PERSEUS

POLICY-ORIENTED MARINE ENVIRONMENTAL RESEARCH IN THE SOUTHERN EUROPEAN SEAS

PERSEUS 2nd Scientific Workshop – Marrakesh 2014

Book of Abstracts

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PERSEUS 2nd Scientific Workshop, 2nd– 4th December 2014,

Hotel Kenzi Agdal Medina, Marrakesh, Morocco

Programme

Tuesday 2nd of December 2014

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15:00-15:15	Oceanographic parameters characterization of Moroccan coastal Mediterranean area	Chioua J., Daoudi M., Abdellaoui B., Makaoui A., Berraho A., Ettahiri O. &

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SESSION 1: 2nd Dec. 2014

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17:15-17:30	Seasonal variability of dissolved organic carbon, chlorophyll-a and major hydrochemical parameters in the north-eastern part of the Black Sea	Kostyleva A.V., Kuprikova N.L., Mosharov S.A. & Yakushev E.V.
17:30-17:45	Alterations in the Black Sea coastal (Varna region) phytoplankton during the last decade: response to climatic forcing or	Moncheva S. & Staneva J.

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17:45-18:00	Contribution to the assessment of open seawater trophic regimes. Case study: nutrient and chlorophyll dynamics in North Aegean Sea.	Pavlidou A., Pagou K., Assimakopoulou G., Giannoudi L., Kontoyianis H., Krasakopoulou E., Lagaria A., Papadopoulos V.P., Psarra S., Souvermezoglou E. & Varkitzi I., Zervakis V.
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18:15-18:30	GRUMERS: Web-site platform to upload jellyfish observations by workers involved in coastal services in the Balearic Sea	Prieto L., Frontera B., Vizoso G., Aguiló J. M., Pujol J. P., Troupin Ch., Grau A. M., Ruiz J. & Tintoré J.
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12:15-12:30	Environmental changes and ecosystem variability in the Central Mediterranean area	Civitarese G., Lavigne H., & the ADREX Group
12:30-12:45	Recent Ecological and Chemical Status of the Sea of Marmara	Tuğrul S., Öztürk D., Öztürk B., Yüksek A., İşinibilir M., Keskin Ç., Balcıoğlu E., Yemenicioğlu S., Kideys A.E., Salihoğlu B., Yücel N., Uysal Z. & Örek H.

SESSIONS 2 & 3: 3rd Dec. 2014

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15:00-15:15	Budget of the particulate metallic trace elements in the Gulf of Lions. Impact of dense water formation.	Aubert D., Charrière B., Delsaut N., Durrieu de Madron X., Estournel C., Menniti C., Sola J. & Ulses C.
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		D. & Calafat A.
16:45-17:00	Pollution status of the seafloor of Saronikos Gulf	Kaberi H. Simboura N., Tsangaris C., Zeri C., Karageorgis A., J. Hatzianestis J., Prifti E., Rousselaki E., Michalopoulos P., A. Pavlidou A., Reizopoulou S., Streftaris N. C. Ioakeimidis, Apostolaki E., Vizzini S. & Santinelli V.

SESSION 3: 3rd Dec. 2014

17:00-17:15	Chemical pollution levels associated with coastal cities 'hot spots': Constanta, Split and Marseille	González-Fernández D., Hanke G, Mariani G., Tavazzi S., Suurkuusk G., Tronczynski J., Andral B., Kušpilić G., Oros A., Pérez-Albaladejo E. & Porte C.
17:15-17:30	Biochemical responses to pollution in selected sentinel organisms across the south-east Mediterranean and Black Sea	Tsangaris C., Moschino V., Strogyloudi E., Coatu V., Ramšak A., Abdu Ala R., Carvaho S., Felline S., Kosyan A., Lazarou Y., Hatzianestis J. & Oros A.
17:30-17:45	Long-term deployment of the JRC Sealittercam on the Western Mediterranean Sea	Hanke G. & González-Fernández D.
17:45-18:00	Litter composition and distribution in submarine canyons of the North Catalan margin from in situ ROV observations	Tubau, X., Canals, M., Lastras, G., Sanchez-Vidal, A. & Calafat, A.M.

Thursday 4th of December 2014

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	thermohaline structure with moored mobile automatic profiler "Aqualog" in the north-eastern Black Sea	S.B., Ostrovskii A.G., Soloviev V.A. & Zatsepin A.G.
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12:45-13:00	Glider sustained observations in the Mediterranean	Testor P., Ait Ameur N., Budillon G., Gana S., Gildor H., Hayes D., Iudicone D., Mauri E., Mortier L., Petihakis G. & Tintore J.
13:00-13:15	The 'quiet revolution': continuous glider monitoring at ocean 'choke' points as key component of an EU cross-platform ocean observation strategy	Heslop E. E., Tintoré J. , Poulain P., López-Jurado J-L. & Torner M.
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SESSION 6: 4th Dec. 2014

SESSION 6		
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14:45-15:00	Investigating the northern Adriatic Sea ecosystem state with a very high resolution model	Mattia G., M. Zavatarelli M. & Lovato T.
15:00-15:15	Numerical simulation of inter-annual variations in the properties of the upper	Shapiro G. I., Wobus F., Zatsepin A. G., Akivis T. M.,

	mixed layer in the Black Sea over the last 34 years	Zanacchi M., Stanichny S. V.
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POSTERS

No	Title	Authors
1	Preliminary assessment of microplastic pollution within benthic sediments of the Grand Harbour, Valletta (Malta, Central Mediterranean): data for Descriptor 10 of MSFD	Deidun A., d'Alessandro M., Esposito V., Andaloro F. & Romeo T
2	Plankton of the western coast of the Moroccan Mediterranean sea (Fnideq - Oued Laou)	Berraho A., Somoue L., Larissi J., Baibai T. & Charib S.
3	Assessment of gaps and harmonized approach of national monitoring programmes in the EU and non-UE countries within the Black Sea region	Begun T., Muresan M., Teaca A.
4	Example of marine adaptive policy: The case of the re-oligotrophication of Saronikos Gulf (Greece)	Panayotidis P., Sauzade D., Breil M.
5	Preliminary studies in preparing MSFD application for GES assessment	Gomoiu M-T.
6	Sedimentation and mixing rates in the Levantine Sea	Schirone A., Herut B., Delbono I., Barsanti M., Delfanti R.
7	Black Sea Experiment (BSEX)	Salihoglu B., Shapiro G., Moncheva S., Yuneva T., Shulman G., Finenko G., Nikolsky V., Anninsky B., Öztürk D., Kocak M., Panayotova M., Stefanova K., Shiganova T., Prieto L., Uysal

		Z., Kideys A., Gücü A. C., Tugrul S., Svetlichny L., Seghedi A. & Orek H.
8	Time series of carbonate system variables at the POSEIDON-E1-M3A site (Cretan Sea, Eastern Mediterranean)	Krasakopoulou E., Frangoulis C., Psarra S., Lagaria A., Giannoudi L. & Petihakis G.
9	A new generation end-to-end model to analyse the Black Sea environmental status	Salihoglu B., Arkin S., Fach B. A., Akoglu E., Oguz T., Dorofeyev V. L., Korotaev G. K. & Orek H.
10	Investigations of Peculiarities of Main Pelagic Fishes Diet in the Zmiinyi Island Coastal Waters During 2013-2014	Snigirov S. & Abakumov A.
11	Danube Flow Influence on the Zmiinyi Island Coastal Water Quality and Microbiota and Phytoplankton Community	Kovalova N., Medinets V., Morozov V. & Derezyuk N.
12	Organic priority substances and microbial processes in marine coastal sediments (Adriatic Sea, Italy)	Zoppini A., Ademollo N., Amalfitano S., Combi T., Dellisanti W., Miserocchi S., Patrolecco L. , Guerra R. & Langone L.
13	Results of Toxic Pollutants Bioaccumulation Study in the Zmiinyi Island Coastal Water Area in the Black Sea (2013-2014)	Medinets V., Denga Yu., Snigirov S., Vostrikova T., Gruzova I. & Tsimbalyuk K.
14	Current State of Ichthyofauna and Macroinvertebrates in the Zmiiniy Island Coastal Waters During 2013-2014	Snigirov S., Abakumov A., Pitsyk V., Kurakin A. & Sylantyev S.
15	Concept of National Integrated Environmental Monitoring and Assessment in the Ukrainian part of the Black Sea.	Medinets V., Cherkez E. & Kovalova N.
16	Measurements of underwater sound at the north-eastern Black Sea shelf providing data for the Descriptor 11 of MSFD GES	Shatravin A., Vedenev A., Kochetov O. & Tsibulsky A.

SESSION 1

The PERSEUS complementary approach to the assessment of pressures, knowledge and data gaps in the Southern European Seas

Crise A. (OGS), Kaberi H. (HCMR), Ruiz J. (CSIC), Zatsepin A. (SIO), Arashkevich A. (SIO), Giani M. (OGS), Karageorgis A. (HCMR), Prieto L. (CSIC), Pantazi M. (HCMR), Gonzalez-Fernandez D. (JRC), Ribera d'Alcalà M. (SZN), Tornero V. (SZN,JRC), Vassilopoulou V. (HCMR), Durrieu de Madron X. (CNRS), Papathanassiou E. (HCMR) and the PERSEUS Group

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Abstract

One of the aims of PERSEUS project is the identification of the most relevant pressures and data/knowledge gaps that potentially put at risk the GES achievement in the Southern European Seas (SES) ecosystems As result of a scientific independent effort, an approach complementary to MSFD has been adopted harvesting and distilling existing scientific knowledge available in SES areas. This synthesis effort, based on the expert judgment, has been projected on the MSFD descriptors, highlighting also the differences between coastal hot spots and the open sea. A comparative analysis of the Initial Assessments (IAs) for five SES countries has been independently performed and a list of impact and knowledge gaps has provided. The knowledge gaps can be considered as priorities in future research agendas. Comparison of results of both analyses demonstrates that they agree on the data gaps found for coastal systems, while, for the open sea, IAs are much less detailed. By contrast, PERSEUS treats the open sea as a separate system and highlights that much less information is available for it. Structural knowledge gaps have been detected for the biodiversity and marine food web descriptors, calling for a substantial improvement of an (operational) understanding of the marine ecosystem composition and functioning. This analysis also allowed the identification of additional research themes (ecosystem resilience, role of gelatinous macrozooplankton, and, more in general, of invasive species in a changing ocean, multiple stressor impact) targeting research topics expected to provide information for an effective implementation of a set of mitigation measures.

Biogeochemical signatures of the Mediterranean Outflow

Huertas I.E. (ICMAN-CSIC), de la Paz M. (ICMAN-CSIC), Flecha S. (ICMAN-CSIC), Navarro G. (ICMAN-CSIC), Prieto L. (ICMAN-CSIC), Makaoui A. (INRH), Zizah S. (INRH), Hilmi K. (INRH), Ruiz J. (ICMAN-CSIC)

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Abstract

Biogeochemical properties of the deep Mediterranean Outflow (MOW) crossing the Strait of Gibraltar have been monitored for almost one decade at the ocean time series GIFT. The content of nutrients, carbon (both natural and anthropogenic), alkalinity, oxygen and non CO2 -greenhouse gases, such as methane and nitrous oxide, has been measured in the MOW and comparisons with surface Atlantic waters have been made in order to compute biogeochemical exchanges through the Strait. In addition, pCO2 and pH in the Mediterranean water are being continuously recorded through autonomous sensors installed in a mooring line that was deployed in November 2011. Here we present an overview of the biogeochemistry in the Mediterranean tongue using data collected by this monitoring program.

Inter-annual variability of exchange processes at the outer Black Sea shelf

Shapiro G. (Plymouth University), Wobus F. (Plymouth University), Yuan D. (Institute of Oceanology, China), Wang Z. (Institute of Oceanology, China)

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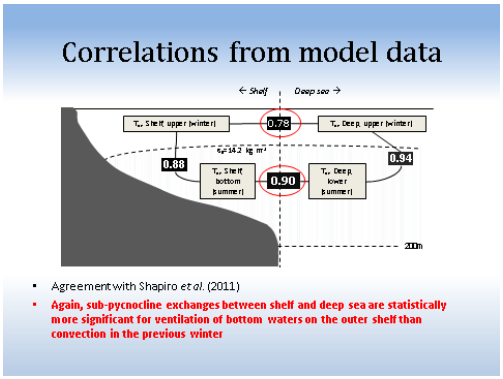
Abstract

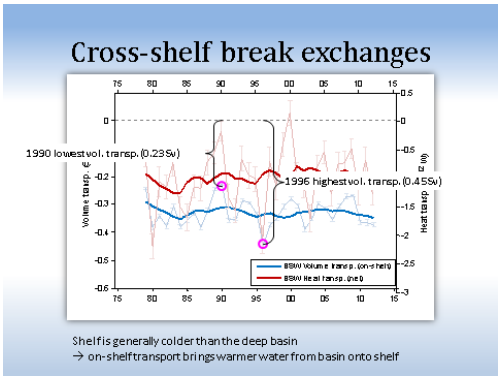
The advection of cold water below the surface mixed layer has a significant role in shaping the properties of the Cold Intermediate Layer (CIL) in the Black Sea, and thus the horizontal redistribution of nutrients. Previous research suggested that cross frontal exchange within the CIL is strongly inhibited, so that CIL waters formed in the deep sea (i.e. offshore of the Rim Current) do not replenish the CIL waters onshore of the Rim Current (also known as near-bottom shelf waters, or BSW), due to strong cross frontal gradients in potential vorticity (PV). In contract, a recent analysis of in-situ observations over the period of 1950-2001 showed a high correlation between the CIL temperatures in the open sea and outer shelf. The latter study however, was unable to clearly establish the relation between the cause and the consequences using statistical methods alone.

In this study we use a 3D numerical model of the Black Sea (NEMO-SHELF-BLS) to quantify the exchange of CIL waters between the open sea and the outer northwest Black Sea shelf and to assess its significance for the replenishment of BSW on the outer shelf. The model with a resolution of 1/16º latitude x 1/12º longitude was run for the period from 1979 to 2012 with meteo forcing from the Drakkar Forcing Set 5.2. The results were validated against in-situ (based on 77867 stations) and night-time satellite monthly mean SST observations.

Referenced to a simulated daily climatology we calculate anomalies as the deviations of the snapshot temperatures from their climatological values. The correlation between the temperature anomalies of BSW on the outer shelf and those in the CIL waters in the deep sea were computed as well as water transports between these water masses across the shelf break. The BSW on the outer shelf are defined as the waters between the density level sigma_theta=14.2 kg m^3 (i.e. the bottom of the surface mixed layer) and the seabed (max z=150 m at the shelf break). The corresponding data from open sea CIL waters in the northwest part of the deep Black Sea were taken from the depth range between sigma_theta=14.2 and z=150 m. The computed Pierson correlation between summer temperatures of BSW and the deep sea CIL is R = 0.90. This significant correlation is in agreement with the previous statistical analysis of observational data.

In order to reveal a physical link between the BSW and CIL, the in-out transports of water with sigma_theta>=14.2 across the shelf break were computed for each day and then averaged over the warm periods of each year. Over the 34 year time span, the on-shelf and off-shelf transports between the CIL and BSW fluctuate in the range of 0.22





to 0.45 Sv, with the maximum values in 1996 and the minimum in 1990. The net cross-shelf transport is small, approximately 0.03 Sv, due to volume conservation, and is directed off-shore due to river discharges. The years with high values of transport correspond to the situation when a 'channel' of constant PV connecting the BSW and CIL exists, forming a conduit for the waters to move across the shelf break.

In the years of reduced transport, there was a PV 'barrier', i.e. a band of significant PV gradient along the shelf break, which inhibits exchanges. The efficiency of the exchange can be represented by the average renewal time of BSW, which is defined as the ratio of BSW volume to the onshore transport. This value, as well as the volumes and the transports vary over the 34 years. The renewal time is within the range between 18 to 42 days.

The short renewal time (31 days on average) compared to the seasonal time scales, suggests an efficient exchange between bottom waters on the outer shelf and the CIL in the deep sea during the warm season.

Recent assessment of autotrophic and heterotrophic production in the Levantine Basin

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Abstract

The spatiotemporal distribution and production of phytoplankton and bacteria was studied for 2 years (2013- 2014) along the Israeli shallow shelf (5- 30 m water depths) and the open sea (>1700 m water depth) at the easternmost Levantine Basin. The surface water in the open sea was characterized by low chlorophyll *a* (Chl.*a*) and low primary productivity rates (PP) and was comprised mainly of *Synechococcus.* A permanent deep chlorophyll maximum (reaching 150 m water depth) was observed during the summer, dominated by *Prochlorococcus*. Along the coast, overall higher Chl.*a* concentrations were measured exhibiting a marked south-north gradient dominated by pico-eukaryotes and *Synechococcus*. Concurrently, PP followed the same trend and was higher at the southern stations. Heterotrophic bacteria were abundant throughout all samplings and water depths and exhibited a positive relationship with bacterial productivity (BP). Interestingly, while in the open sea BP and PP were found positively and significantly correlated, no such coupling was observed along the coast. This may suggest that coastal bacterial populations depend less on PP for dissolved organic carbon, and microbial recycling processes likely predominate such areas. Further, it suggests that the coastal autotrophic and heterotrophic communities in the easternmost coastal waters of the Levant may differ significantly from those present in the open ocean, and their abundance and productivity are controlled by different factors.

