26/05/2017

09:30 - 15:00 | Sala Conferenze
Rettorato Università del Salento

LifeWatch-ERIC

L'infrastruttura di ricerca Europea sulla biodiversita' per scienza e societa'

Conferenza Scientifica

LifeWatch ITALY | UNIVERSITÀ DEL SALENTO | BPP Banca Popolare Pugliese

UN CASO DI STUDIO DI LIFEWATCH COME APPROCCIO MACROECOLOGICO ALLO STUDIO DELLE SPECIE ALIENE

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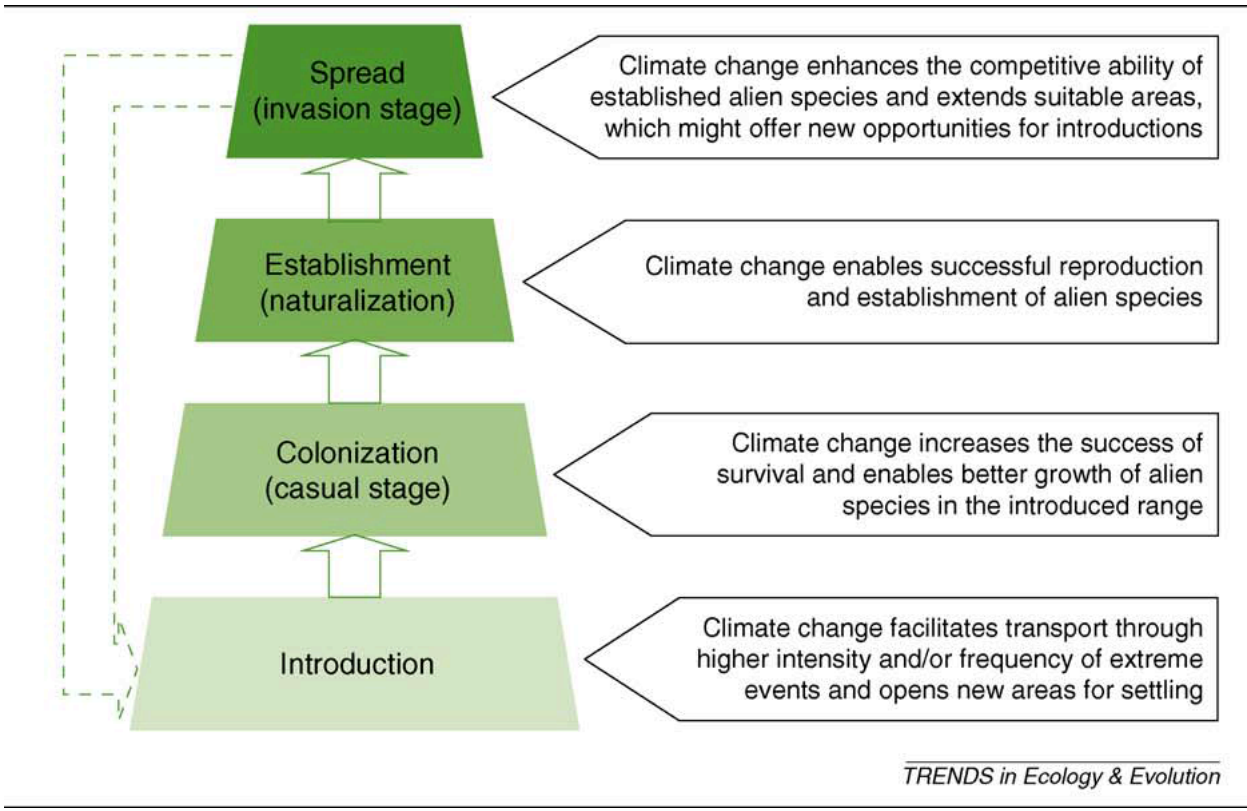
Coordinator of Alien Species Show Case – LifeWatch-ITA

INTRODUCTORY CONSIDERATIONS

- AS are considered one of the major threat to biodiversity, even though their role is going to be reconsidered

  - Influence of AS on both ecosystem structure and functioning (Vila et al, 2011)
  - Climate change is driving new colonisation and AS invasion (Walther et al., 2009)



INTRODUCTORY CONSIDERATIONS

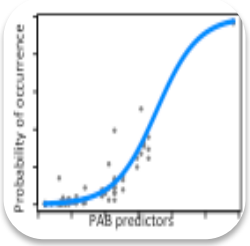
- On the other hand……
  - Most of AS are innocuous (Leung et al, 2012);
  - We are looking at AS invasion using a wrong temporal scale (i.e., too short) and focusing on processes at dis-equilibrium;
  - Evidence of massive invasions with negligible extinctions occurs, at least in plants

RESEARCH QUESTIONS

Identify emergent patterns regarding the potential drivers of occurrence and richness of AS in freshwater, marine and transitional ecosystems

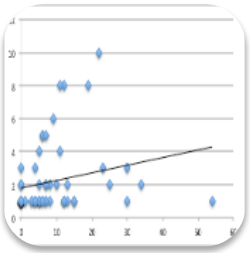
Habitat vulnerability

Are different EUNIS habitat more or less susceptible to invasion?



Invasion drivers

Which abiotic, biotic and pressure attributes of the recipient site affect invasion probabilities?



Determinants of AS richness

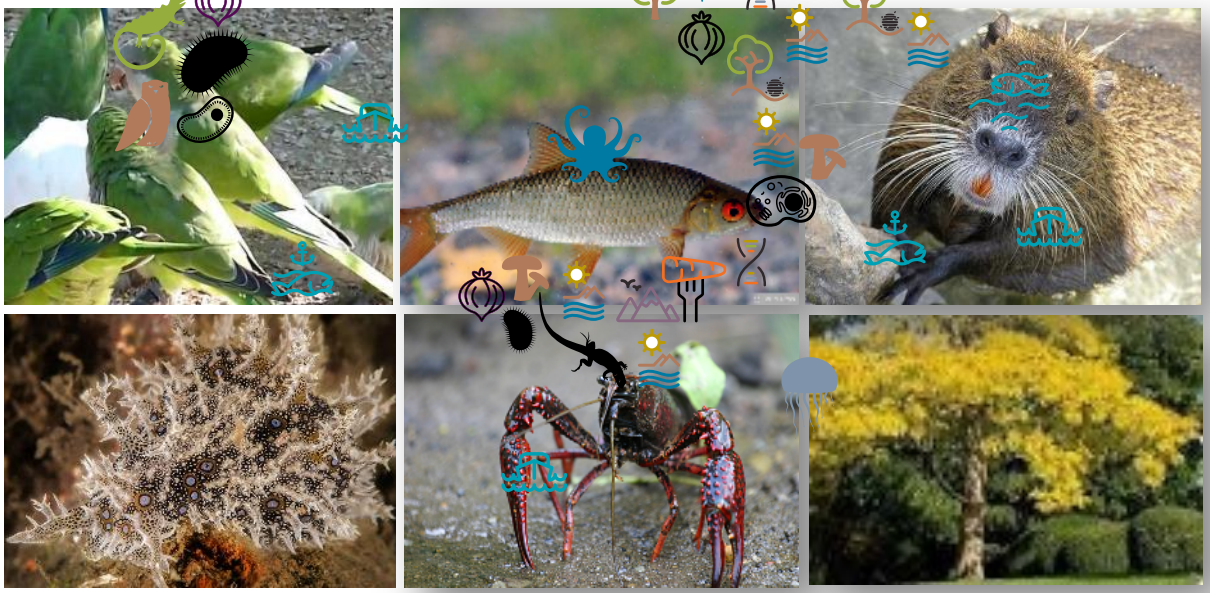
What are the determinants of high or low AS richness in the invaded sites?

THE ALIEN SPECIES CASE STUDY

- Invasion biology often focus on single alien taxon or group of related species (i.e. genera, family, orders)
- The availability of large database (i.e. LW database) allows to **test generalized invasion patters in a macroecological framework**:
  - Multiple taxa
  - Multiple habitat
  - Multiple sites

LTER ITALY
UNIVERSITY OF BARI
UNIVERSITY OF SALENTO
UNIVERSITY OF CAMERINO
UNIVERSITY OF FERRARA
UNIVERSITY OF FIRENZE
UNIVERSITY OF GENOVA
UNIVERSITY OF MOLISE
UNIVERSITY OF PARMA
UNIVERSITY OF PERUGIA
UNIVERSITY OF ROMA 3
UNIVERSITY OF ROMA «LA SAPIENZA»
UNIVERSITY OF ROMA "TOR VERGATA"
UNIVERSITY OF SASSARI
UNIVERSITY OF TORINO
UNIVERSITY OF VENEZIA "CA FOSCARI"
UNIVERSITY OF MARCHE
UNIVERSITY OF MILANO «BICOCCA»
CNR: ISE-ISMAR-IBBE-IREA-IBAF-IAMC
ENVIRONMENT AGENCY PUGLIA
ENVIRONMENT AGENCY OF BOLZANO
CORPO FORESTALE DELLO STATO
SZN ANTON DOHRN
OGS TRIESTE

The **Biodiversity LifeWatch database** contains both native and alien species distributed within Eunis habitats along the Italian peninsula.



