AN UPDATE OF MARINE ALIEN SPECIES OFF THE ISCHIA ISLAND (TYRRHENIAN SEA), WITH A CLOSER LOOK AT NEGLECTED INVASIONS OF *LOPHOCLADIA LALLEMANDII* (RHODOPHYTA)

The island of Ischia, the largest of the Phlaegrean islands (Gulf of Naples), is included within the Marine Protected Area (MPA) of the "Regno di Nettuno" ("Neptune's Realm") since April 2008. This area, as well as the Gulf of Naples, represents an interesting observatory to study the distribution and range expansion of thermophilous species both native and introduced/aliens (Gambi, 2014; Gambi *et al.,* 2016). During the BioMarine Workshop "Management of Bioinvasions in the Mediterranean Sea – a way forward", held in the island of Ischia on 4-5 May 2016 (Gambi and Galil, 2016), we produced a first annotated list of the marine alien taxa recorded from the island of Ischia (Gambi *et al.,* 2016). In that report, a total of 22 alien species were documented including 1 dynoflagellate, 4 macroalgae, 1 sponge, 3 hydrozoans, 7 polychaetes, 2 molluscs, 2 crustaceans, 1 bryozoan and 1 fish (Tab. 1).

With this contribution we update that list, presenting ~~6~~ additional marine alien species recorded from the coasts of Ischia, together with a taxonomic emendation of one of the previously reported species. Two of these alien taxa have been signalled through the Citizen Science web site of the MPA "Regno di Nettuno" (www.citizensciencerdn.org) (Gambi *et al.,* 2018).

The 7 taxa newly reported for the zone are: the red alga *Lophocladia lallemandii* (Montagne) F. Schmitz 1893; the isopods *Paracerceis sculpta* (Holmes, 1904) and *Paranthura japonica* Richardson, 1909; the amphipod *Caprella scaura* Templeton, 1836; the heterobranch mollusc *Aplysia dactylomela* Rang, 1828; the bryozoan *Celleporaria brunnea* (Hinck, 1884), and the tunicate *Styela plicata* (Lesueur, 1823). With regard to *L. lallemandii*, at least two neglected episodes of massive occurrence in the past 20 years, are reported, suggesting a strong potential for invasion by this species. While, the previously recorded polychaete species *Branchiomma bairdi* (McIntosh, 1885) (Arias *et al.,* 2013; Gambi *et al.,* 2016), is actually belonging to the closely related alien species *Branchiomma boholense* (Grube, 1878), as recently clarified by Del Pasqua *et al.* (2018). These new records led to increase the number of aliens around the Phlaegrean islands to 29 taxa (Tab. 1), which is a relatively high number respect to the area, and to the Gulf of Naples and the Central Tyrrhenian Sea (Occhipinti Ambrogi *et al*., 2011).

For each taxon we provide below some notes on the occurrence in the study area.

***Lophocladia lallemandii* (Montagne) F. Schmitz, 1893**

The Rhodophyta *Lophocladia lallemandii* is included in the black list of invasive marine species ~~(IUCN)~~. The impacts of its invasion and massive occurrence are well documented in the Mediterranean Sea (Ballesteros *et al*., 2007; Marba *et al.,* 2014). This species was first observed at Ischia island by the NEMO Association for the Diffusion of the Culture of the Sea in 2009 (Tiberti L., pers. observ.), during the snorkeling marine excursion activities. The excursions were concentrated in some sites with high ecological value around the island of Ischia, in particular the southern zone of the island and the western side of Cape Sant'Angelo, in the area called "Le Parate". The operators of NEMO were attracted by an anomalous increase in the algal coverage moving from the surface up to about 15 m depth. The rocky bottom and the *Posidonia oceanica* (L.) Delile patches were totally covered with a red carpet, never noticed elsewhere, whose coverage increased during the summer season (Fig. 1). Among the thalli, various fish species were observed to hide and find shelter (Fig. 1), thus suggesting that the ~~species~~ invasion had not apparent negative effects on the local fish habitat. During the storms of late August and September 2009, these shrubs of about 15 cm in diameter were easily detached from the substratum and accumulated on the nearby beach "Chiaia di Rose", creating inconvenience to bathers and difficulties for beach operators in the area, as also reported in Sicily (ISPRA, 2011). Following interviews with beach operators, they recalled a similar phenomenon around the 1998/1999, more or less