Oceanographic parameters characterization of Moroccan coastal mediterranean area between Targha and Saidia (Morocco)

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Abstract

In order to determine the main oceanographic features of the coastal area in the Moroccan Mediterranean Sea between Targha-Saidia, an analysis of data from oceanographic cruises carried out in October 2012 and April 2013 is performed.

The main objective is to determine the seasonal variations of in temperature, salinity, concentration of dissolved oxygen, chlorophyll (a) and phytoplankton diversity during spring and fall seasons.

The analysis of these data combined with remote sensing images indicates strong seasonal variability of physical parameters, together with a relatively low variability in terms of phytoplankton diversity. Among other factors, this seasonal variability is related to the fluctuation of the gyre system in the Alboran Sea and to the presence/absence of upwelling at the Spanish coast.

Remote sensing of Phytoplankton Functional Types in the Mediterranean Sea.

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Abstract

During the last decade, the analysis of the ocean color satellite imagery has allowed determining the dominant phytoplankton groups in surface waters through the development of bio-optical models aimed at identifying the main phytoplankton functional types (PFTs) or size classes from space. In this study, we present a regionalised version of the PHYSAT method that has been specifically developed for the Mediterranean Sea due to the peculiarities of phytoplankton assemblages than can be found in the basin and its particular optical properties. The updated version of the method, the so called PHYSAT-Med, has been validated successfully with large in situ datasets available for this oceanic region, mainly for nanoeukaryotes, Prochlorococcus, Synechococcus and diatoms. PHYSAT-Med allows including a much higher number of pixels for the Mediterranean than PHYSAT does, through the use of a new Look-Up-Table created specifically for this oceanic region. Results provided by PHYSAT-Med showed the dominance of Synechococcus versus prochlorophytes throughout the year at the basin level, although nanoeukaryotes were more abundant during winter months. In addition, PHYSAT-Med data identified a rise in the eukaryote biomass (mainly diatoms) during the spring period (March to April), especially in the Ligurian and Adriatic seas. PHYSAT-Med represents a useful tool for the spatio-temporal monitoring of different dominant Phytoplankton Functional Types in Mediterranean surface waters at a high resolution**.**

Spatial and temporal variability of dominant Phytoplankton Size Classes (PSCs) in the Mediterranean Sea from remote sensing data

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Abstract

Cell size is considered one of the most important "non-taxonomic" descriptors for the comprehension of the phytoplankton community structure in terms of composition, ecological roles and biogeochemical functions (Basset et al., 2009; Mouillot et al., 2006). Within this context, remote sensing technologies provide a great tool for a synoptic observation of the ecological state of the marine ecosystem at spatial and temporal scales. In the recent years, several physical, biological and ecological models have been proposed to estimate Phytoplankton Size Classes (PSCs) from remote sensing data. In the present work, three of the principal global models for the determination of the dominant PSCs (micro-, nano- and pico-phytoplankton) by satellite techniques have been studied with the aim to investigate the PSCs distribution in the Mediterranean Sea. Two empirical models that provides biomass-size fractions, Brewin et al., 2010 (Br10) and Hirata et al., 2011 (Hi11), have been tested with a consistent Mediterranean *in-situ* pigment subset, obtained from the SeaBASS dataset (Werdell and Bailey, 2005). Following previous works (Gieskes et al., 2008; Vidussi et al. 2001; Uitz et al., 2006), new coefficients for the determination of the *in-situ* Mediterranean PSCs in terms of total chlorophyll *a* (TChl *a*) fractions have been developed by a multiple regression analysis respect to seven diagnostic pigments. Br10 happens to outperform Hi11 when comparing their predictions to the in-situ data. Therefore, Br10 has been applied to a reanalysis of daily Chlorophyll *a* estimates (carried out by the MyOcean Ocean Colour Thematic Assembling Centre) for the entire SeaWiFS mission (1998 - 2010), together with the semi-analytical Kostadinov et al., 2009 algorithm (Ko09), that returns density-size fractions, complementary information to Br10. Results of the analysis in the first optical depth show the predominant contribution of pico-phytoplankton to the TChl *a* in the most oligotrophic areas. Instead, the TChl *a* in coastal regions is always dominated by micro-phytoplankton. Intense bloom spring areas show an alternation: pico is the principal component of the TChl *a* in almost all seasons, except in the late winter - spring period when the micro and nano fractions contribute more to the higher TChl *a* concentrations. In terms of particle density, Ko09 shows a predominance of the pico-sized particles always in the whole basin.

References

Basset, A., Sangiorgio, F. and Sabetta, L., 2009. Nuovi approcci metodologici per la classificazione dello stato di qualità degli ecosistemi acquatici di transizione. Metodologie ISPRA

Assessing phytoplankton dynamics in the Aegean Sea: combining field data and remote sensing.

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Abstract

The Aegean Sea, at the northern part of the E. Mediterranean, is a complex marine environment with highly variable hydrology, bottom topography and lateral inputs. In the north, inflow of less saline mesotrophic Black Sea Waters (BSW) in conjunction with significant nutrient inflows from rivers enriches locally the NE Aegean area, creating a N-S trophic and productivity gradient. The south Aegean, with higher temperatures and salinities, negligible run-off and intense dust deposition events is an ultra-oligotrophic environment, with surface chlorophyll *a* < 0.4 μg/L during the spring bloom and primary productivity annual estimates among the lowest in the world ocean (60-80 gC m^{-2}). Over the last 20 years, scientific research focusing on the identification of the key factors controlling phytoplankton dynamics and ecosystem functioning in the Aegean Sea is based on biogeochemical measurements obtained through filed oceanographic campaigns. Such data are fundamental for comprehending ecosystem processes but insufficient for assessing long term spatiotemporal phytoplankton and ecosystem dynamics. In order to fill as many puzzle pieces as possible, a compilation of data from historic campaigns complemented with data from PERSEUS cruises in the North and South Aegean Sea as well as with time series data from monthly *in situ* samplings at the POSEIDON E1-M3A station are compared for the first time with high spatiotemporal coverage remotely sensed chlorophyll *a*. In the North Aegean, and particularly in the area most affected by the BSW, remotely sensed chlorophyll *a* tends to be significantly overestimated, whereas in the more oligotrophic south a much better fit with field data is observed. In depth analysis of these data coupled to recent *in situ* measurements of optical properties within PERSEUS and AegeanMarTech projects will provide some first comparisons of field and remote sensing data and allow a better assessment and prediction of phytoplankton dynamics in the Aegean Sea.

Nutrient atmospheric deposition in the Mediterranean: Recent results from observational and modelling efforts

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Abstract

Atmospheric deposition of trace constituents, both of natural and anthropogenic origin, can act as a nutrient source into the open ocean and affect marine ecosystem functioning and subsequently the exchange of CO_2 between the atmosphere and the global ocean. The atmospheric Fe, P and N cycle are parameterized in the global 3-D chemical transport model TM4-ECPL. Both primary emissions of total and soluble Fe and P associated with dust and combustion processes are taken into account, as well as inorganic and organic N emissions. The impact of atmospheric acidity on nutrient solubility is parameterised based on experimental findings. Long-term measurements of chemical composition of deposition in the Mediterranean (both western and eastern basins) are used to drive the nutrient primary sources in the model and atmospheric deposition data are used for the evaluation of the simulations over the Mediterranean. These deposition measurements revealed the existence of important percentage of organic forms of nitrogen and phosphorus in deposition ignored so far in the previous studies. The response of the chemical composition of nutrient-containing aerosols to environmental changes is demonstrated and quantified with focus on the Mediterranean.

Selection of tools and methods supporting adaptive policy making in marine areas

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Abstract

The development of innovative and adaptive policies within dynamic ecosystems such as marine and coastal environments within uncertain and often unexpected scenarios asks for the implementation of flexible tools and methods conveying the use of scientific information and data which are capable of accounting for uncertainties and coping with a wide range of future conditions. Several types of tools and methods have been developed by the research community (e.g. data processing and management, stakeholder analysis, participatory methods, numerical and simulation, assessment methods) to support the interacting steps of the policy making process and ensure the development of adaptive policies to respond to changes over time.

In the framework of the PERSEUS project, a critical review of dozens tools and methods selected from three different references already available ((i) the MESMA toolbox (Monitoring and Evaluation of Spatially Managed Areas; (ii) the Marine Scotland Toolbox; and (iii) the FAO-EAF (Ecosystem Approach to Fisheries) Toolbox) has been performed in order to support the development of the Adaptive Marine Policy Tool Box (AMP TB). The selected tools have been scored and ranked by means of 4 criteria, namely: (i) availability (i.e. whether it can be purchased or is available on the web or not); (ii) simplicity (i.e. whether the tools is applicable to a wide range of issues/situations or not); (iii) applicability by policy-makers; and, (iv) interest (i.e. whether it is of interest to help achieving the goal of a particular step of policy making). Using a particular focus on risk and vulnerability assessment tools and methodologies, the presentation will illustrate some tools, the selection process an potential uses in a policy process.

The final ranking allows the identification of six tools (i.e. AHP in ArcGIS, Differential DPSIR, Conceptual and Qualitative Modelling, Impact/Threat Matrix, Non Formal Risk Categories, Qualitative Risk Analysis) to be included into the AMP TB, and fitted to the different steps of analysis (i.e. from problem identification to evaluation and adjustment of policy). These tools could be integrated in a cumulative risk assessment approach designed to evaluate and compare multiple environmental risk scenarios supporting adaptive policy making process toward the sustainable management of coastal and marine areas and, finally, the achievement of the Good Environmental Status.

Deciphering CDOM nature through UV absorbance in the North Aegean seawater.

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Abstract

As optical properties of chromophoric dissolved organic matter (CDOM) depend on its source (autochthonous, terrestrial) and diagenetic state, absorption measurements can be a useful tool for characterizing CDOM. Absorbance of CDOM, Dissolved Organic Carbon (DOC), chlorophyll-a, primary and bacterial production were measured in the North Aegean Sea during October 2013, March 2014 and July 2014.

Absorption coefficients and spectral slopes at the different regions of the solar radiation (UV-B, UV-A, visible) are marked by the nature of CDOM. Simple, low molecular weight, saturated compounds absorb high energy radiation, thus their absorption bands lie in the UV-B region. These compounds are most likely of autochthonous origin, products of primary production or excreta. High molecular weight, unsaturated, aromatic compounds are strong absorbers of UV-A and visible light. These compounds are of terrestrial origin or formed by condensation reactions in deeper layers of the sea. In contrast to simple compounds, aromatic compounds are particularly stable and resistant to biochemical decomposition. In addition, spectral slopes can provide further insights into the composition and alteration of CDOM that takes place in the water column. Absorption measurements, give us a preliminary picture of the distribution and properties of CDOM as they differentiate the northernmost section from the rest transect and also the surface (<100m) from deeper waters. Absorption results combined with biological parameters can provide more information on CDOM sources.

Seasonal variability of dissolved organic carbon, chlorophyll-a and major hydrochemical parameters in the north-eastern part of the Black Sea

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Abstract

During seasonal monitoring studies concentrations of dissolved organic carbon (DOC), chlorophyll-a (Chl-a), main nutrients (nitrate, nitrite, ammonia, silicate, phosphate) and dissolved oxygen were measured regularly on a 5 mile cross-section near Gelendzhik (the north-eastern Black Sea). Five stations with depths of 10, 25, 50, 100 and 500 meters were sampled every 2-4 weeks from April to November in 2012. Maxima of the DOC and Chl-a, nitrate, nitrite and silicate concentrations were observed during spring-summer period. In July 6-7 a flood of the local Ashamba River took place due to heavy rains. The river carried out a significant amount of nutrients, in particular phosphate (in July 11 at the near shore station with 10 m depth phosphate concentration in the surface layer was 33.25 μM, which is almost two orders of magnitude higher than the average annual concentration).A decrease of DOC amount and Chl-a occurred immediately after the flood. However, the influence of the river discharge on coastal ecosystem was short-term. Judging by the low Chl-a concentration there was no burst of phytoplankton afterwards, and during the next cruise (in July 26) the extreme concentration of phosphate was not found.

During the period from April to July the maxima of nutrients concentrations were observed 2-4 days before the intensive precipitation or along with it. From the late July to November, when the Ashamba River dried up (low-flow period), there was no visible relation between nutrients and precipitations. Gradual increase of phosphate concentrations from September to the end of November could be a result of the autumn deep convection.

Maxima of dissolved oxygen concentrations were found in spring and autumn and minima in summer. Decrease of oxygen concentrations from July to November was rather related to a surface waters cooling, which stimulated better dissolution of oxygen in the seawater. The decrease of the apparent oxygen utilization (AOU) and the concentrations of ammonia in the autumn took place presumably due to the decomposition of semilabile organic matter, produced during the spring-summer period of photosynthetic activity.

An evident correlation was found between the averaged concentrations of DOC and Chl-a in the upper 50 meters. The strongest dependencies were found at stations with depths 50, 100 and 500 meters (r=0.86, 0.70 and 0.60 correspondingly). It testifies to that phytoplankton is a major source of DOC in the photic zone of the coastal area in the NE Black Sea.

Alterations in the Black Sea coastal (Varna region) phytoplankton during the last decade: response to climatic forcing or nutrient alterations

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Abstract

The coastal area of Varna region is impacted by many interacting stressors due to extensive human activity (industry, tourism and urbanization) and recent global climatic changes. From 1934 to 2001 the population increased fourfold, the population density of Varna (1 350 km^{-2}) far exceeding the country's coastal average. In 2000-2004 the number of hotels almost doubled, however the infrastructure development tailored to meet the direct tourist demands for leisure and entertainment facilities did not meet environmental protection needs. On the other side during the last decades summer temperatures showed extreme values which have never been measured before, the frequency and intensity of rain and storm events also increase drastically. The climate change is likely to further stress both the coastal ecosystem and resource management. Phytoplankton during 2000-2013 was featured by an overall decrease of total biomass (and chlorophyll-a), lower frequency of phytoplankton blooms although still observed, on the expense of pronounced alterations of community structure (increased dominance of species from not habitual for the Black Sea classes) introducing shifts in the taxonomic ratios of the phytoplankton assemblages. The phytoplankton related indicators classifying the ecological status of the coastal area between poor-good show a very high variability.

To asses all those changes we will utilize observational data and coupled model simulations and provide an extensive analysis on the response of the ecosystem in the Varna coastal regions to nutrient loads and climatic changes. The results from observations and numerical simulations of the inter-annual and seasonal variability of the lower trophic levels are presented. Important climatologic features for the Black Sea, such as wind variability, changes of the stratification connected with the upwelling events near the coastal areas, the mixed layer and cold intermediate water variability are discussed. The synergy between the model simulations and observational data is demonstrated. We show that the variability in the biological system is strongly controlled by the variability of the meteorological forcing. A number of indicators were derived from marine ecological data, for assessing ecosystem status and trends for the coastal ecosystem, identifying vulnerability level and setting priorities for recovery measures. The indicators computed based on both observational data and modelling results can be used as a tool for socio-economic evaluation of the ecosystem status of the coastal waters.

Contribution to the assessment of open sea water trophic regimes. Case study: nutrient and chlorophyll dynamics in North Aegean Sea.

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Abstract

In this study we present a first attempt to assess the trophic status and possibly its evolution in the North Aegean Sea, influenced by different water masses, during winter-spring and summer-autumn period of 1997-1999; 2005-2006; 2008 and 2013.

The goal is to understand the nutrient dynamics in relation to chlorophyll dynamics and productivity in the North Aegean Sea, which is in direct support of the MSFD implementation (Descriptor 5). Deep formation events in relation to Dissolved Oxygen concentrations are also discussed, since the deep water formation process can affect the productivity of the euphotic zone through the upward injection of large quantities of inorganic nutrients.

Furthermore, a classification scheme for the assessment of the trophic status in the oligotrophic Eastern Mediterranean Sea was used.

A change within the euphotic zone of the study area has been observed during the last sixteen years, towards a more oligotrophic character. The system seems to shift from the "GOOD" trophic status towards the "HIGH" status. Inorganic phosphorus and nitrogen concentrations have decreased during the last years in the euphotic zone of the under study area. This may be related to the outflow of the BSW from the Dardanelles and the amount of inorganic nutrients this water mass carries into the north Aegean Sea following its pathway, together with the biogeochemical processes which take place in the euphotic zone. Consequently, following the changes in nutrient concentrations, a decrease in phytoplankton biomass has been observed which seems to follow the phosphate variation more than the nitrate variation during the last years. However, the scarcity of data concerning the study area is an important factor which does not allow for definite conclusions related to the ecosystem functioning changes.

Numerical modelling to the rescue: environmental models as a novel tool in simulating the trajectory of jellyfish blooms within coastal ecosystems – a case study from the Maltese Islands (Central Mediterranean)

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Abstract

Numerical *modelling* is, nowadays a common method to investigate both physical and ecological issues interesting the marine coastal areas. In this context, a numerical tool based on coupled hydrodynamics and environmental numerical models were developed and applied to the coastal areas of the Maltese archipelago, with the aim of implementing a decision-support system for coastal managers. The core of the system is constituted by two different nested numerical models, an open ocean (ROSARIO6420) and a coastal area (SHYFEM) 3D hydrodynamic model. The system (ROSARIO-SHYFEM) is operational and provides daily a 4 days forecast of the main 3D hydrodynamics fields for the areas covering the Malta-Sicily Channel with a spatial resolution varying between a few km up to 50 m.

