POSTER PRESENTATIONS

CLIMATE CHANGE

01

EVALUATION OF GIOVANNI-NASA-GES DISC - TOWARDS RECENT EUTROPHIC STATE IN THE NORTH AEGEAN SEA. A SATELLITE – CLIMATOLOGICAL - OCEANOGRAPHIC ELABORATION

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The study focuses on the phenomenon of the algae blooms in the area of the North Aegean Sea. Attempts to amplify the approach of Satellite Remote Sensing monitoring as means of applied oceanographic methods in order for possible seasonal over-annual spatio-temporal outlines of its state to be identified presenting the data-to physical attribution of indices-variations, though interdisciplinary, to be delivered in an extend plainly. The North Aegean Sea is directly influenced by outflow of Black Sea water masses through the Dardanelles Strait. Riverine discharge is into account along with special hydrodynamic characteristics of the basin. Black Sea contribution to the North Aegean basin is cold brackish, rather rich in biomass and nutrients, that via eutrophic blooming state fluctuate its relative meso-poor nutrient character. Environmental causes and impacts of the occurrences present multidisciplinary description. They affect local ecology systems, water quality, coastal regions, ichthyo-stock, eco-balance on food-dependable species and ultimately human health. Current analysis leans emphasis on satellite/climatological-oceanographic elaboration for the years 2002-2013 under use of satellite data upon variables that contribute to algae blooms in the North Aegean Sea. Preliminary concern-initiative along with secondary resulting conclusions among recent instability of local biogeochemical recycling of the phenomenon, its prolonged temporal of epochal dispersion and its dependency on surface especially towards north winds, controlled by further meteo-characteristics, is outlined, indicating a possible from 2010 year herein altered profile, especially as the results of 2010 and 2012 are considered compared with the decade under analysis remain. Discussion provides finally some suggestions in need of future elaboration. Data from Giovanni that is a Web-based application developed by the GES DISC (Goddard Earth Sciences Data and Information Services Center) Interactive Online Visualization ANd aNalysis Infrastructure-NASA where used for the analysis in order for possible evaluations to be identified among: Chlorophyll-a concentrations, Precipitations rates, Euphotic Zone Depth, Colored Dissolved Organic Matter, Absorption coefficient for phytoplankton, Sea Level Pressure, Surface Pressure and Northwards wind component.

Keywords: satellite remote sensing, climatology, oceanography, sea-air interactions, chlorophyll-a, North Aegean Sea

02

PUBLICATION BIAS IN CLIMATE CHANGE SCIENCE?

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Non-significant results are less likely to be reported by authors and, when submitted for peer review, less likely to be published by journal editors. This phenomenon, known collectively as publication bias, is found in a variety of scientific disciplines and can erode public trust in the scientific method. Understanding publication bias is especially important for fields like climate change science, where scientific consensus can influence state policies on a global scale, including industrial and agricultural developments. Here we use meta-analysis to examine results from 120 papers of climate change data from the marine realm (comprising 1,154 experimental results) to seek evidence for publication bias. Funnel plots revealed no evidence of non-significant results being underreported, even at low sample sizes. However, we show three other types of bias, largely related to writing style and the apparent rise in popularity of climate change science spurred by the Intergovernmental Panel on Climate Change (IPCC) 2007 Synthesis Report: The mean effect sizes reported in abstracts were significantly larger than effects in the body of reports, especially in journals with high impact factors, and the number of climate change articles and reported effect sizes, both increased within two years after the IPCC 2007 report. Although we found evidence of stylistic biases within many of these reports, we conclude that our sample of 120 articles about climate change in the marine environment gave credence to both significant and non-significant results and was characteristic of unbiased reporting.

03

UNUSUAL WINTER ZOOPLANKTON BLOOM IN THE OPEN SOUTHERN ADRIATIC SEA

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Zooplankton were sampled with vertical hauls of an opening-closing modified Nansen net (53 µm mesh, 0.57 m diameter) during a survey in the southern Adriatic Sea (28 February to 2 March 2015) along two transects at 100, 150, 300, 600, and 1000 m depth. Surface and upper intermediate layers were warmer (14.5-15.0^{o}C) and less saline (38.70-38.75) than usual. This coincided with higher Chl *a*. Microzooplankton abundance was unusually high over the entire study area. Densities averaged over 10000 ind m^{-3} at shallower stations (<300 m) and more than 5000 ind m^{-3} at deeper stations. The maximum, 25094 ind m^{-3}, was found on 28 February between 50 and 100 m at a 300-m station. Markedly high abundance -- 14760 ind m^{-3} - was found at the deepest station in the same depth layer. Protozoans contributed 11% to total microzooplankton density. There was a large number of oceanic surface, sub-surface, and mesopelagic tintinnids, as well as high numbers and densities of typically coastal, neritic, or estuarine species in all deep layers. Copepod developmental stages dominated total microzooplankton (75% overall, 48% nauplii). Mean abundance gradually decreased from surface to bottom, with a maximum between 50-100 m at P300: 21082 ind m^{-3} (total number), 13734 ind m^{-3} (nauplii), and 6505 ind m^{-3} (copepodites). These high values suggest high secondary production, despite the oligotrophic nature of this open-sea environment. This departure from the previously documented seasonal variation of zooplankton abundance in the open Adriatic -*i.e.*, highest values in spring and early summer- might reflect a change in the temperature regime in this branch of the Mediterranean Sea.

04

EXPLORATION OF ARCTIC AND ANTARCTIC SEAWEED BIODIVERSITY IN THE CONTEXT OF POLAR CLIMATE CHANGE

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Polar regions are hotspots of climate change, which inevitably also affects seaweed biodiversity by sea ice recession, increased iceberg scouring, and increased inputs of glacial melt water, all of which can have major impacts on phytobenthic communities. However, any studies of the polar phytobenthos in this context confront major challenges in terms of (1) scarce historic baseline datasets and (2) environmental and logistical constraints for scientific collections, and *in situ* observations by diving. This paper presents highlights from our expeditions to northern Baffin Island (Canadian Arctic, 2009) and Adelaide Island (Antarctica, 2010-2011) which assessed the biodiversity of seaweeds and associated eukaryotic pathogens at established study sites. Our dataset provides a baseline inventory for future work assessing impacts of the currently ongoing changes in the Arctic and Antarctic marine environment. In both cases, diving surveys and collections of macroscopic algae were complemented by applying the Germling Emergence Method and DNA barcode sequencing of the live isolates obtained from substratum samples. We present a baseline seaweed species checklist for northern Baffin Island in the Arctic and southern Adelaide Island / northern Marguerite Bay in the Antarctic, respectively, reporting numerous new records of seaweed taxa and associated pathogens. The paper also discusses implications for establishing baseline inventories and managing safe and scientifically productive diving operations in remote polar locations.

05

TEMPERATURE EFFECTS ON PENIS DEVELOPMENT AND FERTILIZATION OF THE BARNACLE *SEMIBALANUS BALANOIDES* IN A CLIMATE CHANGE CONTEXT

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Geographic distributions of species are expected to change as a result of climate change creating a considerable interest in predicting the effects of climate change on biogeography. The acorn barnacle *Semibalanus balanoides* is the most widespread intertidal barnacle in the Northern Hemisphere and warm temperatures can inhibit its reproductive performance. At its southernmost European distribution limit in Northwest Iberia, temperatures are close to the thermal limit for penis development and fertilization, and it is expected that slight temperature change would acutely reduce reproductive success. We studied the effect of temperature on penis development and fertilization success of *S. balanoides* in the laboratory. Adult *S. balanoides* were collected in the Ría de Arousa, and held in the laboratory at four different temperature treatments below and above the ranges observed in the field; experimental temperature ranges were set from 14ºC to 23ºC during the penis development period and from 12ºC to 21ºC during the fertilization period. Treatment containers were kept in an isotherm chamber where air temperature and light cycle were adjusted to match the field. Periodic samplings were carried out to assess the penis developmental stage (number of annulations) and fertilization success (number and size of fertilized eggs). Exposure to cold water temperatures (14ºC and 17ºC) allowed full penis development in all individuals while warm water treatments (20ºC and 23ºC) inhibited penis development. Penis annulation number and penis length were higher in barnacles exposed to cold water treatments than those held at warm temperatures. Fertilization was completely inhibited at or above 21ºC. At 18ºC, percent fertilization was very low, and in colder treatments 100% fertilization was observed. In addition, this percentage was achieved approximately 1 month before individuals in warm treatments were fertilized.

06

SALINITY STRESS ON *CERASTODERMA EDULE*: COMPARING PHYSIOLOGICAL RESPONSES OF EARLY-SETTLERS AND JUVENILES

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One of the predicted consequences of global climate change is an increase on the occurrence of extreme climatological events such as droughts or extreme rainfalls that modifies coastal salinity. This stress may drive episodes of mass mortality depending on the species, life cycle or spatio-temporal context. This is of special concern when the affected species support important fisheries. The cockle *Cerastoderma edule* shows low tolerance to oscillations of salinity and mass mortality events are often linked to torrential rains. However, environmental stress not only provokes short-term mortality, but may also induce sub-lethal effects like reduction of growth, physiological condition, and reproductive output. Previous studies have reported different salinity survival threshold for adults (15) and larvae (5), as well as different physiological optimums (25 and 30-35 respectively). Nonetheless, information on the consequences of sudden drops in salinity for post-settlers and juveniles of *C. edule* is still lacking even when post-settlement mortality is always high, and early recruits may be especially susceptible to salinity stress. As torrential rains are more frequent during spring (right after cockle settlement) and fall (≈3 months old settlers), we isolated the physiological response (activity, clearance rate, ammonium excretion and oxygen consumption rate) of early-settlers (thread drifters L≈2 mm) and juveniles (sedentary L≈10 mm) to different salinities (8 levels: 2, 5, 10, 15, 20, 25, 30 and 35) in the laboratory during 7 days. Our results show 100% mortality at salinities below 15 for both size classes after 4 days of exposure. At salinities <15, cockles are inactive and physiological rates (oxygen consumption, filtration and excretion) drops almost to zero. As salinity rise over this threshold, physiological rates progressively increase until they reach a plateau at salinity 20-25, although early-settlers show a slightly better performance at higher salinities than sedentary juveniles. Our results may help to parameterize physiological responses to environmental stress and validate physiological performance models. Understanding stage-specific and specie-specific requirements is key for the implementation of management strategies that might mitigate extreme meteorological events consequences.

07

EFFECT OF DECREASE IN SALINITY ON THE SCOPE FOR GROWTH OF BIVALVES OF COMMERCIAL INTEREST

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Regional climate projections show that on the Atlantic coast of Europe there will be an increase in the intensity and frequency of extreme rain falls. Acute fluctuations in salinity due to extreme events may have significant impacts not only in mortality but also on physiological condition of species. This is of special concern when the affected species support important fisheries. In Galicia (NW Iberian Peninsula), the native clams *Ruditapes decussatus* and *Venerupis corrugata*, the introduced clam *R. philippinarum* and the cockle *Cerastoderma edule* represent around 80% of total bivalve landings. These species live in the intertidal and shallow subtidal sediments so extreme fluctuations of salinity result in high mortalities (e.g. episodes occurred in autumn-winter 2000-2001) that prevent these resources from being exploited. However, environmental stress also may have sub-lethal effects on individuals, reducing growth or physiological condition and reproductive output, and increasing vulnerability to disease or predation with consequences for recruitment of juveniles and replenishment of shellfish beds.
We carried out a mesocosm experiment to test the hypotheses that (1) low salinity events of different intensity will have negative effects on the four species, and (2) the native species will be less resistant to salinity fluctuations than the introduced one. Typical autumn conditions were simulated in the laboratory according to available historical records and models from www.meteogalicia.es. For each individual, respiration, filtration rate and absorption efficiency were measured before, during and after the salinity stress treatments. Scope for growth among the species varied and depended on the salinity stress suffered.

08

RELATING AMBIENT ENVIRONMENT TO THE GROWTH RATE OF *MYTILUS TROSSULUS* IN THE NORTHERN BALTIC SEA

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The bay mussel, *Mytilus trossulus*, is the most abundant suspension feeder in shallow coastal rocky habitats of the Baltic Sea. Although small in size, the mussel has a decisive role in nutrient cycles by supporting the self-purification of the coastal ecosystem. Therefore, the farming of *M. trossulus* is considered as a promising blue growth initiative in the Baltic Sea region. In order to assess the farming potential of *M. trossulus*, the growth rate of the bivalve was studied in cylindrical net cages at 15 different habitats of the northern Baltic Sea for two months in 2015. Boosted Regression Trees (BRT) modelling was used to relate the growth rate of *M. trossulus* to the site-specific abiotic environment. The analyses showed that the growth of *M. trossulus* is largely driven by changes in wave exposure, water chlorophyll *a* values and water salinity. In the studied range of salinity, increase in salinity resulted in almost linear increment of mussel growth. An increment of both water chlorophyll *a* and wave exposure raised mussel growth to a threshold value and above the observed thresholds, growth was insensitive to further increment of wave exposure and chlorophyll *a*. The results are in line with the earlier studies of the suspension feeding activity of *M. trossulus* in the Baltic Sea range and suggest a strong linkage between short-term feeding conditions and seasonal growth of mussels. This action contributes to the newly launched project "Baltic Blue Growth – Initiation of full scale mussel farming in the Baltic Sea".

09

PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF THE POLYCHAETE *HEDISTE DIVERSICOLOR* TO DECLINED WATER PH DUE TO POTENTIAL CO_2 LEAKAGE FROM THE SUB-SEABED STORAGE SITE – EXPERIMENTAL STUDY

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Carbon Capture and Storage (CCS) is regarded as a key technology in reducing CO_2 emissions from power plants and other industrial sources. The EU hence supports a selected portfolio of research and industrial projects to promote the implementation of CCS. Although CO_2 has been stored at sub-seabed locations in Europe for more than 10 years (North Sea, Barents Sea) little is still known on short- and medium-term impacts of potential subsurface CO_2 leaks from underground reservoirs on the marine benthic ecosystems. Recently, a potential CO_2 storage site has been proposed in the depleted oil reservoir (B3 field) at water depth of 80 m in the Polish sector of the southern Baltic Sea (the Polish Economical Zone).
This study investigated short- (days) and medium-term (weeks) effects of increased CO_2 concentration in water on the nereid polychaete *Hediste diversicolor* – one of the dominating macrofaunal species in organic rich sediments in the Baltic. In a flow through system, the polychaetes were exposed to four CO_2 levels: 400 ppm (control), 1000 ppm, 2000 ppm and 10000 ppm corresponding to pH 7.7, 7.3, 7.0 and 6.3, respectively i.e., covering a range of CO_2 concentrations predicted to occur in the overlying-bottom water during CO_2 leak. One feeding regime (8167 phytoplankton cells cm^{-3}) was applied to all treatments under stable salinity (7.0) and temperature (10°C) conditions. Basic hydrological variables (T, dissolved O_2, total alkalinity) and biological responses were quantified in five replicates at time-points of 0-day (after 31-day acclimation of animals to experimental conditions, pH 7.7) and then 1, 2, 4, and 8 weeks after CO_2 induction. The impact of low water pH on the polychaete was assessed through measuring selected behavioural indicators (mortality) and physiological markers (respiration rate, energetic reserves and concentrations of lipid peroxidation products, LPO).

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THE EFFECT OF HIGH WATER CARBON DIOXIDE ON ACTIVITY OF SELECTED ENZYMES USING *MACOMA BALTHICA* AS A MODEL SPECIES

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The work presented here is a part of a project addressing environmental risk assessment related to potential CO_2 leakage from the marine sub-seabed storage reservoir. In a series of laboratory experiments, surface sediments and the dominant benthic bivalve, the Baltic clam *Macoma balthica* from the southern Baltic Sea were exposed to different CO_2 levels (final pH 7.0 and 6.3) and a control at pH 7.7 over a period of 40 days. Here, we would like to present the influence of elevated CO_2 concentration on the activities of selected enzymes in the Baltic clam. Malate and octopine dehydrogenases (MDH and ODH) were used as a metabolic proxy and carbonic anhydrase (CA) as a proxy for organisms' acid-base regulation capacity. Due to potential mobilization processes of pollutants accumulated in surface sediments, activities of several antioxidative and detoxification enzymes such as catalase (CAT), superoxide dismutase (SOD), peroxidase (GPx) and glutathione transferase (GST) were also measured. In brief, the activities of selected enzymes were stable in the control conditions (pH 7.7) and varied most in pH 7.0 and 6.3. Temporal changes in enzymatic activities were also observed for CA, CAT, SOD and GST. The results obtained suggest that activities of some constitutive antioxidative enzymes (such as GPx) and enzymes maintaining acid-based balance in the body fluids (CA) decrease in a high CO_2 world (pH 6.3) as compared to control (pH 7.7).

INDICATORS

11

CHANGES OF BLUE MUSSEL (*MYTILUS EDULIS*) PHYSIOLOGICAL CONDITIONS UNDER EFFECT OF INFECTION BY THE METACERCARIAE OF *HIMASTHLA ELONGATA* (TREMATODA: ECHINOSTOMATIDAE)

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We monitored over a full year cycle the heart activity of experimentally infection blue mussels *Mytilus edulis* serving as second intermediate hosts for larval stages (metacercariae) of the trematodes *Himasthla elongate*. We used cardiac activity of Bivalvia because it is usually fast and thus potentially suitable for a fast response in continuous biological monitoring. It should be underlined that all heart function recordings were made *in situ* at the White Sea (subarctic region).
The high significant correlation of temperature and cardiac activity (heart rate and amplitude of heart contraction) from March to October was shown. Non-infected mussels had a significantly higher heart activity in summer and autumn time but not in winter season in comparisons with parasitized animals. Moreover the lower growth rate for infected blue mussels was shown.
Oscillations of heart rate with wave lengths of 7.09 h were found in non-infected mussels during summer time. At the same time it was determined that parasitized animals have lost such rhythmicity. Our results indicate that the mussels infected by *H. elongata* metacercariae may be at an energetic disadvantage relative to non-infected mussels. In addition trematodes infection may derange the subtle neuron regulations of heart function. We think that chemical natures that help mediate the heart rate are the main factor which connected with those changes.
The authors are grateful to the staff of the White Sea Biological Station Kartesh of the Zoological Institute of the Russian Academy of Sciences. Financial support of this study was provided by the federal budget for the implementation of state assignment (Theme no. 0221-2014-003) and RFBR grants nos. 12-04-93081-Norw_a and 16-04-00820-a.

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CONSERVATION SCIENCE MEETS MEDICINE: ECONOMICS OF DECISION LOGIC IN SCREENING TESTS FOR MARINE ECOLOGICAL HEALTH

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The measurement of degree of health of an organic system is a fundamental goal in both medicine and conservation science. In medicine, a large population of individuals is treated via a three-tiered process: 1) an inexpensive screening test is used to screen out individuals who then are assumed healthy; 2) those remaining with positive test result are then given a series of more expensive and accurate tests to further screen out healthy individuals; 3) those remaining with positive tests in both tiers are then given expensive treatment. Conservation science has a similar goal: to distinguish between healthy and impacted ecological populations, processes, and habitats, so that the high cost of intervention is not wasted but applied exactly where it is needed. In the marine environment, assessment of ecological health is especially difficult and costly, and screening tests that are fast and inexpensive can potentially realize large savings in the cost of identifying and conserving marine values and resources. Here we develop a decision tree with associated economic costs in a three-tiered conservation context. We find that, in contrast to medical application with rare disease, in marine environments with high probability of human impact, false positive results have a low economic cost, and the major cost risk is the loss of ecological services due to false negative results, which greatly increase in a two-tiered testing framework, and can become catastrophic even if the second-tier tests have low false-negative error. Ecological screening tests should be avoided in sites likely to be impacted, and instead, accurate assessments using tests with very low false-negative rates (i.e. high statistical power) should be the first line of attack and greatly reduce overall costs. Our analysis shows a fundamental contrast between medical and conservation economics, caused by the high marginal cost of loss of ecological services. The common use of screening tests in marine conservation (e.g. in seagrass monitoring) should be re-evaluated and in many cases abandoned to avoid loss of ecological services due to false negative results. There is an ongoing urgent need for the development of fast and inexpensive marine screening tests with low false-negative error rates. This work was partly supported by the Croatian Science Foundation, under project COREBIO (3107).

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THE INVASIVE *ANADARA TRANSVERSA*, IN THE BIOFOULING COMMUNITIES OF AQUACULTURE AREAS IN THE WESTERN ISTRIAN COAST (NORTHERN ADRIATIC SEA, CROATIA)

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The success of invasive bivalve species *A. transversa* was investigated within biofouling communities that were characteristic of two aquaculture areas along the western Istrian coast (Croatia). Terracotta tiles were immersed at 1m and 5m depth in the Lim Bay (LB) and Pomer Bay (PB) aquaculture areas and subsequently sampled at regular intervals: 2, 4, 6 and 8 months. The biofouling communities were composed of 41 taxa and the most dominant groups were Mollusca, Polychaetes, Tunicates, Crustacea and Algae. Spatial-temporal variations in the composition of the biofouling community were also detected. The most frequent taxa were the annelids *Pomatoceros triqueter* (LB=92.09%, PB=94.19%) and *Spirorbis spirorbis* (LB=99.44%, PB=65.16%), bryozoan *Schizoporella* sp. (LB=78.53%, PB=80.65%) and the tunicate *Bothryllus* sp. (LB=55.37%, PB=82.58%). The most frequent macroalgae were *Sphacellaria* sp. (LB=37.29%, PB=45.16%) and *Polysiphonia* sp. (LB=31.64%, PB=25.16%). Within Mollusca, the most frequent species were the commercial bivalves *Ostrea edulis* (LB=48.59%, PB=30.32%), *Mytilus galloprovincialis* (LB=23.16%, PB=16.13%) and the exotic bivalve *A. transversa* (LB=34.46%, PB=2.58%). *A. transversa* density varied spatially, however, nearly all *A. transversa* individuals colonised tiles at the depth of 5m. *A. transversa* was recorded at both depths at LB whereas it was only found on tiles at 5m depth at PB. The density was of 10 individuals per m^2 and of 465 individuals per m^2 at LB 1m depth and LB 5m depth, respectively. At PB 5m depth, the density was 35 individuals per m^2. *A. transversa* might have been introduced in the north-eastern Adriatic Sea either by shipping or by aquaculture. Specimens of *A. transversa* were found on tiles during the first sampling occasion (June) and its density increased throughout August and November; these results suggested a very long spawning period for this invasive species.

