



## **REPORT OF THE EUROMARINE WORKSHOP:**



# **‘MANAGEMENT OF BIOINVASIONS IN THE MEDITERRANEAN SEA - THE WAY FORWARD’**

***ISCHIA (NAPLES, ITALY), 4-5 MAY 2016***

**Organizers: Maria Cristina Gambi & Bella Galil**

The workshop, funded by the EuroMarine Consortium, was logistically organized by the Stazione Zoologica Anton Dohrn, and held at the Hotel Villa Maria in Ischia Porto the 4-5 May 2016 (Fig. 1, 2). A total of 44 scientists participated and 17 posters were displayed and discussed, in addition to the oral presentations by invited speakers (Fig. 3, 4). The Italian contingent was largest, with many SIBM members, but participants hailed from Austria, Australia, Egypt, Estonia, France, Greece, Israel, Malta, Spain, Tunisia, Turkey, and the United Kingdom. In the plenary session the participants formulated and discussed the following “ISCHIA DECLARATION” signed by all participants\* and corresponding scientists unable to participate in person.

**WE ENCOURAGE YOU TO CONTACT US AND SIGN ON THE DECLARATION.**

\*with the exception of Prof. Dr. Moustafa Fouda, Minister Advisor on Biodiversity, Ministry of Environment, Arab Republic of Egypt.

### **THE ISCHIA DECLARATION**

The number of non-indigenous species (NIS) is substantially greater in the Mediterranean than for other European Seas - coastal habitats comprising native species alone are now a rare occurrence. With increased shipping, recreational boating, aquaculture and the Suez Canal, the number of NIS is expected to substantially grow in the region. The individual and synergistic impacts of the majority of the known invasions have already adversely affected the conservation status of many native species, critical habitats, the structure and function of ecosystems and the availability of natural resources. Some NIS are noxious, poisonous, or venomous and pose clear threats to human health.

As the bioinvasions in the Mediterranean Sea are creating an environmental and conservation crisis, we, the participants in the EuroMarine-sponsored workshop, convened in Ischia, Napoli, May 4-5, 2016 and debated the management challenges. We believe that although large numbers of NIS have been recorded from the Mediterranean Sea, it is not too late to act with effective participation of all relevant sectors.

Valuable efforts\*\* are being made to improve NIS inventorying, monitoring and data sharing. **However, to reduce the risk of new introductions and further spread of NIS already present in the Mediterranean Sea, a strategic focus on effective, science-based trans-boundary management of bioinvasions is needed.**

We call to:

- i) employ a **Mediterranean-wide** harmonized approach and protocols when managing bioinvasions;
- ii) enact a **one authority approach**, both nationally and regionally, appropriately funded to achieve stated targets;
- iii) focus on **preventing invasions** (i.e., 'pre-border' management of invasion vectors and pathways);
- iv) apply the existing **voluntary** Directives/Regulations/Conventions/ Guidelines and codes of practice with compliance, monitoring and enforcement, until **obligatory** pan-Mediterranean legislation is implemented;
- v) exercise the **precautionary approach** (i.e., act even when data/ information is limited in the region);
- vi) embed **risk assessment** (risk analysis and management) into the management at the appropriate level of action ( i.e. at vector, pathway, habitat or species, as relevant) and make the information available through clearing-house mechanisms;
- vii) conduct **multi-vector management**, taking into account future changes in **vector dynamics, climate scenarios** and environmental **changes due to human pressures**;
- viii) collect post-introduction information on **bio-ecological features** and **impacts** of NIS and make it available through clearing-house mechanisms;
- ix) incorporate **lost opportunities** (established NIS) in future *novel* ecosystems.

**“...introduced species undermine in an irreversible way everything that has been done to protect biodiversity, whether through the protection of species or the protection of habitats.”**

Boudouresque C.-F and Verlaque M. (2005) - Nature conservation, marine protected areas, sustainable development and the flow of invasive species to the Mediterranean Sea. *Scientific Reports of the Port-Cros National Park, France*, **21**: 29-54.

\*\*Decision IG.22/12 - Updated Action Plans Concerning “Cetaceans, Coralligenous and Other Calcareous Bioconcretions, and Species Introductions and Invasive Species; Mandate for update of the “Action Plan on Marine and Coastal Birds” and revision of the “Reference List of Marine and Coastal Habitat Types in the Mediterranean” UNEP(DEPI)/MED IG.22/28 (Decision IG.22/12).