The main objective of the first application is to predict the trajectory to be assumed by a jellyfish bloom by providing a 4 forecast of the path to be taken by the same bloom. Within the ambit of the MED-JELLYRISK project, funded under the framework of the ENPI-CBC MED funding programme, the ROSARIO-SHYFEM model was coupled with a particle-tracking Lagrangian model and used in order to simulate both surface water circulation and the transport and diffusion of numerical particles, proxy of jellyfish, inside the area of interest. Besides providing a 4-day forecast for the trajectory of a jellyfish bloom, the developed system can also provide a hindcast for the same trajectory, using archived values for a set of hydrodynamic and biogeochemical parameters still generated through the ROSARIO-SHYFEM system.

The system was integrated into a Graphical User Interface which will allow users to define the position in time and space of a hypothetical bloom found in the Maltese waters, to select the amount of particles to simulate the jellyfish biomass and to launch the trajectory model run. The output will consist on both the geographical positions of each seeded particles within the area of interest and along the whole duration of the simulation and on the impacted coastal areas. Besides being launched by the user, the application can also be launched automatically once optimum conditions for the blooming of a single jellyfish species arise. The later aspect has been achieved by coupling the developed application to a probability model, for the occurrence and distribution of different jellyfish species, also developed within the MED-JELLYRISK project through ensemble modelling.

GRUMERS: Web-site platform to upload jellyfish observations by workers involved in coastal services in the Balearic Sea

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Abstract

Jellyfish swarms in the Mediterranean coasts are a recurrent phenomenon of high scientific interest and with relevant implications at the touristic and socio-economic level. There is, however, a gap of systematic and periodic jellyfish occurrence in beaches, data that can help to understand the inter-annual variability of the episodes and its potential relation with the variability of environmental conditions.

Merged strategies among tools available to scientist, administration and the stakeholders can optimize the cost of obtaining these in situ data and the benefit achieved from its scientific analysis. This joint stakeholder and scientist strategy was designed and tested in the Balearic Island during Summer 2014. It involved the regional environmental and emergency administrations, charter associations as well as CSIC institutes and SOCIB. For the first time, a program of routine surveillance of jellyfish observations is established with qualified and trained personal at high spatial and temporal resolution.

The system includes a web platform and an associated database that compiles the daily sightings in beaches and natural reserves coastal areas at specific locations. They included in the coastal zone, 5 sites in Marine Protected Areas (with several observation points each), and 66 sites in 33 routes from the boat cleaning services. At the beaches, monitoring was carried out by lifeguards from the DG Emergency available at 120 beaches. All observations were performed following established protocols to obtain a systematic, periodic, routine monitoring.

The access is at present restricted to participating institutions and each user is identified. The application also allows the filtering per locality or per period. A “heat map” showing where is the highest abundance of jellyfish is also available, and the entire dataset that is being accumulated can be downloaded by the users.

The total number of observations registered on the web-site during this pilot year is 15.071, although from all those observations only in 783 cases were jellyfish observed. The most abundant specie was *Pelagia noctiluca*, followed by *Cotylorhiza tuberculata* and *Rhizostoma pulmo*. The most active users were from the routes of the boat cleaning services and from the marine protected areas. This is the first time that all the workers involved in coastal services in Balearic Islands can upload their jellyfish observations in real time, constituting an important data base generated under scientific standards to allow a solid understanding of the episodes and the implementation of appropriate knowledge-based future mitigation actions.Social values for Southern European Seas marine ecosystem services. Inventory and critical assessment.

Study of strandings of the jellyfish *Pelagia noctiluca* in the Mediterranean coastline of Tetouan (NW of the Morocco)

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Abstract

For a decade, we noticed outbreaks of jellyfish strandings in the coastline of Tetouan especially during heat waves. To examine factors that may be responsible for the stranding of the jellyfish *Pelagia noctiluca* (Forsskål, 1775) in the coastline of Tetouan (occidental Mediterranean part of Morocco), a monthly monitoring was done at 2 sites (M'diq and Martil) in the years 2011 and 2012. In this study the appearance of these organisms is studied in relation with the tidal currents, wind currents (East wind), weather conditions of the area and physic-chemical parameters of seawater. The appearance of this jellyfish began in June (22.1° C) and reached the maximum of abundance or density in September (24.7° C) to disappear in October. This density fluctuation is correlated with changes in ambient temperature. Analysis of the structure of the population size (umbrella diameter) of the jellyfish shows a size range between 10 mm and 90 mm and an average of 49 mm. Other studies have also observed that the outbreak of the Medusa seems to be related to warm temperatures. Nevertheless, the different processes that are involved in the appearance of jellyfish in a specific coastal area operate at diverse time and spatial scales, which demand to take into account an wide perspective in order to analyze their population dynamics.

SESSION 2

Regional extinctions and invaders' domination: an ecosystem phase-shift of Levant reefs

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Abstract

Using past sporadic data and data from current (2009-2013) extensive surveys and an ecological-biogeophysical monitoring program along the entire Israeli coast (with a focus on the Haifa region) and supplementary expeditions in Cyprus and Crete I show that the previously Atlanto-Mediterranean dominated biota of the Levant rocky reefs (intertidal and subtidal) on the Israeli shore is going through recent major shifts in its biodiversity. Several ecologically-important species (a reef-building vermetid gastropod, sea urchins and a large predatory snail) exhibited major population collapses while several key taxonomic groups (gastropods and bivalves and to some extent fish) are completely dominated by IndoPacific invaders. I infer many more collapses from the absence of dozens of native molluscan species once-described as abundant, and from the domination of invasive species in molluscan assemblages on subtidal reefs. These findings are evidence for a multi-species range contraction at the edge of the Mediterranean Sea, adding to the regional ecosystem phase-shift already driven by massive bioinvasions. The status of commercial fish is poor except inside a small marine reserve in the north of Israel. The state of native species is better in Cyprus and Crete, and the presence of invasives was much less apparent, while the commercial fish status is similarly bad in most sites.

I suggest that the ecosystem phase-shift seen on the Israeli coast may be partly driven by global climate change, supplemented by overfishing. The southeastern coastal waters of the Mediterranean have warmed by 1.5-3ºC in the past 2-3 decades and may have become too hot for some indigenous species and more hospitable to tropical species. This means that the climatic envelope of the native species may have shrunk or shifted. Recent lab and field experiments indicate that the abundant sea urchin, *Paracentrotus lividus*, is indeed dying during peak summer SST on the Israeli coast (>30.5ºC), and its feeding and reproductive potential are reduced by invasive herbivorous fish. Performance curves (e.g., photosynthesis) of several still-abundant (mainly during colder months) native species show that their physiological activity is greatly reduced when exposed to peak and future summer temperatures. Clearly, the ecological implications of these species collapses and invasions, including their effects on ecosystem functions, must be profound and should be urgently studied. With additional warming, these collapses may advance west and impact the rest of the Mediterranean—and potentially its ecosystem functions and services.

Contrasting food web structures and trends across Mediterranean Areas

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Abstract

With the development of the ecosystem approach to fisheries there is an increasing interest in analysing fish communities as networks of functional groups. Functional groups are groups of species that play a similar role in the food web and whose dynamics can be considered as consistent. We propose to build simplified food web models in different Mediterranean areas, starting from the species characteristics, rather than *a priori* assumptions or imposed model structure. The question asked is whether these different communities that share a common environment with local particulars differ in their food web structure. We measured a suite of 10 morphological traits on 75 species, and carried out multivariate analyses to ascribe species to functional groups; the number of functional groups may vary between Mediterranean areas. Using scientific surveys data, we assessed the temporal trends of each the functional groups. Results identified 10 empirically-defined functional groups of fish species which represented low correlation (Pearson r = 0.20) with expert classification. Where experts would identified four major groups of species (i.e. benthic/pelagic and invertebrate/fish feeders), we highlighted a gradient of species diet varying from invertebrate to fish feeders and differentiated the habitat (water column and substrate) on which they feed or live.

Temporal trends of FG biomass underlined three spatial patterns. The first pattern included GSAs corresponding to enclosed bays (i.e. Gulf of Lion, north Adriatic and Aegean Sea) and underlined a general decrease in biomass in almost all the FGs, especially those located at the bottom of the food-web (i.e. benthic groups). The second pattern was observed in the south Adriatic and the Ionian Sea and to a lesser extent in Malta where we observed an increase in almost all the FGs and notably in the pelagic components of the food web. The third pattern was characterized by an increase in the lower compartments of the food-web and included the western Mediterranean areas (Corsica, Sardina, Tyrrhenian Sea). Spatio-temporal patterns of FGs are discussed in light of environmental settings.

The Benthic communities in the AEGEX experiments (North and South Aegean)

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Abstract

Benthic samples were collected along a depth gradient from the upper circalittoral to the bathyal zones in the North Aegean and the South Aegean Seas. Three Box corer samples were taken at each station. Benthic indices were applied at the data covering all four indicators of Benthic community condition sensu the MSFD. The indices include diversity (Shannon), species richness, biotic indices (Bentix), size distribution index (ISD) and a multimetric approach for the weighted integration of all the above indices. Results showed a species richness and diversity reduction with depth but also a strong differentiation between North and South Aegean bathyal stations assumed to be related to organic carbon in sediment and trophic factors. The environmental status was assessed by individual indices and the integrative formula as generally Good at all stations except from a station closest to the coast along the N. Aegean gradient which was found at moderate status. Benthic community status in the N. Aegean stations was found significantly correlated with percentage of organic nitrogen and phosphorus in bottom layer. A benthic hot spot assumed to be related to the accumulation of organic matter in deep canyons was found at the bathyal station of the N. Aegean transect featuring a high dominance of small sized opportunistic polychaetes. Bathyal benthic communities demonstrated a certain level of natural stress either reflected to the dominance of small sized opportunistic species (North Aegean) highlighted by the ISD index, or in the faunistic scarcity of the oligotrophic South Aegean reflected in the diversity and species richness indices. It is evident from the present study that in the deep Mediterranean Sea the natural stresses (oligotrophy or the particular processes governing deep sea canyons) strongly affect the indicators of benthic community condition.

Major constrains of pelagic food web efficiency.

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Abstract:

Grazing pressure plays a key role on planktonic communities affecting and shaping their structures. Predation exerted by eukaryotes controls the carbon fate within the microbial loop and toward the "classic" grazing food web. We analysed more than 50 dilution experiments in order to determine selection for energy sources (in terms of available biomass) that influence prey-predator interactions and thus change the efficiency of the pelagic trophic food webs within the Mediterranean Sea.

Dilution experiments were carried out at different sites spread all over the Mediterranean at the surface and in the meso-bathypelagic zones. These experiments were targeted on microzooplankton (MZP) and heterotrophic nanoflagellates (HNF) predation following the protocol proposed by Landry and Hasset (1982) and modified by Landry et al. (1995).

As regard MZP, at the surface on average 60% of total prey biomass (microphytoplankton, nanoplankton and picoplankton) is due to prokaryotes. This biomass supports the 80% of the total MZP grazing effort. Microphytoplankton overcame 90% of total prey biomass becoming the first choice for MZP when it reached high concentrations. Ingestion rates increase with prey abundances, however when we relate ingestion rates with available biomasses prokaryotes result to be the most exploited community. MZP and HNF similarly affect prokaryotes only during microphytoplankton blooms, in all the other cases MZP have a larger impact.

At the surface MZP heavily graze on prokaryotes as well as on nanoplankton and microphytoplankton; when larger prey biomasses decrease under a specific threshold prokaryotes become the major source of energy and MZP feeding behaviour is pushed from herbivory to bacterivory.

At the surface HNF almost always prey on prokaryotes with a major efficiency on autotrophic fraction in respect to MZP.

In the meso-bathypelagic realms, despite the abundance of the heterotrophic prokaryotes is one order of magnitude lower than at the surface, HNF show a 3 times higher efficiency in exploiting prey stocks.

Initiating the DNA barcoding of the Levant's marine biodiversity

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Abstract

Biodiversity in the oceans was recently estimated at just about 393,000 metazoan species, belonging to 31 phyla, of which only half have been identified so far. Yet it seems that the true number of marine species and their correct identification will never be known, because of Humanity's limited access to large parts of the oceans' depths, the unprecedented species extinction occurring in recent decades the biological introduction rates that may outpace discovery, and the fact that cryptic species, sub-species and closely-related taxa reduce the capacity to monitor the full diversity repertoires presented by aquatic multicellular organisms. The anthropogenic impacts on the marine environments and the changes that follow, primarily at the continental shelf, further highlight the urgent need for accurate, fast and effective documentation of marine biodiversity, whereas at the same time the number of morphological taxonomists decline and hence limits our ability to keep up with identifying species, describing new species and studying their evolutionary and biogeography connections. The Mediterranean Sea is a hot spot for bioinvasion and more than 500 alien species of fish, invertebrates and algae have already been sighted, particularly in the Levant and along the Mediterranean coast of Israel, where more than 335 alien species have been reported - most of which came from the Red Sea through the Suez Canal. Although there is no doubt that the number of foreign species is even higher, we do not have effective tools for investigating this troublesome situation.

Following the understanding that classical taxonomic tools are able to identify only a fraction of the existing biodiversity, a decade of using the mitochondrial (COI) and the Rubisco genes (RBCL) as molecular barcodes for the identification of fauna and flora, respectively, along with a number of prominent studies, revolutionized taxonomy by creating the global web for barcoding terrestrial biota, and the marine barcoding shortly afterwards. Based on this global initiative and in view of the anticipated global changes and accelerated environmental development in the Western Mediterranean, two years ago we started to establish the scientific infrastructure for barcoding the Israeli Levantine marine biodiversity, , a gambit for long-term barcoding research. We rely on the knowledge and skills of available taxonomists, on innovative molecular methods based on specific DNA sequences and on a connection with Global BoLD database. So far, we have identified and uploaded to the BoLD international database 388 marine species, 336 of which are fish, 29 crustaceans and 21 mollusks, all with museum voucher tags. At a later stage, we will upload to the database algae species and other invertebrates, collected from the littoral, the continental shelf, and the Levant's deep sea. The database will be open to scientists, students and to the general public. A database center, currently constructed at Israel Oceanographic and Limnological Research, will enable access to all data, including images, DNA sequences, locations of sampling and other morphological characters.

Assessment of the status of knowledge regarding the effect of Non Indigenus Species (NIS) in fisheries and ecosystems of the eastern Mediterranean

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Abstract

Despite the growing number and extending distribution of Non Indigenous Species (NIS) in the Mediterranean Sea, it is recognized that there is still limited knowledge about the effects of the NIS on the biodiversity and fisheries even in the mostly affected eastern basins. Descriptor 2 concerning NIS has been included among the 11 Descriptors of the Marine Strategy Framework Directive (MSFD), established for the evaluation of the Mediterranean environmental Status. Taking into account monitoring requirements for the estimation of relevant MSFD indicators, an assessment of the current status of knowledge on the effect of NIS collected by fishing gears on fish species assemblages and fisheries in the eastern Mediterranean has been attempted in the context of PERSEUS project. In order to elucidate the spatial variation in the NIS distribution and effects, the Geographical Sub-Areas (GSA) established by GFCM and 4 depth strata (<25m, 25-50m, 50-100m, 100-200 m) were considered.

Among the 112 NIS (70 fish species, 31 crustaceans, 3 cephalopods, 1 gastropod, 2 bivalves, 2 echinoderms, 2 jelly fish, 1comb jelly) collected by fishing gears in the Eastern Mediterranean, only 60 Lessepsian species can be considered as regularly caught at least in one of the eastern Mediterranean GSA. Half of these species are distributed at depths shallower than 50 m and consequently their effect concerns inshore fisheries, practiced by nets, bottom long-lines and Purse-seiners fishing during the day. A few Lessepsian fishes play an important role only to the coastal fish assemblages at GSA22 southeastern part and GSA 23, whereas at GSAs 24-27 Lessepsian species are ranked among the most abundant species over the continental shelf. Poisonus and other non-commercial Lessepsian species dominate fish assemblages over shallower bottoms (<30m), replaced gradually by commercial Lessepsian species that occur in substantial abundances down to 50 m depth but decline in deeper waters, where indigenous species take over. Changes observed in fish communities so over seasons as over longer periods, seem to be also due to the high fishing pressure, affecting both indigenous and non-indigenous species.

Due to the existence of considerable gaps in data series relevant to NIS contribution in fisheries catches, the considerable variation in fisheries development and legislation between countries, the uncertainties in the taxonomy of some non-indigenous species and the limited areas and time periods of specific studies, information given by GSA should be considered as indicative. Continuous and spatially expanded monitoring of NIS catches (landed and discarded) by different fishing gears operating down to 100 m, as well as international targeted experimental surveys on diverse habitats along the continental shelf of the Eastern Mediterranean GSAs, are further required for the reliable estimation of NIS indicators.

Effect of ctenophores *Mnemiopsis leidyi* and *Beroe ovata* on microplankton communities of the Black Sea

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Abstract

The goal of the present study was to investigate the potential mechanisms of excretion and mucus release by the jellies *Mnemiopsis leidyi* and *Beroe ovata* on the low trophic levels of Black Sea ecosystem. Two types of experiments were conducted jointly by SIO- RAS and IO-BAS as part of PERSEUS WP1 and WP2 research program – in lab aquaria and *in situ* mesocosms in the coastal area of Gelendzhik (2013) and Varna (2014).

