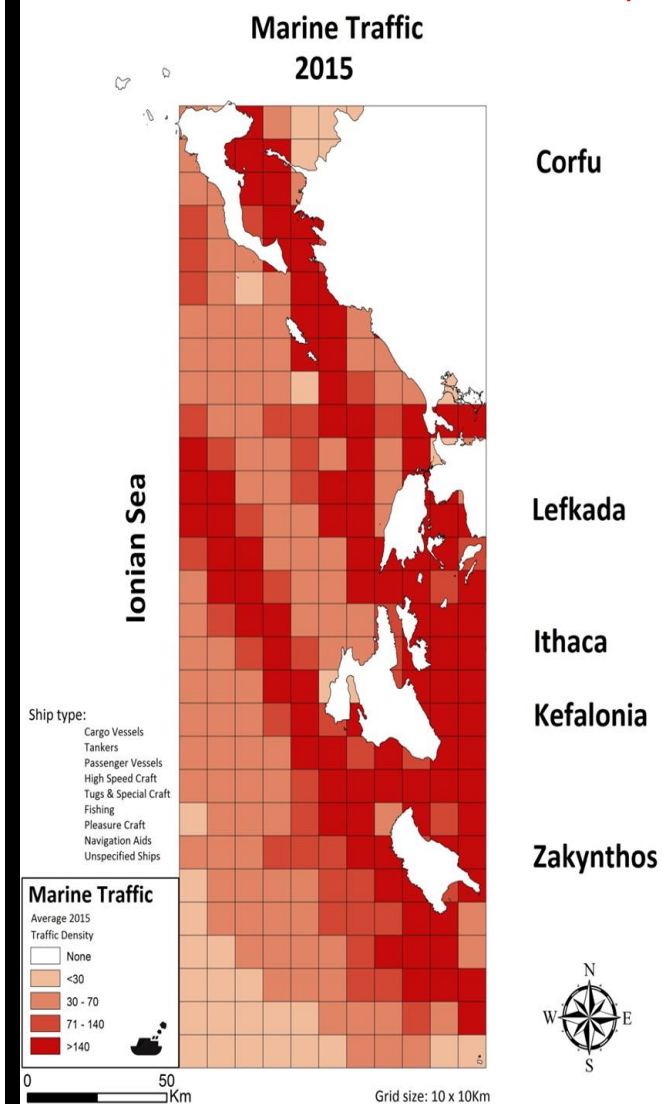
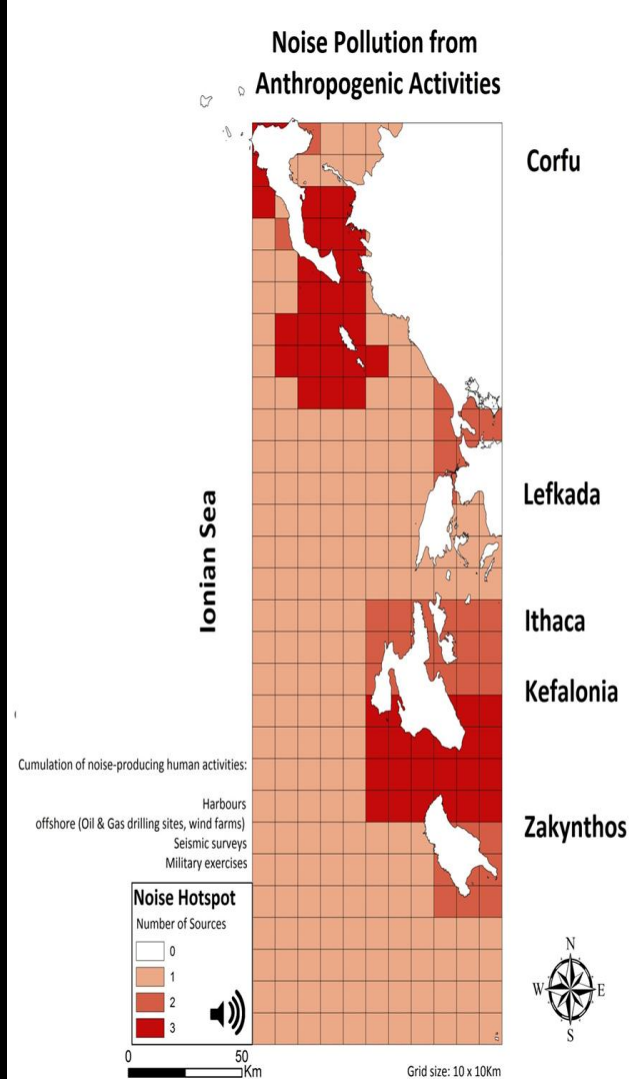
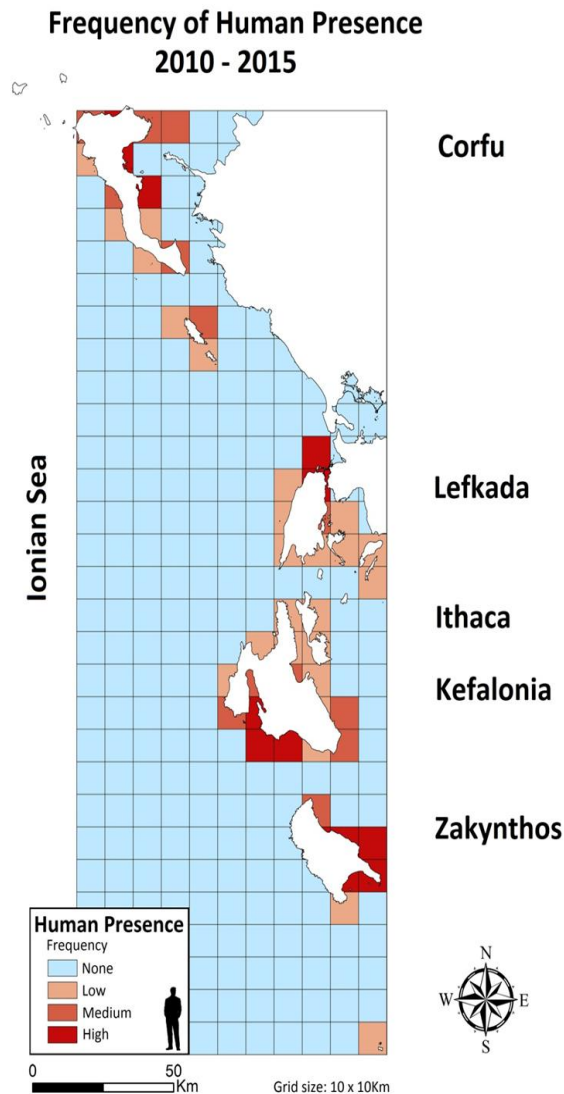
Migration – interesting travels

Species:



Species distributional range

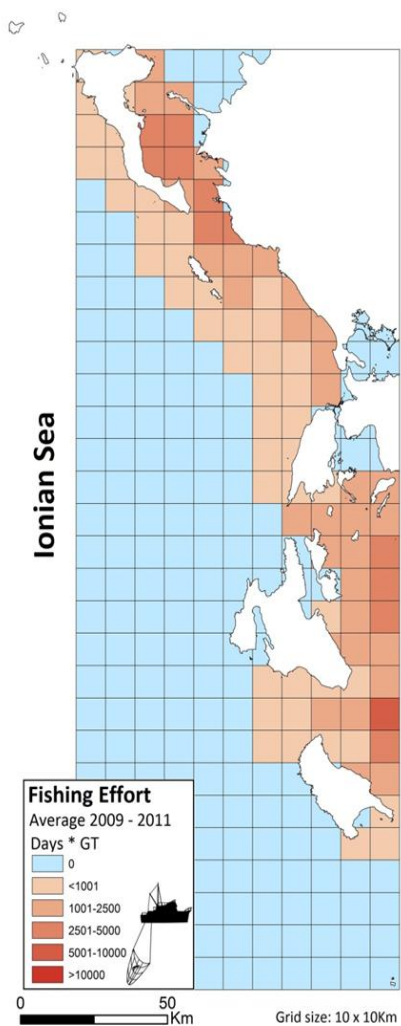
Dimitriadis et al., Under review)



