



Final report on Summer Schools

Deliverable Nr. 8.2





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EXECUTIVE SUMMARY / ABSTRACT

This report describes the main objectives, implementation details and outputs of PERSEUS summer schools held in Constanza, Gelendzik and Anavyssos.

SCOPE

The specific objective of this deliverable is to give an overview of the three training courses held within the course of the PERSEUS project, providing details of the thematic content of the same training courses and of the skills imparted to participants as a result of such training. In this way, this deliverable might prove useful to those entrusted to design and offer future marine environmental policy training in the SES as a showcase of good training practice.

By underscoring the most significant outputs emerging from such training courses, this deliverable also aims to demonstrate how PERSEUS has contributed in a tangible manner towards a new scientific vision for the SES. This deliverable achieved this jointly with the two sister deliverables 8.3 and 8.4, contributing to the fostering of a PERSEUS community of trained MSFD practitioners who can extend the legacy of such a project beyond its lifetime by assisting their respective countries and institutes in achieving MSFD goal compliance through the PERSEUS training they have received.



1. CONSTANZA SUMMER SCHOOL

1.1 Summary of the summer school characteristics

The summer school “The contribution of environmental indices in meeting the objectives and principles of the Marine Strategy Framework Directive” was held in Constanta, Romania, between 3rd and 7th June 2013.

The theme for this PERSEUS Summer School was targeted to give participants detailed insight into the most relevant environmental indices ranging from lower to higher trophic levels, thus contributing to build experience in the formulation of scientifically based synthetic assessment of the state of the marine environment. The lectures on theoretical aspects were supplemented with dedicated practical applications in selecting, computing and using such tools.

The main objectives of the summer school on the contribution of environmental indices in meeting the objectives and principles of the Marine Strategy Framework Directive were:

- to expose participants to aspects of the theoretical and practical background on the assessment of the benthic ecological status using the index M-AMBI (multivariate AMBI - AZTI's Marine Biotic Index) and MSFD assessment issues;
- to provide participants with the most important concepts related to the fishery related indices;
- to get participants acquainted with the main applications of ocean color based index/eutrophication-related core set indicators CSI023 (chlorophyll-a);
- to present theoretical and practical aspects of characterization of the ecological state of marine and coastal waters using Trophic index (TRIX);
- to establish links between different researchers involved in the field of environmental indicators related with MSFD.

1.2 Details of the summer school implementation

1.2.1 Content

The summer school programme is available in the Annex 1.1. The summer school included the following topics:

Day 1: Fishery related indices

The opening session of the course gave participants a broad overview of fishery related indices. In particular, this session briefed students about criteria and indicators related to Descriptor 3 of MSFD. Such a session also gave an insight about the size based indicators and F_{msy} framework - worldwide experience. Also practical applications for Indicators' calculations - choice, examples and exercises were included, together with region specific applicability and future proposals.

Day 2: AMBI, M-AMBI indices and MSFD assessment issues

The main scope of this section of the course was presenting the concept of the Integrative Ecological Status Assessment in Implementing the European Water Framework Directive and the Marine Strategy Framework Directive. Ecological



indices based on macrobenthos: the case of AMBI and M-AMBI in assessing seafloor integrity status were explained to the participants, followed by practical applications of using AMBI and M-AMBI: computation, application and exercises.

Day 3: Characterization of the ecological state of marine and coastal waters using the Trophic Index (TRIX)

Within this session, participants were briefed on definition of environmental indices and their use in MSFD, coastal eutrophication and socio-economic aspects related with eutrophication management. Participants were also given an overview of Northern Adriatic sea system: Emilia-Romagna coastal waters, N/P ratio and the history of the Trophic Index, follow in the afternoon session by practical examples of computation, applications and exercises using TRIX.

Day 4: Field trip in Constanta Harbour

Day 5: Ocean Color Based Index

The scope of this session was the assessment of existing Ocean Color based indicators on Eutrophication. The Ocean Color products: what is available and how to access to the data were overviewed, and a comparison of ocean color and in situ chl-a products, together with a specific case for the Mediterranean Sea were presented. Practical examples related with Ocean Color data access, Chl-a Climatology computation and Ocean Color trend Index: computations were included in the afternoon session.

1.2.2 Participants

The school appealed to a broad range of participants, young researchers and PhD students, from both PERSEUS partner and non-partner institutions, with a scientific background in biological, physical and/or chemical oceanography, willing to expand their field of interest and to disseminate the experience gained from the school to others.

A preliminary screening phase of 29 summer school applicants was conducted by the Selection Committee of PERSEUS: the course scientific coordinator, WP8 leader and the course local organizer. School participants were chosen on the basis of their potential, with the most promising and qualified candidates being generally favoured. Selected school participants were young scientists who had some degree of experience and involvement in the field of environmental indices.

On top of the selection, 7 Romanian scientists (5 NIMRD & 2 GeoEcomar) participated at no cost to the project. Overall, 20 participants attended the course (Table 1). Participants represented a number of countries: Italy (3 participants), Spain (2), Croatia (1), Turkey (2), Russia (1), Romania (7), Bulgaria (1) and Ukraine (3).



Table 1: Participants' details

Country	N of participants	Name	Affiliation	Specialization	E-mail /Telephone
Bulgaria	1	Stefania KLAYN	Institute of Biodiversity and Ecosystem Research - Bulgarian Academy of Sciences (IBER-BAS), Sofia, Bulgaria	Marine ecology, soft-bottom macrozoobenthos, biological oceanography, coastal ecosystems	stefaniaklayn@yahoo.com/ +359898468683
Croatia	1	Jelena MANDIC	Institute of Oceanography and Fisheries, Split, Croatia	Chemical oceanography; Biogeochemical cycle of organic pollutants in marine environment	mandic@izor.hr/ +38599/7068814
Italy	3	Almudena CANOVAS-MOLINA	DiSTAV (Dipartimento di Scienze della Terra, dell'Ambiente e della Vita) Università degli Studi di Genova. Genova, Italy	Oceanography/ Environmental Science; benthic habitats	almucanovass@gmail.com/ +393271848159
		Fabiola FANI	Department of Biology - University of Florence, Florence, Italy	Physiology and taxonomy of phytoplankton; assessment of the quality status of marine waters	fabiola.fani@unifi.it/ +393491288352
		Emanuela	Università di	Aquatic toxicology,	e.fiori

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		Mihaela MURESAN	National Institute of Research and Development for Marine Geology and Geoecology - GeoEcoMar, Romania	Zooplankton and meiobenthos assessment	mmuresan@geoecomar.ro
Russia	1	Nadezda ROMANOVA	PP Shirshov Institute of Oceanology RAS, Moscow, Russia	Marine microbiology	Romanova-Nadya@yandex.ru +7917 5446454
Spain	2	David MARCH-MORLA	Mediterranean Institute for Advanced Studies, Balearic Islands, Spain	GIS; Fisheries; Integrated Coastal Zone Management (ICZM); Marine Spatial Planning (MSP);	david@imedea.uib-csic.es/ +34 679323719
		Elisabet ALBALADEJ O-PEREZ	Institut de Diagnosi Ambiental i Estudis de l'Aigua (IDAEA-CSIC), Barcelona, Spain	Marine biology and biodiversity; Environmental toxicology	eaqam@cid.csic.es/ +34 665071390