Agius, Darmanin Sandra (Univ. of Malta, Malta), Albano, Paolo (Univ. of Vienna, Austria), Ben Souissi, Jamila (INAT, Tunisia), Berline, Leo (Univ. Aix-Marseille, France), Bottaro, Massimiliano (ISPRA Roma, Italy), Boudouresque, Charles F. (MIO, Univ. Aix-Marseille, France), Campese, Lucia (Univ. Federico II & SZN Napoli, Italy), Carlo, Fabiola (Univ. di Firenze, Italy), Cecere Ester (IAMC-CNR, Italy), Ciarlone, Luciano (Univ. of Napoli, Italy), Cinar, Melih Ertan (Ege Univ., Turkey), Colangelo, Paolo (Univ. of Roma, Italy), Cook Cottier, Elizabeth (Scottish Marine Institute, UK), Danovaro, Roberto (SZN Napoli, Italy), Denis, Francoise (Univ. Lemans, France), Di Meglio, Emanuela (SZN Napoli, Italy), Foo, Shawna (Univ. of Sydney, Australia), Gennaro, Paola (ISPRA Roma, Italy), Geropoulos, Antonios (Univ. of Crete, Greece), Giangrande, Adriana (Univ. del Salento, Italy), Gravili, Cinzia (Univ. del Salento, Italy), Grech, Daniele (SZN Napoli, Italy), Guala, Ivan (Fondazione IMC Oristano, Italy), Iacofano, Davide (Univ. of Palermo, Italy), Kumar, Amit (SZN Napoli, Italy), Lo Brutto, Sabrina (Univ. of Palermo, Italy), Lorenti, Maurizio (SZN Napoli, Italy), Marchini, Agnese (Univ. of Pavia, Italy), Mineur, Frédéric (Queen's Univ. Belfast, UK), Nawrot, Rafal (Univ. of Vienna, Austria), Occhipinti-Ambrogi, Anna (Univ. of Pavia, Italy), Ojaveer, Henn (Univ. of Tartu, Estonia), Otero, Maria del Mar (IUCN Malaga, Spain), Petrocelli, Antonella (IAMC-CNR, Italy), Pierri, Cataldo (Univ. of Bari, Italy), Piraino, Stefano (Univ. del Salento, Italy), Procaccini, Gabriele (SZN Napoli, Italy), Rinkevich, Baruch (NIO, Israel), Rubino, Fernando (CNR IAMC Taranto, Italy), Teixido, Nuria (SZN Napoli, Italy), Tempesti, Jonathan (Univ. of Pisa, Italy), Urcun, Sera Ovgu (S. Demirel Univ., Turkey), Uttieri, Marco (Univ. Parthenope Napoli, Italy), Vella, Adriana (Univ.

of Malta, Malta), Vella, Noel (Univ. of Malta, Malta). Additional adesiions: Silvia Rodriguez Climent (Instituto IPMA, Lisbon-Portugal), Michele Scardi (Univ Roma Tor Vergata, Italy), Michele Mistri (Univ. Ferrara, Italy), Paolo Balistreri (Univ. Palermo, Italy).



Fig. 1 – View of the meeting room with Bella Galil introducing the workshop on Bioinvasions at Hotel Villa Maria at Ischia.

### **The scope, topic and objectives of the workshop**

The number of recorded non indigenous species (NIS) in the Mediterranean Sea is far higher than in other European Seas, their number more than doubled between 1970 and 2015, with the greatest increase recorded in the 1990s and the 2000s.

The EU Regulation on the prevention and management of the introduction and spread of invasive alien species (IAS Regulation) (EC 2014) and the Marine Strategy Framework Directive (MSFD), where NIS constitute part of the evaluation of ‘Good Environmental Status’ (GES) (EC 2008, EC 2010), acknowledge the critical role of vectors in biological invasions and consider it crucial to manage the pathways. The general provisions ask Member States to “carry out a comprehensive analysis of the pathways of unintentional introductions and spread of invasive alien species in their territory and identify the pathways which require priority action (priority pathways)” (EC 2014, Art.13.1).

Yet, of the 23 states bordering the Mediterranean Sea only 9 are EU Member States. Though States are responsible for ensuring that activities within their jurisdiction do not damage the environment of other States, for the IAS Regulation concerning marine NIS to be effective in the Mediterranean Sea, implementation depends on policy coordination with the Regional Sea Convention (Barcelona Convention). At the Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols (Athens, Greece, 9-12 February 2016) the parties adopted the ‘**Updated Action Plan concerning Species Introductions and Invasive Species in the Mediterranean Sea**’ that focuses on the collection of data and the further development of the Marine Mediterranean Invasive Alien Species (MAMIAS) Database, but lacks management actions to prevent NIS introduction, control the spread of those already introduced, and endeavour to mitigate the damage they cause to the marine ecosystem.

The workshop objective is fully in line with the CBD decision of “*Identifying and prioritizing pathways of introduction of invasive alien species, taking into account, inter alia, information on the taxa, the frequency of introduction, and the magnitude of impacts, as well as climate change scenarios*” and to discuss the feasibility of the Aichi target 9 of the CBD, according to which “*By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment*”.

**The EuroMarine workshop ‘Management of bioinvasions in the Mediterranean Sea - the way forward’ aimed to discuss a general framework of what a comprehensive action plan for managing NIS under the unique conditions of the Mediterranean Sea should contain.** Amongst others, the following issues are to be considered: i) data collection and dissemination, ii) monitoring parameters

and reporting protocols, iii) pathway management, iv) abundance control, v) rapid response, vi) management in and adjacent to marine conservation/protected areas.



Fig. 2 – View of the meeting room during a discussion at the BioMarine workshop on Bioinvasions at Ischia.

