

**REPORT – CYIAS**  
**STSM TD 1209**  
**Short term Scientific Mission Report**

**Title**

**Creating CY. I.A.S**

The Cyprus Invasive Alien Species (CY.I.A.S) inventory

AF Martinou

**State of the Art**

Biological invasions are one of the most important drivers of biodiversity loss and major pressure to several types of ecosystems with environmental and economic impacts (MEA, 2005). A conservative estimate of the annual damage caused in the EU is 12 billion euros (Shine et al. 2010). Action 16 of the Biodiversity Strategy explicitly requests that by 2020 invasive alien species and their pathways are identified, that priority species are managed or eradicated and that pathways are managed to prevent the introduction and establishment of new invasive alien species. Furthermore, currently a regulation is proposed at European level for the prevention and management of the introductions of alien species and member countries will be asked to create priority lists for invasive species. Countries that lack the foundations *i.e.* organized, up to date information at the national level on invasive alien species (IAS) will face difficulties in order to decide for species of priority concern.

Several online databases have been created to provide information on IAS. These information systems provide the basic knowledge for various landmark assessments of alien invasions in Europe. National experts, monitoring and reporting systems as well as local networks are the foundation for the provision of up to date information to larger networks that assist to European policies regarding invasive species. A gap was identified for Cyprus as it was lacking such a foundation therefore the current STSM was undertaken in order to develop a national IAS database aiming at the provision of up to date information and the identification and continuous engagement of experts at regional and national level.

During the current scientific mission an information platform based on the HCMR/EEA and ELNAIS principles was created on invasive species for Cyprus on the distribution and establishment success of invasive alien species. The platform covers marine, estuarine freshwater and terrestrial species. Data for terrestrial species were obtained from DAISIE and EASIN/GBIF. The database is a dynamic and ongoing process and it is anticipated to be enhanced and continuously updated after the completion of the STSM.

### **CYIAS aims at:**

1. Providing up-to-date centralized information system on the distribution of invasive species. The database design aims at including GIS and quantitative data. The database is developed as a resource in order to assist recording, monitoring and surveillance programmes, define appropriate indicators and provide the infrastructure for an invasive species early warning rapid response system. A complete updated list of the aliens of Cyprus- Cyprus Invasive Alien Species (CYIAS) was created based on data from HCMR, DAISIE, EASIN/GBIF and literature. The database also contains information on pathways, origin, establishment success, first sighting-collection date, first reports (references). Nomenclature and taxonomy are based on WoRMS for marine species. Relevant details for terrestrial and freshwater species are currently archived following the DAISIE system while validation for these species is pending.

Previously DAISIE (2009) reported a total of 75 alien marine species from Cyprus but this figure is a marked underestimation of the actual one. Katsanevakis et al. (2009) reported a total of 126 but this number has increased since 2009 to nearly 140 to date (Zenetos, personal communication). CYIAS currently contains 155 marine alien species, 15 freshwater species (12 freshwater fish and 3 freshwater molluscs) and 494 terrestrial species. The established (and invasive) species in Cyprus are expected to increase in the future, as they currently represent a small percentage of the established alien species in the Levantine basin. The marine alien species introduced via the Suez Canal are thermophilic species, and it is likely that an increasing seawater temperature will favour their reproduction, growth, survival, and thus establishment in the area. Such an increase of established alien marine species is expected to have an adverse impact on the state of many native populations as well as an unpredictable impact on fisheries and local economies (Katsanevakis et al. 2009). Table 1 contains summarized information from CYIAS on fifty two marine alien

species and their establishment success characterized as most invasive for the Mediterranean sea that are also present in the Levantine area, Cyprus. From the species present on table 1 special focus should be placed on *Pterois miles* the common lionfish and the nomad jellyfish *Rhopilema nomadica* and an early warning rapid response system for fishermen is essential to be developed regarding these two species. Attention should also be placed regarding a species with invasive potential not yet present in the area namely *Plotosus lineatus*. Table 2 presents alien species with commercial potential in the wider area. Two species currently lacking from table 2 and not present in Cyprus that we should account for are also the fish *Nemipterus randali* and the shrimp *Farfantepenaeus aztecus* (Ives, 1891).