ALIEN SPECIES DEFINITION

FRESH WATER

Species deliberately or inadvertenly introduced to Italy by human activities after the discovery of the new word by C. Colombo

MARINE

IN THE MEDITERRANEAN TWO MAJOR BENCHMARKS ARE RECOGNIZED:

- 1869, the opening of the Suez Canal (Zenetos *et al*., 2010)
- 1945, the end of the second world war and the increasing traffic due to shipping, aquaculture and research (Occhipinti-Ambrogi *et al*., 2011; GSA-SIBM, 2012)

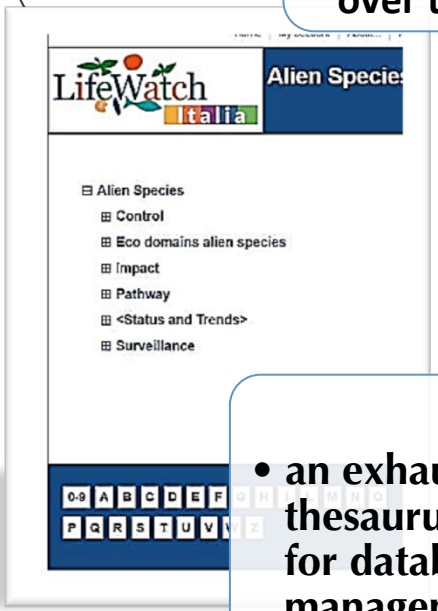
In the present study, all marine and lagoon species introduced into Italian waters since the opening of the Suez Canal are considered as aliens

No differences between alien and naturalized species have been considered….so the term alien was used in its broadest sense

WHAT WAS DONE

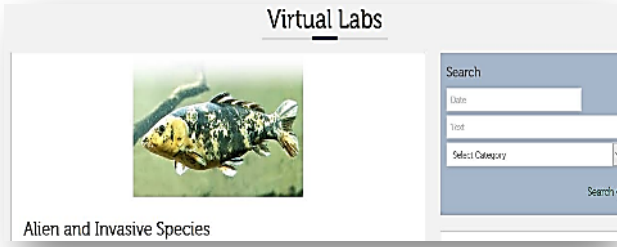
- exploratory work on available data then increased over time

- Data Cleaning (taxonomic reliability and consistency) manually by the LW experts, then through the tools of data cleaning available on the LW portal



DATA GATHERING | VALIDATION

ALIEN SPECIES THESAURUS | DATA INTEGRATION



A VIRTUAL LAB

- an exhaustive thesaurus on AS for database management

- Metadata (surface, habitat, lat&long, year)
- AS Occurrence with ecological/ anthropic/ environmental drivers

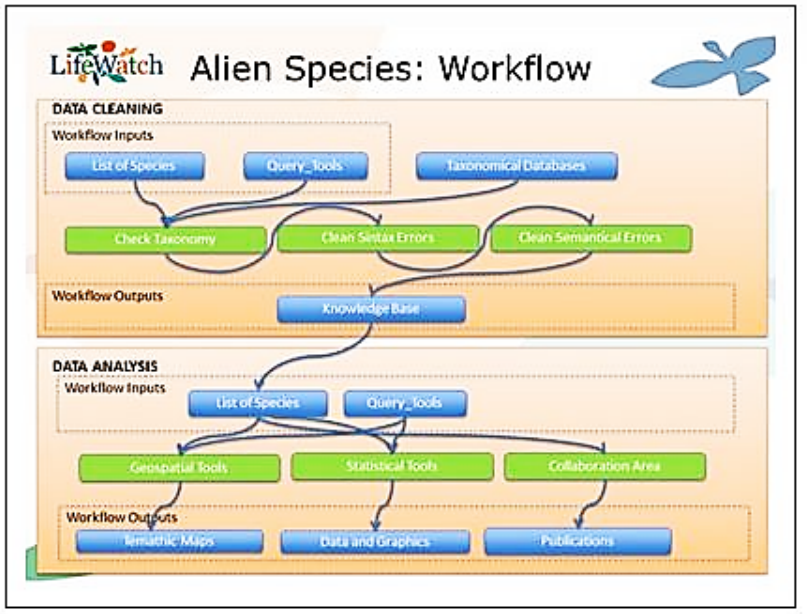
DATA STANDARDISATION AND QUALITY CONTROL

Data standardisation:

- Sampling period
- Data source: biodiversity surveys (published or unpublished papers, reports, notes,…)
- Data homogeneity checked

Data cleaning by local/national experts:

- Taxonomic reliability
- Taxonomic consistency
- Assignment Alien /Native species



www.faunaitalia.it/checklist/ www.eunis.org omnidia.free.fr

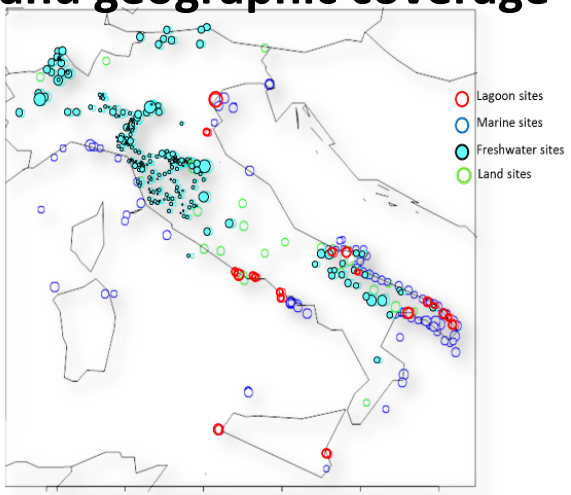
www.marinespecies.org www.ittiofauna.org www.fishbase.org

www.faunaeur.org www.algaebase.org scientific publications

The large database allows to test and describe generalized invasion patters

A large taxonomic, habitat and geographic coverage

34386 TOTAL OBSERVATIONS
12406 SPECIES
563 SITES
42 PHYLA
36 HABITATS (EUNIS LEVEL 2)
40 YEARS OF OBSERVATIONS



The **LifeWatch Biodiversity database** contains both native and alien species distributed within Eunis habitats along the Italian peninsula.

The accuracy of the results is linked to the spatial, ecological, taxonomic, and temporal data homogeneity.

Access to data is a priority strategy

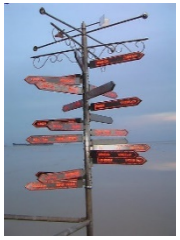
Data papers

INTEGRATION OF DATA

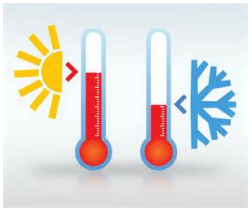
Data of occurrence were integrated with an array of variables abiotic on sites of observation.

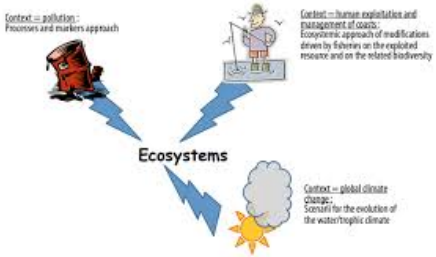
Annual Mean Temperature
Mean Diurnal Temp. Range
Isothermality
Temperature Seasonality
Max Temperature of Warmest Month
Min Temperature of Coldest Month
Temperature Annual Range
Mean Temperature of Wettest Quarter
Mean Temperature of Driest Quarter
Mean Temperature of Warmest Quarter
Mean Temperature of Coldest Quarter
Annual Precipitation
Precipitation of Wettest Month
Precipitation of Driest Month
Precipitation Seasonality
Precipitation of Wettest Quarter
Precipitation of Driest Quarter
Precipitation of Warmest Quarter
Precipitation of Coldest Quarter

Bioclimatic and environmental variables, interpolations of observed data, representative of 1950-2000



Surface Chlorophyll-a Concentration (ChlA)
Annual Sea Surface Temperature 2009-2013
Distance (in min) from large cities
Distance (in km) from large harbors
Pathways and vectors
Anthropic pressure
Max length of a species (in mm)
Min salinity (PSU)
Mean salinity (PSU)
Max salinity (PSU)





WorldClim - Global Climate Data
Free climate data for ecological modeling and GIS

INTEGRATION OF DATA

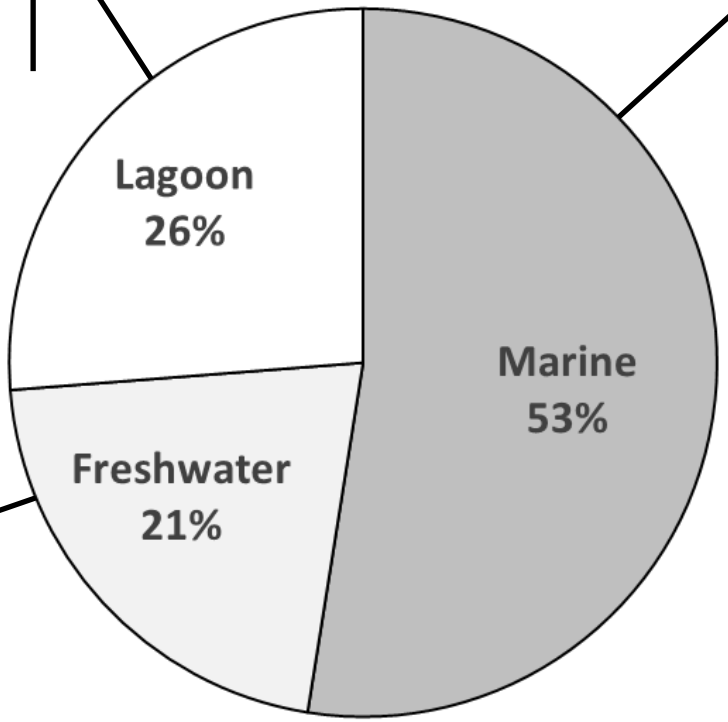
Maritime traffic

Aquaculture activities

7400 DIFFERENT SPECIES IN DIFFERENT AQUATIC COMPARTMENTS

X02 saline lagoons
X03 brackish lagoons

1834 species



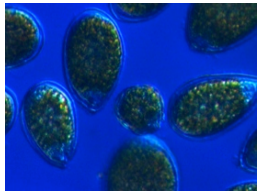
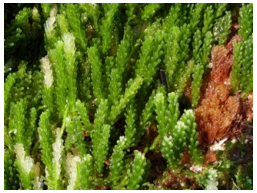
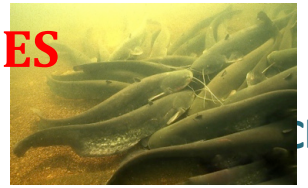
A1 littoral rocks
A2 littoral sediments
A3 infralittoral rocks
A4 circalittoral rocks
A5 sublittoral sediments
A6 deep sea beds
A7 pelagic waters