The laboratory (aquaria) experimens were designed to analyze the effects of exotic ctenophores on bacteria, ciliates, heterotrophic flagellates, phytoplankton taxonomic composition and chemical parameters of the environment, while in the mesocosms experiments, one more trophic level mesozooplankton as the main prey of M. leidyi was examined in addition to the same set of parameters. Here the results of the Gelendzhik experimental phase are reported.

Under controlled laboratory conditions both *Beroe ovata* and *Mnemiopsis leidyi* induced changes in chemical properties of the media – pronounced increase of nutrients ($P0_4$ and NH_4) and a decrease of pH, but the nutrients release was much higher in the aquaria with *Beroe ovata*.

Autotrophic flagellates and heterotrophic flagellates demonstrated an increase on the 2nd day and dropped to the initial level on the 5^{th} day of the experiment. The growth of Diatoms, Dinoflagellates and Euglenidae also was stimulated by the two ctenophores. While diatoms and euglenophytes proliferated to a similar level, Dinoflagellates outburst was marked in the *B.ovata* experiments. Possible reasons of the observed changes in the structural and functional traits of heterotrophic and autothrophic plankton communities are discussed.

There's nothing simple about estimating social values for marine ecosystem services: A critical reading of the estimates in the MSFD Initial Assessment reports

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Abstract

Economic valuation of ecosystem services is strongly anchored within the logic of the Marine Strategy Framework Directive (MSFD) as it is a prerequisite for setting priorities within this framework in several aspects. The Working Group on Economic and Social Assessment (WG ESA) developed a Guidance Document for supporting the development of the Initial Assessment of the MSFD. Given the variety of alternative approaches, it's not surprising that each Member-State has developed its own methodology towards preparing the Initial Assessment report required by MSFD. As a result, the estimates differ significantly and are not comparable across the Member-States. These discrepancies could jeopardize the targets of MSFD, e.g. in case that a Member-State would seek the most 'convenient' approach to prove that additional measures are not required or are not cost-effective. We apply the valuation database V-MESSES developed within the PERSEUS project in order to homogenize the different approaches followed by the Member-States and to provide a common basis for estimating the value as well as the cost of degradation of marine waters. We re-calculate the cost of marine degradation for Spain, France, Italy, Greece and Cyprus on the base of the V-MESSES estimates highlighting technical deficiencies and analytical gaps.

PERSEUS Marine Optics – Ocean Colour in the Aegean Sea

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Abstract

Ocean colour is one of the 50 essential climate variables that have been defined as part of the Global Climate Observing System (GCOS) and until the PERSEUS-AEGEX experiments, marine optical properties were poorly sampled in the Aegean. They are essential for ocean colour developmental work and validation of measurements from space and thus to address this data gap a profiling suite of optical sensors was assembled by HCMR and successfully deployed during the AEGEX experiments in the north and south Aegean. The measurements taken were attenuation, absorption and backscatter (the IOPs) and irradiance and radiance (the light field) across the wavelengths of the visible spectrum and through the surface layer/euphotic zone of the ocean. A suite of bottle data (SPM, DOC, CDOM and more) were simultaneously collected, thus formulating a unique, multifaceted data set. Additional data (in space and time) were collected within the auspices of the AEGEANMARTECH project. This paper highlights the IOP results giving an initial optical characterization for the Aegean. As part of ongoing PERSEUS work it also gives indications of their use in satellite ocean colour research, the validation of data from satellite sensors, and the possible relationships between the light regime and the marine ecology of the Aegean.

Integrated ecosystem assessment reveals regime shifts in fish stocks and water quality in the Black Sea

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Abstract

Throughout history, the Black Sea has undergone dramatic changes that allow using it as a 'natural laboratory' for studying the marine ecosystem. Analyses of multiple data reveal characteristic patterns explainning past and current changes and enabling forecasting of trends in ecosystem quality. The developed explanatory model, involves Atlantic teleconnections influencing Black Sea hydroclimate, which together with fishing shapes the ups and downs in fish abundance. The change in fish induces lagged response in competitor jelly-plankton, that cascades down to phytoplankton and water quality. Proposed mechanisms rely on the role of planktivorous fish to explain regime shifts occurring over the last decades. Management is often deficient to deal with complex ecosystem issues, when understanding of essential processes is missing. Proposed models explain processes and patterns relating overfishing and fish stock dynamics to ecosystem shifts and water quality and bring insights on issues such as causality of ecosystem interactions, forecast of regime shifts, and ecosystem based management.

ALBOREX: a major intensive multi-platform and multidisciplinary experiment in the Alboran Sea

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Abstract

Multi-platform ocean observation with, 25 drifters, 2 gliders, 3 argo floats, one ship, 50 scientists and 8 days, these were the headline numbers for ALBOREX, a major intensive multi-platform and multidisciplinary experiment that was completed in May 2014 as part of PERSEUS EU Project (SubTask 3.3.4). Leaded by CSIC and with strong involvement of other five international institutions (SOCIB, OGS, CNR, IEO, WHOI), this week long experiment was designed to capture the intense but transient vertical exchanges associated with mesoscale and sub-mesoscale features, in order to fill gaps in our knowledge connecting physical process to ecosystem response.

The vertical motion associated with mesoscale and (sub-)mesoscale features such as ocean eddies, filaments and fronts plays a major role in determining ocean productivity, due to the exchange of properties between the surface and the ocean interior. Understanding the relationship between these physical and biological processes is crucial for predicting the marine ecosystems response to changes in the climate system and to sustainable marine resource management. However, to understand the links between mesoscale and sub-mesoscale features and ecosystem responses, it is necessary to capture a range of ocean data at a range of temporal and spatial scales, and then combine this data with coupled physical and biochemical models.

Tha ALBOREX experiment fulfilled all its objectives of sampling the intense front where Atlantic and Mediterranean waters meet in the Eastern Alboran Sea. The work to unravel the three-dimensional structure of oceanic eddies associated with strong density fronts is already ongoing. Surface salinity data from thermosalinograph revealed the frontal location with gradients ranging from 36.6 PSU (Atlantic Waters) to 38.2 PSU (Mediterranean Waters). Drifters followed a massive anticyclonic gyre. Near real time data from ADCP showed coherent patterns with currents up to 1m/s (2 knots). The gliders detected a subduction of chlorophyll located in areas adjacent to the front. Argo floats transmitted high frequency and interdisciplinary data. More than 500 samples (salinity, chlorophyll and nutrients) collected at 66 CTD stations are being currently analyzed.

This intensive multi-platform and multidisciplinary experiment is an example of the new integrated and quasi real time approach to Ocean Observation thanks to joint and collaborative efforts of scientists and technicians from diverse international institutions.

Environmental changes and ecosystem variability in the Central Mediterranean area

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Abstract

The ADREX approach considers two important natural processes involving large part of the Central Mediterranean area: the dense water formation, and the decadal reversal of the North Ionian Gyre (NIG) circulation. Dense water inflowing in the Ionian via the Strait of Otranto and NIG circulation mutually influence, generating a decadal oscillation through a negative feedback mechanism called BiOS – Bimodal Oscillating System. Many crucial oceanographic properties are subject to this cyclical variability: the buoyancy in the South Adriatic (that drives the winter convective mixing), the vertical displacement of nutricline in the Ionian Sea (that affects both the upward nutrients flux in the Ionian and the horizontal nutrients advection into the Adriatic), the salt redistribution in the Eastern Mediterranean (and in the Western subbasin, too).

Changes in environmental conditions and nutrient availability influence the number, magnitude and timing of phytoplankton bloom events, whilst the advective migration of different types of allochthonous organisms into the Adriatic and the Ionian affects biodiversity, according to the circulation regime.

Here, we show evidences of the BiOS sensitiveness to the climatic conditions, taking into consideration the case study of 2012 when an unespected reversal from the cyclonic to the anticyclonic mode took place. In addition, alterations in the functioning of Central Mediterranean ecosystem due to decadal change of the Ionian circulation regime are illustrated looking at the impact on the phytoplankton phenology.

Linking environmental conditions variability to marine ecosystem dynamics represents a crucial goal in the assessment of the Mediterranean ecological status and in improving our capability to identify possible future trends.

Recent Ecological and Chemical Status of the Sea of Marmara

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Abstract

The Sea of Marmara has been receiving substantial amounts of anthropogenic pollutants from different sources within the Marmara region and from the Black Sea via the Bosphorus surface flow during the year. The Marmara region is the most density populated and industrialized area of Turkey; therefore, sustainability of both economy and ecology is vital and dependent on multiple stressors and pressures. Within the scope of the Perseus project, a basin wide cruise (MAREX) and monthly samplings from two locations along the Bosphorus have been accomplished. Extensive chemical (nutrients and pollutants), biological and physical data from recent studies, and past data have been combined to establish MSFD descriptor parameters, such as the present baseline and threshold values, pristine stage etc. The nutrient fluxes between Marmara-Black Sea and Marmara-Mediterranean Sea, recent and actual species diversity, non-indigenous species distribution and abundance, and contaminant (PAH, PCB, Heavy metals) concentrations in water, sediment and organisms (Algae, Fish, Shrimp and Mussel), have been revised and updated.

General hydrographic conditions in the Sea of Marmara were determined to be virtually unchanged; therefore the general water budget of the upper and lower ?layers have remained unaffected, but the chemical and biological diversities were found to have altered during the last decades. As expected, the nutrient rich Black Sea inflow and discharge from Istanbul Metropolitan have enhanced organic matter production and POM abundance in the Sea of Marmara upper layer and thus POM export to the lower layer. Comparison of long-term data indicates that both nitrate and phosphate stocks of the lower layer have increased since the 1960's as concurrent upward shifts have occurred in the oxycline and nutricline to the steep halocline. Nutrient exchange fluxes in the TSS are seasonally variable. Long term increases in the total nutrient stocks of the Sea of Marmara upper and lower layers have naturally introduced more nutrients to the adjacent seas via exchange flows in the TSS. The Sea of Marmara is a sink for nitrate influx from the Black Sea. Based on past and recent data, preliminary threshold values have been determined for nutrients, nutrient ratios, secchi disk depth, oxygen saturation and chlorophyll concentration.

Deterioration in water quality of the Sea of Marmara, harmful / toxic algal blooms, mucilage events, increase of red-tides, hypoxia or anoxia events, and fish mortalities are more frequently recorded.. Specifically, 11 toxic phytoplankton species have been detected in the Sea of Marmara, since 1990 and *Noctiluca scintillans* has been identified as the most abundant heterotrophic dinoflagellate which is an indication of an unhealthy ecosystem. Zooplankton composition and abundance have also shifted, from hyponeustonic species to more pollution resistant copepod species like *Acartia clausi*, whose abundance greatly increased in fold over the last 20-30 years. In terms of abundance, Cladocera in the Sea of Marmara in 1979 constituted only 1.1% of total summer plankton whereas in 2010 it constituted 86% with similar results being found during the last MAREX cruise in 2013.

Among the jellyfish species, *Aurelia aurita* attained its highest biomass in the southern Sea of Marmara whilst *Mnemiopsis* dominated in the eastern and northern surface waters. The benthic community structure was observed to be very variable along the shelf with diversity decreasing as the sediments became muddier.

The environmental status in three coastal areas of Mediterranean and Black Seas: a eutrophication approach towards the MSFD implementation

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Abstract

Towards the implementation of the Marine Strategy Framework Directive (MSFD) and the achievement of good environmental status by 2020, we evaluated the impact of anthropogenic pressures in South European Seas (SES) and their coastal water quality in the frame of RERSEUS EU project. We chose three areas, representative of the ecological conditions in SES, namely the Gulf of Trieste (N Adriatic, Italy) and the Gulf of Saronikos (Aegean Sea, Greece) in Eastern Mediterranean, and the Bay of Varna (Bulgaria) in Western Black Sea. We used the Descriptor Eutrophication (D5) and some related variables: chlorophyll a (as a proxy for phytoplankton biomass) and inorganic nutrient inputs (nitrates, nitrites, *ammonium* and *phosphates*). A classification of the ecological quality was performed, according to the biological quality element (BQE) phytoplankton values according to scales adopted in each area In addition, we followed a multivariate statistical methodology in order to better approach the multidimensional nature of eutrophication in coastal ecosystems. For this purpose, we performed Principal Components Analysis (PCA) on these variables, using a time series dataset from the three areas since 2000. Then, the Eutrophication Index (E.I.) by Primpas et al. was calculated and compared in the three areas. The results and conclusions of this study are discussed.

Seagras presence and distribution as Ecological Status indicators: Case studies in the Eastern Mediterranean and the Black Sea

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Abstract

Results from three PERSEUS case study areas were evaluated in order to evaluate the possible use of seagrass presence and distribution pattern as Ecological Status descriptors.

In Saronikos Gulf the presence and distribution pattern of the seagrasses *Posidonia oceanica* and *Cymodocea nodosa* was studied on a confinement gradient which is also a gradient of chronic anthropogenic disturbance due, mainly, to urban waste water. The Ecological Status evaluated using of two specific bio indicators (CymoSkew for *C. nodosa* and PREI for *P. oceanica*) was correlated to the Land Use Simplified Index (LUSI). The two seagrass bio-indicators were also correlated with the macro-algae bio-indicator (EEI-c).

In Sozopol Bay there is local small-scale eutrophication gradient developed by a seasonally fluctuating point source of untreated municipal waste waters. In Burgas Bay there is large-scale stable gradient of chronic anthropogenic impact developed by number of point as well as diffusive sources of treated and untreated municipal and industrial waste waters. In both sites the seagrass *Zostera noltii* is present. The results showed that large scale eutrophication gradients may significantly contribute to the overall distribution pattern of *Z. noltii* depending on the distance to and intensity of the sources of impact. LUSI index, correlates well with the large-scale eutrophication gradients observed in the area. The bio-indicators used for *Z. noltii* were Leaf Area Index (LAI), Total LL, A/B biomass ratio, Shoot density, CymoSKEW. At local scale, in the zone of immediate impact all indices correlate negatively to the intensity of the pressure.

SESSION 3

Supporting knowledge-based marine governance through integrated web-based tools: A test on users' requirements for PERSEUS' Adaptive Marine Policy Toolbox

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Abstract

Adaptive Marine Policy Toolbox (hereafter AMP) is a web-based platform designed to assist policy-makers, policy consultants, NGOs and other interested parties in elaborating adaptive policies aiming to overcome situations at risk of non-achievement of the GES. AMP has been developed using a participative approach involving stakeholders and scientists specialized in marine risks. The present contribution gives a preliminary assessment of the results of testing the AMP in PERSEUS Pilot Cases (NWMed, Adriatic, Aegean Sea, W. Black Sea). This is implemented in a number of individual in-depth interviews with experts and policy makers and group meetings. We present the rationale of testing AMP and the design of the testing process so as to ensure its suitability for policy planning at various scales in support of reaching marine GES in the context of the Sustainable Development of the EU riparian countries. We report on the results of the testing referring to: a) scope, b) content, c) user interactions, d) technical aspects and e) support. We discuss lessons learned and suggest possible ways to improve the interface of the AMP tool and users.

Underlying concepts of adaptive management within the PERSEUS' Adaptive Marine Policy- Tool Box (AMP-TB)

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Abstract

It is essential for resource managers to have access and be able to use most recent information and knowledge in order to promote the best knowledge sound-based management of natural resources. Research and management ought not to be treated as separate activities and should be integrated in a detailed collaborative framework. However, effective and resourceful research governance frameworks are scarce or even absent, particularly at the Southern European Seas.

The EU Marine Strategy Framework Directive (MSFD) (already in place), requires the implementation process to be flexible adaptive and to rely on an ecosystem based management approach. The Directive states that "Adaptive management on the basis of the ecosystem approach shall be applied with the aim of attaining good environmental status" in view of the dynamic nature of marine ecosystems and their natural variability, and given that the pressures and impacts on them may vary with the evolvement of different patterns of human activity and the impact of climate change Accordingly, it is appropriate that programmes of measures for the protection and management of the marine environment be flexible and adaptive and take account of scientific and technological developments. (European Commission, 20081).

Accordingly, EU Member States are also required to ensure that their marine strategies are kept up to date on a six-yearly basis starting from their initial assessments in 2012. Having a six-yearly management-cycle, means that there will be regular opportunities to review the sustainability and effectiveness of the management, allowing its elements (i.e. the determination of GES; the environmental targets; associated indicators; the PoMs; etc.) to be adapted. This means that apart from using the management itself to pursue management objectives (i.e. to achieve or maintain GES), simultaneously we can learn about management consequences. In fact, a well-designed plan provides the opportunity to learn about the decision-process (i.e. institutional learning) and the resource system (technical learning) (Williams and Brown, 2014[2]).

However, management cannot be defined as adaptive only because of the application of a cyclical process is applied. It also requires adaptive and flexible strategies that can be pursued under a range of different future conditions, including elements -capable of reacting in a flexible manner on future uncertainties and coping with a wide range of future conditions- (e.g. scenario analysis and modelling).

Accordingly, with objective of providing policy-makers with the necessary guidance framework and resources to develop adaptive policies or measures to achieve or maintain GES under the requirements of the MSFD, a specific decision support system called "Adaptive Marine Policy Tool Box" (AMP-TB) has been developed within the PERSEUS

[1] European Commission, 2008. DIRECTIVE 2008/56/EC. Marine Strategy Framework Directive.