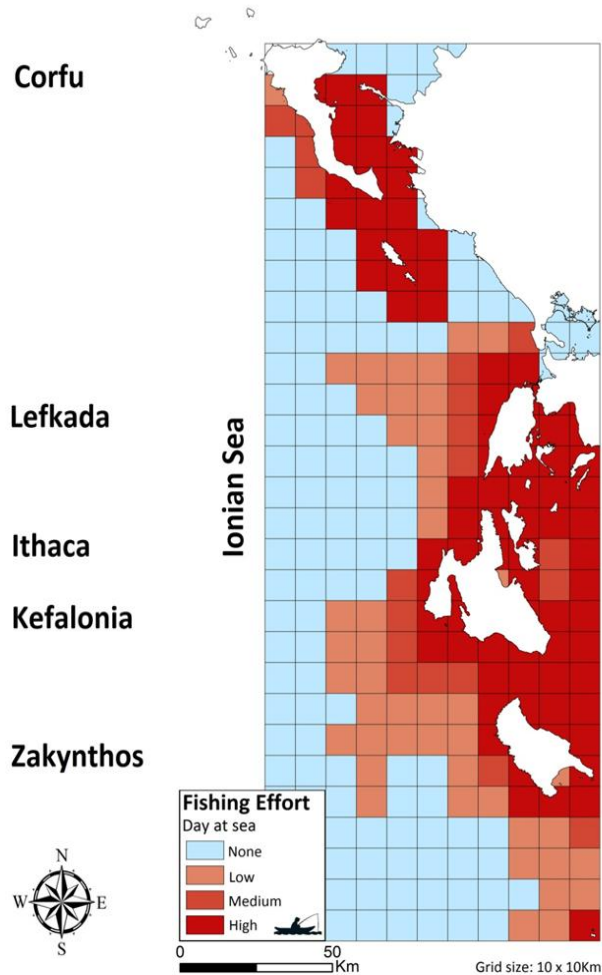
Species distributional range

Dimitriadis et al., Under review)

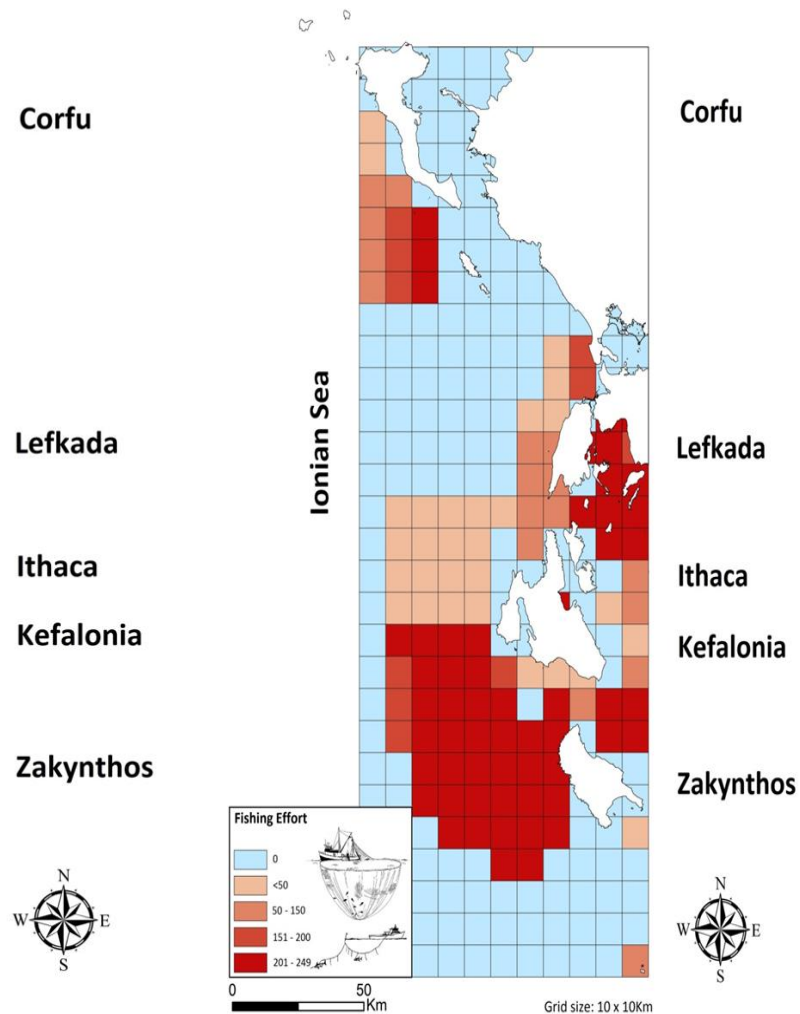
Fishing Effort of Bottom Trawlers



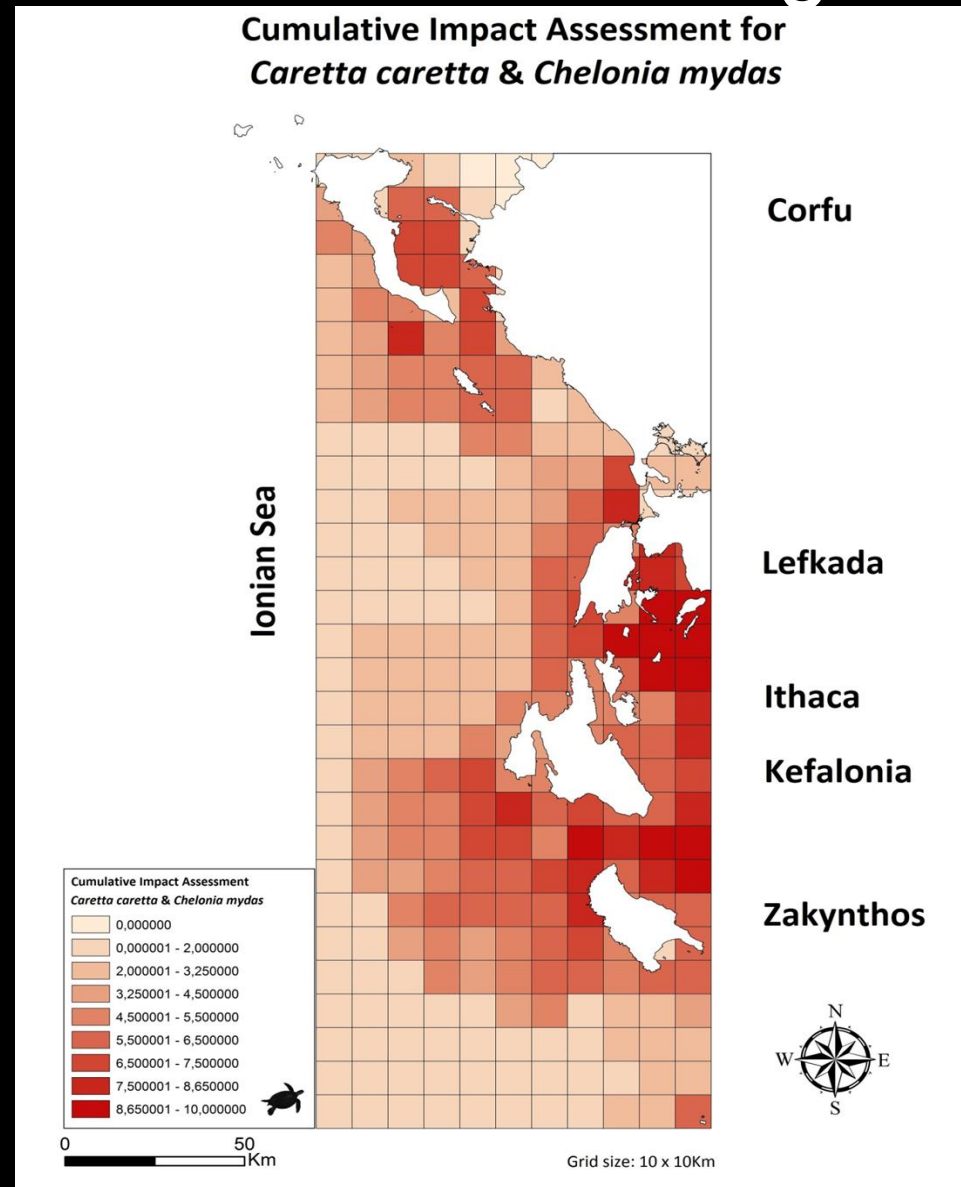
Fishing Effort of Small-Scale Coastal Fisheries Fleet 2012