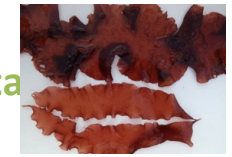
3962 species

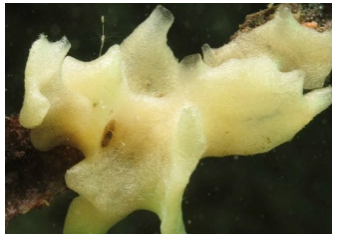
C1 standing waters
C2 running waters
J5 artificial waters

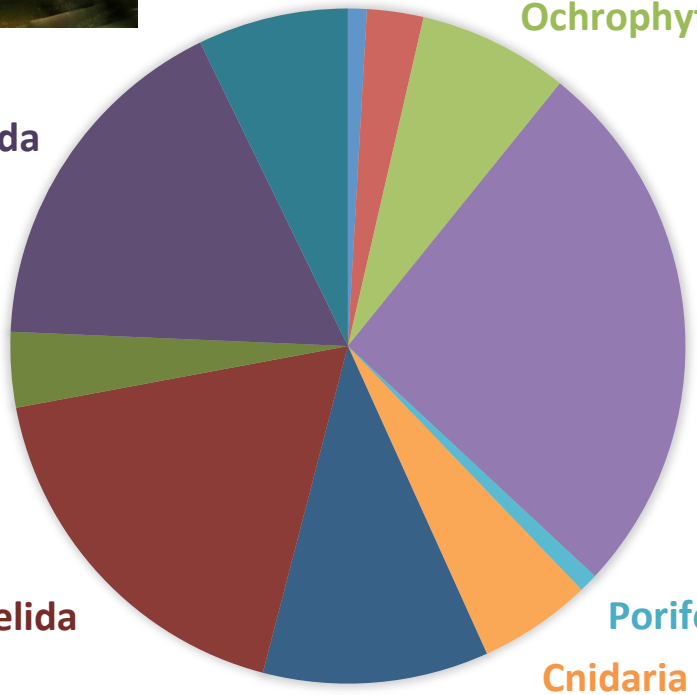
1604 species

186 ALIEN SPECIES

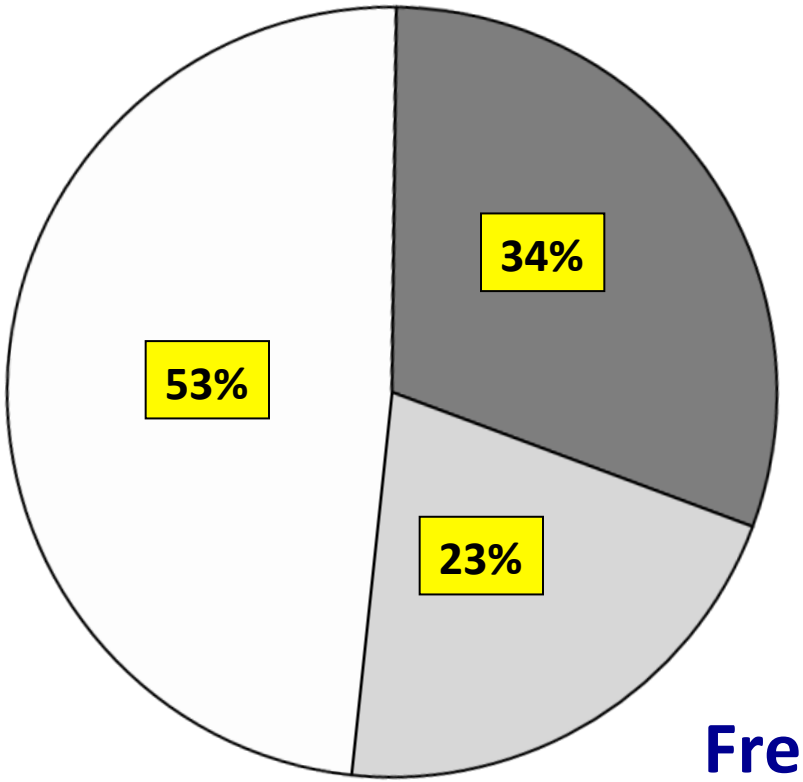


ALIEN SPECIES IN DIFFERENT AQUATIC COMPARTMENTS

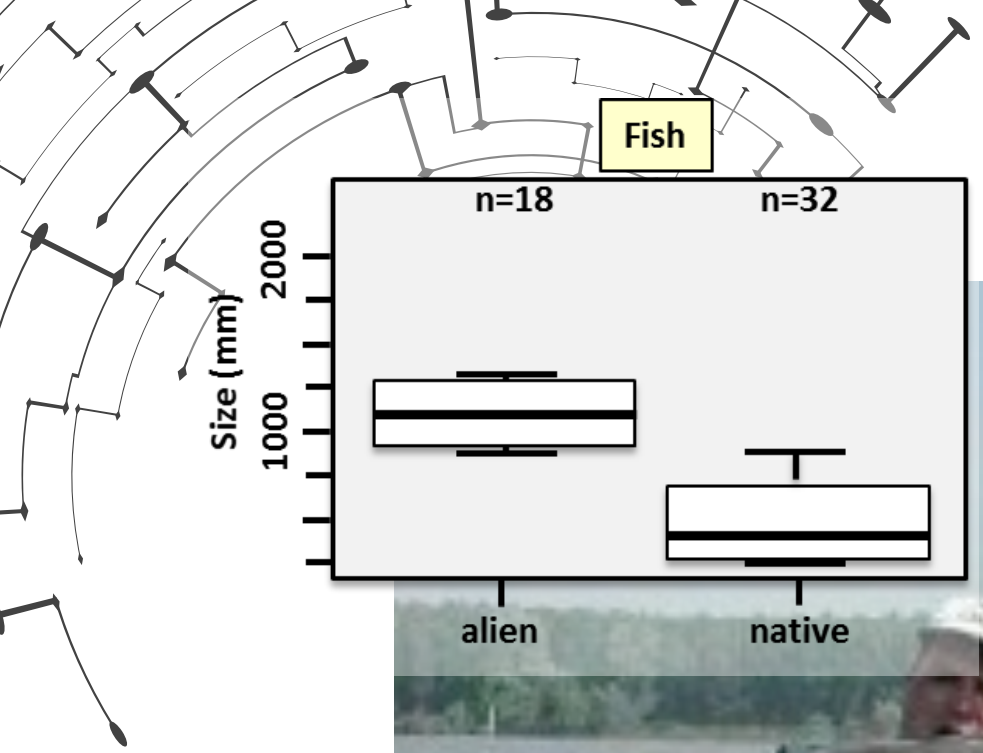
186 AS

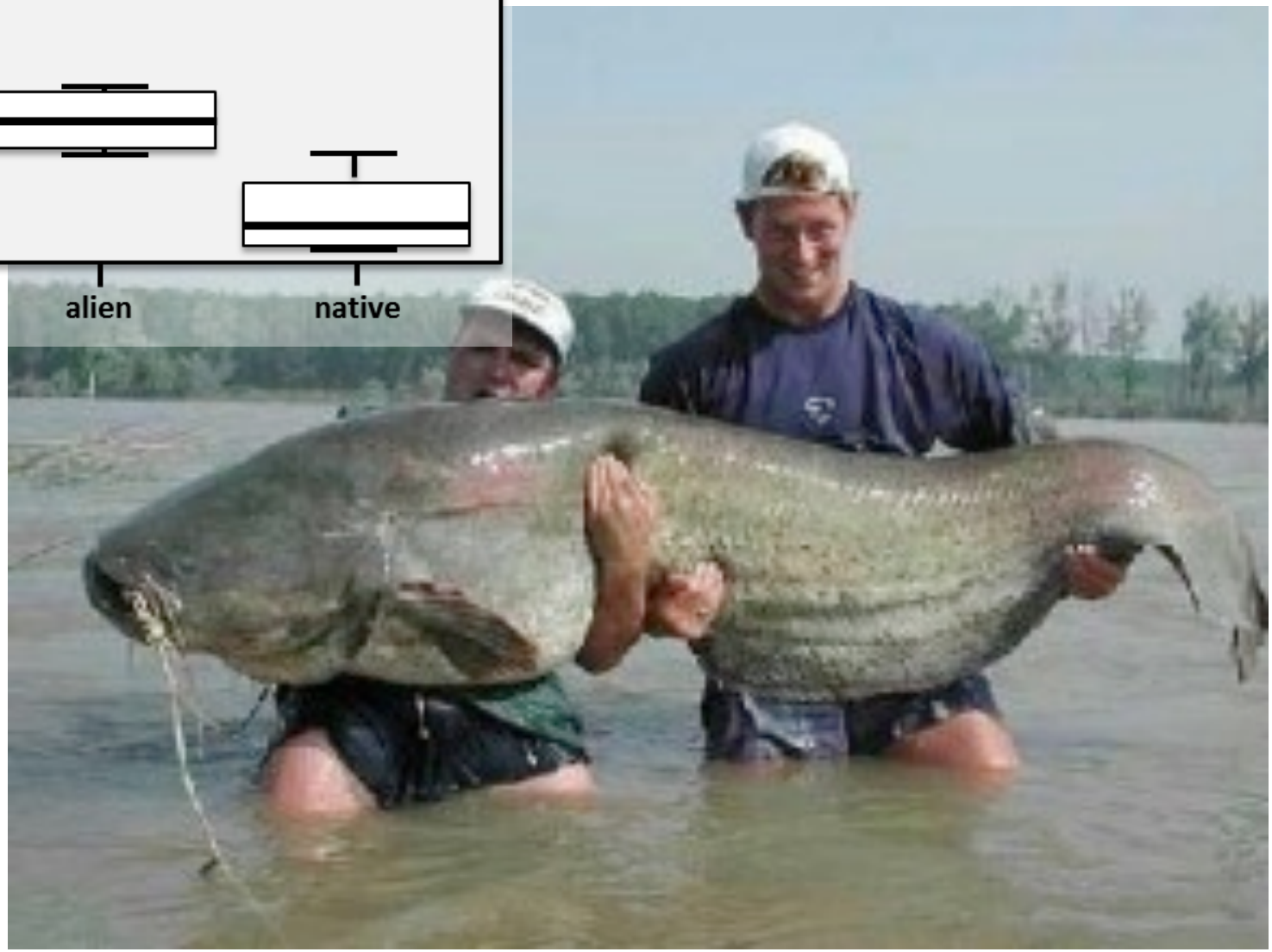


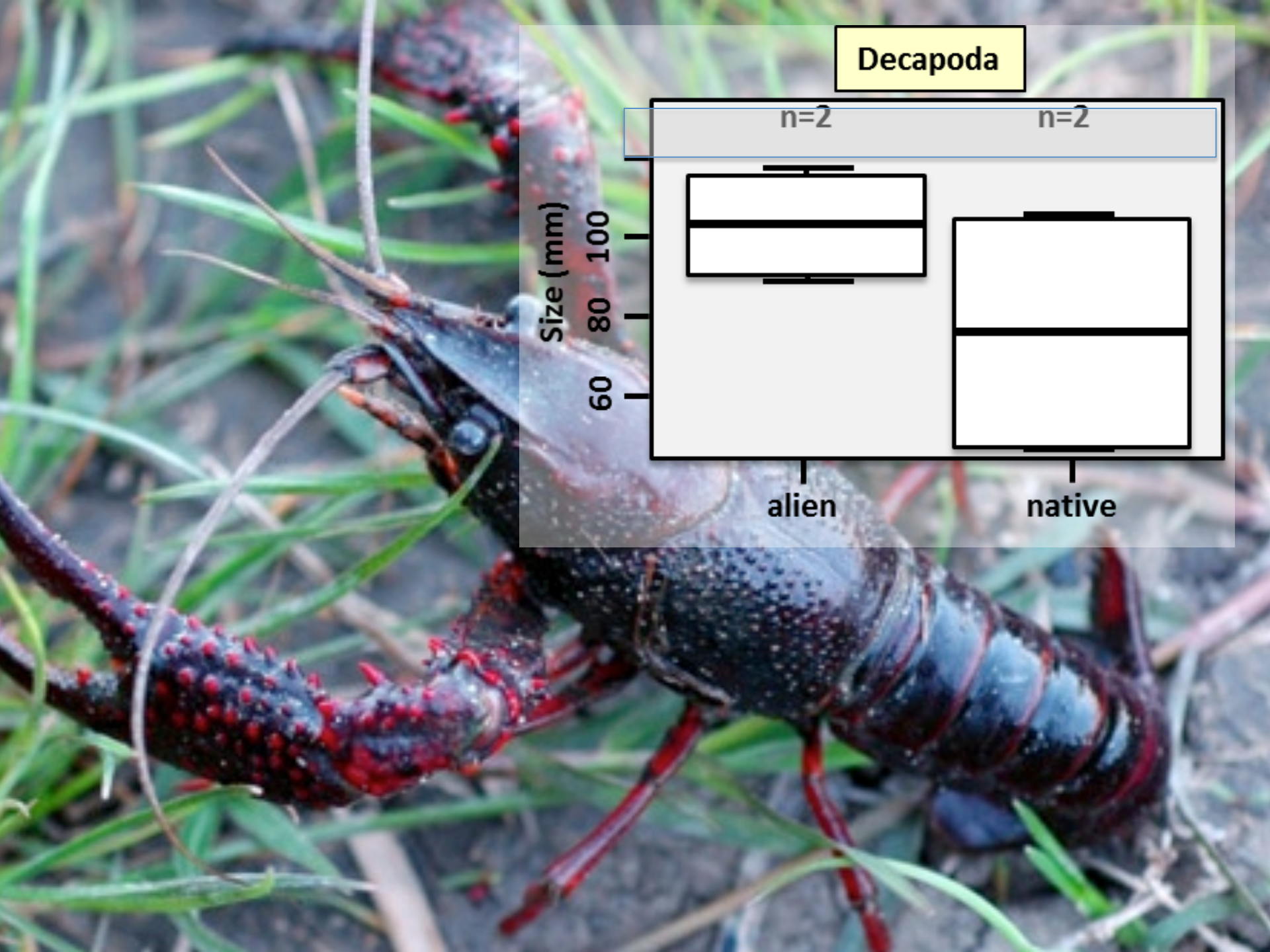
Marine
56 AS (1.5%)

Lagoon
78 AS (4.9%)