[2] Williams, B.K. & Brown, E.D. 2014. Adaptive Management: From More Talk to Real Action. Environmental Management, 53:465–479.

project. To make it adaptive four key and fundamental characteristics have been considered: (i) use of scenario planning methods; (ii) stakeholder's involvement; (iii) a scientific Ecosystem Based Approach (EBA) to management and (iv) a cyclical process-path where learning about management consequences is simultaneously incorporated.

To conclude, given the importance and need of adaptive management, this work will present the underlying concepts, principles and examples of adaptive management and the way these principles have been included in the PERSEUS AMP-TB.

Testing the biomass size spectrum as an indicator of the impact of combined pressures on the pelagic community of Saronikos Gulf -Athens

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Abstract

PERSEUS has identified a lack of information on the impact of pressures on plankton and pelagic fish in Saronikos Gulf-Athens. In fact, besides a partially known impact of nutrient enrichment on plankton in this area, impacts of other pressures such as hazardous substances and oxygen deficiency in bottom waters are not well known (see Deliverable 2.1). In an effort to improve understanding of this system, in the framework of WP2/subtask 2.3.1 (Study of pressures and impacts on pelagic ecosystems) we examined the normalized biomass-size spectrum (NBSS). The NBSS methodology offers a quantitative indicator on the impact of multiple stressors on pelagic communities. NBSS has been often used as an indicator of impacts from perturbations such as pollution or overfishing. In this context, we reconstructed the pelagic community from bacteria up to pelagic fish in terms of NBSS, and compared the inner, supposedly more impacted, Saronikos to the outer gulf in winter (December 2012) and end of summer (September 2013). NBSS analysis up to now indicated a stratification effect on NBSS in the whole area and a modification of slopes in summer suggesting a less efficient energy transfer to larger organisms for that period. In the inner gulf, NBSS results indicated several larger zooplankton size classes missing in the field, especially in winter, and suggested a more perturbed system during that season.

Budget of the particulate metallic trace elements in the Gulf of Lions. Impact of dense water formation.

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Abstract

The LIONEX experiment in the Gulf of Lions (NW Mediterranean) focuses on dense water formation processes which amongst other things enhance the transfer of particulate matter and associated chemicals from the coastal zone to the open ocean, and their dispersal in the basin.

The winter of 2012 experienced peculiar atmospheric conditions that triggered a massive formation of dense water on the continental shelf and in the deep basin. Multi-platforms observations (satellite, gliders, moorings, and cruises) enabled, with an unprecedented resolution, a synoptic view of dense water formation and spreading at the basin scale. Five months after its formation, the dense water of coastal origin created a distinct bottom layer up to few hundreds of meters thick over the central part of the NW Mediterranean basin, which was overlaid by a layer of newly formed deep water produced by open-sea convection.

Near-bottom oceanic particles fluxes collected on the moorings also showed a significant increase of the fluxes linked to the transport of material in suspension with the plume of dense shelf water spreading throughout the basin, and the resuspension of deep sediments by the fast currents that prevailed during and especially after the deep offshore convection event.

Simultaneous monitoring of particulate metal trace elements inputs to the shelf, by rivers and atmospheric deposition, and export towards the deep sea via canyons enables to contrast the levels of concentration of natural elements (e.g., Al, Fe) or anthropogenic elements (e.g., Pb, Zn and Cd) in the different compartments of the system, and assess the impact of an intense dense water formation event on their fate.

Distribution and sources of aliphatic hydrocarbons, polycyclic aromatic hydrocarbons and organochlorinated pollutants in sediments and suspended particles of the open Aegean Sea (Eastern Mediterranean)

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Abstract

The Aegean Sea is affected by pollutant inputs from intense merchant shipping/oil transportation, atmospheric inputs as well as riverine inputs, especially in the northern part, discharging, amongst others, various organic contaminants. Aiming at recording levels of priority pollutants and trends addressing MSFD Descriptor 8, undisturbed surface sediment samples were collected from 8 stations at the North Aegean Sea and 4 at the South Aegean (Cretan) Sea, within the framework of PERSEUS WP1. Also, high volume water filtering was conducted at various depths of 7 stations at the North Aegean Sea. Our main goals were: a) the study of organic pollutants (aliphatic hydrocarbons, PAHs, organochlorine compounds) in surface sediments, in order to report present contaminant levels and evaluate the type and degree of pollution, and b) to investigate distribution patterns of particle-associated organic pollutants (aliphatic hydrocarbons, PAHs), in order to assess their occurrence and major sources along with water-column processes controlling their vertical/lateral export.

Concentrations of sedimentary total aliphatic hydrocarbons (<10.5 μg g^{-1}), PAHs (<110 ng g^{-1}, 25 compounds), polychlorinated biphenyls (<1.5 ng g^{-1}, 13 congeners) and DDTs (<0.5 ng g^{-1}) determined were low, comparable to those reported for surface sediments in unpolluted coastal and/or open sea areas. The profile of determined aliphatic hydrocarbons and PAHs indicates an admixture of chronic oil-derived pollution (UCM, C_{27}-C_{35} hopanes, petrogenic PAHs), pyrolytic/combustion sources (parent PAHs with ≥ 4 aromatic rings), but also natural/terrestrial inputs, with the latest being more prominent in the northern part.

Distribution patterns of particle-associated total aliphatic hydrocarbons and 16 priority PAHs reveal a dominant contribution from fossil fuel products (atmospheric inputs/maritime activities) but also pyrolytic/combustion sources (mostly atmospheric inputs), with no significant compositional differences. Their vertical distribution is controlled by both biological processes and prevailing circulation patterns. Our results highlight the role of North Aegean basins as pollutant inventories.

Intercomparison of the ecological quality assessment methodologies involving benthic indices in different regions across the SES. Evaluation of assessments and selection of indices.

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Abstract

Benthic macroinvertebrate data from five areas (Saronikos Gulf, Constanta coastal area, Burgas Bay, Sevastopol bay and Gulf of Marseille) of the SES region were analysed using estabished benthic indices. Nine benthic indices were tested, among which three commonly assessed (AMBI, M-AMBI, BENTIX). All indices were subjected to intercomparisons through correlations, multidimentional plots and class agreement calculations. The three biotic indices were correlated with contaminant values including sediment organic carbon and nitrogen content, PAHs and trace metals, using graphical methods and statistical correlations. In Saronikos gulf Bentix showed the highest correlation with abiotic factors and linking with gradient of contaminants. In Constanta class assessment linking with contaminants did not show any clear message with any biotic index, but M-Ambi showed the most relevant response. In Burgas Bay a discrimination between two main shallow coastal habitats, seagrass beds and bare sandy sediments, is evident for the indices assessment and AMBI seems to be the more suitable index for both types of habitats in this area. In Sevastopol Bay, AMBI showed the most relevant correlations but not statistically significant. In Marseille gulf none of the indices indicated lower than Good status, among them M-Ambi indicating good and high status with the majority of stations at Good status. Conclusively, indices affinities and response in pressure gradients are different for each area. The relationship with the contaminants is determining the suitability of the indices. Conclusively, BENTIX is highlighted as most appropriate for Saronikos gulf, M-AMBI for Constanta and probably Gulf of Marseille, AMBI for Burgas Bay and Sevastopol. A harmonization of assessment following the formula presented in 1st Perseus SW could be tested for all regions using the most appropriate biotic index at each case.

Modern spawning grounds of the Black Sea anchovy

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Abstract

The Black Sea marine ecosystem experienced severe changes over the last decades and its inhabitants drastically impacted. Anchovy, being one of the most crowded populations of the pelagic realms, is among those most impacted. Hydrographic changes, increased eutrophication, invasion of an exotic gelatinous and various other detrimental features occurring over its most precious northern spawning and feeding habitats, forced this tiny fish to move south in 1990s. In the last decades, several remedial measured have been enforced by the riparian countries as well as some other European countries locates on its large catchment basin, to turn the plight of the ecosystem. The immediate impacts of the measure on the near coastal areas has been witnessed and reported, however, it is not clear whether the changes occurred in 1980s persist or the ecosystem is returning to its pristine state.

In an attempt to elaborate on this question, the modern anchovy spawning areas in the southern half of the Black Sea has been investigated along with the state of its gelatinous competitors/predators and the hydrographic features. The results clearly showed that the importance of the southern half of the Black Sea, as an anchovy spawning ground has been further increased compared to the past, despite the fact that biomass of gelatinous zooplankton remained within the same range as before. The findings also shed some lights on the question as to whether the changes in the spawning habitat may or may not be used to evaluate the impacts of the remedial efforts on the status of the changing ecosystem.

Emerging pollutants in the deep Mediterranean Sea

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Abstract

Since the late 1940s perfluoroalkyl substances (PFASs), consisting of a hydrophobic alkyl chain partly or fully fluorinated and a hydrophilic end group, have been extensively manufactured for a number of industrial and consumer applications such as oil, stain and water repellents for textiles and paper products, insecticides, surfactants, fluoropolymers, metal plating and cleaning, and lubricants. Their high bioaccumulation, extreme persistence and toxic properties make the study of their occurrence in the various environmental matrices and their biological effects of considerable interest.

The finding of PFAs in settling particles to the deep Western Mediterranean Sea confirms the role of particles with varying composition as ballast for the transfer of pollutants to the deep. This finding also confirms that those pollutants are transported very far from their sources and suggests that the deep Mediterranean basins are a major sink for them. High-energy, atmosphere-driven physical oceanographic processes enhance such transfer to the deep. We present data from winter 2012, when dense shelf water formation and subsequent cascading due to sea surface heat losses and evaporation triggered the flushing of large amounts of PFASs from the shelf and upper slope to depths in excess of 1000 m in the Northwestern Mediterranean Sea. We have found quantifiable concentrations of a number of PFASs including perfluorooctane sulfonic (PFOS), perfluorooctanoic (PFOA), perfluorononanoate (PFNA), perfluorohexanoic (PFHxA), and perfluorobutanoic (PFBA) acids. This, together with the recently revealed presence of the persistent organic pollutants (POPs) polychlorobiphenyls (PCBs), dichlorodiphenyltrichloroethane and its metabolites (DDTs), chlorobenzenes (CBZs) and hexachlorocyclohexanes (Salvadó et al., 2012; Environmental Science and Technology), as well as microplastic fibres including rayon, polyester, poliamides, acetate, acrylic and nylon (Woodall et al., submitted; Royal Society Open Science), confirm the deep Western Mediterranean Sea as a major sink for emerging environmental pollutants.

Pollution status of the seafloor of Saronikos Gulf

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Abstract

An attempt was made to synthesize the different observations on the benthic environment of Saronikos Gulf obtained in the framework of PERSEUS subtasks 2.3.2, 2.3.4 and 2.3.5. The Saronikos Gulf is subjected to intense anthropogenic pressures as it is the marine border of the cities of Athens and Piraeus. To the north, a shallow embayment is formed, the Elefsis bay. Several point and non-point pollution sources are present in the greater area of the Saronikos Gulf and Elefsis Bay. One of the most important point sources is the Athens/Piraeus wastewater treatment plant (WWPT), whereas the industrial zone of Athens, with numerous polluting activities, is situated at the Elefsis area. Data on benthic communities' status and condition as assessed by ecological status classification indices (ex. Bentix) combined with other indices such as Shannon diversity and species richness indices proposed by the MSFD guidelines for the Sea floor integrity descriptor, are correlated with heavy metal contamination levels of the surface sediments as well as concentrations of organic pollutants. Furthermore, the results from the experiments on the mobility and bioavailability of contaminants at the water-sediment interface are combined with toxicity tests (Microtox) of sediments and pore water samples. To complete the study of the pollution status of the seafloor of Saronikos Gulf, the density of benthic debris will be presented. The progress of the study of carbon storage as the key ecosystem process in *H. stipulacea* meadows vs. the native *P. oceanica* and *C. nodosa* meadows will be also presented.

Chemical pollution levels associated with coastal cities 'hot spots': Constanta, Split and Marseille

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Abstract

Coastal cities are potential pollution "hot-spots" where important anthropogenic activities take place, generating chemical pollution inputs to the marine environment. Organic chemical pollutants have been analyzed in surface seawater in three European coastal cities: Marseille, Split and Constanta. Toxicological data in sediments has been also included for Constanta. In seawater, spatial distribution showed higher levels of pollutants in proximity to point sources. In Marseille, highest levels of chemicals were associated to the city wastewater outlet, while in Split were associated to the inner part of Kastela bay. In Constanta, the highest concentration of pollutants was found in the vicinity of the harbor. Additionally, toxicological data indicated that the highest cytotoxicity and the highest ability to induce EROD activity were associated to sediments from Constanta harbor. Results in seawater were compared to Environmental Quality Standards (EQS, Directive 2013/39/EU) and discussed in relation to WFD and MSFD. In some cases, certain substances showed concentrations above 'annual average' and/or 'maximum allowable' EQS limits, both within and beyond 1 nautical mile distance to the coastline.

Biochemical responses to pollution in selected sentinel organisms across the south-east Mediterranean and Black Sea

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Abstract

Pollution effects were assessed by means of biochemical biomarkers (catalase (CAT), glutathione –S- transferase (GST), acetylcholinesterase (AChE) and metallothioneins (MT)) in five species at selected sites across south-eastern European Seas. The well established sentinel species *Mytilus galloprovincialis* was employed in the Adriatic Sea, Aegean Sea and Black Sea. Alternative sentinel species the mussel *Brachidontes pharaonis* and the fish *Mullus surmuletus* were used in the Levantine Sea where *M. galloprovincialis* was not available. The fish *Diplodus sargus sargus* and the gastropod *Rapana venosa*, were additionally employed in the Adriatic and the Black Sea, respectively.

CAT activity showed low variability in mussels *M. galloprovincialis* from different geographical areas (ranging from 1.6 to 5.0 units/mg proteins) and gastropods *R. venosa* (2.6-3.7 units/mg proteins), higher values in the two fish species (10.2 - 11.2 units/mg proteins) and highest activity in mussels *B. pharaonis (*31.2 to 38.8 units/mg proteins). The highest AChE activity was detected in *R. venosa* (from 286 to 289 units/mg proteins) and in both fish species (from 171 to 295 units/mg proteins). Particularly low GST activity was detected in mussels collected in the Slovenian coast (3.7-5.3 nmoles/min/mg proteins) whereas *M. galloprovincialis* from the other studied areas showed higher mean values (34.1 - 83.4 nmoles/min/mg proteins). The highest GST activity was exhibited by *D. sargus sargus* and *R. venosa*. MT mean values were low in mussels from the Lagoon of Venice in comparison with the other geographical areas, whereas the highest MT content was detected in *D. sargus sargus* (327and 428 mg/g tissue in reference and impacted sites, respectively).

Comparisons of biomarker levels between reference and impacted sites within each geographical area show a consistency in the biomarker responses of mussels *M. galloprovincialis* at sites described as impacted in the various geographical areas and similar trends although not significant, in mussels *B. pharaonis*. CAT, AChE and GST were the most responsive biomarkers to pollution in mussels. Among the alternative sentinel species used, only *R. venosa* showed marked responses of CAT and MTs. The approach based on the reference deviation concept for interpretation of overall biomarker responses proved useful but seemed to be biased by differences in the levels of contamination of the reference sites verifying the need for establishment of baseline levels of biomarkers.

Acknowledgement

Work was contribution from the course ‘Biochemical biomarker techniques for the assessment of pollution effects in marine organisms’ held in May and June 2013 at HCMR (Greece) under the PERSEUS training visits scheme 2013/2014.

Longterm deployment of the JRC Sealittercam on the Western Mediterranean Sea

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Abstract

Plastic litter floating at sea is a thread to marine wildlife through ingestion and entanglement. Quantification of litter objects is therefore a first step in order to determine the environmental state and to identify hotspot areas. The monitoring of floating meso/macro litter at sea is performed typically by ship-based observers. This time consuming observation can only be performed occasionally and suffers from low monitoring frequency, limited spatial coverage and variable data quality. In order to overcome these shortcomings, JRC has developed the Sealittercam to survey the sea surface unattended for floating litter. 4 images per second are being acquired and stored for later analysis by image recognition software (Trimble).

The camera was deployed unattended for 91 days at sea on a ship of opportunity (Costa Crociere) and acquired a total of 4.2 million images. The surveyed sea surface in that time was ca. 1100 km². After a prescreening procedure images are being subject to analysis in a 3 step procedure with an object based imaging analysis. The presentation shows the approach and first results from the image data analysis.

