Plankton and plastic in the eastern Ionian and South Aegean
31st May -28th July 2014 – Route from Otranto (IT) to Milos (GR)

Analysis of samples collected during the "Mediterranea Project" in May-July 2014, has helped to identify the regions most impacted by the presence of microplastics (i.e. coloured plastic fibres, up to 3 cm long, Fig.1) between Otranto (Italy) and Milos (Greece).
Microplastics were found in all stations sampled in the Ionian Sea, whereas the Cyclades were relatively plastic-free, with less than 50% of the samples containing plastic fibres. Relatively high concentrations of plastics were found off Zakynthos and Methoni in the Ionian Sea (Stations 10 and 14) and around the islands of Aegina and Thira in the South Aegean (Stations 20 and 24).

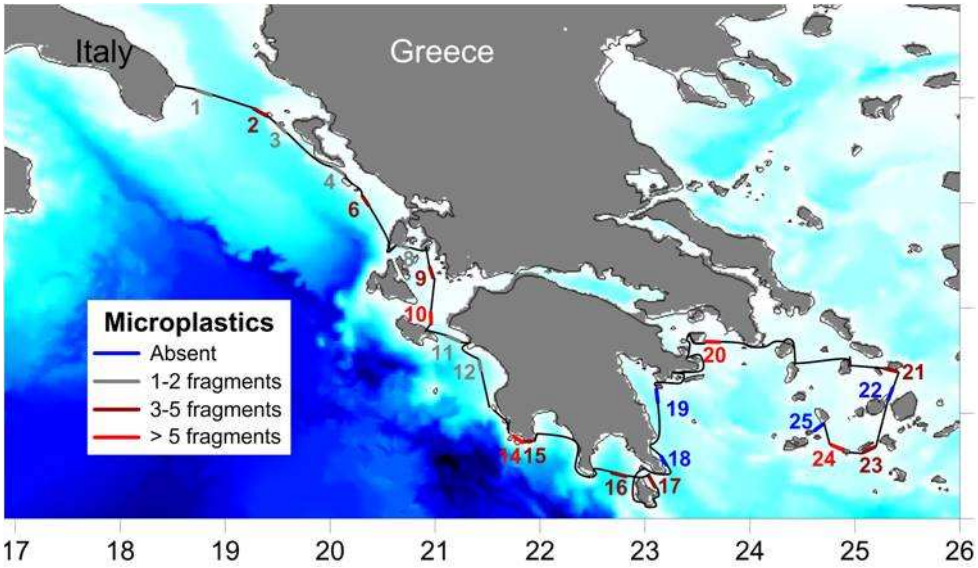

Figure 1. 31st May-28th July 2014, route Otranto-Milos. Stations 1-25, i.e. routes along which the "Mediterranea Project" sampled horizontally the plankton in surface waters. The coloured traits indicate the quantity of microplastics found in the samples (see legend for details).

Analysis of the samples collected along the route Otranto-Monemvasia (stations 1-18, Fig.1) allowed to map the biodiversity of plankton in the eastern Ionian and in the South Aegean.
Overall 89 phyto- and zooplankton species/taxa, all typically Mediterranean, were identified within 24 distinct taxonomic groups (Tab.1).

Table 1. 31st May -25th June 2014, route Otranto-Monemvasia. Plankton species/taxa identified in the stations sampled by the "Mediterranea Project".