Three hundred and ninety nine terrestrial species of non-indigenous organisms that belong to different groups were archived in the CYIAS database from DAISIE. A further 295 species were also imported from EASIN. However, due to time constraints and the short nature of the current scientific mission it was impossible to cross check thoroughly and update all information regarding terrestrial species and this is expected to be a continued process after the end of the scientific mission.

**Table 1:** Alien species characterized as most invasive for the Mediterranean region also present in the Levantine area, Cyprus.

Species	Author	First sighting	Establishment Success	Consulted database
<i>Amphistegina lobifera</i>	Larsen, 1976	1976	cryptogenic established	HCMR/EEA
<i>Aplysia dactylomela</i>	Rang, 1828	2004	Established	HCMR/EEA
<i>Apogonichthyoides pharaonis</i>	(Bellotti, 1874)	1964	Established	HCMR/EEA
<i>Aquilonastra burtoni</i>	(Gray, 1840)	2003	Established	HCMR/EEA
<i>Asparagopsis armata</i>	Harvey, 1855	1998	Established	HCMR/EEA
<i>Atherinomorus forskali</i>		1929	Established	HCMR/EEA
<i>Brachidontes pharaonis</i>	(P. Fischer, 1870)	1960	Established	HCMR/EEA
<i>Branchiomma bairdi</i>	(McIntosh, 1885)	1998	Casual	HCMR/EEA
<i>Branchiomma luctuosum</i>	(Grube, 1870)	1998	Unknown	HCMR/EEA
<i>Cassiopea andromeda</i>	(Forsskål, 1775)	1903	Established	HCMR/EEA
<i>Caulerpa racemosa</i> var. <i>cylindracea</i>	(Sonder) Verlaque, Huisman & Boudouresque, 2003	1997	Casual	HCMR/EEA
<i>Caulerpa racemosa</i> var. <i>lamourouxi</i>	(Turner) Weber-van Bosse, 1898	1991	Established	HCMR/EEA
<i>Caulerpa racemosa</i> var. <i>turbinata</i>	(J.Agardh) Eubank, 1946	1992	cryptogenic	HCMR/EEA
<i>Ceratonereis mirabilis</i>	Kinberg, 1865	1997	Established	HCMR/EEA
<i>Cerithium scabridum</i>	Philippi, 1848	1983	Established	HCMR/EEA
<i>Chama pacifica</i>	Broderip,	1998	Established	HCMR/EEA

	1835			
<i>Cladophora cf. patentiramea</i>	(Montagne) Kützing, 1849	1991	Established	HCMR/EEA
<i>Dendostrea folium</i>	(Linnaeus, 1758)	2008	Established	HCMR/EEA
<i>Ergalatax junionae</i>	Houart, 2008	1993	Established	HCMR/EEA
<i>Erugosquilla massavensis</i>	(Kossmann, 1880)	1956	Established	HCMR/EEA
<i>Fistularia commersonii</i>	Rüppell, 1838 (Forsskål in Niebuhr, 1775)	1999	Established	HCMR/EEA
<i>Fulvia (Fulvia) fragilis</i>	(Forsskål) Ascherson, 1867	1983	Established	HCMR/EEA
<i>Halophila stipulacea</i>	Ascherson, 1867	1967	Established	HCMR/EEA
<i>Hydroides dianthus</i>	(Verrill, 1873)	1997	Questionable	HCMR/EEA
<i>Hydroides elegans</i>	(Haswell, 1883)	1996	Established	HCMR/EEA
<i>Hydroides heterocerus</i>	(Grube, 1868)	1998	Established	HCMR/EEA
<i>Lagocephalus sceleratus</i>	(Gmelin, 1789)	2004	Established	HCMR/EEA
<i>Lophocladia lallemandii</i>	(Montagne) F.Schmitz, 1893	1997- 98	Established	HCMR/EEA
<i>Notomastus mossambicus</i>		1997	Established	HCMR/EEA
<i>Parexocoetus mento</i>	(Valenciennes, 1847)	<2002	Established	HCMR/EEA
<i>Pempheris vanicolensis</i>	Cuvier, 1831	1995- 96	Established	HCMR/EEA
<i>Penaeus semisulcatus</i>	De Haan, 1844 [in De Haan, 1833-1850] (H. Milne Edwards, 1853)	2010	Casual	HCMR/EEA
<i>Percnon gibbesi</i>		2006	Established	HCMR/EEA
<i>Pinctada imbricata radiata</i>	(Leach, 1814)	1899	Established	HCMR/EEA
<i>Portunus segnis</i>	(Forskål, 1775)	1958	Established	HCMR/EEA