Fishing Effort of Purse Seiners & Longliners



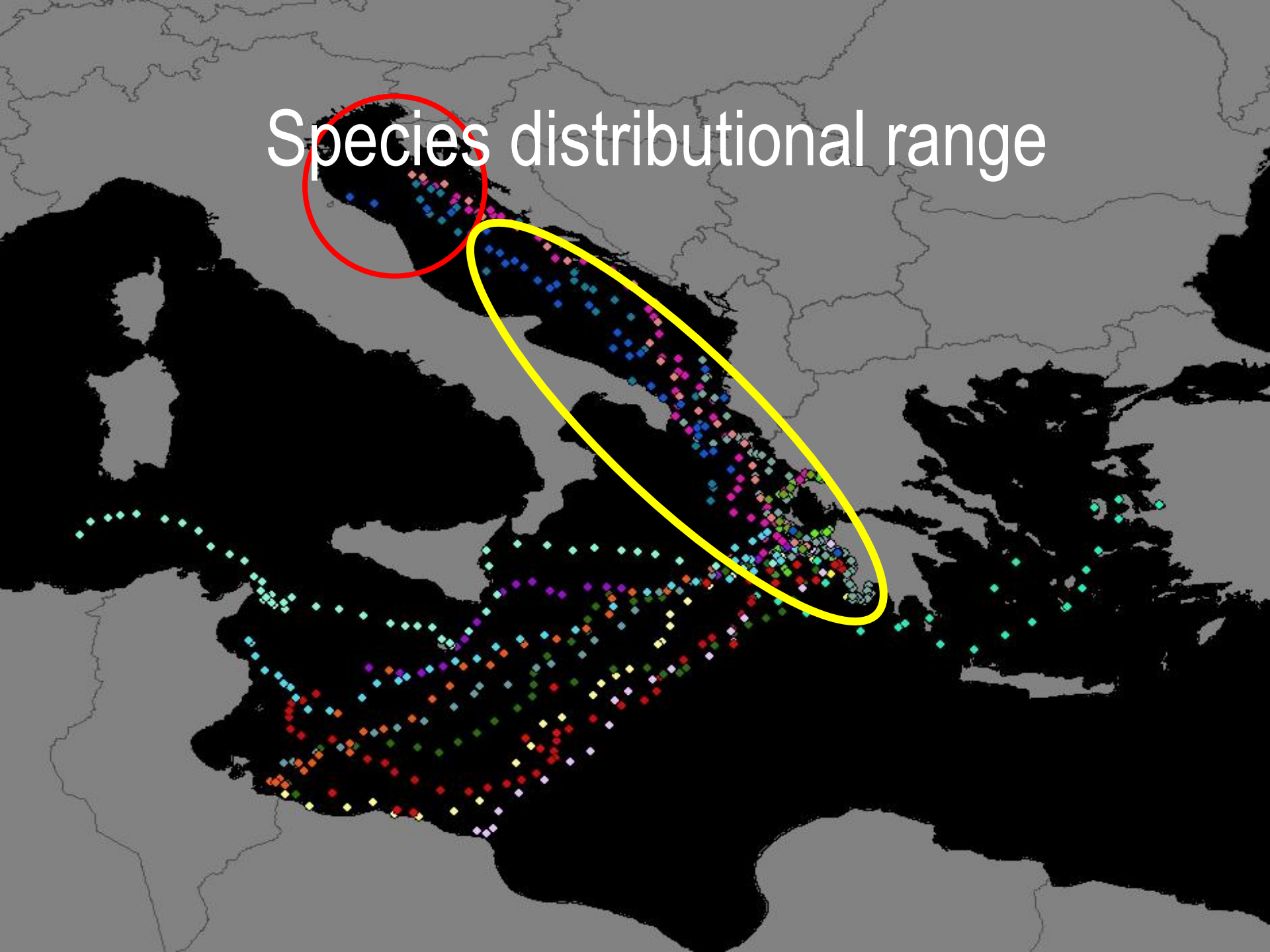
Species distributional range - CEA



Species distributional range

Foraging- - Wintering

Species distributional range

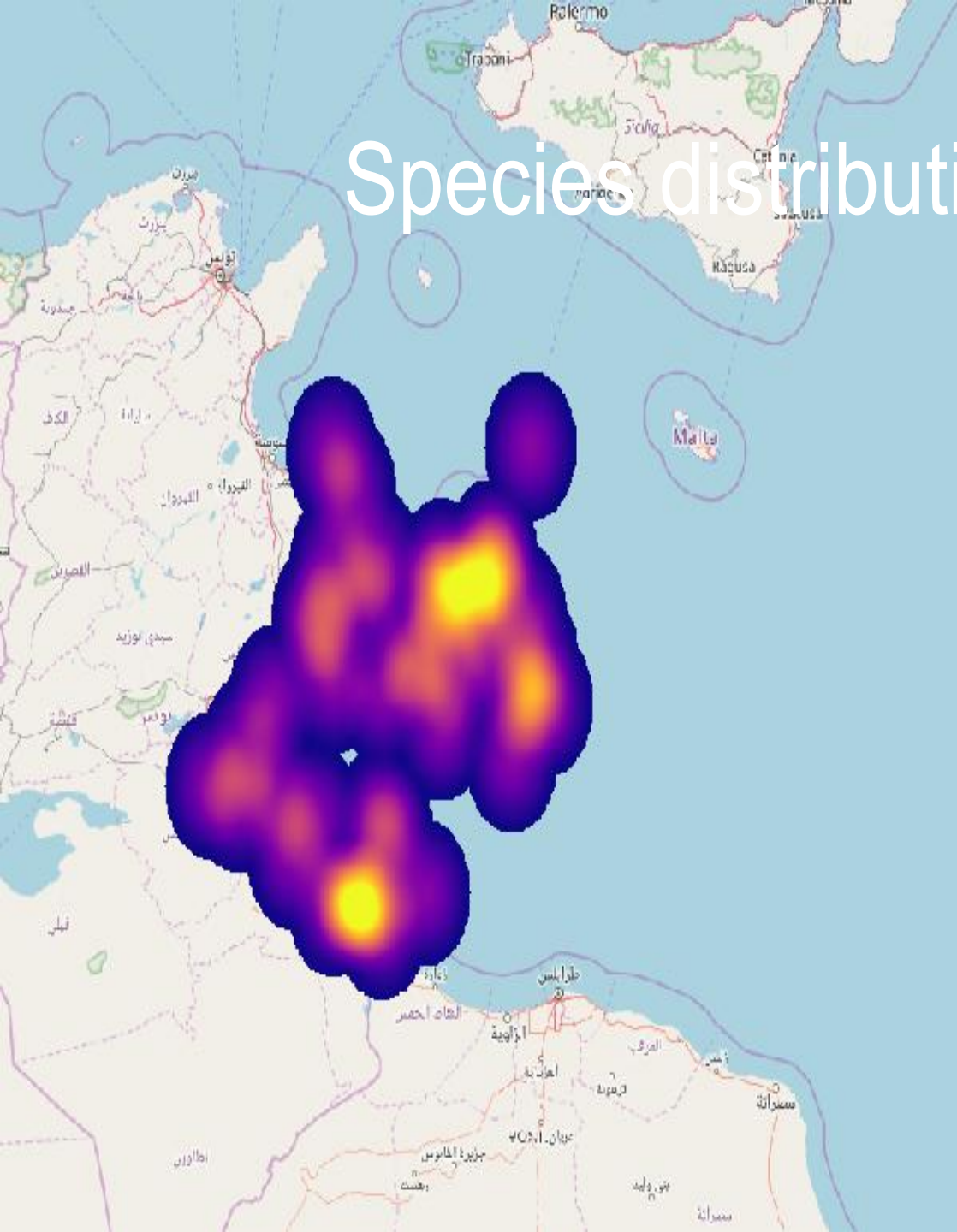




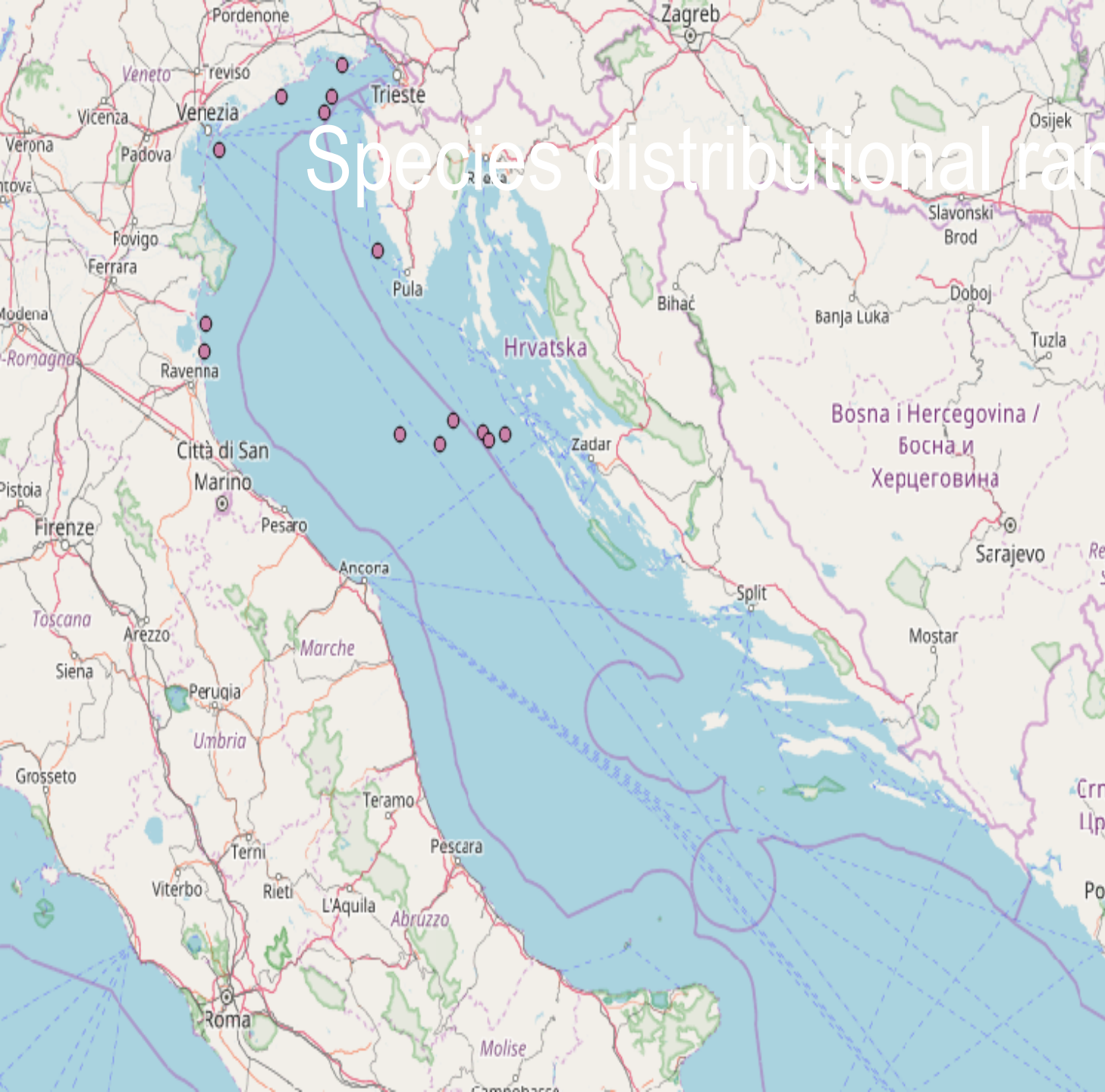
Species distributional range

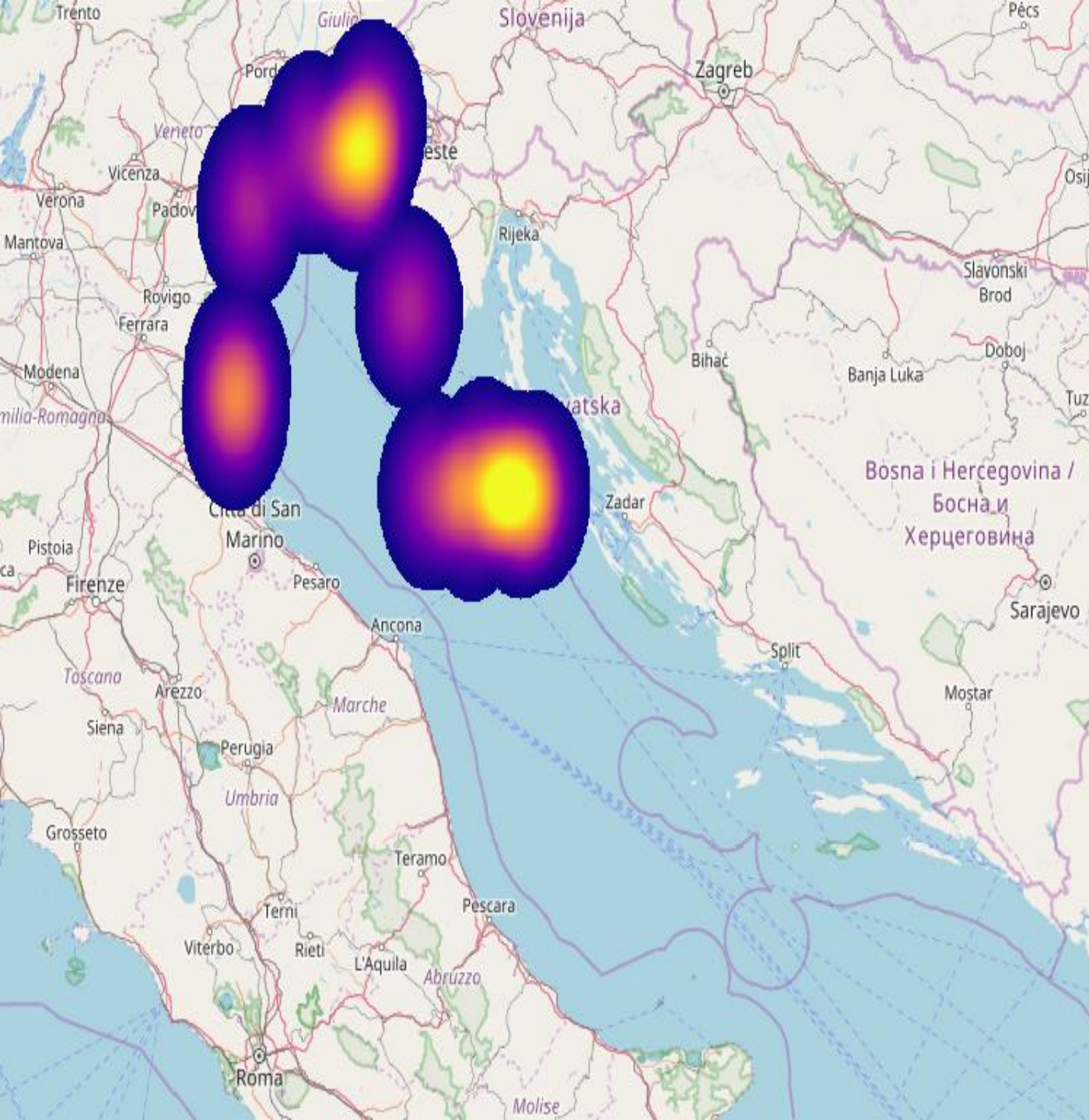


Species distributional range



Species distributional range





Basic methods

Land based surveys

Aeries surveys

Satellite

In-water surveys



G.Schofield & K. katselidis working in Zakynthos nesting rookery

Indicator: Population abundance

Sea turtles

biological and behavioral characteristics :

- long lived animals
- high fidelity to specific nesting areas
- only mature females come ashore for nesting
- great variability in reproductive performance
 - Variable remigration interval (duration between two successive nesting seasons)
 - Variable renesting interval (duration between two successive nesting attempts)
- great variation in reproductive output
 - Number of clutches laid
 - Number of eggs per clutch

Sea turtles

some critical features:

- Somatic growth rate is significantly reduced as animals get older (after maturation time)
- High reproductive value of each nesting individual
 - During a nesting season an individual turtle may lay more than 600 eggs
- High mortality rates during the first years of their lives
 - ‘from 1000 hatchlings entering the sea one of them will probably survive to adulthood’