Fresh water
67 AS (2.6%)


Fish
n=18
n=32
Size (mm)
2000
1000
alien
native



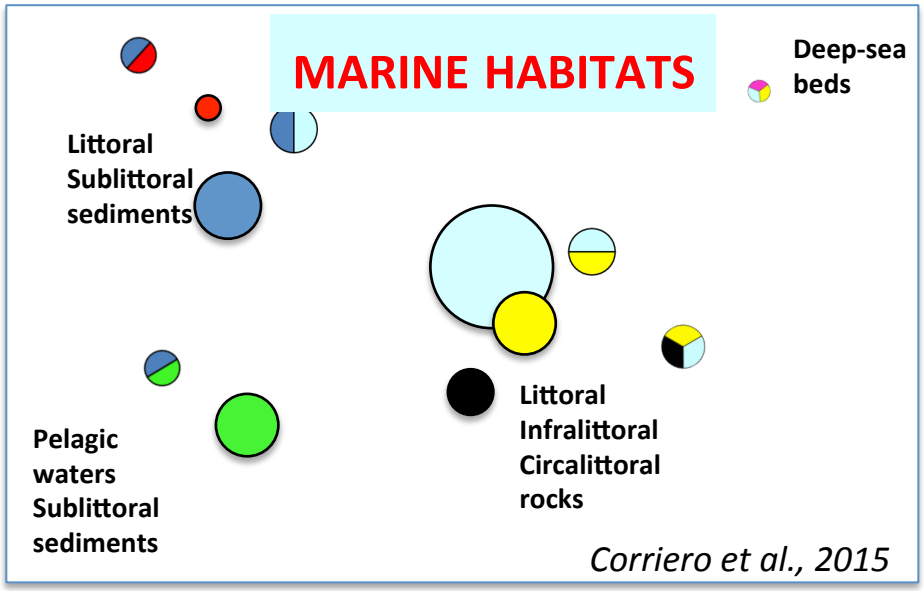

Decapoda
n=2
n=2
Size (mm)
60
80
100
alien
native

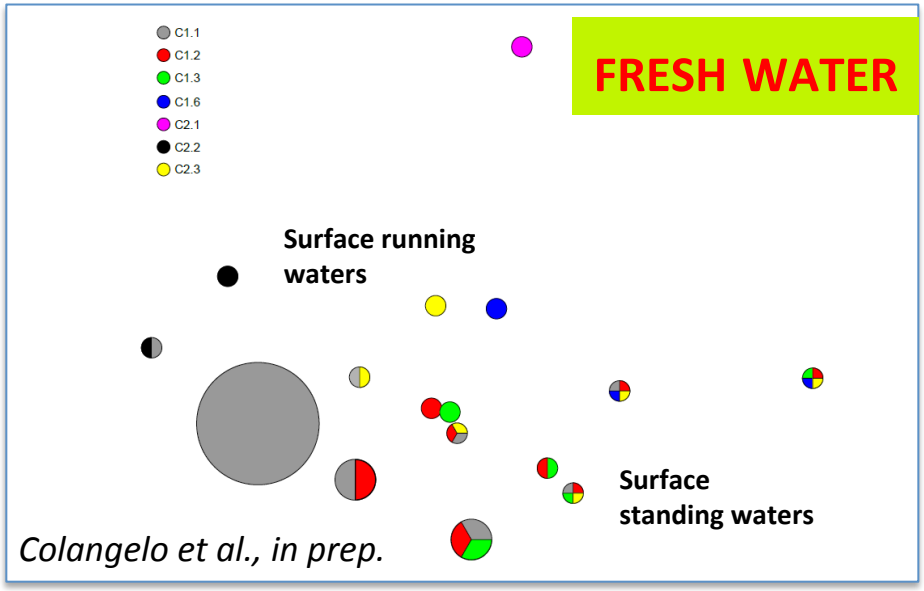
TRANS-HABITATS DISTRIBUTION OF AS

ACCORDING TO LITERATURE*, 38 AS REPORTEDED IN LIFEWATCH DATA SET ARE POSSIBLE INVASIVE.

THE ANALYSIS OF THEIR DISTRIBUTION HIGHLIGHTS THAT THEY SHARE THE ABILITY TO COLONIZE DIFFERENT (SOMETIME VERY DIFFERENT) HABITATS (TRANS HABITAT AS).