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Ukraine	3	Andrii BAGAIEV	Marine Hydrophysical Institute of National Academy of Sciences of Ukraine, Sevastopol, Ukraine	Operational forecast of pollution transport in the Black Sea; Ecological and benthic state via marine indicators and indexes	bagaiev.andrii@gmail.com/ +38 (066) 211-16-89
		Khrystyna KHARKEVYCH	Benthos Ecology Department, Institute of Biology of the Southern Seas NAS of Sevastopol, Ukraine	Marine biodiversity and ecology, zoology of Tardigrades, structure of meiobenthos community	k.kristinna@gmail.com/ +38 067 957 79 66
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			Ecological Studies, Odessa, Ukraine		
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1.2.3 Experts

The school was scientifically coordinated by Marco Zavaterelli (CONISMA, Italy) and featured the participation of leading international experts in the field of environmental indices related with MSFD implementation, including Angel BORJA (AZTI - Tecnalia - Marine Research Division, Spain), Giovanni COPPINI (Euro-Mediterranean Centre for Climate Change (CMCC), Italy), Cristina MAZZIOTTI (ARPA Emilia-Romagna, Struttura Oceanografica Daphne, Italy), Violin RAYKOV (Institute of Oceanology - BAS, Department of Marine Biology and Ecology, Varna, Bulgaria).

Table 2: Experts of the Constanza summer school

Name	Affiliation	Address	E-mail /Telephone
Angel BORJA	Principal Researcher	AZTI-Tecnalia Marine Research Division 20110 Pasaia (Spain)	aborja@azti.es
Giovanni COPPINI	Researcher	Euro-Mediterranean Centre for Climate Change (CMCC) Via Augusto Imperatore 16, scala B, 1° Piano Lecce 73100	giovanni.coppini@cmcc.it
Cristina MAZZIOTTI	Researcher	ARPA Struttura Oceanografica Daphne V.le Vespucci, 2 47042 Cesenatico (FC) Italy	cmazziotti@arpa.emr.it
Violin RAYKOV	Research Scientist, lecturer	Institute of Oceanology Bulgarian Academy of Sciences. Department of Marine Biology and Ecology, Varna, Bulgaria	vraykov@io-bas.bg



1.2.4 Photos of the event



Figure 1 - Group photo of the PERSEUS Summer School participants



Figure 2 – Social excursion for the course participants and lecturers aboard the “Anghel Saligny” vessel

1.3 Outputs

1.3.1 Participants’ perspective

In order to gauge participants feedback on the conduction of the summer school and its didactic content, a short questionnaire based on six different criteria was compiled



by all participants. The questionnaire ascribes a score to each and every criterion. A copy of the same questionnaire is being included in Appendix III, along with the overall scores registered by school participants.

In general, participants had a positive opinion about the PERSEUS summer school, allotting the highest scores to the “Conduction of lectures“, “Lecture content“, “Lecturer knowledge“, “Organization/logistics“ and “Overall success/outcome of course“ fields (Table 3).

Positive scores were given for all six criteria, whilst the “very bad” and “bad” scores were not chosen for any of the six criteria. Participants comments are available in Annex II.

Course participants who consistently attended the course sessions were presented with certificates during a brief ceremony at the end of the course.

CONSTANTA SUMMER SCHOOL FEEDBACK

TOTAL = 20 STUDENTS

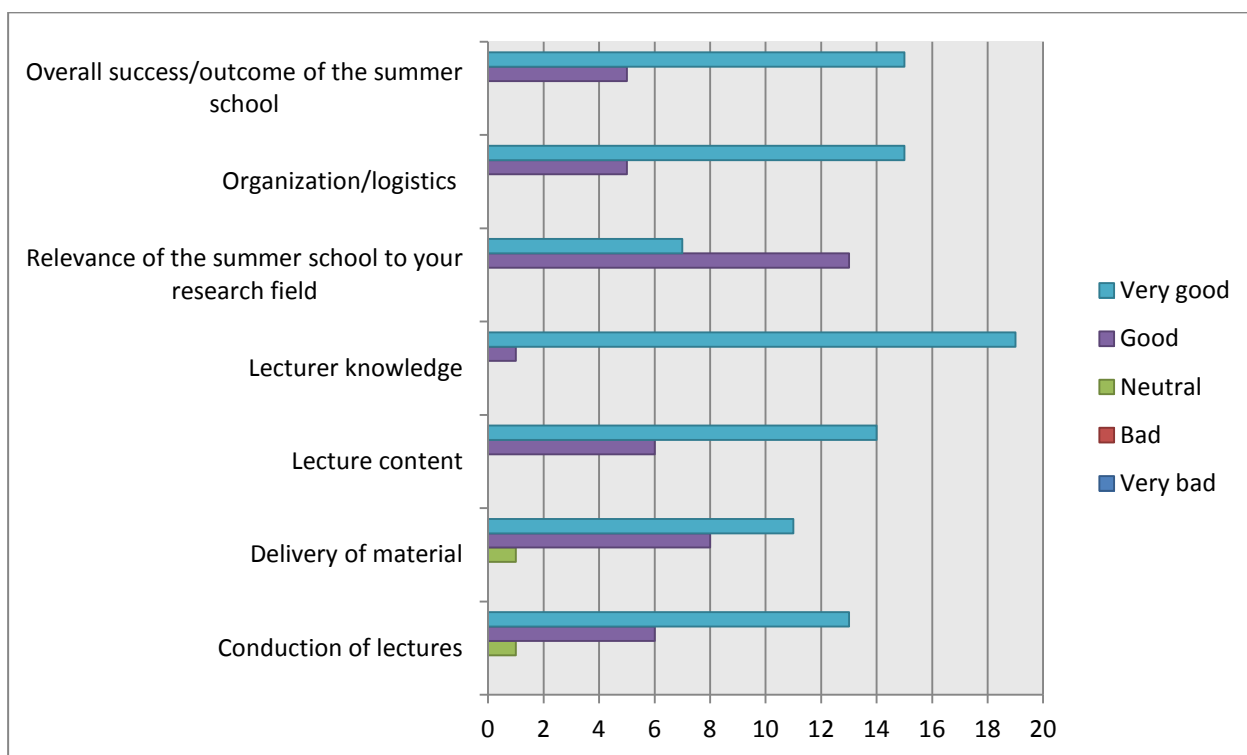


Figure 3 - Overall feedback by course descriptors

1.3.1 Dissemination

The Summer School, as well as the Perseus Project overall were well disseminated in the local mass media, which resulted in a good visibility of this activity throughout the entire week of lectures. A press release (see Appendix I) was drawn-up and distributed to the media and a poster of the event was elaborated (Appendix II).

The Official Opening was attended by several media representatives and the outcomes were video material broadcast on national and local television and newspaper articles published in printed newspapers and on-line editions.



The articles relating the Summer School are listed below and can be accessed following the links.