**List of the presentations by the invited speakers (in alphabetical order):**

• **Leo Berline**

Université Aix-Marseille, Mediterranean Institute of Oceanography, Campus de Luminy, 13288 Marseille, France

HOW CAN WE USE OCEAN CIRCULATION KNOWLEDGE TO IDENTIFY AND PRIORITIZE PATHWAYS OF INVASION

• **Melih Ertan Cinar**

Ege University, Faculty of Fisheries, Department of Hydrobiology, 35100 Bornova, Izmir, Turkey

MONITORING MARINE INVASIVE SPECIES IN THE MEDITERRANEAN SEA

• **Elizabeth Cook Cottier**

Scottish Marine Institute, Oban, Argyll PA37 1QA, UK

MANAGEMENT OF MARINE INNS IN MARINE CONSERVATION AREAS

• **Bella Galil**

National Institute of Oceanography, 31080 Haifa, Israel

MANAGEMENT OF BIOINVASIONS IN THE MEDITERRANEAN SEA - THE WAY FORWARD

• **Adriana Giangrande<sup>1</sup>, Marco Lezzi<sup>1</sup>, Michela Del Pasqua<sup>1</sup>, Maria Cristina Gambi<sup>2</sup>**

<sup>1</sup>Dipartimento di Scienze e Tecnologie Biologiche e Ambientali, Università del Salento, Unità CoNISMa, Lecce, Italy

<sup>2</sup>Dept. Integrative Marine Ecology, Stazione Zoologica Anton Dohrn, Naples, Italy

A WAY FORWARD THE LIST OF ALIEN SPECIES: THE CASE STUDY OF THE FOULING IN THE GULF OF TARANTO, ITALY

• **Frédéric Mineur**

School of Biological Sciences, Queen's University Belfast, Belfast BT9 7BL, UK

INTENTIONAL AND ACCIDENTAL TRANSPORTS OF MARINE ORGANISMS INTO THE MEDITERRANEAN SEA: TRACKING AND REGULATING PATHWAYS

- **Anna Occhipinti Ambrogi, Jasmine Ferrario, Agnese Marchini**

Department of Earth and Environmental Sciences, University of Pavia, Pavia, Italy

TRANS-NATIONAL DISPERSAL OF NIS IN THE MEDITERRANEAN SEA: PATHWAYS OF SECONDARY SPREAD AND CONTROL STRATEGIES

- **Henn Ojaveer**

Estonian Marine Institute, University of Tartu, Pärnu, Estonia

MANAGING MULTIPLE VECTORS FOR MARINE BIOINVASIONS

- **Baruch Rinkevich**

National Institute of Oceanography, 31080 Haifa, Israel

UNORTHODOX ECOLOGICAL APPROACHES IN THE MANAGEMENT OF MARINE BIOINVASIONS

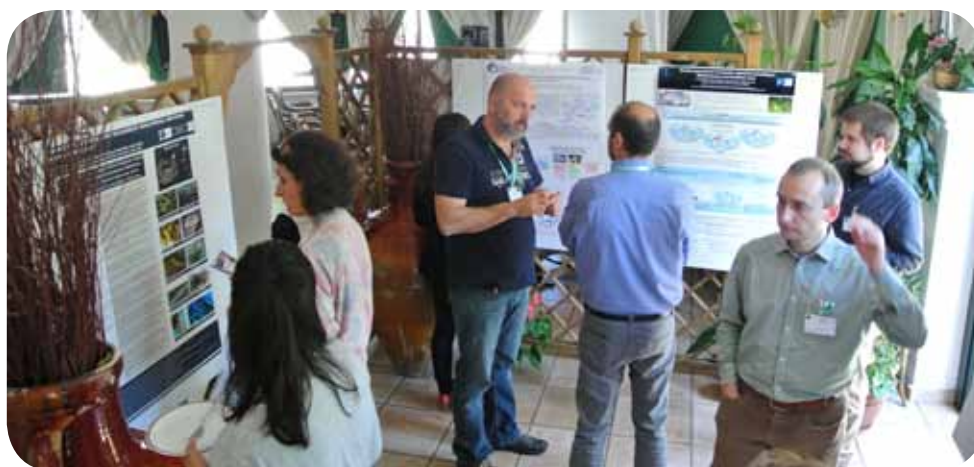


Fig. 3 - View of the poster session during the BioMarine workshop on Bioinvasions at Ischia.