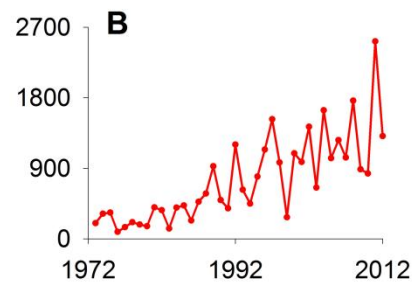
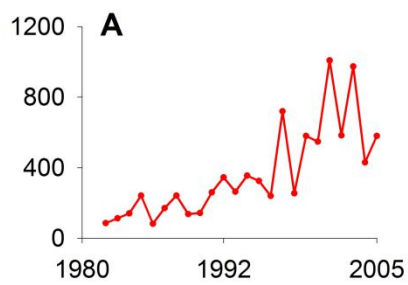
Sea turtles

problems arising when modeling sea turtles:

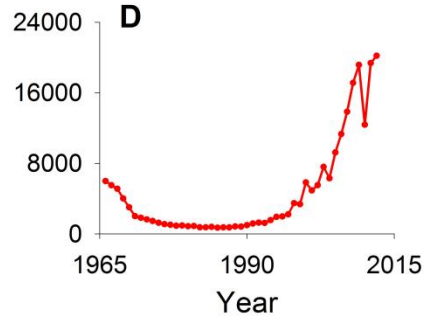
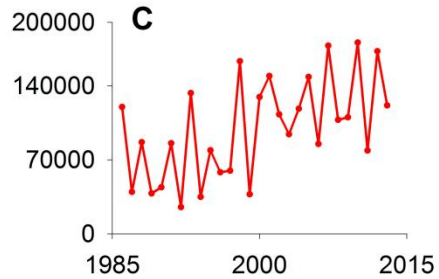
- Assessment of population trends is based on the number of nesting females
- Lacking information regarding:
 - survival rates
 - life span
 - age of maturation
 - re-nesting behaviour
 - density dependence mechanisms
 - population structure
 - population size
 - age-specific distribution



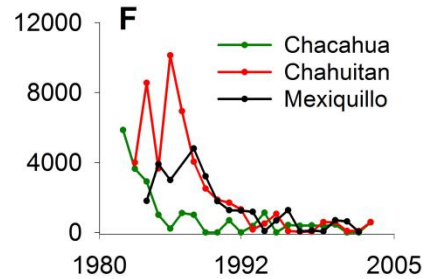
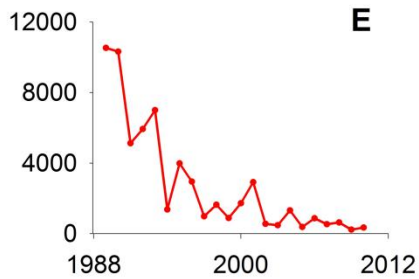
Number of nests



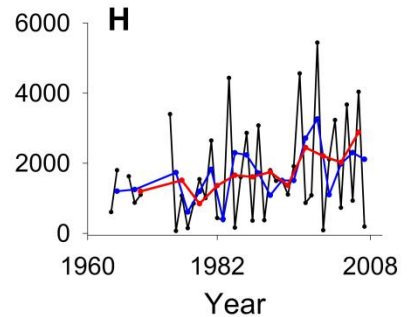
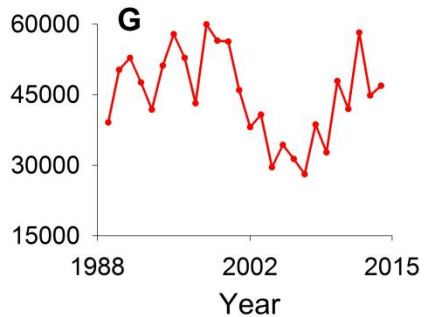
Number of nests



Number of nests



Number of nests



A) Increase in abundance at the leatherback (*Dermochelys coriacea*) sea turtle nesting site at St. Croix National Wildlife Refuge, U.S. Virgin Islands

(B) Increase in abundance at the green turtle (*Chelonia mydas*) nesting site at East Island, French Frigate Shoals, northwestern Hawaiian Islands, USA

(C) Increase in abundance at the green turtle nesting site at Tortuguero, Costa Rica **(D)** Increase abundance at the Kemp's ridley (*Lepidochelys kempii*) nesting site at Playa de Rancho Nuevo, Tamaulipas, Mexico

(E) Decline in abundance at the leatherback nesting site at Playa Grande, Costa Rica **(F)** Decline in abundance at three leatherback nesting sites along the Pacific coast of Mexico

G) Non significant trends in abundance for loggerhead (*Caretta caretta*) nesting sites at 26 index beaches in Florida, USA

(H) The green turtle nesting site at Heron Island, Australia

Tagging data could be used for estimating survival rates by applying Capture Mark Recapture models

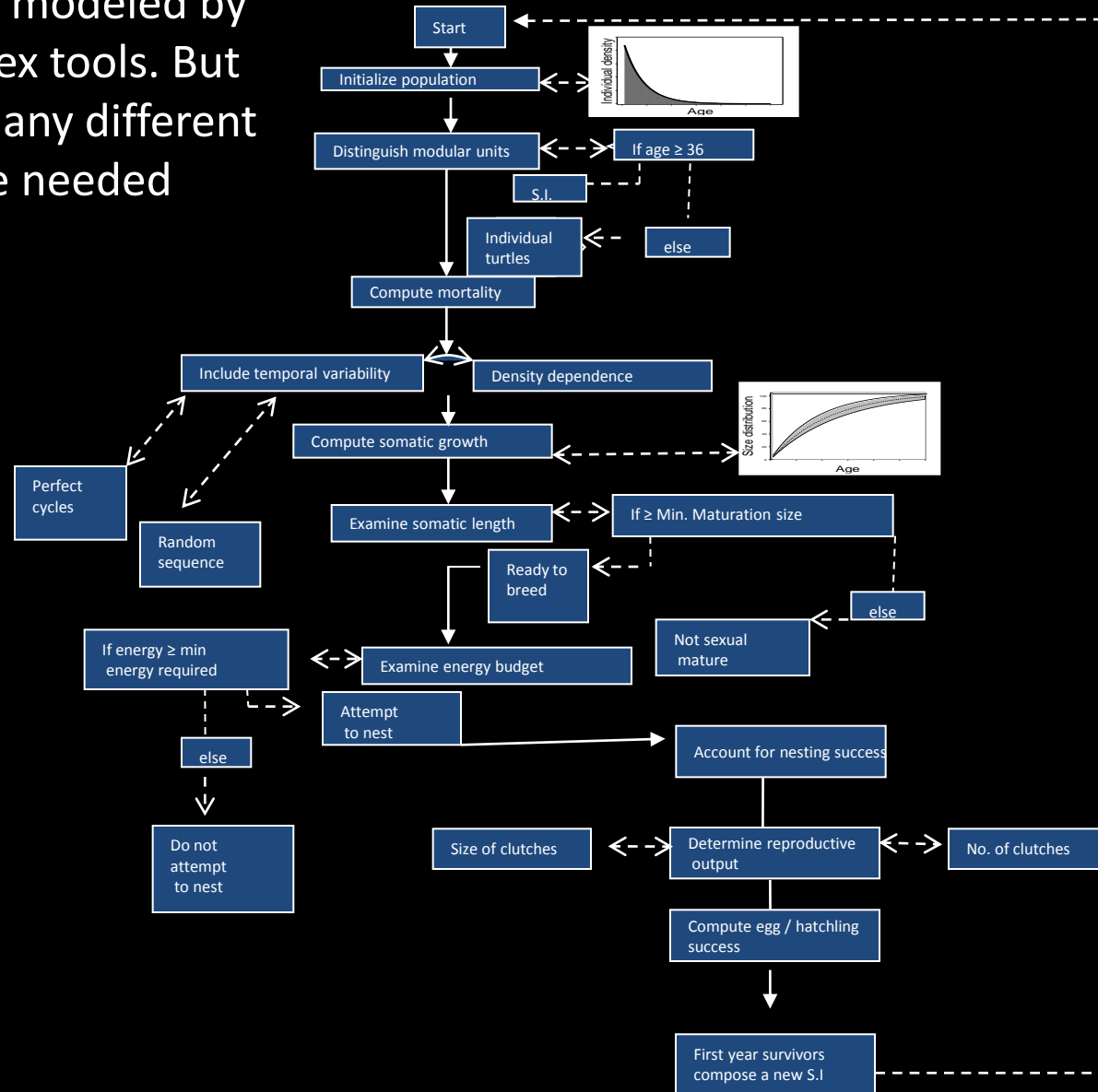
Still.. information on survival rates is very limited.

