MSFD EC Decision (2010/477/EU) -Descriptor 2

The two criteria for assessing progress towards GES

2.1. Abundance and state characterisation of non-indigenous species, in particular invasive species — Trends in abundance, temporal occurrence and spatial distribution in the wild of non-indigenous species, particularly ***invasive non-indigenous*** species, notably in risk areas, in relation to the main vectors and pathways of spreading of such species (2.1.1)

2.2. Environmental impact of invasive non-indigenous species — Ratio between invasive non-indigenous species and native species in some well studied taxonomic groups (e.g. fish, macroalgae, molluscs) that may provide a measure of change in species composition (e.g. further to the displacement of native species) (2.2.1)

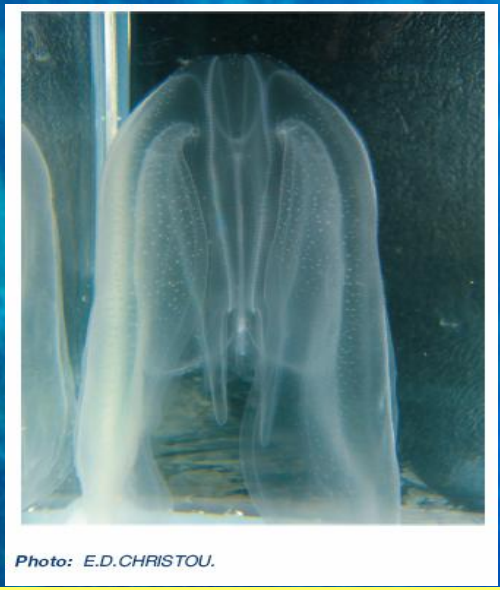
— Impacts of non-indigenous invasive species at the level of species, habitats and ecosystem, where feasible (2.2.2).

Indicator on impact Trends in IAS Early Warning System

IAS: Invasive Alien Species

nuisance, noxious, pests and invasive have also been used to describe introduced species that are known, or believed, to threaten resources valuable to humans and/or Ecosystem services

Harmful species



Mnemiopsis leydi
Origin: NW Atlantic

Phyllorhiza punctata
Origin: Pacific

Rhopilema nomadica

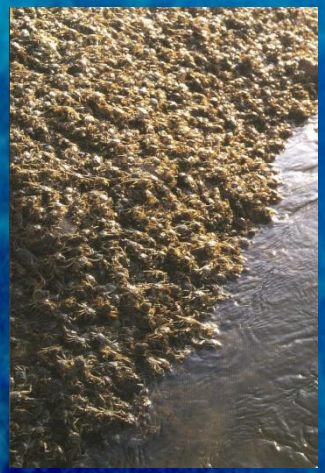
Each summer since the mid 1980s huge swarms of the invading jellyfish, *Rhopilema nomadica*, Galil, have appeared along the Levantine coast. The species originated in the Red Sea and the East African coast, but entered the Mediterranean through the Suez Canal and have established a Levantine population.

A swimmer stung by *Rhopilema nomadica* at Yumurtalik (Adana) during fall 2009 (Photograph:Tahir Ozcan).

Net Damage by Alien Jellyfish- extra cost for fishermen

Photos: Bayram Ozturk

Examples of IAS in European Seas



A. Dreissena (D. Minchin)
B. Didemnum (D. Offer)
C. Eriocheir (S. Gollasch)
D. Crassostrea (S. Gollasch)

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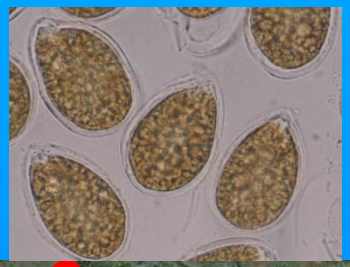
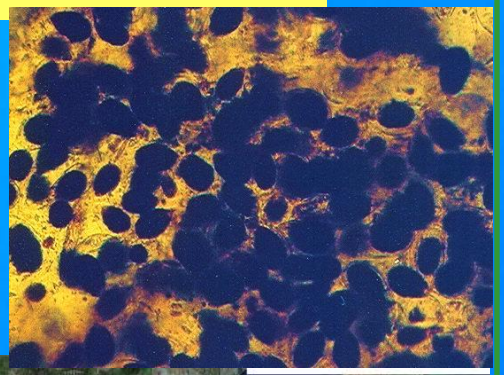
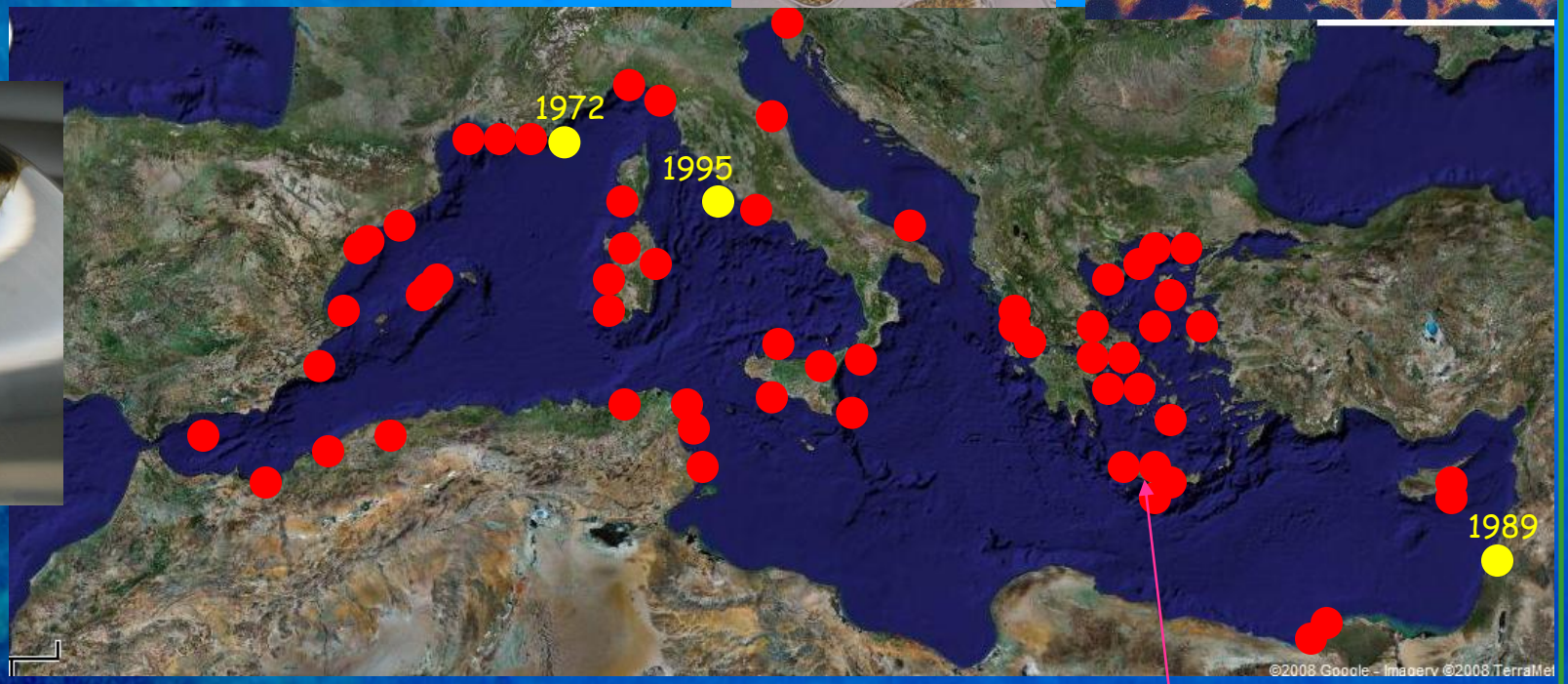
Ostreopsis spp. in the Mediterranean Sea

O. ovata

O. cf. *siamensis*







Source: Aligizaki, 2008. phD Thesis. AUTH, Thessaloniki, Greece.
Aligizaki, 2009. *CIESM monographs, 40. Tunis, 10-14 October 2009*

Crete:2003-2007

Institute

tourism

Beaches On Italy's Riviera Deserted Amid Toxic Algae

Rome (AFP) Jul 20, 2005

Beaches were deserted along a 15 kilometre (nine mile) stretch of the Italian riviera Wednesday after nearly **200 people were hospitalized** having come into contact with a toxic algae flourishing along the Ligurian coast.

Victims had come into either direct contact with the algae while swimming or inhaled it because of a windblown "aerosol affect", doctors at Genoa's Galliera hospital said. All were discharged within a few hours, after being treated for **fever, nausea and irritation to eyes and nose.**

The toxic algae, known by its scientific name "***Ostreopsis ovata***", first appeared on Sunday. Genoa mayor Giuseppe Pericu ordered the beaches closed to bathers on Tuesday.

And while the azure Ligurian sea looks inviting in the summer heat, fines of **50 euros** will be imposed on anyone defying the ban.

Brescianini et al. 2006. Eurosurveillance 11(9).
Ciminiello et al. 2006. Anal Chem. 78, 6153-6159.

aquaculture

Restriction of fisheries and commercial activities regarding bivalve mollusks for **more than 3 months** each year due to **Shellfish Contamination By Palytoxin-like Compounds**

Aligizaki K, Katikou P, Nikolaidis G, Panou A, 2008. **First episode of Shellfish Contamination By Palytoxin-like Compounds from *Ostreopsis* species** (Aegean Sea, Greece). *Toxicon,* 51: 418-427.