### ***Posters:***

- ASSESSING BIOLOGICAL INVASIONS IN MACROALGAL ASSEMBLAGES OF MEDITERRANEAN HARD BOTTOM HABITATS: A NEW INDEX PROPOSAL

***L. Piazzì<sup>1</sup>, P. Gennaro<sup>2</sup>, G. Ceccherelli<sup>1</sup>***

<sup>1</sup>Department of Sciences for Nature and Environmental Resources, University of Sassari, Via Piandanna, 4 – 07100 Sassari, Italy

<sup>2</sup>Italian National Institute for Environmental Protection and Research (ISPRA), Via di Castel Romano, 100 - 00128 Rome, Italy

- GENETIC ASSESSMENT OF *HALOPHILA STIPULACEA* SPREADING IN MEDITERRANEAN AND CARIBBEAN SEAS

***L. Campese<sup>1</sup>, K. Chiquillo<sup>2</sup>, R. Haroun<sup>3</sup>, M. Jahnke<sup>1</sup>, G. Procaccini<sup>1</sup>, G. Winters<sup>4</sup>, D.A. Willette<sup>2</sup>***

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<sup>2</sup>University of California, Los Angeles, USA

<sup>3</sup>Universidad de Las Palmas de Gran Canaria, Canary Islands, Spain

<sup>4</sup>The Dead Sea Arava Science Center, Neve Zohar, Israel

- BIODIVERSITY CHANGES IN THE TARANTO SEAS: THE ROLE OF ALIEN SPECIES INTRODUCTION

**Rubino F., Cecere E., Belmonte M., Portacci G., Petrocelli A.**

Institute for Coastal Marine Environment-CNR, UOS Taranto, Italy

- DEATH ASSEMBLAGES ENABLE QUANTIFICATION OF TIME-LAGS IN FIRST DETECTION OF ALIEN SPECIES

**P.G. Albano<sup>1</sup>, I. Gallmetzer<sup>1</sup>, A. Haselmair<sup>1</sup>, D.S. Kaufman<sup>2</sup>, A. Tomašových<sup>3</sup>, M. Stachowitsch<sup>4</sup>, M. Zuschin<sup>1</sup>**

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<sup>4</sup>Department of Limnology and Bio-Oceanography, Center of Ecology, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria

- NON-NATIVE SPECIES ALTER THE REGIONAL BODY-SIZE DISTRIBUTION OF MEDITERRANEAN BIVALVES

**R. Nawrot<sup>1</sup>, P.G. Albano<sup>1</sup>, D. Chattopadhyay<sup>2</sup>, M. Zuschin<sup>1</sup>**

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<sup>2</sup>Department of Earth Sciences, Indian Institute of Science Education and Research, Kolkata, Mohanpur, WB-741246, India

- HOW A TINY COPEPOD BECOMES UBIQUITOUS: SETTLEMENT OF *PSEUDODIAPTOMUS MARINUS* IN THE MEDITERRANEAN SEA

**Sabia L.<sup>1</sup>, Zagami G.<sup>2</sup>, Mazzocchi M.G.<sup>3</sup>, Zambianchi E.<sup>1</sup>, Uttieri M.<sup>1</sup>**

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- *MNEMIOPSIS* DISTRIBUTION ALONG THE ITALIAN COASTS

**Zampardi S.<sup>1</sup>, Boero F.<sup>1,2</sup>, Piraino S.<sup>1</sup>, Gravili C.<sup>1</sup>**

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<sup>2</sup>Istituto CNR-ISMAR, Genova, Italy

- MONITORING INVASIONS: A COLLABORATIVE EFFORT WITH THE FISHING COMMUNITY

**A. Vella, S. Agius Darmanin, N. Vella**

Conservation Biology Research Group, Biology Department, University of Malta, Malta

- LIFEWATCH-ITALY, THE E-RESEARCH INFRASTRUCTURE FOR THE STUDY OF BIODIVERSITY: TOOLS, SERVICES AND GOOD PRACTICES

**Pierrri C.<sup>1</sup>, Colangelo P.<sup>2</sup>, the LifeWatch-Italy community**

<sup>1</sup>CNR-IBAF Montelibretti (Rome), Italy

<sup>2</sup>CNR-ISE, Verbania Pallanza, Italy

- FURTHER RECORD OF *PARANTHURA JAPONICA* (RICHARDSON, 1909) (ANTHURIDEA, ISOPODA) FROM A MEDITERRANEAN COMMERCIAL HARBOUR

**J. Tempesti, J. Langheneck, A. Castelli**

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- TAXONOMY LAB: A SENTINEL FOR MEDITERRANEAN BIOINVASIONS

**Lo Brutto S., Iacofano D., Schimmenti E., Arculeo M.**

Dip. STEBICEF, University of Palermo, Italy

- NEW ALIEN SPECIES FROM TUNISIAN COASTAL WATERS: ONE YEAR SINCE THE LAST UPDATE (MARCH 2015)

**J. Ben Souissi, M. Rifi, J. Zaouali**

Institut National Agronomique de Tunisie, 43, Av. Charles Nicolle, Cité Mahrajène, Université de Carthage, Tunis, Tunisie

- MACROECOLOGICAL MODELLING AND MAPPING RISKS OF INVASIVE MARINE SPECIES

**P. Colangelo<sup>1</sup>, C. Pierrì<sup>2</sup>**

<sup>1</sup>Institute of Ecosystem Study - National Research Council, Verbania-Pallanza

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- YOU ARE HERE: ALIEN SPECIES OF ISCHIA, PROCIDA AND VIVARA (GULF OF NAPLES)

