MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

MAREAMICO

MINISTERO DELLE POLITICHE AGRICOLE
ALIMENTARI E FORESTALI

Under the High Patronage of the President of the Republic
and with the sponsorship of the Senate of the Republic and of the Chamber of Deputies

Marine resources and fishing activity within a framework of sustainable development

2ª SEA CONFERENCE

Rimini 12/15 April 2012 - Meeting Room - Hotel Sporting

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Emilia-Romagna Region

Province of Rimini

City of Rimini

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23 SEA CONFERENCE

with the partnership of

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23 SEA CONFERENCE

THE PATRONAGE OF THE PRESIDENT OF THE REPUBLIC

Mareamico si occupa da sempre dei temi connessi al mare, al turismo e alla pesca promuovendo iniziative nazionali ed internazionali con i Paesi dell'area mediterranea in un ottica di cooperazione finalizzata alla tutela del mare e alla cura delle aree di particolare interesse naturalistico.

Anche per questo, come sempre, la nostra Associazione si mette a disposizione di tutti gli interlocutori per favorire le ragioni del dialogo, della collaborazione internazionale, della amicizia tra i Popoli.

Quest'anno la ***Rassegna del Mare***, la più importante manifestazione organizzata dalla nostra associazione, si svolgerà a Rimini e sarà ancora una volta (siamo arrivati al 23° anno consecutivo) occasione di confronto approfondito e come sempre accattivante tra personalità accademiche, scientifiche e politiche italiane ed estere. Dibattiti e tavole rotonde su tematiche di grande attualità relative all'ecosistema marino, alla gestione delle sue risorse, ai nuovi strumenti di *governance* daranno vita alla Rassegna.

Il mare e le sue molteplici sfaccettature, i suoi segreti, le sue ricchezze, le grandi opportunità che può offrire e i pericoli che nasconde, le difficili soluzioni ambientali, il mare, ancora per tanti aspetti misterioso, è l'anima della ricerca e delle analisi che il ***Comitato Scientifico di Mareamico*** svolge quotidianamente con passione e professionalità.

Ai suoi membri che anche quest'anno a Rimini saranno i veri padroni di casa e daranno, con la loro presenza, prestigio alla Rassegna va il mio ringraziamento.

Roberto Tortoli
Presidente di Mareamico

Mareamico's Sea Conference is one of the most important events for discussing and researching solutions regarding policies for safeguarding the marine environment and for understanding the socio-economic impact of such policies.

The international approach of the workshops fully meets the challenges posed by the impact of climate change on every living being on this planet. And in the context of the Mediterranean Sea, the need for cross-border environmental protection policies has an even more strategic scope. Of course, we cannot consider the health of ***Mare Nostrum*** without also considering the implementation of new governance tools, developed by the European Union in conjunction with the Mediterranean countries of the southern shores, whose purpose is to oversee human activities and new models of tourism, as has already occurred in the fishing industry with the Common Fisheries Policy Reform *(P.C.P.)*.

Along these lines is the *"route decree"* signed last March 1st by myself and by Corrado Passera, the Minister of Economic Development, Infrastructure and Transportation.

In light of the environmental risks relating to the dramatic sinking of the Costa Concordia near the island of Giglio, we decided to set limits on transit near national protected areas and other environmentally sensitive areas such as the cetacean sanctuary and the Venice lagoon.
Vessels will also be required, in areas of high environmental fragility, to adopt load restraint systems to ensure maximum grip and stability, thereby anticipating and preventing accidental spills.
International cooperation will also be essential for facing the greatest challenge, namely the impact of climate change on natural marine systems. Rising sea temperatures especially threaten biodiversity, the consequences of which can already be seen in the composition of the flora and fauna of the Mediterranean.

For this reason, the governments of the world's most developed countries have decided to drastically reduce the percentage of fossil fuels, which are responsible for the greenhouse effect, used in energy production.

This has been an extraordinary effort that, in 2010, saw a global investment in renewable

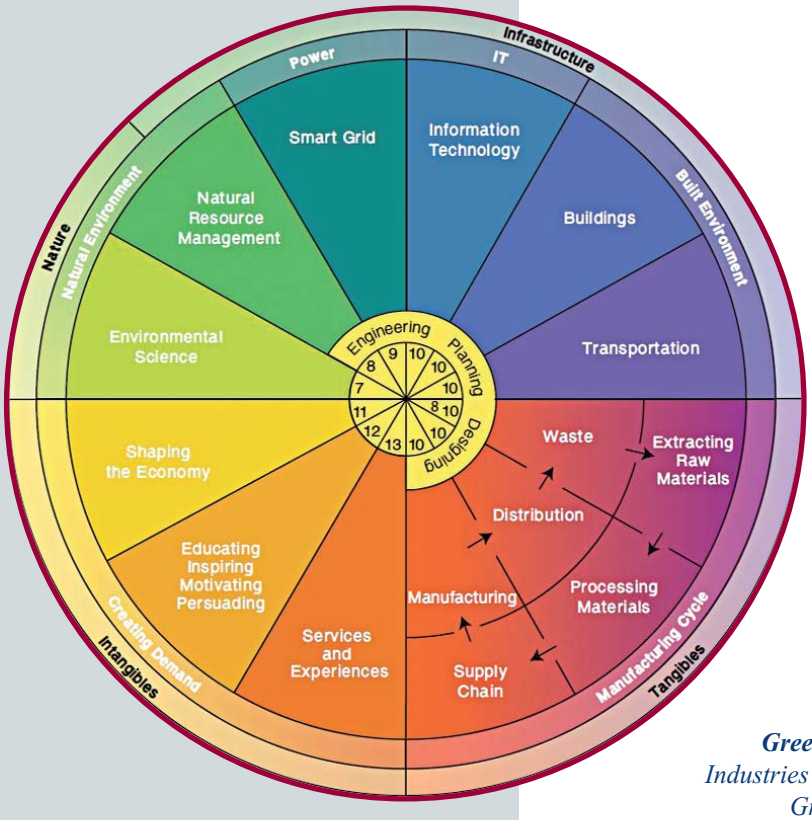
energy of about €225 billion, which represents a 5% increase since 2009 and an impressive 45% increase since 2007.