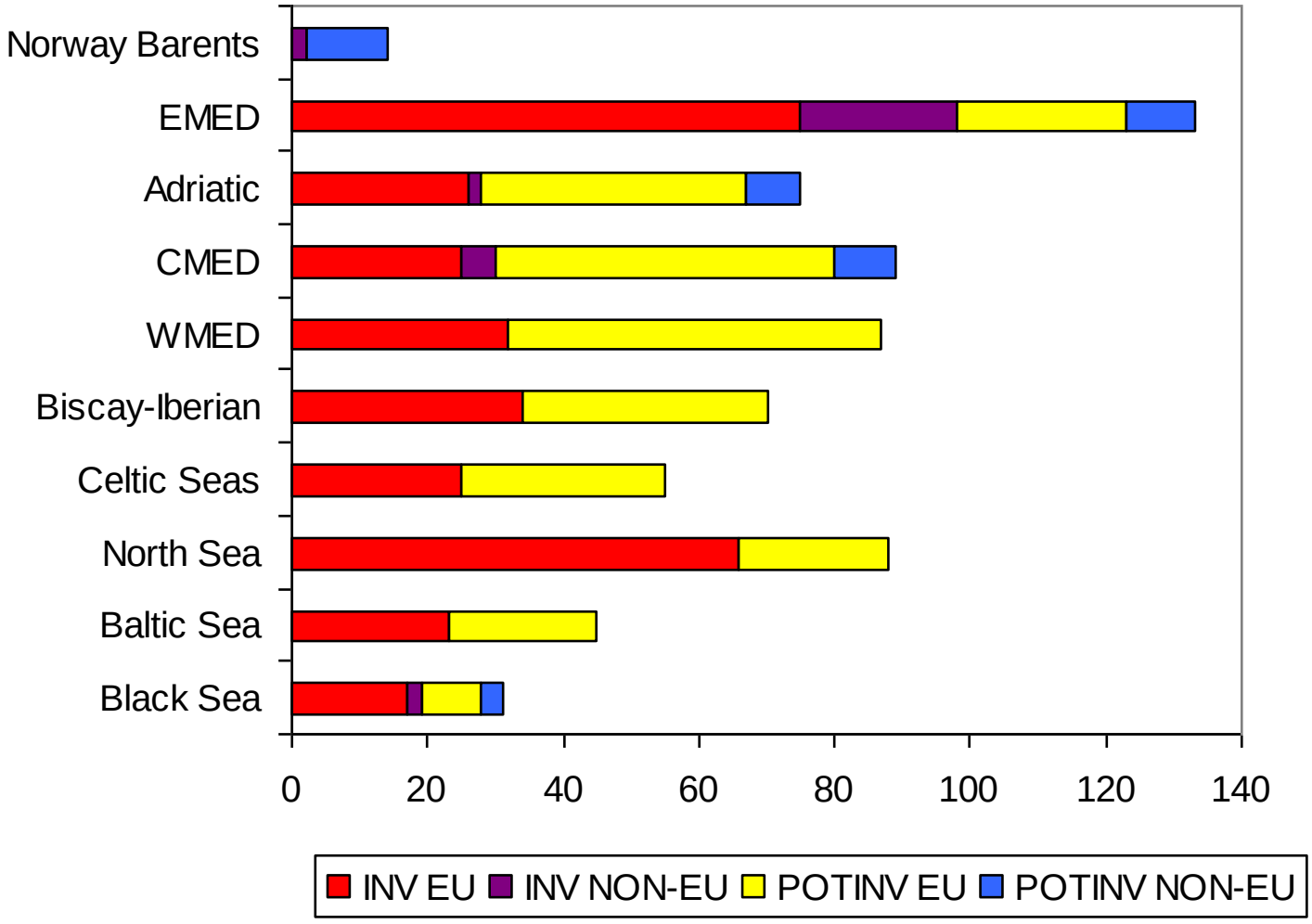
Selection of most invasive species in European Seas

	other	CABI	SEBI	NOBANIS	DAISIE	BSEP	SESAME
Acartia tonsa		yes	yes				
Acrothamnion preissii	"ALIENS"		yes				yes
Alexandrium monilatum						yes	
Amphistegina lobifera							yes
Anadara kagoshimensis			yes			yes	yes
Anadara transversa			yes				yes
Anguillicola crassus		yes	yes	yes	yes		
Aplysia dactylomela							yes
Apogon pharaonis							yes
Aquilonastra burtoni							yes
Asparagopsis armata	"ALIENS", UK		yes				yes
Asparagopsis taxiformis			yes				
Austrominius modestus	GISD	yes	yes				

In European MSFD 184 IAS have been reported, 28 of which are cryptogenic

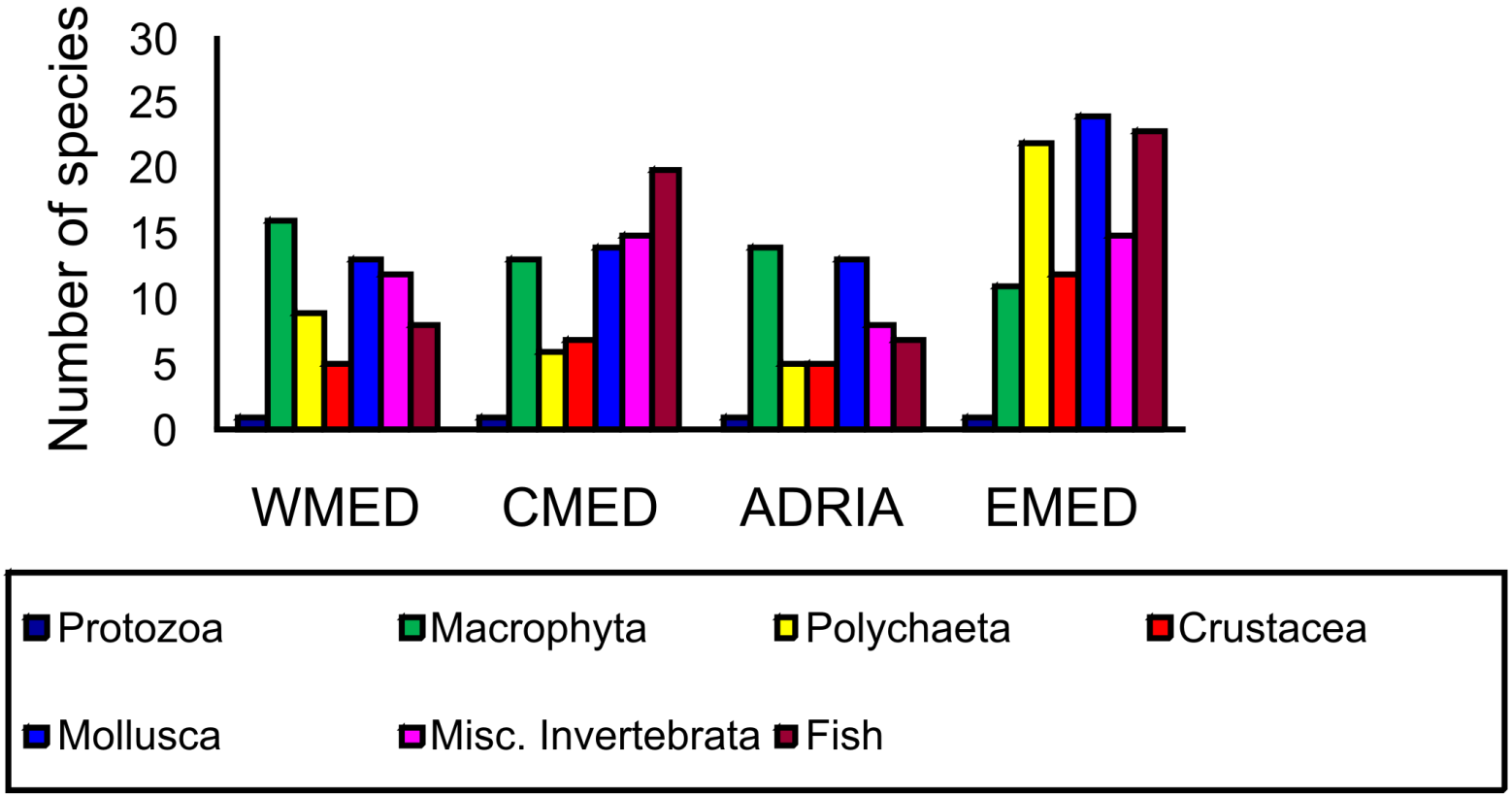
Distribution of IAS in EU MSFD areas

Distribution of IAS and Potential IAS in European Regional Seas



Mediterranean IAS =120 species [-27 in non EU]

- about 19 are commercially exploited (8 fish, 5 crustaceans, 6 molluscs)
- 20 are classified as worst invasives.
- 43 more species are recorded as potentially invasive.

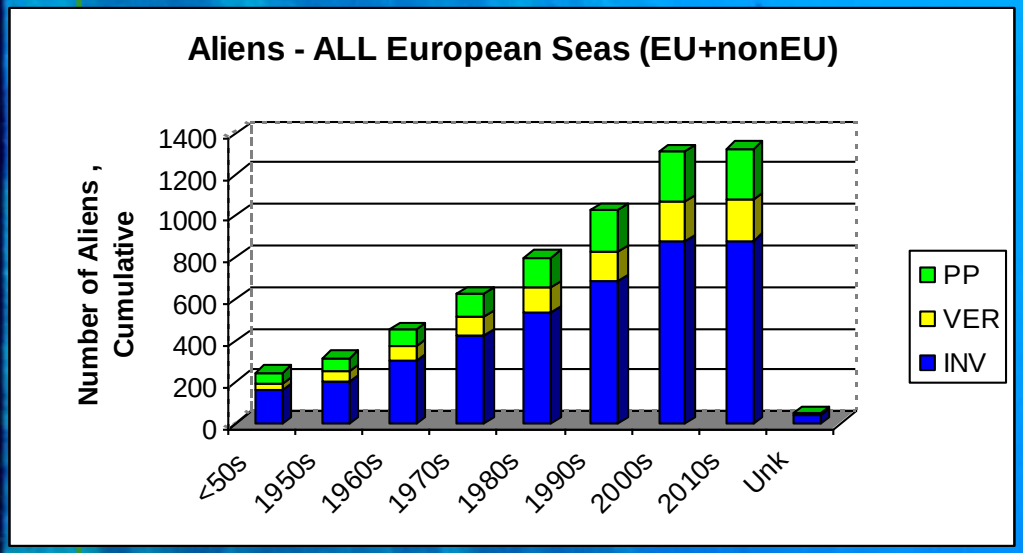


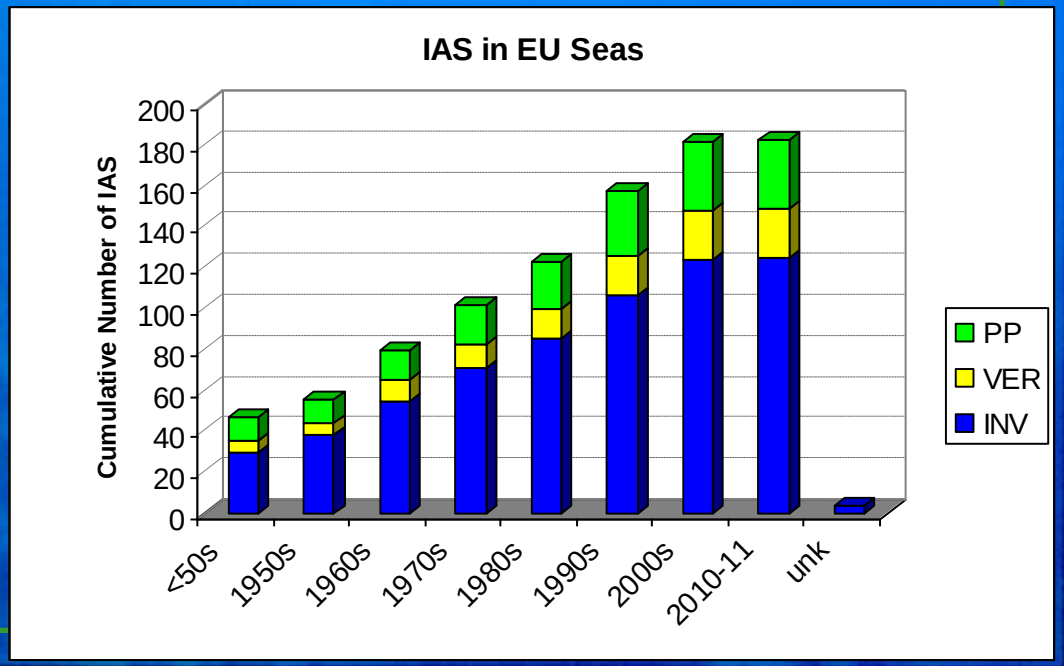
134 IAS in the Mediterranean: WMED (64) CMED(75) ADRIA(53) EMED (108)

Source: Zenetos et al., 2010 MMS

Baltic Sea: only 23 species are classified as invasive in the Baltic Sea, 10 of which are among the "worst invasive" while another 22 are classified as potentially invasive.