1. online edition of the local newspaper www.ziarconstanta.ro
 Title: SUMMER SCHOOL - ENVIRONMENT
<http://www.ziarconstanta.ro/stiri/fapt-divers-36/scoala-de-vara-mediu-2931/>

2. local newspaper (www.ziuaconstanta.ro) online edition
 Title: SUMMER SCHOOL ON ENVIRONMENTAL ISSUES IN GRIGORE ANTIPA INSTITUTE CONSTANTA
<http://www.ziuaconstanta.ro/diverse/stiri-calde/scoala-de-vara-pe-probleme-de-mediu-la-institutul-grigore-antipa-458449.html>

3. the video news was broadcast on NEPTUN TV (national) on the 19.00 NEWS on Monday, 3 June.
 Title: SUMMER SCHOOL FOR MARINE RESEARCHERS IN CONSTANTA
<http://www.reporterntv.ro/stire/scoala-de-vara-pentru-cercetatorii-marini-la-constanta>

4. local newspaper www.lideruldeopinie.ro
<http://lideruldeopinie.ro/95239/in-cautare-de-solutii-pentru-mediul-marin#axzz2VPPVNmT>
 SEEKING FOR SOLUTIONS FOR THE MARINE ENVIRONMENT

5. Perseus Summer School Closing Day article www.telegrafonline.ro (most read local newspaper of Constanta) THE MARINE ENVIRONMENT, FOCUS OF RESEARCHERS WORLDWIDE
http://www.telegrafonline.ro/1370638800/articol/236768/mediul_marin_in_atenti_a_cercetatorilor_din_intreaga_lume.html



Figure 4 - Snapshots from the video material



Figure 5 - Excerpts from the news articles

1. GELENDZIK SUMMER SCHOOL

2.1 Summary of the summer school characteristics

The summer school “Challenge for good environmental status in coastal waters” was organized by Shirshov Institute of Oceanology, Russian Academy of Sciences (SIO RAS), its Southern Branch (SB SIO RAS) and an Autonomous Non-commercial Organization Scientific Research Center “Coastal Zone Dynamics”. It was held in Russia at the Black Sea coast in Gelendzhik at the SB SIO RAS territory from 30th of June to 4th of July 2014.

The scientific program of the Courses/Seminar was focused on four main issues:

- integrated coastal zone management in the Mediterranean and Black Seas and PERSEUS project achievements;
- coastal erosion and dynamical processes in the near shore zone;
- interaction of the coastal zone with the open sea: impact on the ecosystem;
- studies and monitoring of the coastal and open sea ecosystems.

2.2 Details of the summer school implementation

2.2.1 Content

The summer school addressed the following topics:

Day 1: Integrated coastal zone management (ICZM) in the Mediterranean and Black Seas and PERSEUS project achievements

Day 2: Coastal erosion and dynamical processes in the near shore zone



Day 3: Interaction of the coastal zone with the open sea: impact on the ecosystem.

Days 4-5: Studies and monitoring of coastal and open sea ecosystems

The summer school programme is available in the Annex 1.2.

2.2.2 Participants

The event was attended by more than 50 participants from different countries, such as Croatia, Greece, Italy, Malta, Russia and Ukraine (Table 3). Abbreviation of the scientific organisations are available in the Annex III.

Table 3: Participants' details

Country	Number of participants	Name	Affiliation	Post	E-mail
Croatia	2	Kreshmir MARKULIN	Institute of Oceanography and Fisheries, Split	Junior researcher. Ph. D. student.	markulin@izor.hr
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Italy	3	Elisa FURLAN	CMCC, Padova	Ph.D. student.	Elisa.furlan@unive.it
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		Maksim GULIN	IBSS, Sevastopol	Associated Professor	
		Oxana BUNIAK	National Mechnikov University,	Ph.D. student.	bynyako@ukr.net



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Only a part of the students received financial support from the PERSEUS project and RFBR grant. Particularly, 15 of students received the PERSEUS fellowship (there were 19 applications for the PERSEUS fellowship), 12 – the fellowship of RFBR grant and the rest participated without financial support from organizers. The fellowship covered the travel and accommodation expenses and meals for lecturers and students.

2.2.3 Experts

The lectures were addressed by 22 experts from Bulgaria, Germany, Greece, Italy, Israel, Netherlands, Norway, Russia and United Kingdom (Table 4) who shared their knowledge and experience with young scientists and students interested in the study of coastal areas of the Mediterranean and Black Seas.

Table 4: Experts of Gelendzik summer school

Name	Affiliation	E-mail
Dr. Violeta VELIKOVA	SuRDEP, Varna, Bulgaria	velikova_violeta@yahoo.com
Prof. Hans KUNZ	Oldenburg University, Germany	Hans.Kunz@t-online.de
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Dr. Isaac GERTMAN	IOLR, Haifa, Israel	isaac@ocean.org.il
Dr. Eugeny YAKUSHEV	NIWA, Oslo, Norway	evgeniy.yakushev@niva.no
Dr. Evangelos PAPATHANASSIOU	HCMR, Anavyssos, Greece	vpapath@hcmr.gr
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Dr. Alexander MIKAELIAN	SIO RAS, Moscow, Russia	mikaelyan@ocean.ru



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Prof. Ruben KOSYAN	SB SIO RAS, Gelendzhik, Russia	rkosyan@hotmail.com

2.2.4 Photos of the event





Figure 7 - Group photo of the Gelendzik Summer School participants

2.3 Outputs

Participants of the Summer School not only listened to lecturers, but also they made their own presentations (oral and poster) on topics of the Courses/Seminar. These presentations were a matter of fruitful discussions among the young participants and lecturers.

2. ANAVYSSOS SUMMER SCHOOL

3.1 Summary of the summer school characteristics

Summer School “Supporting monitoring in the Mediterranean Sea towards GES” was held between 8th and 12th of June 2015. The summer school was hosted at the premises of the Hellenic Centre for Marine Research (HCMR), located in Anavyssos, Greece. The school had also the assistance and participation of the UNEP/MAP Monitoring Correspondence Group (CORMON).

PERSEUS focus from the beginning has been to assist in the implementation of the MSFD by identifying monitoring gaps, driving more scientific research towards that direction and proposing through its specific objectives and with the interaction with stakeholders and policy makers a program of measures that would allow to reach a state of good environmental conditions. Therefore, the invited speakers of the summer school were of a scientific background and people that have worked with the descriptors of the MSFD and the "pupils" of the school were key players for applying the principles of the MSFD in their countries.

This approach is a teaching, learning interaction leading to a Q&A interaction of both speakers and invitees aiming to have concrete solutions and conclusions towards the MSFD strategy and the road to GES.

3.2 Details of the summer school implementation

3.2.1 Content

Dr. Papathanassiou welcomed everyone to the summer school by saying a few words on the HCMR premises and showing a short 5 minutes video of the center. A *tour de table* followed in order to have a first idea of the participants group. The complete programme is available in the Annex 1.3.

Day 1

The opening session of the course gave to the participants a broad overview on the summer school course as well an overview of the PERSEUS project, its tasks and results. Further on, the two conventions that of the Mediterranean (UNEP/MAP) and that of the Black Sea (BSC) have briefed the participants on the monitoring that both regions are currently working on specifying on some descriptors and indicators. Additionally, the Ecosystem Approach of UNEP has already added to the implementation of the monitoring activities in the Mediterranean.

Day 2



The following session on the second day of the summer school has focused on the development of the monitoring "indicators" and monitoring needs. Therefore, most of the presentations on this day dealt with the most well studied indicators for the Mediterranean and Black Sea, such as eutrophication, contaminants, marine litter, biodiversity.