The interest in the development and distribution of efficient energy technology is also demonstrated by the great success of numerous requests for funding from the Kyoto Environment Fund. € 600 million in funding has been granted and is in effect until July 14th at the Cassa Depositi e Prestiti *[Deposit and Loan Bank]*. The funding, to be distributed in three instalments of € 200 million each, is provided at the subsidized rate of 0.50% and will have a multiplier effect for all production sectors related to the green economy.

The funds will be used to develop small renewable sources and services for production cycles that will have a positive effect on the dynamics of activities along the Italian coast.

From that point of view, I'm certain the ***23rd Sea Conference*** will be a sounding board for the many innovative ideas that influence Italian environmental policy and act as a laboratory for the academic and scientific community with a view toward the Rio+20 conference in June.

Corrado Clini
Minister for the Environment and for Land and Sea Conservation



Green Economy Map
Industries and Sectors within the Green Economy.

Our country's sea is a natural heritage that deserves to be treated and protected with great responsibility so that we can avoid a progressive and irreversible depletion.

We have at our disposal an extraordinary richness that is often underestimated and even more often abused. Resources, by their very definition, have to be, above all else, valued and defended.

It is our duty to convey to future generations a true and proper culture of the sea: it is an invaluable asset composed of a variety of sectors or areas of activity, including fishing, which has a major impact on the national economy.

At the same time, the sea must be perceived not only as an economic asset, but also an environmental, cultural and social asset.

We are experiencing a particular economic situation, and we need a strategic rethinking that can return a reliable frame of reference to the Italian fishing industry, also in view of the major reforms being discussed at the EU level. We must learn to fish less and fish better in order to give fish stocks a chance to recover and the fishermen a chance to receive a fair return. Italy, in this sen-se, must take a lea- ding role in paving the way for the new common fisheries policy, especially in relation to the method of adaptation in the Mediterranean.

We must not lose sight of the need to provide consistent ru- les for the protection of marine ecosystems, for the exploitation of available resources and the protection of fish species, and I am sure that these will be the key elements in the debates and meetings to be held during this ***23rd Sea Conference***.

Mario Catania
Minister for Agriculture, Food and Forestry Policy

Rimini and sea are two words that are associated almost automatically: a major reason for this is obviously the strategic importance that beach tourism has historically had in this part of Italy, which, by using the sea and the beaches, has been able to create a rich and prosperous economy and society.

But that's not all the sea means to Rimini and its province: indeed, the sea makes up a great part of the identity of the community, always ready to meet, exchange, and welcome.

On its shores, Rimini has seen the birth and development of its greatest accomplishment: a system of hospitality services which, since the earliest pioneering bathing establishment founded by Counts Baldini in 1843, has grown rapidly to become Europe's most important and most famous tourist hub.

Even 170 years after that first establishment, the Riviera of Rimini is still one of the most loved and desired destinations for Italian and foreign tourists. Rimini has always understood, and often anticipated, their wishes, a tradition that transformed the culture of hospitality into a fundamental value.

That's why we are particularly pleased and proud to host this year's prestigious ***23rd edition of Mareamico's Sea Conference***, and to welcome the eminent academic, scientific and political figures from Italy and abroad who will be taking part in the conference.

The topics covered will allow us to scientifically deepen our knowledge of various subjects that are of particular importance for our territory.

Much of our area's wealth depends on the respect and care of the marine environment, but it would be simplistic to think of that wealth from a purely economic point of view. What really binds us to the sea, and what unites us to ***Mareamico's*** organizers and speakers, is a deep love for the marine ecosystem and a profound respect for life and the environment. I extend to you a warm and friendly greeting, then, and best wishes for a successful and enjoyable conference.

Stefano Vitali

President, Province of Rimini

This year's event, the ***23rd edition of the Sea Conference***, represents an important opportunity to mention the innovations and changes that the advent of technology is making to sea life and the exploitation of its resources.

I think it is useful in this context to make a small parallelism that, although it may seem obvious, I do feel it is important to highlight once again the binding bond that links our civilization, as well as the companies that rely on it, to the marine environment.

As mentioned, I refer to the acceleration given by the advent of technology. If this phenomenon is quite evident in social relations conducted in everyday life and in more common settings, perhaps less obvious but no less important is that regarding professional and business relationships that take place at sea and in particular in the world of professional sea fishing.
The recent EU legislation on the control makes it mandatory. In fact, the purpose of adopting different technological systems is to monitor the withdrawal activities to ensure the sustainability of fishing and safeguard the maintenance of fish stocks.

I refer in particular to the extent of the ship categories that will be required to adopt the V.M.S *(vessel monitoring system)*, the fishing logbook, electronic sales notes and the A.I.S *(Automatic Identification System)*.

Although the extreme computerization of the sector may almost seem a detachment, a departure from the primordial relationship that has always bounded man to the sea, the actual intent is to reinforce and strengthen this relationship.