Black Sea: **17** species are classified as invasive (with another 9 classified as potentially invasive); however this number corresponds to only two countries that are part of European waters in that MSFD (in the rest of the Black Sea 2 more species are recorded as invasive and 3 more as potentially invasive


Aliens - ALL European Seas (EU+nonEU)
Number of Aliens , Cumulative
1400
1200
1000
800
600
400
200
0
<50s
1950s
1960s
1970s
1980s
1990s
2000s
2010s
Unk
PP
VER
INV


IAS in EU Seas
Cumulative Number of IAS
200
180
160
140
120
100
80
60
40
20
0
<50s
1950s
1960s
1970s
1980s
1990s
2000s
2010-11
unk
PP
VER
INV

2.1. Trends indicators

2.1.1. Abundance and state characterisation of non-indigenous species, in particular invasive species — Trends in abundance, temporal occurrence and spatial distribution in the wild of non-indigenous species, particularly ***invasive*** *non-indigenous species, notably in risk areas,* ***in relation to the main vectors and pathways*** *of spreading of such species (2.1.1)*

European Environment Agency

d Inland Waters

hcmr
ΕΛΚΕΘΕ

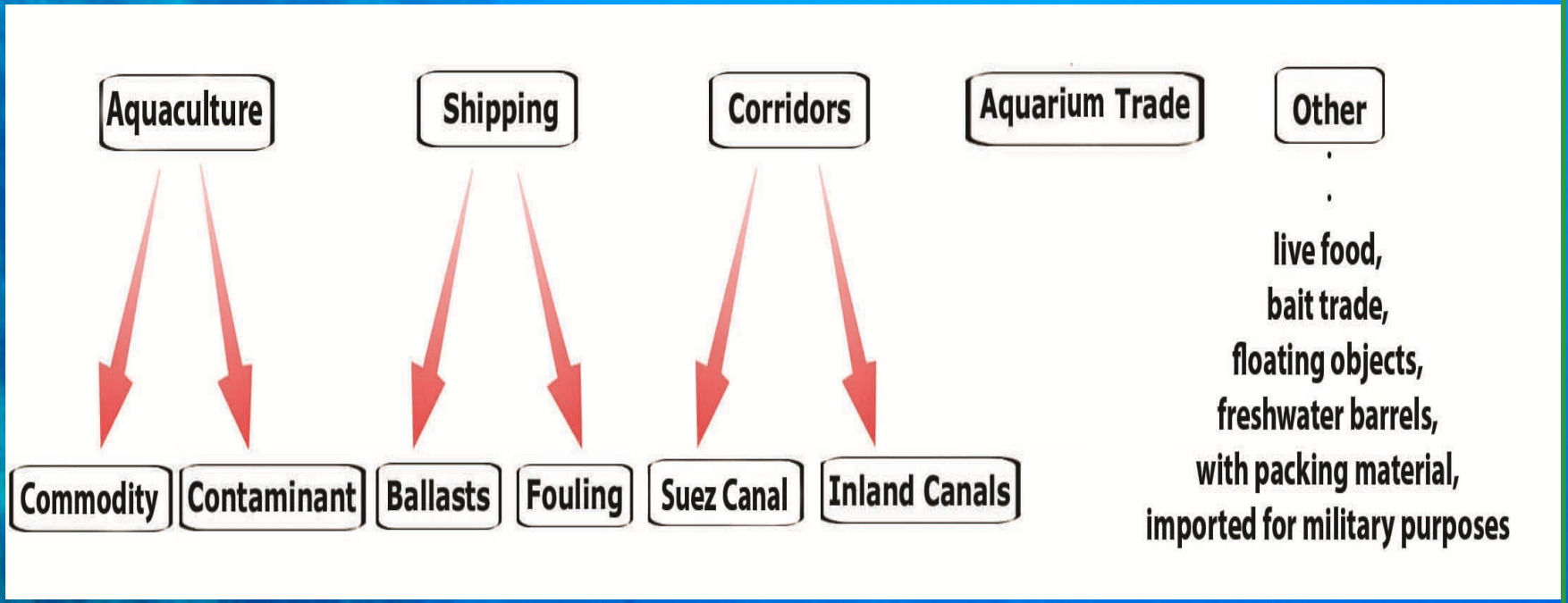
The significance of various pathways/vectors for introduction of Marine alien Species in European Seas

Transitional Coastal and Marine Indicators

EEA activity: 1.5.2.b Sub-assessments on Marine Environmental aspects to 2012 water report

ETC/ICM task.milestone: 5

Pathway	Vector examples of each pathway
Aquarium trade/Public aquaria	Transported water, waste discharge, direct release, packaging
Canals	A specific canal
Culture activities	Aquaculture equipment, packaging, stock movement
Leisure activities	Angling baits, stocking, discharges, sport equipment
Live food trade	Intentional release, waste discharge, transported water
Management	Habitat management, biological control
Natural spread*	Water currents, wildlife
Research & education	With equipment, intentional release, waste discharges
Vessels: ships, vessels, platforms	Ballast water and sediments, sea-chests, hull fouling
Wild fisheries	Fishing gear, discharges, stock movements



Pathways of primary introduction of marine alien species. The framework to categorize pathways of introduction is an adaptation of the frameworks proposed by Hulme et al. (2008) and Molnar et al. (2008)
MAS Pathways analysed in this work for EEA in collaboration with JRC

Definition & Methodology for Trends in Pathways

Different levels of certainty are associated with alien species that become introduced. A scheme proposed by Dan Minchin (2007

There is ***direct information of a pathway/vector***: The species was clearly associated to a specific vector(s) of a pathway at the time of introduction to a particular locality. This is the case in intentional introductions (i.e. aquaculture/commodity) and in many cases of Lessepsian immigrants (

***Amost likely pathway/vector* can be inferred**: The species appears for the first time in a locality where a single pathway/vector(s) is known to operate and there is no other rational explanation for its presence except by this pathway/vector(s). This applies to many species introduced by shipping or aquarium trade or as aquaculture contaminants.

One or more *possible pathways/vectors* can be inferred: The species cannot be convincingly ascribed to a single pathway/vector. Inference is based on the activities in the locality where the species was found and may include evidence on similarly behaving species reported elsewhere.

Unknown: Where there is doubt as to any specific pathway explaining an arrival. Herein, the pathway of 91 species has been assigned as 'unknown'

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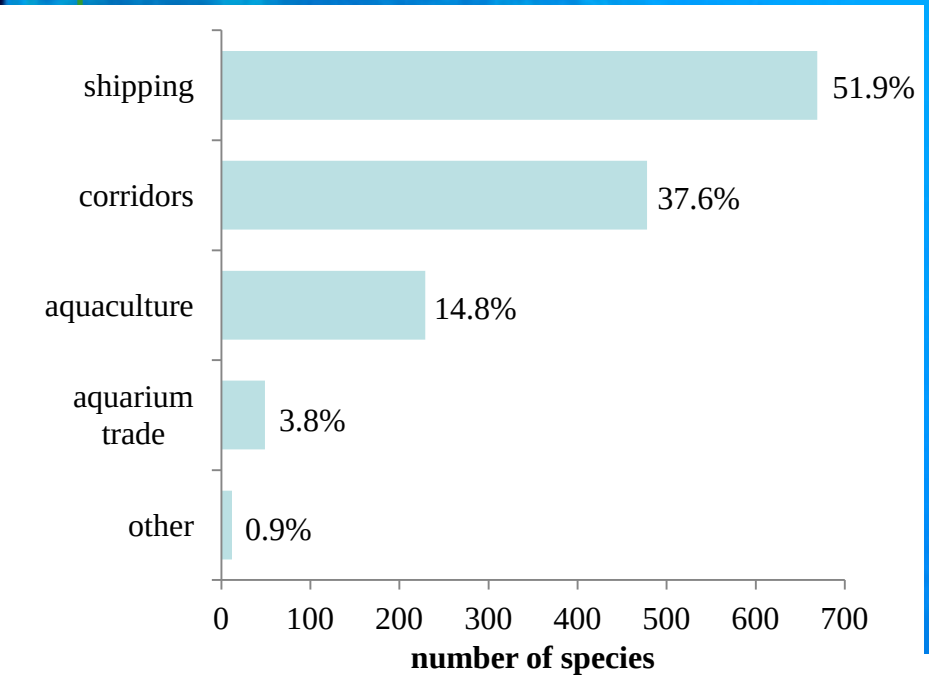