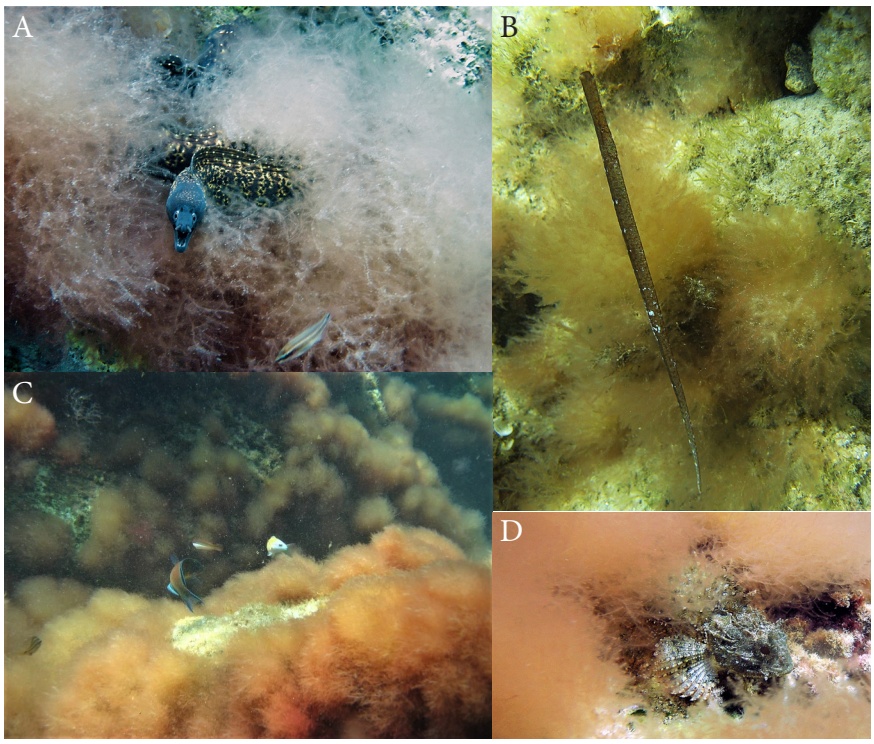

Fig. 1 - Different views of Lophocladia lallemandii recorded in Sant'Angelo during the massive occurrence in 2009 (1-2 m depth), note the presence of various species of fishes among the thalli (photos by Tiberti L.).

corresponding to the year of the record of the species from the Balearic Islands, 1995 (Patzner, 1998). An informal report was then sent to a researcher of the Stazione Zoologica A. Dohrn, who hypothesized that it could be *L. lallemandii* (Buia M.C., pers. comm.), previously reported in a technical report (ARPAC, 2007) in another part of the island, Capo Negro, not far from Sant'Angelo. *Lophocladia lallemandii* is one of the first alien species reported in the Mediterranean Sea (Petersen, 1918), and its first report in Italy dates back to 1971 in Sicily (Furnari and Scammacca, 1971). From summer 2016 onwards, the operators of the NEMO Association noticed a decrease in both the density of the alga (approx. from value 5, on the Braun-Blanquet scale, to value 4), and the extension of the invaded area (absence of thalli in the area between the shoreline and the breakwater barriers with consequent almost complete disappearance of thalli stranded to shore).

In the light of the ever increasing attention in monitoring and management of alien species in Marine Protected Areas, given the lack of information on the presence and distribution of this species in Ischia (with the exception of the aforementioned technical report by ARPAC, 2007), and in the spirit of partnership and diffusion of the Local Ecological Knowledge (Huntington, 2000), in 2018 the NEMO Association considered appropriate to point out this phenomenon through the Citizen Science portal created by the ~~Protected Marine Area~~ "Regno di Nettuno" (islands of Ischia, Procida and Vivara) (Gambi *et al*., 20128): www.citizensciencerdn.it.

The report was then taken into consideration and in October 2018 we carried out a survey in the area with collection of the alga whose taxonomic identification let us to confirm it was *L. lallemandii*. In October 2018 the species was observed in a quite large area from 2 to 5 m depth (Fig. 2), inside and outside the breaking barriers and in the "Le Parate" cove. ~~The~~ western slope of the promontory (where is located ~~the cove "Le Parate"~~), the tufa volcanic rocks deposits~~,~~ form a terrace up to 10 m depth ~~and~~ gently degrade up to 30 m depth, where we found the edge of various canyon heads, so the area is exposed to wave and current actions. The thalli were settled mainly on the rocky reefs, and also surrounding small *Posidonia* patches (Fig. 2), but not observed above the seagrass canopy. The thalli showed different sizes, mainly around 5-10 cm in diameter, and with a distribution in patches of different dimensions and density. We registered also other occurrence of the species near Punta San Pancrazio, on the southern side of Ischia, at 5 m depth with isolated thalli (Sorvino P. and Gaglioti M., pers. comm.). In the absence of further information, we are led to believe that the species has invaded