THE TOTAL NUMBER OF TRANS HABITAT AS IN LIFEWATCH AQUATIC DATASET IS 65

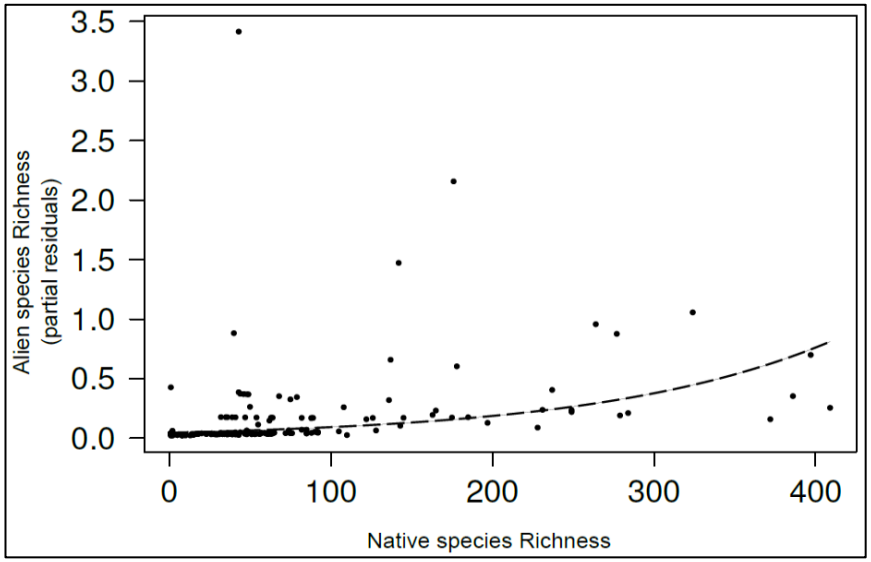


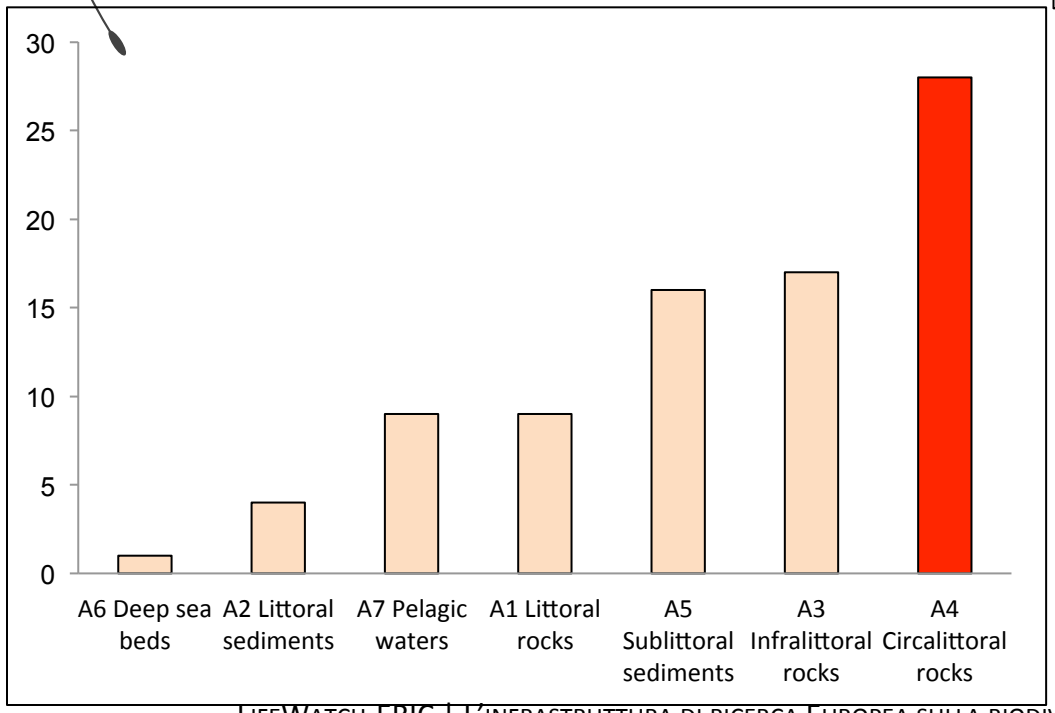


*Streftaris and Zenetos, 2006. Alien Marine Species in the Mediterranean – the 100 «Worst Invasive» and their impact.

NATIVE RICHNESS VS. ALIEN RICHNESS

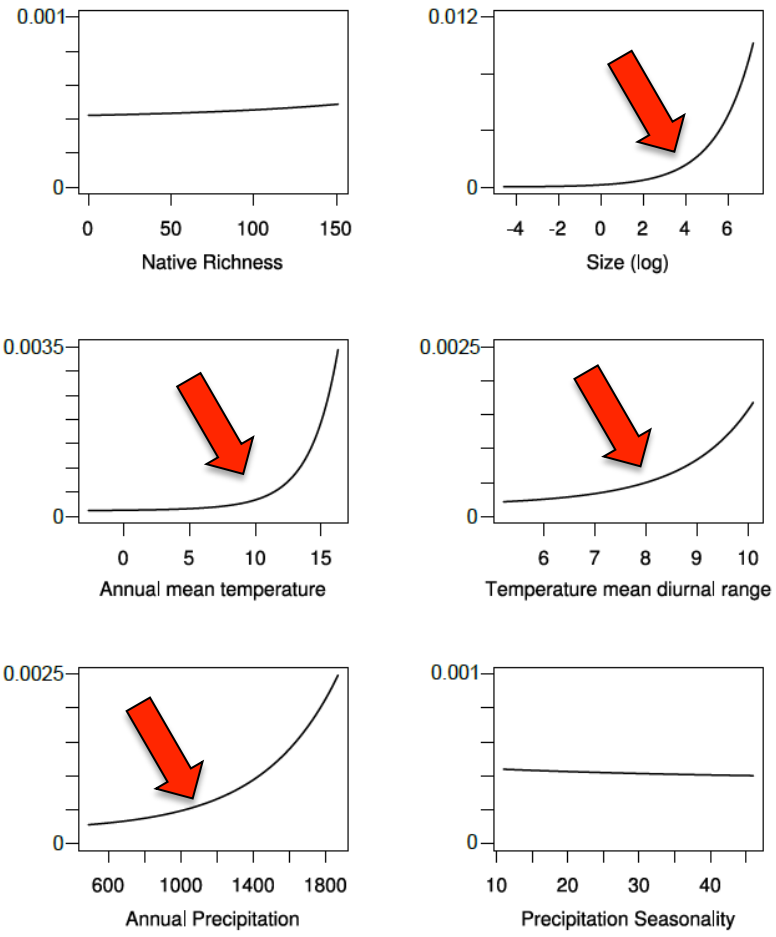
Positive correlation with species richness in freshwater and marine habitats





The highest number of AS occurs in Circalittoral rocks habitats

Predictive models



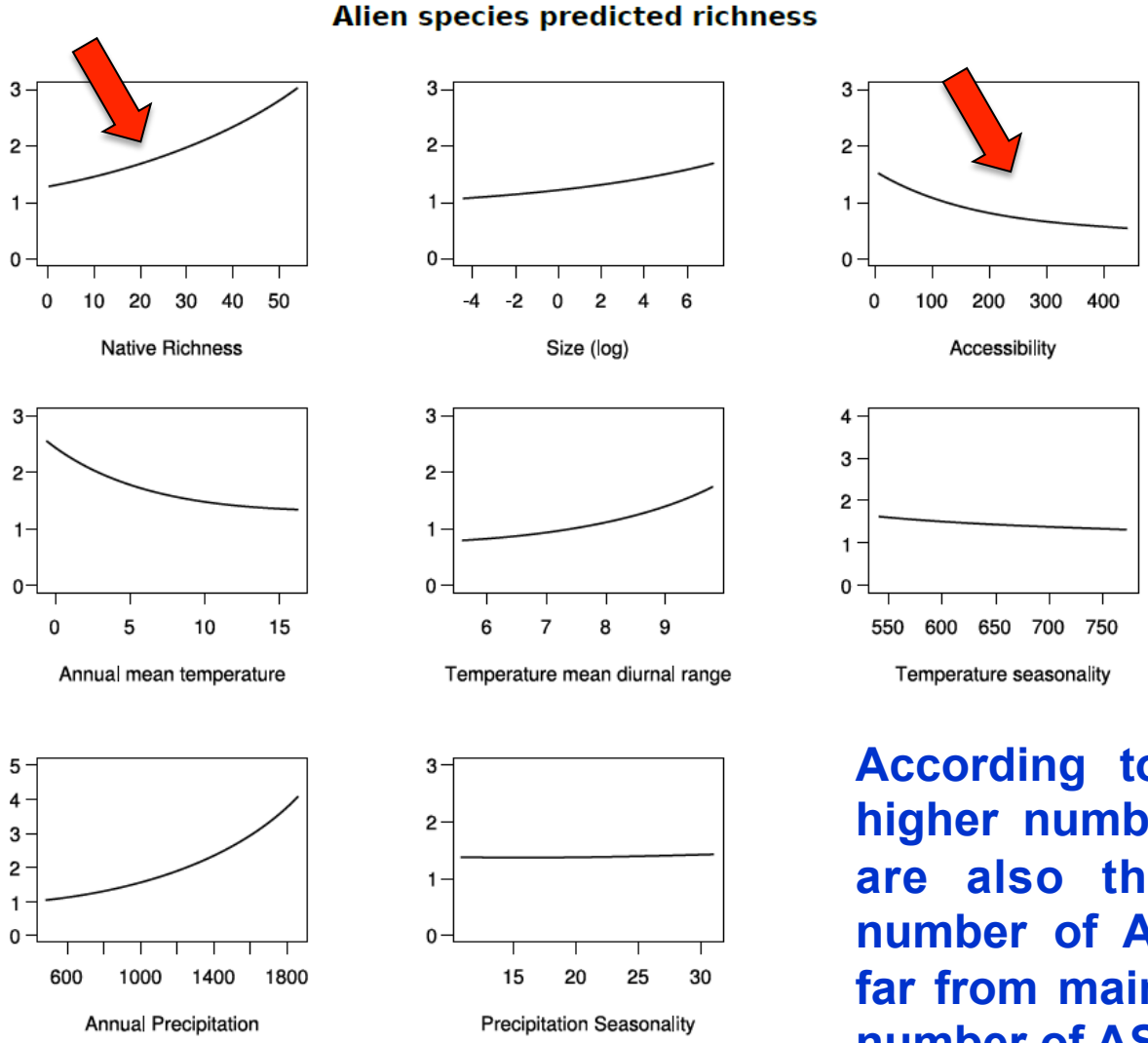
FRESH WATER

AS OCCURRENCE PROBABILITY

GLMM suggests that AS occurrence probability increases with increasing values in almost all the climatic variables. In particular, when the annual mean temperature reaches 10°C the probability to find AS increases exponentially. Also size of species may be a sign of invasion risk

Colangelo et al., in prep.