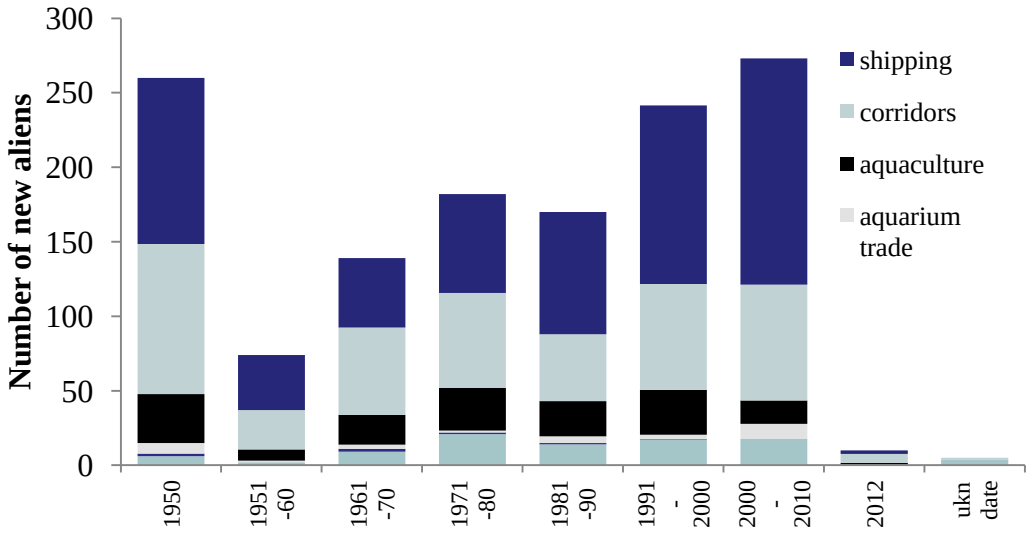

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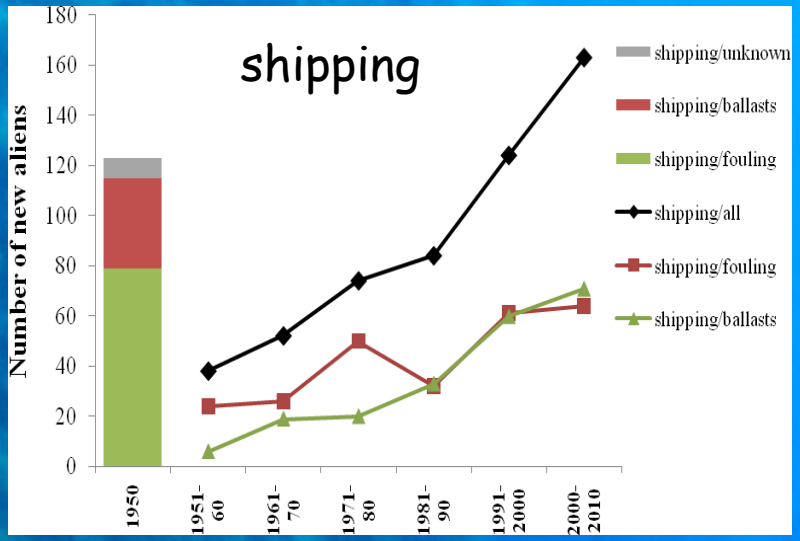
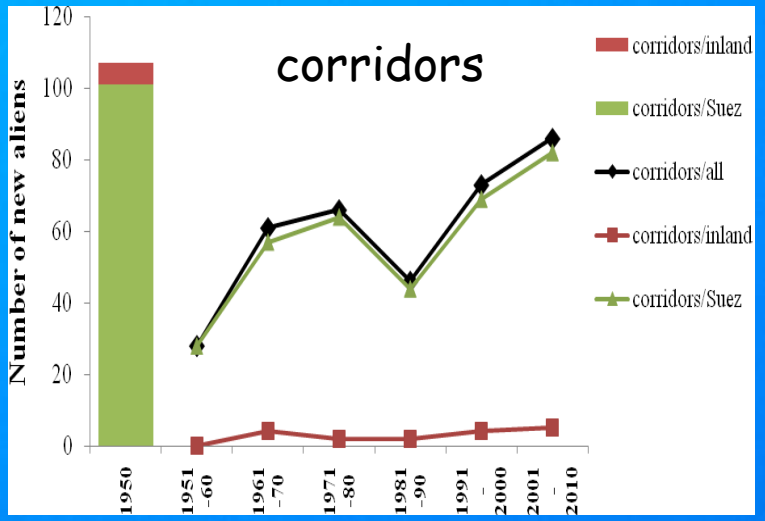
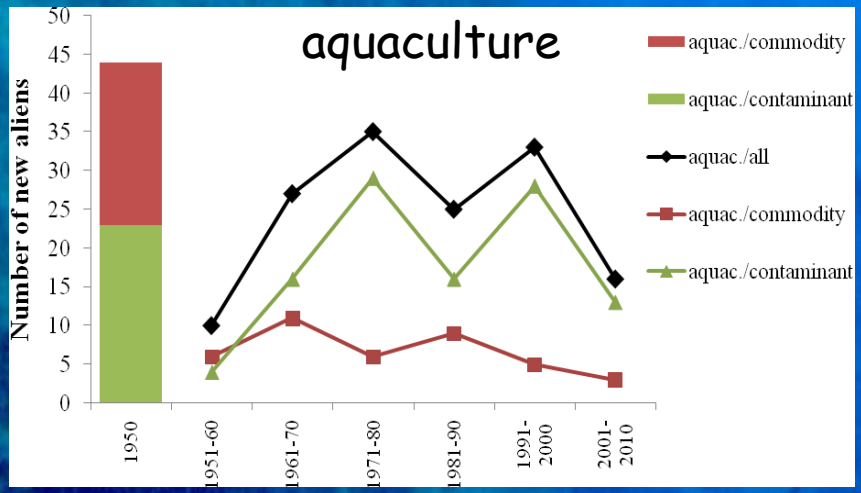
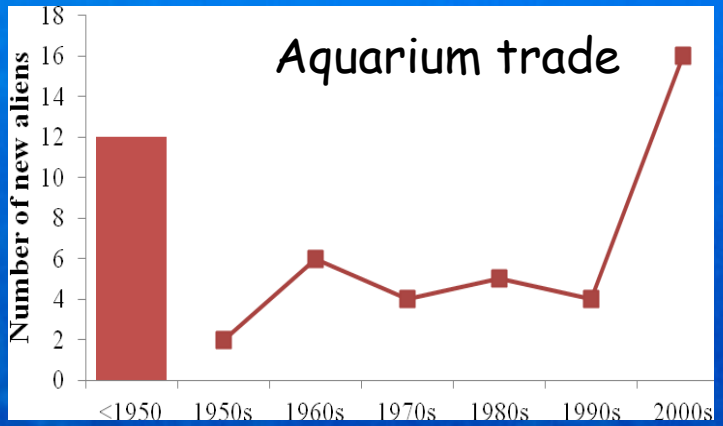








- The transfer of MAS in European Seas with ships' ballast water, tank sediments, and hull fouling increasingly exceeds the importance of other vectors (51.9%) followed by unintentional introductions via marine and inland corridors (37.6%), aquaculture related activities (14.8%) and aquarium trade (3.8%).
- Trends in pathways exhibit an increasing rate of ship mediated MAS whereas the rate of species' introduction related with aquaculture activities (imported and accidentally introduced with them: contaminants) is decreasing. Aquarium Trade introductions have tripled over the last decade

Argyro Zenetos (HCMR), Stelios Katsanevakis (JRC), Constança Belchior (EEA), Ana Cristina Cardoso (JRC)

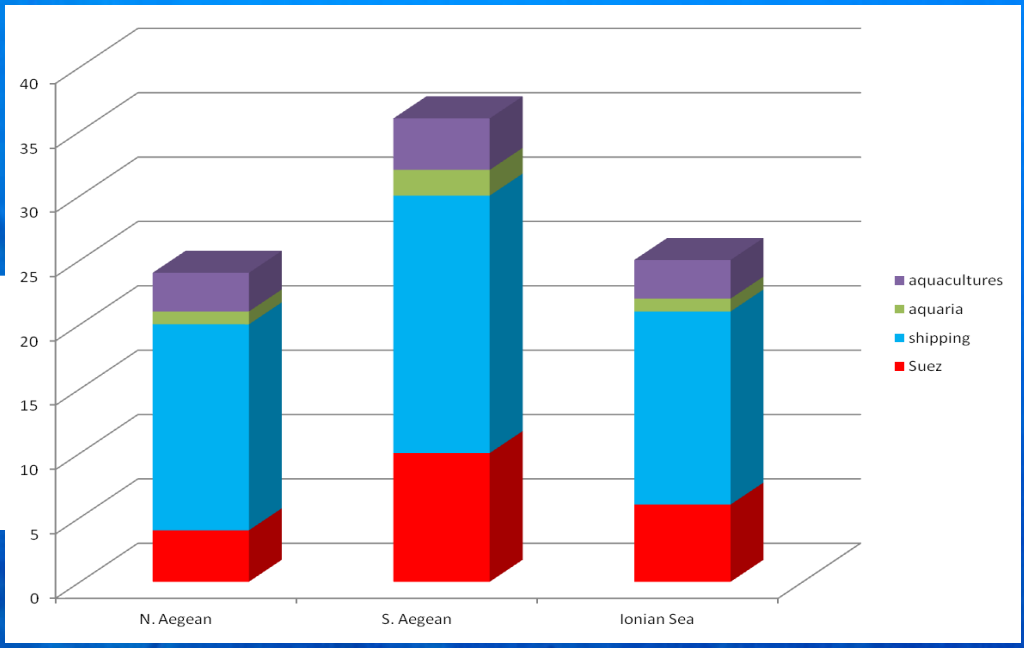
Invading European Seas: assessing pathways of introduction of marine aliens

submitted to *Biological Invasions*

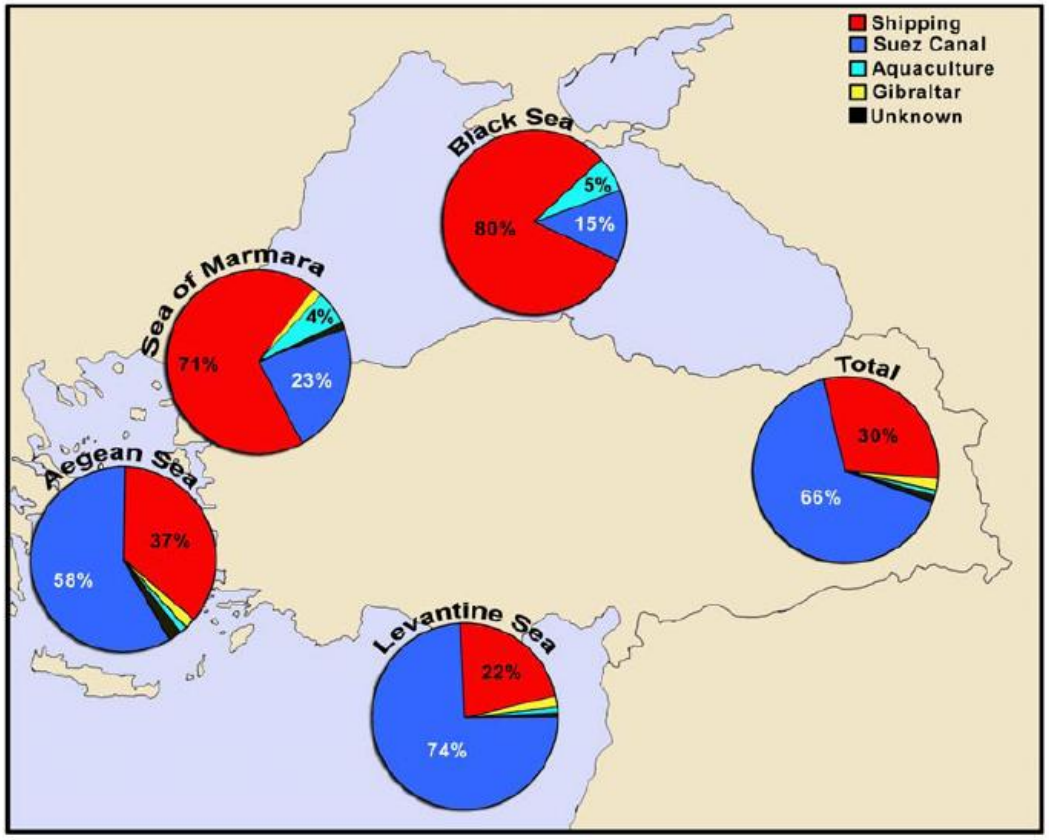
Next steps

Pathway/vector per MSFD area

Pathway for alien macroalgae in Greece (Tsiamis, 2009)



The modes of introduction for alien species on the coasts of Turkey.