<i>Pseudonereis anomala</i>	Gravier, 1900	1969	Established	HCMR/EEA
<i>Pterois miles</i>	(Bennett, 1828)	2013	Casual	HCMR/EEA
<i>Pteragogus pelycus</i>	Randall, 1981	1997	Established	HCMR/EEA
<i>Rhopilema nomadica</i>	Galil 1990	1995	Established	HCMR/EEA
<i>Sargocentron rubrum</i>	(Forsskål, 1775)	1961	Established	HCMR/EEA
<i>Saurida undosquamis</i>	(Richardson, 1848)	1960	Established	HCMR/EEA
<i>Scomberomorus commerson</i>	(Lacepède, 1800)	2008	Established	HCMR/EEA
<i>Sillago sihama</i>	(Forsskål, 1775)	2009	Casual	HCMR/EEA
<i>Sphoeroides pachygaster</i>	(Müller & Troschel, 1848)	2005	range expansion	HCMR/EEA
<i>Sphyraena chrysaenia</i>	Klunzinger, 1884	1964	Established	HCMR/EEA
<i>Spirorbis marioni</i>	(Caullery & Mesnil, 1897)	1996	Unknown	HCMR/EEA
<i>Spirobranchus tetraceros</i>	(Schmarda, 1861)	1996	Established	HCMR/EEA
<i>Spondylus spinosus</i>	Schreibers, 1793	2001	Established	HCMR/EEA
<i>Stephanolepis diaspros</i>	Fraser-Brunner, 1940 (Kützing)	1935	Established	HCMR/EEA
<i>Styopodium schimperi</i>	M.Verlaque & Boudouresque, 1991	1990	Established	HCMR/EEA
<i>Synaptula reciprocans</i>	(Forsskål, 1775)	1986	Established	HCMR/EEA
<i>Womersleyella setacea</i>	(Hollenberg) R.E.Norris, 1992	2008	Established	HCMR/EEA

**Table 2:** Marine species of commercial importance in the Mediterranean

<b>Species</b>	<b>Author</b>	<b>First sighting</b>	<b>Establishment Success</b>	<b>Consulted database</b>
<i>Charybdis hellerii</i>	(A. Milne-Edwards, 1867)	1986	Established	HCMR/EEA
<i>Charybdis longicollis</i>	Leene, 1938	1998	Established	HCMR/EEA
<i>Callinectes sapidus</i>	Rathbun, 1896	1964	Established	HCMR/EEA
<i>Conomurex persicus</i>	(Swainson, 1821)	1985	Established	HCMR/EEA
<i>Etrumeus golani</i>		1999	Established	HCMR/EEA
<i>Marsupenaeus japonicus</i>	(Spence Bate, 1888)	1961	Established	HCMR/EEA
<i>Siganus luridus</i>	(Rüppell, 1829)	1964	Established	HCMR/EEA
<i>Siganus rivulatus</i>	Forsskål & Niebuhr, 1775	1928	Established	HCMR/EEA
<i>Upeneus moluccensis</i>	(Bleeker, 1855)	1961/1964	Established	HCMR/EEA
<i>Upeneus pori</i>	Ben-Tuvia & Golani, 1989	2004	Established	HCMR/EEA

2. Establishing a national network of aquatic and terrestrial experts that will actively engage in the development and updating of the national CYIAS database was one of the aims of the CYIAS project. Contact details for all experts willing to coming can be found on table 3.