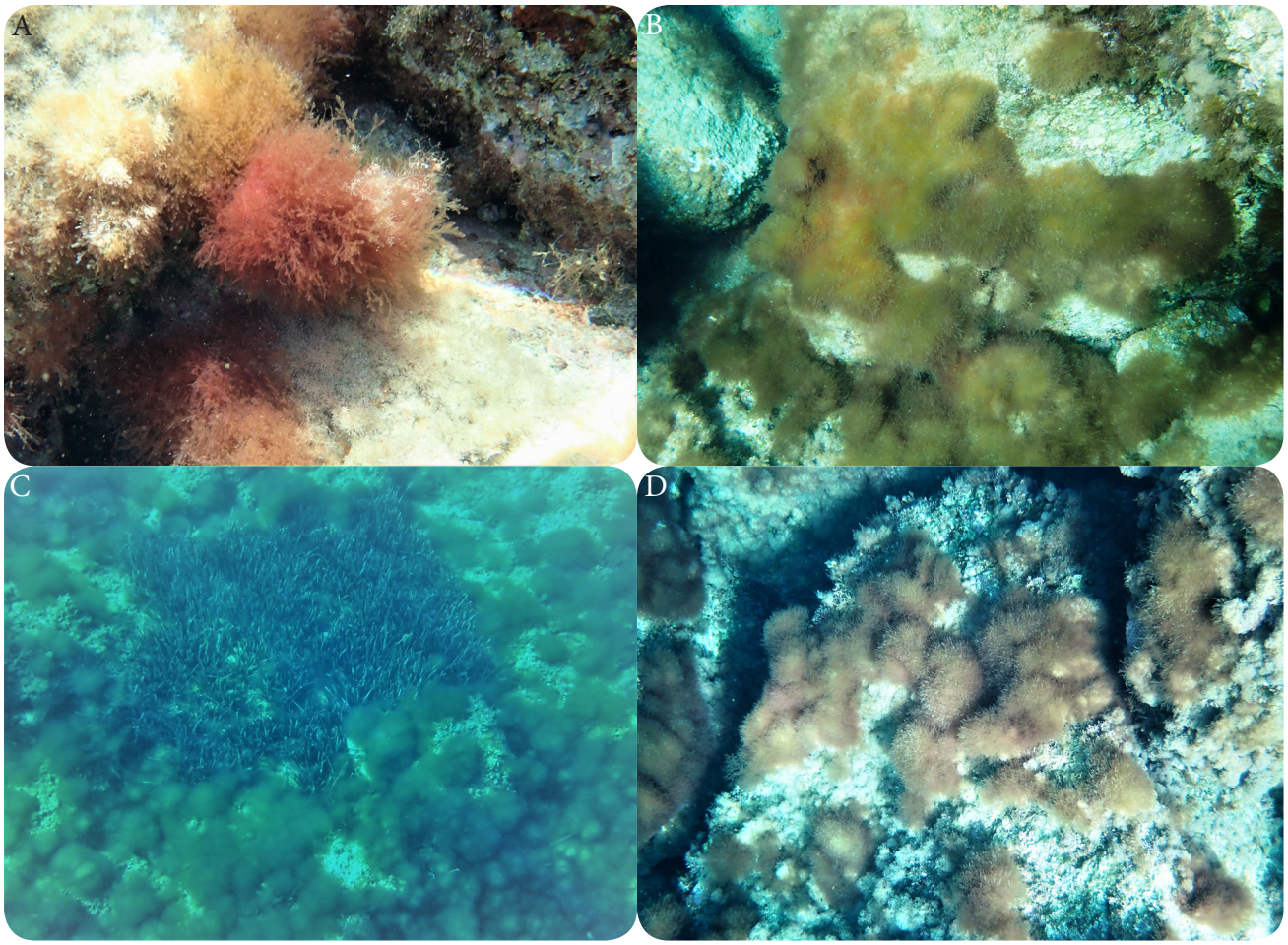

Fig. 2 - Different views of *Lophocladia lallemandii* settled on hard bottoms and around a Posidonia oceanica patch ~~in~~ "Le Parate" cove (Sant'Angelo) during the massive occurrence recorded in October 2018 (1-5 m depth) (photos by Gambi M.C.).

only the southern side of the island.