PHYTOPLANKTON (Plant Kingdom)	ZOOPLANKTON (Animal Kingdom)	
MICROALGAE	**PROTISTA**	**METAZOANS**
PHYLUM OCHROPHYTA	PHYLUM FORAMINIFERA	PHYLUM ARTHROPODA
BACILLARIOPHYCEAE	GLOBOTHALAMEA	MAXILLOPODA (Copepoda)
Pseudo-nitzschia delicatissima complex	*Globigerina* spp.	*Onychocorycaeus ovalis*
Pseudo-nitzschia spp.		*O. giesbrechti*
	PHYLUM RADIOZOA	*Paracalanus parvus*
COSCINODISCOPHYCEAE	ACANTHARIA	*Sapphirina* spp.
Chaetoceros spp.	Acantharia spp.	*Temora stylifera*
Guinardia striata		
Leptocylindrus cf. danicus	POLYCYSTINA	BRANCHIOPODA (Cladocera)
Leptocylindrus mediterraneus	Spumellaria spp.	*Evadne spinifera*
Trieres regia		*Penilia avirostris*
Paralia sulcata	PHYLUM CILIOPHORA	*Podon* spp.
Proboscia alata	OLIGOTRICHEA	
Pseudosolenia calcar-avis	*Dictyocysta* spp.	ECHINODERMATA
Rhizosolenia cf. imbricata	*Parafavella* spp.	Echinoderm larvae (sea urchin)
Thalassiosira spp.	*Tintinnopsis* spp.	
		OSTRACODA
FRAGILARIOPHYCEAE	**METAZOANS**	Ostracods
Fragilaria spp.	PHYLUM CNIDARIA	
Rhaphoneis spp.	HYDROZOA	PHYLUM MOLLUSCA
Thalassionema nitzschioides	*Aglaura hemistoma*	GASTROPODA
	Liriope tetraphylla	*Creseis acicula*
PHYLUM DINOPHYTA	Siphonophora spp.	*Limacina* spp.
DINOPHYCEAE		Gastropod larvae
Cladopyxis spp.	PHYLUM ANNELIDA	
Tripos arietinum	Polychaete larvae	PHYLUM BRYOZOA
T. candelabrum		Bryozoan larvae
T. carnegiei	PHYLUM ARTHROPODA	
T. extensum	MALACOSTRACA (Decapoda)	PHYLUM CHAETOGNATHA
T. furca	Decapod larvae	*Sagitta* spp.
T. fusus		
T. hexacanthum	MAXILLOPODA (Cirripedia)	PHYLUM CORDATA
T. lineatum	Cirripedia larvae	APPENDICULARIA
T. massiliense		*Fritillaria* spp.
T. pentagonus	MAXILLOPODA (Copepoda)	*Oikopleura* spp.
T. pulchellum	*Acartia clausi*	
T. teres	*Agetus flaccus*	THALIACEA
T. trichoceros	*A. limbatus*	*Doliolum* spp.
T. tripos	*Calanus helgolandicus*	*Salpa fusiformis*
Oxytoxum scolopax	*Candacia giesbrechti*	*Thalia democratica*
Prorocentrum micans	*Centropages kroyeri*	
Protoperidinium depressum	*C. typicus*	Fish eggs
Dinoflagellate cysts	*Clausocalanus arcuicornis*	Fish larvae
	C. furcatus	
PHYLUM HAPTOPHYTA	*C. lividus*	
COCCOLITHOPHYCEAE	*C. parapergens*	
Emiliania huxleyi	*C. pergens*	
Coccolithophores undetermined	*Clytemnestra* spp.	
	Farranula spp.	
PHYLUM CHLOROPHYTA	*Labidocera* spp.	
CHLORODENDROPHYCEAE	*Lucicutia flavicornis*	
Pachysphaera spp.	*Microsetella norvegica*	
	Oithona spp.	
PYRAMIMONADOPHYCEAE	*Oncaea* spp.	
Halosphaera spp.		
Pterosperma spp.		

The Otranto Channel (St. 1) and the North Ionian Sea (St. 3-9) appeared to be hot-spots of plankton biodiversity (Fig.2), with a relatively high number of species.
In June 2014, the spring bloom and main reproductive season for zooplankton had already started, as indicated by high densities of phytoplankton and juvenile stages of zooplankton filter-feeders, both particularly abundant in the South Ionian and in the Aegean.
The data collected from the "Mediterranea Project" confirm that, as already reported in offshore waters, small species of crustaceans and gelatinous zooplankton are dominant in coastal waters of the eastern Mediterranean, as they are well adapted to oligotrophic (i.e. nutrient-poor) waters, typical of this region.