MSFD EC Decision (2010/477/EU) -Descriptor 2

The two criteria for assessing progress towards GES

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— Impacts of non-indigenous invasive species at the level of species, habitats and ecosystem, where feasible (2.2.2).

	COLL *et al.*, 2010			This work	
Taxon	all	aliens	native	aliens	% aliens
Protozoa (excluding Foraminifera)		0	0	4	
Foraminifera	>600	0	600	50	8.3
Rhodophyta	657	73	584	79	13.5
Phaeophyta & Pelagophyceae	277	23	254	24+1	9.8
Chlorophyta	190	17	173	20	11.6
Magnoliophyta	7	1	6	1	16.7
Polychaeta	1172	75	1097	129	11.8
Crustacea	2239	106	2133	153	7.2
Mollusca	2113	200	1913	212	11.1
Cnidaria	757	3	754	46	6.1
Bryozoa	388	1	387	23	5.9
Ascidiacea	229	15	214	16	7.5
Echinodermata	154	5	149	12	8.1
Porifera	681	0	681	8	1.2
Platyhelminthes	1000	0	1000	12	1.2
Other Invertebrates	2168	2	2166	16	0.7
Fish	650	116	534	149	27.9
Total		637*		954*	
Average %		**3.3 %**			**5.9 %**

Source: Zenetos et al., 2010 MMS

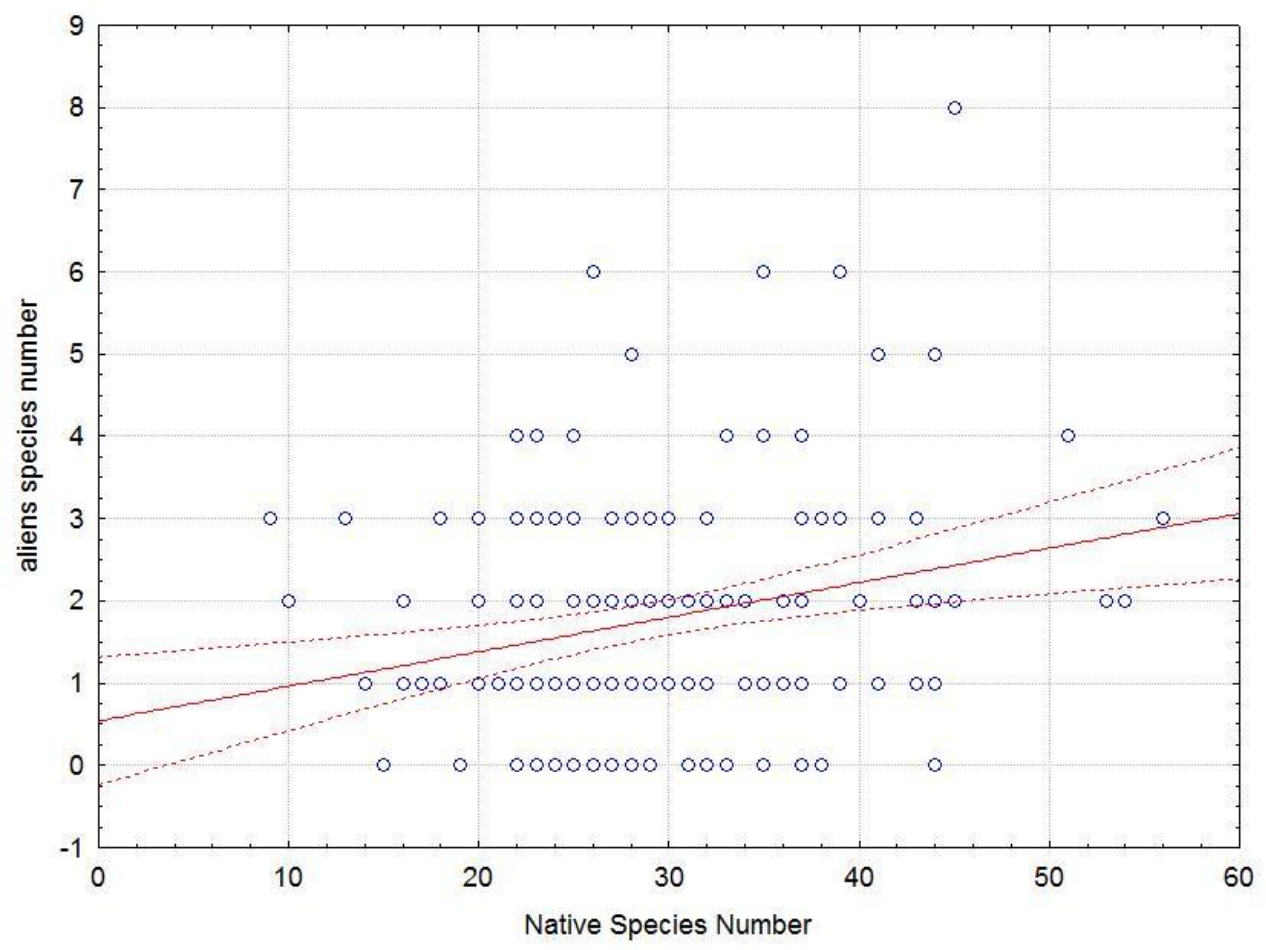
Contrasting results

East Mediterranean

Fish: 60-70% of the catch

Mollusca: 14.3 % in number. 7.7 in abundance- Iskenderun (AlbayraK, 2010)

Spearman Rank Correlation: 0.22 = no significant correlation!



Macrophytes, Greece, Tsiamis 2012, Ph.D

Ongoing Initiatives in Europe

European Data bases:
EASIN,
MAMIAS,
ESENIAS,

Research projects
PERSEUS, VECTORS

MEDITERRANEAN NETWORKS

MAMIAS: Mediterranean Marine Invasive Alien Species

NELESFISH: Network of Experts on the effect of LESsepsian species on FISHeries in the eastern Mediterranean

ESENIAS: East and West European Network on Invasive Alien Species

PERSEUS: Policy-Oriented Marine Environmental Research in the Southern European Seas

European Alien Species Information Network

Aim: facilitating the access to information on alien species in Europe through a set of interoperable web services

Not: to generate or collect information → not replacement for existing information systems

Strengths:
- Real-time information (no central data storage, although some metadata is generated and cached)
- Flexibility (info can be directly consumed by other services)
- Spatial resolution (georeferenced occurrences)

Weaknesses:
- Reference species list needs updating
- Dependent on quality source databases

Alien species catalogue for Europe

- 43 online 'alien species databases'
- 49 countries (Europe)

} 18682 names of 'alien species'

Global and regional information systems

AVIBASE	EPPO PQR
Baltic Sea	EU-BIRDS
Caspian Sea	FAO-DIAS
CABI-ISC	FishBase
CIESM	GISD
DAISIE	NOBANIS

Country-level databases

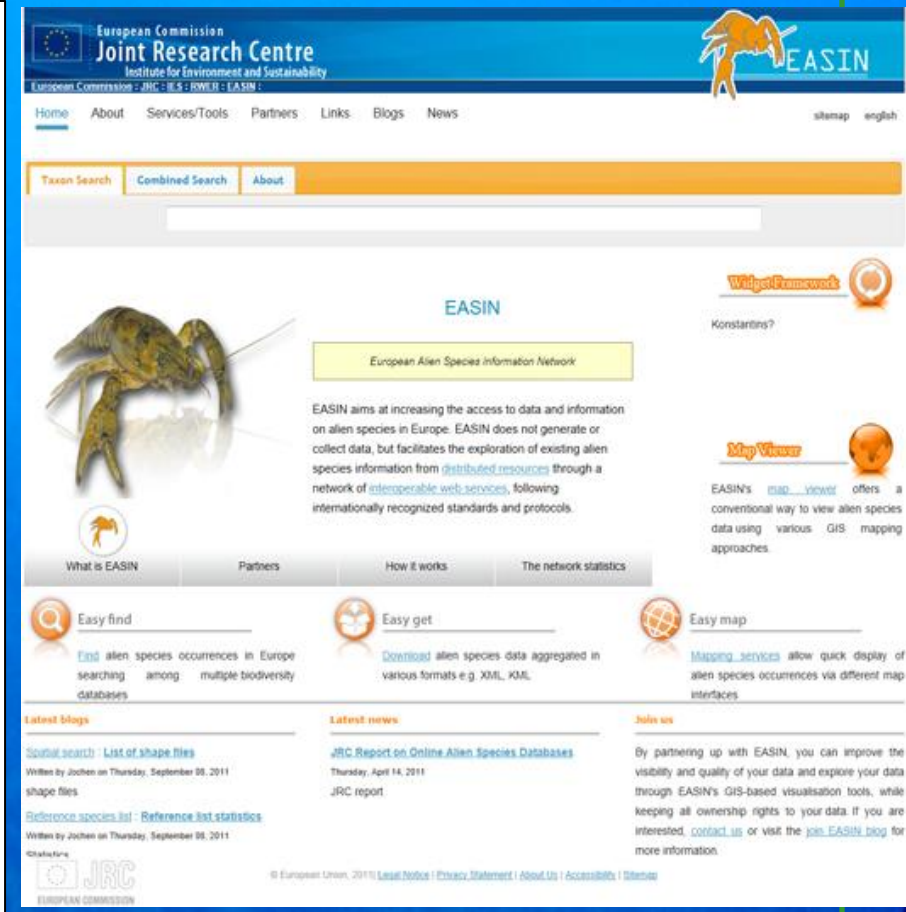
Austria, Belarus, Belgium, Denmark, Estonia, Germany, Greece, Iceland, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Republic of Ireland, Russia, Spain, Sweden, Switzerland, United Kingdom