Day 3

The 3rd day in the morning lectures focused on the examples and suggestions regarding the monitoring at EU projects and at countries national level. The presentations were followed by four parallel sessions where participants were divided into two groups of Eastern and Western Mediterranean and each team followed one of the four sessions to be taught at a time. The sessions focused in teaching the "students" of four tools from three projects. Participants had the ability to use their own data and laptops to download or use online the tools and learn their usability.

Day 4

The presentations of that day focused on the tools that could be utilized for monitoring purposes in the Mediterranean Sea. Therefore, this sessions discussions were on integrated observing systems such as platforms having integrated sensor systems, Argo floats, gliders, etc and including the potential of using models for the assessment of the marine ecosystem. Finally, there was the presentation of a management tool for fisheries (PERSEUS result), the Vessel Monitoring System (VMS).

In the afternoon of the same day the two groups divided on day 3, had to come together and prepare one presentation each regarding the usefulness of the summer school (lectures and tools) and prepare the joint monitoring plans (JMPs) that they would suggest with the knowledge they gained throughout the course (Annex IV).

Day 5

The final day the groups presented the two JMPs presentations. Furthermore, a document was asked by the two leaders of the groups on JMPs and a raw draft of it is found in Annex IV. All presentations are also available upon requested from PERSEUS MO.

3.2.2 Participants

Table 4 lists the summer school participants.

Table 5: Participants of Anavyssos summer school

Name	Email
Amila MUMIC	amila.mumic@heis.ba
Bernal SOLUNA SALLES	Soluna.salles@ma.ieo.es
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Michailidis SAVAS	smichaelides@dfmr.moa.gov.cy
Nachit DRISS	nachited@yahoo.fr
Nikos STREFTARIS	nstrefta@hcmr.gr
Yael SEGAL	yael_segal@ocean.org.il

3.2.3 Experts

Table 6 lists the lecturers and stakeholders of the summer school

Table 6: Experts of Anavyssos summer school

Name	Email
Areti KONTOGIANNI	akonto@aegean.gr
Aris KARAGEORGIS	ak@hcmr.gr
Celia VASSILOPOULOU	celia@hcmr.gr
Evangelos PAPATHANASSIOU	vpapath@hcmr.gr
Francois GALGANI	Francois.Galgani@ifremer.fr

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Gyorgyi GURBAN	Gyorgyi.Gurban@unepmap.gr
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Peter FRETWELL	ptf@bas.ac.uk
Popi PAGOU	popi@hcmr.gr
Sofia REIZOPOULOU	sreiz@hcmr.gr
Tatiana HEMA	tatjana.hema@unepmap.gr



3.2.4 Photos of the event



Figure 8 - Group photo of the Anavyssos Summer School participants

3.3 Outputs

3.3.1 General outcome

The summer school attained a high level both on the participants but also on the lecturers that briefed them throughout the course and who encompassed high teaching qualifications. We acknowledged the fact that there was enthusiasm from the participants part especially on the 3rd day where the monitoring tools were presented engaging into a fruitful conversation among them.

The format of the course assisted into having a Q&A approach and this synergistic approach together with the lecturers and the course organizers contributed into making all into yet again another successful event.

Besides the training of the key players, the main outcome are the JMP proposals and the agreement of the participants on them dealing with the monitoring issues in the Mediterranean and Black Sea basins (Annex 4).

3.3.1 Participants' perspective

In order to receive a feedback from all participants that attended the course, a questionnaire was handed out into them either printed or electronically (where necessary) having a scoring associated to the lectures and tools, to self-evaluation, to organization, but also having an input for additional comments and an overall course rating. In Annex III all ratings could be observed. In general all were from good to excellent and especially on the overall rating on lectures (70% very good), the level of comprehension (89% very good) and the increased ability to carry out monitoring (69% very good). Additionally all comments were useful, especially the ones that assist into improving such workshops in relation to their content (practical vs



theoretical) and the materials provided (background information on the schools specific topics).



1.1 Constanza summer school programme

3.06.2013

9.00-9.30

Official opening:

- **Local organisers - Dr. Simion NICOLAEV / NIMRD Director;**
- **Scientific course coordinator - Dr. Marco ZAVATARELLI (CONISMA); VIOLIN RAYKOV - Institute of Oceanology - BAS, Department of Marine Biology and Ecology, Varna, Bulgaria**

(Fishery related indices)

9.30 -13.00

- Fishery related indices - Criteria and indicators;
- Size based indicators;
- F_{msy} framework - worldwide experience;

14.30-18.00

- Indicators calculations - choice, examples and exercises;
- Region specific applicability;
- Future proposals;

4.06.2013

ANGEL BORJA - AZTI - Tecnalia - Marine Research Division, Spain

(AMBI, M-AMBI index and MSFD assessment issues)

9.00-13.00

- Integrative Ecological Status Assessment in Implementing the European Water Framework Directive and the Marine Strategy Framework Directive;
- Ecological indices based on macrobenthos: the case of AMBI and M-AMBI in assessing seafloor integrity status;

14.30-18.00

- Using AMBI and M-AMBI: computation, application and exercises;

5.06.2013

CRISTINA MAZZIOTTI - ARPA Emilia-Romagna, Struttura Oceanografica Daphne, Italy

(TRIX index)

9.00-13.00



- Environmental indices: definition;
- Environmental indices in MSFD;
- Coastal eutrophication;
- Socio-economic aspects: eutrophication management;
- Northern Adriatic sea system: Emilia-Romagna coastal waters;
- N/P ratio;
- Trix Index: hystory;

14.30-18.00

- Trix Index: computation;
- Trix Index: application;
- Trix Index: exercises;

6.06.2013

Excursion and official dinner;

7.06.2013

GIOVANNI COPPINI - Euro-Mediterranean Centre for Climate Change (CMCC), Italy

(Ocean Color Based Index)

9.00-13.00

- Introduction: indices on Eutrophication;
- Ocean color based indicator;
- Ocean Color products: what is available and how to access to the data;
- Comparison of ocean color and in situ chl-a products;
- Specific case for the Mediterranean Sea;

14.30-18.00

- Ocean Color data access;
- Chl-a Climatology computation;
- Ocean color trend Index: computation;

Ceremony of presentation of Certificates to participants.

- *Coffee (10.30-11.00) and light lunches (13.00-14.30) on Monday 3/6, Tuesday 4/6, Wednesday 5/6 and Friday 7/6 were offered by the organizers;*

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- *The excursion on Thursday 6/6 was planned on board of the Maritime Harbours Administration vessel around Constanta Harbour (9.00-12.00), followed by a visit at the Natural Sciences Museum Complex (13.00-15.00).*
- *An official dinner was offered by the organizers on Thursday 6/6 evening at the Villa Reyna at 19.00.*



1.2 Gelendzik school programme

Training Courses/Summer School “Challenge for good environmental status in coastal waters” and

3-rd International Seminar «Dynamics of the coastal zone in the non-tidal seas»

Monday, 30 June

OPENING OF THE MEETING

09:00-09:30 Opening of the meeting, welcome words from the organizers

SESSION 1. Integrated coastal zone management (ICZM) in the Mediterranean and Black Seas and PERSEUS project achievements

09:30-10:15 **Violeta Velikova** (SuRDEP, Varna, Bulgaria) ICZM in the Black Sea region: history of governance and management in rehearsal

10:15-11:00 **Violeta Velikova** (SuRDEP, Varna, Bulgaria) Coastal zone – the terra incognita et quanto aqua sensitivus est (What the Black Sea region says about that?)