As it well documented, the island of Ischia, especially its northern side, is ~~completely~~ surrounded by extensive *P. oceanica* meadows (Buia *et al.,* 2003), and the presence of *L. lallemandii* may represent a serious threat for the resilience of this ecosystem, as observed in other areas of the Mediterranean Sea (Ballesteros *et al.,* 2007; Marbà *et al.,* 2014). Therefore, we consider important to deepen the monitoring of this species ~~also~~ in the future, also - but not only - through communication campaigns aimed at soliciting the contribution of the local community. In our opinion, the Sant'Angelo site is of high scientific interest because it is included almost entirely within the B no-take zone of the Marine Protected Area (entrance allowed only for bathing and guided snorkel and SCUBA diving) and, ~~as it is within the coastal strip and~~ the rocky cost and reefs are quite steep, anchorage and fishing are not allowed, therefore, the anthropic disturbance is ~~very~~ reduced.

***Branchiomma boholense* (Grube, 1878)**

The genus *Branchiomma* is well represented in the Mediterranean Sea by various native species and by three alien taxa: *Branchiomma luctuosum* (Grube, 1870), *B. bairdi* (Mc Intosh, 1885) and *B. boholense* (Grube, 1878). The three alien species are common in the fouling of degraded habitat, ports and marinas (Del Pasqua *et al.,* 2018). In the Italian coastal waters *B. luctuosum* is known since 1983 (Licciano *et al*., 2002), while *B. bairdi* was first reported in the lake of Faro, near the Messina Strait by Giangrande *et al.* (2012), and successively in other sites by Arias *et al.* (2013) and Mytilineou *et al.* (2016). In particular, in the study of Arias *et al.* (2013) there are records of this species for the coast

of Ischia (*e.g.*, Casamicciola and Lacco Ameno marinas), including the acidified area off the Castello CO_2 vents (Gambi *et al.*, 2016). *Branchiomma bairdi* was originally described from Bermuda, and has frequently been reported as an invader in the Mediterranean, the Atlantic and the Eastern Pacific, but recent observations have raised some taxonomic questions. In fact, a detailed morphological and genetic analyses revealed a conspicuous genetic divergence between the sampled Mediterranean populations and the extra-Mediterranean ones which also differ in some morphological and reproductive features (Del Pasqua *et al.,* 2018). On the base of the genetic analyses, samples from Ischia (vents and other sites inside the marinas; Fig. 3) together with other Mediterranean samples were re-designated as *B. boholense*, originally described from Philippines (Del Pasqua *et al.,* 2018). *Branchiomma bairdi* and *B. boholense* differ in body size (smaller for *B. boholense*), development type, shape of micro and macrostylodes, size of radiolar eyes and body pigmentation. Therefore, the distribution of *B. bairdi* and *B. boholense* within the Mediterranean basin should be reconsidered, and previous records of *B. bairdi* reported for the Italian coasts should probably refer to *B. boholense*. *Branchiomma boholense,* present in the Eastern Mediterranean since the early 1900s (Knight-Jones *et al.,* 1991), recently has spread and establish successfully in the central and western Mediterranean basin (Del Pasqua *et al.,* 2018). The Indo-Pacific origin of *B. boholense* and its first findings from the Eastern Mediterranean, suggest the species might have entered the Mediterranean trough the Suez Canal (Del Paqua *et al.,* 2018). While *B. bairdi* occurs in the western side of the basin and its records at Canary and Madeira Islands are consistent with a probable introduction from the Atlantic Ocean throughout the Gibraltar Strait.

Fig. 3 - A specimen of *Branchiomma boholense* (at 1.5 m depth) settled on the rocky reef among the macroalgae at the southern side of the acidified area off the Castello CO_2 vents (photo by Vassallo P.).