In fact, the above systems prove a valuable aid for the benefit of the institutions, but also of all those who love the sea, through which one can control its state of health.

During a previous *Sea Conference* I had occasion to mention the ambitious goal consisting in the involvement of all nations concerned in the creation of a marine protection program that goes beyond national and European boundaries: the adoption of these technologies is an important step toward achieving that goal.

Francesco Saverio Abate

Director General of Maritime Fisheries and Aquaculture - Ministry of Agriculture, Food and Forestry

A blue stretch of sea and 15 kilometres of beach: everyone knows Rimini, the most popular holiday destination in Europe.

Much of its popularity stems from its 250 beaches, the more than 1,000 hotels overlooking the sea *(from the Grand Hotel favoured by Fellini to boutique hotels and family-run pensione)*, its theme parks and thousands of fun activities. For over two centuries - since the first foreign bather in Rimini's history dove into the sea - the holiday capital has continued to welcome visitors and make them feel at home. Rimini's strong identity and bicentennial history have made it a well-known worldwide destination since 1843 - when the first bathing establishment was officially founded by Counts Baldini and the physician Tintori - and have seen the city change from the villas of the belle époque to the world's largest and most efficiently organised beach of our time.

But Rimini, and indeed the ancient Ariminum, is also a city of art with over 22 centuries of history. Visitors shouldn't miss the oldest part of town that surrounds the old fish market, with its narrow alleys and small neighbourhood cafés and bars.

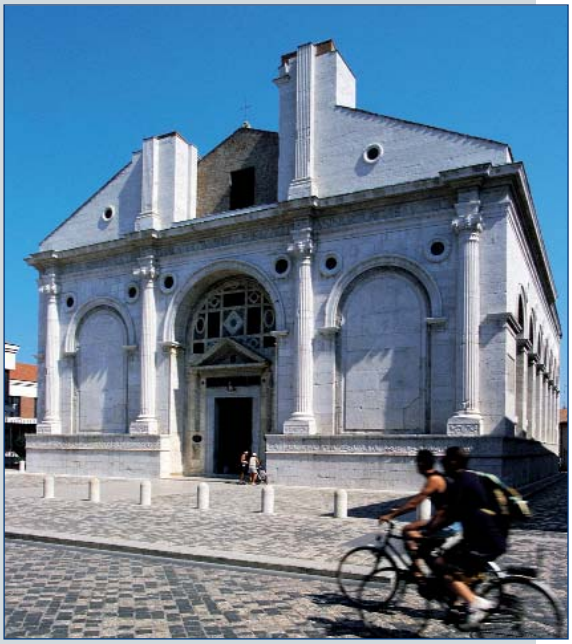
Wandering through Rimini's historic centre is a wonderful experience, as cars are banned and sightseers must stop every five minutes as they stumble upon yet another Roman monument or Renaissance castle.

To get to know Rimini from the beginning, that is the Roman Rimini one should start at the ***Arch of Augustus***, the oldest surviving Roman arch, which stands in a strategic position *(marking the end of Via Flaminia)* and was built by Emperor Augustus in 27 BC.

Another must is a stop in Piazza Ferrari to visit

the Rimini's own mini Pompeii: the archaeological site called the ***Surgeon's Domus***, dates from the second century A.D.
The site brought to light a unique historic heritage particularly through the collection of exceptional surgical instruments that was found here, the most complete of its kind in the world that has reached us from antiquity. The two-storey Surgeon's Domus directly overlooked the sea, which has since retreated by 1 km.

A ten-minute walk leads to the beautiful central squares: Tre Martiri and Cavour. Situated within a few meters of each other are two jewels of Renaissance Rimini. The first, the snow white ***Malatesta temple*** *(1449)* with a façade by Leon Battista Alberti, was to be the grand mausoleum for *Sigismondo Malatesta* and his young lover, then his wife - a dream never realized due to the downfall of Sigismondo.
But the Temple still contains an abundance of masterpieces from Giotto to Piero della Francesca. The second jewel is the fortress of ***Castel Sigismondo***, a symbol of the power of the Malatesta lordship in Rimini. Carefully restored, the site is now a venue for international exhibits, such as the current *"From Vermeer to Kandinsky: Masterpieces from the Museums of the World"*, which can be admired from now until June the 3rd. The walk ends at the ***Bridge of Tiberius***, one of the most important and best preserved Roman bridges in the world, begun by Augustus in 14 A.D. and completed by Tiberius in 21 A.D., which is notable for its architectural design, the grandeur of its structure and the construction techniques used.



For tourist information visit:
www.riminiturismo.it

MAREAMICO AWARD

Donatella Bianchi

Donatella Bianchi began her journalistic experience in the editorial office of ***"Secolo XIX"*** in her home city, La Spezia.

As a publicist, she works with ***"Gente Viaggi"*** and other monthly and weekly magazines dealing with tourism, the environment and cultural heritage. From 1989 to 1992 she wrote and hosted the feature ***"Viaggi d'Autore"*** on the programme ***"Sereno Variabile"***, for which she produced exclusive reports from around the world. She was the first, in 1990, to document the discovery of the foundations of the Temple of David near the Western Wall in Jerusalem, and the only female journalist allowed access to the male sector of the temple. That same year, she broadcast live from the Valley of the Kings in Luxor for the reopening of several tombs of great archaeological interest, from the Egyptian oases and from Mount Olympus in Greece. In 1991, Bianchi wrote and conducted numerous radio programs, both live and recorded, for Radiouno, including ***"Senti la Montagna"*** and ***"Quando i Mondi si incontrano"***.