Predictive models



FRESH WATER

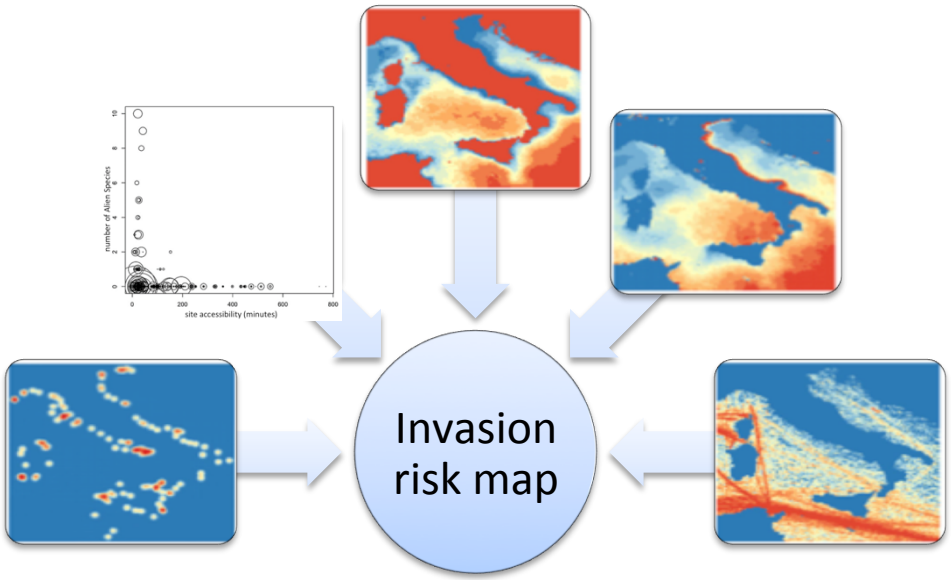
According to GLMM, sites with higher number of native species are also those with a higher number of AS, and sites placed far from main cities have a lower number of AS.

Colangelo et al., in prep.

INVASION RISK MAP

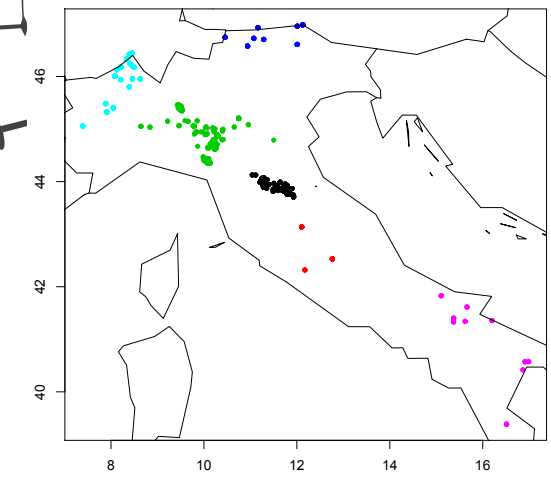
We explored potential drivers on AS invasion (climate, human activities, ecc.) in sample sites and combined them to extraplotate results at a national level

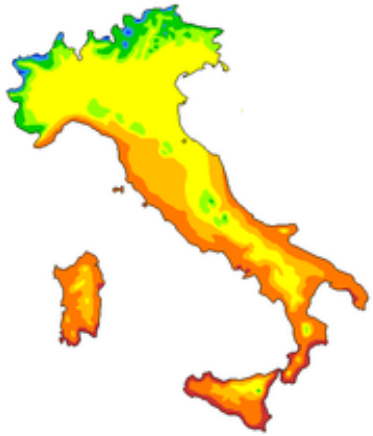
We are exploring the possibility to use the outcomes of GLMMs models to produce invasion risk maps.

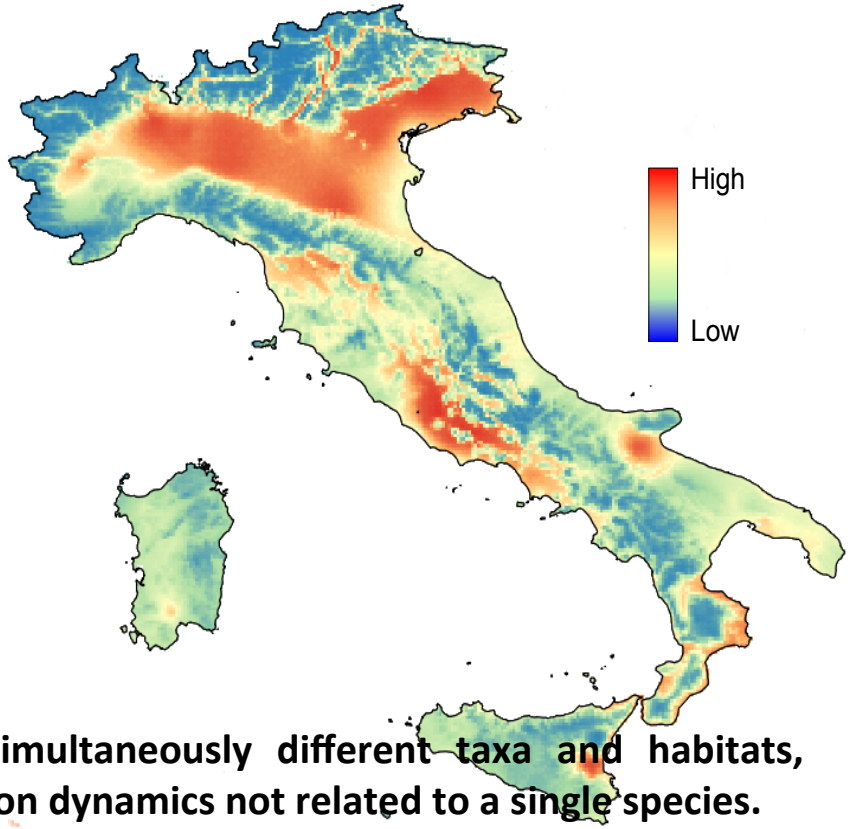


FRESH WATER

INVASION RISK MAPS





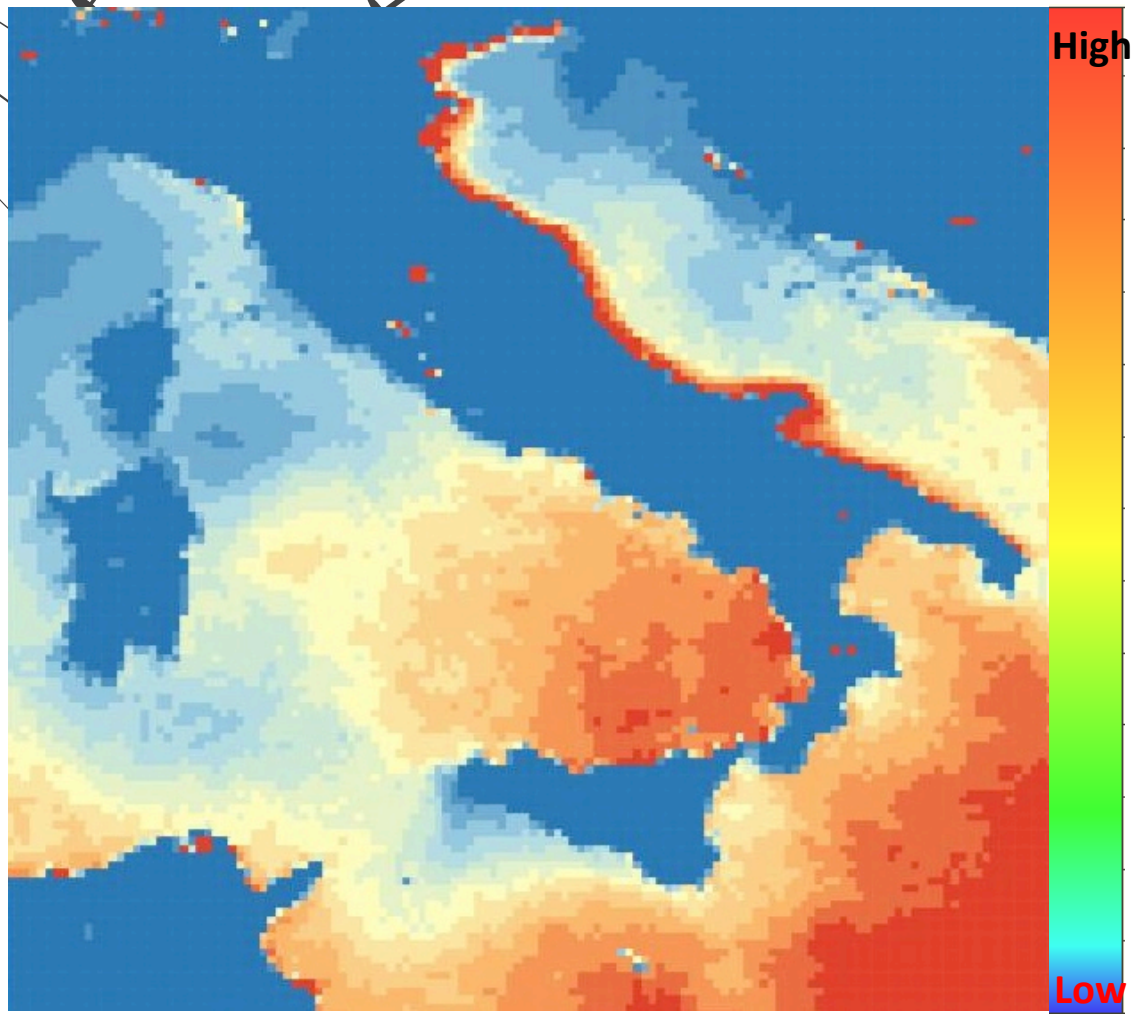


The model considers simultaneously different taxa and habitats, giving a picture of invasion dynamics not related to a single species. In principle it is possible use to create an invasion risk map for the entire Italy.

Results revealed that along the Italian peninsula there are large areas with higher probability of occurrence of AS (Po Valley, northern Tuscany and Lazio regions).. In north-eastern Italy the Tagliamento and Piave Rivers also fall in a high risk area. In central Italy the Arno, the Tevere, Aniene, Sacco and Liri fall in an area of moderate-high risk. Major northern Italian lakes (Maggiore, Iseo and Garda) fall in an area of moderate risk Southern Italy seemed to have lower probabilities of occurrence than northern and central Italy. However, at least three rivers, the Volturno (Molise and Campania), the Simeto (Sicily) and the Crati (Calabria) rivers fall in an area at a relative higher risk. Finally, mountainous areas such as the Alps and the Apennines show a low probability of occurrence of AS.