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EVALUATION OF PHYSICAL LOSS PRESSURE IN THE ITALIAN SEAS FOR THE IMPLEMENTATION OF MARINE STRATEGY FRAMEWORK DIRECTIVE

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Many different human activities exert pressure on the marine environment and the effects may vary according to the intensity, spatial and temporal scales. Several EU Directives require to assess the condition of marine environments; in particular Marine Strategy Framework Directive (MSFD) applies an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status. Mapping stressors in a standardized and comparable way is a critical step to assess both the spatial pattern and temporal change of human pressures, as well as their ecological impacts. This approach allows to identify which areas and ecosystem types are relatively pristine or heavily impacted, supporting biodiversity conservation and spatial planning decision processes. In this paper we provide a method to estimate the spatial distribution and extent of physical loss pressure (Seafloor Integrity Descriptor *sensu* MSFD). In Italy, physical loss is represented by sealing; smothering is absent. First of all, human activities inducing sealing were identified (ports, submarine pipelines, submarine cables, hard defense structures, wrecks, recurrent defense operations areas, hydrocarbon extraction subsea wells and platforms) and the available data were extracted from official sources. Spatial extent of human activities was estimated and mapped using GIS tools. A total of 9 study areas, representing the whole Italian coastal-marine environments, were analyzed and all data layers and model outputs were overlaid on 250m*250m grid cells. Results highlighted that the spatial extent of sealing in each study area covers an area of a mean of 0.01%; moreover, the sealing distribution is not regular and its values in coastal zone (buffer of 500 m^{-1} km) reach a mean of 0.6%.
Results of this study are a useful tool for establishing a baseline condition for the physical loss pressure, one to compare future conditions and to evaluate different management scenarios, representing also a suitable approach to be used in environmental impact assessment, above all in coastal areas mainly characterized by the presence of protected and sensitive habitats.

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MICROPLASTIC INGESTION IN MARINE BIOTA: A CASE STUDY IN THE NORTHERN IONIAN SEA

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Growing concern on the impacts of marine litter on marine life has highlighted the need to develop indicators for monitoring plastic particles ingested by marine animals. Mussels and fish are recommended indicator species for monitoring microplastics (plastic items smaller than 5 mm), since they can ingest microplastics from water and/or food, and they are also used for pollution monitoring worldwide. The current study examines microplastics ingested by mussels (*Mytilus galloprovincialis*), red mullets *(Mullus barbatus*) sardines *(Sardina pilchardus)* and common pandora (*Pagellus erythrinus*) from the Northern Ionian Sea (Central Mediterranean Sea). Mussels were collected by hand from the port of Corfu and from a mussel farm in Thesprotia. Fish were caught by trawling north of Corfu. Mussel tissues involved in feeding and digestion (gills and digestive glands), and fish gastrointestinal contents were microscopically examined for microplastics after a digestion treatment with hydrogen peroxide. Items resembling microplastic were found in all species examined. The items were photographed, counted and categorized according to maximum length, colour and shape. Fourier transform infrared spectroscopy (FT-IR) was used to confirm the synthetic polymer origin of the microplastic resembling items. FT-IR spectroscopy, although limited by particle size, identified polyethylene and polypropylene items. FT-IR microscopy is required to analyze the majority of suspicious items found in mussels and fish. Our results provide information on levels of microplastics in selected species, and can contribute to future research for the development of indicators of microplastic ingestion.
This work was carried out within the framework of DeFishGear project co-funded by the European Union Instrument for Pre-Accession Assistance (IPA).

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BENTHIC POLYCHAETE FUNCTIONAL RESPONSE TYPES IN THE AEGEAN COAST OF TURKEY

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Groups of species that respond to their environment in similar ways are often referred to as functional response types and exhibit one or more similar traits as a result of successive environmental filtering from natural and anthropogenic gradients. For benthic macroinvertebrates, typical response traits to disturbance (mechanical or organic pollution) include behavioural, life-form and life-history characteristics (such as feeding mode, body size, longevity and larval development) with different combinations being selected under different regimes. Given the current focus on ecosystem functioning for the purposes of environmental health evaluation, understanding how species traits can inform monitoring and assessment is increasingly gaining importance.
In the current study, we aim to determine functional response types of benthic polychaetes in soft-sediments and examine their relationship with environmental variables that represent natural (bottom temperature and salinity, depth) and anthropogenic (chlorophyll a) gradients in the area. Presence/absence data of benthic polychaetes were compiled for 52 stations in the Aegean coast of Turkey and their trait modalities determined from available databases (MARLIN BIOTIC, Polytraits, WoRMS) and relevant literature. Response groups are identified through ordination of the species x traits table, followed by hierarchical clustering. Preliminary results indicate the importance of the feeding mode-living habit followed by the size-longevity trait combinations in explaining trait space variability patterns and delineating species classifications. The different response groups are characterised by different relative frequencies of sensitive/tolerant species (assignment to ecological groups follows a national database developed for the infauna of the region and implemented in the TUBI synthetic index) and their distribution shows different degrees of correlation with chlorophyll a, winter bottom temperature and bathymetry. The inclusion of different functional traits is explored so that the final traits matrix best reflects the response of soft-sediment polychaetes to stress and the findings are discussed in the context of the potential for indicator development.

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THE OCCURRENCE AND DISTRIBUTION OF VIBRIO SPECIES IN THE VARIOUS MARINE AREAS, TURKEY

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In this study, the occurrence and distribution of *Vibrio* spp. were investigated in the various marine areas of Turkey. *Vibrio* spp. are indigenous in marine environments. Due to the fact that *Vibrio* consist both pathogenic and candidate species for biotechnological applications, determination of presence and distribution of these species is important related to human and environmental health and industrial applications.
In this study the sea water samples were collected from the Turkish Strait System (the Sea of Marmara, Istanbul and Canakkale Straits), Güllük Bay, Aegean Sea, northern part of the Aegean Sea around Gökçeada Island. The samples were transported in the cold chain to the Istanbul University Aquatic Microbial Ecology Laboratory in different time periods throughout 2002 and 2016. The pure isolates obtained were identified using the automated biochemical identification system VITEK 2 Compact 30 (Biomereux, France).
The occurrence of *Vibrio alginolyticus, V. fluvialis, V. parahaemolyticus, V. Vulnificus, V. harveyi, V. anguillarum, V. Damsela* and *V. metschnikovii* in the biota (crustaceans, fish, blue crabs and invertebrates) in the Turkish marine areas previously reported.
In this study, while *Vibrio fluvialis* and *V. parahaemolyticus* were reported in the sediment samples taken from Güllük Bay, Aegean Sea, *V. alginolyticus* and *V. vulnificus* were reported in the ballast water samples taken from the ships coming from various marine areas of the world to the Sea of Marmara. *V. vulnificus* also reported in the seawater samples taken around Gökçeada and Prince Islands. *V. cholera*, responsible for epidemic/pandemic cholera, was not isolated in the sampling areas. The strains were stocked for further studies related to possible industrial applications uses such as removal of ammonia, degradation of petroleum hydrocarbons, decolorization of azo-dye. The data obtained in this study contribute to the knowledge on the occurrence and distribution of Vibrio species in Turkish marine environments.

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TRENDS IN DECAPODA BIODIVERSITY IN GREEK COASTAL WATERS

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Coastal regions, especially those residing in enclosed embayments or protected gulfs, are often subject to pollution as a result of anthropogenic activities, such as aquaculture, sewage, or maritime traffic. Water quality and biodiversity are the imminent effects of this, the negative impact of which is, in some cases, irreversible. Benthic macroinvertebrates might comprise a good bio-indicator of habitat health, as they are very susceptible to environmental changes. As a matter of fact, it has been shown that macroinvertebrates tend to have a low diversity in polluted waters.
Among the organisms of the macrobenthos, crustacea constitute one of the most important components of the marine benthic community.
The present study is based upon work that was carried out within the context of the Water Framework Directive (WFD) implementation for the Hellenic coastal waters. It shows the results for the composition and abundance of decapod crustaceans and it covers a period of four-year sampling in a total of 65 stations, distributed in mainly enclosed water bodies all over Greece.
Samples were taken during March and April of four subsequent years (2012-2015), from coasts of the Aegean and the Ionian Seas. A total of 30 stations, which belong to the operational monitoring type, were sampled every year, whereas there were 50 more stations (surveillance monitoring type) that were sampled once, during the project.
On the whole, 68 species of decapods distributed among 688 individuals were identified, out of 3420 crustaceans that were sampled overall. A focus on the operational stations – where a comparison between sampling periods was possible- showed that species richness and abundance followed the pattern of the ecological quality index BENTIX calculated on the total of the benthic fauna, increasing at stations with “GOOD status”.

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EMBRYO MALFORMATION IN AMPHIPOD CRUSTACEANS AS AN INDICATOR OF BAD ENVIRONMENTAL STATE: EXPOSURE EFFECT OF CONTAMINATED SEDIMENT FROM THE BALTIC SEA

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Amphipods have great potential for the sediment toxicity tests in estuarine and marine areas; because they are intimately associated with sediments either through their burrowing activity or by ingestion of sediment particles. The paper focuses on new biotest endpoint as the embryo malformation rate in the amphipod *Gmelinoides fasciatus* (Berezina 2015). To study sublethal effect of toxic sediments exposure to embryogenesis in the amphipod we collected toxic sediment from known contaminated site (Copenhagen harbour, Denmark) and clean sediment from reference site (the Sea of Bothnia, background concentrations in the Baltic Sea) and study effects of different concentrations of hazardous substances in sediments (by dilution of the field-collected sediment from 1:32 to 1:1024) to amphipod embryos state. The highest exposure concentrations (1:32 dilution) were the following: total organotins 2868 µg Sn kg dw-1, 16 polycyclic aromatic hydrocarbons (PAH) 6064 µg kg dw-1, and 352, 115 and 159 mg dw-1 of trace metals Cu, Pb and Zn, respectively. We found concentration-dependent negative effects on the fecundity in the amphipods and embryo status after 30 days exposure already at the lowest dilution as 1:1024. We distinguished different types of morphological malformations and aberrations in embryos such as impaired membranes where lipids had leaked outside the embryo; malformed eyespot; enlarged embryos with no other visible damage; unidentified stage dead eggs/embryos or undifferentiated embryos in which cells have degenerated; embryos with aberrant cleavages in the early embryogenesis and dead embryos per female. Percentage of malformed embryos in the amphipod reached 20-60% testifying on high toxic effect of harbour sediments to embryogenesis of amphipods and consequently ecosystem health. Reference sediment exposure (background response) has considerably lower number of malformed embryos per females <5%. The frequency of malformed embryos in the amphipod *Gmelinoides fasciatus* may be recommended to be a general indicator of PAH and trace metal toxic effects in marine environments. This study provides important basis for development of this new biotest endpoints for assessment of environmental status of the Baltic Sea and other marine regions. The study was funded by the Nordic Council of Ministers (CONTEST project) and the Finnish Ministry of the Environment.

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ECOLOGICAL STATUS ASSESSMENT OF SOFT BENTHIC MACROINFAUNA EXPOSED TO PRODUCED WATERS DUMPED IN THE SHALLOW COASTAL ZONE

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The ecological attributes of soft benthic macroinfauna are controlled by natural variability and diverse sources of anthropogenic stress. The aim of this study is to assess the ecological status of Dos Bocas, Tabasco, a southern Gulf of Mexico locality, using benthic indices, pollutants, and sediment quality guidelines (SQGs) in an area exposed to produced waters dumped in the shallow coastal zone. The sampling design consisted in a grid of twenty-three sites arranged around the marine diffuser. Depth as well as water and sediment diagnostic variables were measured. Collection of sediment was accomplished with a Smith-McIntyre grab to obtain macroinfauna organisms and sediment to determine texture, hydrocarbons and metals. A non-metric multidimensional scaling reflected the ecological affinity among sites. AMBI (AZTI's Marine Biotic Index) was calculated to assess the ecological status (ES), assigning each species to an ecological group (EG). Relationships among EG and pollutants were determined by generalized linear models. Sampling yielded 2,656 individuals belonging to 117 taxa. Three site clusters were identified according to benthic macroinfauna, sediment texture, redox potential (Eh) and depth ($p<0.05$), while variance of salinity and temperature was minimal. Sites around the marine diffuser presented the highest abundance dominated by polychaetes (*Prionospio*, *Armandia agilis*), where clay sediments were associated with the lowest median Eh at deeper sites. Near shore sites were associated with lower abundances, principally by crustaceans (*Phrotohaus torius*, *Emerita*) with the highest median Eh. Sites near river mouths showed higher abundances mainly of polychaetes (*Prionospio*, *Capitella*) and bivalves (*Tellina*) at intermediate depths (both groups presented similar values in silty sediment). Vanadium, nickel, lead, chromium, zinc, cadmium and high molecular weight polycyclic aromatic hydrocarbons (HMW PAHs) were significantly related with EG, but only nickel exceeded SQGs in rivers sites. The AMBI index classified 78% of the sites as good ES; however, sites with moderate ES (13%) were located in front of the marine diffuser with higher concentrations of the pollutants mentioned above. In conclusion, the use of benthic indices and pollutants are useful to assess the ES of an area exposed to produced waters dumped in the shallow coastal zone.

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ASSESSING PHYTOPLANKTON BIOMASS FROM SATELLITE AND *IN-SITU* OBSERVATIONS AT THE OLIGOTROPHIC DEEP WATERS OF THE SOUTH AEGEAN SEA

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Under the Marine Strategy Framework Directive (MSFD), European Union member states are required to achieve Good Environmental Status (GES) of both coastal and offshore regional waters. An essential factor in achieving GES is assessing chlorophyll-α concentrations (an index of phytoplankton biomass). So far in the Eastern Mediterranean, such monitoring was achieved mainly by *in-situ* sampling at coastal stations and discrete depths within the euphotic zone of the water column, under the Water Framework Directive (WFD). Due to logistical and economic challenges, monitoring of marine offshore waters may require the use of ocean observation system methodologies, e.g. satellite remote sensing and *in-situ* operational observatories. In this study, a 5-years (2007-2011) combined dataset of *in-situ* real-time measurements and satellite observations is utilized to present Sea Surface Chlorophyll-α (SSChl) variability of the deep oligotrophic waters in the south Aegean basin. An inter-comparison of different mathematical and statistical approaches for the analysis of the factors that affect SSChl is presented. Furthermore, the seasonal and inter-annual patterns of SSChl and the relationships between SSChl, physical, and biochemical properties are investigated, in an attempt to understand the former's dependence on the environmental conditions. The outcomes from the south Aegean station example indicate that the combination of remote sensing and *in-situ* data is promising in such areas, and highlights the limitations of determining chlorophyll-α concentration from an operational monitoring platform alone. The expansion of the operational monitoring network and the integration of the biogeochemical component may determine the possibility of using remotely sensed data for the assessment of GES in the near future.

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MULTI-SPECIES MODELLING OF POLYCHAETE ASSEMBLAGES IN THE AEGEAN COAST OF TURKEY

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Benthic infaunal species and communities have been extensively used to evaluate environmental quality of the marine environment. Within the MSFD, biotic elements of the benthos are addressed most commonly through Descriptor 6 (Seafloor integrity), criterion 6.2 (Condition of benthic communities). At the same time, the Directive has stipulations for addressing and assessing indicators linked with pressures in an explicitly spatial manner. At larger scales, achieving this through point sampling may be impractical or unfeasible; hence predictive methods are being increasingly employed to produce the large scale spatial data that are often required for the overall health assessment of wider marine areas.
The aim of the current work was to develop statistical and spatial modelling tools that can predict the distribution of soft-sediment benthic polychaetes in the Aegean coast of Turkey.
To do that, we employed Species Archetype Models (SAMs), a novel analytical and modelling framework which clusters multiple species responses to environmental variables by mixing generalised linear models (GLMs) employing finite mixture models. The resulting GLMs are termed Species Archetypes and may represent one or many species that have similar ecological/physiological tolerances. Polychaete presence/absence data were obtained for 52 stations from published sources. Modelling was performed with taxa present in at least 5 stations (109 taxa). Environmental predictors consist of bottom temperature and salinity, depth, chlorophyll a concentration, fishing pressure and distance from ports. The resulting models are interpreted in light of the sensitivity/tolerance classification scheme for benthic invertebrates, which were assigned sensitivity scores following a national database.
Three Species Archetypes were identified through the SAM modelling framework. In brief, Species Archetype 1 consists of the most prevalent species in the dataset and primarily follows the salinity and depth gradients. Species Archetype 2 is dominated by sensitive and indifferent species and responds negatively to chlorophyll a, whereas Species Archetype 3 represents mostly tolerant and opportunistic polychaetes with increased probability of occurrence as chlorophyll a increases. These results from a limited data set show promise that SAMs as a modelling tool has the potential to provide valuable information towards determining ecologically meaningful scales of assessment and designing suitable monitoring campaigns.

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FIRST REPORT ON THE ECOLOGICAL QUALITY STATUS OF CORALLIGENOUS AND POSIDONIA HABITATS IN THE AREA AFFECTED BY THE COSTA CONCORDIA SHIPWRECK (GIGLIO ISLAND, ITALY)

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First results on the assessment of ecological status of Coralligenous and Posidonia habitats sensu Water Framework Directive (2000/60/CE) are presented to evaluate the effects of sinking of the Costa Concordia ship. Sampling activities were carried out in the summer of 2015 with the purpose of assessing the ecological quality status of sensitive habitats that may have been directly or indirectly damaged by the shipwreck and the wreck removal activities. For *P. oceanica*, the PREI index (Posidonia Rapid Easy Index) was calculated in order to integrate the information on physico-chemical, biological and morphological alterations of the habitat. Although the values of the PREI index were always between the Good and High threshold, lower values of the index have been detected in the area next to the sinking of the Costa Concordia, suggesting the existence of an impacting effect due to the presence of the wreck, as well as of the yard for the restoration activities. The ecological status of the Coralligenous habitat was evaluated by the ESCA index (Ecological Status of Coralligenous Assemblages) in order to integrate the information about impacts of human activities, such as physicochemical and biological alteration or significant physical and morphological alterations of the coastline. Values of the ESCA index indicate a lower quality status in the impacted site, highlighting a suffering state of the marine assemblages in the area affected by shipwreck.

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AZTI MARINE BIOTIC INDEX AND COMPONENTS OF BETA DIVERSITY TO ASSESS ECOLOGICAL STATUS: UNDER TWO DIFFERENT PRESSURE SOURCES IN THE SOUTHERN GULF OF MEXICO

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Here we hypothesize that depth (D, an environmental factor) and offshore oil exploration and production (OEP, a type of human activity) leave a detectable imprint on benthic infaunal assemblages, where turnover and nestedness reflect the ecological status of the environment. The aim of this study was to determine the ecological status (ES) of the southern Gulf of Mexico (sGM) in connection with the spatial distribution of beta diversity. A grid of 62 sampling sites was analyzed in 2013 for assessing the influence of D and OEP on benthos variability. The partitioning of the ß-diversity was calculated using the beta part routine in R package, allowing the identification of the total Sorensen dissimilarity associated with turnover ($ß_{SIM}$) and nestedness ($ß_{SNE}$). The effect of depth on benthic fauna composition was assessed by Adonis function. Ecological status was calculated by AZTI's Marine Biotic Index, based upon the distribution of five ecological groups (EG): sensitive (EGI), indifferent (EGII), tolerant (EGIII), second-order (GIV) and first-order opportunistic species (EGV). Overall, 4,372 individuals belonging to 231 taxa were collected. Partitioning of the ß-diversity showed that $ß_{SIM}$ is higher than $ß_{SNE}$ in both D and OEP; however, the patterns of dissimilarity among sites in D were different since composition of species changed with depth (r^2=0.17; P=0.001): (i) platform sites (5-272 m) showed the greatest abundance (3,796 ind) dominated by polychaetes, from sensitive to opportunist species (*Armandia, Lumbrineris, Prionospio, Cirratulus, Capitella*), and crustaceans basically EG I-II (*Bemlos mackinneyi, Xenanthura brevitelson*), (ii) deep sites (646-3,570 m) with low abundance (209 ind) characterized by amphipods (*Jassa* like EGV). Besides, OEP presented polychaetes assigned to EGI-IV (*Armandia, Lumbrineris, Prionospio, Cirratulus*), crustaceansas GE III and V (*Apseudes, Jassa*) and nemerteans like GE III. According to ES, 28 stations (90%) were classified as slightly disturbed in platform sites. Nevertheless, deep sites and OEP exhibited some degree of disturbance, 9 (53%) from moderately to extremely disturbed and 4 (21%) from moderately to heavily disturbed, respectively. Results show that dissimilarity is due to turnover so that most sGM sites presented good ES, while undegraded sites were mainly so because of depth.

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STUDY OF THE ACCUMULATION OF HEAVY METALS IN SOME TISSUE OF SMALL MAMMALIAN (MURIDAE) IN NORTHERN MOROCCO: OUED SIAD / JEBEL MOUSSA

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This study that was conducted in the Mediterranean region of Oued Siad / Jebel Moussa in north of Morocco, aims to study the diversity of rodents in this region and to ensure the degree of contamination of their vital organs by adopting the morphometric analysis to confirm species identification. Four rodent species belonging to the family Muridae were caught. The concentrations (µg/kg dry weight) of Cr, Pb, Cu, Fe and Zn in the various organs (liver, kidney, and heart) of the analyzed species were determined by atomic absorption spectroscopy Varian AA 240 with graphite furnace. The highest concentrations of Pb, Cu, Fe and Zn were found in the liver of *Rattus norvegicus*, while those of Cr were detected in the kidneys of *Rattus rattus*. Medium and low levels of contamination were detected in *Lemniscomys barbarus* and *Mus spretus* respectively. The results suggest that the genus *Rattus* can be considered as a bio-indicator that accumulates more trace-metals than the genus *Mus* and *Lemniscomys*.