CYIAS developers have identified established and networked with a number of national and international experts on aquatic and terrestrial IAS. Upon completion of the STSM, AFM plans to arrange a meeting in Cyprus with all related stakeholders in order to inform them and find a suitable hosting environment for the CYIAS database. In addition to the experts on table we have identified two more experts that will be contacted shortly in order to become part of the network namely: Mr. Chatzisterkotis and Dr Marina Argyrou.

**Table 3:** A National Experts registry willing to contribute to CYIAS

Name	Surname	Title	Expertise	Affiliation	Address	Tel.	Email
Kelly	Martinou	Postdoctoral Researcher, Ecology, Entomology	Agroecology/ Ecosystem Services & biocontrol agents, terrestrial	Dpt of Agriculture, Food Science and Biotech. C.U.T.	Athinon & Anexartisias Pitsillides Building, Limassol 3036 46,7 km Athens-Sounio Avenue, Anavyssos	00357-25002091	<a href="mailto:angeliki.martinou@cut.ac.cy">angeliki.martinou@cut.ac.cy</a>
Kostas	Tsiamis	Postdoctoral Researcher	Marine Benthos, seaweeds & seagrasses, marine	HCMR, Institute of Oceanography	19013, Attica, Greece	0030-2291076334	<a href="mailto:kostas.tsiamis@gmail.com">kostas.tsiamis@gmail.com</a>
Nikolas	Michailidis	Fisheries Officer	Fisheries biology	Dpt of Fisheries and Marine Research	Vithleem, 1416 Nicosia, Cyprus	00357 - 22807866	<a href="mailto:nmichailidis@dfmr.moa.gov.cy">nmichailidis@dfmr.moa.gov.cy</a>
George	Constantinou	Amateur	biodiversity			00357-96376823	<a href="mailto:fanigeorge@hotmail.com">fanigeorge@hotmail.com</a>
Efthymios	Odyseos	Agricultural Officer A'	Plant Health, Quarantine plant pests	Dpt Agriculture, Ministry of Agriculture, Natural Resources and Environment	Louki Akrita Av. 1412, Nicosia 7 Km Athinon-Souniou, Anavissos	00357-22408629	<a href="mailto:eodisseos@da.moa.gov.cy">eodisseos@da.moa.gov.cy</a>
Stamatis	Zogaris	Dr Geographer, Biologist	fish, birds, vegetation ecology	HCMR, Greece	Attiki 19013	0030- 693 2000010	<a href="mailto:zogaris@gmail.com">zogaris@gmail.com</a>
Charalambos	Christodoulou	BSc (Hons) Forest Management	Flora and vegetation/Plant diversity conservation/Management and conservation of protected areas	Dpt of Forests, MANRE	Dpt of Forests, 1414 Lefkosia	00357-22462937	<a href="mailto:floracy@primehome.com">floracy@primehome.com</a>
Christodoulos	Pipis	Vet		Dpt Animal Health	1417 Αθαλάσσα	00357-22805249	<a href="mailto:animal.health@vs.moa.gov.cy">animal.health@vs.moa.gov.cy</a>

3. CYIAS aims at linking IAS issues in Cyprus with European and global databases and establish a national network of experts that will be actively involved in gathering information and conduct IAS related research projects. Therefore the CYIAS developers contributed by sending an updated list for the marine alien species for Cyprus to DAISIE database. The list included 155 marine species including 8 cryptogenic, 2 range expansions and 12 exclusions. A sheet with all synonyms and literature for the data collected was also provided to DAISIE.