11:00-11:30 Coffee break

11:30-12:15 **Evangelos Papathanassiou** (HCMR, Anavyssos, Greece) “PERSEUS” project – Contribution to better governance for Mediterranean and the Black Sea based on scientific results.

12:15-13:00 **Elena Arashkevich** (SIO RAS, Moscow, Russia) Pressures and impacts on the Mediterranean and Black Sea coastal ecosystem: present knowledge and gap analysis in the frame of “PERSEUS” project

13:00-13:45 **Isaac Gertman** (IOLR, Haifa, Israel) Oceanographic cast data processing and analysis (CTD, Bottle, Floats and Sea Gliders) from raw data to “PERSEUS” project DB

13:45-14:30 **Marina Krylenko** (SB SIO RAS, Gelendzhik, Russia) Monitoring of the Black Sea coast dynamics

13:45-15:15 Lunch

15:15-17:15 Poster presentations: **K.Edwards, E.Furlan, I.Sherina, O.Sytnik, E.Zhuk, M.Gulin**

19:00-22:00 Outdoors ice-break party (barbecue)

Tuesday, 1 July

SESSION 2. Coastal erosion and dynamical processes in the nearshore zone

09:30-10:15 **Ruben Kosyan** (SB SIO RAS, Gelendzhik, Russia) Basic lithodynamical problems for the Black Sea coasts and related physical processes

10:15-11:00 **Hans Kunz** (Oldenburg University, Germany). Current state of the coasts protection methodology

**11:00-11:30 Coffee break**

11:30-12:15 Alessio Giardino (Deltares, Unit Marine and Coastal Systems, Netherlands) Erosion control and coastline management at different spatial and temporal scale: recent concept and tool developments.

12:15-13:00 Sergey Kuznetsov (SIO RAS, Moscow, Russia) Nearshore hydrodynamics

13:00-13:45 Petr Zavialov (SIO RAS, Moscow, Russia) Dynamics of the river plumes and its impact on the contamination transport in the marine coastal zone.

13:45-15:15 Lunch

15:15-17:15 Poster presentations: O.Buniak, P.Chernshev, A.Chernysheva, N.Esin, F.Gippius, O.Gusakova, K.Karmanov, O.Kovaleva, S.Myslenkov, A.Pogorelov, M.Shtremel, N.Zhurbas

Wednesday, 2 July**SESSION 3. Interaction of the coastal zone with the open sea: impact on the ecosystem.**

09:30-10:15 Boris Chubarenko (AB SIO RAS, Kaliningrad, Russia) Distinctive characteristics of coastal lagoons and estuaries: hydrological and lithodynamical studies

10:15-11:00 Georgy Shapiro (University of Plymouth, Plymouth, UK) Exchange processes between shelf and deep sea

11:00-11:30 Coffee break

11:30-12:15 Irina Chubarenko (AB SIO RAS, Kaliningrad, Russia) Sea-shelf heat and mass exchange: diagnostics and quantification on the base of SST data

12:15-13:00 Vladimir Zhmur (MIPT, Moscow region, Russia) Underground intrusion of marine waters in the coastal zone of the sea

13:00-13:45 Evgeniy Yakushev (NIVA, Oslo, Norway) Coastal zone biogeochemical regime studies in NE Black Sea

13:45-15:15 Lunch

15:15-17:15 Poster presentations: M.Golenko, A.Kostyleva, E.Kubryakova, O.Lobchuk, S.Mukhametov, A.Polukhin, V.Pilipchuk, M.Smirnova, N.Stepanova

Thursday, 3 July**SESSION 4. Studies and monitoring of coastal and open sea ecosystems**

09:30-10:15 Alexander Mikaelyan (SIO RAS, Moscow, Russia) Temporal changes of phytoplankton in the open and coastal waters of the Black Sea



10:15-11:00 Vladimir Silkin (SB SIO RAS, Gelendzhik, Russia) Phytoplankton and good environmental status in coastal waters

11:00-11:30 Coffee break

11:00-12:15 Eleonora Rinaldi (CNR, Roma, Italy) Satellite products for developing environmental indicators: a necessary tool for the European Marine Strategy Framework Directive

12:15-13:00 Sergey Stanichny (MHI, Sevastopol, Ukraine) Long-term studies of the Black Sea dynamics and its potential impact on the ecosystem on the base of satellite data

13:00-13:45 Alexander Ostrovskii (SIO RAS, Moscow, Russia) Modern methods for the long-term multidisciplinary studies of coastal zone

13:45-15:15 Lunch

15:15-17:15 Poster presentations: L.Bordbar, A.Kosyan, A.Kostyleva, A.Lifanchuk, J.Lusic, K.Markulin, O.Podymov, N.Romanova, V.Sergeeva, I.Sherina, S.Skejic, O.Yasakova

Friday, 4 July

SESSION 4 (continuation). Studies and monitoring of coastal and open sea ecosystems

09:30-10:15 Andrey Zatsepin (SIO RAS, Moscow, Russia) SIO RAS hydrophysical testing area at the Black Sea near Gelendzhik: scientific background, measuring platforms and their usage for permanent monitoring of the marine environment

10:15-11:30 Andrey Zatsepin, Alexander Ostrovskii, Vladimir Soloviev (SIO RAS, Moscow), Sergey Kuklev, Oleg Podymov (SB SIO RAS, Gelendzhik, Russia) Demonstration of measuring platforms and the real time data transmission systems

11:30-12:00 Coffee break

12:00-12:45 Valery Chasovnikov (SB SIO RAS, Gelendzhik, Russia) Methods and instruments for hydrochemical studies and monitoring of the Black Sea shelf-slope zone

12:45-14:00 Valery Chasovnikov et al. (SB SIO RAS, Gelendzhik, Russia) Demonstration of the analytical chemistry equipment facilities of SB SIO RAS Chemical Laboratory

14:00-15:15 Lunch

15:15-17:15 Poster presentations: D.Elkin, E.Esiukova, E.Gurova, N.Kalashnikova, A.Kubryakov, K.Silvestrova, G.Suaria,

17:15-18:00 Closing Session

19:00-22:00 Barbecue party



1.3 Anavysos Summer School programme

PERSEUS Summer School
“ Supporting Monitoring in the Mediterranean Sea towards GES”

8-12 June 2015

**Venue: Hellenic Centre for Marine Research,
 Anavysos (Amphitriti Room)**

Day 1

Monday 8 JUNE 2015

13:30 **Bus from Eden Hotel to HCMR premises (place of venue)**

13:45 **-**

14:30 **Registration**

Current status of monitoring under MSFD and EcAp

Chair: E. Papathanassiou

		Speakers
14:30-14:45	Welcome	
14:45-15:00	Tour de Table from the Participants.	
15:00-15:30	Introduction to the Summer School	N. Streftaris, HCMR, Greece
15:30-16:00	Presentation of PERSEUS	E. Papathanassiou, HCMR, Greece
16:00-16:30	Coffee break	
16:30-17:00	Monitoring in the Mediterranean under MSFD	M. Morgantin, CORILA, Italy
17:00-17:30	Monitoring in the Mediterranean: The added value of EcAp implementation	T. Hema, UNEP/MAP
17:30-18:00	Monitoring in the Black Sea (BSIMAP)	I. Makarenko, Black Sea Commission
19:00	Ice Breaking Reception (EDEN Hotel- Mavro Lithari)	