Keywords: Mediterranean, Oued Syad/Jbel Moussa, Muridae, bio-indicator, trace-metals

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IMPACT OF FISHING ACTIVITIES ON DIFFERENT CORALLIGENOUS ASSEMBLAGES OF GULF OF NAPLES (ITALY)

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Coralligenous assemblages are likely the most heterogeneous and rich hard bottom biocoenoses of Mediterranean Sea, characterized by the presence of highly sensitive species, such as fan corals. These organisms might be strongly endangered by fishing activities; particularly, lost gears from both professional and recreational fishing, may cause mechanical damages, breaking and upturning coral colonies, and increase overgrown.
The main aim of this work is the assessment of the extent of fishing impacts on three sites with different morphological types of coralligenous assemblage (rim, bank and shoal) located in the southern Gulf of Naples (Italy). Underwater investigations were performed at depths between about 50 and 155 m, using a ROV (Remotely Operated Vehicle), and video frames were randomly extrapolated and analyzed using specific software, in order to estimate the morphological groups' abundances of coralligenous assemblages and the presence of different types of lost gears.
The study area is characterized by diversified coralligenous assemblages, with a very high presence of fan corals at rim and shoal, down to about 110 m depth, after which the substrate appears mainly colonized by sponges. The deeper bank (about 120 m) is usually dominated by serpulids and solitary madrepores. On the overall, the most abundant groups are encrusting sponges, encrusting coralline algae, serpulids, solitary madrepores, massive sponges, erect bryozoans, and hydroids. With the increase of depth or the decrease of slope, a distinct decrease of coralligenous percent covering and a decrease of morphological groups' number and abundance, was observed.
The impact of fishing activities was confirmed by the high presence of different lost gears entangling several organisms. At bank, about 53% of frames with coralligenous assemblages showed the presence of nets (46%), longlines (38%) and other fishing litters (16%); at shoal, the presence of longlines (80%), other litters (16%) and nets (4%), was detected in about 31% of frames; at rim, longlines (78%) and nets (22%), were observed in about 27% of frames. The damage by fishing gears is also stressed by the presence of different coral colonies upturned or colonized by parasitic species.

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CHECKLIST OF THE AMPHIPODA (CRUSTACEA, PERACARIDA) OF GREECE

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The amphipod fauna of the Mediterranean Sea is quite well known since Ruffo's (1982, 1989, 1993, 1998) comprehensive monographs, however much taxonomic work remains to be done and many areas have been poorly collected especially in the Eastern part of Mediterranean Basin. The species list for the Amphipoda of Greece has been revised based on the latest available data. This checklist represents a general faunistic survey of the pelagic, benthic, freshwater and terrestrial amphipods of Greece. For each species the currently accepted name, synonyms, distribution, habitat and depth are provided. The checklist includes about 370 species and should act as a benchmark in assessing future changes in the faunal composition of the Amphipoda for Greece.

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EUTROPHICATION ASSESSMENT AND POTENTIALLY HARMFUL PHYTOPLANKTON SPECIES IN A COASTAL AREA OF EASTERN MEDITERRANEAN, AFFECTED BY RIVER INPUTS

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The Marine Strategy Framework Directive (MSFD, 2008/56/EC) requires that European Union member states achieve Good Environmental Status (GES) in marine waters by 2020. Following an ecosystem-based approach, MSFD introduces eleven Descriptors with several criteria and indicators for GES. The MSFD Quality Descriptor 5 refers to eutrophication adverse effects in marine waters, involving human drivers, pressures and their resulting alterations. The eutrophication assessment needs to combine information on phytoplankton composition and biomass, Harmful Algal Blooms occurrence (HABs) and nutrient levels, as ecologically relevant primary and secondary effects. Phytoplankton is also one of the Biological Quality Elements of the Water Framework Directive (WFD, 2000/60/EC) for the coastal waters quality assessment.
Maliakos Gulf is a coastal area in central Greece, directly affected by the inflows of river Spercheios, characterized by eutrophication and frequent HAB incidents. In 2009, the toxic phytoplankton species *Chattonella* sp. caused massive fish-killings. In 2014-2015, the eutrophication and ecological status in Maliakos Gulf were estimated, according to WFD and MSFD, in order to highlight the role of river discharges (pressure) on coastal phytoplankton communities (impact). A network of coastal stations was sampled monthly/bimonthly and the spatio-temporal distribution of phytoplankton biomass and populations, HAB species occurrence and nutrient levels, were studied. The Eutrophication Index for Greek coastal waters was calculated and correlated with river discharges and coastal waters' parameters. Moderate chlorophyll a concentrations and phytoplankton species abundances were recorded in Maliakos Gulf, with higher values close to the river mouth. Maximum phytoplankton abundances were observed in spring, while minimum in summer. Diatoms thrived throughout the year, while Dinoflagellates were the second most abundant group. HAB species were constantly present, reaching 28% of the total phytoplankton community in spring. Most frequent potentially toxic species were the Dinoflagellates *Alexandrium tamarense* and *Dinophysis caudata,* and the Diatom *Pseudo-nitzschia multiseries*, exceeding the alert levels. Ecological quality was poor to moderate and eutrophication status ranged at mesotrophic levels throughout the year in Maliakos Gulf. High river inflows increased eutrophication levels and decreased the ecological quality in the area during the wet period, while the opposite pattern was found during the dry period.

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THE BALTIC SEA *FUCUS VESICULOSUS* RELATION WITH TROPHIC STATE AND OXIDATIVE STRESS LEVEL

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In the Baltic Sea ecosystem, although several fish species and molluscs have been used as biomarkers of oxidative stress, there is less information regarding *Fucus vesiculosus* as key species of coastal habitats. The aim of this study was to examine spatial differences in the activity of enzymes Glutathione - S transferase (GST), glutathione reductase (GR) in connection with macrophyte community diversity, productivity and trophic state level in the littoral of the Gulf of Riga, Finland and Bothnia bay at 6 stations. The Bray-Curtis cluster analyses of stations with macrophyte communities main groups biomass (Chlorophyta, Phaeophyta, Rhodophyta) revealed that Tvaerminne, Mersrags and Hanko habitats are rich with *Fucus vesiculosus* biomass (460.0, 338.0 and 302.0 mg dry weight/m^2). At stations Rauma and Klamila *F. vesiculosus* biomass lowered – 137.0 and 137.0 mg dry weight/m^2, but at Saulkrasti habitat (eastern part Gulf of Riga) it was only 57.0 mg dry weight/m^2. The species diversity in 6 habitats correlates with brown algae biomass level – 10 species were identified in the Tvaerminne habitat (the Gulf of Finland), but in the Saulkrasti habitat only 5 species were identified. Enzyme activity results for the GST are as follows: the highest activity in 2009 and 2010 in *Fucus vesiculosus* was found in Saulkrasti habitat (587 and 490 nanomoles/min/mg protein) and the minimum activity was found in Mersrags and Klamilla (2010) habitats (105.0, 100.0, 104.0 nanomoles/min/mg protein, respectively). GR activity also shows the maximum value for *F. vesiculosus* at Saulkrasti and Klamilla habitats in 2009 -607.0 and 403.0 nanomoles/min/mg protein- thereby producing increased environmental stress effects on macrophyte populations in the investigated habitats. There is no clear trend in oxidative stress level in the Gulf of Riga between 2009 and 2015.

Keywords: *Fucus vesiculosus,* oxidative stress, trophic state

OPEN SESSION

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LESSONS LEARNED FROM THE CRISIS MANAGEMENT OF FISH KILLS DUE TO A *CHATONELLA* SP. BLOOM IN MALIAKOS GULF (CE AEGEAN SEA) AND AN ANOXIC UPWELLING EPISODE IN AMVRAKIKOS GULF (IONIAN SEA), GREECE

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An unusual fish kill, extended for a 4-week period (10/3- 18/4/2009) within a semi-enclosed and natural protected (EU Network Natura 2000) embayment, Maliakos Gulf (located N.E. of the Aegean Sea), is analyzed, as a crisis management case study. The hazard identification was not an instant action, since fish health diagnosis, in relation to the detection of the environmental stressors, takes 1-2 months to give a clear answer about the underlined etiology (*Chatonella* spp) regarding the mass mortalities. Fish kill losses affect directly the income of the fishermen. As dead fish gradually appear in different regions along the coastline at different times, has a tremendous effect on the local residents as well as on the consumers of local seafood products and, consequently, the tourism for several years. The importance of the social trust to the public administrators is also discussed giving details about the effects on the social behavior of the crisis communication. The crisis management of another mass mortality event (17/02/2008), in NE Amvrakikos Gulf, (Ionian Sea) is also discussed. Amvrakikos is a semi-enclosed natural protected (EU Network Natura, 2000) embayment, with a fjord-like oceanographic / hydrographic profile and several fish kills reported in the past due to the upwelling of anoxic water masses. The short term phenomenon (just an overnight event for few hours) but with an enormous effect (950 tons of dead on-growing farmed fish) is analyzed in terms of its management. The technical problems of the exploitation of “a pile of dead biomass” are demonstrated in relation to appropriate hygiene and sanitary measures of this operation. The role of the communication on the governance of this crisis that lasted about a month and the relevant socioeconomic effects are also discussed. Knowledge raised from both cases, which are presented for risk management improvements in the near future.

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ENVIRONMENTAL AND ECONOMIC ASSESSMENTS FOR MARITIME SPATIAL PLANNING IN THE GULF OF NAPLES

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Marine Protected Areas (MPAs) are often considered key tools for conservation of coastal ecosystems even if they are not always effective to ensure habitats' conservation. Thus, several complementary measures for systematic conservation planning were developed worldwide. They implement management schemes at the scale of ecosystem processes, leading to approaches for conservation such as Ecosystem Based Management (EBM) and Integrated Coastal Zone Management (ICZM).
In this work the first map of habitats in the whole Gulf of Naples is shown. The unusual shelf-edge rocky habitat is also mapped. By analysing the map, information on bottom seascape arises. In fact, seascape results to be mainly due to both geomorphological features and shape and distributions of epibiontic cover characterizing the habitats.
Algorithms to evaluate costs of the main human activities carried out in the marine territory of the Gulf are implemented, with the characteristic to be: i) independent from expert judgement (data from literature are used) and ii) comparable each-other (algorithms relate monetary values to one hectare of marine territory).
The effectiveness of MPAs has been measured by using likelihood of connectivity among habitat-patches, in order to assess the most important areas to preserve, and by comparing these results with actual zonation.
Priority areas for conservation have been assessed by matching the map of habitats with the map of costs, using MARXAN software. Results show that the most important sources of propagules are located around the islands of the Gulf. Therefore, the four MPAs, established alongshore, are alone insufficient to sustain life in the habitats of the Gulf. Four scenarios' features have been used in MARXAN analyses: habitat-patches and connectivity (as features of conservation); exploitation pressure and monetary values (as features of opportunity costs). The twelve resulting scenarios have been then compared by a PERMANOVA analysis. Results show that the priority areas are mainly selected on the basis of conservation features; instead, the type of opportunity costs does not influence the selection of priority areas.

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CAN OFFSHORE STRUCTURES OPERATE AS ARTIFICIAL REEFS IN THE MEDITERRANEAN?

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In response to rising energy demand, the likely expansion of both offshore renewable energy devices, and offshore oil and gas platforms in the Mediterranean, will bring with it an expansion of artificial vertical relief structure sites. Understanding the impact this expansion may have on fish communities is essential. Using results from a European FP7 pilot project (CoCoNET), we present the fish species abundance, density and diversity from an artificial vertical relief structure pilot site, and make a comparison with a natural rocky outcrop and a region of bare substrate. Multivariate data analysis showed the number of fish is similar at both the artificial units and the control sites, albeit at lower levels than at a natural reef site. Around the artificial units the aggregation of individuals was relatively higher (up to a 15 m radius) whereas the species richness was lower in comparison with the control sites. The results are discussed in the context of similar studies from both Mediterranean and Northern European seas.

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PHYLOGEOGRAPHY AND BARCODING OF DEEP CORALS IN THE MEDITERRANEAN

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[…]

In the framework of the research project CYCLAMEN (*CY*prus *C*old-water corals *L*evantine Se*A*, Eastern *ME*diterranea*N*), which started in December 2014, a research cruise was conducted to perform the first detailed study of cold-water coral (CWC) communities in eastern Cypriot waters. During the CYCLAMEN cruise, samples of CWC *Dendrophyllia ramea* were collected in order to conduct different investigations, such as genetic studies. One of the objectives of CYCLAMEN is to complete a phylogeographic study on species for which samples are already available in other geographical areas. This would help testing population connectivity for these focal coral species and to understand the evolution of DWCs in different basins. The results will also be used for the interpretation of on-going ecophysiological studies. Here we present the first results on the analysis of two mitochondrial (COI, 16S) and one nuclear marker (H3). The analysis is based on comparisons between Eastern and Western Mediterranean individuals and with sequences from other scleractinian corals. These data are discussed at the light of genetic diversity observed in other corals from the Mediterranean Sea.

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EFFECT OF ANTHROPOGENIC HABITAT FRAGMENTATION ON FISH COMMUNITIES AT ROCKY SUBSTRATES IN THE EASTERN ADRIATIC SEA

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Fragmentation of habitats has dual effects: low levels create microhabitats and increased biodiversity, high levels promote species loss or dominant species, including invasive. While seagrass fragmentation has received ample attention, rocky shoreline habitats are understudied. Massive displacements of rocky shorelines in the Western Mediterranean are linked to an overall drop in biodiversity. Along the Croatian Adriatic, direct coastline developments are sparse and of small scale. To investigate the effect of artificial hard and vertical surfaces typical for seawalls, marinas, and swimming enclosures, we observed fish communities at 24 locations representing 500 km of distance. We conducted 562 stationary lure-visual census counts to a depth of 7 m, a method validated and optimized within this study. Use of a lure resulted in higher observed richness and abundance which increased its power as a comparative tool. Observation duration was optimized to maximize fish richness and application efficiency under avoidance of double counts, interference, and identification errors. We tested the null hypothesis that taxonomic and functional fish community descriptors do not differ across three habitat types –pristine natural rocky slopes, vertical concrete surfaces, and adjacent rocky slopes. Fish abundance and taxonomic and functional richness and diversity did not significantly differ across habitat types. Of the 53 recorded fish species, planktivorous and cruising fish dominated, with the same four species ranking highest in each habitat type. Eight species were unique to developed and two to pristine rocky shores. No invasive species were observed. Microhabitat diversity was similar across habitat types. Concrete walls that displaced large boulders supported higher taxonomic and functional richness than boulders. We conclude that the level of rocky shore fragmentation in the Croatian Adriatic has no net-negative effect on demersal fish and may locally increase diversity due to microhabitat provision. Overall, we found that fish assemblages significantly differ across sampling sites but do not cluster according to development status or geographical distance. This suggests that other drivers are more important in structuring fish assemblages along Croatia's coastal rocky shores. This work was partly supported by the Croatian Science Foundation under the project COREBIO (3107).

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CITIZEN SCIENCE FOR CIGESMED: INVOLVING DIVERS IN MARINE BIOLOGICAL MONITORING

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Mediterranean coralline reefs, known as "coralligenous", are bioherms built by calcifying rhodophytes on hard substrates in dim-light conditions. They are hotspots of biodiversity, harbouring rich assemblages and valuable biological resources. The assemblages they host are popular among SCUBA divers due to their complex structure, conspicuous biological wealth and high aesthetic value. Nevertheless, data on their distribution, structure and conservation status is still scarce for several Mediterranean areas (e.g. southern and eastern sectors). These habitats are also vulnerable to multiple anthropic pressures, alongside with sea surface warming and biological invasions.
Over the last decade, inventorying and monitoring of marine biodiversity has significantly benefited from the active engagement of volunteers. Although several Citizen Science projects concern tropical reef ecosystems, none of the existing initiatives has yet specifically focused on their Mediterranean equivalents. Citizen Science for CIGESMED is a European project aiming to engage enthusiast divers in the study and monitoring of Mediterranean coralligenous assemblages through the gathering of some simplified information. A specific protocol for underwater observation was developed along with data-recording dive slates, to acquire information about: (a) basic topographic and abiotic features for the preliminary description of each site and the creation of data series for sites receiving multiple visits, (b) presence and relative abundance of typical conspicuous species, as well as (c) existence of pressures and imminent threats, for the characterization and assessment of coralligenous assemblages.
The testing of the protocol and the associated guidance material was achieved through the involvement of volunteer divers in preliminary field trials at different areas of the Mediterranean. In order to test the reliability of the protocol and identify possible correction factors for the obtained datasets, the validity of the answers provided by divers was assessed in comparison to those provided by scientists. The results showed that for few species (e.g. small-sized ones with a patchy/scarce distribution in the study site) the abundance was underestimated. Some pressures also appeared difficult to identify and (semi-) quantify. Future efforts will aim to maximize the engagement of the enthusiast participants, train the less competent ones, and enhance the communication between citizen scientists and professional researchers.

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SEDIMENT CORES FROM THE BRIJUNI ISLANDS NATIONAL PARK REVEAL A STRUCTURAL SHIFT FROM EPI- TO INFAUNA-DOMINATED BENTHIC COMMUNITIES OVER THE LAST CENTURIES

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The northern Adriatic Sea with its densely populated coastline has experienced strong anthropogenic impacts during the last centuries. The Brijuni islands at the southern tip of Istria, Croatia, have been a national park since 1983 and are of special interest when comparing impacted marine areas with regions under protection that were able to recover from the pressure of fishing and bottom trawling. The present study focuses on benthic community shifts as a result of anthropogenic impacts since the Holocene transgression.
Four cores of 1.5 m length and 90 mm in diameter were taken close to the main island of the Brijuni archipelago and sliced into smaller subunits (2 and 5 cm) for sediment analyses and the investigation of death assemblages. Hard part remains of molluscs, crustaceans, bryozoans, echinoderms and tubeworms were analysed and identified to the highest taxonomic level possible. Death assemblages were compared with surface samples of the recent fauna taken from the same area by grab-sampling and diving. The results show a steep increase of species abundance and diversity in the early stages of the Holocene transgression, at the very bottom of the core, followed by a steady decline representing a major shift from a previously epibenthic to an infauna-dominated community. Towards the top of the core, this trend weakens, and in the uppermost 6 cm, it reverses. This indicates a recovery of benthic communities since the protection of the area. By correlating down-core changes in benthic community structure with sediment parameters (grain size distribution, TOC, heavy metal content, concentrations of organic pollutants) and age data derived from radiometric sediment and direct shell dating, we assessed the timing of past ecological changes and the influence of anthropogenic habitat modification on the benthic fauna.

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SPATIAL PREDICTION OF DEMERSAL FISH DIVERSITY IN THE BALTIC SEA: COMPARISON OF MACHINE LEARNERS AND REGRESSION-BASED TECHNIQUES

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Marine spatial planning (MSP) is considered a valuable tool in implementation of ecosystem-based management of marine areas. Predictive modelling may be applied in MSP framework to obtain spatially explicit information about biodiversity patterns. Growing number of statistical approaches, used for this purposes, implies the urgent need of conducting comparisons between different predictive techniques.
In the presented study we evaluated performance of selected machine learners and regression-based methods which were applied for modelling fish community metrics. We hypothesized that habitat features can influence fish assemblages' structure and investigated effect of environmental gradients on demersal fish diversity (species richness and Shannon-Weaver Index). We used fish data from Baltic International Trawl Surveys (2001-2014) and six potential predictors mapped by HELCOM: bottom salinity, depth, seabed slope, growth season bottom temperature, seabed sediments and annual mean bottom current velocity. Then we compared performance of six alternative modelling approaches: generalized linear models, generalized additive models, multivariate adaptive regression splines, support vector machines, boosted regression trees and random forests with repeated 10-fold cross-validation using accuracy as the measure of models quality. Finally, we selected random forest, as the best performing algorithm, and implemented it for spatial prediction of fish diversity in the broad range of the Baltic Sea. To obtain information on data reliability and confidence of developed models, essential for MSP actions, we estimated uncertainty of predictions employing properties of ensemble random forest method.
We showed how state-of-the-art predictive techniques, based on easily available data and simple tools of Geographic Information System, can be used to obtain reliable spatial information about fish diversity. We hope that presented paper will stimulate more studies in the field of quantitative modelling of marine fish assemblages' structure and promote application of novel statistical approaches for purposes of MSP.

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TROPHODYNAMICS OF FISH ASSEMBLAGES ASSOCIATED WITH *CAULERPA PROLIFERA* AND *POSIDONIA OCEANICA* MEADOWS IN A SHALLOW SEMI-ENCLOSED EMBAYMENT OF THE EASTERN MEDITERRANEAN

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Semi-enclosed coastal ecosystems are considered to be highly productive as they are often associated with seagrass and/or macroalgal habitats characterised by high structural complexity and offering a great variety of ecological niches. Elounda Bay, located in the north-eastern part of Crete Island (Greece) covers a total area of 6.5 km^2. In the inner shallow basin of the bay, occupying 4.7 km^2 (max. depth 8.7 m), the seabed is silty and covered by a continuous and dense meadow of *Caulerpa prolifera*. In contrast, the outer basin is deeper (max. depth 15 m) and the sandy bottom is covered by patches of *Posidonia oceanica*. Seven field surveys were carried out during the period 2006-2007 over a grid of eleven stations using a local fishing boat. Physico-chemical (e.g. temperature, chloroplastic pigments) and biological (macrobenthos, zooplankton) parameters in the surface sediments and the water column were measured and analysed. For the study of fish fauna, a local boat seine net was used. Stomach content analysis of the most important fish species, in terms of abundance and biomass, was carried out and further examined. A total of 12,949 and 8,342 individuals of fish were collected and identified to 37 and 41 species in the inner and outer basins, respectively. The total fish biomass was almost the same in both basins (80 and 90 kg) throughout the study period. The dominant fish species were *Boops boops* and *Spicara smaris* in both basins. In addition, *Mullus barbatus* and the cephalopod *Sepia officinalis* in the inner part and *Pagellus acarne* and *Pagrus pagrus* in the outer part were also abundant. Taxa composition, abundance and frequency of occurrence of fish prey revealed significant differences between the two basins. Data from the fish stomach contents were also compared with the available macrofaunal organisms in both habitats. Results showed that the presence of the *Caulerpa prolifera* meadow along with the specific abiotic and biotic features prevailing in the inner basin provide a significantly greater variety of ecological niches and shelter for the development of juvenile fishes, in comparison with the *Posidonia oceanica* habitat which occupies the outer basin of the Bay.