#### **Common objectives between CYIAS and COST action TD 1209:**

**WP1 Early warning and rapid response:** COST Action TD1209 through WP 1 aims to systematically review past trends relevant to EWRR which will inform data integration (WG4). CYIAS the proposed Cypriot database can now serve as the basis and enable recommendations to be developed for rapid dissemination of IAS notifications at the national level. Furthermore, through the experts registry CYIAS has identified information system managers at the national level. CYIAS will enable the early warning and rapid response of invasive species such as the Lionfish *Pterois miles* that has recently raised justifiable concerns of a possible onset of a new invasion in the Mediterranean Sea (Bariche et al. 2013). CYIAS will gather timely information for species such as *P. miles* and *R. nomadica*. Such information will serve as a basis in future awareness programmes and monitoring efforts during the early stage of colonization while control measures are still effective especially since complete eradication programmes for species such as *P. miles* would be unrealistic (Barbour et al. 2011).

**WP2 Trends analyses on pathways for the MSFD:** CYIAS inventory includes information on pathways (similar to ELNAIS) and will serve as a basic tool for trends and analysis on pathways especially for the marine strategy framework directive (MSFD: 2008/56/EC) which requires that Member States take measures to achieve or maintain Good Environmental Status (GES) by 2020. According to Articles 5 and 11 of the MSFD, coordinated monitoring programmes should be established and implemented by 15 July 2014 in order to assess the environmental status of marine waters (Zampoukas et al. 2012).

**WP3 Trends and analyses on impacts of priority species:** Knowing and predicting the environmental and socio-economic impact of actual and potential IAS is an essential component of an efficient information and EWRR system on IAS.

Definition of priority species among IAS at national level is essential in order to understand the trends and analyze the impact of these priority species. A list of a priority species list for marine species has been developed through CYIAS and another list for terrestrial species is pending and will be the subject of experts discussion during the meeting/presentation of the CYIAS database that is planned to take place in Cyprus.

**WP4 Data standardisation and harmonisation:** CYIAS was created and operates in accordance with the aims of WP4 as input data on terrestrial IAS of different taxonomic groups come from DAISIE and EASIN and data on marine species are based on the ELNAIS principles and data stored within HCMR/EEA, DAISIE and ELNAIS. Since CYIAS is a new inventory based on existing information from sources such as DAISIE and **HCMR/EEA**, it can provide output data in harmonization with DAISIE but also EASIN avoiding the risk of inconsistencies with a consensus on terminology.

### **CYIAS future plans**

A number of activities have been planned or are expected to be planned in order to keep CYIAS updated and functional with as much information regarding invasive alien species in Cyprus as possible

- 1) A stakeholders meeting where the database will be presented
- 2) An experts network that has been established will be contacted by email by Angeliki F Martinou at regular intervals in order to collect and update news and grey literature information on invasive species for Cyprus.
- 3) The CYIAS database is currently uploaded on ACCESS system and it currently provides information regarding the establishment success, pathways and origin of IAS species in the future we have made a provisional design in order for CYIAS to be able to hold information maps for IAS in Cyprus.

### **Future collaboration with the Host and Host Institute Hellenic Centre Marine Research**

## Foreseen Publications

Dr Zenetos and I are currently in preparation of a publication with the title: “Marine Invasive Alien species Inventory of the European Marine environment as a basis of an early warning rapid response system”. We also plan to write a second manuscript as a short paper on CYIAS and currently consider submitting an abstract for a poster presentation at the Neobiota conference 2014.

## Future collaboration with the Host

Given that a database is a dynamic process that needs continuous input, development and updating, I feel that we have now just started with CYIAS. It was a pleasure working with Dr Zenetos and I sincerely hope that we get or make the chances to continue working on biological invasions

## References

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- WoRMS Editorial Board (2014).** World Register of Marine Species. Available from <http://www.marinespecies.org> at VLIZ. Accessed 2014-04-28
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## **CYIAS WEBSITE DEVELOPMENT**

CYIAS is currently an offline database based on ACCESS but it is hoped that it will be soon online. Herein we provide a draft plan for the website design.