Litter composition and distribution in submarine canyons of the North Catalan margin from in situ ROV observations

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Abstract

Here we present preliminary results on the nature and distribution of litter in the large, deeply incised submarine canyons of Cap de Creus, La Fonera and Blanes located in the North Catalan margin. Our aim also is identifying the most likely sources of the different litter types and investigating the interactions betwen litter and high-energy hydrodynamic processes occurring in the study area. To this purpose a systematic survey was carried out during the PROMARES-OASIS DEL MAR research cruise onboard *R/V Sarmiento de Gamboa* by using the *Liropus 2000* remotely operated vehicle (ROV). Plastics were the dominant litter component followed by lost fishing gear and metal objects. Litter abundance in the studied canyons is higher than those reported in other deep-sea areas worldwide. The observed litter is mainly land-sourced and reaches the ocean through rivers and direct dumping along the coast in towns and industrial and recreational areas. Likely, sun and beach tourism and associated activities represent a relevant contribution mostly during summer months. While most of the largest concentrations were found in canyon floors at water depths exceeding 1000 m, relatively little litter was identified in canyon walls. This suggests an efficient transport of marine litter to the canyon floor and to mid and lower canyon reaches. Dense shelf water cascading (DSWC) and severe storms are the most energetic hydrodynamic processes in the study area and are, therefore, the preferred candidates as main carriers of land-sourced litter to the deep. The fact that the investigated canyons have their heads at short distance (<4 km) from the shoreline enhances their ability to trap littoral drift currents and also to convey the above-mentioned high-energy events to the deep, including their litter load. During the ROV dives we also noticed that different organisms such as crustaceans and fishes frequently use litter to shelter or hideout, while others like cold-water corals grow on it.

SESSION 4

Oral presentation of posters

SESSION 5

Stakeholders expectations regarding supports for elaboration of policies aiming to achieve GES

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Abstract

One of the main objectives of the Perseus project is to define a framework for future implementations of adaptive policies and management schemes aiming to achieve or maintain Good Environmental Status (GES) in the Southern European Seas. The framework developed to reach this objective includes two complementary components: i) a decision support system on the web, the Adaptive Marine Policy (AMP) Toolbox, worked out to assist policy-makers in the elaboration of policies; ii) Stakeholder platforms gathering experts involved in the implementation of the MSFD, at the levels of the four Pilot cases* and at basin scale.

After some considerations on the Stakeholder mapping, this paper will present the results of the stakeholder consultations conducted at Pilot case level. Interviews were conducted according a five steps pattern: 1) Clarification of the purpose and procedure for stakeholder consultations, in the context of the PERSEUS project, its scope and objectives; 2) Analyses of the marine and coastal ecosystem governance through the local institutional and organisational frameworks in which the MSFD is being implemented; 3) Opinions expressed by the interviewed stakeholders on their priority issues in terms of the risks of not achieving GES; 4) Emphasis on how the MSFD implementation steps are prepared, with a focus on the programme of measures and 5) Identification of the stakeholder expectations and needs regarding supports for the elaboration of the programme of measure and preparation of the PERSEUS AMP Toolbox tests.

*(i) West Mediterranean: Gulf of Lions - Catalan Sea; (ii) Central Mediterranean: Northern Adriatic Sea; (iii) East Mediterranean: Aegean Sea - Saronikos Gulf, and; (iv) Western Black Sea: Romania and Bulgaria

Development of a Methodology for the Identification of Significant Environmental Aspects in Mediterranean and Black Sea Ports

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Abstract

It is widely acknowledged that any kind of economic and industrial activity has a certain impact on nature. Port and harbour activities are not an exception, as they are very complex systems. Identifying the environmental aspects that are considered significant in a port is a first step in the prevention, control and mitigation of the potential impacts that may be generated.

According to the ISO 14001 (2004), an environmental aspect is defined as an element of the port authority's activities, products or services that can interact with the environment. A Significant Environmental Aspect (SEA) is the one that has or can have a significant impact on the environment. This significance is based on different factors, such as the commercial profile of the port, legal requirements, or local concerns.

Although it is highly recommended that each port should determine its SEAs in order to focus both time and efforts on those issues with major potential for environmental impact, the truth is that there is not a standardised process followed by port authorities to identify and select them. This conclusion was reached after a revision of the best practices in the environmental management in EU ports, and in particular in Mediterranean and Black Sea ones.

This led to the need of a tool to identify SEA in individual ports. This methodology, which has been developed in the framework of the PERSEUS project, consists of four different steps:

1. **Selection of port activities.** Each port has to provide (through a checklist) the list of activities that are performed in it.
2. **Provision of an initial list of aspects.** Each port activity is associated to several aspects. Based on the activities previously selected, a broad list of aspects is generated.
3. **Application of criteria.** A set of criteria is applied in order to reduce the extensive list of aspects to a shorter set of SEA. These criteria include issues related to the frequency, duration, stakeholders' complaints and severity of impact, among others.
4. **Identification of SEA.** In the last step, the tool provides the final set of Significant Environmental Aspects that is considered to be meaningful for the port.

Since the identification of SEAs is essential to set up the basis of any Environmental Management System (EMS), the output of this methodology is expected to assist managers and officers in their daily tasks of port environmental management. As a result, it is also expected that it will improve the overall quality of the environment in the port area.

References

- ISO (International Organisation for Standardisation), 2004. ISO 14001:2004 Environmental Management Systems – Requirements with Guidance for Use.

Making the Perseus observing data available in near real time and delayed mode

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Abstract

To set up a steady observing data flow, the PERSEUS observing components rely on existing European data management infrastructure: MyOcean for near real time data circulation and SeaDataNet for delayed mode data circulation. A MoU has been signed (December 2013) between Perseus, MyOcean and Perseus to formalize this coordination.

In addition, when drafting the PERSEUS DoW, it was identified as of first importance that the PERSEUS contribution to a global observing data system should be easily identified and available in a dedicated repository, as well as through the standard EU data distribution systems. To reach these objectives, 2 tracks have been identified: 1) a Data Management Handbook has been created to answer the following question: how do I have to proceed to share, within and outside the Project, the data I have had the responsibility to collect? 2) in the continuity of what was created during the SESAME project, the PERSEUS database has been adapted to be the final repository for PERSEUS data.
With these two components the PERSEUS project participants, responsible for data acquisition across a range of observing platforms, will be able to submit and share the in situ data collected under the umbrella of PERSEUS, ensure that this data is identified as PERSEUS data, and, be assured of its availability over the long-term for project participants and other science or society users.

This presentation will detail how the Data Management Handbook has been drafted and will explain how to submit and download PERSEUS data.

Near-real time sea temperature monitoring in the Mediterranean Sea

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Abstract

Operational oceanography has the aim to produce reliable ocean forecast to meet the needs of a wide users community. Decision Support Systems devoted to support a safer marine traffic, the management of the emergencies as well as coastal and environmental planning provide valuable results only when based on reliable forecasts. The huge amount of datasets released from operational oceanography are of importance to define the best monitoring sampling strategies and are useful for climatic and impact assessment studies. Nevertheless, good forecast rely on a sound observation system and to this end huge efforts have been made in the last years to develop and implement efficient observational ocean networks. Among the components of an integrated marine observatory, the expendable probes (XBT and XCTD) and ARGO floats represent the main tools to provide a wide coverage of relevant observations in the interior of the ocean at a basin scale.

Since 1999 ENEA is coordinating the monitoring activity of seawater column temperature in the Mediterranean by means of XBT probes operated by ships of opportunity (SOOP). This activity was planned as a part of EU-funded projects (Mediterranean Forecasting System - Pilot Project, and Mediterranean Forecasting System - Toward Environmental Predictions) and originally based on six north-south oriented and one east-west transects across the Mediterranean. Since 2006, only national activities survived: in Italy, under the coordination of GNOO (National Group of Operational Oceanography). Since 2012, three transects across the Mediterranean sea are regularly operated by ENEA under the EU projects PERSEUS and IONO.

At the end of each data acquisition, temperature profiles are subjected to quality control (specifically developed for Mediterranean seawater since 1999, with last improvements based on My-Ocean and SeaDataNet results) and sent to the Thematic Assembly Centre at HCMR in Athens. On the other hand, raw profiles are sent NOAA-AOML in Miami (USA) and included in the GTS network. Tests evaluating the confidence and the robustness of XBT measurements are periodically conducted and more complete metadata are realized.The collected data will be also relevant for the implementation of the observational networks required by the MSFD (Marine Strategy Framework Directive).The main routes operating, the data flow along with the recent improvements in the quality check procedures and the consistence of the historical available data set will be presented.

Mooring upgrades with new sensors and expansion under PERSEUS – Building a future strategy towards monitoring the South European Seas

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Abstract

Oceanographic observing networks in the Southern European Seas (SES) have been undergoing major changes during the last decade. Within the PERSEUS FP7 project framework, the review and upgrade of the current observing capacity has been highlighted and identified as a high priority activity that will lead to the provision of solid grounds for the implementation of MSFD. These actions are described under WP3 "Upgrade-expand the existing observational systems and fill short term gaps" objectives. In this work the upgrades implemented for open sea moored observatories in the Mediterranean and Black Seas are presented. This activity has been carried out under subtask 3.2.1 "Multi-parametric moorings upgrade with new sensors and expansion" for the last 20 months following 12 months of preparation and the adoption of Task 3.1 "Review of ocean observing systems in the SES and recommendations on upgrades to serve PERSEUS needs" (D3.1) outcomes. The review process identified several gaps including the lack of monitoring biogeochemical parameters and the scarcity of water-column and seabed monitoring. It also identified the need for new sensor technology integration.

With the joint efforts of the Task partners and PIs the upgrades of 7 deep open-sea mooring stations and of 3 coastal sites have been reported. In addition, 7 sites not mentioned in the project's description of work are also presented here, since they were upgraded with new sensors in key areas. These activities have introduced new sensor technology (optical, acoustic, etc.), and initiated the monitoring of new parameters through the plurality of the new state-of-the-art instruments that have been implemented. This will help to address MSFD by estimating qualitative descriptors such as eutrophication, alternations of hydrography, and noise. Nevertheless there are some remaining concerns regarding future planning and expansion of observing capacities in the Mediterranean and Black Sea.

Long-term studies of horizontal currents, acoustic backscatter and vertical thermohaline structure with moored mobile automatic profiler "Aqualog" in the north-eastern Black Sea

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Abstract

This presentation is focused on the data on seasonal and interannual variability of horizontal current velocities, temperature, salinity and density profiles acquired in 2012-2014 with the moored mobile automatic profiler "Aqualog" (*Ostrovskii and Zatsepin*, 2011). The profiler is built to carry a load of modern oceanographic instruments. It moves down and up along the mooring line as a sea 'lift' carrying various instruments including CTD probe, acoustic current meter, and optionally – oxygen, fluorimeter and turbidimeter sensors. The profiler mooring line is made of stainless steel wire that allows a user to extend the maintenance period of the mooring system up to several months. The programmable hardware of the profiler gives a possibility to set up the automatic operation algorithm (variable movement speed, time and period of the profiling, etc.).

In autumn 2012 the profiler "Aqualog" was installed in the north-eastern part of the Black Sea, near the town of Gelendzhik, five nautical miles away from the shore at the depth of about 250 m for long-term monitoring of currents and thermohaline stratification. Since that time the profiler was collecting data continuously during almost 2 years, interrupted for maintenance work that took from a few days up to one month. About 2-4 vertical profiles were measured daily, from the depth of 220 m to 15-30 m. In total, more than 1200 vertical profiles with horizontal velocities and complimentary CTD data were acquired.

The analysis of this unique data revealed oscillations of the permanent pycno-halocline position with the amplitude excursion up to 40-50 m and a characteristic period of 5-15 days. These oscillations result in a significant variation of oxygen-containing layer thickness and position of the oxic-anoxic interface that is hard to estimate on the base of intermittent ship-born measurements. Energy-bearing time scales were calculated via spectral analysis of the gathered data. The calculations have shown the presence of a pronounced maximum of alongshore current velocity oscillations with a period of about 12 days that corresponds well with the indicated above period of oscillations of the permanent pycno-halocline position. The most probable physical nature of these oscillations is the meandering of the Rim current and mesoscale eddy variability.

Vertical diurnal migration of zooplankton was observed in the water column using the acoustic backscatter signal.

The work was fulfilled in the frame of the PERSEUS FP7 collaborative project, under the agreement № 14.604.21.0044 with the Russian Ministry of Education, Program 23 RAS, RNF project 14-17-00382, and RFBR grants № 13-05-41450 and 14-05-00159.

Ostrovskii A.G., Zatsepin A.G. Short-term hydrophysical and biological variability over the north-eastern Black Sea continental slope as inferred from multiparametric tethered profiler surveys // Ocean Dynamics. 2011. V.61. P.797-806.

Perseus upgrade of float measurements in the SES

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Abstract

The monitoring of the SES with profiling floats has been enhanced as part of the Perseus Project. The number of standard floats measuring profiles of temperature and salinity has increased in most sub-basins of the SES. The goal was to obtain a uniform sampling throughout all the SES areas. In addition, floats equipped with bio-geochemical sensors have been deployed in key areas such as the Alboran Sea, the Ionian Sea and the Adriatic Sea. In the Black Sea, floats with CTD and dissolved oxygen sensors have been deployed. Floats with bio-geochemical (dissolved oxygen, chlorophyll, and CDOM, nitrate) and optical (radiances and PAR) are collecting interesting data throughout the Mediterranean and Black seas. After calibration/validation, these data are integrated in the Perseus database. More floats will be deployed in the SES in 2014-2015, in particular a float equipped with a sensor to measure nitrate and hydrogen sulfide will be deployed in the Black Sea. Preliminary results of these floats are presented.

Multi-Sensor Investigation in the Channel of Sardinia (MuSiCs)

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Abstract

In the framework of the EC funded project, PERSEUS (WP3, Subtask 3.3.1: Repeated glider sections in key channels and sub-basin) and with the support of JERICO TNA (FP7), a deep water glider (up to 1000m) was deployed from the R/V Tethys in the Sardinia Channel and has carried out 3 return trips during the period spanning from the 16th of August 2014 to the 19th of September 2014. The Gilder was equipped with CTD, O2 sensors, Fluorometers (ChlA), back scattering from 470 to 880 nm and was programmed to follow a path close to SARAL satellite track #887 (Figure 1).

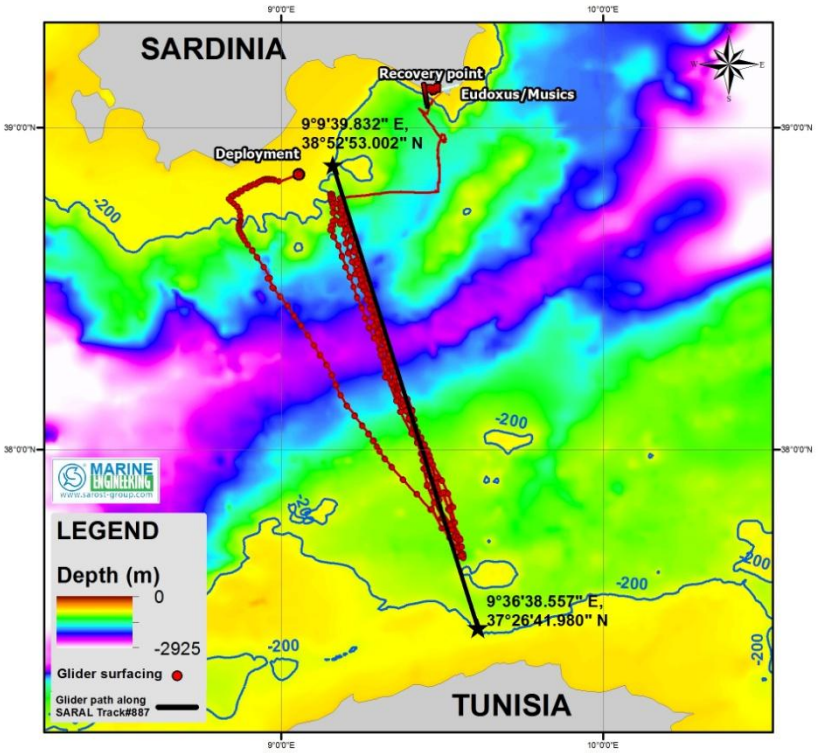

Figure 1: The Glider was planned to follow SARAL satellite track #887 (black solid line)

The Sardinia Channel is a zonally oriented passage connecting the Algerian and the Tyrrhenian basins, with a sill depth of about 1900 m. In spite of the considerable amount of work achieved and accurate results obtained about the circulation in the Western Mediterranean Sea, during the last 20 years, the Sardinia Channel is still one of the region where the dynamical processes and water exchanges are not clearly identified. In order to clarify some of these processes, including the behavior of the Algerian current and associated eddies, our methodology will be based on a combined approach using glider observations and sea surface height observation by satellite altimetry. The combination of satellite altimetry with independent in-situ data has demonstrated the benefits for improving our knowledge on mesoscale dynamics.

The main objectives of the experiment are :

- identification of the physical properties of the surface and intermediate water masses between Northern Tunisian Coast and Sardinia
- study of the variability of the physical properties of surface and intermediate water masses
- understanding exchanges through sub-basins and the complex interactions through eddies
- evaluation of the transport of water, salt and heat through the area and verify if the interannual variability of the surface and intermediate water masses is due to climatic changes;
- validation of the operational hydrodynamic numerical model of the western Mediterranean (http://www.seaforecast.cnr.it/en/fl/wmed.php) through the use of in-situ and satellite data
- assessment of the capabilities of coastal altimetry when validated by in-situ data

The data analysis is currently in progress. The first results will be presented and discussed.

Glider sustained observations in the Mediterranean

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Abstract

Since 2010, and even before for some part of the network, sustained transects with underwater gliders – the so-called endurance lines – are maintained in the Mediterranean Sea. Two areas are presently covered: the northwestern Mediterranean from the Gulf of Genoa to the Ibiza Channel, and the area South of Cyprus. This activity is supported by three main gliderports which have developed common practices in particular for the real time data flow: one in the South of France, one in Palma de Mallorca, one in Cyprus. These sustained transects have formed the long term observations period for several targeted projects in these areas. For example, from September 2012 to September 2013, intensive glider observations, combined with other platforms, have been carried out in the northwestern Mediterranean Sea. Such a high density network of platform has allowed a 3D description of the biogeochemical parameters of the most important blooming area in the Mediterranean. The sustained transects allowed to put this particular experiment in the context of the interannual variability in the area.