***Aplysia dactylomela* Rang, 1828**

The heterobranch mollusc *Aplysia dactylomela*, known as "ring's aplysia", is a thermophilous species, originary from the Atlantic Ocean, and found more frequently in the surface waters of the Mediterranean Sea (Valdes *et al.,* 2013; Mannino *et al.,* 2017). The short larval cycle, the presumed toxicity and the consequent lack of predators have probably facilitated the rapid spread of this species in the whole Mediterranean basin. Initially reported in the Mediterranean from different areas of Sicilian waters ~~(2002),~~ this species successfully reached in just over a decade, both the extreme eastern side of the Mediterranean (including the Adriatic Sea) and the western one, thus becoming one of the most spread heterobranch along our coasts (Valdes *et al.,* 2013; Mannino *et al.,* 2017~~;~~). *Aplysia dactylomela* is easy to recognize, both for its considerable size (30-35 cm), and for the typical cream / yellowish color of the body marked with contrasting black rings. It is probably for this reason that *A. dactylomela* is frequently reported in web sites concerning marine species. Around the waters of the Ischia island the species was in fact reported at the ~~citizen science~~ web-site of the MPA (www.citizensciecerdn.org) from January to August 2018 in at least three sites in the south-eastern coast of the island, from Cape Pisciazza to Cape San Pancrazio. Three specimens were first reported by NEMO Association (Tiberti L., pers. observ.) near Cape Sant'Angelo and S. Pancrazio between 2 and 5 m depth (Fig. 4), while other specimens were reported always on the eastern-south side of the island, including one individual observed at the entrance of the Grotta del Mago (Mago's Cave), a semi-submerged large cavern ~~(Sorvino P., pers. observ.)~~.

Fig. 4 - Specimens of *Aplysia dactylomela* recorded at Ischia island on shallow hard bottoms (2-5 m depth) (size approx. 30-35 cm) (photo on the left by Tiberti L.; photo on the right by Sorvino P.).

***Paracerceis sculpta* (Holmes, 1904)**

Paracerceis sculpta is an alien isopod well established along the Italian coasts (Occhipinti-Ambrogi *et al.*, 2011; GSA-SIBM, 2015). At Ischia, the specimens were recorded by Ulman *et al.* (2017) in the dock fouling of three small marinas around the island: Ischia Porto, Casamicciola and Sant'Angelo.

***Paranthura japonica* Richardson, 1909**

Paranthura japonica is an isopod Anthuridae recently recorded from various Italian locations (Venice, Olbia, La Spezia, and Mar Piccolo of Taranto) by Marchini *et al.* (2014) and Lorenti *et al.* (2016). This species, native from the Asian-Western Pacific, is rapidly spreading to other geographic areas, especially within marinas and harbours (Marchini *et al.*, 2014). At Ischia is reported by Ulman *et al.* (2017) in the dock fouling inside the three marinas around the island: Ischia Porto, Casamicciola and Sant'Angelo.

***Caprella scaura* Templeton, 1836**

Caprella scaura, an euryhaline amphipod (Caprellidae) native to the western Indian Ocean, usually inhabiting rocky substrates from the intertidal down to about 10 m depth. *Caprella scaura* can be identified from the other European species by the well-developed occipital spine on the head, occurring in both sexes. The first record of *C. scaura* in the Mediterranean Sea dates back to 1994 (Venice Lagoon, Northern Adriatic Sea). Further records were from Greece in 2002; from Ravenna harbour, Livorno and eastern Sicily in 2004; Iberian Peninsula in 2005; and from Mar Piccolo of Taranto (Prato *et al.*, 2013). At Ischia the species was ~~recently~~ reported by Martinez-Laiza *et al.* (2019)~~,~~ among the alien taxa collected in the dock fouling of three small marinas: Ischia Porto, Casamicciola and Sant'Angelo.

***Celleporaria brunnea* (Hincks, 1884)**

The cheilostome bryozoan *Celleporaria brunnea* (Hincks, 1884), is a non-indigenous species of Pacific origin, and it is already known for the Mediterranean Sea, mainly recorded in many Italian harbors and marinas, which provide evidence that recreational boating is the main vector for the successful spread of this species (Ferrario *et al.*, 2015; Lezzi *et al.*, 2015). At Ischia, in fact, the species was ~~recently~~ reported by Ullman *et al.* (2019) (Supplementary Appendix A), among the alien taxa collected in the dock fouling of three small marinas: Ischia Porto, Casamicciola and Sant'Angelo.