European Alien Species Information Network

http://easin.jrc.ec.europa.eu

–Alien species is becoming available at 3 levels:

- Widget framework, widgets may be viewed on ANY website
- MapViewer
- Interoperable Web Services e.g. Open Geospatial Consortium standards, OpenSearch



PERSEUS

Subtask 2.3.3. Non-indigenous Species (NIS)

Participants: Greece, Tunisia, Turkey, Israel

+Malta, Romania, Slovenia, Ukraine

ANDROMEDA data base

UNEP MAP/ RAC-SPA

« Feasibility study in setting up a regional mechanism for collecting, compiling and circulating information on marine alien species in the Mediterranean»

Zenetos A. & Polychronides L, 2010

COUNTRY	DAISIE	HCMR	Review papers	comments
	12/2006	12/2010		
SLOVENIA	11	18	18	understudied
CROATIA	18	42	**Sep 2011=47**	
MONTENEGRO	-	9	9	??
ALBANIA	**9**	**17**	**Dec 2010=17**	Understudied
GREECE	**88**	**237**	**Dec 2010=237**	
TURKEY	**182**	**400**	**Dec 2010=400**	
BULGARIA			**Sep 2011=45**	
ROMANIA	14		**Sep 2011=58**	

Institute of Marine Biological Resources and Inland Waters

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mamias net Marine Mediterranean Invasive Alien Species Network

Home | Species Directory | Database Search | Invasive Species | Country/Subregion statistics | Experts Registry | Links | More..

Factsheets on the following invasive alien species provide information on their biology, ecology habitat and distribution as well as on their impact in the recipient habitats.

INVERTEBRATES

MOLLUSCA
- *Anadara demiri*
- *Anadara inaequivalvis*
- *Brachidontes pharaonis*
- *Bursatella leachi*
- *Chama pacifica*
- *Cerithium scabridum*
- *Crassostrea gigas*
- *Crepidula fornicata*
- *Musculista senhousia*
- *Mya arenaria*
- *Petricola pholadiformis*
- *Pinctada radiata*
- *Rapana venosa*
- *Ruditapes philippinarum*
- *Spondylus spinosus*
- *Strombus persicus*

POLYCHAETA
- *Branchiomma luctuosum*
- *Ficopomatus enigmaticus*
- *Polydora cornuta*
- *Pseudopolydora paucibranchiata*
- *Spirorbis marioni*

CRUSTACEA
- *Callinectes sapidus*
- *Eriocheir sinensis*
- *Marsupenaeus japonicus*
- *Metapenaeus monoceros*
- *Percnon gibbesi*
- *Portunus pelagicus*

OTHER INVERTEBRATES
- *Asterina burtoni*
- *Asterias rubens*
- *Mnemiopsis leidyi*
- *Microcosmus squamifer*
- *Oculina patagonica*
- *Phylorhiza punctata*
- *Rhopilema nomadica*
- *Styella clava*
- *Tricellaria inopinata*

VERTEBRATES
- *Lagocephalus sceleratus*
- *Fistularia commersonii*
- *Saurida undosquamis*
- *Seriola fasciata*
- *Siganus luridus*
- *Siganus rivulatus*

PLANTS
- *Asparagopsis armata*
- *Asparagopsis taxiformis*
- *Bonnemaisonia hamifera*
- *Caulerpa racemosa*
- *Caulerpa taxifolia*
- *Codium fragile*
- *Halophila stipulacea*
- *Sargassum muticum*
- *Stypopodium schimperi*
- *Undaria pinnatifida*

UNEP | MAP | RAC/SPA

in colaboration with hcmr ΕΛΚΕΘΕ

Project Team
Project co-ordinator
Database Administrator
IT Manager

ESENIAS

East and South European Network for Invasive Alien Species

News

4th Congress of Ecologists of the Republic of Macedonia with International Participation and marking the 40th Anniversary of the Macedonian Ecological Society, Ohrid, Macedonia, 11—15 October 2012 [*.DOC]

NEOBIOTA 2012, Halting Biological Invasions in Europe: from Data to Decisions, 7th European Conference on Biological Invasions, Pontevedra (Spain), 12—14 September 2012 [*.DOC]

39th IAD Conference: Living Danube, 21—24 August 2012, Szentendre, Hungary [*.DOC]

International Congress on the Zoogeography, Ecology and Evolution of Southeastern Europe and the Eastern Mediterranean, Athens, Greece 18—22 June 2012 [*.DOC]

International Conference on Marine and Coastal Ecosystems (MarCoastEcos2012): Increasing knowledge for a sustainable conservation and management, Tirana, Albania 25—28 April 2012 [*.DOC]

EU Strategy on Invasive Alien Species [*.DOC]

EEA/EIONET Balkan meeting on networking activities on IAS, 17—18 October 2011 [*.DOC], Agenda [*.DOC], List of participants [*.DOC]

ESENIAS
East and South European Network for Invasive Alien Species

The East and South European Network for Invasive Alien Species (ESENIAS) has been initiated with the participation of all the countries in the region and with the support of the European Environment Agency.

Objectives: ESENIAS is a regional data portal on invasive alien species (IAS) which will provide data on:
— Invasive alien species in East and South Europe — scientific names, biology, ecology, habitat, invasiveness, pathways of introduction, impact
— First findings, distribution and spread of invasive alien species in East and South Europe
— Risk assessment and management information on IAS
— Regulations, guidance, scientific references related to IAS in the region

Participating countries:
Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Kosovo under UNSC Resolution 1244/99, FYR Macedonia, Montenegro, Serbia, Romania (invited country) and Turkey

Policy Question(s)

Is the number of alien species increasing or decreasing? In Europe ? In MSFD areas?

Are policies on controlling pathways of marine biological invasions effective?

Specific policy question (s)

- Is the number of alien species introduced via aquaculture diminishing or increasing?
- Is the number of alien species transferred via shipping increasing?
- What is the role of corridors such as the Suez Canal in the spread of marine alien species?

Indicator definition

- The indicator for the marine and estuarine species represents the cumulative number (i.e. the sum) of primary producers (plants), invertebrate and vertebrate alien species that have been recorded in European waters since 1950
- Number of species per group (primary producers, invertebrate and vertebrates) at Pan-European level, at regional level (MSFD area) and at country level (only countries with marine borders)

Methodology Uncertainty

- Year of introduction is based on reported first collection dates but do not necessarily imply true year of introduction that may be years earlier.
- Cryptogenic species – Baltic Sea, North Sea
  Azores, Canaries not considered
- Vagrant species - Mediterranean
- Range expansion - Black Sea

Work in progress

- Trends in major ports

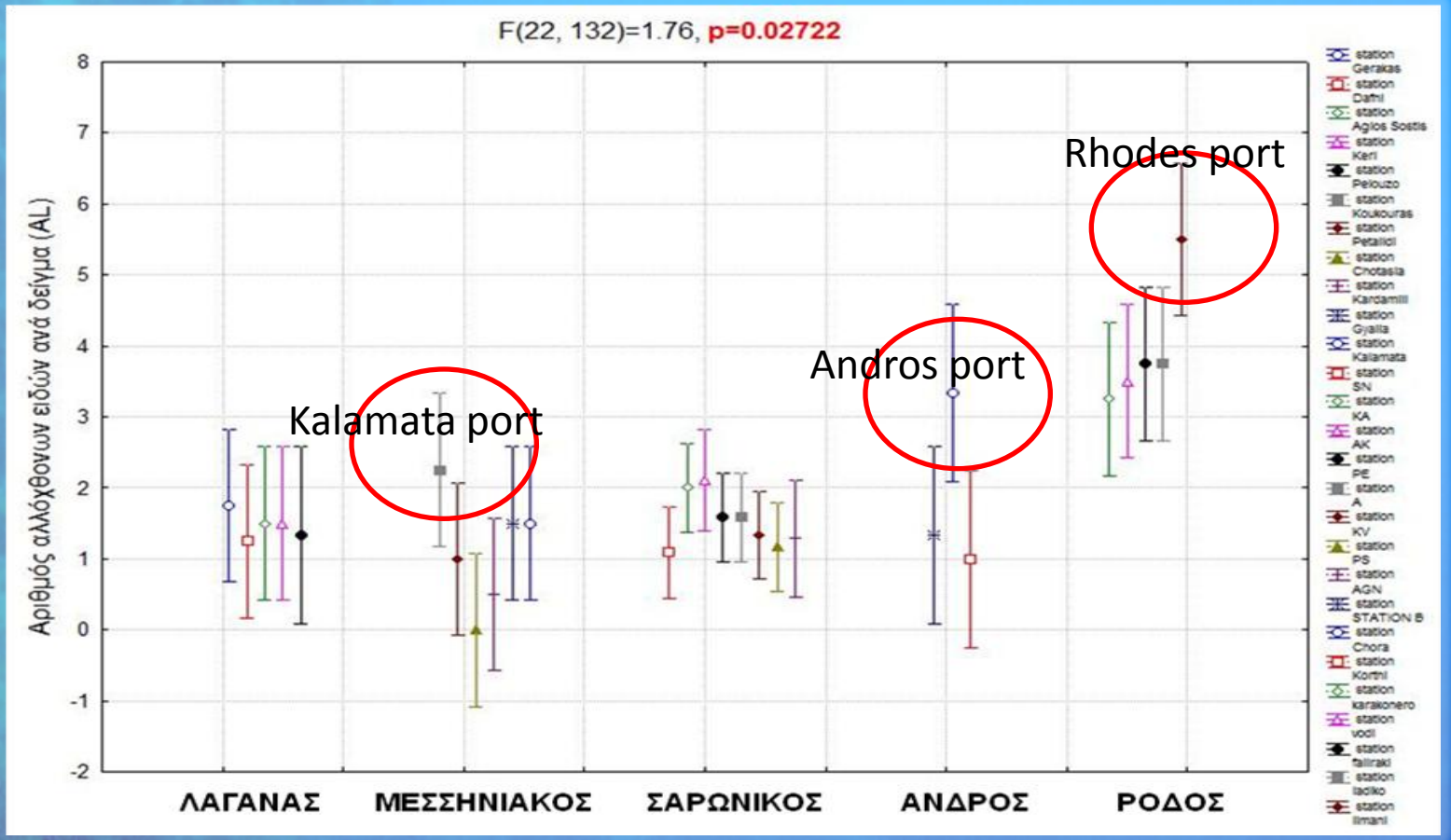
Alien species ok (Iskenderun, Peiraias, Trieste, Venice, Naples, Barcelona, Tunis, Marseille)