Thanks to the experience gained by the teams in these gliderports, tests for other transects in key areas have also been performed, mainly in the South Western Mediterranean. These transects have focused in the Algerian basin which circulation is key in distributing the Atlantic Waters in the other Mediterranean sub-basins and also constitutes a homogeneous area in term of trophic regime (biogeochemical province). In addition to some preliminary Observing System Simulation Experiment, there tests have allowed to achieved a first assessment of what could be the glider component of the future Integrated Mediterranean Marine Observations System.

This context also favors the emergence of a new glider activity in countries like Italy, Greece and Israel. In coordination with the already established glider facility in Cyprus, these countries are developing their glider facility and will cooperate to implement the glider observing system in the Adriatic and in the Central and Eastern Mediterranean. Plans are also developed in countries like Algeria and Tunisia which demonstrate the interest of the recent capacity-building workshops carried out in these countries.

The 'quiet revolution': continuous glider monitoring at ocean 'choke' points as key component of an EU cross-platform ocean observation strategy

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A quiet revolution is taking place in ocean observations; in the last decade new multi-platform, integrated ocean observatories have been progressively implemented by forward looking countries with ocean borders of economic and strategic importance. These systems are designed to fill significant gaps in our knowledge of the ocean state and ocean variability, through long-term, science and society-led, ocean monitoring. These ocean observatories are now delivering results, not the headline results of a single issue experiment, but carefully and systematically improving our knowledge of ocean variability, and thereby, increasing model forecast skill and our ability to link physical processes to ecosystem response. Part of the work in PERSEUS is to assess current observational gaps and needs, and then to develop recommendations and strategy for the development of a coordinated Mediterranean and Black Seas ocean observing system. Here we present the results from a 3-year quasi-continuous glider monitoring at a key circulation 'choke' point in the Western Mediterranean undertaken by SOCIB, the Balearic Islands Ocean Observing and Forecasting System, to highlight the results from one such component of the 'quiet revolution'. Then use this experience to reflect on what could be key components of an integrated EU strategy for ocean observing and forecasting, to meet both science and society needs.

SESSION 6

Presentation of the Adaptive Marine Policy Toolbox on the web

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Abstract

The EU MSFD and other ecosystem based managements of marine ecosystems, such as the EcAp initiative of the Mediterranean Action Plan, provide implementation of programme of measures or policies to achieve or maintain the Good Environmental Status. These policies correspond to the Response step of the well-known DPSIR framework. However, effects of Responses on Drivers, Pressures and States are often characterized by multiples uncertainties related to the dynamic of the considered anthropic and natural systems. In this context, the MSFD recommends to assess the socioeconomic impact of measures prior their implementation and to develop adaptive management, which by now is broadly seen as a natural, intuitive, and potentially effective way to address decision-making in the face of uncertainties (Williams, 2014).

To assist policy makers in the implementation of such policies in Southern European Seas (SES), PERSEUS has developed specific guidelines on the web, the Adaptive Marine Policy (AMP) Toolbox, on line in the Policy-makers corner of the project website.

The AMP Toolbox is structured around a five steps policy cycle, from "Set the scene" to "Evaluate and adjust policies" and twelve key activities such as "Involve experts and stakeholders" or "Develop Scenario's and perform Risk analysis". Around this core methodological structure, the Toolbox gives an easy access to methods, tools and databases useful to elaborate and implement adaptive policies in the (SES) at various scales. Some of these resources have been selected in existing ones, while others have been specifically developed in the framework of PERSEUS. The main features of the AMP Toolbox will be demonstrated during the presentation.

Reference:

Williams B. K, Brown E. D (2014) Adaptive Management: From More Talk to Real Action, Environmental Management (2014) 53:465–479

Towards the practical use of models: merging acoustics and IBMs to project anchovy dynamics in the NW Mediterranean

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Abstract

Advancing in the understanding of high trophic levels dynamics in the ocean often requires dynamic approaches where oceanography is embedded in population dynamic processes. We show the application of a Spatially-Explicit Individual-Based Model (SEIBM) to understand the recruitment process of European anchovy. The SEIBM is applied to simulate the effects of inter-annual variability in parental population spawning behavior and intensity, and ocean dynamics, on the dispersal of eggs and larvae from the spawning area in the Gulf of Lions (GoL) towards the coastal nursery areas in the GoL and Catalan Sea (northwestern Mediterranean Sea). For each of seven years (2003-2009), we initialize the SEIBM with the real positions of anchovy eggs during the spawning peak, from an acoustics-derived eggs production model. We analyze the effect of spawners' distribution, timing of spawning, and oceanographic conditions on the connectivity patterns, growth, dispersal distance and late-larval recruitment (14 mm larva recruits, R14) patterns. The area of influence of the Rhône plume was identified as having a high probability of larval recruitment success (64%), but up to 36% of R14 larvae end up in the Catalan Coast. We demonstrate that the spatial paths of larvae differ dramatically from year to year, and suggest potential offshore nursery grounds. We showed that our simulations are coherent with existing recruitment proxies and therefore open new possibilities for fisheries management. The application of these models for comparing systems and for projecting scenarios is discussed.

Investigating the northern Adriatic Sea ecosystem state with a very high resolution model

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Abstract

The northern Adriatic Sea ecosystem dynamics is simulated using the coupling of the BFM (Biogeochemical Flux Model) with the NEMO (Nucleus for European Models of the Ocean) model.

The modeling system is implemented at very high horizontal (~800 m) and vertical (95 z-level) resolution and is nested with a coarser scale Adriatic/Mediterranean model.

Simulation in hindcast and projection mode are being executed and are aimed to evaluate the ecosystem attributes (vigor, organization, resilience), in order to understand the ecosystem state of the basin with respect to the so-called "Good Ecosystem State" (GES) as defined by the EU-MSF9 Directive.

Skill of the model in replicating integrated environmental indices such as the EU-EEACS1023^{+} is also investigated.

Finally the model is also open to an off-line coupling with an higher trophic level (HTL) model.

Numerical simulation of inter-annual variations in the properties of the upper mixed layer in the Black Sea over the last 34 years

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Abstract

The Black Sea is a nearly land-locked basin where a combination of salt and heat budgets results in a unique thermohaline water mass structure. An important feature of the Black Sea is that oxygen is dissolved and rich sea life made possible only in the upper water levels. This is due to a strong pycnocline which cannot be mixed even by strong winds or winter convection (Shapiro, 2008). The upper mixed layer (UML) with a nearly uniform temperature profile and a very sharp seasonal thermocline at its lower boundary develops during the summer season (Sur & Ilyin, 1997). The deepening of the UML has an important effect on the supply of nutrients into the euphotic upper layer from the underlying nutrient-rich water mass. The temperature of the UML at any given location is dependent on the surface heat flux, horizontal advection of heat, the depth and the rate of deepening of the UML.

In this study we use a 3D ocean circulation model, NEMO-SHELF (O'Dea et al, 2012) to simulate the parameters of the UML in the Black Sea over the last 34 years. The model has horizontal resolution of 1/12×1/16 degrees and 33 layers in the vertical. The vertical discretization uses a hybrid enveloped s-z grid developed in Shapiro et al. (2012). The model is spun up from climatology (Suvorov et al., 2004); it is forced by the Drakkar Forcing Set v5.2 (Brodeau et al., 2010, Meinvielle et al., 2013) and river discharges from 8 major rivers are included. For each year the model is run from 1st January and the data for the period April to October are used for analysis. The sea surface temperature produced by the model is compared with satellite data (Modis–Aqua, 2013) to show a good agreement. The model simulations are validated against in-situ observations (BSERP-3, 2004; Piotukh et al., 2011). The analysis is performed for the deep basin where the depth of the sea is greater than 1000m. It clearly shows the interannual variations of both the SST and the depth of UML. The depth of UML is calculated using the method by Thomson (1976). It is highly dependent of the meteorological forcing, in particular the wind speed. The correlation between the variations of parameters of UML, the weather patterns, buoyancy fluxes and the kinetic energy of the UML circulation is analysed.

References

BSERP-3. Black Sea Ecosystem Recovery Project. BSERP-3 cruise, May 2004. http://www.research.plymouth.ac.uk/shelf/projects/Black_sea/C_S_BSERP3_final.pdf, 2004.

Brodeau, L., B. Barnier, A-M. Treguier, T. Penduff, S. Gulev : An ERA40-based atmospheric forcing for global ocean circulation models, Ocean Modelling, 31, (3–4), 88-104, 2010, http://dx.doi.org/10.1016/j.ocemod.2009.10.005

POSTERS

Preliminary assessment of microplastic pollution within benthic sediments of the Grand Harbour, Valletta (Malta, Central Mediterranean):data for Descriptor 10 of MSFD

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Abstract

Within the ambit of the Biodivalue project co-financed by the EU Commission and implemented by Maltese and Italian partners, sediment from three replicates at 5 sampling stations within the Grand Harbour on the Central Mediterranean island of Malta was collected by means of a 0.1m^2 van Veen grab. Sediments were stored in 90% ethanol and plastics were subsequently sorted by type, counted and weighed. Plastics recorded within the samples were classified on the basis of their dimensions, in the following categories: microplastic, macroplastic, megaplastic and plastic. Results indicate that the microplastic category constituted, in terms of number of fragments, the most abundant category, being responsible for 57.8 % of all plastic fragments, followed by the macroplastic category (19.8 %). The mean density of plastic litter within the sampled sediment was 894.4±628.2 N/m^3 and 11.3±11.8 g/m^3, with the highest values being recorded from station BN1 which was closest to drainage pipe. This study represents the first study on the categorization and quantification of plastic present within benthic sediment collected from a Central Mediterranean industrial harbour and its results are potentially useful for meeting the monitoring obligations of the Marine Strategy Framework Directive, within which marine litter is included as one of the 10 Descriptors.

Plankton of the western coast of the Moroccan Mediterranean sea (Fnideq - Oued Laou)

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Abstract

Located on the western Mediterranean coast of Morocco, the area Fnideq - Oued Laou is considered to be very sensitive for changes in natural orders and / or anthropogenic. According to previous works, the hydrodynamic of this area is mainly dominated by the jet of cold, low salinity Atlantic water at the exit of the Strait of Gibraltar, and the presence of a wide dispersion of rivers plumes. Thus, three areas have been identified, each with specific hydrological characteristics. In this regard, an oceanographic monitoring in the area Fnideq area - Oued Laou was undertaken from 2009 to 2014 in order to detect possible changes in abundance of planktonic components. Indeed, environmental changes affect productions, primary and secondary, and also fish species, through ichthyoplankton (eggs and larvae), that is a critical phase of the life cycle of fish species to economic interest.

Assessment of gaps and harmonized approach of national monitoring programmes in the EU and non-UE countries within the Black Sea region

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Abstract

The work package 5 of the PERSEUS project aims to strengthen networking and increase the SES capacity for ecosystem state assessment, definition of Good Environmental Status, monitoring and management based on the descriptors, and to provide tools for the application of common principles in non-EU countries of the SES. The study performed within this WP has been based on data provided by the EU countries (Romania and Bulgaria) in the Initial Assessment Reports (Art. 8 of MSFD) and the available monitoring data existed in the non-EU countries (Ukraine and Georgia). The new data collected within several joint surveys carried out in 2013 and 2014 in the Black Sea and Mediterranean basins occasioned the cooperation between international scientific teams from Romania, Bulgaria, Turkey, Ukraine, Georgia, which focused their research on specific topics. One of the most concerning studies performed simultaneously by several institutions in different Black Sea regions pursued the ecosystem based approach and the analysis of component elements (e.g., species biodiversity, populations abundance and distribution), evaluation of impact of invasive species, evaluation of key components of food webs, eutrophication (nutrients concentration, nutrient ratios), habitats degradation, marine and seafood contaminants in the Black Sea. In order to assess the environmental status of the Black Sea, common methodologies and parameters have been used for several indicators. The paper will deal with detailed presentation of the new parameters and indicators agreed by both EU and non-EU countries to evaluate the environmental status of the Black Sea environment.

Example of marine adaptive policy: The case of the re-oligotrophication of Saronikos Gulf (Greece)

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Abstract

During the last decades of the 20th century, the PERSEUS case study area "Saronikos Gulf" used be a hot spot of eutrophication, due to massive untreated urban waste water disposure. Ten years after the implementation of the EU waste water treatment policy (Directive 91/271/EEC) there was spectacular improvement of the sea water quality. The main result was a re-oligotrophication, which was clearly marked by the decrease in the abundance of the nitrophilic green algae *(e.g. Ulva spp.)*. But, in parallel, there was also decrease of the big brown algae (e.g. *Cystoseira spp*.), which according the Water Framework Directive (2000/60/EC) are indicators of good ecological status. Actually, on the rocky coasts of Saronikos Gulf there is a spectacular increase of sea urchin populations (e.g. *Paracentrotus lividus*), which are over-grazing on the big brown algae populations. As the EU conservation policy does not allow the collection of sea urchins for commercial purposes, it is probable that in the next decade the big brown algae populations will be totally lost.

In our point of view the case of Saronikos Gulf shows how the implementation of the waste treatment policy reviled the contradictions between the conservation policy and the ecological quality policy. An adaptive policy, aiming the regulation of the sea urchin over-population, could lead to the establishment of a balanced rocky coastal ecosystem in the study area. Proposal for elaboration of such policy will be presented, using methods and resources of the PERSEUS Adaptive Marine Policy Toolbox.

Preliminary studies in preparing MSFD application for GES assessment

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Abstract

Studies within the EU FP7 Project PERSEUS widely revealed, on SESs scale, the state of marine ecosystems, their present situation, the working methods and the gaps in order to improve some negative aspects.

In accordance with the principles and objectives of the Marine Strategy Framework Directive (MSFD), 2008/56/EC, the main tasks with regard to basin-wide application of MSFD implementation elements of UE FP7 PERSEUS Project are to identify, develop and promote instruments and methods to assess the environmental status across the SESs (Mediterranean and the Black Sea basins) with emphasis on non-EU countries.

Based on results obtained in the EU FP7 project PERSEUS, the research team involved in the work package on "Basin-wide application of MSFD implementation elements" made an analysis of the reports submitted by the Member States (MS) on the initial assessment (IA) and the GES assessment in accordance with MSFD, mainly concluding:

- lack of regular monitoring;
- lack of adequate monitoring networks;
- lack of monitoring for special purposes;
- national monitoring programs overlap wastage and non-compliance results;
- lack of information on the extension of monitoring at spatial and temporal scale;
- lack of data on the intensity and frequency of environmental pressures and their impact on biodiversity.

The results explain partially the final conclusions of the study, such as:

- The IA report and GES output are partially documented;
- Data are missing for a number of criteria → lack of operational methodological elements;
- Assessments are predominantly on sectors / species, considering products separately;
- A more inclusive and comprehensive analysis is necessary in the near future;
- Absence of thresholds presentation → requires further development;
- Knowledge among countries are heterogeneous → the situation should be improved;
- WFD methodologies are prevalent (80%) → they should be recommended for larger use in non-EU countries;
- The most successful combinations of methodologies are those presented in the European Directives, Regional Sea Conventions and the national methods → the methods should be recommended for general use;
- Methodologies are poorly harmonized, and thresholds, as a rule, are not available → need improving.

In this presentation the authors have proposed emphasizing several recommendations to improve the future assessments and possibilities of comparing GES results concerning SESs.

In full agreement with the MSFD, the PERSEUS Project provisions and on the basis of some EU Member States (MS) reports on the initial assessment (IA) and assessment of good ecological state (GES) in some basins of the SESs system, there was made the characterization of the 11 descriptors together with the presentation of the criteria and defining indicators of the respective states.

Sedimentation and mixing rates in the Levantine Sea

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Abstract

Preliminary results of the measurements of $^{210}Pb_{xs}$ and ^{137}Cs in sediment cores from the Levantine Sea are presented. These radionuclides, used to date sediments and hence to calculate sedimentation and mixing rates, when coupled to metal and organic pollutants, , enable to assess the accumulation of pollutants in the seabed in decadal scale, and to distinguish present conditions from pristine states of the basin. Five sediment cores were sampled along two transects perpendicular to the eastern Mediterranean coast, with an along-shore distance of about 130 km. This sampling configuration should capture the variability introduced by the distances from land-base sources of pollution (East-West component) and from the Nile delta (South-North component).

The sampled area includes three different sedimentary environments: the continental shelf (H01 core), the continental slope (H02 and S4_01) and the abyssal plain (G5 and G30). In each core the layer that has been influenced by the recent contaminants (since 1950 till today) has been identified. The H01 core is mainly affected by sedimentation rather than bioturbation processes, even with some uncertainty introduced by the effects of an important organic fraction. The Mass Accumulation Rate (MAR) is about 0.1 g cm^{-2} y^{-1}, in the range of low coastal rates. The impacts of the industrial era are surely restricted to a layer near the surface (thickness≈10 cm).