***Styela plicata* (Lesueur, 1823)**

Styela plicata, a solitary ascidian found in shallow, protected environments in tropical and warm-temperate oceans, is commonly found in ports and marinas around the world. Its origin is uncertain

since it has been recorded from several oceans, thus showing a very broad geographical distribution. Although *S. plicata* has been historically classified as a cosmopolitan species, in the past few decades it has been considered as an introduced or invasive species in some regions of the world (de Barros *et al.*, 2009). *Styela plicata* is a pest species which can outcompete native encrousting and fouling organisms from natural and artificial hard substrates. It is also found in disturbed areas such as in the proximity of refineries, power plants, and fishing harbors. It can be considered as an indicator species in areas that have experienced intense stress (de Barros *et al.*, 2009). It can adhere to several types of substrate, particularly artificial ones, and it is also found in epibiosis on the shell of bivalves. Along the Italian Coast *S. plicata* is well known (Mastrototaro and D'Onghia, 2008; GSA-SIBM, 2015), while at Ischia it has been recorded by Ulman *et al.* (2017) in the fouling of three marinas: Ischia Porto, Casamicciola, and Sant'Angelo.

Tab. 1 - List of the marine alien species up to date recorded at Ischia (mainly from Gambi *et al.*, 2016, modified) (*) = invasive; (§) = present contribution.

(*) *Ostreopsis ovata* Fukuyo, 1981	(*) *Branchiomma boholense* (Grube, 1878)
(*) *Caulerpa cylindracea* (Sonder) Verlaque, Huisman & Boudouresque	*Novafabricia infratorquata* (Fitzhugh, 1973)
(*) *Asparagopsis taxiformis* (Delile) Trevisan de Saint-Leon	*Spirorbis marioni* Caullery & Mesnil, 1897
Acrothamnion preissii (Sonder) E.M. Wollaston	*Percnon gibbesi* (H. Milne Edwards, 1853)
Womersleyella setacea (Hollenberg) R.E. Norris	*Mesanthura* sp.
(*) (§) *Lophocladia lallemandii* (Montagne) Schmitz, 1893	(§) *Paranthura japonica* Richardson, 1909
Paraleucilla magna Klatau *et al.*, 2004	(§) *Paracerceis sculpta* (Holmes, 1904)
Filellum serratum (Clark, 1879)	(§) *Caprella scaura* Templeton, 1836
Clytia linearis (Thorneley, 1900)	*Bursatella leachi* De Blainville, 1817
Cirrholovenia tetranema Kramp, 1959	(§) *Aplysia dactylomela* Rang, 1828
(*) *Pseudopolydora paucibranchiata* Okuda, 1937	*Polycerella emertoni* Verrill, 1881
Lysidice collaris Grube, 1870	(*) *Amathia (Zoobotryon) verticillata* (Delle Chiaje, 1822)
	(§) *Celleporaria brunnea* (Hincks, 1884)
Streblosoma comatus (Grube, 1859)	(*) (§) *Styela plicata* (Lesueur, 1823)
Branchiomma luctuosum (Grube, 1869)	*Fistularia commersonii* Rueppel, 1838

Acknowledgements: We wish to thank the MPA "Regno di Nettuno" (islands of Ischia, Procida and Vivara) in the persons of Drs Antonino Miccio and Caterina Iacono, for promotion and managing the citizen science web site www.citinsciencerdn.org. We wish to thank the NEMO Association, Pietro Sorvino (ANS diving, Ischia) and Olga Lanzetta for report of various sightings of the heterobranch mollusk *Aplysia dactylomela* in the MPA citizen science web site.

References

ARIAS A., GIANGRANDE A., GAMBI M.C., ANADON N. (2013) - Biology and new records of the invasive species *Branchiomma bairdi* (Annelida: Sabellidae) in the Mediterranean Sea. *Mediterr. Mar. Sci.*, 14 (1): 162-171.

ARPAC (2007) - "Il monitoraggio dell'*Ostreopsis ovata* lungo il litorale della Campania (giugno-agosto 2007).

Riprodotto in proprio servizio CIE-URP (2007).

BALLESTEROS E., CEBRIAN E., ALCOVERRO T. (2007) - Mortality of shoots of *Posidonia oceanica* following meadow invasion by the red alga *Lophocladia lallemandii*. *Bot. Mar*., 50 (1): 8-13.

BUIA M.C., GAMBI M.C., LORENTI M., DAPPIANO M., ZUPO V. (2003) - Aggiornamento sulla distribuzione e sullo stato ambientale dei sistemi a fanerogame marine (*Posidonia oceanica* e *Cymodocea nodosa*) delle isole Flegree. *Acc. Sc. Lett. Arti Napoli, Mem. Soc. Sc. Fis. Ma*t., 5: 163-186.

DE BARROS R.C., DA ROCHA R.M., PIE M.R. (2009) - Human-mediated global dispersion of *Styela plicata* (Tunicata, Ascidiacea). *BioInv. Rec*., 4 (1): 45-57.