In 1993 she joined the editorial staff of TGR, for which, besides her video and editorial duties for the main editions of news radio and for TG, she wrote ***"TGR Italia Agricoltura"***, the feature broadcast on RAI Tre that was dedicated to the world of agriculture and environment, and hence became a professional journalist.

A year later, RAI Uno planned the launch of a new program devoted to the sea and called upon Donatella Bianchi to be the female host. By birth and vocation inherited from her family of sailors, the sea has always been a natural point of reference for Donatella, who in 2011 celebrated her 18 years with ***Lineablu*** as a special correspondent for RAI Uno, author and host of the program.
Passionate about the environment, she collaborated with the Ministry of Environment and Agriculture as a witness to the major campaigns of WWF, Legambiente and Marevivo.

She is also the face of major media campaigns on safety at sea produced by the Coast Guard.

Honorary citizen of the City of Santa Teresa di Gallura and Ustica, she has received numerous awards during her career for her commitment to journalism on the environment and the sea. Since 2007 she has represented Italy in the European Union for the Green Paper, the green book of sea policy. In 2009 she published her

first book ***"Storie dal Mare"*** with Aliberti Editore. The Ministry of Environment, Land and Sea conferred upon Donatella the award ***"Ambassador of Biodiversity 2010"*** for her efforts in Environment and Biodiversity Conservation.

Also in 2010, the President of the Republic Giorgio Napolitano conferred upon her the honorary distinction of ***Commendatore of the Italian Order of Merit.***

Her next engagements will be the new edition of Lineablu, which is being shown from the first Saturday in June on Raiuno, and her second book published by Rizzoli on the beauty of the Italian coastline.

EcoLogicaCup AWARD

Mareamico and University of Salento

EcoLogicaCup is the first national online ecology competition for middle school students. Sponsored by S.It.E. and the University of Salento's Centre for the ***Ecology and Health of Mediterranean Ecosystems***, and in collaboration with the editorial group *"La Repubblica"* and the *Mareamico Association*, EcoLogicaCup is a veritable scientific Olympics, which is currently in its fifth year.

The goal of the programme is to draw students' attention to issues regarding the health of our planet and ecology in general. The competition is open to one or more teams from each school, coordinated by a teacher/coach, and plays out via computer technology and communication.

The main point of reference for the entire learning experience is the website *www.ecologicacup.unisalento.it*, which tracks both the content to be addressed and the progress of the competition itself. In fact, the website is the main tool that schools and students use to participate in the competition and deepen their knowledge in the field of ecology.

The ***EcologyAmo*** project, an interactive space made available during the last phase of training, allowed registered teams to access classes via videoconferencing, which allowed the teams to have a dialogue in real time about the ecological issues that are at the core of the competition.

Former Minister of the Environment Stefania Prestigiacomo awards last year's winners

SCIENTIFIC RESEARCH, ENVIRONMENTAL EDUCATION AND COMMUNICATION

Giovanni LELLI - Commissioner ENEA

The sea and the marine environment still represent a source of cultural and economic wealth, which is essential for the countries bordering the Mediterranean.

Let's think about the transportation of goods and passengers, industrial activities, fossil fuel extraction, power lines, pipelines, recreational and educational activities and, of course, the fishing activities that bring delights to our tables, but that pose ever greater difficulties for maritime organizations.

All these activities take place in an environment that has not yet revealed all its secrets and its potential, and it is just for that reason, to be able to deepen this knowledge and access these riches, that we have to preserve the integrity that is put at serious risk every day, even from a single incident that can have a major impact on habitats and ecosystems.

If we are aware that the soil has been used in an almost exhaustive manner and that the sea, with its many different forms of life and energy largely still to be explored, could become the new frontier, then it is now that we must begin to think about its governance and about the activities that we should develop and monitor with greater attention.

With its unique heritage, 10% of which is protected, Italy has a notable wealth that could be better used.

And it's precisely about the future - not only of the Adriatic Sea or the sea within national borders, but of the entire Mediterranean - that we have to question. The Mediterranean Sea is already the source of numerous agreements and networked infrastructures, and we increasingly recognize the importance the role this body of water may play, both culturally and economically, between the countries of southern and northern Europe.

The Adriatic Sea is an example of different uses of the sea, with activities that make more or less of an impact, and where fish and shellfish farming - essential resources for the economy of the Adriatic - must have the necessary guarantees to operate and coexist in an environment devoid of polluting sources.

In addition to the regulatory context that is al-

ways aimed at greater protection, communication and environmental education play an important role, both from a cultural point of view - I'm thinking about schools where research bodies and experts can work together to provide an updated overview of necessary human, scientific and technological knowledge - and from an economic point of view, where communication and environmental education are the necessary preconditions for the development of new industries.

I refer in particular to the Marine Protected Areas and Marine Parks, in many cases consisting of insular areas that often suffer from problems related to the lack of diversification of local economies, mainly tourist and seasonal. Here, new activities of high environmental value can be created that are related to water management, the waste cycle, the optimization of the consumption of resources and, not least, a greater efficiency and energy self-sufficiency achieved also through the use of renewable sources. These are all areas in which ENEA has been present for some time through programs of scientific cooperation with schools.

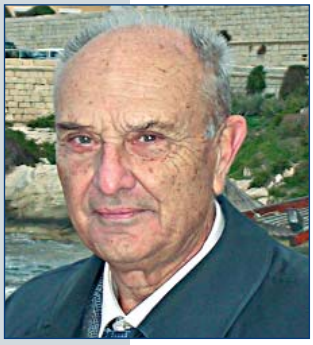
Research can play an important role in accomplishing the proposed action, and must be ready on one hand to provide the necessary technical assessments to the decision-making bodies, and on the other hand to continue raising awareness - together with associations that deal with protection, education and environmental communication, professionals and public opinion - about the importance of maintaining the characteristics of these environments.