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BIOGEOGRAPHY OF TOP PREDATORS ALONG LATITUDINAL TRANSECTS IN THE TEMPERATE AND TROPICAL ATLANTIC OCEAN

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Hydrological parameters influence the distribution of top predators - seabirds and marine mammals. In high latitudes, for example, distinct changes between water masses are often characterized by enhanced biological productivity which leads to accumulations of prey and corresponding high abundances of top predators. For tropical waters, information on distributional patterns of top predators, which may be determined by abiotic and biotic factors, is limited. The present study, thus, aims 1) to provide baseline distributional data for future comparisons, for example with respect to climate change, and 2) to test how water masses and their boundaries affect distributional patterns of seabirds in the eastern temperate and tropical Atlantic Ocean.
During four trans-equatorial expeditions of RV “Polarstern” from 2011 to 2014, data of seabird and marine mammal distributions were acquired. Half-hour transect counts were conducted continuously from the vessel’s bridge without width limitation during daylight and travelling speed of the vessel, while environmental data (e.g. temperature and salinity) were continuously recorded by Polarstern’s navigation system.
In general, abundances of top predators in temperate and tropical regions were low when compared to polar regions. A mixed effects modelling approach on the eight most abundant seabird species revealed differences in their abundances to be related to hydrological zones and seasons. In most cases, the borders between water masses and distributional ranges of seabirds were not very distinct due to gradual changes in surface water properties.
Seabird abundances, therefore, were correlated to water masses but, in contrast to polar waters, not strongly linked to borders between water masses. Further factors, e.g. distance to local production areas (upwelling) and interspecific competition effects, may be similarly important in shaping the seabird’s distributional patterns in the tropical and temperate Atlantic, but were not assessed in the present study. In the context of predicted climatic changes, a further monitoring of avian top predators is essential, particularly in order to gain a better understanding about their distributional patterns and potential changes in abundance and geographical distribution.

Keywords: seabirds, marine mammals, distributional patterns, biogeography, water masses, Atlantic Ocean

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DETERMINATION OF FEEDING ECOLOGY OF THREE BATOID FISHES FROM ISKENDERUN BAY (NORTH EAST LEVANTINE SEA)

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The feeding ecology of three most abundant batoid fish species, *Gymnura altavela, Raja asterias* and *Raja clavata*, was investigated in the north-eastern Levantine Sea. 60 individuals were caught by trawlers (*G. altavela*; 1 female, 10 male; *R. asterias*, 10 female, 13 male; *Raja clavata*, 27 female, 9 male). Max. total length of the studied individuals was measured as 595 mm, 549 mm and 611 mm, respectively. Following the stomach dissections, the observed prey items were classified in three major groups; Decapoda, Cephalopoda and Teleostei. The main diet items of *G. altavela* composed *Equilites klunzingeri* and *Champsodon sp.* Teleostei and Decapoda groups were preferred by Rajidae species. *Bragmaceros atlanticus*, the only identified species, was the main prey of *R. asterias*, while *Alpheus* sp. was the most abundant prey in the diet of *R. clavata*. We combined stomach content analysis and the stable isotope values of species. The trophic positions and dietary compositions of the species were confirmed by the results.

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FEEDING IN DEEP-SEA SPONGES: INFLUENCE OF BIOTIC AND ABIOTIC FACTORS

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In shallow benthic communities, sponges are widely recognized for their ability to contribute to food webs by cycling nutrients and mediating carbon fluxes through filter feeding. In comparison, little is known about the feeding ecology of deep-sea species and how it may be modulated by environmental conditions. The present experimental study focused on colonies of *Polymastia* sp. and *Radiella hemisphaerica* collected on the continental slope of Northeast Newfoundland at ~1000 m depth. Filtration rates (as clearance of phytoplankon cells) were positively correlated with particle concentration, ranging from 13.7 to 166.7 cells ml^{-1} h^{-1} at nominal concentrations of 10000 to 40000 cells ml^{-1}. Feeding was also positively correlated with increasing seawater temperature, from 5.1 cells ml^{-1} h^{-1} at 0°C to 252.0 cells ml^{-1} h^{-1} at 6°C. Low pH (7.54 ± 0.02) and the presence of a predator inhibited feeding activity in all sponge colonies tested. Measurable growth and morphological variations (e.g. in shape/size of papillae and crest) were documented in three of the sponge colonies during the feeding trials. Under the most extreme abiotic challenges, such as low pH and near-freezing temperatures, decreased filtration rates occurred that coincided with a visible shrinking of the papillae, suggesting that sponges were responding negatively to changes in their environment. This work highlights the sensitivity of deep-sea sponges to various types and levels of environmental fluctuations, inferring a consequent vulnerability to natural and anthropogenic disturbances.

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THE DEEP-SEA NEOGASTROPODA *BUCCINUM SCALARIFORME*: REPRODUCTION, DEVELOPMENT AND GROWTH

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Specimens of the neogastropod *Buccinum scalariforme* (~65 mm shell length) collected between 900 and 1450 m depth along the continental slope of eastern Canada were kept for 3 years in mesocosm settings. Their mating, spawning and development were assessed, thereby generating a first account of the life cycle of a deep-sea gastropod. Egg laying occurred in March and September, with a total of 9 egg masses laid in 2013 and 2015. Reproduction coincided with periods of maximum deposition of particulate organic matter (phytodetritus). Oviposition lasted ~2 h and the female protected the egg mass for ~3 days until it had hardened. Typically, egg masses contained 5-75 capsules, each measuring 0.5-0.8 cm in diameter. In the case of multiple layings by the same female, masses decreased in size. Each capsule contained between 100-150 spherical eggs (300-500 µm) of which only ~30 developed into embryos. Potential fecundity calculated from the entire egg mass at spawning was between 1500-2250 propagules; it drastically decreased during 5 mo of development to an effective fecundity of 100-150 juveniles (i.e. only 1 or 2 juveniles emerged from each capsule). Development went through blastula and gastrula stages in ~30 days, followed by intracapsular veliger larva (500 µm) and intracapsular pediveliger (1000 µm) after 120 days. Completion of development presumably relied on adelphophagy (consumption of nurse eggs or sibling embryos). The juveniles (1-2 mm) hatched by perforating and eventually consuming the capsule membrane. Large gastropods like *B. scalariforme* are among the most abundant vagile benthic marine invertebrates of the bathyal zone of eastern Canada. Knowledge of their reproductive biology could improve understanding of their vulnerability and resilience in environments that are under ever growing anthropogenic pressures from fisheries and oil/gas exploration and exploitation.

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BENTHIC FAUNA OF THE NOVAYA ZEMLYA ARCHIPELAGO BAYS (THE KARA SEA)

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For the last decades the interest in exploring the near-shore areas of Arctic seas (bays and fjords in particular) kept growing steadily. The isolation degree of benthic fauna in those areas as well as the presence of specific communities, which differ from the open-sea biota, deserve detailed consideration.

During the voyages of RV “Professor Shtokman” and RV “Akademik Mstislav Keldysh” in 2013-2015 in the Kara Sea, an integrated study of the benthic fauna of the five Novaya Zemlya archipelago bays was conducted for the first time ever. Sampling was carried out in 50 stations, at each station three replicate samples were taken using a 0.1 m^2 Ocean grab. Samples were washed over a 0.5 mm mesh, fixed in formalin on board and then all animals were identified to the lowest practical taxon. Statistical analysis was performed using the PRIMER package (Clarke, Warwick, 2001).

For the five bays of the Novaya Zemlya archipelago the abundance, biomass and diversity data was obtained and benthic communities were described in all parts of the bays. The composition and main characteristics of benthic fauna turned out to be similar in all bays. The outer slopes of the bays tend to be inhabited by the community typical for the open parts of the Kara Sea, while the inner parts are usually presented by the depleted communities with remarkably low faunal diversity. The differences between the inner and outer parts are conditioned upon the bays’ morphometry (presence or absence of the threshold) and the high mineral particles content in the water column, caused by the glacier runoff.

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SPONGE DIVERSITY (PORIFERA) IN ILDIR BAY (AEGEAN SEA, TURKEY)

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During 2011-2015, several scuba divings and snorkelling were performed to elucidate the sponge diversity in Ildır Bay, where intense fish farming activities take place. Forth is aim, several habitats including *Posidonia oceanica* and coralligenous were sampled at depths ranging from 0 to 30 m. In the field, sponge specimens were directly removed from habitats, or were photographed using a photo-quadrat device, especially in coralligenous habitats. In the laboratory, the sponge specimens were treated with the Rützler's and Klautau & Valentine methods to examine their spicules. Photographs were analyzed by using photoquad software.
The faunistic analysis revealed a total of 55 sponge species belonging in 3 classes and 30 families. Of these, 8 species (*Sycon elegans*, *Sycon quadrangulatum, Oscarella lobularis*, *Leucandra aspera*, *Prosuberites longispinus*, *Cinachyrella levantinensis, Corticum candelabrum* and *Hexadella racovitzia*) are new to the marine fauna of Turkey. The majority of sponge species (41 species) were encountered at the depth interval 0-10 m. In the study area, *Cliona celata* (present in 94% of stations), *Aplysina aerophoba* (88%), *Spirastrella cunctatrix* (88%), *Chondrosia reniformis* (75%), *Chondrilla nucula* (69%), *Ircinia variabilis* (69%) and *Cliona viridis* (62%) were the highest frequency index values. A total of 11 boring (=bioeroder) sponge species belonging to 4 families were determined. Twenty-one species were found on the coralligenous habitat. Among the sponge species, *Crambe crambe* (6% of the total surface area) was the highest mean coverage value in this habitat. The majority of the sponges (55% of total number of species) found in Ildir Bay were the species of Atlanto–Mediterranean origin. A total of six species [*Axinella cannabina, A. damicornis*, *A. polypoides, Aplysina aerophoba, Tethya aurantium* and *Spongia* (*Spongia*) *officinalis*] were endangered species according to the Bern and Barcelona Conventions.

Keywords: sponge, porifera, Ildır Bay, Aegean Sea, eastern Mediterranean Sea

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PARAONIDAE (ANNELIDA: POLYCHAETA) FROM IZMIR BAY (AEGEAN SEA, EASTERN MEDITERRANEAN)

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The diversity of Paraonidae in Izmir Bay was studied based on the material collected during 1983 and 2014 within the framework of a project aimed to monitor water quality of the bay. Soft-bottom benthic samples at several stations selected in polluted and unpolluted parts of Izmir Bay were taken using a Van Veen grab (sampling an area of 0.1m^{-2}) at depths ranging from 10 to 75 m. The faunistic analysis of samples yielded a total of 21 species belonging to 4 genera (*Aricidea, Cirrophorus, Levinsenia* and *Paradoneis*). The most speciose genus in the area was *Aricidea* with 13 species, followed by *Levinsenia* with 4 species. The most dominant and common species in the area were *Aricidea claudiae* and *Levinsenia demiri*. Some species such as *A. pseudoarticulata*, *A. suecica meridionalis, Cirrophorus furcatus* and *Paradoneis lyra* seem to be tolerant to organic pollution, occurring abundantly in the polluted inner part of the Bay. However, *A. claudiae*, *A. simonae* and *L. demiri* were found to occur in unpolluted soft substrata of the outer Bay.

Keywords: Polychaete, Izmir Bay, Paraonidae, eastern Mediterranean

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DEEPEST AND NORTHERNMOST RECORD OF TROPICAL -SUBTROPICAL OCTOCORAL, FAMILY MELITHAEIDAE

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Coral family Melithaeidae (Octcorallia, Cnidaria) distributed from the Red Sea, Indian Ocean, Indo-Pacific Ocean to Hawaii, previous latitude distribution is 34.35S – 39.36N. Most of their observation is limited to warm, shallow tropical-subtropical waters (Reijnen 2014). The previously known depth distribution has been 0-937 m.
Eleven new species of family Melithaeidae are described from Japan and four species are synonymised (Matsumoto & Ofwegen, 2015). One genus *Melithaea* of the family Melithaeidae exists in Japanese water and all new species from Japan are endemic. Seventeen species of Japanese Melithaeid corals (*Melithaea abyssicola, M. arborea, M. corymbosa, M. doederleini, M. habereri, M. japonica, M. modesta, M. mutsu, M. nodosa, M. oyeni, M. sagamiensis, M. satsumaensis, M. suenson, M. tanseii, M. tenuis, M. tokaraensisi, M. undulata*) are reported from cold temperate or deep water, while, in contrast, five species (*M. boninensis, M. frondosa, M. isonoi, M. keramaensis, M. ryukyuensis*) are only found from warm waters. Northern most recorded species is *M. sagamiensis* with the latitude 41.59N, and the deepest Japanese species is *M. undulata* from the depth 975-1027 m. The results expand the distribution of family Melithaeidae to the north. Our results suggest that the warm Kuroshio water current which has sourced from North Equatorial Current can affect up to latitude 41.59N. We also discuss depth relations of other deep and cold octocoral species.

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MORPHOMETRIC STRUCTURE AND ALLOMETRY PROFILES OF THE *PLESIONIKA NARVAL* (FABRICIUS, 1787) IN THE SOUTH EASTERN AEGEAN SEA (E. MEDITERRANEAN)

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The narwal shrimp *Plesionika narval* is a temperate pandalid with a wide geographical distribution in the Eastern Central Atlantic, extending northwards into the Mediterranean Sea. The species inhabits shallow waters, inside submarine caves or rocky cavities, but is also found on sandy or muddy substrates at greater depths (0-900 m depth). *P. narval* is a traditional food for residents and tourists of the Dodecanese islands. In recent years a drastic stock's reduction has been suspected, while the scientific knowledge is lacking. This is the first study regarding morphometric structures of *P. narval* in the Mediterranean Sea and could be of great importance for further investigation.
A total of 8376 specimens were analyzed (5843 females, 2533 males), caught in the period from November 2014 to January 2015 in the Dodecanese islands (south-eastern Aegean Sea). Minimum and maximum carapace lengths (CL) were 6.55 to 21.21 mm for females and 7.02 to 19.85 mm CL for males. The relative growth of body parts [abdomen (ABD), uropod (U), scaphocerite (SC), telson (T), rostrum (R) and the third pereiopod (P)] of both sexes of the narwal shrimp was studied within the frame of Plesionika Manage (Operational Programme Fisheries 2007-2013, Greece) scientific project (www.plesionika-manage.eu). Appendages are related to distinct functional aspects, such as swimming, walking-cropping, balance or orientation ability, mating behaviour, sexual segregation, feeding. The carapace length was considered as the independent variable for all relationships performed. Morphometric relationships between sexes showed similar patterns of relative growth. Morphological characters of females were significantly greater than males showing a clear sexual dimorphism in size. A negative allometry between swimming appendages (uropod, scaphocerite, telson), abdomen (related to the rapid locomotion, reproduction), the third pereiopod (involved in walking ability) and of rostrum (mating behaviour, sexual segregation, feeding) was found for both sexes. All the CL/body measurement ratios (CL/ABD, CL/U, CL/SC, CL/T, CL/R, CL/P) were proportionally higher for juveniles males (CL<12.23 mm) and lower for juveniles females (CL<13.65 mm) in comparison to the adult ones, indicating that the allometry differs for this species during its life cycle.

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HUNTING THE HUNTERS: ARE WE ABLE TO DETECT SUBARCTIC INTERTIDAL INVERTEBRATE PREDATOR IMPACT ON *MACOMA BALTHICA* CLAM?

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The subarctic White Sea is covered with ice ordinary from November to mid-April. Due to harsh conditions, intertidal communities are characterized by noticeably lower species richness than those from other North European seas (Kuznetzov, 1960; Naumov, 2007). Diversity of invertebrate predator species on the White Sea intertidal follow this pattern, and none of these species was shown to bias the populations of their potential preys. Iceland moon snail *Amauropsis islandica* (Gmelin, 1791) is one of four naticid species in the White Sea, and one of three among them occurring in the intertidal zone. Here *A. islandica* prey primarily upon *Macoma balthica* clams (Aristov et al., 2015). In the present study we tested the hypothesis of consistency between the long-term changes in abundance of *Amauropsis* and *Macoma* in order to detect the predator-prey relationships, on the basis of 15-year monitoring observations. Samples were collected annually in early July at two intertidal locations (2001-2015 at 1st location and 2007-2015 at 2nd location), 4 km away from each other, in the top of the Kandalaksha Bay. Each of 10 to 15 samples from site consisted of two nested cores, where *Macoma* specimens were collected from 0.03 m^2 cores, and *Amauropsis* from 0.25 m^2 cores. All samples were sieved through 1 mm mesh. Patterns of population dynamics in *Macoma* were different at two locations (no significant cross-correlations were found), so it doesn't seem to be affected by temperature solely. Then, generalized additive model (GAM) was fitted to describe dynamics of *Macoma*. Optimized model, though, included three predictors, (1) a smooth function for year, (2) density of *Amauropsis* and (3) interaction between factors. The predictions made by the optimized model shows that density of *Macoma* was negatively related with density of *Amauropsis*. This tendency was failed in particular years, which is probably related to the shift in *Amauropsis* size-structure. The study was partly supported by the grant 16-34-00682 provided by RFBR.

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SIZE AND ABUNDANCE RELATIONS BETWEEN MESOZOOPLANKTON AND ICHTHYOPLANKTON IN THE THERMAIKOS GULF IN 2006

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This study presents the trophic relations of mesozooplankton and ichthyoplankton in Thermaikos Gulf in June 2006. Samplings were performed at nine stations using a bongo net, environmental data were collected using a CTD sensor and Chl-a was derived from satellite data. Taxonomic determination was carried out for each station. Body length and mean dry weight of the most abundant (~90% abundance) mesozooplanktonic taxa, as well as total dry weight for each station were measured. Body and snout length of fish larvae for the two most abundant (>80%) icthyoplankton taxa (the Anchovy – *Engraulis encrasicolus* and the round Sardine – *Sardinella aurita*) were also measured. Fish larvae were classified according to growth stage (1st - lecithotrophic, 2nd - critical period, 3rd – planktotrophic and 4th - swimming capable planktotrophic, where "2", "3" and "4" are predatory stages) and mesozooplankton taxa were classified according to prey group (2, 3 and 4) by comparing mean length of each taxa with the snout length of the two dominant fish larvae. This procedure resulted in 4 groups: Prey2 (copepod eggs), Prey3 (*Evadne* sp., *Appendicularia*, *Echinoderma larvae*), and Prey4 consisting of two smaller groups: Prey4-only (*Penillia avirostris*, *Podon* sp., *Calanus* sp., *Centropages typicus*, *Oithona* sp., *Acartia clausi*, *Oncea* sp., *Corycella* sp.) and a group that are also predators of smaller animals, Prey4-Predators (*Doliolum*, *Chaetognatha*). Cluster-MDS analysis, based on the abundance and diversity of mesozooplankton and ichthyoplankton, distinguished three main groups of stations at 80% level on the Bray-Curtis similarity index, with a complex geographical pattern presented on GIS maps. This was attributed to environmental factors (salinity, Chl-a, temperature, depth, distance from the coast and current circulation), and can be further explained by a biotic factor, namely, prey-predator relations. The statistically significant relations revealed by regression analysis between the abundance of specific taxa labeled as prey and some of the predator fish larvae, as well as between the Prey4-Predators group and groups Prey2, 3 and 4 are indicative of the trophic relation pattern in the area. This last relation is also indicated by the results of the Cluster-MDS analysis, where Prey4-Predators, Prey4, Prey3 and Prey2 are grouped together.

Keywords: trophic relations, mesozooplakton, ichthyoplankton, *Engraulis encrasicolus*, *Sardinella aurita*, Thermaikos gulf, fish larvae, prey, predator, snout length

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TROPICAL SEASCAPES AS FEEDING GROUNDS FOR JUVENILE PENAEID SHRIMPS IN SOUTHERN MOZAMBIQUE REVEALED BY STABLE ISOTOPES APPROACH

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The feeding grounds for four of the most commercially important penaeid shrimp species (*Metapenaeus monoceros*, *M. stebbingi*, *Penaeus japonicus* and *P. indicus*) within the mangrove and its adjacent coastal habitats (sand flat, mud flat and seagrass meadows) were investigated on Saco and Sangala bays (Inhaca Island, Mozambique, southern East Africa). The study used carbon and nitrogen stable isotope ratios to identify the potential food sources for the different shrimp species within each habitat. Significant differences ($p<0.05$) were observed among potential food sources in each habitat on both Saco and Sangala Bays (isotopic ratios discriminating habitats), as well as between shrimp species among the different habitats. No ontogenetic dietary shifts were reported for the studied penaeid shrimp species. The mangrove habitat did not seem to be a direct food source provider for these species at Saco and Sangala Bays. On the contrary, results from the seagrass habitat suggested it as a feeding area, mainly through seagrass epiphytic algae, sediment, polychaetes and plankton, which seemed to be the most likely potential food sources for the shrimp species. The mud and sand flat habitats contributed in less extent with food sources to the shrimp species at Saco Bay, while the sand flat habitat was also used as feeding area at Sangala Bay. The possibility to identify feeding grounds is a fundamental tool for the conservation of the resources and their habitat and for an ecosystem approach fishery management.

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BIOSTALACTITES FROM CAPE OF OTRANTO (SOUTH EAST ITALY). ^{14}C DATING OF EXTRA-TUBULAR CALCAREOUS MATRIX

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Biostalactites of underwater caves at Cape of Otranto (South East Italy) represent a unique marine concretion with a core of calcareous tubes of gregarious polychaetes. Such a polychaetes association is embedded in acalcareous matrix whose origin is still to be ascertained.
The embedding matrix has been radiocarbon dated in 12 different points of a single biostalactite, by AMS (Accelerator Mass Spectrometry) with the same technique already used for dating the polychaete tubes at 5 different points along the biostalactite length. Radiocarbon analyses were also aimed at indirectly ascertaining the biogenic origin of the matrix.
Results of the dating gave an ordinated picture for the different parts of the considered biostalactite, with the age of matrix samples correspondent to those of the core tubes if close to them. Matrix showed an age diminishing from the basis to the tip of the structure, and with growing distances from the tubes at each of the four transversal sections considered. The core tubes showed ages comprised in a range of about 3,000 years (five points from basis to the apex of the biostalactite), while the embedding matrix showed ages comprised in more than 5,500 years (12 points at 4 different transversal sections), thus demonstrating that the matrix growth proceeded up to 2,500 years after the stop of tubes production.
Such an ordered growth of the matrix around the core of polychaete tubes, indirectly proves its organic origin. Being the age of each matrix sample completely compatible with those of the core tubes, it was not the result of the deposition of already existing sediment (which should be elder than tubes). The matrix is here interpreted as the consequence of the growth of concretion generating bacteria around the core of polychaete tubes.