### **HEADLINE 1: CYIAS HOME**

#### **TEXT:CYIAS: CYPRUS INVASIVE ALIEN SPECIES**

Biological invasions are one of the most important drivers of biodiversity loss and major pressure to several types of ecosystems with environmental and economic impacts (MEA, 2005). A conservative estimate of the annual damage caused in the EU is 12 billion euros (Shine et al. 2010). Action 16 of the Biodiversity Strategy explicitly requests that by 2020 invasive alien species and their pathways are identified, that priority species are managed or eradicated and that pathways are managed to prevent the introduction and establishment of new IAS. Furthermore, currently a regulation is proposed at European level for the prevention and management of the introductions of alien species and member countries will be asked to create priority lists for invasive species. To help those tackling the invasive species challenge, The CYIAS database provides a ‘place’ for information on biological invasions in Cyprus. Please note that the aim for the database is to be continually updated and soon uploaded on a website. Read [more about CYIAS](#).

### **HEADLINE 2: CAN WE ESTIMATE THE WORST INVASIVE FOR CYPRUS**

#### **TEXT: .....**

### **HEADLINE3: MORE ABOUT CYIAS**

#### **TEXT: ABOUT CYIAS**

This database was developed as part of the Cyprus Invasive Alien Species project undertaken by Dr Angeliki F Martinou, Cyprus University of Technology, Cyprus under the guidance and supervision of Dr Argyro Zenetos Hellenic Centre of Marine Research Greece funded through a short term scientific mission by the COST Action TD1209 – Alien Challenge. It provides information on biological invasions in Cyprus and a registry of national and international experts working on IAS in Cyprus.

The general objectives of CYIAS are:

1. To create an inventory of invasive species that threaten Cypriot terrestrial, freshwater and marine environments
2. To structure the inventory to provide the basis for prevention and control of biological invasions through the understanding of the environmental, social, economic and other factors involved
3. To assess and summarize the ecological, economic and health risks and impacts of [the most widespread and/or noxious invasive species](#)

4. To use distribution data and the experiences of the individual Member States as a framework for considering indicators for early warning

CYIAS is a pivotal instrument in developing a nationally-wide strategy that encompasses both the geographical scale of the problem and unites the study of different taxa in marine, freshwater and terrestrial environments. A direct access to a national knowledge base policy makers and stakeholders addressing the invasive alien species challenge will easily obtain data on species that are invasive or potentially invasive in particular habitats, and use this information in their planning efforts. Data has been collated for vertebrates, invertebrates, marine and inland aquatic organisms as well as plants.

Search for information on one of the ... alien [species](#) occurring in Cyprus

- Search for one of the .... [experts](#) on biological invasions in Cyprus
- Search [regions](#) to explore the alien species threats across Cyprus, terrestrial freshwater and marine habitats.

Reliable, detailed information on the most invasive alien species in Cyprus is an essential tool for preventing their spread and impact, and for applying effective and appropriate control strategies. Using CYIAS' major resource we aim to identify the worst invasive aliens in Cyprus, covering a broad spectrum of life forms and representing some of the worst species in terms of their impact on biodiversity, economy and health. Species accounts for these species provide information on their biology and ecology, **habitat and distributions (including detailed maps in the future)**, introduction pathways, invasion trends, impacts and management methods including ways of prevention.

Use the menu items on the left-hand side of this page to find out more about alien species and the CYIAS project. Other information may also be found at [www.cyias.cy](http://www.cyias.cy)

#### **HEADLINE 4: Search Species**

##### **TEXT:**

**Please enter some search criteria and click on search to get some results**

Taxon:.....

Species name:.....

Common name:.....

#### **HEADLINE 4: Search Region**

##### **TEXT:**

Select from list of regions:

#### **HEADLINE 5: Experts Registry**

##### **TEXT:**

Find experts (include a list)

Register as an expert

**HEADLINE 6: Contact information**

**HEADLINE 7: Report a new finding**