In this context the Italian National Agency for New Technologies, Energy and the Environment *(ENEA)* is involved in strategic areas of research for the identification and development of new environmentally sustainable technologies.

AIMS OF THE 23rd SEA CONFERENCE

Giuseppe COGNETTI - University of Pisa
Chairman of the Mareamico Scientific Committee

This year's event will be focussing on specific issues relating to modern management practices where marine resources are concerned; with individual workshops being organized, we will be following the format that met with such success last year and the year before. The results of each workshop will be discussed overall in a plenary session in order to have a full picture of the various views held by each of the experts attending, providing them with the opportunity to suggest practical solutions to the issues raised.



Rimini, a city where trade and commerce are predominantly linked to the sea, is the choice of venue for the ***23rd Sea Conference*** in order to demonstrate how a suitable balance can be found between the economy and ecology in the Adriatic, a sea that is virtually exploited to the hilt and where contrasting business interests cross paths, with fishing, acquafarming and tourism meeting up with port operations, industry and mining. This results in an ongoing need to monitor water quality and to implement increasingly stricter defences to protect biodiversity.

It is essential, against this backdrop, to work closely with countries on the eastern coast, especially where the sharing of knowledge and information is concerned, as well as in relation to scientific research. The productive relationship fostered by *Mareamico* with the Cattaro Institute of Marine Biology *(at the University of Montenegro)* is of particular relevance here, as the results of the three technical and scientific conferences organized in Budva over the last years clearly demonstrate.

It is my sincere hope, therefore, that the closing session of this year's event will see proposals that aim to strengthen and extend cooperation between the two shores of the Adriatic, with the spotlight on environmental information being a requirement to ensure that work can be done in partnership to protect the environment. Correct information, being information that has a secure scientific footing, also assists in raising awareness on the part of the individual and the important role that they themselves can play in protecting the environment, and is essential if public authorities tasked with implementing defences to protect marine resources are to make informed decisions. It is, therefore, necessary that a certain distance be adopted from fundamentalist ideologized environmentalism based on emotion, which can lead to conclusions being drawn in relation to particular ecological situations that prove to be incorrect; instead, the focus should be on the need to forge close ties between the scientific basis of ecology and the scientific basis of information, in order to be able to identify solutions to the very many problems faced by the environment. The aim behind this is to single out the ecological principles that combine environmental protection with an increase in economic wellbeing, adopting a vision that tackles the conservation of the environment.

THE REFORM OF THE GFCM

Stefano CATAUDELLA - University of Rome " Tor Vergata",
President of the GFCM

The General Fisheries Commission for the Mediterranean is one of the regional fisheries organizations, established in the FAO more than 50 years ago, which today possesses a budget and an independent seat.

The primary purpose of a regional fisheries organization is to define a system of common rules on a scientific basis, with the active participation of countries having jurisdiction in the geographical reference area of the organization. In the case of GFCM, all countries bordering the Mediterranean and Black Sea are members.

The EU is a member of the Commission considered that fishing is a matter of shared responsibility between Member States and the Union. Japan is also a member of the GFCM, given that in the past, before ICCAT regulations, this country actively practiced fishing for Bluefin tuna in our sea.

Today the central issue of fisheries policy is the conservation of biodiversity, to ensure this activity's ecological and economical sustainability. This ambitious goal requires a strong scientific basis, a system to collect reliable data in Member States, supporting joint decisions to adopt common rules.

The Mediterranean Sea is socially and economically very complex. Africa and Europe meet in this region. Very different cultures, religions, economies and politics, despite the effects of globalization, complicate the assumption of common rules that are effectively applied and controlled. But without common rules for the management and control of shared biological resources it is difficult to achieve the objective of responsible fishing *(according to the Code of Conduct for Responsible Fisheries FAO/95 and subsequent amendments)*.

To address the complex issues raised, a review process of the Treaty governing the mandates of the GFCM is in progress. This process was initiated by a consensus proposal made by the Commission itself in its 35th *(2011)* session. This review shall be conducted under the supervision of the Presidency and performed by the Secretariat of the GFCM through a series of consultations.

In fact, a task force has been put in place involving all countries, using a computer platform for the exchange of information and sub-regional and validation meetings have been held.

The proposals of the task force will be brought to the attention of the Commission in the 36th session to be held in Morocco in May 2012. If the review proposals of the Treaty are deemed satisfactory by the GFCM, formal procedures will be initiated in close collaboration with the legal offices of the FAO.

The reasons for a revision of the Treaty, the role of the task force and the importance of a participatory process for the success of the sea policies, including fishing and aquaculture, are summarized in the brief communication.

PORTS AND PORT OPERATIONS: IMPACT ON THE ENVIRONMENT AND EFFECTS ON MARINE BIODIVERSITY

Alberto CASTELLI, Michele BARBIERI e Ferruccio MALTAGLIATI - University of Pisa

Ports have always played an important role, not just as the stage for trade, commerce and transport but also given the contribution that they make to the development of the surrounding area. From the point of view of the environment, a port represents an extremely fragile area that has to cope with the effects of a vast array of factors that threaten environmental conditions overall and can put marine biodiversity at risk when chemical contaminants are released into the water or as a result of organic enrichment resulting from cloacal discharge.