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A SUCCESSFUL CASE OF BI-NATIONAL MEDITERRANEAN COOPERATION FOR SEA TURTLE PROTECTION

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Since the beginning of the 1980s, the Hydrobiological Station of Rhodes (HSR) of the Hellenic Centre for Marine Research has systematically collected data on sea turtle strandings along the coasts of Rhodes island, providing first care to live injured specimens, in the frame of the Nationwide Sea Turtle Stranding Network established by ARCHELON, the Sea Turtle Protection Society of Greece, and in close cooperation with the Port Authorities and the regional Forestry Agency. A female *Caretta caretta* (named Laura) (carapace curved length n-t 73 cm, carapace curved width 66 cm, weight 50.5 kg), stranded alive in 5 October 2013 on a beach of the Northwest coast of the island and she was immediately transferred to the HSR facilities. Apart a deep injury on the head, she was seriously distressed, unable to feed and dive in the hosting tank. The turtle had the Tag TRY-0212/Ministry of Forest and Environment of Turkey, applied after her nesting on Dalyan beach, Turkey, on 30 May 2012 and she was subsequently observed also on 19 June 2012 on the same beach. After a long period of treatment and rehabilitation at the HSR, under veterinary and sea turtle expert assistance, Laura was released (weight 57 kg) in the same stranding area on 17 July 2014, with two tags, the first mentioned above and a second one, A917/Sea Turtle Protection Society of Greece. On 23 March 2016 she was observed near Dalyan beach during the mating season, carrying only the Greek tag. She seemed healthy and ready to nest, and she was re-tagged with TRY-2734. Between 1984 and 2015, a total of 204 *Caretta caretta* strandings were recorded in the island: among the 48 live specimens stranded, Laura was the only one bearing a tag.
Concluding, a Dalyan turtle, rehabilitated in Rhodes, goes back to Dalyan for nesting; its identity resumed over the years by alternating Turkish and Greek tags. This interesting case shows that a migratory species can only be protected through international cooperation.

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APPLICATION OF CUMULATIVE IMPACTS ASSESSMENT TO VISUALIZE PRESSURES FROM HUMAN ACTIVITIES ON KEY ECOSYSTEM COMPONENTS: A FUNDAMENTAL PART OF THE MSFD AND THE MSPD IMPLEMENTATION

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Cumulative impacts assessment was applied to evaluate pressures on selected key ecosystem components (i.e. *Posidonia* meadows, *Cystoseira* canopies and coralligenous outcrops) in coastal areas of the Ionian Sea. The analysis was conducted in the frame of the FP7 CoCoNet project and was based on a well-established methodology that requires as basic input spatial data on the distribution of ecosystem components and human activities. For the latter category the following have been considered during the analysis: aquaculture, fisheries, cables network, ports, waste disposal areas. Weighting coefficients were then computed to describe vulnerability of each ecosystem component (i.e. habitat) to each activity/stressor. Then, on the basis of the weighting coefficients for each combination of habitat/stressor, the cumulative impact scores were calculated across all habitats and activities and mapped using a Geographic Information System environment (ArcGIS 10.1) for each 1 km^2 pixel. Outcomes revealed that the most impacted areas were located in sites where aquaculture activities and waste disposal discharges were more intense. The above constitutes an attempt towards the quantification of impacts of human pressures on marine ecosystem components. Cumulative impact assessment efforts based on high quality data and a well developed and standardized methodology may provide a valuable tool for the visualization of spatial threats which may jeopardize Good Environmental Status (GES) as defined by the Marine Strategy Framework Directive (MSFD). The latter constitutes crucial knowledge of core concepts necessary to the implementation of the Maritime Spatial Planning Directive (MSPD) under an Ecosystem-Based Management (EBM) approach.

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CREATING THE "WORLD ATLAS OF MARINE STATIONS"

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Around the globe a vast amount of marine research facilities exist, ranging from small field stations to large marine institutes and universities. These marine research infrastructures are and have always been important for conducting marine research. They act as a hub for doing all kinds of marine research, and are also essential for teaching, Ocean Literacy, etc.
It was in 1843 that Pierre Joseph Beneden founded the first marine station in Ostend. The following half-century saw a dozen marine stations or laboratories established round the coasts of Europe and the eastern coast of the United States. Since then the amount of Marine Research stations has been growing rapidly.
In 1963 the World Directory of Hydrobiological and Fisheries Institutions was published. In this book by Robert Hiatt a comprehensive and inclusive list of all marine and fresh water research facilities around the world was given, some 600 in total. Although some lists of marine stations around the world exist (online) today, none of them is complete and up to date.
We aim to compose a comprehensive and inclusive inventory on research facilities of all marine stations around the globe, eventually forming the "World Atlas of Marine Stations". To this end, we have built a website, on which it will be possible to enter a marine station, and its specifics, and to search for marine stations with specific details. In this way it will be possible to quickly search for certain marine research facilities with specific characteristics all around the world. This will facilitate the cooperation between marine stations and the exchange of knowledge, equipment and staff.

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MAPPING OF ECOLOGICAL FEATURES FOR THE CONSERVATION OF MARINE BIODIVERSITY IN THE AEGEAN SEA: THE MARISCA PROJECT

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The scope of the MARISCA project is to design a network of Marine Protected Areas (MPAs) for the conservation of biodiversity in the Aegean Sea, in line with the European Directive (2014/89/EU) on the establishment and implementation of a national maritime spatial plan. The large size and geomorphologic complexity of the study area (encompassing a highly indented coastline and numerous islands and rocky islets) necessitates the mapping of key ecological features (habitats and species) across the Aegean ecoregion, in order to define conservation priorities. In this context, a comprehensive list containing all marine habitats and species which are under strict protection according to national or international legislation was created. This list includes 7 habitat types, 9 habitat sub-categories, and 61 animal species (9 species of Porifera, 7 Anthozoa, 9 Mollusca, 2 Echinodermata, 2 Osteichthyes, 20 Chondrichthyes, 1 Reptilia, 7 Mammalia, and 4 Aves). For each ecological feature (habitat or species), past and present distribution was assessed based on peer-reviewed scientific and grey literature, on-line databases, datasets provided to the MARISCA project by universities, research institutes, and NGOs, as well as personal observations of expert scientists, divers, and diving centers. Additional data collection and ground-truth sampling were realized by means of satellite telemetry, aerial photography, acoustic mapping, and SCUBA diving, to inform existing records and explore understudied areas. All information gathered allowed the production of distribution maps of ecological features, the assessment of habitat cover, and the development of spatial distribution models for data-deficient areas. The ecological information and distribution maps presented in this work were used to identify biodiversity hotspots, and represent the most comprehensive and updated inventory of protected marine habitats and species in the Aegean Sea. Future work will focus on combining the ecological data presented herein with the distribution of human activities and cumulative impacts of on-going pressures, in order to propose an MPA network based on the principles of systematic conservation planning.

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MITOCHONDRIAL GENOME OF THE ARCTIC KEYSTONE COPEPOD *CALANUS GLACIALIS*

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Most zooplankton biomass in the shelf seas of the European Arctic is formed by *Calanus glacialis*, a lipid-rich calanoid grazer. In the lipid-based arctic food web, it is a key link between the low-energy microalgae and higher trophic levels, including fish and planktivorous seabirds. We aimed to sequence the complete mitochondrial genome of *Calanus glacialis* in order to study evolutionary relationships between copepods, and to link this knowledge with the climatic changes being observed in the Arctic. *Calanus glacialis* was collected from the Hornsund fjord (western Spitsbergen, Svalbard Archipelago) and its DNA has been sequenced using NGS platform. Mitochondrial sequences were identified by comparative analysis. Despite a good coverage (approx. 100 fold), we were unable to retrieve a complete mitochondrial genome in one contig from the assembly. Instead, two contigs of 15kbp and 8kbp were assembled. The typical set of mitochondrial genes is present in this genome but the non-coding (NC) regions are unusually long and complex. There are at least three NC regions longer than 300bp within the 15kb contig and only 2.5kb of the 8kb contig is coding. In addition, the ends of both contigs contain NC regions characterized by long and complex repeats, hence their length is uncertain. This structure is somewhat similar to the closest mitochondrial genome available in GenBank, which belongs to the North Pacific *Calanus sinicus* and contrasts with the much more simple mt genome of the deep-water, Arctic *Calanus hyperboreus*. The structural similarities parallel the genetic distances in this case, reflecting the general evolutionary trend for expansion of NC regions within mitochondrial genomes of Arctic *Calanus* species. We speculate that this phenomenon is associated with the well known general trend of body size change within this lineage. Further data for comparative analyses are needed to verify this hypothesis.

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DOWNSCALING SIZE-ABUNDANCE RELATIONSHIPS: AN APPLICATION TO LAGOON MACROZOOBENTHOS

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The relationships between the density and the average body size of groups of individuals represent fundamental patterns in ecology. On energetic base, it is expected that individuals' density scales with the average individual size as the opposite of the individual energetic requirements, i.e. as a power law with exponent -0.75. This trend is detectable at global scale and merging large data sets, while deviations from the metabolic scaling x/4 laws are commonly observed when body size patterns at local scale, on guild or community levels, are considered.
Here, we use a dataset on benthic macroinvertebrates of Mediterranean and Black Sea lagoons, covering 15 ecosystems and 7 habitat types and comprehensive of 249 taxa, to describe size patterns and address the degree of their dependency on environmental and taxonomic resolution as inferential factors.
The overall dataset has been partitioned at increasing levels of both taxonomic and environmental grain, downscaling global size patterns up to (within species size patterns) intra-specific and (within site size patterns), respectively, using the following data clustering levels: Phylum, Class, Order, Family, Genus, Specie for taxonomic grain downscaling; Typology, Lagoon, Habitat, Site for environmental grain downscaling. At all levels, different models have been used to investigate the shape of the studied patterns; models discriminate between shapes of the size patterns (i.e, left peaked vs triangular) and between central and upper boundary tendencies.
We observed a large variation in scaling coefficients estimated from different models. The patterns of variation were consistent across different scales of biological organization and size range. In particular, we observed that models fitted on the upper boundary and on relatively large-sized taxa show regularly scaling coefficients distributed around the a value of -0.75, independently of the size range and the hierarchic levels of data partitioning above which the model was fitted. The results suggest that, despite the relevant influence of both stochastic and deterministic sources of deviations, energetic constraints related to metabolic requirements are potential drivers of community and population structure at all levels of biological organization.

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ASPECTS OF THE REPRODUCTIVE BIOLOGY OF *MULLUS SURMULETUS* (L., 1758) IN THE AEGEAN SEA (EASTERN MEDITERRANEAN)

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The present work is a preliminary study on the reproductive biology of the striped red mullet *Mullus surmuletus*, one of the most economically important species of the trawl fishery in the Hellenic waters. A total of 535 individuals, ranging from 76 to 306 mm in total length and from 5 to 401 g in total weight, were sampled within the Data Collection Framework Program from November 2013 to November 2014 in the Aegean Sea. The overall sex ratio (females: combined sexes) was 0.67. Females outnumbered males in almost all size classes and particularly at lengths over 170 mm (P_{x2}=0.005). Mature females and males ranged from 127 to 306 mm and from 124 to 271 mm in total length, respectively. The proportion of mature specimens increased with size. Females and males reached 50% maturity (L_{50}) at 159 and 162 mm, respectively. According to the monthly distribution of the maturity stages, the highest spawning activity of *M. surmuletus* was observed from March to May, regardless of sex, with the largest individuals maturing in early spring in contrast to the smaller ones that seemed to mature mostly in summer.

Keywords: striped red mullet, maturity, Mediterranean Sea

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THE ROLE OF CEPHALOPODS IN THE DIET OF TWO DEMERSAL SHARKS IN THE AEGEAN SEA (EASTERN MEDITERRANEAN)

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Despite the ecological importance of cephalopods in the marine ecosystem, there is still a significant lack of information on these animals' biology, distribution, and role in the food web. This study concerns the cephalopod species participating in the diet of the small-spotted catshark *Scyliorhinus canicula* and the longnose spurdog *Squalus blainville*, captured in different locations across the Aegean Sea during a 6-year period. Cephalopod remains were recorded at about 37.5% of examined non-empty stomachs for both shark species, including flesh, eye lenses and beaks being either loose or embedded in buccal mass remains. The latter ones were used for species identification by comparison with beaks of the IMBRIW-HCMR reference collection or using cephalopod beaks identification guides. Calibrated digital images of lower and upper beaks were obtained through the stereoscope image analysis system of HCMR and measurements of standard beak dimensions were made by use of Image-Pro PLUS to enable reconstruction of preyed specimens' size. Both shark species were found to prey upon Teuthoidea, Sepioidea and Octopoda, with a higher species diversity recorded in *S. canicula* (N=15) than in *S. blainville* (N=10) cephalopod preys. Specifically, representatives of five families of cephalopods (Enoploteuthidae, Ommastrephidae, Onychoteuthidae, Sepiolidae and Octopodidae) were common in the diet of the examined predators. Neritic Loliginidae, mesopelagic Histioteuthidae and epipelagic Thysanoteuthidae and Argonautidae species participated only in *S. canicula* stomach content, reflecting its nocturnal ascent into surface and shallow prey-rich areas. Pelagic and benthopelagic species were equally represented in *S. canicula* diet, composing 80% of cephalopod prey specimens, out of which the odd bobtail squid *Heteroteuthis dispar* and the shortfin squid *Illex coindetii* were the most abundant. Among cephalopod specimens preyed by *S. blainville*, dominated those assigned to benthopelagic species (%N=72.7), mainly ommastrephids, followed by pelagic ones (%N=22.7).

Keywords: stomach content, cephalopods, Chondrichthyes, eastern Mediterranean Sea

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ALGAL BLOOMS ON THE INSHORE FISH SPAWNING GROUNDS OF THE GULF OF GDAŃSK

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Shallow inshore waters of the Gulf of Gdansk (down to one meter depth) are inhabited, in majority, by marine fish species. During a yearly investigations appearance of 13 marine, three freshwater and one anadromous fish species was noticed. The highest fish number in shallow water area was usually observed in summer time, when algal blooms are appeared. In that time mostly young individuals of gobies, small sand eel, flounder, three spine stickleback and occasionally young herring were present. Studies of blooms dynamic show that the highest biomass accumulation of *Nodularia spumigena* is very often observed in the shallowest gulf area. Laboratory investigations of *N. spumigena* high concentration effects, on some fish species, showed that it had negative influence on organisms' condition and mortality. As it is well known, fishes are able to abandon a region where adverse environmental conditions occur. Therefore it is interesting what is happening during blooms in natural conditions? Does the bloom occurrence have impact on fish abundance in shallow zone? Whether the presence of blooms will decrease the number of fish in the area, or contrary they did not responded escape. We will try to answer that question in our presentation.

Keywords: shallow waters, fish, abundance, algal blooms

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MARINE LITTER INGESTION BY FISH IN THE EASTERN IONIAN SEA

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During the last years an increasing number of organisms have been documented to ingest marine litter (macro and micro litter items), alarming their potential input and accumulation in the trophic web and the potential risks on marine life and also human health. To quantify the occurrence of ingested litter in fish caught in the Ionian Sea, 927 specimens of thirteen bony fishes and seven Elasmobrachs were analysed. Fish were sampled during two experimental bottom trawl surveys carried out off Corfu Island (Eastern Ionian Sea) during September 2014 and April 2015. Fish were processed according to the DeFishGear protocol for litter in biota and the content of their guts were examined directly under the stereomicroscope. Litter items were found only in 6 species: fibres in *Citharus linguatula*, *Lepidotrigla cavillone, Pagellus erythrinus, Sardina pilchardus, Mullus barbatus* and *Scyliorinus canicula*. Moreover, charcoal was found in *Mullus barbatus* and pieces of plastic bags and pieces of hard plastic were found in *Scyliorinus canicula*.
According to our preliminary results, the incidence of ingested litter in the Ionian Sea fish species is low (2.77% occurrence in the entire sample). It is worth noting that the highest percentage of occurrence (8.57%) was found in an Elasmobrach species as also observed in another area of the E. Ionian Sea.
This work was carried out within the framework of DeFishGear project, co-funded by the European Union Instrument for Pre-Accession Assistance (IPA).

Keywords: ingested marine litter, Mediterranean Sea

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PHYLOGENY OF *UNCINARIA* (NEMATODA) HOOKWORMS (NEMATODA: UNCINARIA) OF PINNIPEDS FROM SOUTH AMERICA, INFERRED BY MOLECULAR ANALYSES AND MORPHOMETRIC VARIATIONS

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The hookworms (*Uncinaria* spp) parasitize pinniped pups in different geographical regions around the world. A recent phylogenetic analysis of the genus *Uncinaria* showed seven independent evolutionary lineages or species, including the two species formally described and five undescribed species. These molecular analyses showed that *U. lucasi* parasitize *Callorhinus ursinus* and *Eumetopias jubatus* in Northern America coasts while *U. Hamiltoni* parasitize *Arctocephalus australis* and *Otaria flavescens* in Southern America coasts. However, the authors did not include specimens of *Uncinaria* from hosts from the west coast of South America (SA). In order to evaluate the taxonomic and phylogenetic status of hookworms parasitizing fur seal from Southeastern Pacific coast (SEP), nematodes were collected from dead pups of *A. australis* from the coasts of Perú, Chile and Uruguay. Molecular analyses were performed at 12 specimens using two genetic markers (ITS and 28S). Also, 100 specimens were used to perform multivariate analyses (principal components, PCA and discriminant, AD) in order to study the nematode morphometry. Phylogenetic trees using Maximum Likelihood method and Mr. Bayes showed that *U. hamiltoni* described in the Atlantic coast of SA shaped a different clade compared with *Uncinaria* sp. from the SEP. Moreover, one polytomy for hookworms from the SEP was detected, which could be suggesting the existence of more than one species of these hookworms along the SEP. Hookworm genetic differences between *Uncinaria* from *A. australis* populations from Peru and Uruguay coasts were supported by significant morphometric variations. The geographical isolation of the hosts could explain the phylogeographic pattern of this parasite in South-America coasts.
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ARE ALL SOUTH AMERICAN DESCRIBED SPECIES OF *APOROCOTYLE* (DIGENEA: SANGUINICOLIDAE) GOOD SPECIES? A MOLECULAR APPROACH

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Eighteen valid species have been described in the genus *Aporocotyle* (Digenea: Sanguinicolidae) infecting the heart, bulbous arteriosus and blood vessels of marine fishes of five teleost order from the Atlantic, Pacific, Antarctic and Indian Ocean, as well the Japan and Baltic Sea, eight of them have been described from three species of *Merluccius* and three species of *Genypterus* from the Pacific (Chile and Perú) and Atlantic (Argentine) coast of South America. *Aporocotyle* species seems to be highly specific, and all of them (except *A. simplex* and *A. garciai*) are found in a single host species, but two different species of *Aporocotyle* have been found in the same host species. The plea of Hernández-Orts et al. (2012) requesting more molecular data on aporocotylid to explore phylogenetic relationships inspire us to study the *Aporocotyle* species found in the species of *Merluccius* and *Genypterus* from the Pacific and Atlantic coast of South America (Chile and Argentina). Our results based on three molecular markers (V4 region of the SSU rRNA, LSU rDNA and cytochrome oxidase subunit 1) show that *Aporocotyle* species found in *M. hubbsi* (from Argentine), *M. gayi* (from Chile and Perú) and *M. australis* (from Argentine and Chile) are the same species (*Aporocotyle argentinensis*, Smith, 1969 by priority law) and *A. australis* and *A. wilhelmi* become junior synonymous, but with a strong genetic population structure associated to the host species. Two of the three species of *Aporocotyle* from *Genypterus* spp. are synonymous. *A. mariachristinae* and *A. ymakara* were found in the pink cusk-eel from Chile. *G. blacodes* is host for two *Aporocotyle* species in the south Atlantic as well south Pacific coast of South America.
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THE TRADITIONAL ILLEGAL TRAWLING IN THE MARMARA SEA

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Trawl fishery is an important fishing technique to catch demersal fishes all over the world, yet the illegal application of it is very common. At the coasts of Turkey, like at the Mediterranean Sea, the intense activity of illegal trawl fishing is done at locations especially on seagrass meadows, which is under protection. The problem of illegal trawling makes a bad perception at the community. The Marmara Sea, which is a territorial sea, is an intense illegal trawling location and this is documented with official records. In this study, the specifications of the trawling nets and the illegal trawling operations, which are conducted and apprehended in the territorial Sea of Marmara, have been documented. It has been detected that the trawling nets and otters, which were used for illegal trawling operations, are smaller than commercial trawling nets and otters. Also, the boats which were used for illegal trawling are smaller sized (>5 m) than commercial trawling boats. It has been officially reported that illegal trawling is done more at winter at the Prince Islands, the Istanbul Strait (Bosporus) and more at the shores. It is the liability of the General Directorate of Protection and Control of Aquaculture, which is subsidiary to Ministry of Food, Agriculture and Livestock and it is the liability of the Coast Guard to catch and take legal action against illegal trawling. The illegal trawlers have developed techniques like mostly cutting their trawling nets and leave them at the sea to not get caught in action. Besides, even if they get caught in action, they mostly only get a money fine because of the gaps in the regulations. This problem does not apprehend the illegal trawlers, therefore illegal trawling deserves the adjective “traditional” because of its activity for many years.

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THE STATE OF EUROPEAN HAKE (*MERLUCCIUS MERLUCCIUS* LINNAEUS, 1758) IN THE MARMARA SEA, TURKEY

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Fishes are important sources for the human kind as a food since being one of the important protein basis. There is considerable fishery potential in Turkey. Anchovy, sardine, horse mackerel and tuna species are the important catches for the pelagic zone while cod, whiting, halibut and European hake are important for the demersal zone in the world fisheries as a high catch amount in the world. The European hake fishery has a significant value in the Marmara Sea. The demersal and pelagic fish fauna in the Marmara Sea displays dynamic and various structure and being among the two different ecosystems Black Sea and Mediterranean it has a specific significance with involving resting, feeding and breeding location for the economical species. European hake has an essential role in the fisheries compared to the other species as a high catch amount and economical value. This species has been caught with gillnets as the trawl fishery banned in the Marmara Sea and involves in beam trawl and beach seine fishery for deep water rose shrimp as by-catch. Although the demersal species caught in the Marmara Sea are few amount comparing to the pelagic species, they have more economic value than pelagic. The catch amounts for the last decade are 4380 tons in 2004, 4100 tons in 2005, 3460 tons in 2006, 3337 tons in 2007, 1252 tons in 2008, 1557 tons in 2009, 1256 tons in 2010, 921.1 tons in 2011, 892 tons in 2012 and 676 tons in 2013 in Turkey and 204.7 tons in Marmara Sea in 2013. In this study, European hake fishery in the Marmara Sea summarized, the catch amounts compared with the other countries and advices offered with the management strategies.