MARINE HABITATS

INVASION RISK MAPS



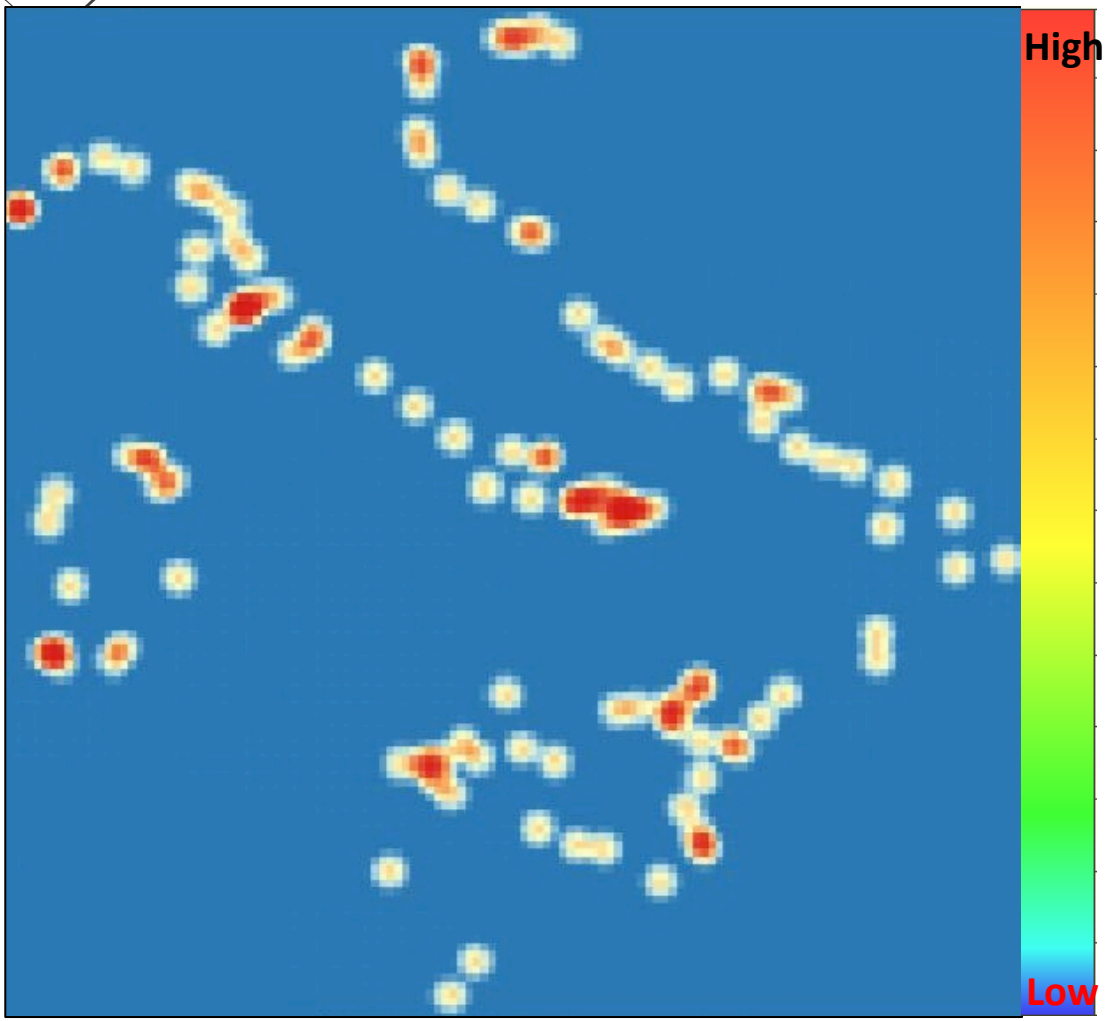
The closer relationship between distribution of AS and examined variables is with the Superficial Water Temperature.

Areas with warmer surface water are more suitable to the AS.
In the Adriatic sea, in particular, the data highlight a high suitability of AS for coastal areas. This is probably due to the low depth.
The model will be tested, as well as on the average, also the limit values of WATER TEMPERATURE, together with temporal variables.

MARINE HABITATS

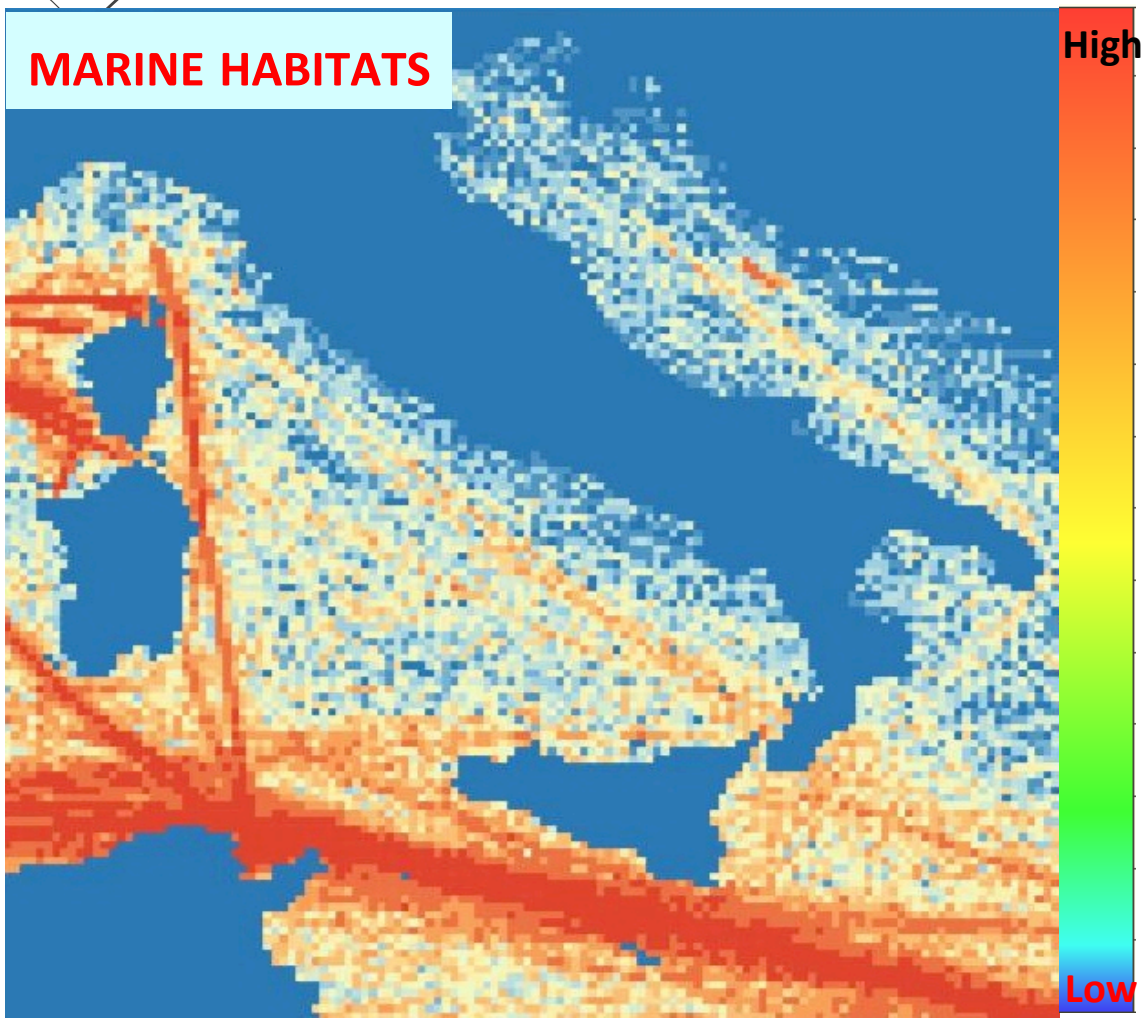
INVASION RISK MAPS

Distribution of AS related to the Italian harbours



As expected AS resulted distributed around the harbours

INVASION RISK MAPS

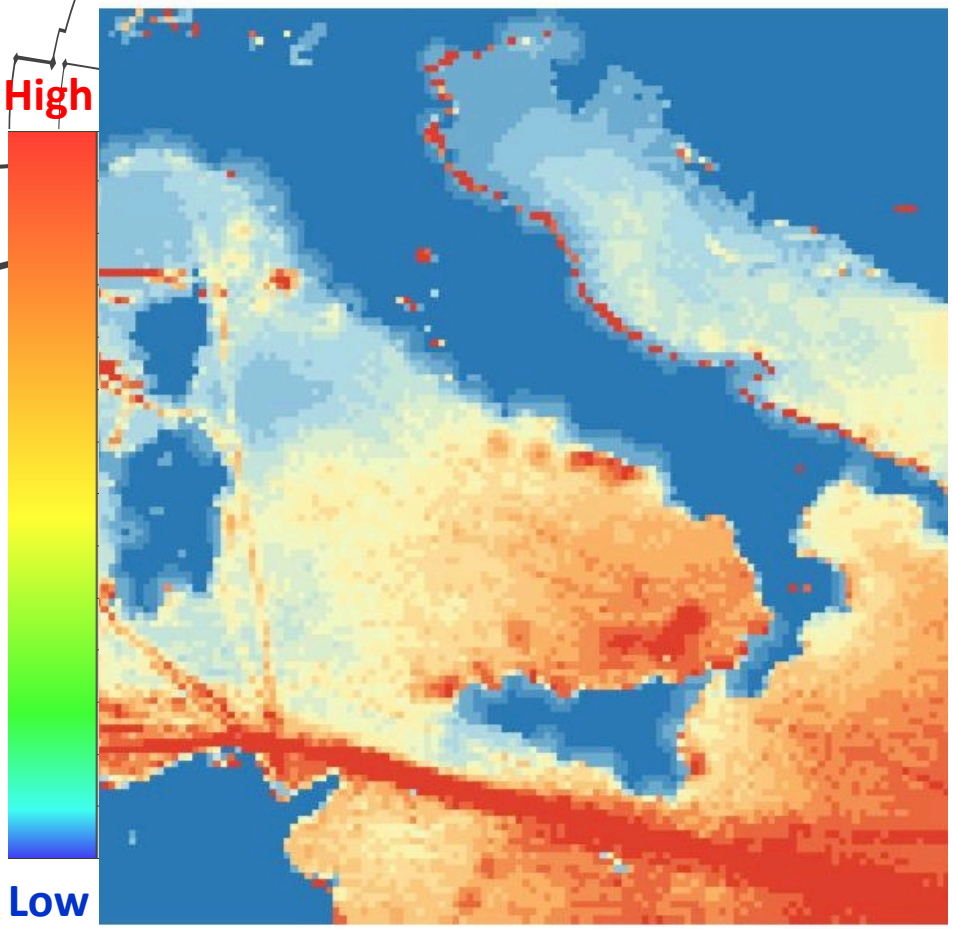


The model indicates the biggest risk values in the Sicily Channel, the Adiatic coast line, and the low Tyrrhenian.