It follows, therefore, that these areas have to be monitored in order to keep the impact on the environment as a result of port operations, the ramifications of which can also extend to affect the surrounding area, to an absolute minimum. We are pleased to have been able to contribute to the organization of the workshop focussing on this topic, which aims to tackle the issues connected with the management and running of ports, as well as dealing with the ecological issues that may have an effect on biodiversity in the area and which have to be kept under tight rein given the possible negative implications for ports and the surrounding areas.

Contributions to this workshop will deal with a range of issues typically faced in ports and which have a bearing on port management. It is proposed that some will deal with the problem of colonization of allochthonous species transported by merchant ships; for these species, ports represent extremely easy routes of access, from which point they can then spread out to the surrounding areas, prompting substantial changes to biodiversity. Recent research into this process along the Italian coastline has demonstrated the considerable extent of this problem and how maritime traffic is one of the favoured routes into the area for allochthonous species. One example is provided by the fascinating case of the allochthonous mussel *Limnoperna securis* which, over recent years, has multiplied at a truly astonishing rate in the canals around the port of Livorno on the north-west coast of Italy.

Such habitats can also become settlement locations for thermophilic species which, with the temperature of the water in the Mediterranean gradually rising, can spread far and wide and be another reason behind biodiversity undergoing a substantial change. Certain species of polychaetes of the *Ophryotrocha genus* provide a typical example: these are often found in port environments and are colonizing these areas at increasingly higher latitudes.

With all these matters being of great interest, along with the involvement of speakers from other countries in the Mediterranean, we will be aiming to take stock of steps already put in place and to weigh up the current situation in the various countries concerned, in order to obtain an overall view of the issues referred to above.

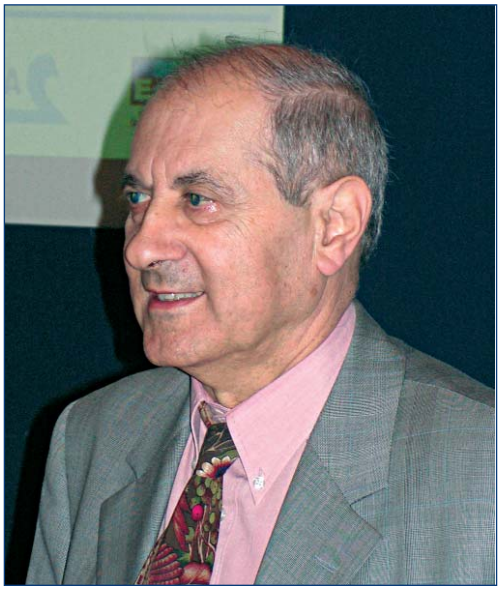
MARINE TOURISM: WHAT PERSPECTIVES AND PRACTICES?

Jean-Pierre LOZATO-GIOTART - Paris III Sorbonne Nouvelle
Mareamico Scientific Committee

During the last year 2011, the seaside international tourism arrival was more important than 450 millions of customers. Beach, sun and sea in any case are always the first world attractively tourism destination in the summer time for Europeans and Nord Americans people but also during winter season for the tropical zone in Asia and Latin America particularly.

Not only for the traditional swimming seaside but also for sport activities, thalassoterapy and sea cruised. But the geographical tourism concentration of some resorts, tourism ports and other infrastructures like artificial beach would have some negative environmental impacts.

It's certainly necessary to delimit what kind of sustainable territorial carrying capacity for what kind of sea side and maritime tourism development for the future with more than 800 millions of customers around 2020-2030.



Rimini beach

SOME THOUGHTS ON SUBSIDENCE

Lucio UBERTINI - " Sapienza" University, Rome
Mareamico Scientific Committee

As you know, subsidence refers to the vertical lowering of the earth's surface, regardless of the cause that produced it, its areal development, the speed of development, the temporal evolution and the environmental changes resulting from it.

This phenomenon can be induced either by natural causes or by human activities. Examples of natural causes include the compaction of geologically more recent sediments, the collapse of underground cavities or the settling due to seismic events. Among human causes, the most significant is certainly the extraction of fluids from the subsurface. Natural subsidence is generally characterised by a very slow evolution, with the sole exception of seismic phenomena of high magnitude. Human-induced subsidence, on the other hand, develops rather quickly, often at a speed far superior to that of natural origin and with effects that, if not foreseen, controlled and managed, can strongly compromise human activities and work.

Indeed, such subsidence can significantly affect the structure of the territory, resulting in substantial damage to property and modifying, in a largely irreversible manner, the physical-mechanical characteristics of the soil involved and the surrounding environmental conditions. Seabed subsidence, for example, reduces or blocks the nourishment of the shores, thereby causing setbacks in the coastline, weakens any defence systems placed in the sea, and causes frequent flooding in urban and agricultural areas. Evaluation of subsidence risk calls for the study of areas already affected by this evolution dynamic so as to quantify the areal distribution and its spread over time.

In fact, this analysis of phenomena related to the lowering of the surface makes it possible to implement prospective studies and identify appropriate measures to limit the consequences, the most effective of which often seem to be the suspension or drastic reduction of the activity responsible for the subsidence. During the investigation and analysis of the phenomenon, the measurement and monitoring of superficial ground movements play a fundamental role, whether obtained through traditional methods like geometric levelling, or through more innovative methods like GPS *(Global Position System)* and SAR *(Synthetic Aperture Radar)* differential interferometry techniques.

Subsidence is a phenomenon found also in our country and affects most of the coastal and alluvial plains, where it is triggered or accelera-

ted by human-operated mining and drainage activities. A good case study is that of Emilia-Romagna.