**M.C. Gambi, M. Lorenti, F.P. Patti, V. Zupo**

Stazione Zoologica Anton Dohrn, Dept Integrative Marine Ecology, Villa Dohrn-Benthic Ecology Center, Ischia (Naples), Italy

- SEARCHING FOR BIOLOGICAL CHARACTERISTICS OF BENTHIC MEDITERRANEAN EXOTIC SPECIES: EXTENSIVE GAPS IN KNOWLEDGE

**A. Geropoulos, I. Karakassis**

Biology Department, University of Crete, Voutes University Campus, 70013, Heraklion, Greece

- EXPANSION OF THE DISTRIBUTION AREAL OF *DYKEROGAMMARUS VILLOSUS* (AMPHIPODA) IN THE WATERSHED OF A RECENTLY COLONIZED ARTIFICIAL WATER BODY (FLORENCE, ITALY)

**C. Rossano, F. Carlo, F. Scapini**

Department of Biology, University of Florence, Italy

- MEDMIS PLATFORM TO FOLLOW MARINE INVASIVE SPECIES IN MEDITERRANEAN MARINE PROTECTED AREAS (MPAS)

**M. Otero**

IUCN-Centre for Mediterranean Cooperation, Spain

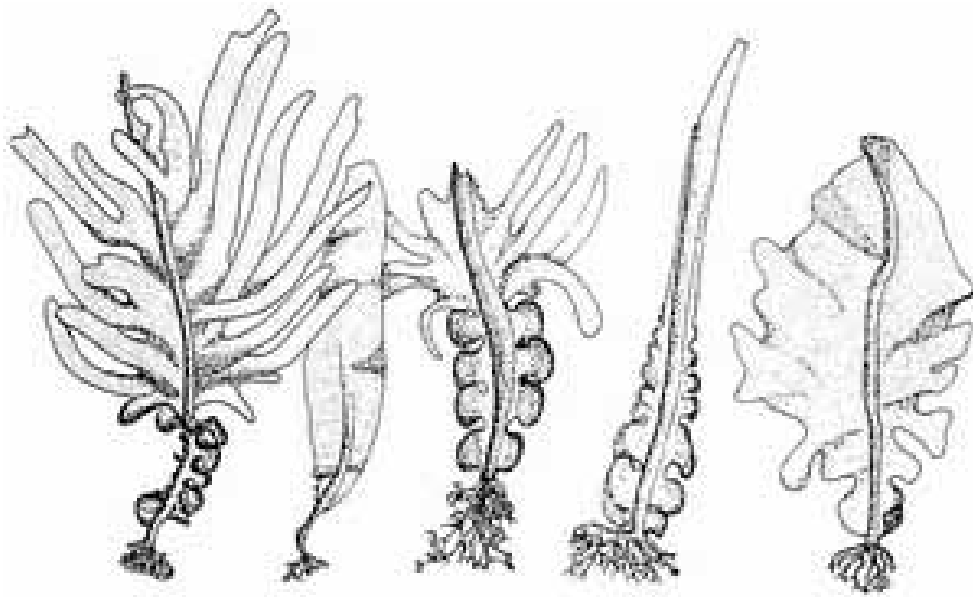
**Acknowledgements:** We wish to thank the Stazione Zoologica Anton Dohrn (Napoli) for additional financial support to the workshop, and Rosanna Messina for her thorough secretary help during the workshop. Very special thanks to Dario Della Vecchia and the whole Villa Maria Hotel staff for the kindness, patience, computer support, poster set-up, and for the pictures.

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Fig. 4 - The group of participants at the BioMarine workshop on Bioinvasions at Ischia in front of the workshop's venue at Villa Maria Hotel (Ischia Porto, Italy).



(FAO FishFinder)



## AN ANNOTATED LIST OF ALIEN MARINE SPECIES OF THE ISCHIA ISLAND (GULF OF NAPLES)

This contribution was presented as a poster at the BioMarine Workshop “Management of Bioinvasions in the Mediterranean Sea - a way forward”, held on the island of Ischia on 4-5 May 2016, with the aim of updating the information and providing the workshop’s participants with a list of the alien taxa that have been recorded in the area hosting the meeting.

The island of Ischia, and the nearby islands of Procida and Vivara (Phlaegrean islands), are located on the northern side of the Gulf of Naples, and are included within the Marine Protected Area of the “Regno di Nettuno” (“Neptune’s Realm”) since April 2008 (Gambi *et al.*, 2003).

The Phlaegrean islands are considered a biogeographic boundary which constitutes the distribution limit of most South Mediterranean thermophilous species, since the 14 °C *minimum winter surface temperature* isotherm (the 14 °C divide) is occurring between Ischia and the Pontine archipelago (e.g., Ventotene island) (Gambi *et al.*, 2009; Gambi, 2014). In the past two decades, due to global warming also detected in the Mediterranean surface waters, we observed a northward shift of the 14 °C divide, while the minimum winter isotherm in the area of the Phlaegrean islands is now often rising to the 15 °C divide. Therefore this zone is an interesting observatory for the distribution and migratory pattern of thermophilous species both native and introduced/aliens (Gambi, 2014). Occurrence and increase in the abundance of some native Mediterranean warm-species have been documented for this area (Dappiano and Gambi, 2004; Cigliano *et al.*, 2007; Gambi, 2014), as for the coral *Astroides calycularis* (Pallas, 1776), the bryozoan *Calpensia nobilis* (Esper, 1796), and the fishes *Sparisoma cretense* (L., 1758), *Spherooides pachygaster* (Müller & Troschel, 1848) and *Sphyræna viridensis* Cuvier, 1829.