Tuesday 9 JUNE 2015

Day 2

Development of Monitoring 'indicators' Presentation of monitoring needs

Chairs: G. Gurban & L. Giannoudi

		Speakers
09:00-09:30	Noise	M. Andre, UPC, Spain
09:30-10:00	Marine litter	F. Galgani, IFREMER, France
10:00-10:30	Contaminants and pollution impact	N. Bihari, Institut Rudjer Boskovic, Croatia
10:30-11:00	Fisheries	V. Vassilopoulou, HCMR, Greece
11:00-11:30	Discussion	
11:30-12:00	Coffee break	
12:00-12:30	Non-indigenous species	A. Zenetos, HCMR, Greece
12:30-13:00	Eutrophication	K. Pagou, HCMR, Greece
13:00-13:30	Discussion	
13:30-15:00	Lunch	
15:00-15:30	Biological Diversity	M. Frost, Marine Biological Association, UK
15:30-16:00	Food web	H. Teixeira, JRC, Italy
16:00-16:30	Coffee break	
16:30-17:00	Biological Diversity (macroalgae)	P. Panayotidis, HCMR, Greece
17:00-17:30	Benthic communities	M. Simbora, HCMR, Greece
17:30-18:00	Discussion	



Day 3

Wednesday 10 JUNE 2015

Existing Projects and Examples of Monitoring: Space, time and Effort

Chair: N. Streftaris

		Speakers
09:00-09:30	Joint Monitoring Plans in Mediterranean -IRIS	K. Pagou, HCMR, Greece
09:30-10:00	MedSea Checkpoint	S. Reizopoulou , HCMR, Greece
10:00-10:30	Discussion	
10:30-11:00	Coffee break	
11:00-11:30	Scales of Monitoring	S. Reizopoulou , HCMR, Greece
11:30-12:00	Monitoring whales from space	P. Fretwell, BAS, UK
12:00-13:00	Discussion	
13:00-14:00	Lunch	

Tools for designing Monitoring (introduction, demonstration and application)

The following four sessions will run in parallel by dividing the participants into 3 groups (East Med, Central Med & West Med).

Each team will be rolling from one session to the next.

Participants will have hands on training on how to use the tool and apply it, in case specific studies.

- Participants are asked to bring their own laptop. They could also bring their own data, if they wish, to test them against the different tools in this session.

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14:00-18:30	Integration among Descriptors tested across indicators within D6 under PERSEUS Project. Working examples (1hour: cyclical for the 4 groups)	N. Simboura, HCMR, Greece
	DEVOTES innovative tools in assessing GES (1hour: cyclical for the 4 groups)	H. Teixeira, JRC, Italy
	Coffee break (16:00-16:30)	
	The GIS tool for Joint Monitoring Planning, developed under the IRIS-SES Project. Case studies: eutrophication and contaminants (1hour: cyclical for the 4 groups)	A. Karageorgis & P. Drakopoulou, HCMR, Greece
	Using the PERSEUS AMP tool (1hour: cyclical for the 4 groups)	M. Skourtos & A. Kontoyanni, AUA & UoWM, Greece



Day 4

Thursday 11 June 2015

Tools that can be utilized for Monitoring in the Mediterranean Sea

Chair: S. Reizopoulou

09:00 - 09:30	Integrated observing systems in the Med: Can they be used for monitoring?	J. Tintore, SOCIB, Spain
09:30-10:00	Vessel Monitoring System: A management tool for monitoring fisheries activities in the Med	S. Kavadas, HCMR, Greece
10:00-10:30	Assessing the potential of Modelling in the Med	M. Zavatarelli, UniBO, CONISMA, Italy
10:30-11:00	Coffee break	
	<p>Developing monitoring plans across the Mediterranean workshop Three groups: Western, Central and Eastern Mediterranean</p> <p><i>Chair and rapporteurs proposed by each of the group</i></p>	
11:00-13:00	Workshop on Joint monitoring plans. Preparation of presentations. <i>(Each Group will wrap up contributions from previous day(s) and prepare 3 presentations on joint monitoring plans in the Western, Central and Eastern Mediterranean) for the following day. The group of "experts and teachers" can do the same for the whole basin.</i>	
13:00-14:30	Lunch	
14:30-17:00	Preparation of the presentations for eastern, central, western Mediterranean groups (for the next morning).	
19:00 From Hotel	Excursion to Sounion / Dinner at Sounion	



Day 5

Friday 12 June 2015

Monitoring plans across the Mediterranean

Chair: E. Papathanassiou

10:00-11:30	Presentations on proposals for JMPs Presentation by the 3 groups and the group of 'experts'	
11:30-12:00	Coffee break	
12:00-13:00	Discussion & Conclusions	
13:00	End of the Meeting	
13:00-14:00	Lunch	



ANNEX II

2.1 Additional comments from the students of Constanza summer school

- Undoubtedly, the lectures, practicals as well as the lively dialogs have enriched my background, will stimulate my work and shape my individuality as an ecological modeller.
- Prof. Marco Zavatarelli organized a really important event that allowed all of us to experience up to date trends in the European scientific community that works on the Marine Strategy Framework Directive.
- I am thankful to Dr. Violin Raykov for my better taking in fishery related indices that are applied in the EU, which will be essential as far as our institute involved in international activity.
- Dr. Angel Borja broadened my understanding of the marine biotic indices, but for me it was also interesting to work with the software utilities that are developed by the European scientist to make the application of algorithms easier and the scientific advices more understandable for the policy makers.
- Dr. Cristina Mazziotti explained the trophic index extremely clear and I look forward to the possibility of implementing that knowledge in my research.
- Dr. Giovanni Coppini shaped my view on a systematical, complex approach to the ecosystem modelling and ecosystem state assessment using the model data. It will be helpful in further development of my own model and others ecological applications.
- Finally, I wish to thank the local organizers: Dr. Simion Nicolaev, Dr. Tania Zaharia and Dr. Mariana Golumbeanu for the highest scientific level, perfect organization and warm atmosphere.



**2.2 Evaluation of the 2nd Summer School of PERSEUS project,
"SUPPORTING MONITORING IN THE MEDITERRANEAN TOWARDS GES",
HCMR, Anavyssos, 8-12 June 2015**

1. Lectures & Tools Evaluation

	Poor	Average	Above average	Very good	Excellent
Degree to which the scientific subjects were covered			20%	40%	40%
Academic level of the lectures				50%	50%
Prevention of thematic overlap among lectures			10%	50%	40%
Level of comprehension				89%	11%
Level of discussion between lecturers and participants			10%	60%	30%
Sufficient duration of lectures			30%	30%	40%
Overall rating of the lectures				70%	30%
Which Session did you find most useful?	AMP TOOLS			3	
	NOISE			1	
	FISHERIES			1	
	DEVOTE TOOLS			1	
	GIS TOOLS			1	
	ECAP/MAP			1	
	MONITORING IN THE MEDITERRANEAN SEA			1	
	MONITORING IN THE BLACK SEA			1	
	SESSION (DAY2) DEVELOPMENT OF MONITORING INDICATORS			2	
Which Summer School lecture(s) did you find most interesting?	AMP TOOLS			4	
	MONITORING IN THE MEDITERRANEAN SEA			4	
	FISHERIES			1	
	MONITORING WHALES FROM SPACE			2	
	NOISE			4	



	SESSION (DAY 4) TOOLS THAT CAN BE UTILIZED FOR MONITORING IN THE MEDITERRANEAN SEA	1
	MODELLING IN THE MED	1

2. Self-Evaluation

	Poor	Average	Above average	Very good	Excellent
Ability to understand			10%	90%	
Gaining new knowledge and experience			40%	30%	30%
Increase the ability to carry out monitoring		22%	11%	67%	
Exposure to techniques directly applicable to my career			10%	90%	
Additional comments	<ul style="list-style-type: none"> ❖ I think that it would have been helpful to provide literature or make an introductory presentation on GES and descriptors. ❖ Understanding ability varied depending on the specific subjects of lectures. Useful new info, but limited applicability potential in my country due to limitation of human and financial resources and expertise. ❖ I was missing the background of the 11 descriptors. 				