What is needed:

Data sharing

Knowledge exchange.

Population abundance and dynamics could be modeled by using more complex tools. But even in the case many different parameters are needed



FOW HOW LONG?

It is extremely important that continued monitoring occurs to lengthen available time series of nesting data

Decreasing annual nest counts in a globally important loggerhead sea turtle population

BLAIR WITHERINGTON,^{1,4} PAUL KUBILIS,² BETH BROST,³ AND ANNE MEYLAN³

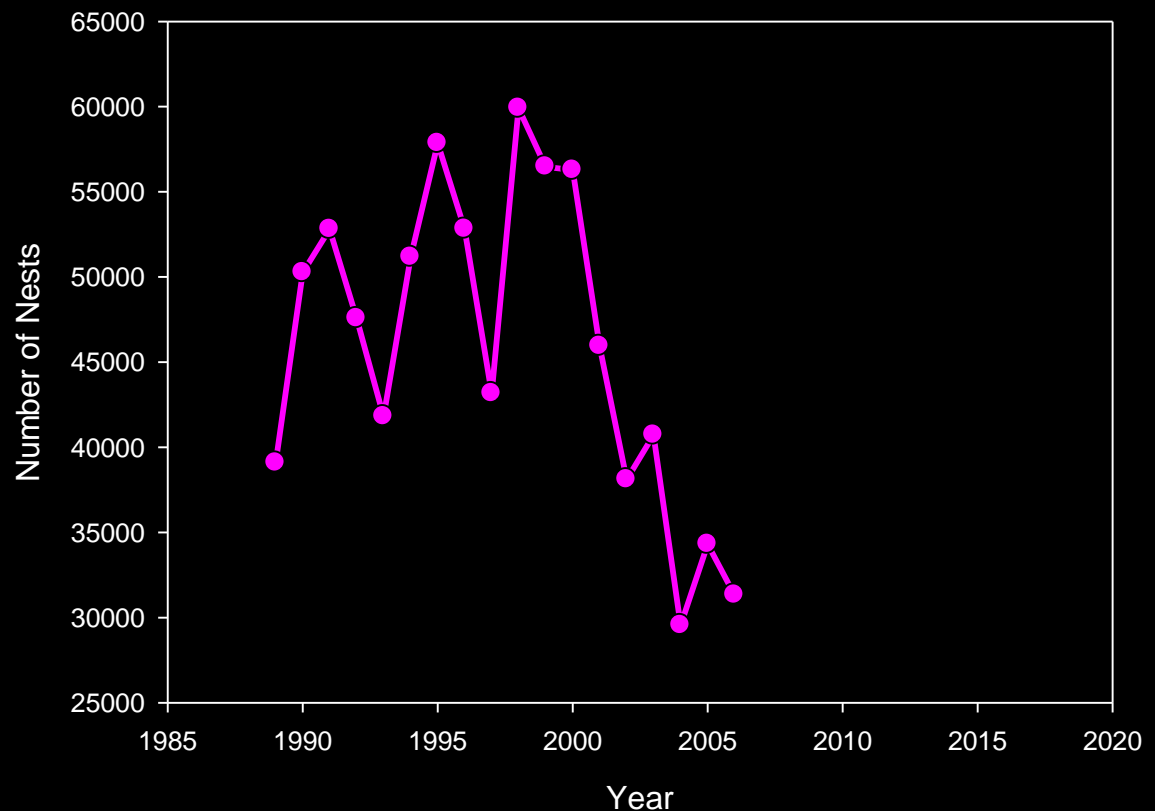
¹Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 9700 South A1A, Melbourne Beach, Florida 32951 USA

²Florida Program for Environmental Statistics, IFAS Statistics Department, University of Florida, 419 McCarty Hall C, P.O. Box 110339, Gainesville, Florida 32611 USA

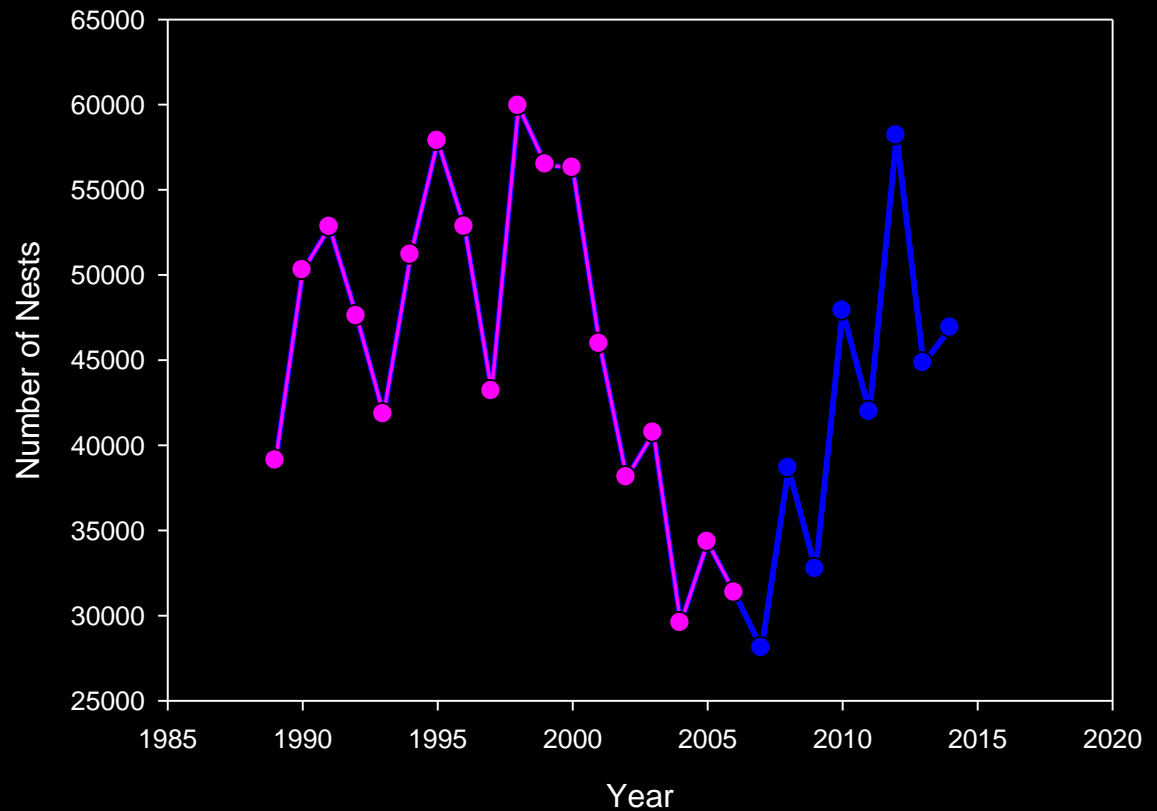
³Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 100 8th Avenue Southeast, St. Petersburg, Florida 33701 USA

Abstract. The loggerhead sea turtle (*Caretta caretta*) nests on sand beaches, has both oceanic and neritic life stages, and migrates internationally. We analyzed an 18-year time series of Index Nesting Beach Survey (Index) nest-count data to describe spatial and temporal trends in loggerhead nesting on Florida (USA) beaches. The Index data were highly resolved: 368 fixed zones (mean length 0.88 km) were surveyed daily during annual 109-day survey seasons. Spatial and seasonal coverage averaged 69% of estimated total nesting by loggerheads in the state. We carried out trend analyses on both annual survey-region nest-count totals ($N = 18$)