DEL PASQUA M., SCHULZE A., TOVAR-HERNÁNDEZ M.A., KEPPEL E., LEZZI M., GAMBI M.C., GIANGRANDE A. (2018) - Racing for the Mediterranean: clarifying the taxonomic status of *Branchiomma bairdi* and *Branchiomma boholense* (Annelida: Sabellidae) using molecular and morphological evidence. *PLoS ONE*, 13 (5): e0197104.

FERRARIO J., MARCHINI A. MARIĆ M., MINCHIN D., OCCHIPINTI-AMBROGI A. (2015) - Further spreading of the non-indigenous bryozoan *Celleporaria brunnea* in the Mediterranean Sea: port to port morphological variations. *PeerJ PrePrints* 3:e1592v1

FURNARI G., SCAMMACCA B., (1971) - Presence de *Lophocladia lallemandii* (Mont) Schmitz aux environs de Catane (Sicile orientale). *Rev. Algol*., 10: 161- 163.

GAMBI M.C. (2014) - L'isola d'Ischia: un osservatorio speciale per lo studio del cambiamento climatico globale a mare. In: Leone U., P. Greco (eds), *Ischia Patrimonio dell'Umanità. Natura e Cultura*. Doppiavoce Ed., Napoli: 71-97.

GAMBI M.C., GALIL B. (2016) - Report of the Euromarine Workshop: Management of bioinvasions in the Mediterranean Sea - the way foreward. *Notiziario S.I.B.M*., 70: 56-63 (www.sibm.it).

GAMBI M.C., LORENTI M. PATTI F.P., ZUPO V. (2016) - An annotated list of alien marine species of the Ischia Island. *Notiziario S.I.B.M*., 70: 64-68 (www.sibm.it).

GAMBI M.C., IACONO C., MICCIO A., BIASCO A. (2018) - Un progetto di *Citizen Science* nell'area marina protetta del "Regno di Nettuno" (isole di Ischia, Procida e Vivara). *Notiziario S.I.B.M*., 73: 57-62 (www.sibm.it).

GIANGRANDE A., COSENTINO A., PRESTI C.L., LICCIANO M. (2012) - Sabellidae (Annelida) from the Faro coastal lake (Messina, Ionian Sea), with the first record of the invasive species *Branchiomma bairdi* along the Italian coast. *Mediter. Mar. Sci.,* 13 (2): 283-293.

GSA-SIBM (2015) - Specie aliene presenti nei mari Italiani. www.sibm.it

ISPRA (2011) - Identificazione e distribuzione nei mari italiani di specie non indigene. http://www.medalien.isprambiente.it/

HUNTINGTON H.P. (2000) - Using traditional ecological knowledge in Science: methods and applications. *Ecol. Appl*., 10 (5): 1270-1274.

KNIGHT-JONES P., KNIGHT-JONES W., ERGEN Z. (1991) - Sabelliform polychaetes, mostly from Turkey's Aegean coast. *J. Nat. Hist*., 25: 837-858.

LEZZI M., PIERRI C., CARDONE F. (2015) - Presence of *Celleporaria brunnea* (Bryozoa: Lepraliellidae) in the Central Mediterranean: First occurrence in the Gulf of Taranto. *Mar. Biodiv. Rec.,* 8: E137.

LICCIANO M., GIANGRANDE A., GAMBI M.C. (2002) - Reproduction and simultaneous hermaphroditism in *Branchiomma luctuosum* (Polychaeta, Sabellidae) from the Mediterranean Sea. *Invert. Biol.,* 121 (1): 55-65.

LORENTI M., KEPPEL E., PETROCELLI A., SIGOVINI M., TAGLIAPIETRA D. (2015) - The non-indigenous *Paranthura japonica* Richardson, 1909 (Isopoda: Anthuroidea: Paranthuridae) from the Mar Piccolo lagoon, Taranto (Italy, Mediterranean Sea). *Environ. Scie. Poll. Res.,* 23 (13):12791-12796.

MANNINO A.M., PARASPORO M., CROCETTA F., BALISTRERI P. (2011) - An updated overview of the marine alien and cryptogenic species from the Egadi Islands Marine Protected Area (Italy). *Mar. Biodiv.*, 47: 469-480.

MARBÀ N., ARTHUR R., ALCOVERRO T. (2014) - Getting turfed: The population and habitat impacts of *Lophocladia lallemandii* invasions on endemic *Posidonia oceanica* meadows. *Aquat. Bot*., 116: 76-82.