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TAGGING OCTOPUSES

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Tagging techniques are becoming more commonly used techniques by marine biologists and fishing researchers. Devices, which are developed for this use, reveal the unknown details of the fishes on which they get deployed. But the factor of success in these studies depends on the animals getting used to the device and live in peace with it attached. During pre-studies in tanks conducted on the *Octopus vulgaris* which is hunted a lot in the Aegean Sea, unexpected results were obtained. It was seen that the octopuses using their arms and suckers carefully and patiently removed the tags. During the removing of the tags it was seen that the octopuses obtained potential fatal wounds, yet all of the octopuses survived. This study contains observations on how tagged octopuses remove their tags and their general behaviour in a controlled environment. Additionally, it contains information on their wounds, pre-studies on telemetry researches, and shows how important it is to observe these animals.

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FISHERS' OPINIONS ABOUT MARINE PROTECTED AREAS IN PORTUGAL

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Benefits of marine protected areas (MPAs) depend on local ecological and socio-cultural aspects which are critical to the success of these management tools. Understanding the social, cultural, economic and institutional factors surrounding MPAs is crucial for their success. A survey was carried out with representatives from the Portuguese fishing industry and with local fishers from the Arrabida Marine Park (AMP) in order to gauge their perceptions about MPAs, impacts MPAs have on their fishing activity, the management of MPAs, and participation in the MPA decision-making process. In general, Portuguese fishers perceive MPAs to increase restrictions and impact negatively on their fishing activity, by increasing production costs and diminish revenue. Fishers also complain about the increase in competition with other stakeholders for the use of the sea (e.g. recreational fisheries, diving). Fishers feel alienated from the MPA decision-making process, and complain about the lack of transparency on the implementation of MPAs and the lack of trust between stakeholders. There is a need for an increase of dialogue and transparency between conservation and governmental bodies and the fishing industry, and to have the fishing industry more involved in the MPA decision-making process for the success of these management tools.

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EFFECTS OF WINTER PHYTOPLANKTON BLOOM ON THE MEIOBENTHIC COMMUNITY OF MALIAKOS GULF

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Meiobenthic community structure and how it is influenced by environmental variables of the water column (pH, dissolved oxygen, nutrients, chloroplastic pigments, suspended particulate organic matter and total organic matter, organic and total carbon, bacterial abundance, biopolymers) and in the sediment (granulometry, water content, chloroplastic pigments, bacterial abundance, total nitrogen and carbon, biopolymers) were investigated in the river-influenced semi-enclosed Maliakos gulf, Greece.
Sediment samples were collected at three stations along a distance-depositional gradient from the river mouth (R), a middle station (M), to the open sea (H) before, during and after a phytoplankton bloom on early February 1999, using a corer of 5.8 cm diameter at 12 m depth.
Twenty one meiofaunal taxa were found, with Copepoda identified down to family level. Nematoda and Copepoda accounted for ~70% of the total abundance. Taxonomic richness and total abundance increased from R to H. Dominant copepod families were Miraciidae in the outer two stations and Cletodidae in R station.
Chlorophyll-a and phaeophytin peaked in the water column, during the phytoplankton bloom, and in the sediment (upper 3 mm) after the bloom.
MDS analysis showed a spatial gradient of abundance from the inner to the outer station. In each station, the samples taken during the phytoplankton bloom were relatively detached from the rest. This may be an indication of the effect of the phytoplankton bloom on the decrease of the meiobenthic abundance observed.
PCA showed that the high bacterial abundance measured in the surface sediment is the variable that better explains the lower values of meiofauna during the bloom.

Keywords: meiofauna, winter phytoplankton bloom, taxonomy, Maliakos gulf, bacterial effect

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BIOLOGICAL RESPONSE TO SALINITY STRESS IN BIVALVES *MACOMA BALTHICA* AND *MYA ARENARIA* FROM THE GULF OF GDANSK, SOUTHERN BALTIC SEA

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The Baltic clam *Macoma balthica* and the soft-shell calm *Mya arenaria* inhabit commonly marine and estuarine soft bottom habitats in the Northern Hemisphere. Both species are characterized by the ability to withstand a broad range of environmental variables including salinity. On the genetic level they display, however, very different characteristics. *Macoma balthica* demonstrates high genetic variability and its populations are often genetically adapted to local conditions (e.g. brackish salinity in the Baltic Sea), whereas *M. arenaria* shows low genetic diversity across its distribution range. Thus, the two species may respond differently to varying salinity, in particular *M. arenaria* should have better performance under osmotic stress. In order to test this hypothesis we exposed clams to various salinity conditions (2, 7.8 - ambient, 15, 25 and 35 PSU) over 5 weeks and measured selected biomarkers including respiration rate, biochemical compositions (lipids, proteins, carbohydrates, heat shock proteins) and histological parameters. Laboratory exposure to the different salinities induced in both species apparent changes in all parameters analyzed, being much more pronounced in *M. balthica*. The results obtained seem to confirm the research hypothesis about larger relative phenotypic plasticity of *M. arenaria* reflecting different evolutionary strategy of adaptation of this bivalve to heterogeneous habitats.

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DIVERSITY OF PTEROPODS IN THE WORLD OCEAN – META-ANALYSIS OF NEW AND EXISTING DATA

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Pteropods are pelagic opistobranch gastropods consisting of two groups: omnivorous shelled Thecosomata and carnivorous naked Gymnosomata. Even though pteropods are often a dominant component of zooplankton communities, playing a key role in pelagic food webs, still relatively little is known about their taxonomic diversity and biogeography. Particularly, there is a lack of a relevant broad-range synthetic study of available data. Such development is particularly important in terms of global changes and ocean acidification as pteropods contribute considerably to carbon cycle and are sensitive to pH decrease. In the present study, based on own data from three oceanographic expeditions (r/v Academic Ioffe, Antarctica; r/v Oceania, Arctic; r/v Polarstern, East Atlantic) and the available literature data, we analyzed global pattern of pteropod diversity on different taxonomic levels along latitudes and longitudes and across environmental conditions (depth, temperature, productivity). In summary, our study provides the first comprehensive insight into the diversity and biogeography of pteropods in the World Ocean.

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AN INTEGRATED SIMULATOR FOR HABITAT AND ORGANISMS: AN APPLICATION ON THE *CALLINECTES SAPIDUS*

Konstantinos Drossos, **Romanos Kalamatianos**, Markos Avlonitis

[…]

In this work the Life/ORganism Expansion Simulator (LORES) is presented, which is an online platform that can be used by researchers in order to conduct experiments simulating the dynamic evolution of an arbitrary organism. It is based on a cellular automaton, where habitat and organisms may be mapped to discrete cells in space while multiple interactions between organisms as well as organisms and habitat in time and space may be robust simulated. Each organism and habitat can have multiple characteristics with one or more rule-sets applied onto each characteristic. A demonstration of the platform will be presented on the case of the *Callinectes sapidus*, also known as the blue crab.

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COMMERCIAL SPONGE FISHING ACTIVITIES IN THE CENTRAL MEDITERRANEAN: A PRELIMINARY ATTEMPT AT CHARACTERISING SUCH AN ANCIENT PRACTICE

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Commercial sponge fisheries is one of the most enduring fishing methods in the Mediterranean Sea, tracing its routes to antiquity and representing a cultural common heritage of the entire Basin.
Nowadays, the exploitation and trade in natural sponge individuals have decreased greatly in significance due to the availability of synthetic replacements on the market. However, in some areas of the Mediterranean, the local fishing population is still highly involved in and economically supported by this small-scale economic activity. Despite the early origins of such specialised fisheries, scant qualitative and quantitative information is available from ongoing activities within the Central Mediterranean, with the only known assessment having been published for Libyan waters, such that management measures targeting commercial species of sponges are not necessarily based on scientific evidence.
In order to address such knowledge gaps, a mixed approach was embarked upon throughout 2015 and 2016, within the larger Strait of Sicily geographical area ranging as far west as the coastal area of Tunisia and as far east as the Maltese Islands, in order to condense as much anecdotal information held by coastal communities about sponge fishing as possible. Questionnaires were conducted with fishermen on the Italian islands of Sicily, Lampedusa and Pantelleria, and on the Maltese Islands, whilst the Directorate of Fisheries national archives in the Maltese Islands were consulted for evidence of the issuing of sponge fishing licenses to third parties. Since sponge fishing activities in the Central Mediterranean are still being conducted by Greek fishermen, a Greek version of the questionnaire was also disseminated within communities based on the Greek island of Kalymnos.
The study presents semi-quantitative results of the mass of commercial sponge species fished over the years from the chosen geographical area, as well as useful insights on the target species, preferred fishing grounds and on possible trends in sponge fishing activity.

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MSFD REPORTING ON DESCRIPTORS 1, 4, 6 IN THE MEDITERRANEAN; DEFINING GES AND ESTABLISHIN mG TARGETS

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In the framework of the first implementation cycle of the Marine Strategy Framework Directive (MSFD) 2008/56/EC, EU Member States (MSs) had to report on Articles 8, 9 and 10 in October 2012 as designated in the directive in order to fulfill the first set of its requirements. Among the 11 MSFD descriptors, D1, D4 and D6 focus on biodiversity. The data reported by Spain, France, Italy, Malta, Slovenia, Croatia, Greece and Cyprus were considered in order to examine the methodological approaches and standards used by Mediterranean MSs and their heterogeneity while addressing these biodescriptors and analyse MSs Good Environmental Status (GES) Definitions and Establishment of Environmental targets.
In accordance with the MSFD, it is needed to make provisions for the development of criteria and methodological standards so as to ensure consistency and enable comparability of the extent to which GES is being achieved between marine regions or subregions. The criteria to be used by MSs for assessing the environmental status of marine waters are specified in Part B of the COM Dec 2010/477/EU. COM Dec states that for most criteria, the assessment methodologies required need to take into account and base on those applicable under existing Community legislation as well as the approaches developed under Regional Sea Conventions (RSC). In the analysis performed the main issues were the level of coherence among MSs regarding the criteria and indicators applied for each descriptor, the qualitative or quantitative nature of methodologies used to approach descriptors, the level of integration of other EU legislation and Regional/ International agreements, the nature of the established targets.
Some important results of the analysis performed;

- GES determination varied considerably among Mediterranean EU MSs, despite application of COM Dec 2010/477/EU. Thus, a consistent determination of GES was not actually achieved.
- Existing EU legislation and RSC standards were not integrated.
- The targets established by MSs differ considerably, remaining too general in many cases.
- There is considerable lack of methodological approaches, as well as thresholds and baselines.

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COMPARATIVE ANALYSIS OF ASSESSMENT METRICS AND THEIR UNCERTAINTY FOR KEY INDICATORS OF THE PHYTOPLANKTON ELEMENT IN RELATION TO BIODIVERSITY AND EUTROPHICATION

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Among the goals of ActionMed subtask 1.1.3 “Applicability of D1, D4, D6, D7 indicators to case studies in the Mediterranean”, a particularly challenging one is the development of experimental tests of uncertainty associated to biodiversity indicators currently used by MSs or scientific networks. This topic indeed involves issues related to both methodological (i.e. sampling effort), and theoretical (i.e. the ecological basis on which the indicators have been developed) aspects of the monitoring procedures.
Phytoplankton datasets allow the implementation of bootstrap techniques to calculate uncertainty. In this study, we present an analysis of different ecological indicators of phytoplankton responses to both natural and anthropogenic (impact) environmental variability. The analysis has been primarily performed on the phytoplanktonic datasets provided from the Italian partnership (Universita del Salento). The case study will be further extended by including datasets provided from the Slovenian (NIB) and Greek (HCMR) partners. We show that indicators of taxonomic diversity usually fail in detecting impacted sites, while indices based on taxa distributional patterns (e.g. Q index) or on individuals characteristics (e.g. ISS index) perform well. Moreover, we show that indicator scores are less variable for impacted sites rather than for reference ones. The implication is that sample size can be eventually reduced (to match economical constrains) with limited effects on the indicators performances in detecting impacted sites.

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QUANTITATIVE & QUALITATIVE ANALYSIS OF SEA BREAM, *SPARUS AURATA* (L.), HUMORAL IMMUNE RESPONSE, VACCINATED WITH COMMERCIAL AND EXPERIMENTAL VACCINES AGAINST VIBRIOSIS AND PHOTOBACTERIOSIS

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Photobacteriosis and vibriosis are two important septicemic fish diseases that are caused from the bacteria *Photobacterium damselae* subsp *piscicida* and *Vibrio anquillarum* (different serotypes), respectively. The aim of this study was the analysis of the specific humoral immune response of sea bream, *Sparus aurata* (L.), against *Vibrio anguillarum* O1 and *Photobacterium damselae* subsp. *piscicida* (Phdp) after vaccination with commercial and experimental bacterins, quantitatively and qualitatively. Specific anti-V. anguillarum O1 and anti-Phdp levels provoked by the adjuvanted commercial vaccine reached higher levels in comparison to the aqueous commercial and experimental bacterins. Infection of vaccinated fish with *V. anguillarum* O1 bacterial cells acted as a boost of the humoral immune response. When vaccinated groups were infected with Phdp, infection acted as boost of the humoral immune response mainly for the group vaccinated with a monovalent Phdp bacterin and to a lesser degree for the group vaccinated with the aqueous commercial vaccine. Western blot analysis of the sera against *V. anguillarum* O1 whole cell antigens revealed strong reactions to only a few antigens at below 54kD and above 15kD and weak reactions to other antigens. Similar reactions were observed from the sera isolated from the controls. An additional reaction against an antigen between 41kD and 27.5kD was noted from sera isolated from the infected fish of the groups immunized with the commercial formulations. Western blot analysis of the sera against Phdp whole cell antigens revealed strong reactions to only a handful of antigens below 20.7 and below 6.4kD and weak reactions against other antigenic material. Only the sera isolated from the group immunized with the adjuvanted commercial vaccine showed reactions against the complete range of the aforementioned antigens, both quantitatively and qualitatively. Sera from the control group, as in the case of *V. anguillarum* O1, reacted with Phdp whole cell antigens. No differences between monovalent and bivalent formulations were noted, in contrast to the adjuvanted and aqueous bacterins.

Keywords: photobacteriosis, vibriosis, *Vibrio anquillarum*, *Photobacterium damselae* subsp *piscicida*, fish vaccination, immunological investigation, immunological memory, ELISA method, Western Blot, natural antibodies

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A PRELIMINARY APPROACH TO RETROSPECTIVE AND PROSPECTIVE DISTRIBUTION ANALYSES OF BENTHIC COMMUNITIES ALONG THE SPANISH COAST

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Recent changes in average and extreme thresholds of different meteo-oceanographic variables may be responsible for drastic shifts on current distribution patterns of certain macrophyte-based benthic habitats (e.g. sea grasses, macroalgae). The coasts of Spain are located in different regional seas (Gulf of Biscay, Atlantic, Mediterranean), which seem to be particularly vulnerable to the effects of climate change (e.g. sea level rise, global warming, storm surge), as demonstrated by the latest observations in geographic distribution of some macroalgae assemblages. Retrospective and prospective analyses of interactions between biological and physic-chemical variables, taking advantage of data mining techniques, come up as a powerful tool to understand the current and future shifts in benthic communities.

For that purpose, a standardized and validated database, including both physical and biological information, was generated in this work, as the base for the analysis of the vulnerability of biological elements to climate change along the Spanish coast. Topo-bathymetric, meteo-oceanographic (current speed, wave height, storm surge, bottom shear stress, wind, radiance, temperature) and physic-chemical water data sets (salinity, turbidity) were combined with species distribution records, looking for space and time trends and relationships. Several data sources were employed (satellite-sensors, numerical modelling, *in situ* data) for the period 1948-2014. All the information was homogenized into the same spatial scale by a 10 km mesh. Similarly, temporal scale was adapted, according to different variable requirements (daily, monthly, annual; medium or extreme information). This valuable information allow defining specific indicators (predictors) that justify to a certain probability level the space-time distribution of natural structuring components (populations, communities, habitats) along the Spanish coast.

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DIVERSITY, ECOLOGY AND BIOGEOGRAPHY OF POLYCHAETES LUMBRINERIDS IN THE EASTERN MEDITERRANEAN SEA

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Lumbrinerids are abundant and widespread polychaetes in worldwide oceans. The simple external shape of these worms and the use of inappropriate taxonomic keys caused several misidentifications in the past. A recent effort has been made in several regions, particularly in the European coasts, to update taxonomic keys of this family following in-depth morphological and phylogenetic analysis.
In the present study, the diversity of Lumbrineridae was assessed from 42 sampling sites spread over the southern coast of Cyprus (Vasiliko bay and nearby coastal area), in the eastern Mediterranean Sea, as part of a large-scale benthic macrofauna research survey. Samples were collected with a 0.1 m^2 Van-Veen grab, sieved with 0.5 mm mesh and fixed in formalin. In the laboratory, macroinvertebrates were sorted, identified and preserved; lumbrinerids were classified according to Martins et al. (2012) and D'Alessandro et al. (2016) and morphologically studied following the nomenclature of Carrera-Parra (2006a, b). Photographs of relevant details were taken from each identified species. Sediments were also analysed in terms of grain-size, organic matter and chemical elements.
A total of 1719 lumbrinerids were found belonging to more than 10 species. From these species, *Abyssoninoe bidentata, A. cf. hibernica, A. cf. scopa, Gallardoneris iberica, Lumbrineris pinaster* and *L. lusticanica* correspond to the first record in the eastern Mediterranean Sea. The high diversity and abundance of lumbrinerids in Cypriot coasts reinforces (a) the expansion of species distribution in the Mediterranean biogeographic province; (b) the importance of this province as hotspot of biodiversity and (c) the importance of using updated taxonomic keys to minimize species misidentifications.

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A PHYLOGEOGRAPHIC INVESTIGATION OF THE BLOTCHED PICAREL (Spicara maena) AROUND THE Turkish Coastal Waters AND the MEDITERRANEAN SUGGESTS THE PRESENCE OF TWO SPECIES

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In aquatic environments, fish are accepted as one of the most important natural resources and reduction of the genetic diversity of natural fish populations has become an important fisheries management problem. Measuring genetic diversity in natural fish population is essential for interpretation, understanding and effective management of fish population or stocks. In this regard, conservation, management and phylogeographic studies of natural fish population are aided by the use of molecular markers to identify the representatives of individual stocks. Phylogenetic relationship and morphologic discrimination of *Spicara maena* and *Spicara flexuosa* are not clear in the Mediterranean Sea (Minos et al., 2013). Sexual dimorphism also exists making male *S. smaris* and female *S. flexuosa*, and male *S. flexuosa* and female *S. maena* hard to differentiate (İlkyaz et al., 2007). In this study, the effect of the Turkish Straits System (TSS), comprising a biogeographical boundary that forms the connection between the Mediterranean and the Black Sea, on the evolutionary history, phylogeography and intraspecific gene flow of the blotched picarel (*Spicara maena*), a demersal fish species, was investigated. For these purposes, the mitochondrial DNA (CO1) nd nuclear IRBP genes were used. In addition, genetic comparisons samples from other regions (Greece, France, Israel, Malta, Portugal, Italy) obtained from Genbank and Barcode of Life Database were made to better understand the phylogeographic history of the species at a larger geographic scale. Within this study, low level of genetic differentiation were observed along the Turkish coastal waters, suggesting that TSS is not a barrier to dispersal. However, two different haplogroups were observed based on COI and IRBP, one found in Israel, Portugal, Turkey, Italy and the other in Greece, France, Sardinia and Malta.

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A LIONFISH (*PTEROIS MILES*) INVASION HAS BEGUN IN THE MEDITERRANEAN SEA

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Until now, few sightings of the alien lionfish *Pterois miles* have been reported in the Mediterranean and it was questionable whether the species could invade this region like it has in the western Atlantic. Here, we present evidence from divers and fishermen that lionfish have recently increased in abundance and within a year colonised almost the entire south eastern coast of Cyprus, likely due to sea surface warming. At least 23 different fish are reported of which 6 were removed. Groups of lionfish exhibiting mating behaviour have been noted for the first time in the Mediterranean. Managers need this information and should alert stakeholders to the potential ecological and socio-economic impacts that may arise from a lionfish invasion. Actions could involve incentives to engage divers and fishermen in lionfish removal programmes, as these have worked well at shallow depths in the Caribbean. Given that the Suez Canal has recently been widened and deepened, measures will need to be put in place to help prevent further invasion.

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FIRST RECORD OF THE LESSEPSIAN FISH *UPENEUS PORI* BEN –TUVIA & GOLANI, 1989 IN SARONIKOS GULF

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Upeneus pori Ben-Tuvia & Golani, 1989, is a Lessepsian fish species that came into the Mediterranean sea via the Suez canal. Westwards, it has reached the Tunisian Sea and northwards it is reported in the Gokova Bay. The last sighting of the species in the Hellenic seas was in 2003 at the SE coast of Rhodes Island in the Aegean Sea. On October 24th 2015, a single specimen of 165 mm total length was caught in Saronikos Gulf at a depth of 20 m during commercial fishing with trammel nets (inner net mesh size: 36 mm stretched). This contribution aims to report a new occurrence of the species in the Hellenic Seas, demonstrating the gradually range expansion of the species to the northern parts of the Mediterranean and the Hellenic Seas.

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BAIKALIAN SPECIES *GMELINOIDES FASCIATUS* IN THE GULF OF FINLAND AS A MODEL FOR STUDYING GENETIC MECHANISMS OF ADAPTATION

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Invasion of Baikalian amphipoda *Gmelinoides fasciatus* in the Gulf of Finland is a result of anthropogenic activity in the 60th of the 20 century. Now it is wide spreading in a lot of fresh and brackish water reservoirs in the northern-western of Russia (Berezina, Petryashev, 2012). Attempts to adapt to the new environmental conditions of Baltic Sea go with sharp physiological, biochemical and other changes in living organisms. These changes result in alteration at the genome level. We consider that different genetic traces of adaptation are the good point to start the investigation of an organism state using the level of genes and the genetic machinery of the target cells.

We used cytogenetic approach to determine karyotype and chromosome aberration frequency in mitotic dividing cells of *G. fasciatus* from aborigine (Baikal Lake) and invasive (Gulf of Finland) crustacean populations. Anaphase-telophase method showed absence of any differences between frequencies of spontaneous chromosome disturbances in mitotic cells of both investigated populations. The level of spontaneous chromosome aberration frequency was 2%. Surprisingly it coincides with the data obtained for other crustacean species (*Jeara albifrons, Asellus aquaticus, Porcellio scaber*, etc.) (Daev et al., 2011; 2015). We suggested that it served as an evidence of successful adaptation of *G. fasciatus* to the new environment.