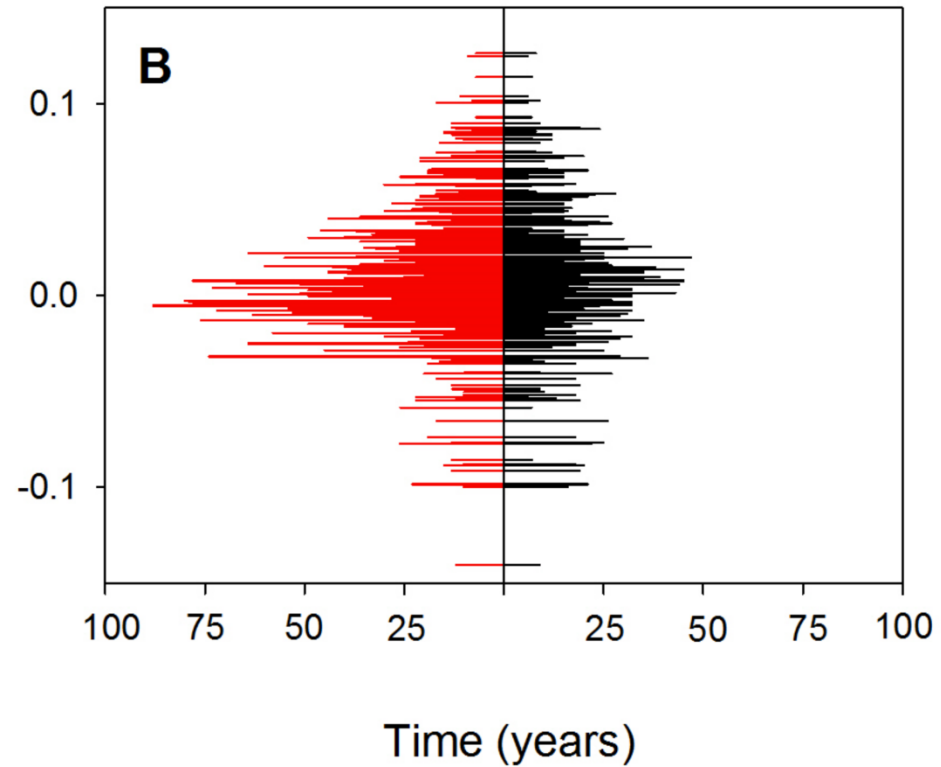
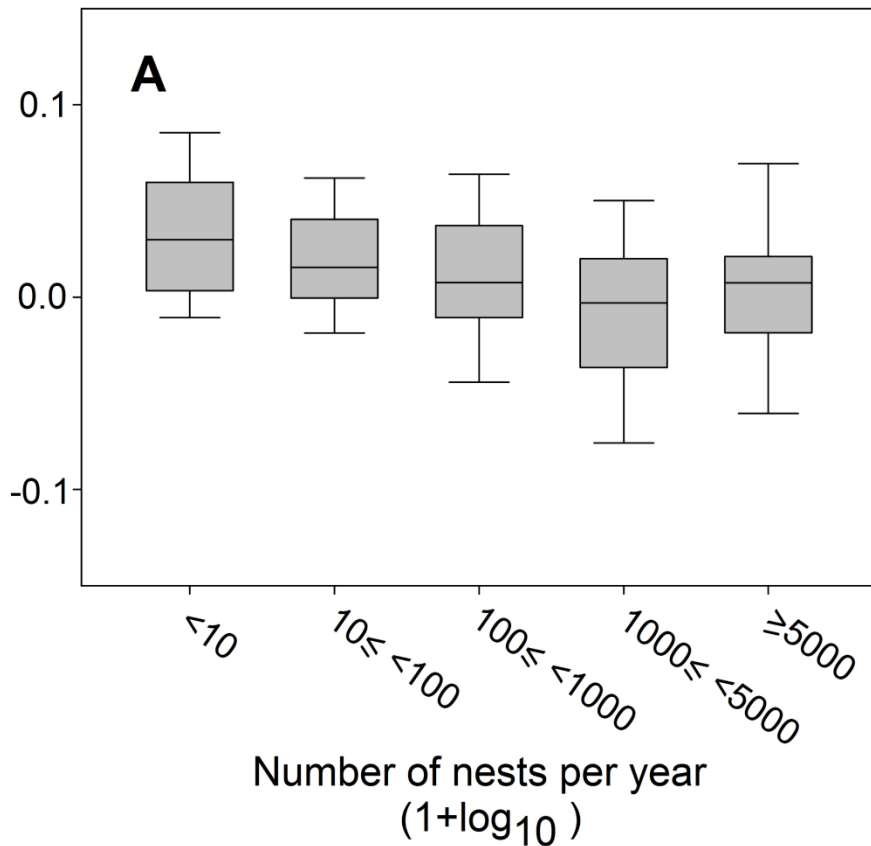
Outputs generated by short time series could be misleading as the number of eggs gives only a limited idea on actual population size..



Given the high interannual variability, we need to spend many years to get a rather confident output on population trends (based on the number of nests)



Slope of nesting abundance change

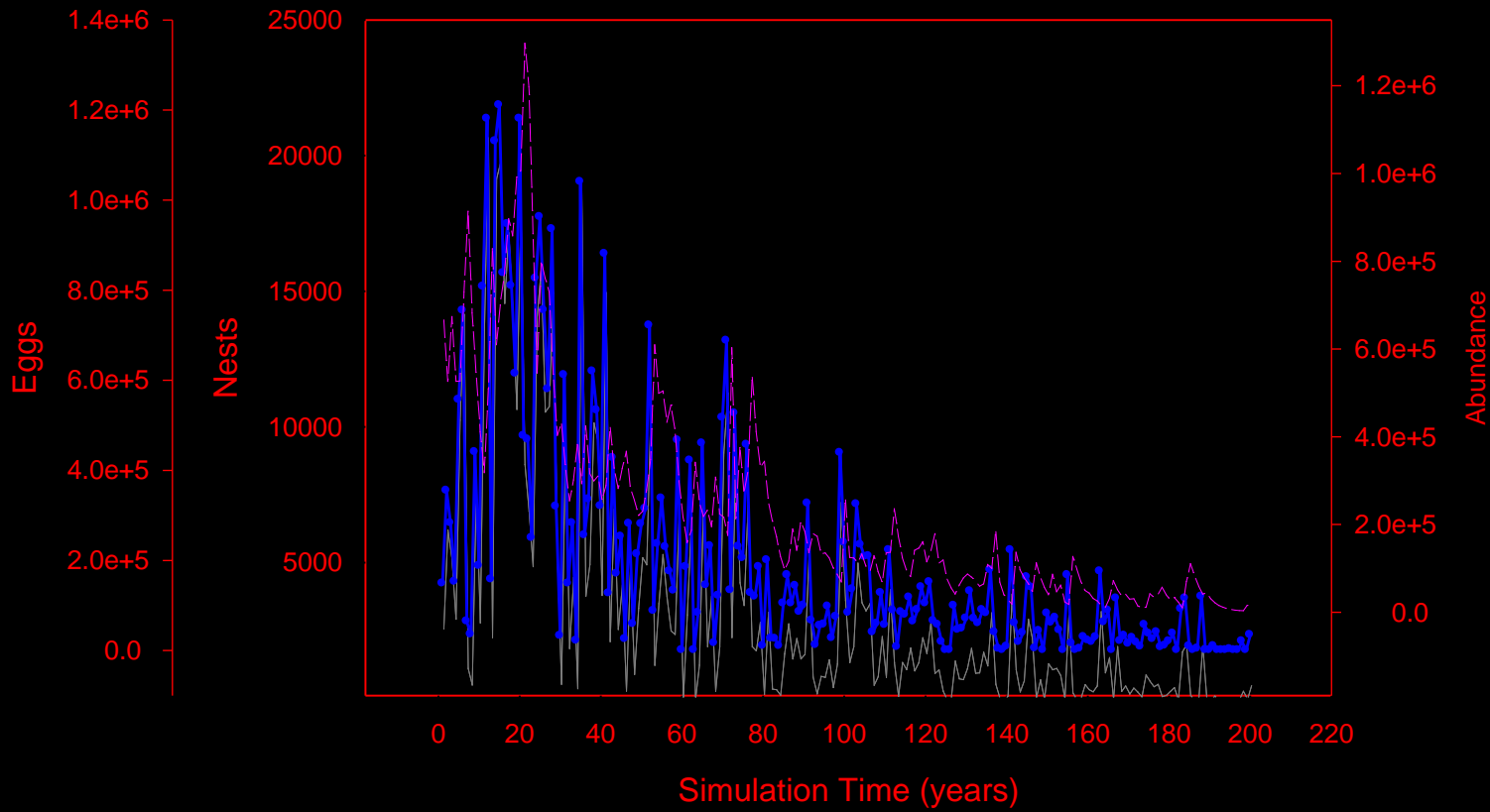


Even small populations have the potential to recover.. So we need to continue efforts

Other stages?
Sex ratio?