Ship traffic since 1950 difficult

Temperature –

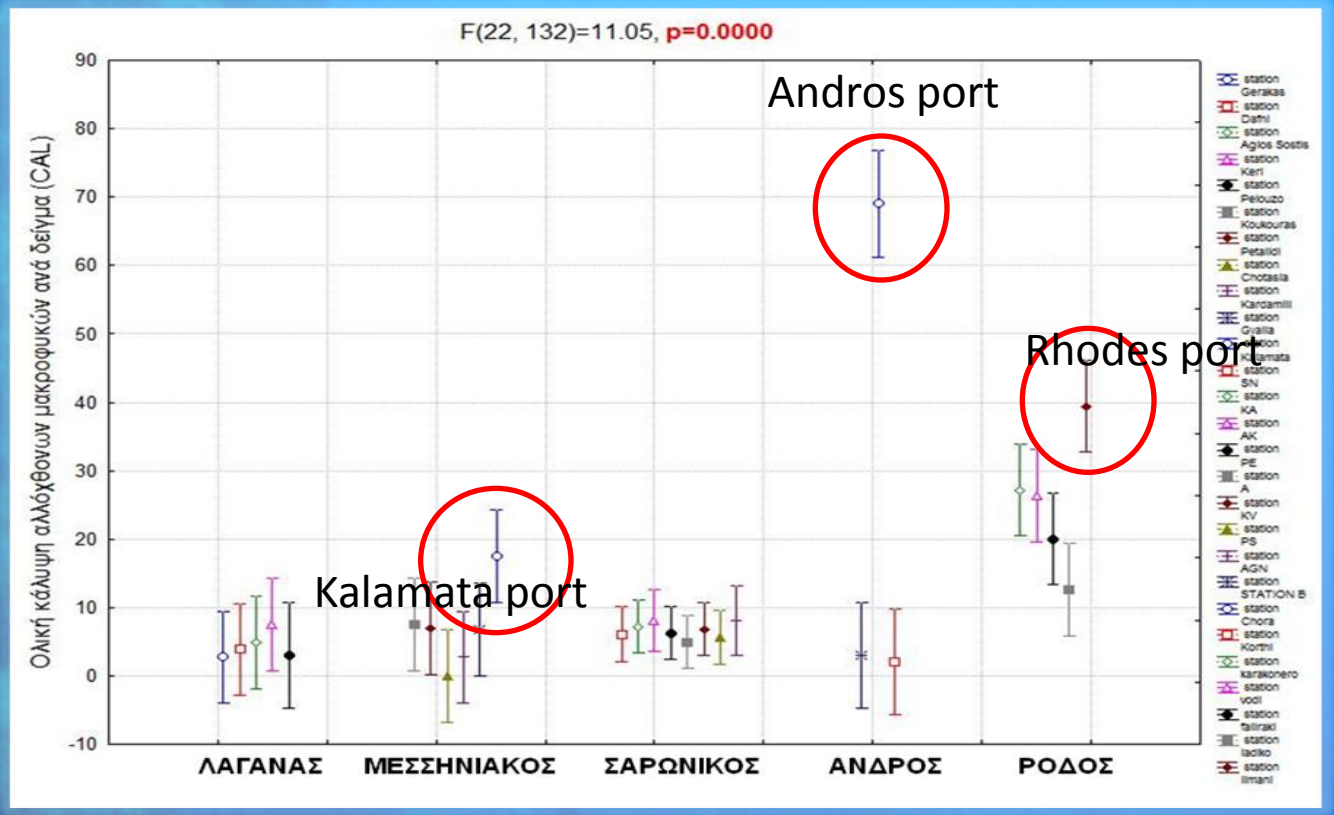
Indicator ratio/native - problematic

Alien species number per station



Tsiamis. 2012

Spearman Rank Correlation: 0.22 = no significant correlation!



Alien species abundance per station

Tsiamis. 2012

Marine vegetation inside Andros Chora

Codium fragile

Marine vegetation inside Andros Chora

Asparagopsis taxiformis

MSFD Descriptor 2: Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem

The two criteria for assessing progress towards GES were defined as:
2.1. Abundance and state characterisation of non-indigenous species, in particular invasive species — Trends in abundance, temporal occurrence and spatial distribution in the wild of non-indigenous species, particularly invasive non-indigenous species, notably in risk areas, in relation to the main vectors and pathways of spreading of such species (2.1.1)
2.2. Environmental impact of invasive non-indigenous species
— Ratio between invasive non-indigenous species and native species in some well studied taxonomic groups (e.g. fish, macroalgae, molluscs) that may provide a measure of change in species composition (e.g. further to the displacement of native species) (2.2.1)
— Impacts of non-indigenous invasive species at the level of species, habitats and ecosystem, where feasible (2.2.2).

Biopollution indicator

The BPL (Biopollution Level) index takes into account the abundance and distribution range of an alien species in relation to native biota and aggregates data on the magnitude of the impacts in three categories:

1) impacts on native communities,
2) 2) habitats and,
3) 3) ecosystem functioning.

Olenin, Minchin, Daunys, 2007. *Mar. Pol. Bul.)*

Tethys returns to the Mediterranean: Success and limits of tropical re-colonization

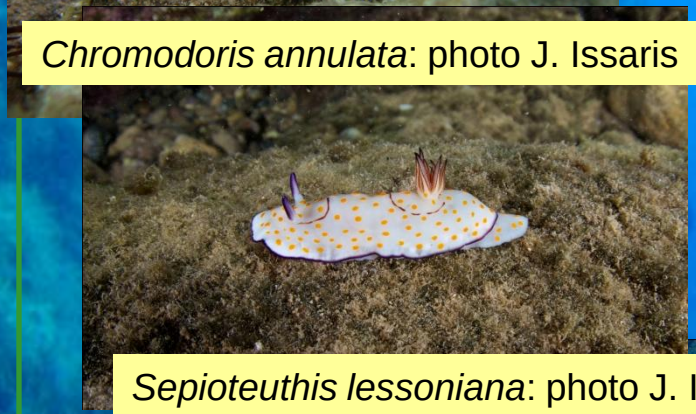
Francis Dov Por

BioRisk 3: 5–19 (2009)

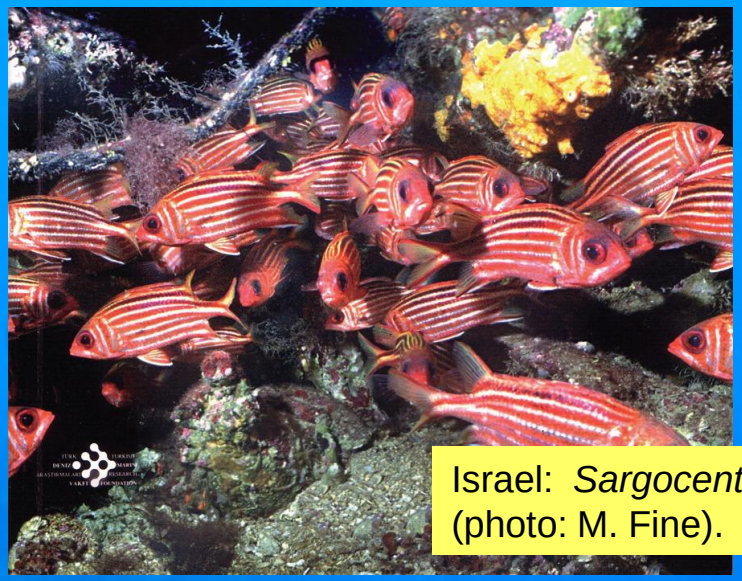
doi: 10.3897/biorisk.3.30

www.pensoftonline.net/biorisk

Hypselodoris infucata: photo G. Apostolopoulos

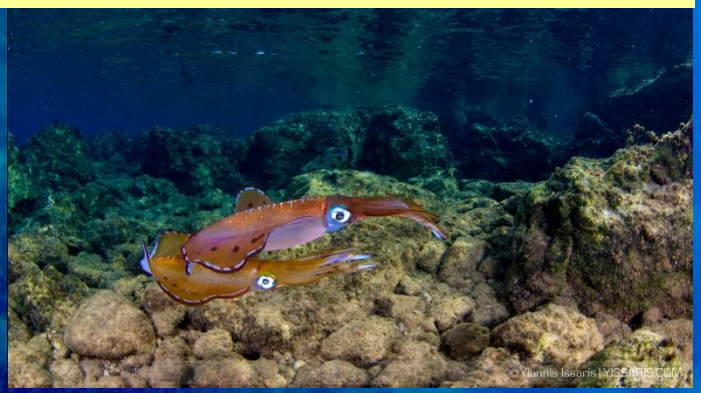


Chromodoris annulata: photo J. Issaris



Israel: *Sargocentrum rubrum* (photo: M. Fine).

Sepioteuthis lessoniana: photo J. Issaris



Percnon gibbesi: photo J. Issaris

Gaps

- varying coverage in relation to different groups of organisms;

lack of coordination between countries, especially in relation to neighbouring countries;

- lack of attention to IAS issues when dealing with N.Africa countries
- Lack of national database in the Mediterranean, Black Sea
- EoE: EEA initiative

New Eye on Earth global mapping and information service now live

Topics: Environment and health | Environmental technology | Various other issues

Published: Dec 13, 2011 Last modified: Dec 14, 2011

A new global web service allowing users to create maps and visualise data on environmental issues is now live. The new Eye on Earth global public information service brings together vast amounts of data about the environment in a powerful, visual format.