In spite of elimination of chromosomal macro-damages it seems possible to find some differences between native Baikalian and invasive populations at the molecular level in SNP. It is also possible that the comparison of karyotypes will reveal the balanced micro-rearrangements.

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ALIEN SIPUNCULA SPECIES IN THE MEDITERRANEAN SEA

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The Mediterranean Sea has been largely under the influence of alien species. A total of 955 alien species were reported from the region up to date, of which 535 species (56%) have become established. The eastern basin hosts higher number of alien species due to its proximity to the Suez Canal and dense shipping traffic. A total of 8 alien sipuncula species belonging to 4 families have been reported from the region. Among them, 4 species (*Apionsoma misakianum*, *Phascolosoma scolops*, *Aspidosiphon mexicanus*, and *A. elegans*) have been reported to become established in Mediterranean Sea and 2 species (*Apionsoma trichocephalus* and *Phascolion convestitum*) are casual. More recently, 2 species (*Nephasoma eremita* and *Phascolion caupo*) were reported to be alien species in the Mediterranean Sea. As only one specimen of *N. eremita* was encountered in the Levantine Sea, this species could be a casual species. However, as *P. caupo* was reported in some different places with high number of individuals in the western Mediterranean Sea, this species can be accepted as an established alien species for the Mediterranean Sea. *Aspidosiphon elegans* is active bioeroders of calcareous rocks, stones or corals which distribution limited to the eastern basin for the Mediterranean Sea on hard substrata at shallow depths (0-14 m). *Phascolosoma scolops* was recorded at hard bottom in the Adriatic Sea and northern Cyprus from 0 to 65 m depth. *Aspidosiphon mexicanus* and *Apionsoma misakianum* were widely distributed in the eastern basin in the region, on both soft and hard substrata at 0-429 m depth, whereas, *Phascolion caupo* was restricted to the Spanish waters of the western Mediterranean at 7-45 m depth. The other three species (*Apionsoma trichocephalus*, *Nephasoma eremita* and *Phascolion convestitum*) were rare species on soft substrata at depths 24-260 m.

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FLORA OF RHODOLITH BEDS AND INVASIVE SPECIES. THE CASE OF RHODES ISLAND, SE AEGEAN (GREECE)

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The biodiversity of coralligenous communities in the Eastern Mediterranean has been rarely explored. Here, for the first time, deep water sampling was conducted by SCUBA diving, on a site on the NE of Rhodes Island, which was hypothesized of harboring maërl beds. In total, 46 person-dives were conducted down to 55 meters depth. In total, 33 flora taxa were collected from the habitat, which was dominated by small rhodoliths, mainly of the genus *Lithophyllum* and *Phymatolithon*. The samples revealed the presence of 10 brown algal species, 8 green, 13 red and 2 Phanerogams. One of the species collected, the red alga *Ptilophora (Beckerella) mediterranea* (H. Huvé) R.E. Norris, 1987, is endemic in the South Aegean. Out of the seven non indigenous species that were identified, the red seaweed *Womersleyella setacea* is considered among the worst invaders of the Mediterranean Sea and while it was known to impact shallow-water communities in the Eastern Mediterranean, the surveys conducted within the framework of this study suggest that its impact is likely profound also in the low-light and colder-water, deeper communities. Furthermore, the recent finding the green alga *Caulerpa taxifolia* var. *distichophylla* in 2010, showed an invasive behavior at the surveyed site, covering a large surface. The vicinity of Rhodes Island to the Suez Canal, increases the probability of new introductions.The coralline algae that form the maërl beds are amongst the slowest-growing species, therefore non indigenous algae with an invasive behavior can be expected to have a severe impact on these habitats.

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ALIEN FISH SPECIES AS BYCATCH AND DISCARDS: REVIEW OF CURRENT KNOWLEDGE FROM BOAT SEINES IN THE AEGEAN SEA

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Information of fish bycatch and discards from boat seines in the Aegean Sea is limited. Recently the immigration of non-indigenous fish species from the Red Sea and Indo-Pacific Ocean through the Gibraltar strait has changed coastal fish assemblage structures. Following EC regulation no 1967/2006 boat seining operating over seagrass beds is banned in the EU countries. Boat seines in Greece mainly operate over *Posidonia oceanica* meadows and less over soft bottoms, due to less productive biotope. Reported discards ratio for the Aegean Sea is approximately 10% while the results of the present quantitative meta-analysis of 120 boat seines, performed seasonally during period from 2007 to 2011 reveals that discard ratio in the south-eastern Aegean Sea amount to 24% of the total catch. This is in accordance with the results presented in the Turkish Aegean Sea (21%) and in the Adriatic Sea (28.5%).When target species of boat seines are *Boopsboops* and *Spicara sp.*, contribution of catch, bycatch and discard were found to be 58%, 18% and 24%, respectively. Four important aspects presented in this study are :i) the density and size of juvenile fish, ii) the fish diversity over *P. oceanica* meadows (96 species), iii) the seasonality in fishing operation and habitat use of fish species through classification of species into function guilds (seagrass residents, seasonal migrants, juvenile migrans and occasional visitors) and iv) the contribution of non-indigenous fish species, contributing up to 8% to the total catch. The above are discussed in the light of the socio-economic implications of the boat-seine fishery for the marine ecosystem.

Keywords: boat seine, non-indigenous, fish, bycatch, discards

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THE FAT AND THE LEAN: ENERGY STORAGE AND FOOD PREFERENCES OF EGG-CARRYING FEMALES OF *HEMIGRAPSUS SANGUINEUS* AND *CARCINUS MAENAS*

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The Asian shore crab *H. sanguineus* first appeared at the French coast in the late 1990's. It rapidly extended its range further north to the German Wadden Sea and recently to western Sweden. In the intertidal area, it co-occurs with the European green crab *C. maenas*. As the ecophysiology of *H. sanguineus* is virtually unknown, the physiological capacities of both species and their potential for intra-guild competition were investigated. The aim of this study was to specifically compare the energy deposition and dietary preferences of ovigerous females of both species.
Females of *H. sanguineus* and *C. maenas* carrying immature or mature eggs were collected in April, June, August and October 2015 in an intertidal area of the Island of Helgoland, North Sea. Total lipid levels and fatty acid compositions were determined of both midgut glands and eggs.
In *H. sanguineus,* total lipid levels of the midgut glands were clearly higher than those of *C. maenas* (40% vs. 10% dry mass, DM). Immature eggs were quite lipid-rich in both species with 30% and 25% DM, respectively, whereas in mature eggs, lipid levels decreased to ~15% DM each. A Principal Component Analysis of the fatty acid compositions of midgut glands and eggs revealed separate clusters for both species with *C. maenas* lipids more characterized by membrane fatty acids. In *C. maenas* fatty acids of midgut glands and eggs clustered together largely dominated by carnivory biomarkers. Fatty acids of midgut glands and all eggs of *H. Sanguineus* formed separate clusters and trophic markers indicate a more herbivorous diet.
Higher lipid levels and thus more pronounced energy deposition in *H. sanguineus* midgut glands indicate higher starvation tolerance for females, a potential competitive advantage over *C. maenas*. Direct food competition, however, seems negligible, as *H. sanguineus* prefers a more herbivorous diet than *C. maenas*. Deviating fatty acid compositions in *H. sanguineus* midgut glands and eggs suggest that this species may represent an income breeder, utilizing energy from both the midgut gland but also from dietary input. Most brachyuran crabs are capital breeders, which rely exclusively on internal reserves.

Keywords: Brachyura, southern North Sea, energetics, diet, lipids, fatty acid composition

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DEATH ASSEMBLAGES FROM SEDIMENT CORES ENABLE QUANTIFICATION OF TIME LAGS IN FIRST DETECTION OF MARINE ALIEN SPECIES

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The invasion process by alien species is rarely directly observed in its entirety. The first introduction and the initial stages of establishment may go unnoticed because of lack of awareness, insufficient sampling, lack of taxonomic knowledge, or poor detectability of organisms. Lack of observation of the early phases implies a time lag in aliens' first detection and a bias in studies on introduction rates, hampering our understanding of the process dynamics.
Therefore, overcoming the lack of direct observation in the early phases of introduction would greatly improve our understanding of alien invasions. A unique but under-exploited source of information is death assemblages (DAs), the taxonomically identifiable, dead or discarded skeletal remains encountered in a seabed. Due to the slow degradation of hard skeletal parts (e.g., shells) in the sea, DAs represent archives that contain the skeletons of alien species since their first appearance. Geochronological and paleoecological methods such as the analysis of down-core changes in species composition and abundance, ^{210}Pb sediment dating and shell dating can be applied to these DAs to reconstruct the timing of invasion of individual species.
The arcid bivalve *Anadara transversa* (Say, 1822) is one of the most invasive species in the Mediterranean Sea. In the Adriatic Sea, it was first recorded in a wide area in its Northern and Central sectors in the year 2000. The occurrence of large populations of large-sized specimens over a 200 km-long coastline is unlikely related to simultaneous introduction of propagules. Indeed, 150 cm-long sediment cores collected off the Po River delta offered a high-resolution stratigraphy that allowed us to determine that the species first settled there in the late 1970s. Until the late 1990s, propagules continued to be introduced but failed to reproduce: the species remained smaller than 10 mm in length, which is the threshold for reproductive individuals. Population size was also small. After that, specimens grew larger and population size increased, marking the establishment of the species. Our data suggest that simultaneous increase in abundance and size triggered the first detection.

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STOCK DISCRIMINATION OF *DIPLODUS ANNULARIS* FOR TWO INSULAR POPULATIONS (DJERBA AND KERKENNAH) BY ANALYSIS OF OTOLITH SHAPE IN TUNISIA

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The annular sea bream *Diplodus annularis* (Linnaeus, 1758) is the most common sparid fishes in the Mediterranean Sea. This species is widespread in Tunisia. Despite their economic importance, due to their excellent white flesh and fine (demersal fish) and their significant size, few studies have focused themselves to stock discrimination and to the fisheries management. The goal of this research was to evaluate by using otolith shape, the stock structure of Sparidae (*D. annularis*) for two Tunisian insular populations (Djerba and Kerkennah) using different statistical approaches. In the same population, the P-value (left-right) is highly statistically significant ($p<0.0001$) for the males originating in Djerba Island only (case of left-right asymmetry). However, the p values for the distances were not significant ($P>0.05$) for the females of Djerba ($p=0.5006$), the males ($p=0.1947$) and females ($p=0.2609$) of Kerkennah (case of left-right symmetry). The results of the comparison between both lots of fish (Djerba and Kerkennah) revealed a clear difference between the otoliths (Left-Right) of males and females ($p<0.05$).
The asymmetry (Left-Right) of otoliths revealed here indicates that the two populations of fish (Djerba and Kerkennah) have a different morphology of otoliths and belongs to different fish stock.

Keywords: otolith, shape, structure, stock, *Diplodus annularis*

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THE DETERMINATION OF *DIPLODUS ANNULARIS* OTOLITH SHAPE IN TUNISIA (KELIBIA AND BNI KHIAR) STUDIED BY USING DISCRIMINANT FACTOR ANALYSES

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The aim of this research is to investigate by using otolith shape, the stock structure of *Sparidae* (*Diplodus annularis*) in the Tunisian coasts (Kelibia and Bni Khiar). Otolith shape was determined by using Fourier analysis. The mathematical analysis of the otolith shape was achieved by the Discriminant Factor analysis (D.F.A). The basis of this method is the detection of the phenotypic polymorphism between the two populations of fish, between pairs of otoliths from each station and between the pairs of otoliths of different stations. In the same population, the P-value (left-right) is statistically significant ($p<0.05$) for the males originating from Bni Khiar (case of left-right asymmetry); however, the p values for the distances were not significant ($P>0.05$) for the females (case of left-right symmetry). The same result was found for Kelibia's population (an asymmetry detected for the males and symmetry for the females). The comparison between both lots of fish revealed a clear difference between the otoliths (Left-Right) of males and females ($p<0.05$). The asymmetry (Left-Right) of otoliths revealed here indicates that the two populations have a different morphology of otoliths and belongs to different fish stock.

Keywords: otolith, shape, stock, *Diplodus annularis*, Kelibia, Bni Khiar

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DISCRIMINATION OF TWO MARINE POPULATIONS (MAHDIA AND GABES) OF *DIPLODUS VULGARIS* FROM TUNISIAN COAST USING MORPHOLOGICAL CHARACTERISTICS OF OTOLITHS

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The inner ear contains three otic fish bags which are: the sacculus, the lagena utriculus and which contain the sagitta, the lapilus and astericus.
The sagitta is, in most cases, the largest of the three parts limestone, but also the first to appear during the formation of the larva. That is why this otolith is used in this work in order to compare two Tunisian populations of *Diplodus Vulgaris*: a population from the sea of Mahdia and the other from Gabes.
The methodology is based on three steps: First, the removal and cleaning of otoliths. Then, photography and photo processing and finally the statistical analyzes.
The Wilks' Lambda test shows the existence of two distinct populations with very significant differences (*p-value* less than 0.001). The projection of otoliths of individuals collected from these two stations shows that the two populations are separated by the axis F1.

Keywords: *Diplodus Vulgaris*, sagitta otolith, sea of Mahdia, sea of Gabes, Tunisia

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STOCK DISCRIMINATION OF TWO TUNISIAN POPULATIONS (SEA OF BIZERTE AND SOUSSE) OF *DIPLODUS VULGARIS* BY ANALYSIS OF OTOLITH SHAPE

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Fish have three pairs of otoliths, real small stones located in the inner ear. Just like humans, these stones are involved in maintaining good balance. But in fish, they also record all aspects of life.
To do this, these calcified parts are used in this study to compare two Tunisian populations of the species *Diplodus vulgaris:* sea of Sousse and Bizerte.
The sagitta are extracted by dissection, rinsed, wiped, and then photographed, subsequently, photos were submitted to treatment of images by software (Photoshop and Shape) and multidimensional analysis.
The statistical results obtained allow to highlight two distinct populations; Bizerte population is placed on the negative side of the F2 axis and Sousse population in the positive side.
This makes it possible to draw the following conclusion:
The otoliths of both populations are strictly distinct from the morphology of their contour perspective.
In conclusion, discrimination of the two populations may be due, to the location sites that are geographically distinct.

Keywords: *Diplodus Vulgaris*, sagitta otolith, sea of Bizerte, sea of Sousse

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THE COMPARISON OF OTOLITH SHAPE FOR EVALUATING STOCK STRUCTURE OF *MULLUS BARBATUS BARBATUS* BETWEEN TWO POPULATIONS OF TUNISIA (BENI KHIAR AND SOUSSE)

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The relevance of the otolith morphology in species identification is a source of information for studies of discrimination of fish stocks. In fact otoliths are calcium carbonate concretions arranged around a nucleus and located in the inner ear of fish.
This work consists of a study aimed at otolithometry discrimination stocks of red mullet fish species *Mullus barbatus barbatus* two Tunisian sites (Beni Khiar and Sousse).
The study of otolith shape was based on elliptic Fourier analysis followed by Discriminant Analysis (AFD). Indeed, analysis of the otolith shape allows the identification and stock discrimination.
Comparing the two populations, the value (p-value) between the left and rights otoliths is highly significant ($\alpha<0.05$) with a p-value <0.0001.
In conclusion, we can mention that the two lots (Beni Khiar and Sousse) are different based on the projection of the otoliths.

Keywords: *Mullus barbatus barbatus*, otolith, stock, Béni Khiar, Sousse

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STOCK DISCRIMINATION OF *MULLUS BARBATUS BARBATUS* FOR TWO MARINE POPULATIONS (SIDI RAIIS AND HAWARIA) BY ANALYSIS OF OTOLITH SHAPE IN TUNISIA

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Otoliths are small calcareous concretions in the inner ear of teleost fish; they represent the organs of hearing and balance. Their interest in fish identification and determination of species identity and stocks has been shown by many studies.
Using otolithometry tool, this work aims to compare this heterogeneity in the Tunisian marine waters (Sidi Raiis and Haouaria) of two populations of *Mullus barbatus barbatus*, this comparison is based on elliptic Fourier analysis followed by Discriminant analysis (AFD) of the otolith morphology (the sagittae).
Statistical analysis showed significant differences between the pairs of otoliths (G and D) ♂ and ♀ of the two stations with a p-value <0.0001. The results also show that the axis F1 absorbs and separates 39.76% both of populations Sidi Raiis than Haouaria while the axis F2 absorbs 15.22% between males and females.
In conclusion, these results show a clear difference in otolith shape of *Mullus barbatus barbatus* two stocks harvested in two different Tunisian media, which allowed us to confirm the role of otolith as a great discriminating.

Keywords: *Mullus barbatus barbatus*, otolith, shape, Sidi Raiis, Haouaria

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STOCK DISCRIMINATION OF TWO POPULATIONS (HAOUARIA - KÉLIBIA) OF *LIZA AURATA* USING OTOLITH SHAPE ANALYSIS

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Otoliths have a very distinctive shape that is characteristic of the species of fish to which they belong. In other words, different species of fish form different otoliths.
The variability of the outline shape of otoliths was analyzed for purposes of discrimination of specimens of *Liza aurata* captured in two stations (Kélibia and Haouaria). These otoliths are treated by the technique of Fourier analysis. The data of these (left and right) were compared by gender.
The results allow us to draw the following conclusions:
▪ Two separate populations along the axis F1 (absorption = 63.14%); Population Kélibia occupies the positive part of this axis, while Haouaria located in the negative part.
▪ For each of these populations, left and right otoliths are separated by the axis F2 (absorption = 14.34%); left otoliths of individuals caught in Kélibia are placed on the positive side of this axis while the right otoliths occupy the negative part like the otoliths of individuals caught in Haouaria (duties are placed on the side positive while the left otoliths occupy the negative part).
However, statistical tests show significant differences on the one hand, between the two populations, and also between the left and right otoliths of each population ($P<0.0001$).

Keywords: *Liza aurata*, otoliths, shape, Tunisia

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NON-NATIVE CRUSTACEAN SPECIES IN THE BALTIC SEA – ONLY INVASION?

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Crustaceans belonging to invertebrates commonly occur in the Baltic Sea. Many of them are invasive, threaten the local biodiversity or/and economy, are destructive to natural systems. Alien crustaceans inhabiting the Baltic Sea are characterized by high physiological plasticity, broad tolerance in relation to environmental factors, mainly to water salinity and temperature. They are characterized by high reproductive capacity, are omnivorous and resistant to water pollution.

The aim of investigations was to determine the effect of alien species occurring over the past 50 years in the Baltic Sea on the environment and human economy. It is interesting: what are the consequences of alien species? The Baltic Sea is vulnerable to colonization by alien species. Low native species richness and empty ecological niches in this sea are favorable for flexible alien species. The connection with the North Sea gives possibility to appearance in the Baltic Sea such species as: *Carcinus maenas* or *Palaemon elegans*. On the other hand low salinity of the Baltic Sea creates difficult conditions and is also a ‘‘border” for many crustaceans of both freshwater and marine origin. Only adult individuals of *Orconectes limosus* can occur in the brackish waters of the Baltic Sea, but reproduce in the freshwaters. *Eriocheir sinensis* from Chinese coast reproduces in the Baltic Sea in waters of above 20 psu.

The negative effect of alien species on native biodiversity is observed. *Gammarus tigrinus* and other alien gammarids completely supplanted the native gammarid species: *G. duebeni* and *G. zaddachi* in the Vistula Lagoon. North American crayfish: *O. limosus* and *Pacifastacus leniusculus* replaced native crayfish *Astacus astacus* and *A. leptodactylus* in many freshwater reservoirs in Poland. Alien crustaceans compete for food with native species. Many of alien crustaceans carry parasites e.g. *O. limosus* and *E. sinensis*. On the other hand Ponto-Caspian gammarids: *Pontogammarus robustoides, Dikerogammarus villosus, D. haemobaphes* were used for fish enrichment purposes. Other alien crustaceans e.g. *E. sinensis* and *G. tigrinus* are used us food for breeding species. Some alien species create new environments. We should consider the role and importance of each species separately by determination of the direct and indirect impacts of the species.

TRANSITIONAL WATERS

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SEASONAL VARIABILITY IN SEDIMENT ERODIBILITY AND NUTRIENT DYNAMICS IN THE COASTAL ZONE OF THE BALTIC SEA

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Coastal areas maintain many ecosystem functions and processes that have a significant role in nutrient retention and cycling. Nutrients are buried into the sediments, but physical and biological disturbances on the sediment surface may lead to nutrient release from pore water and sediment particles. In coastal environments, waves and currents cause shear stress onto the sediment surface and initiate sediment erosion and re-suspension, if the erosion threshold (τ_c) is exceeded. In re-suspension events, nutrients from the sediment are released into the water column and thus become available to primary producers. Sediment re-suspension also affects benthic ecosystems and benthic-pelagic coupling more broadly, for example, by increasing water turbidity, recycling organic matter between sediment and the overlying water, and stimulating oxygen uptake. Biogeochemical sediment properties define sediment erodibility and thus sediment tendency to resuspend. Benthic macrofauna can either stabilize or destabilize the sediment, depending on the species and their functioning in and on the sediment (e.g. bioturbation). In addition, benthic macrofauna play an important role in elemental cycling, e.g. through degradation of organic matter and oxidizing sediments. Eutrophication is a worldwide threat for coastal and estuary ecosystems and therefore it's important to understand the mechanisms controlling sediment stability and thereby nutrient fluxes in coastal zones. Although sediment erodibility is predicted to vary significantly associated with seasonal changes in benthic primary and secondary production, there is only limited knowledge of how sediment erodibility changes along a seasonal cycle. We measured erosion thresholds and sediment re-suspension induced nutrient fluxes from three locations in Hanko archipelago approximately bimonthly from April to December 2015. Erosion thresholds and nutrient concentrations before and after re-suspension were measured using a core-based erosion device (EROMES). Macrofauna and sediment characteristics were quantified and analyzed after erosion measurements. The results of the study will be discussed.