A significant homogenisation of available subsidence data for the 1970s-1990s and data from the regional subsidence monitoring network, completed in the late 90s, made it possible to develop maps of the ground lowering, which in turn allowed for the identification of the most critical situations and the attribution of the causes to the massive withdrawal of fluids *(water and hydrocarbons)* from the subsurface, an activity that continued throughout the post-WWII era.

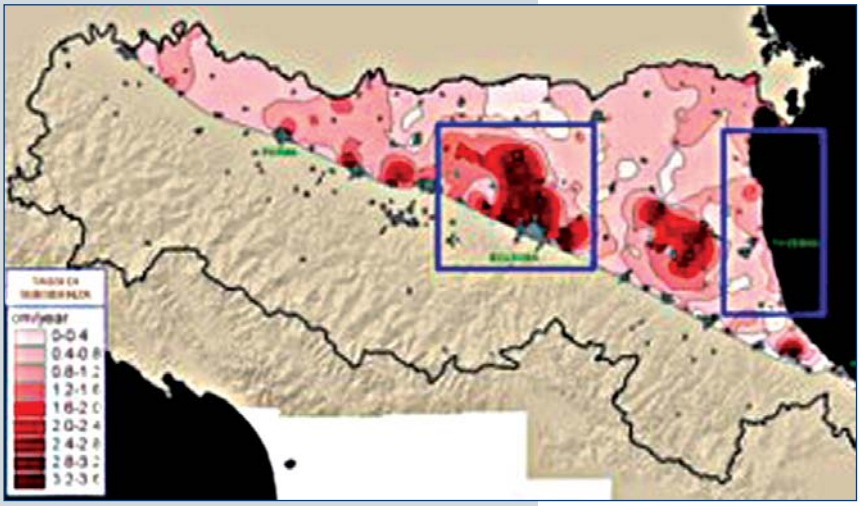
A similar situation is also found in Louisiana, where subsidence, along with the loss of wetlands, is a direct result of oil operations in the Mississippi River flood plain.

The subsidence phenomenon is well known and studied: in 1984, for example, the International Association of Hydrological Sciences *(IAHS)* held its ***"3rd International Symposium on Land Subsidence"*** in Venice.

Interest on the subject is considerable, both because of the serious consequences that can arise from it, and for its close ties with deeply-felt issues - like the optimal management of soil or groundwater - within the wider area of environmental heritage protection.

Certainly, subsidence is a phenomenon that must be tackled with an interdisciplinary approach, involving not only a variety of professionals, hydraulic and geotechnical engineers, geologists, geophysicists, hydrologists, but also statisticians and mathematicians.

Indeed, all such professionals are called upon to contribute to the study of the phenomenon through mathematic schemes and modelling, through the description of tools able to measure it and analysis of recorded data, through the identification of its causes and the environmental, economic and social effects encountered, and finally through the presentation of possible solutions for the various case studies.



Distribution of subsidence in the plains of Emilia Romagna in the period 1993-1999 and delineation of two critical areas subject to specific studies. ARPA Data - Environmental Engineering, Bologna.

MARINE POLLUTION FROM PLASTICS

Joandomènec ROS - Department of Ecology at the University of Barcelona
Mareamico Scientific Committee

In his account of the ***Kon-Tiki*** expedition, Thor Heyerdahl told how the raft's crew found plastics and other materials of anthropogenic origin floating in the sea many hundreds of miles from terra firma.

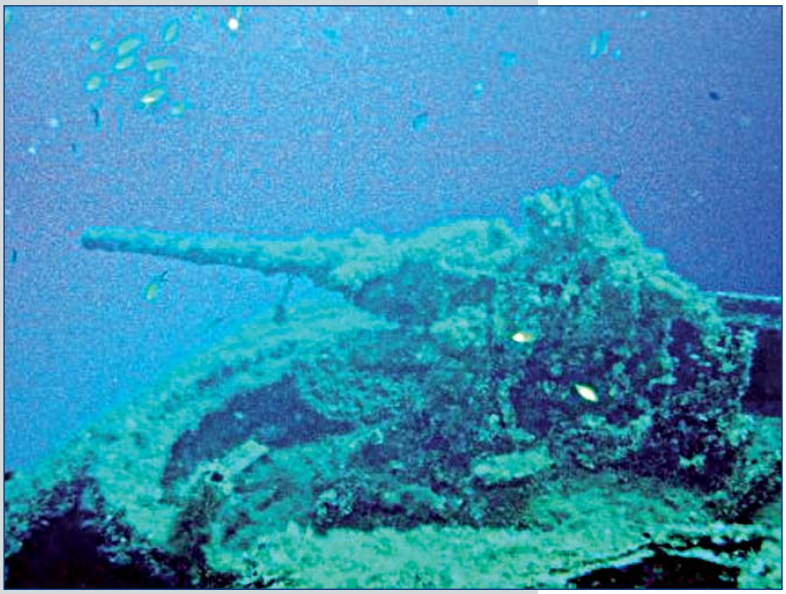
This famous expedition took place more than sixty years ago and we do not need reminding how much the production and widespread use of plastic materials has increased since then. So it comes as no surprise that the accumulation of plastics, first on our beaches and then on the open sea, should now represent a major problem and not just one of aesthetics. Many organisms benefit from floating materials on which they establish themselves. However, many others confuse these plastics, particularly when degraded and fragmented, with potential food.

As a result, fish, turtles and seabirds are paying a huge price in terms of death from indigestion and disorders of the digestive tract. Fish that feed on neuston, the albatross of the oceanic islands and turtles across the globe are falling victim to the proliferation of these inedible fragments.