3. Organization

	Poor	Average	Good	Very good	Excellent
Information provided prior to Summer School opening			10%	70%	20%
Summer School duration			40%	30%	30%
Structure of the schedule			40%	20%	40%
Secretariat support			11%	22%	67%
Meals during lectures				50%	50%
Meals at the hotel		10%	30%	30%	30%
Hotel accommodation	10%	30%	30%		30%
Extra-curricular activities			20%	10%	70%

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Overall organisation		20%	30%	50%
Additional comments	<ul style="list-style-type: none"> ❖ Well done!!! When's the next workshop? ❖ I would add fruits/veg. for coffee break. 			

4. Additional Comments

	Yes	No	I do not know
Have you gained knowledge and experience from the Summer School?	100%		
Did it help you improve your networking - make new acquaintances?	100%		
Do you think the course will be useful for your career?	80%		20%
Have you attended another Summer School before?	44%	56%	
What was the most impressive feature of the Summer School?	<ul style="list-style-type: none"> ❖ Each of the organizers and lecturers were polite and successful. ❖ The beach bar. ❖ Organization coverage of different topics. ❖ New advanced knowledge. Excellent organization and hospitality. ❖ Dinner at Sounion, all the lectures and activities. ❖ Some lectures. ❖ Good exchange of expertise among teachers and participants. Excellent atmosphere. 		
What suggestions do you have towards improving the PERSEUS Summer School on monitoring?	<ul style="list-style-type: none"> ❖ Provide literature on UNEP-MAP directive and GES to read before the summer school. ❖ More hands on activities. ❖ More time devoted on practical issues and exercises to meet real challenges Med countries face. ❖ Perhaps making it shorter. Increasing practical activities. ❖ Each country to present its own monitoring program. ❖ On site demonstration of new tools can be utilized for monitorings. ❖ More comparability of results among the different sub regions. 		

PERSEUS Deliverable 8.2



Any other comments	<ul style="list-style-type: none"> ❖ Thanks for your kind invitation! ❖ More time for (some) presentations. Not all presentations were equally useful. ❖ Everybody was very nice and friendly and very helpful. ❖ The number of participants was ideal to promote good interaction and discussion, which was very enlightening.
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Overall Rating

	Poor	Average	Above average	Very good	Excellent
Overall Rating of the course			20%	30%	50%



ANNEX III

Abbreviations of the scientific institutions related to the Gelendzik summer school

HCMR – Hellenic Center of Marine Research

OGS – National Institute of Oceanography and Experimental Geophysics

SuRDEP – Nongovernmental Organization for Sustainable Regional Development and Environmental Protection

SIO RAS – Shirshov Institute of Oceanology of Russian Academy of Sciences

SB SIO RAS – Southern Branch of SIO RAS

AB SIO RAS - Atlantic Branch of SIO RAS

MIPT – Moscow Institute for Physics and Technology (State University)

MSU – Moscow State University

NIVA – Norwegian Institute for Water Research

MHI – Marine Hydrophysical Institute

IOLR - Israel Oceanographic and Limnological Research Institute



Joint Monitoring Proposals from the two Groups involved in the PERSEUS Summer school "Tools for designing monitoring sessions"

Group 1

Workshop on Joint monitoring plans in the Mediterranean:
Report on the output of Group 1

An Integrated Monitoring and Assessment Programme in the Mediterranean has been drafted by the UNEP-MAP Secretariat and is being discussed within CORMON group of the EcAp process (UNEP(DEPI)/MED WG.411/3).

At the last CORMON meeting (30 March – 1 April 2015), common needs and challenges, interlinkages between the various ecological objectives, common indicators and their monitoring and assessment needs have been addressed in detail in break-out groups (sub-clusters), focusing on monitoring and assessment specifics of biodiversity and fisheries, pollution and litter and coast and hydrography. There is already, for most elements of the Draft Monitoring and Assessment Programme, a common understanding of and a general agreement on what has to be monitored and associated ecological objectives. The specific task that has been given to the participants of the PERSEUS Summer School was to develop a proposal to move from an ‘integrated’ monitoring to a ‘joint’ monitoring programme. The present document reports the proposal by the participants belonging to Group 1

Monitoring according to the EcAp approach encompasses several and quite diverse elements, that could be divided into ‘state’ and ‘pressure’ monitoring elements as in Figure 1.



State related elements	Pressure related elements
<i>Monitoring of hydrographical properties</i>	<i>Monitoring the occurrence of non-indigenous species</i>
<i>Monitoring phyto and zooplankton</i>	<i>Monitoring on commercial exploitation of fish, cephalopods and shellfish</i>
<i>Monitoring of birds</i>	<i>Monitoring of eutrophication</i>
<i>Monitoring of marine mammals</i>	<i>Monitoring of contaminants</i>
<i>Monitoring of reptiles</i>	<i>Monitoring of contaminants in fish and fish products</i>
<i>Monitoring of benthos</i>	<i>Monitoring of litter</i>
<i>Monitoring of fish, cephalopods and shellfish</i>	<i>Monitoring of underwater noise</i>
<i>Monitoring food webs</i>	

Figure 1 - Main monitoring elements in the draft Integrated Monitoring and Assessment Programme of UNEP-MAP EcAp.

A joint monitoring programme could have the following advantages: i) improve the quality of the data, ii) reduce costs of monitoring, iii) increase the spatial coverage, iv) enhance cooperation among Mediterranean countries.

The elements of a monitoring programme that may be shared include, but are not limited to, methods, assessment tools, facilities, modeling and remote sensing data, cruises.

Quality of the data could be improved by sharing methods and assessment tools, by performing intercalibration exercises and training activities, by sharing the specifics of the information flow, etc. Costs could be abated if vessels/facilities/equipment for selected activities/measurements are shared (i.e. gliders, buoys, laboratory instruments, etc.) and knowledge of modeling and remote sensing data is shared. The latter could also increase the spatial coverage of the data beyond the waters of national jurisdiction. Indeed, joint monitoring cruises, especially among neighboring countries, could abate costs and increase spatial coverage. An example could be a cross-Adriatic cruise with transects from the west to the east side of the Adriatic, covering eutrophication monitoring and some biodiversity indicators.