Keywords: macrofauna, re-suspension, sediment stability, seasonality

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PERCEPTIONS OF DEGRADATION OF ECOSYSTEM SERVICE IN A ESTUARINE ZONE, CENTRE OF MOZAMBIQUE

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Coastal habitats such as mangroves and estuaries are some which provide important ecosystem services for the human communities. These habitats are also some of the most heavily exploited by humans and therefore threatened natural systems. The livelihoods of inhabitants Nova Mambone, a small village in southern Mozambique, suffering severe erosion caused by periodic floods of Save River and, cyclones are studied to understand the implication of extreme events on their livelihoods. This village, established in 2008, is adjacent to an estuary, forming extensive mangrove forests, linked with the non-agricultural sources. Fishing and allied activities from the rivers and estuary are carried out without restrictions. Male fishers are engaged in exploiting fish, prawns and crabs in large scale for commercial purposes, female adults are either unemployed or are engaged in informal business, while children are enrolled in collection of shells, fish and crabs, honey and firewood used to satisfy their daily needs. There is no restriction for the products collection of the mangrove forest areas.
Semi-structured open interviews were conducted to 25 key informants and structured interviews conducted to 400 households selected randomly within village. Fishing was the main source of income, followed by wages from employment, handcraft, animal sale, sale of agricultural products and small business. Between the fishers respondents (83%) perceived that the current fish abundance reduced compared with 10 years ago and (72%) recognize that their fish consumption reduced if compared with 10 years ago. Despite the reduction in fish reduction, most fishers are reluctant to abandon fishing even under difficult social and economic situations. Attractive alternative livelihood options for the fishers would be a driver for them to exit the fishery.

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UNTANGLING THE PROCESSES SUSTAINING MICROPHYTOBENTHOS PATCHES AROUND WILD OYSTER BEDS

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The high primary production of intertidal mudflats, especially of the superficial layer of microphytobenthos (MPB), provides a large potential food source to consumers, which include cultured oysters and invertebrates important as prey for fish and birds. Furthermore, the patchy distribution of MPB suggests, at least in places, that primary production can be in excess of *in situ* consumption. Two temporally consistent and highly productive MPB patches surrounding wild *C. gigas* reefs were previously identified and the macrofaunal compartments described within Bourgneuf Bay, the fourth most important bay in France for oyster aquaculture output. Two competing hypotheses were identified to explain these patches: 1) oyster reefs affect the hydrology resulting in the concentration of allochthonous nutrients; 2) oysters directly stimulate MPB growth by the addition of faeces and pseudofaeces. We addressed our question by a BACI approach, by killing one reef of the invasive oyster, the other reef being maintained as an undisturbed control. High spatial resolution data on community diversity and biomass, and compartmental stable isotopes of carbon and nitrogen were compared before and after this manipulation. We present preliminary results from structural equation modelling, contrasting models of our two competing hypotheses. The observed changes in the system support an important role of wild oyster reefs in supporting MPB patches. Compartmental biomasses and diversity still need to be monitored to compare the short 'pulse' impacts of this manipulation with longer 'press' impacts.

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SPATIAL VARIABILITY OF THE CIRCALITTORAL BIOCONSTRUCTED COMMUNITIES BETWEEN THE NORTH AND SOUTH SHORES OF THE WESTERN BASIN OF THE MEDITERRANEAN SEA

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The circalittoral bioconstructed reefs, commonly referred to as "coralligenous", constitute an endemic and emblematic seascape, and a hot spot of biodiversity in the Mediterranean Sea. They present a valuable ecological and economical interest, since they support several highly diverse and complex marine assemblages, stimulating richness of both species and ecosystem functioning.
Hence, these highly diverse biogenic habitats are getting considerably studied, but the majority of the studies focused on the north western basin, and are essentially lacking in the southern Mediterranean sector. Anyway, in both zones, few studies looked into the distribution of coralligenous habitats and the variability of their composition and structure.
This study investigates the spatial variability of coralligenous epibenthic communities between the northern and the southern coasts of the western basin of the Mediterranean Sea (Marseille, France and Algiers, Algeria).
Several biodiversity patterns have been highlighted, thanks to a large-scale hierarchical photographic sampling. We proceeded by: i) describing and mapping the distribution of coralligenous habitats; ii) inspecting their structure and quantitatively characterizing their taxonomic richness and functional composition, in relation to multiple environmental factors and according to various anthropic and natural disturbances; A particular attention was devoted to the analysis of important structuring taxa: the scleractinians.
Overall, this study offers a first insight into the coralligenous communities of Algeria, establishing a reference state of their taxonomic diversity, and comparing them with northern communities. Different similarity patterns were found from local to regional scales. In addition, this study pointed out the remarkable bioconstructional role of stony corals (scleractinians) along Algerian coasts, generally considered as secondary builders after the calcifying rhodophytes. This may suggest that, in the south western sector of the Mediterranean, these calcified invertebrates contribute more significantly than in the northern area to the construction of coralligenous bioherms.
Such studies are central for an accurate overview of these key-habitats, and provide essential baselines to develop common conservation strategies at Mediterranean scale.

Keywords: characterization, variability, circalittoral bioconstructed communities, coralligenous

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MODERN DEVELOPMENTS IN THE INSTITUTIONAL FRAMEWORK FOR THE PROTECTION OF THE MARINE ENVIRONMENT AND HUMAN LIFE AT SEA

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During the last years, there has been a disproportionate increase in the marine environment through human intervention on it. Since the beginning of its constitution, protection of human life and the environment were the main subjects of engagement for IMO. Apart from the two main regulations SOLAS and MARPOL, which cover the most important aspects of human life and the marine environment accordingly, over the years a lot of modifications and additions on these and as well as new regulations have taken place. This study intends to summarize the most recent institutional developments that have been made by IMO and stakeholders.
Furthermore, it should be noted that the shipping industry is involved in the marine environment's pollution with the lowest proportion over other branches of human activities which have impact on marine environment. In this context, it needs pollution sources separation. Stakeholders and governments, nowadays, appear to adopt, under pressure from the authorities and NGOS, more and more "green" programs.
To sum up, as undergraduate students of the Maritime Studies Department, we should not forget that an economist in his hand always must have got a "green" finger, with the participation of his ecological consciousness when he takes decisions, as rightly noted by Adam Smith.

Keywords: IMO, institutional framework, SOLAS, MARPOL, STCW, ISPS CODE, accidental pollution, operational pollution, Australian Protection System, Regional Seas Program, protection of human life, protection of marine environment

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PREDATOR IMPACTS ON INSHORE BALTIC HERRING (*CLUPEA HARENGUS*) LARVAE: LIONS, TIGERS AND BEARS - BUT WHERE?

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Bottom-up and top-down driven larvae mortality is generally accepted to be a key element controlling the recruitment success and population dynamics of fishes. The majority of studies that examine larvae predation have been conducted in offshore and rather oceanic habitats. However, many important spawning beds and larval nursery areas of marine fish species are located in transitional zones such as estuaries and inshore lagoons. Hypothesizing that the mortality of fish larvae in transitional waters is influenced by another community of predators than in the pelagic offshore habitats, we investigated herring larvae and their potential predators in an important herring spawning area in the western Baltic Sea (Greifswald Bay). Combining weekly high-resolution ichthyoplankton survey data on herring larvae abundances with analyses of plankton net bycatches and additional sampling data, we found a spatial overlap between herring larvae and dominant resident predators such as sticklebacks. However, this spatio-temporal match did not result in a targeted predation on the larvae. Despite very high abundances of herring larvae, we found nearly no larvae in the stomachs of the resident predators. An additional sampling in the very shallow littoral of the lagoon (≤1 meter depth) confirmed a coexistence of herring larvae and sticklebacks in this habitat as well, but again not a single larva was found in the examined predator stomachs. Furthermore, we found a remarkable mismatch between herring larvae and gelatinous plankton in the bay since the latter first appear in the area when the majority of the larvae have already emigrated or reached the juvenile stage. This is in contradiction to observations made in other parts of the Baltic Sea, Northern Atlantic and Pacific Ocean, where gelatinous plankton have been demonstrated to be an important predator of fish larvae. However, we found no significant predation impact on herring larvae within the lagoon and conclude that other mechanisms might control herring reproduction success in these types of nursery grounds. Beyond that, low predation rates might act synergistically with favourable temperature conditions (early increase in spring) and generally high productivities making transitional waters that valuable as spawning and nursery grounds for marine fishes.

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SPATIAL AND TEMPORAL DISTRIBUTION OF ICHTHYOPLANKTON IN MALIAKOS GULF DURING MONTHLY SURVEYS FROM APRIL 2014 TO JANUARY 2016

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This study examines the spatial and temporal distribution of ichthyoplankton in Maliakos gulf (with high influence from river runoff, currents and tides). A grid of 7 stations was sampled monthly from April 2014 to January 2016 (1.5 year period). Samples were collected with a 60-cm bongo net (0.250 & 0.500 mm mess size) by oblique tows. In addition, environmental parameters (temperature, salinity and chlorophyll-a) were measured. The eggs and larvae of both nets were sorted and identified into taxa (family, genus and species) and their abundance expressed as individuals per m^3 filtered water. A total of 55 taxa belonging to 34 families, 5 genus and 47 species were identified. The most abundant larvae were *Gobiidae* (19.41%), *Engraulis encrasicolus* (11.32%), *Symphodus* sp (10.92%), *Sardina pilchardus* (10.52%) and *Mugilidae* (9.71%). Regarding eggs, the most abundant *species* were *Mugilidae* (30.94%), *Buglossidium luteum* (16.04%), *E. encrasicolus* (12.32%), *S. pilchardus* (5.79%) and *Callionymus* sp (5.16%). A multivariate analysis was performed in order to identify spatial and temporal differences in ichthyoplankton assemblages. Cluster and nMDS analysis precise four different groups of stations related with seasonality. The difference or the similarity between the stations related to the different spawning strategies of the taxa (i.e. summer spawners: *E. encrasicolus, Symphodus* sp*, Trachurus mediterraneus, Sardinella aurita* – winter spawners: *S. pilchardus, B. luteum, Solea solea, Dicentrarchus labrax*) and the environmental parameters.

Keywords: monthly sampling, ichthyoplankton, Maliakos gulf (Greece), spatial and temporal distribution

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ANTHROPOGENIC IMPACT IN A MEDITERRANEAN COASTAL LAGOON TRACED BY MEANS OF NITROGEN ISOTOPIC ENRICHMENT IN THE MAIN BENTHIC MACROINVERTEBRATE GROUPS

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Autochthonous organic matter and allochthonous inputs, from coastal waters and anthropogenic activities, are key resources in lagoonal ecosystems. Is yet uncertain at which extent those diversified resources can affect the benthic macroinvertebrate food-web. The benthic macroinvertebrate food web in Messolonghi lagoon was studied by means of the carbon and nitrogen isotopic composition across the main benthic habitats. The autochthonous food resources were not significant different in δ13C and δ15N signatures. Anthropogenic continental inputs in form of particulate organic matter (POM), from a sewage treatment plant and two irrigation canals, presented reduced δ13C signatures and enriched δ15N signatures in comparison with the POM signatures across the studied habitats. A total of 14 macroinvertebrate groups matched across the studied habitats and presented a significant enrichment in δ15N composition in the *V. aegagropila* habitat. However, no significant differences in δ13C signature were found. Results outline the short distance impact that anthropogenic originated food resources have over the δ15N signature in the benthic macroinvertebrate food web. Anthropogenic enrichment may lead to primary production and macroinvertebrate dietary shifts across an enrichment gradient. No significant impact of the habitat itself could be traced.
Our study provides an insight how the benthic macroinvertebrates food web can be δ15N enriched by anthropogenic inputs and how these can be detected in short distances.

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ASSESSING WHOLE BENTHIC COMMUNITIES THROUGH GENOMICS

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Benthic biodiversity studies rarely quantify the whole eukaryotic community. Traditional methods for the quantification of marine benthic biodiversity are labour intensive and time consuming creating a bottleneck in the species recovery from a community. However, in recent years the development of next generation sequencing platforms has created opportunities for developing new genetic methods for rapid species identification called DNA metabarcoding. In our study, we further developed metabarcoding methods to enable accurate extraction and quantification of eukaryotic DNA from bulk sediment samples. We conducted experiments on mock marine benthic communities in order to remove two current limitations of metabarcoding techniques, bias from PCR steps and false positives from extracellular DNA (eDNA) contamination. Our experiments showed that eDNA contamination can be reduced significantly, with two different treatment methods: phosphate buffer washing and enzymatic degradation. Also by removing PCR from the metabarcoding pipeline, and implementing shotgun sequencing and bioinformatic sorting, bias is potentially reduced and accuracy of biodiversity estimates increased. Further developments of metabarcoding techniques along these lines should enable accurate quantification of genetic biodiversity of the whole living marine benthic community. This will be of high relevance for future approaches in environmental monitoring as well as for fundamental community ecology.

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THE ROLE OF PLANKTON IN THE TRANSFER OF HARMFUL SUBSTANCES IN THE MARINE ENVIRONMENT – PENTACHLOROPHENOL (PCP) IN PLANKTONIC ORGANISMS IN THE GULF OF GDAŃSK (THE BALTIC SEA)

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Pentachlorophenol (PCP) and its salts and esters are halogenated aromatic compounds, which have been widely used for years in the 30s of the last century, among others as fungicides, insecticides, defoliants and wood preservatives. The uncontrolled use, insufficient utilization of residues of commercial products containing PCP and its derivatives (Na-PCP, PCPL, PCA) and the relative recalcitrance to biodegradation, contributed to its accumulation in the environment. Since 2011, PCP has been a candidate to be listed as a persistent organic pollutant (POP) under the Stockholm Convention due to the proven toxic effects on organisms, including the human ones, the ability for long range atmospheric transport, due to the low vapour pressure and potential for bioaccumulation.
The marine environment, especially transitional waters - estuaries and bays, characterized by the limited water exchange, becomes a collector of a wide range of organic pollutants, including PCP. There is still a lack of data on POPs' precursors, such PCP, in organisms at the trophic pyramid's base, especially from the environment.
The aim of the study was to evaluate the bioaccumulation of pentachlorophenol (PCP) – dioxins' (PCDD/F) precursor and a candidate to the group of Persistent Organic Pollutants (POPs) in marine plankton from the Gulf of Gdansk (the Baltic Sea). The study area covered 1 coastal and 3 offshore stations under the influence of the Vistula river and the Gdansk Dumping Site. Sampling was carried out in August and September 2015. The collected environmental material has consisted of marine water, phytoplankton and zooplankton. The results indicate minor importance of passive transfer from water to phytoplankton. The relevant bioaccumulation factor (BAF) considerably suggests consumption of phytoplankton as a key route in plankton contamination by PCP. The Gdansk Dumping Site may be considered as a potential source of secondary pollution from sediments to the water column and poses a threat to the marine trophic chain. However, the analysis of plankton biomass and plankton pollution suggests a "biodilution process" in the water column. Bioaccumulation appears to be reasonably related to conditions affecting PCP partition, rather than the plankton biological diversity.

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QUALITY ASPECTS OF OYSTERS REARED IN THE VARANO LAGOON (SOUTHERN ITALY) IN RELATION TO MARKETABILITY

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Shellfish culture, based on ecological and market assessment, is considered a driving force for socio-economic change in ecological complex coastal systems as lagoons throughout the Mediterranean area. In order to diversify the fish production, the pacific oyster *Crassostrea Gigas* was cultured at commercial farms in the Varano lagoon (SE Italy). The aims of this study were to evaluate the quality and market aspects, through three condition indices (CI, CI^{CG}, CI^{E}) and Polydora index (PI), of oysters reared in two different sites (Site FO and Site LA) of the Varano lagoon, characterized by different hydrodynamic conditions. Our results showed over the period observation (March – September 2015) the highest value of CI in September (4.79±0.75) and May (5.62±1.09) for Site FO and Site LA respectively; instead the lowest values were registered in July (2.67±0.28) and in September (3.55±0.82) for Site FO and Site LA respectively. The highest values of CI^{CG} (reflecting the fullness of an oyster cup) were observed in September (67.07±13.72) and May (86.84±26.03) for Site FO and Site LA respectively, whereas the lower values were found in July for both sites (22.47±6.05 for Site FO and 45.47±15.13 for Site LA). The highest values of CI^{E} (indicating economic quality of oysters) were recorded in June (0.43±0.06) and in September (0.45±0.05) for Site FO and Site LA respectively, instead the lower values were registered in May in both sites (0.37±0.061 Site FO and 0.36±0.05 Site LA). Polydorid Index (PI) indicates mud worm presence for each site all over the observation period. The highest values of PI were recorded in September in both sites (0.37 in the Site FO and 0.50 in Site LA). The results highlight the potential economic benefits associated with sustainable aquaculture development in the lagoon, despite the mud blister worm presence (*Polydora Ciliata*), which is a real problem for the value market, as it reduces the market value of the oysters and poses a serious financial loss to the farmer.

Keywords: shellfish culture, *Crassostrea Gigas*, condition indices, Polydora Index, Varano lagoon, mud blister worm

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VERTICAL DISTRIBUTION OF BENTHIC MACROFAUNA IN INTERTIDAL SEDIMENTS AT THE MERJA ZERGA LAGOON, MOROCCAN RAMSAR SITE

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The distribution of shorebird species is strongly linked to that of their food especially during migratory stopovers or during wintering. In these phases, the abundance and species diversity of birds present on the intertidal zone depend on the availability of prey mainly represented by benthic invertebrates.
To better understand the functioning of this trophic relationship benthos-waders at the intertidal mudflats, it is obvious to evaluate, as a first step, the importance and the vertical distribution of the fraction of the benthic macrofauna accessible to waders.
In total 19 stations were selected to cover the main mudflats frequented by birds. The samples were collected using a PVC corer to a depth of 20 cm, each corer was then cut into 3 bathymetric slices 0-5 cm, 5-15 cm and >15 cm.
The analyses of the results showed a vertical stratification of the benthic population according to their species richness, abundance and biomass. Indeed, the density decreases rapidly with depth, while the decrease in species richness and biomass is done gradually and in a discreet way. This proves the importance of the first bathymetric portion located at the interface water sediment in the functioning of the benthic ecosystem.
We showed furthermore that the upper portion of the sediment is mainly colonized by species and/or small individuals with high abundance and low biomass. This phenomenon is reversed progressively and we encounter in depth only a few large individuals with high biomass.
The vertical distribution of sedimentary factors (content of organic matter, pelites rate, fine sands and coarse sand + gravel) is done homogeneously to a depth of 20 cm suggesting a continuous mixing of the sediment under the influence of bioturbation by benthic species.

Keywords: Merja Zerga lagoon, benthic macrofauna, vertical distribution, birds

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ASSOCIATION BETWEEN BRITTLE STARS (ECHINODERMATA: OPHIUROIDEA) AND CORALS (CNIDARIA: ANTHOZOA) FROM ARGENTINEAN DEEP SEA

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Deep water corals are found in all of the world's oceans, and are most common at depths between 200 and 1000 m. In the tropical waters they form complex habitats with high diversity associated organisms, but little is known about their associated fauna in deep-water. Brittle stars are remarkable echinoderms due to their trends to epizoism and ectocommensalism, as well as symbionts. They are able to hold on to other animals due to their flexible arms, especially sponges and cnidarians, allowing them to live above the substrate, feeding on suspended particles from the current. The present work aims to report the associations between octocorals and hydrocorals and brittle stars from the Argentinean Sea for the first time. Composition, distribution and association of this fauna are described based on material collected from Mar del Plata's Canyon. Samples were collected during several sampling campaigns from 2012 to 2014 using a bottom trawl and fishing nets. Specimens were preserved in ethanol 96% and photographed *in situ* using a SLR digital camera.
The collected material consists of 12 samples. A total of 56 individuals and approximately 9 species were recorded. Corals organisms were identified as *Stylaster* sp. and the Primnoidae family such as *Plumarella* sp., *Primnoella* sp., *Thouarella* sp., *Onogorgia* sp. Brittle stars host associated with corals were identified as *Astrotoma* sp., *Gorgonocepahalus* sp., *Asteronyx* sp. and *Ophicantha* sp. Some of this species are major records for Argentinean deep sea. The ability to live in a variety of habitats may represent an adaptation for species with short larval periods or direct development to ensure successful dispersal in the long run. However, little is known about the life history for most of the species occurring on deep-water corals. A characteristic of cold-water colonial coral species is their widespread but fragmented spatial distribution due to the sparse hard substratum where the colony can settle, so they act as a substrate amplifier. Therefore it is very important to incorporate the associated community when assessing the status of deep water corals as well as deep water diversity.

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COMPARING MACROINVERTEBRATE ASSEMBLAGES IN RESPECT TO SAMPLING TECHNIQUES AND HABITATS: AN EXPERIMENT IN A PROTECTED MEDITERRANEAN LAGOON DOMINATED BY MARINE WATER INPUT (SANT' ANDREA LAGOON, GALLIPOLI, ITALY)

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The conservation of biodiversity is fundamental to ensure the ecosystem stability, functions and services. Despite covering small areas of Earth, transitional waters (TWs) support a remarkable biodiversity. Growing anthropogenic pressures threaten their ecosystem health and consequently there is need for different conservation strategies (reserves, Natura 2000) and biomonitoring. Macroinvertebrates have been demonstrated to be good ecological indicators for TWs, but very few studies highlight that the descriptors of assemblages, as well as the ecological indicators, depend on sampling method and effort. Box-corer/grab is the most common method to collect species living in the sediments, but it underestimates the vagile species. In this context, the research aims to evaluate the influence on assemblage descriptors of sampling methods, comparing box-corer and leaf-bag, and of habitat types, comparing samples over prairie and un-vegetated sites. The experiment ran during summer 2015 in a protected shallow lagoon dominated by marine water (Sant' Andrea lagoon, Gallipoli, Italy). Three types of leaf-bags each containing 3 g of dry leaves were prepared with *Phragmites australis* (terrestrial input), *Posidonia oceanica* (marine input), and a mixture of both. At moment of leaf-bag submersion, box-corer samples were collected in two stations *per* habitat (three replicates) and 27 leaf-bags (9 *per* type) were submerged in each station. Three leaf-bag series were retrieved *per* station after 15, 30, and 45 days. Abiotic features were recorded at each sampling time. Macroinvertebrate density, taxonomic richness, similarity, diversity indices, secondary production and individual body-size were measured and compared between sampling methods and habitats. 31 species were sampled, 17.6% in prairie, and 3.8% in un-vegetated were common to both methods; leaf-bags captured 94.1% and 69.2% of species in prairie and un-vegetated respectively; box-corer collected 23.5% in the vegetated and 34.6% in the un-vegetated habitat. Taxonomic richness, density and secondary production were significantly higher in the prairie than in the un-vegetated. Finally, macroinvertebrate assemblages were better described when pooling box-corer and leaf-bag samples together, even if the richness of leaf-bag assemblages was always higher than box-corer one. In accordance with previous studies, this research highlights the relevance of sampling methods to obtain a better description of macroinvertebrate assemblages in Mediterranean lagoons.