The H02 and S4_01 cores were sampled in a steep slope environment: the distribution of radionuclides is then possibly affected by relevant horizontal mass fluxes. The whole cores are affected by recent inputs (37 and 35 cm depth, respectively), probably due to lateral transport. These irregular depositions are shown by layered profiles. The overall MARs are in both cores about 1 g cm^{-2} y^{-1}, typically observed in depositional environment with high sedimentation such as estuaries.

In the deep cores (G5 and G30) the radionuclides distribution show the typical decay near the surface (till 3-4 cm) and a sort of tail till the layer 6 – 7 cm (4-5 g cm^{-2}) and requires further studies. The exponential decay near the surface has the typical length observed in other cores from the Eastern Mediterranean, comparable to Atlantic and Pacific oligotrophic areas.

The vertical profiles of metal concentrations will be discussed together with sedimentation rates.

Black Sea Experiment (BSEX)

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Abstract

Experienced teams in several of the Black Sea regions designed a specialised study with emphasis on addressing MSFD descriptors, which demand more detailed investigations. By making use of experimental investigations or process models the BSEX team mainly aims to address 3 defined hot topics; eutrophication, invasive ctenophores, anchovy spawning areas.

During the BSEX 2013 joint cruises the level of eutrophication and distribution of phytoplankton, zooplankton and impact of gelatinous zooplankton is studied and changes in the phytoplankton composition are addressed with respect to decreased concentrations of certain micronutrients (such as silica and phosphorus). Temporal levels in the concentration of invasive ctenophores and their impact on native zooplankton and especially on fish are updated. Modern spawning areas most abundant fish is investigated by sampling eggs and larvae of anchovy during the peak spawning seasons.

Time series of carbonate system variables at the POSEIDON-E1-M3A site (Cretan Sea, Eastern Mediterranean)

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Abstract

In 2000, a moored multi-sensor array was installed in the Eastern Mediterranean (Cretan Sea), at the POSEIDON-E1-M3A site (1400 m depth-~20nm offshore), aiming to create a long time-series observatory of physical and biochemical parameters. Since 2010, R/V monthly visits are performed, involving CTD casts and water/plankton sampling. During the period October 2011-December 2012, sampling for the determination of carbonate system parameters (C_T [total dissolved inorganic carbon] and A_T [total alkalinity]) was also included.

The monitoring of physical and biochemical parameters during October 2011-December 2012 depicts the importance of this type of pelagic monitoring site, revealing important interannual variability. In addition the ultra-oligotrophic character of S. Aegean open waters and an important seasonal variability was also denoted. The ultra-oligotrophic character was reflected by the total chlorophyll-a maximum in the "spring bloom". The mechanism observed was the classical homogenization of the water column during late winter-early spring bringing nutrients to the surface layers resulting to the spring bloom. The important feature is that the timing of this succession may vary 1-2 months from year to year causing a respective variation of the resulting bloom "strength".

During the same period, the C_T values measured in E1-M3A site varied between 2267 μmol kg^{-1} and 2338 μmol kg^{-1}, while the A_T values ranged from 2602 μmol kg^{-1} to 2672 μmol kg^{-1} in accordance with previous findings stating that the eastern basin is clearly characterized by A_T>2600 μmol kg^{-1}.

The vertical profiles of C_T reveal in December considerably higher C_T concentrations in the waters deeper than 100m, in relation to May 2013 that could be attributed to respiration/remineralisation processes.

The dependency of C_T time-series data on the corresponding chlorophyll-a concentrations was examined and exhibited very weak negative linear correlation (r^2= 0.137) implying that the biological activity has a slight effect but is not the driving force of the C_T variability in the upper layer of the Cretan Sea.

In addition the A_T fields will be reconstructed based on CTD data using the appropriate relationships for the Mediterranean Sea and will be compared with the measured A_T values.

A new generation end-to-end model to analyse the Black Sea environmental status

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Abstract

A three-dimensional hydrodynamic model coupled with a new generation end-to-end (biogeochemical and a higher trophic level, HTL) model developed for the Black Sea to provide an integrated analysis of ecosystem attributes that will contribute to the criteria relevant to the MSFD descriptors. The biogeochemical model, including the carbonate module, comprises 19 state variables. The trophic interactions within the food web are controlled by top-down pressures introduced by small pelagic fish and gelatinous carnivore (*Beroe ovata*) and from the bottom-up by resource availability. The autotrophs are represented by four groups of phytoplankton. Coccolithophores are introduced as a separate group due to their special feature of calcification ($CaCO_3$ formation). Concentration of $CaCO_3$ attached to coccoliths and some small zooplankton species is also introduced as an independent state variable (Ca). The consumers comprise four zooplankton functional/species groups including the carnivorous gelatinous species *Mnemiopsis leidyi* (Z_g). Dissolved oxygen (O_2) and hydrogen sulfide (HS) are two additional state variables describing the redox processes across the suboxic-anoxic interface. The redox model of the oxic-anoxic interface zone is represented by a simplified set of reaction kinetics, which maintain stability of the anoxic interface without resolving many details of the complex biogeochemical features. The HTL model used in this project for the Black Sea is a FORTRAN implementation of the Ecopath with Ecosim (EwE) model developed at IMS-METU. The model includes 13 fish species and is forced using spatial averages of the required LTL compartments.

Model system is used to carry out hindcast analyses for 1980-2013 period and forecast analyses for the 2013-2020 time period assuming “business as usual” conditions in the anthropogenic pressure acting on the Black Sea. Model performance is analysed based on the 20 yr hindcasts by assessing the potential spatial and temporal scales of predictability of seasonal, and interannual annual forecasts appropriate to both lower and higher trophic levels.

The results indicate that the Black Sea model system demonstrate a range of skill, depending on the variables chosen. Physical variables (e.g. T, S) are generally have the most skill) followed by chemical variables (e.g. O2, Nutrients) then plankton variables (e.g. chlorophyll) for the coupled hydrodynamic LTL models. The HTL model have more skill for small pelagic fish (e.g. Anchovy) than larger pelagic and demersal fish.

Investigations of Peculiarities of Main Pelagic Fishes Diet in the Zmiinyi Island Coastal Waters During 2013-2014

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Abstract

Results of the studies carried out in 2013-2014 in the framework of the FP7 PERSEUS Project (Subtask 2.3.4b: Assessment of bioaccumulation and trophic biomagnification in short coastal and pelagic food webs) have been presented.

Brief account of standard methods of samples collecting from the Zmiinyi Island coastal waters in 2013-2014 and their analysis has been given. Detailed description of methodology of fish stomach content biological analysis has been presented.

Diets of the following main pelagic species in the Zmiinyi Island coastal waters have been described and analysed: bluefish *Pomatomus saltatrix* (L., 1766), horse mackerel *Trachurus mediteraneus ponticus* Aleev, 1956, Black Sea anchovy *Engraulis encrasicolus ponticus* (Alexandrov, 1927) and Black Sea sand *Atherina pontica* (Eichwald, 1831). Analysis of Relative Importance Index of prey items sizes for horse mackerel and bluefish has shown that its main diet comprised fish.

It has been shown that the most significant diet for anchovy and Black Sea sand were planktonic crustaceans and polychaete. Sizes of Food Similarity Index and Species Similarity Index of bluefish and horse mackerel and the values of the same indices for Black Sea anchovy and Black Sea sand in the period of studies appeared to be quite high, which has evidenced similarity of the studied pelagic fish species diets in the Zmiinyi Island area.

Danube Flow Influence on the Zmiinyi Island Coastal Water Quality and Microbiota and Phytoplankton Community

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Abstract

Results of study of the Danube flow influence on the Zmiinyi Island coastal water quality including microbiota and phytoplankton community state performed in the framework of the PERSEUS Project Sub-Task 2.3.1a "Changes in environmental parameters and impacts on plankton" have been presented.

Statistical connections between the Danube runoff rates and indicator of coastal water quality – (TRIX) index, as well as phytoplankton and bacterioplankton abundance and biomass have been analyzed for 2004-2013. It has been shown that no reliable connection between runoff rates, TRIX index values, phytoplankton and bacterioplankton abundance and biomass was revealed.

Analysis of temporal distribution of the studied characteristics has shown that average annual TRIX values varied from 4.8 (2013) to 5.8 (2004), at that, runoff rates during those years were approximately equal. In the years of minimal (2012) and maximal (2010) runoff rate the TRIX index has also been the same and made 5.0, which indicated stability of water quality in the Zmiinyi Island area that practically did not depend on the Danube annual flow.

Studies of statistical interconnections for some years (2005, 2012-2013) have shown that coefficients of correlation between the studied parameters and river discharge were quite high. It has been revealed that in 2012-2013 positive correlation coefficient between the TRIX index and the Danube discharge was observed, which equaled to 0.48 ($p>0.1$). Practically no statistically significant interconnections between river flow and phytoplankton and bacterioplankton characteristics have been discovered. However, statistically significant positive correlation ($r=0.33$, $p>0.01$) has been revealed between the Danube flow rate and green algae (Chlorohhyta) biomass in the Zmiinyi Island coastal waters, which could evidence inflow of desalinated river water into the Zmiinyi Island area.

Based on results received the following conclusion has been made: the Zmiinyi Island area could be referred to the Black Sea areas having minimal anthropogenic influence.

Organic priority substances and microbial processes in marine coastal sediments (Adriatic Sea, Italy)

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Abstract

PERSEUS EU FP7 Project aims to identify the interacting patterns of natural and human-derived pressures on the Mediterranean and Black Seas, to assess their impact on marine ecosystems and, using the objectives and principles of the Marine Strategy Framework Directive (MSFD) as a vehicle, to design an effective and innovative research governance framework based on sound scientific knowledge. In the frame of this Project (subtask 1.3.3 ADREX: Adriatic and Ionian Seas Experiment), a preliminary monitoring survey has been conducted in the Adriatic Sea (Italy) in order to verify the occurrence and the variation of selected classes of organic priority substances in sediments and to study the structural and functional characteristics of native bacterial communities. The study site represented a good natural laboratory sensitive to climate variability and human pressure, owing to the semi-enclosed nature of the Adriatic Sea and to the increasing trend of human activities in the coastal regions. During the cruise ADRI-13 (November 2013), we sampled three coastal areas nearby Ancona, Gargano Promontory and Bari. Surface sediments were collected in all areas, while sediment cores were sampled in selected sites. The sediment contamination level was determined by measuring the concentration of contaminants included in the list of organic priority substances: PAHs, PCBs, organochlorine pesticides (OCs), bisphenol A (BPA), alkylphenols (Aps), selected on the basis of the anthropogenic pressure. The extraction-clean-up for the PAHs, BPA and Aps was performed by ultrasonic bath with the appropriate solvent, followed by analytical determination with LC-MS and HPLC UV-fluorescence. The extraction of PCBs and OCs was performed by Soxhlet extraction and the concentrated extracts were cleaned-up using acidic silica chromatographic column, followed by determination on GC-ECD. The sediment bacterial abundance was determined by epifluorescence microscopy; the rate of bacterial carbon production was determined by measuring the ^{3}H-leucine uptake rates and the community respiration was estimated by the measurement of the *electron transport system* (ETS) activity. The analyses of organic pollutants and microbial functional properties in marine sediments described the impact of anthropic pressure on the selected coastal areas. Microbes associated with marine sediments play an important role in the C-flux being responsible for the transformation of organic carbon (autochthonous and allochthonous) into biomass. At the surface layers, the microbial carbon assimilation and mineralization rates were affected by the increasing concentration of pollutants. The higher concentrations of organic pollutants were measured in the deeper sediment analysed (20 cm), along with the reduction of microbial metabolic activities. The results of this study can contribute to acquire information to improve MSFD and to reach the good environmental status.

Results of Toxic Pollutants Bioaccumulation Study in the Zmiinyi Island Coastal Water Area in the Black Sea (2013-2014)

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Abstract

Toxic pollutants bioaccumulation in hydrobionts has been one of the main Black Sea problems. The aim of our studies in the framework of PERSEUS Project (Subtask 2.3.4b - Assessment of bioaccumulation and trophic biomagnification in short coastal and pelagic food webs) has been to study the current state of marine environment toxic pollution with trace metals (TM), organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs) and polyaromatic hydrocarbons (PAHs) in the Zmiinyi Island area. Methodologies of fish, molluscs, water and bottom sediments sampling and analysis carried out during 2011-2013 by the staff of the Research Station of Odessa National I.I.Mechnikov University "Zmiinyi Island" have been briefly described. Analyses of marine environment samples have been carried out in accordance with the national methods and the methods recommended by the ISO in the laboratory of the Ukrainian Scientific Centre of the Ecology of Sea. The data on coastal sea water, bottom sediments, fish and molluscs pollution for 2013-2014 with OCPs, PCBs, TM and PAHs are presented and being analyzed. Assessments of toxic substances bioaccumulation in fish and mollusc tissues have been performed. Coefficients of pollutants accumulation in fish and mollusc tissues have been calculated and are discussed using the data on the pollutants concentration in water. The origin of pollution in coastal water, sediments and fish and mussel species near the Zmiinyi Island has been discussed. Results of studies of the levels of TMs, OCPs and PCBs accumulation in hydrobionts in connection with the age of hydrobionts (fish and molluscs) have been considered. The levels of toxic pollution have been compared for coastal waters of Odessa Bay and the Zmiinyi Island areas under different anthropogenic impacts with the conclusion that the Zmiinyi Island area could be used as a reference site.

Current State of Ichthyofauna and Macroinvertebrates in the Zmiiniy Island Coastal Waters During 2013-2014

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Abstract

Results of macroinvertebrates and fish fauna studies carried out in the Zmiinyi Island coastal waters in 2013-2014 in the framework of the FP7 PERSEUS Project, Sub task 2.3.1b: Pelagic fish (Action 4: Diversity and feeding of the main pelagic fish community in the NW Black Sea) have been presented. Standard methodologies using hydrobiological samplers have been briefly described. During the period of studies visual observations have been performed using diving outfit. Altogether during the period of studies over 70 catches of fish and 30 samples of macroinvertebrates were analysed. As the result of the analysis ichthyofauna species list (comprising 65 fish species belonging to 17 orders 40 families, 54 genders) and macroinvertebrates species list (78 species, in 12 cases benthic organisms identification has been developed to higher taxa level) have been improved. Structural characteristics of ichthyofauna and macroinvertebrates fauna, as well as distribution of their species with depths and substrates in the island coastal waters have been analysed. Main hydrological parameters that influenced fish and macroinvertebrates diversity have been determined. Analysis of aggressive invasive Rapana mollusk impact on the Zmiinyi Island coastal biocenosis has been performed. It has been shown that total biomass of macroinvertebrates, which 70-80% consisted of mussels, decreased during past 7 years from 8300 t to 3700 t. Decrease of mass bottom fish species abundance has been pointed out, first of all round goby, whose main diet consists of mussels.

Concept of National Integrated Environmental Monitoring and Assessment in the Ukrainian part of the Black Sea.

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Abstract

The National Black Sea Integrated Environmental Monitoring and Assessment (BSIEMA) Concept for the purposes of Marine Strategy Framework Directive (MSFD) and Water Framework Directive (WFD) implementation in the framework of Association Agreement between EU and Ukraine, as well as with the view of Ukrainian obligations under the Black Sea Convention (BSC) fulfillment has been presented based on findings of EMBLAS and PERSEUS projects and is proposed as a basis for the National BSIEMA Program Development.

The BSIEMA cycle, which should comprise not only performing of observations and their analyses, but also other stages, such as formulation of Information needs, the Monitoring and Assessment strategies, Monitoring Networks, Monitoring Programs etc. has been presented and discussed. The map with areas of interest and lists of observations required for MSFD, WFD and BSC are cross-analyzed. It has been proposed that the efforts of National Authorities and Researchers in the Black Sea region should be exercised to establish the future Joint BSIEMA System, as the Black Sea is a unique water body with very interferential mutual impact/influence between different parts of the sea. Monitoring and Assessment strategies should be based on the DPSIR and Ecosystem-wide approach declared in the BSC Diagnostic report (2010) and used in the MSFD. The natural media of the Black Sea ecosystem (water, atmosphere over the sea, coastal zone, river mouths, bottom sediments and hydrobionts) should be taken into account when studying impacts/pressures. Influence of all those impacts/pressures on the state of the entire BS including trans-boundary impacts and tracing of climate changes should be duly taken into consideration. Steps for joining of existing programs of different Ministries into a single National Program have been proposed. Strategy of National Monitoring Sites Network development has been grounded.

Measurements of underwater sound at the north-eastern Black Sea shelf providing data for the Descriptor 11 of MSFD GES

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Abstract

A series of short-term continuous acoustic measurements were carried out at the north-eastern Black Sea shelf near the Gelendzhik Bay in 2013 and 2014 in accordance with the Subtask 2.3.5 b) of the PERSEUS work plan. Each year two autonomous hydroacoustic stations were deployed for roughly one week at two locations approximately 6 km apart in summer and at the same points in autumn, when conditions for sound propagation are different. Although the primary objection of the measurements was to analyse the low-frequency sound (the 63 Hz and 125 Hz center-frequency third octave bands are recommended by the MSFD-GES as basic frequency bands for the Indicator 11.2.1), the frequency band of the recordings lies between 20 Hz and 16 kHz, which contains the main energy input from anthropogenic and natural sources of underwater sound. Energy input from transient sound sources of high intensity is analysed as well as dependence of the received signal characteristics on weather conditions during periods of absence of distinguishable sound sources.

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