Indicator : Population demographic characteristics



Complex models could be useful but we need information on many parameters.

Population demographic characteristics

- Survival rates
- Life span
- Somatic growth
- Reproduction fitness
- Sex ratio
- Emergence success
- Nest locations
- Duration in incubation period
- Onset of nesting
- Stranding data

Population demographic characteristics

What can we do?

MPAs

Raising awareness

Involve local communities

Promoting regional and
international agreements

Lobbying for turtle-friendly fishing
practices, such as the use of turtle
excluder devices (TED)

Halting the illegal trade of turtle
meat and eggs

Share data and information

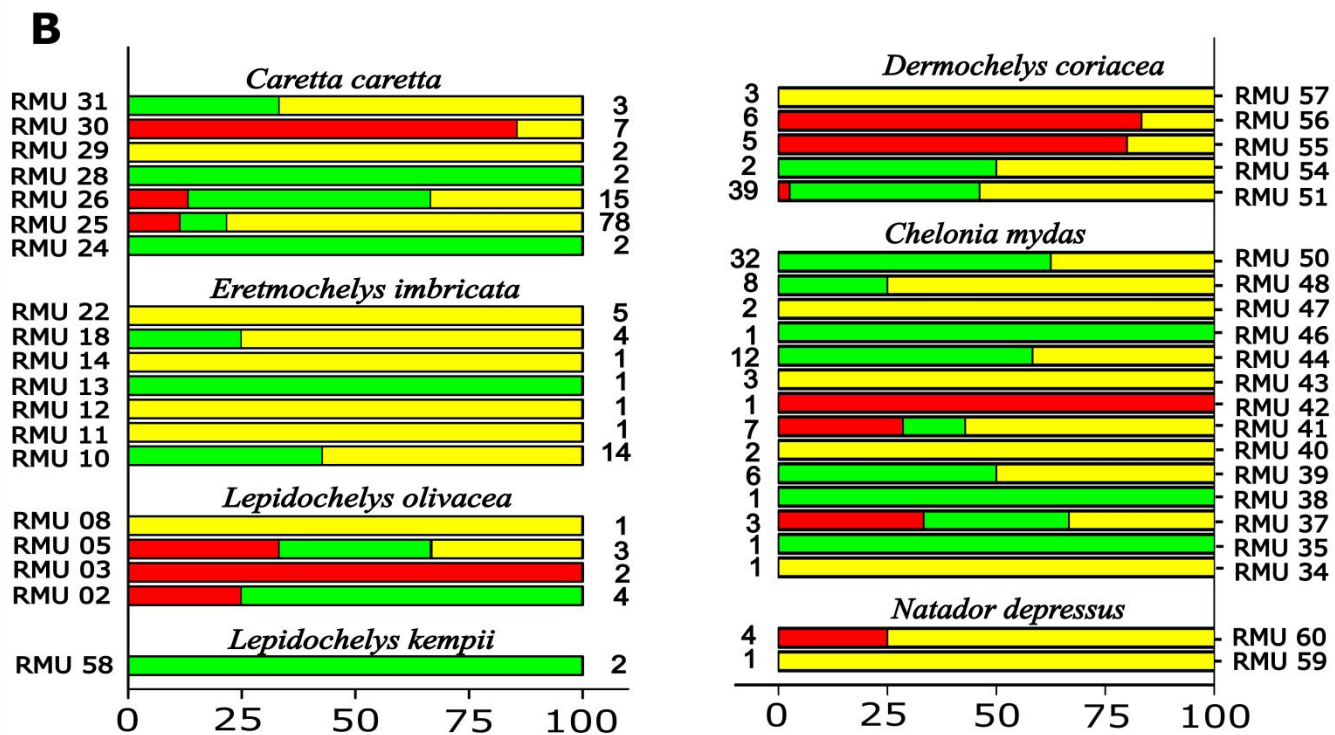
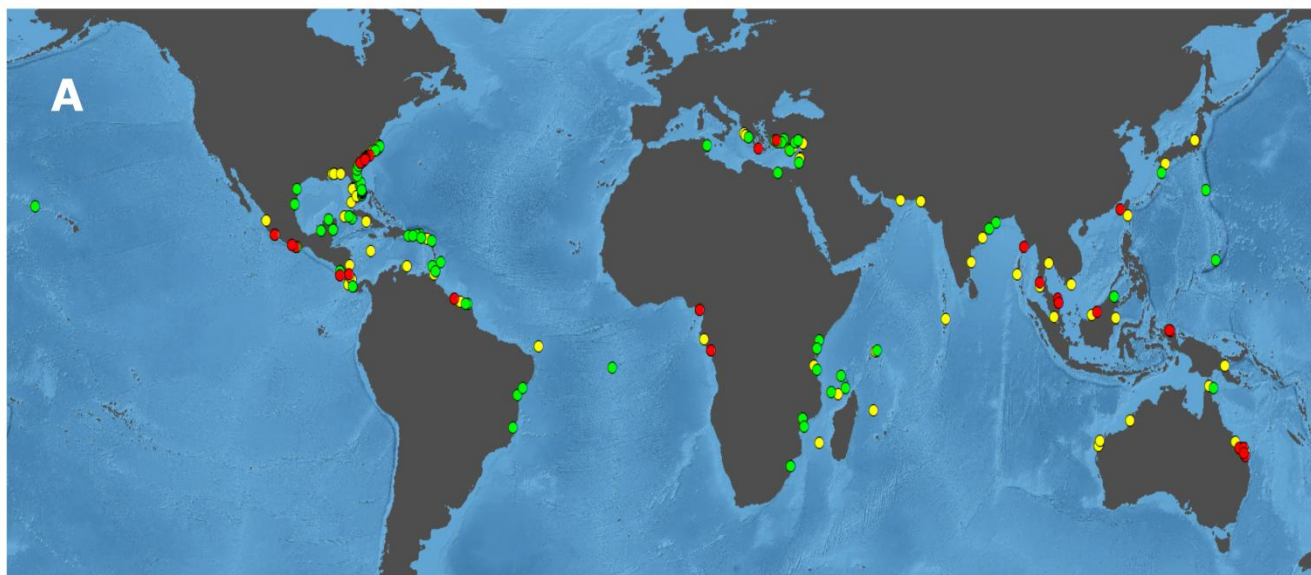
MARINE CONSERVATION

Global sea turtle conservation successes

**Antonios D. Mazaris,¹ Gail Schofield,^{1,2} Chrysoula Gkazinou,¹
Vasiliki Almpnidou,¹ Graeme C. Hays^{2*}**

We document a tendency for published estimates of population size in sea turtles to be increasing rather than decreasing across the globe. To examine the population status of the seven species of sea turtle globally, we obtained 299 time series of annual nesting abundance with a total of 4417 annual estimates. The time series ranged in length from 6 to 47 years (mean, 16.2 years). When levels of abundance were summed within regional management units (RMUs) for each species, there were upward trends in 12 RMUs versus downward trends in 5 RMUs. This prevalence of more upward than downward trends was also evident in the individual time series, where we found 95 significant increases in abundance and 35 significant decreases. Adding to this encouraging news for sea turtle conservation, we show that even small sea turtle populations have the capacity to recover, that is, Allee effects appear unimportant. Positive trends in abundance are likely linked to the effective protection of eggs and nesting females, as well as reduced bycatch. However, conservation concerns remain, such as the decline in leatherback turtles in the Eastern and Western Pacific. Furthermore, we also show that, often, time series are too short to identify trends in abundance. Our findings highlight the importance of continued conservation and monitoring efforts that underpin this global conservation success story.

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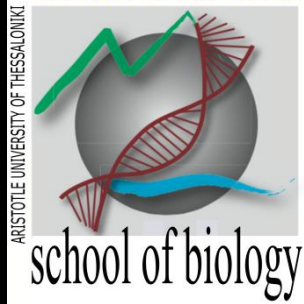
Conservation efforts seems to work,
highlighting the long term benefit of
monitoring efforts

BUT we need to continue



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Marine turtle monitoring protocols

Antonios D Mazaris

**Dpt. Ecology, School of Biology,
Aristotle University of Thessaloniki,
Greece**