As for the alien taxa the annotated list of the species recorded at Ischia is reported in Tab. 1.

A total of 22 alien species have been documented including 1 dinoflagellate, 4 macroalgae, 1 sponge, 3 hydrozoans, 7 polychaetes, 2 molluscs, 2 crustaceans, 1 bryozoan and 1 fish. Although some of the listed taxa are occasional and have been recorded in the area only once (e.g., the fish *F. commersonii* or the opisthobranch *B. leachi*), this number of aliens is relatively high, in comparison with areas of larger extension. As an example, 47 taxa are reported from the Central Tyrrhenian Sea and 31 from the Southern Tyrrhenian Sea (see Occhipinti Ambrogi *et al.*, 2011). The high number of records from Ischia is probably in relation to the large amount of benthic studies issued from the activity of the Stazione Zoologica, especially at the Villa Dohrn-Benthic ecology Center (Ischia), whose investigations around the island date back to the late 1960s (Gambi, 2014).

Some of the species recorded show an invasive habit, such as the dinoflagellate *O. ovata*, the macroalgae *C. cylindracea* and *A. armata*, and the invertebrates *B. bairdi*, *P. paucibranchiata*. Most of the species have a Indo-Pacific origin and some of them likely entered from the Red Sea via the Suez Canal (e.g., *B. luctuosum*, *B. leachi*, *F. commersonii*), while *P. magna*, *B. bairdi* and *A. verticillata* have a South Atlantic or Caribbean origin.

Finally, it is interesting to note that various alien species have been recorded from the acidified zones (low and extreme low pH conditions) of the Castello Aragonese CO<sub>2</sub> vents, such as *O. ovata*, *A. taxiformis*, *C. cylindracea*, *B. bairdi*, *N. infratorquata*, *Mesanthura* sp., *P. gibbesi* (Fig. 1), and thus in agreement with what observed with other “nuisance” species in other CO<sub>2</sub> vent’s systems (Hall-Spencer and Allen, 2015). Several other species were reported inside or in the vicinity of the harbor of Ischia, e.g., *S. comatus*, *B. bairdi*, *P. antennata*, or associated to artificial structures, e.g., *P. magna*, *B. luctuosum*, *B. bairdi* and *A. verticillata*, thus confirming the general observation that more impacted and low competition habitats are more prone to the colonization/invasion by aliens (Occhipinti Ambrogi *et al.*, 2011).