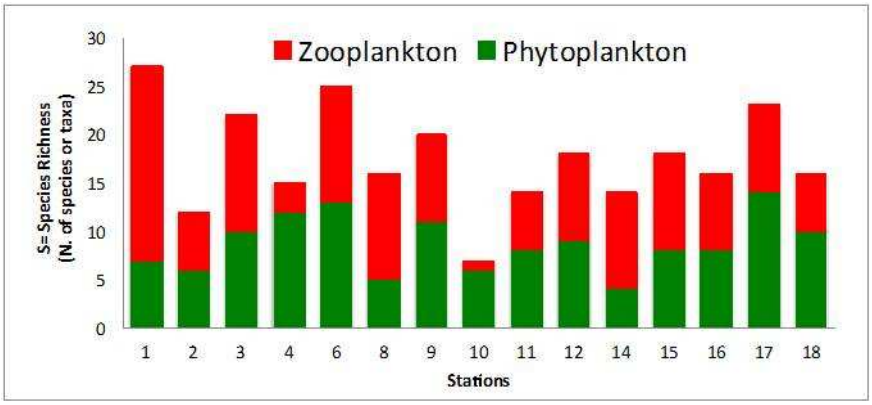

Figure 2. 31st May -25th June 2014, route Otranto-Monemvasia. Number of phyto- and zooplankton species (i.e. Species Richness) identified in the stations sampled by the "Mediterranea Project".

Based on the phyto- and zooplankton taxa identified, three main "marine coastal provinces" were found, each characterised by a distinct planktonic population (Fig.3): the Otranto Channel (St. 1); the Ionian Sea (St. 2-17), with a northern region more diversified as compared to the central-south Ionian population, which was relatively homogeneous; the south Aegean (St. 18).
The "Mediterranea Project" also enabled the identification of spawning/nursery areas for different fish species, off Mathraki, Meganisi, Kastos, Methoni, Elafonisos and in the gulf of Kyparissia (stations 3, 8, 9, 12, 14 and 17).

Data collected from the "Mediterranea Project" has provided important baseline information on the marine communities of the eastern Ionian and South Aegean Sea. This information can help improve a sustainable management of those ecosystems and their resources.

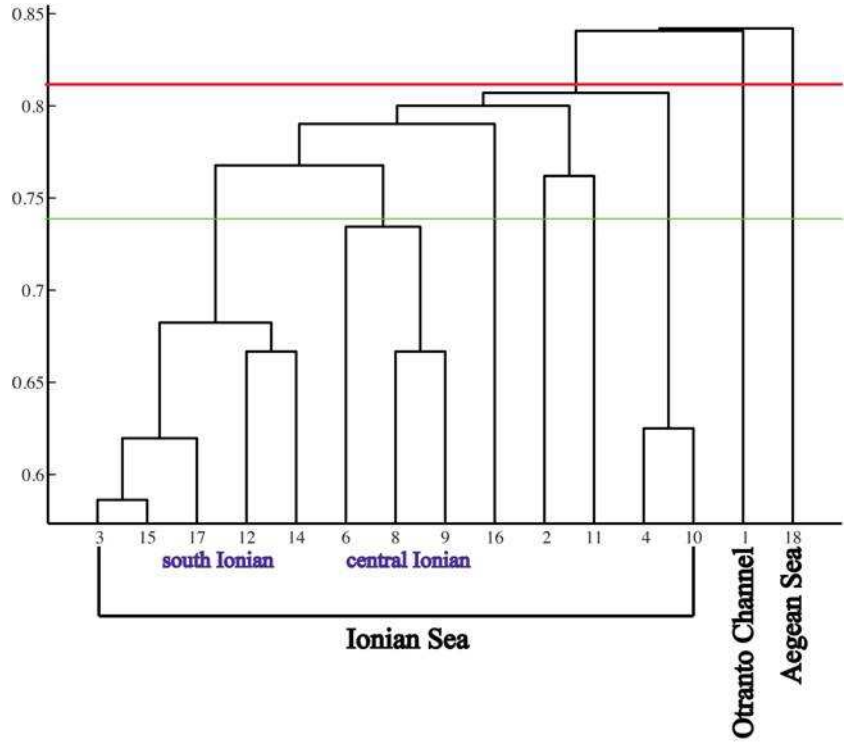

Figure 3. 31st May-25th June 2014, route Otranto-Monemvasia. Main coastal marine provinces characterised by different plankton populations, as identified by the analysis of the data collected by the "Mediterranea Project". The horizontal bars of the tree group stations (indicated on the *x* axis) based on their dissimilarity (measured by the distance coefficient of Jaccard, indicated on the *y* axis). The populations in the Otranto Channel, Ionian Sea and Aegean Sea were more than 80% different, while those in the central and south Ionian showed dissimilarities between 55-74%.