Maritime traffic little explains the AS distribution, with Taranto and Venice showing lower risks than the low Tyrrhenian and the low Ionian seas.

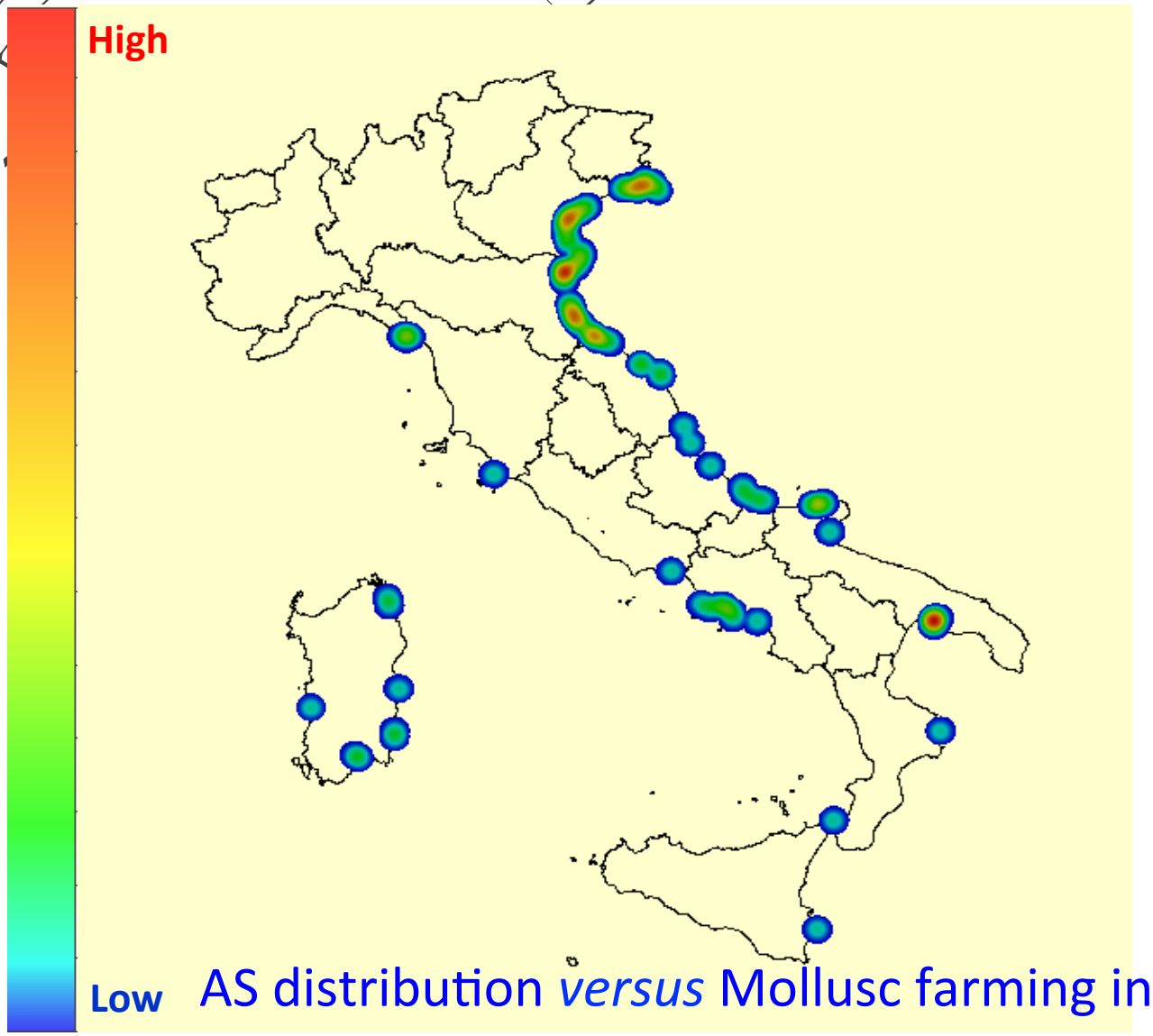
MARINE HABITATS

INVASION RISK MAPS

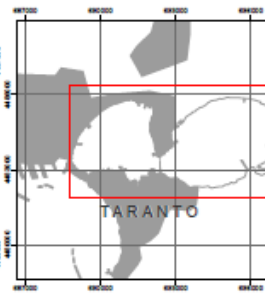


- The model which takes into account together **CHL, Water Temperature, Distance from ports** and **Maritime traffic** gives a more precise picture of the invasion risk;
- The risk is mainly driven by temperature and ChlA. Maritime traffic and distance from harbours locally correct the map;
- The Adriatic Sea, unexpectedly, shows high risk only along the coast;
- Southern Tyrrhenian, Ionian Sea and Sicily channel show the higher risk.

INVASION RISK MAPS



AS distribution *versus* Mollusc farming in Italy.



Coordinate System: WGS 1984 UTM Zone
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500.000,0000
False Northing: 0,0000
Central Meridian: 15,0000
Scale Factor: 0,9996
Latitude Of Origin: 0,0000
Units: Meter

Authors: Francesco Mastrototaro, Giovanni Francesco Curci
- ULR CoNISMa Bari -
Dipartimento di Biologia
Università degli Studi di Bari Aldo Moro

0 0,5

Legenda

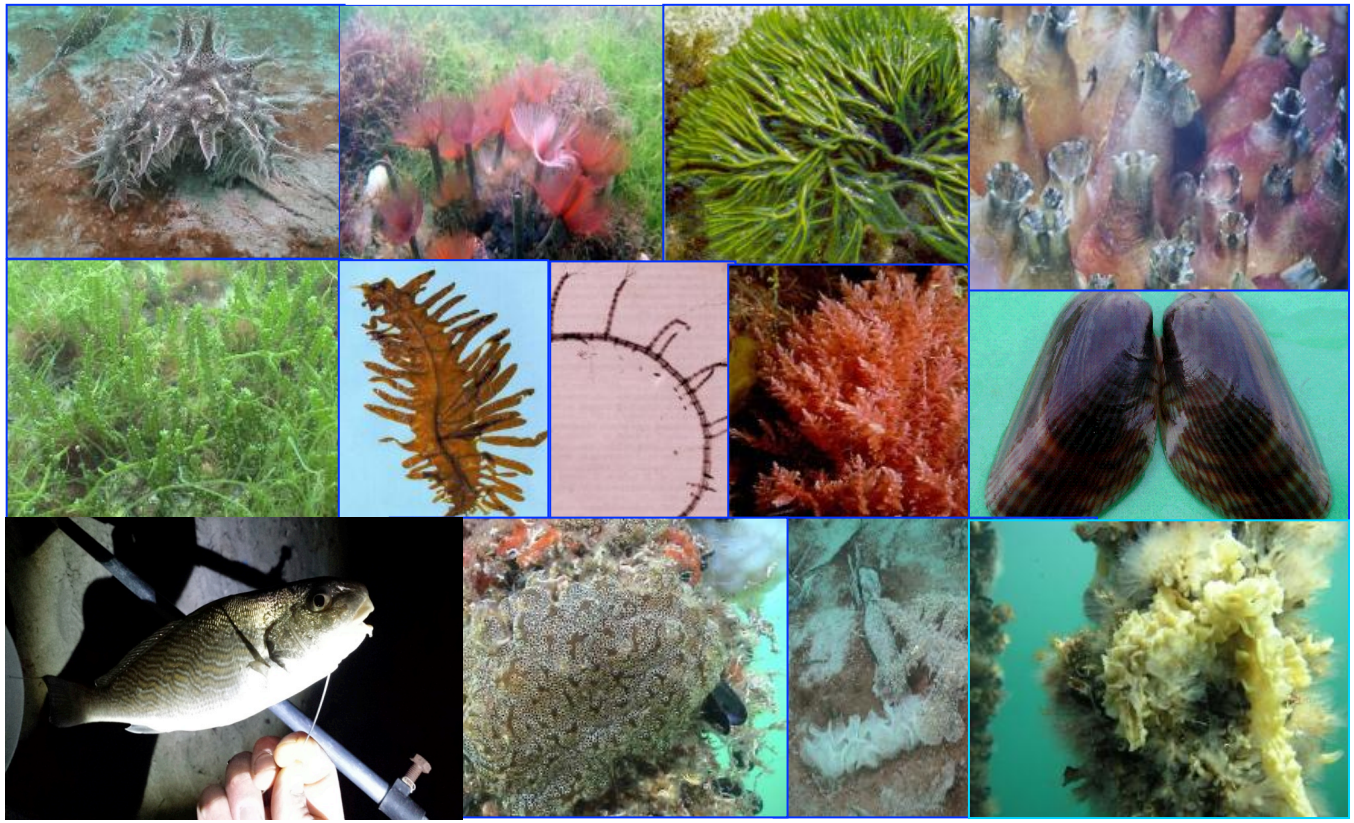
Impianti di mitilicoltura

Tav.:

Scala: 1:130

Titolo:

According to some Authors (Hewitt *et al.*, 2007; Cecere et al., 2010), the most likely vector for the introduction of AS could be the importation of aquaculture organisms for different purposes



An example of LifeWatch dataset: some AS reported from the Mar Piccolo di Taranto. Most of them strongly affect the autocthnous assemblages and show an invasive pattern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Thank You