It is proposed that a gap analysis on availability of methods and assessment tools, of proper facilities (research vessels, equipments, labs) to carry out the monitoring and analysis, of know-how on modeling and remote sensing data is being carried out by Contracting Parties. Such analysis could be carried out within each of the sub-clusters of EcAp (biodiversity and fisheries, pollution and litter, coast and hydrography), with the necessary contribution of a sub-cluster on socio-economic analysis.

Once the gaps have been identified, they could be addressed on a sub-regional basis or at a larger scale, depending on the type of gap.

As a preliminary indication, before a proper gap analysis is being carried out, the table below (Figure 2) highlights which monitoring activities may be better candidates for joint monitoring cruises.



State related elements	Pressure related elements
<i>Monitoring of hydrographical properties</i>	<i>Monitoring the occurrence of non-indigenous species</i>
<i>Monitoring phyto and zooplankton</i>	<i>Monitoring on commercial exploitation of fish, cephalopods and shellfish</i>
<i>Monitoring of birds</i>	<i>Monitoring of eutrophication</i>
<i>Monitoring of marine mammals</i>	<i>Monitoring of contaminants</i>
<i>Monitoring of reptiles</i>	<i>Monitoring of contaminants in fish and fish products</i>
<i>Monitoring of benthos</i>	<i>Monitoring of litter</i>
<i>Monitoring of fish, cephalopods and shellfish</i>	<i>Monitoring of underwater noise</i>
<i>Monitoring food webs</i>	

Figure 2 - Suitability of joint monitoring activities in the Mediterranean Sea. Green: high; orange: medium; white: low.

The monitoring elements in green are those for which the assessment is needed at large scale, i.e. at the regional scale for large cetaceans, at the sub-regional scale for small cetaceans, birds, seals, turtles, most fish, etc. In orange, the elements that may need to be assessed at a smaller scale (i.e. benthos, litter, NIS) and/or for which a high level of expertise is needed, such as for monitoring underwater noise. In this latter case, a strong collaboration among contracting parties to share knowledge and technologies is envisaged, and joint monitoring could be carried out among 2 or more Contracting parties. In white, monitoring activities that could be carried out at the national level, with some local exception, such as monitoring eutrophication, phytoplankton and zooplankton in the Adriatic Sea.

Group 2:

Workshop on Joint monitoring plans in the Mediterranean:

Report on the output of Group 2

Due to the transboundary character of the marine environment a common understanding and approach is required by the MSFD to ensure a regionally coherent assessment of the environmental status and definition of GES, as well as in setting environmental targets and developing the related monitoring programmes to measure progress towards GES (based on 11 descriptors).

Within the Barcelona Convention framework, the EcAp-MED project, conducted by MAP Coordination Unit, aims at supporting UNEP/MAP to implement the decisions regarding the application of the ecosystem approach in the Mediterranean in full synergy and coherence with the implementation of the MSFD. Although, the MSFD and EcAp processes are running in parallel and considerable efforts have been made



to ensure a coordinated approach on the establishment of the national monitoring programmes.

Currently it seems that these monitoring programs are similar in some respects, but in many others they are unique and difficult to compare. Thus, the primary aims of an international monitoring program would be to provide a more holistic view of the Mediterranean Sea environmental status by standardizing methods and inter-calibrating data. Such data sets would enable highlighting the trans-boundary processes taking place between all the different environments in the Mediterranean Sea, whether in the territorial waters of one country or the adjacent high seas as well as deep sea habitats that have been studied very little previously. In the following we provide a rough outline of what such a monitoring program would consist of.

Aims and objectives of the International Monitoring Program

1. Follow climate change trends and impacts.
2. Distinguish between anthropogenic pressures and natural variations.
3. Establish baseline conditions for the entire basin.
4. Provide body of data to enable the understanding of processes and impacts by *ad-hoc* research programs. For instance characterize the impact of invasive species, climate change and other anthropogenic pressures on indigenous species and habitats.
5. Develop a versatile hydrodynamic, biogeochemical and ecological modeling tool for use by the scientific community and policy makers of partner and non-partner countries. Such a tool would provide a scientific basis for assessing both local and regional climate change impacts as well as scientific basis for development that may have basin scale effects, e.g. gas and oil drilling and extraction (spills), doubling of the Suez Canal.
6. Promote international collaboration between the countries that are sharing the same sea.
7. Inform management and assessments.

Knowledge Gaps

1. After reviewing and assessing the existing body of literature and data identify the knowledge gaps and needs.
2. Basic mapping – habitats, bathymetry, pollutant gradients, other sediment characteristics, in particular for the southern part of the Mediterranean and offshore areas.
3. Limited coverage of noise measurements.
4. Limited coverage of litter measurements.
5. Biological components including offshore birds, cetaceans and reptiles, inshore and deep sea fish communities, and deep sea benthic communities.

Monitoring Methodology

1. Specific methodology to fill knowledge gaps.
2. Standardization of existing data.
3. Intercalibration of methods.



4. Adopt standard protocols for sampling, measuring, data analysis and reporting of key core variables (see below).
5. Use state of the art automated measuring platforms and best available practices for sample analysis.
6. Report raw data to a coordinating body.
7. Modeling of Hydrodynamic, biogeochemical and ecological parameters for the whole basin.
8. After calibration and validation run scenarios (detailed below) and adjust monitoring program accordingly to optimize trends and impacts identification and monitoring.

Core variables for monitoring

1. Physical – Temperature, salinity, bathymetry, sea level, waves, currents, optical properties, bottom characterization, surface and air temperature, benthic habitats.
2. Chemical – dissolved oxygen, pH and/or PCO₂ (continuous), DIC, total alkalinity, nutrients, contaminants, methane.
3. Biological – Ocean color, chlorophyll a, Bacterial and Primary production, pathogens, biological effects of contaminants, phytoplankton, macro algae, angiosperms, zooplankton, fish, invertebrates, mammals, reptiles, sea birds, non indigenous species...
4. References – UKIMON, USIOOS.

Pressures monitoring

1. Shipping - satellite
2. Fisheries – each partner in their EEZ (if proclaimed)¹
3. Gas and oil platforms – each partner in their EEZ (if proclaimed)
4. Nutrient and contaminant loads – each partner in their own EEZ
5. Unique habitat loss – each partner in their own EEZ.
6. Marine litter – each partner in their own EEZ
7. Noise – each partner in their own EEZ and a number of hydrophones at key locations in the area of the high seas.
8. Introduction of non-indigenous species – each partner in their own EEZ.
9. Aquaculture – each partner in their own EEZ.
10. While not technically a pressure it is important to monitor the major inlets and into the Mediterranean Sea, and passages/straits within it, e.g. Gibraltar Strait, The Sicilian Strait, Dardanelles, Suez Canal, Nile Delta, Strait of Otranto etc... These will provide important inputs and constraints for the HD and biogeochemical models.

Expected outcomes of the monitoring program

1. Central standardized data base.

¹ The Mediterranean states seem reluctant to proclaim an EEZ. Morocco, Egypt, and Croatia have proclaim EEZ but still are in the negotiations part.



2. Reduce knowledge gaps.
3. Trans-national current state assessment (Baseline) for the entire Mediterranean using measurements and models.
4. Assess present and future levels of anthropogenic pressures and climate change on the entire Mediterranean.
5. Recommendations for adjustment and optimization of the monitoring program.
6. Scenario assessments based on models for effectiveness of marine protected areas (coastal and open water), gas blow outs at relevant sites.

Inform future research.