Tab. 1

Alien species/origin	Notes and references
(*) <i>Ostreopsis ovata</i> Fukuyo, 1981 (Dinoflagellata, Dinophyceae) (Indo-Pacific)	Recorded in Ischia since 2011-2012 (reported in Di Cioccio <i>et al.</i> , 2014), including the acidified areas of the Castello CO <sub>2</sub> vents. Recorded also recently in September 2016 (Gambi M.C., pers. observ.)
(*) <i>Caulerpa cylindracea</i> (Sonder) Verlaque, Huisman & Boudouresque (Chlorophyceae) (Indo-Pacific)	Recorded since 2000 in various areas off Ischia (Buia <i>et al.</i> , 2003 indicated as <i>Caulerpa racemosa</i> ) is highly invasive especially in summer and autumn. It occurs also on the CO <sub>2</sub> vents off the Castello Aragonese (Hall-Spencer <i>et al.</i> , 2008) although not all years (Gambi M.C., pers. observ.)
(*) <i>Asparagopsis taxiformis</i> (Delile) Trevisan de Saint-Leon (Rhodophyceae) (Indo-Pacific)	Recorded in 2000 off Ischia and Procida (Flagella <i>et al.</i> , 2003; D'Archino <i>et al.</i> , 2003 in Gambi <i>et al.</i> , 2003) and confirmed to belong to <i>A. taxiformis</i> based on genetic analysis by Andreakis <i>et al.</i> (2004). At present, it is very abundant/invasive in spring also in the north acidified area of the Castello Aragonese CO <sub>2</sub> vents, both on bare rock and among <i>Posidonia</i> shoots (Gambi M.C., person. observ.)
<i>Acrothamnion preissii</i> (Sonder) E.M. Wollaston (Rhodophyceae) (Indo-Pacific)	Recorded in June 2015 in shallow rocky reefs (10 m depth) off Ischia (Ballesteros E., Teixido N. & Gambi M.C., unpublished data)
<i>Womersleyella setacea</i> (Hollenberg) R.E. Norris (Rhodophyceae) (Indo-Pacific)	Recorded in June 2015 in shallow rocky reefs (10 m depth) off Ischia (Ballesteros E., Teixido N. & Gambi M.C., unpublished data)
<i>Paraleucilla magna</i> Klatau <i>et al.</i> , 2004 (Porifera) (South Atlantic, Brazil)	Recorded in 2014 on artificial barriers and structures around the coast of Ischia (Grech <i>et al.</i> , 2015)
<i>Eudendrium merulum</i> Watson, 1985 (Hydrozoa) (South Pacific)	Observed along the coast of Ischia by Piraino S. (pers. observ.) and reported in Gravili <i>et al.</i> (2010)
<i>Clytia linearis</i> (Thorneley, 1900) (Hydrozoa) (Circumtropical)	Recorded as epiphytic on <i>Posidonia oceanica</i> by Boero (1981a, b)
<i>Cirrholovenia tetranema</i> Kramp, 1959 (Hydrozoa) (Indo-Pacific)	Recorded by Brinckmann (1965), but already signaled at Ischia by Uchida (1964) and identified as <i>Eugymnanthea minuta</i> (see Kubota, 1995)
(*) <i>Pseudopolydora paucibranchiata</i> Okuda, 1937 (Polychaeta, Spionidae) (Indo-Pacific)	Recorded in July 2014 in the soft bottoms of the harbor of Ischia, but present in the harbor since 1977 (identified as <i>Polydora antennata</i> in Fresi <i>et al.</i> , 1983, 1984). The present record represents the first in the Western Mediterranean (Radashevsky V., Giangrande A. & Gambi M.C., unpublished data)
<i>Lysidice collaris</i> Grube, 1870 (Polychaeta, Eunicidae) (Red Sea, lessepsian)	Species borer of <i>Posidonia oceanica</i> seagrass sheaths, recorded in Ischia since 1995 (Guidetti <i>et al.</i> , 1997)
<i>Streblosoma comatus</i> (Grube, 1859) (Polychaeta, Terebellidae) (Indo-Pacific)	Reported as <i>Streblosoma hesslei</i> in the harbor of Ischia in 1977 (Giangrande <i>et al.</i> , 1981)
<i>Branchiomma luctuosum</i> (Grube, 1869) (Polychaeta, Sabellidae) (Red Sea, lessepsian)	Recorded in Ischia in 1992 on a <i>Cymodocea nodosa</i> meadow (Sordino and Gambi, 1992) and in artificial moorings (Gambi M.C., pers. observ.); it seems no more present in this area (Gambi M.C., pers. observ.)
(*) <i>Branchiomma bairdi</i> (McIntosh, 1885) (Polychaeta, Sabellidae) (Caribbean Sea)	Recorded in July 2012 inside the marinas of Lacco Ameno, Casamicciola and Ischia. It occurs also in the acidified areas of the south side CO <sub>2</sub> vents of the Castello (Arias <i>et al.</i> , 2013), where is now becoming invasive (Gambi M.C., pers. observ.)
<i>Novafabricia infratorquata</i> (Fitzhugh, 1973) (Polychaeta, Fabriciidae) (Caribbean Sea)	Recorded in rocky vegetated reef of the low pH area of the Castello CO <sub>2</sub> vent's system in 2008 (Giangrande <i>et al.</i> , 2014)

<i>Spirorbis marioni</i> Caullery & Mesnil, 1897 (Polychaeta, Serpulidae) (Indo-Pacific)	Recorded in 2008 on artificial settlement structures off the Castello Aragonese area at Ischia but in areas with normal pH conditions (Cigliano <i>et al.</i> , 2010)
<i>Percnon gibbesi</i> (H. Milne Edwards, 1853) (Crustacea Decapoda) (Atlantic and Pacific)	Visually observed since 2004 in several intertidal/upper subtidal areas of Ischia (Lorenti M., Zupo V., Gambi M.C., pers. observ.; Dappiano and Gambi, 2004). A few juveniles, identified as <i>P. cf. gibbesi</i> , have been collected in the <i>Posidonia oceanica</i> meadow off the Castello d'Ischia in 2011 (Garrard <i>et al.</i> , 2014)
<i>Mesanthura</i> sp. (Crustacea, Isopoda) (Indo-Pacific?)	A species showing the traits of an alien, likely conspecific with <i>M. romulea</i> Poore & Lew Ton, 1986 (Indo-Pacific) (Lorenti <i>et al.</i> , 2009). Found on the rocky reefs off the Castello Aragonese at Ischia (Kroeker <i>et al.</i> , 2011)
<i>Bursatella leachi</i> De Blainville, 1817 (Mollusca Opisthobranchia) (Red Sea, lessepsian)	Recorded at Ischia in 1986 (Russo, 1987) in a <i>Cymodocea nodosa</i> meadow. Never recorded after
<i>Polycerella emertoni</i> Verrill, 1881 (Mollusca Opisthobranchia) (Amphi-Atlantic species)	Recorded as <i>Polycerella recondita</i> Schmekel, 1965 by Schmekel (1968) in the Cartaromana Bay at Ischia (2-10 m depth). Never reported after
(*) <i>Amathia (Zoobotryon) verticillata</i> (Delle Chiaje, 1822) (Bryozoa) (Caribbean Sea)	Observed in 2000 as epiphytic on <i>Cymodocea nodosa</i> and some macroalgae and gorgonians (Gambi M.C., pers. observ.), and in more recent years (2013-2014) in artificial reefs off Ischia (Grech <i>et al.</i> , 2015)
<i>Fistularia commersonii</i> Rueppel, 1838 (Osteichthyes) (Red Sea, lessepsian)	Recorded at Ischia (Sant'Angelo cliff, 14 m depth) in November 2014 (Tiberti <i>et al.</i> , 2015)