MARCHINI A., SORBE J-C., TORELLI F., LODOLA A., OCCHIPINTI-AMBROGI A. (2014) The non-indigenous *Paranthura japonica* Richardson, 1909 in the Mediterranean Sea: travelling with shellfish? *Mediterr.*

Mar. Sci., 15 (3): 545–553.

MARTÍNEZ-LAIZA G., ULMAN A., ROSC M., MARCHINI A. (2019) - Is recreational boating a potential vector for non-indigenous peracarid crustaceans in the Mediterranean Sea? A combined biological and social approach. *Mar. Poll. Bull.*, 140: 403-415.

MASTROTOTARO F., D'ONGHIA G. (2008) Spatial and seasonal distribution of ascidians in a semi-enclosed basin of the Mediterranean Sea. *J. Mar. Biol. Assoc. UK,* 88 (05): 1053-1061.

MYTILINEOU C., AKEL E., BABALI N., BALISTRERI P., BARICHE M., BOYACI Y., CILENTI L., CONSTANTINOU C., CROCETTA F., ÇELİK M., DERELI H., DOUNAS C., DURUCAN F., GARRIDO A., GEROVASILEIOU V., KAPIRIS K., KEBAPCIOGLU T., KLEITOU P., KRYSTALAS A., LIPEJ L., MAINA I., MARAKIS P., MAVRIČ B., MOUSSA R., PEÑA-RIVAS L., POURSANIDIS D., RENDA W., RIZKALLA S., ROSSO A., SCIROCCO T., SCIUTO F., SERVELLO G., TIRALONGO F., YAPICI S., ZENETOS A. (2016) - New Mediterranean Biodiversity Records (November, 2016). *Mediterr. Mar. Sci.*, 17 (3): 794-821.

OCCHIPINTI-AMBROGI A., MARCHINI A., CANTONE G., CASTELLI A., CHIMENZ C., CORMACI M., FROGLIA C., FURNARI G., GAMBI M.C., GIACCONE G., GIANGRANDE A., GRAVILI C., MASTROTOTARO F., MAZZIOTTI C., ORSI-RELINI L., PIRAINO S. (2011) - Alien species along the Italian coasts: an overview. *Biol. Invasions*, 13: 215-237.

PATZNER R.A. (1998) - The invasion of *Lophocladia* (Rhodomelaceae, Lophotalieae) at the northern coast of Ibiza (western Mediterranean Sea). *Boll. Soc. Hist. Nat. Balears*, 41: 75-80.

PETERSEN H.E. (1918) - Algae (excl. Calcareous algae). Report 01 the Danish Oeeanographie Expedition, 1908-1910, to Medit. and adjac. Seas, JI, Biol., K3: 1-20.

PRATO E., PARLAPIANO I., BIANDOLINO F. (2013) - Seasonal fluctuations of some biological traits of the *invader Caprella scaura* (Crustacea: Amphipoda: Caprellidae) in the Mar Piccolo of Taranto (Ionian Sea, southern Italy). *Scie. Mar.,* 77: 169-178.

ULMAN A., FERRARIO J., ~~OCCHPINTI AMBROGI~~ A., ARVANITIDIS C., BANDI A., BERTOLINO M., BOGI C., CHATZIGEORGIOU G., ÇIÇEK B.A., DEIDUN A., RAMOS-ESPLÁ A., KOÇAK, C., LORENTI M., MARTINEZ-LAIZ G., MERLO G., PRINCISGH E., SCRIBANO G., MARCHINI A. (2017) - A massive update of non-indigenous species records in Mediterranean marinas. *Peer J* 5: e3954.

ULMAN A., FERRARIO J., FORCADA A., ARVANITIDIS C., OCCHIPINTI-AMBROGI A., MARCHINI A. (2019) - A Hitchhiker's guide to Mediterranean marina travel for alien species. *J. Environ. Manag.,* 241: 328-339.

VALDÉS Á., ALEXANDER J., CROCETTA F., YOKEŞ M.B., GIACOBBE S., POURSANIDIS D., ZENETOS A., CERVERA J.L., CABALLER M., GALIL B.S., SCHEMBRI P.J. (2013) - The origin and dispersal pathway of the spotted sea hare *Aplysia dactylomela* (Mollusca: Opisthobranchia) in the Mediterranean Sea. *Aquat. Inv.*, 8: 427-436.

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