> **“Environmental problems are increasingly complex and interconnected. The good news is that there is now a huge volume of**

The online service has been developed jointly by the European Environment Agency (EEA), an EU body and a leading environmental network and information partner, the geographic information system

Combined geographical information layers

Featured article

being. Forests clean our air, o
regulate our climate, amongst
and forests are not always ass

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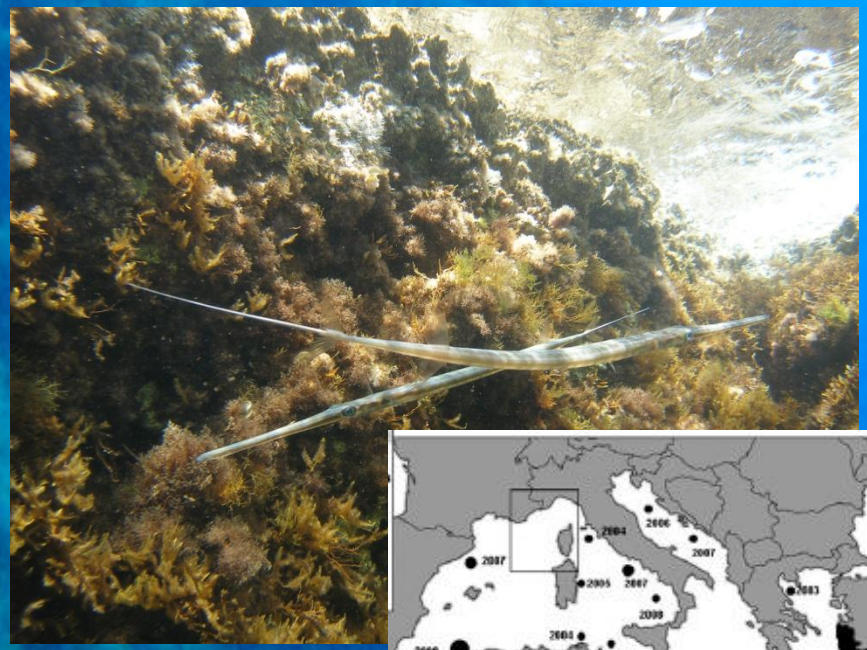
EEA Press room overview

News

New Eye on Earth global ma

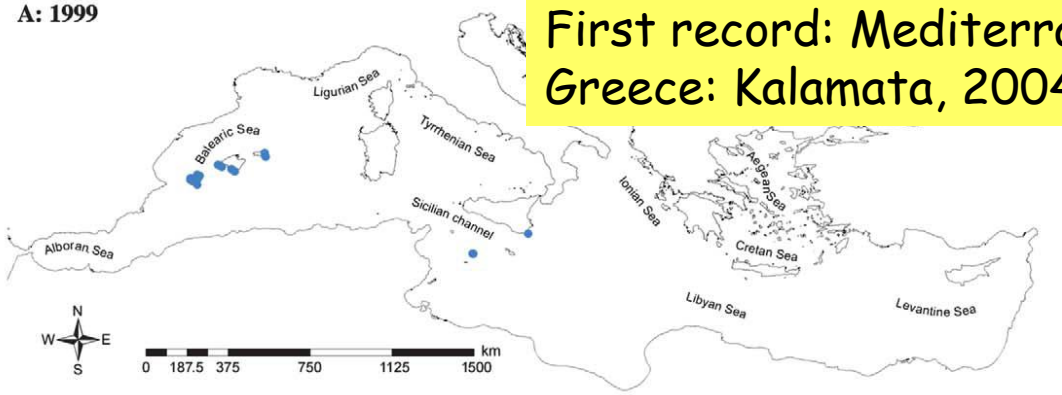
Fish: *Fistularia commersonii*

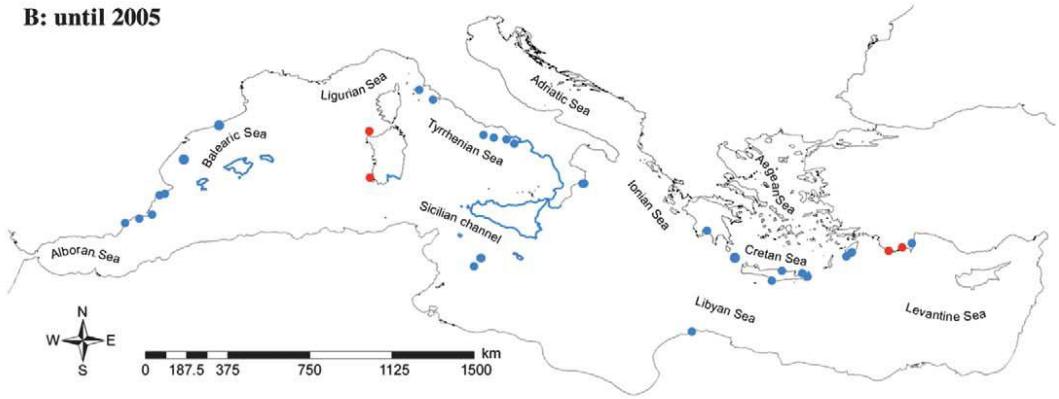


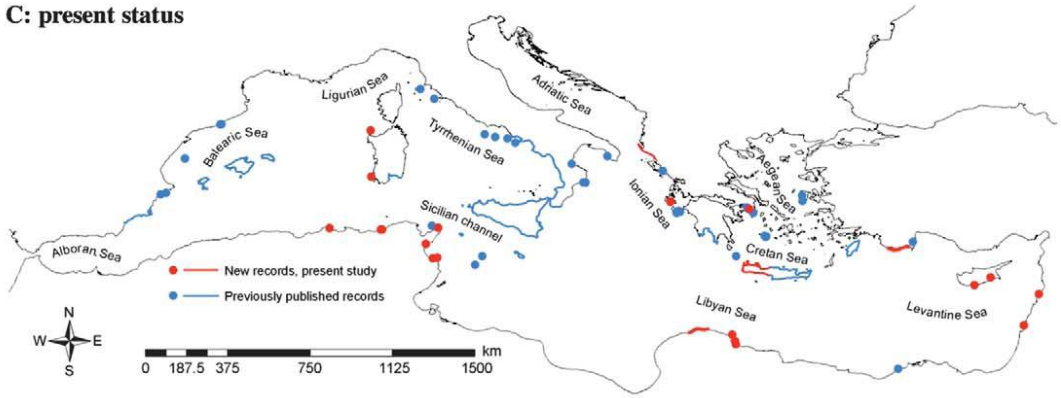
First Med record: 2000
Greece, Rodos, 2001

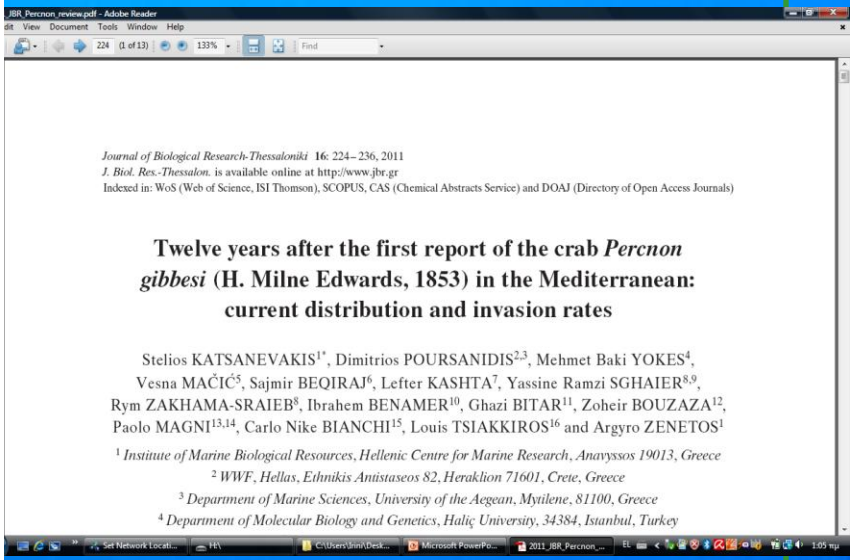
Kriti: 2002
Tingilis et al, 2003

First record: Mediterranean, 1999
Greece: Kalamata, 2004









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J. Biol. Res.-Thessalon. is available online at http://www.jbr.gr
Indexed in: WoS (Web of Science, ISI Thomson), SCOPUS, CAS (Chemical Abstracts Service) and DOAJ (Directory of Open Access Journals)

Twelve years after the first report of the crab *Percnon gibbesi* (H. Milne Edwards, 1853) in the Mediterranean: current distribution and invasion rates

Stelios KATSANEVAKIS[1*], Dimitrios POURSANIDIS[2,3], Mehmet Baki YOKES[4], Vesna MAČIĆ[5], Sajmir BEQIRAJ[6], Lefter KASHTA[7], Yassine Ramzi SGHAIER[8,9], Rym ZAKHAMA-SRAIEB[8], Ibrahem BENAMER[10], Ghazi BITAR[11], Zoheir BOUZAZA[12], Paolo MAGNI[13,14], Carlo Nike BIANCHI[15], Louis TSIAKKIROS[16] and Argyro ZENETOS[1]

[1] *Institute of Marine Biological Resources, Hellenic Centre for Marine Research, Anavyssos 19013, Greece*
[2] *WWF, Hellas, Ethnikis Antistaseos 82, Heraklion 71601, Crete, Greece*
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[4] *Department of Molecular Biology and Genetics, Haliç University, 34384, Istanbul, Turkey*

What more is needed...

..... IMO BW Convention

Collaboration of all fora for monitoring the phanomenon in hot spot areas

Monitoring beaches for toxic dinoflagellates

Implementation of EU Directives e.g, imported species for aquaculture 708/2007, WFD, MSFD

Networking, developing national databases

Further collaborative research in developing indicators

Institute of Marine Biological Resources and Inland Waters

Descriptor 2 of the Marine Strategy Framework Directive: ten suggestions to move forward

Henn Ojaveer*, Sergej Olenin, Dan Minchin, Ana Amorim, Joao Canning-Clode, Paula Chainho, Gordon Copp, Bella Galil, Stephan Gollasch, Anders Jelmert, Stefan Kacan, Francis Kerckhof, Ian Laing, Maiju Lehtiniemi, Tracy McCollin, Cynthia McKenzie, Josip Mikus, Laurence Miossec, Anna Occhipinti, Marijana Pecarevic, Judith Pederson, Gemma Quilez-Badia, Andrea Sneekes, Lauri Urho, Jeroen Wijsman and Argyro Zenetos

Marine Strategy 2012, 14-16 May 2012, Copenhagen, Denmark

1. Availability of taxonomic expertise is critical;
2. Evaluation of the numbers of NIS, their spread and impact need to be standardized;
3. Evaluation of the newly arrived NIS may start with selected well studied taxonomic groups;
4. Ratio of NIS/NS (native species) in a region or habitat is to be calculated and evaluated based on contemporary reliable data;
5. Ratios (NIS/NS) and NIS impacts may vary with habitat, region, and presence of other drivers, and so could be independent of NIS management actions;
6. NIS with lesser recognized impact may be evaluated separately;
7. NIS inventories should be accompanied by pathways and vectors analyses;
8. Selected areas (hot-spots) could be used in monitoring to improve cost-effectiveness;
9. Management options should be agreed by neighbouring countries because of the risk of secondary spread of NIS, as appropriate
10. NIS with known impact(s) are to be managed as is practicable and on the basis of this the success of managements effort should be evaluated