(\*) = invasive

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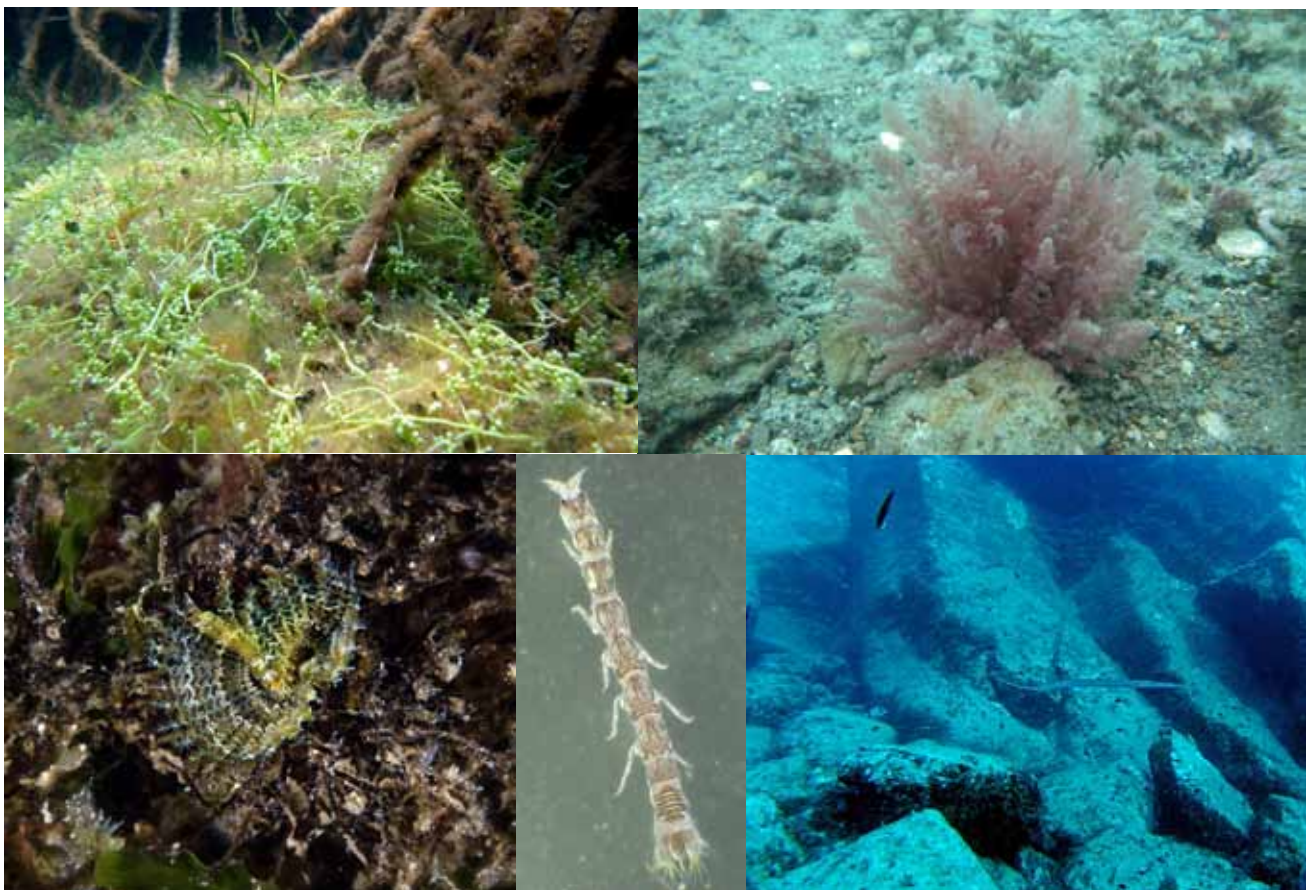


Fig. 1 - Some of the alien species recorded along the coast of Ischia: top left) *Caulerpa cylindracea* settled among *Posidonia* at the Castello south side low pH zone (3 m depth; photo: Iacono B.); top right) *Asparagopsis taxiformis* settled on bare rocks at the Castello north side low pH zone (3 m depth; photo: Gambi M.C.); bottom left) *Brachiomma bairdi* settled at the Castello south side low pH zone (1 m depth; photo: Vassallo P.); bottom center) *Mesanthura* sp. (photo: Lorenti M.); bottom right) *Fistularia commersonii* at San Angelo cliff (Ischia, 14 m depth; photo: Renella G.).