The volume of plastics from all sources that end up in the sea is so great that large accumulations of plastic fragments, of all types and from all origins, were recently found floating at the centre of the large anticyclonic eddies of the world's oceans, first in the North Pacific, later in the North Atlantic and finally in all of the world's oceans. The estimated volume of one of these *"continents"* is striking: in the central North Pacific plastic materials cover a surface area equivalent to that of the United States and reach a depth of some ten metres, measured from the surface. So it is a plastic laminated *"Sargasso Sea"*, with the difference being that it is not a blessing for the many species

that find refuge, food and breeding grounds amongst the floating brown algae: this drifting mass of pollutants is rather a curse and one that is constantly growing as more plastics find their way into the oceans.

The plastics that accumulate on the ocean surface are subject to mechanical fragmentation and degradation as well as chemical erosion, which create smaller sized fragments that float on the surface of the water. A study that we carried out during the spring of 2011 in the Sargasso Sea and in the subtropical gyre of the North Atlantic confirmed the vast quantities of plastics floating in this part of the Atlantic. The sampling was carried out during March 2011 on board the oceanographic research ship Sarmiento de Gamboa.



The results of the study indicate that the size of most of the fragments was less than 0.5 cm; however, there is also an abundance of medium and large sized plastics. The fragments were mainly white, transparent and blue in colour and, less often, coffee colour, red, yellow and orange. Monofilaments and fragments were the most abundant types and, in turn, the main components of larger and smaller sized fragmentation.

The majority of plastics found are materials related to the fishing industry and shipping but materials emanating from a variety of uses *(industrial, domestic)* are also often found on the *"continent"*.

There is still a great lack of knowledge about the rate of degradation of the various types of plastics and the time that they remain in the sea; however, by the very nature of the materials, degradation and fragmentation occur very slowly, such that entry rates from the various sources are certainly much greater than exit rates through fragmentation and, potentially, sinking. It is therefore a matter of urgency that studies are carried out to clarify these extremes and, potentially, that measures are established to reduce this type of pollution in the marine ecosystem.

GLOBAL CHANGES IN THE MARINE ENVIRONMENT

Franco PRODI - University of Ferrara
Mareamico Scientific Committee

In recent years the notion of *"global change"* has emerged, as the result of changes on a planetary scale that takes the Earth to conditions not previously experienced, and in which the climatic condition is just one, even if the most striking and discussed, of those recorded.

The reason for believing that these are conditions never before experienced is in the unprecedented fact that a living species is expanding both in number and in terms of energy demand, and consequently uses the resources of the planet, changing its characteristics and interfering with what would be its natural evolution.

This period in Earth's history is even given a name -*Anthropocene*- in parallel to what has been done in other great geological eras. This notion of global change, initially limited to the Earth and its compartments *(oceans, land, atmosphere, polar ice caps, vegetation)* and its cycles *(of water, nitrogen, carbon, sulphur, phosphorus, etc.)*, is also extended to the human population, economy, transportation, energy use, land use, biodiversity, food resources, and so on.

In the context of considering the sea, and after having dedicated the past year to considering climate change, it seems particularly convenient for us to focus this year on global changes in the marine environment that are possibly connected to other *"neighbour"* compartments *(atmosphere and exchanges, intake of rivers, etc.)*.
It would be wise to pay specific attention to what is already being done in chemical oceanography, marine biology and so on.

In this session, we plan to focus on the global changes in the seas *(including lagoons and coastal areas)* and on the progress of observational methods and models, with the aim of determining the causes. We'll also look at whether an anthropogenic cause is detectable and, if so, whether its contribution can be separated from the natural evolution of the system and to what extent it is quantifiable.

We expect to have input from ocean circulation modellers, remote sensing operators for the surface of the oceans and coastal areas, and ocean chemists, oceanographers and marine biologists, with an eye toward the chemical composition of water and sediment, to the flow of nitrogen in coastal areas, to suspended particulate material, to the extinction of marine species in relation to pH changes in the oceans.
As for the sectors bordering the sea, studies on matter exchange between ocean and atmosphere are crucial since they are related to the knowledge of the boundary layer and the contribution of precipitation as well as the contribution of rivers, on the effect of the increased use of water before it reaches the sea by agricultural and industrial activities and by dams and weirs.

MONITORING TECHNIQUES FOR GEOLOGICAL STORAGE SITES AT SEA

Sergio PERSOGLIA - CO_2GeoNet, Secretary-General

The year 2011 was the year of transposition in all European countries in the national legislations of the European Directive on Geological Storage of Carbon Dioxide *(CO_2)*.

The purpose of the Directive is to establish an appropriate legal framework in order to proceed with the safe geological storage of CO_2, avoiding that any negative impact can occur on the ecosystems and human activities. The two key factors, repeatedly mentioned and defined in great detail, are certainly the identification and characterization of storage sites and monitoring plans, which must cover a very wide time span, from before starting to inject the CO_2 in deep geological formations to several years after the operations have been concluded and the storage facilities abandoned.

The monitoring operations are therefore very important and have different purposes, such as:

- monitoring the operational injection phases;
- quantifying the CO_2 injected into the neighbouring geological formation;
- controlling the tightness of the overlying sealing formation;
- verifying that any faults present remain closed and also constitute a barrier to the movement of deep fluids;
- *"mapping"* the extension of the injected CO_2 in the reservoir;
- identifying and quantifying the leakage of CO_2 on the surface and check that they are of natural origin and therefore, not related to the storage operations.

In reality, the data collected is of great importance in order to:

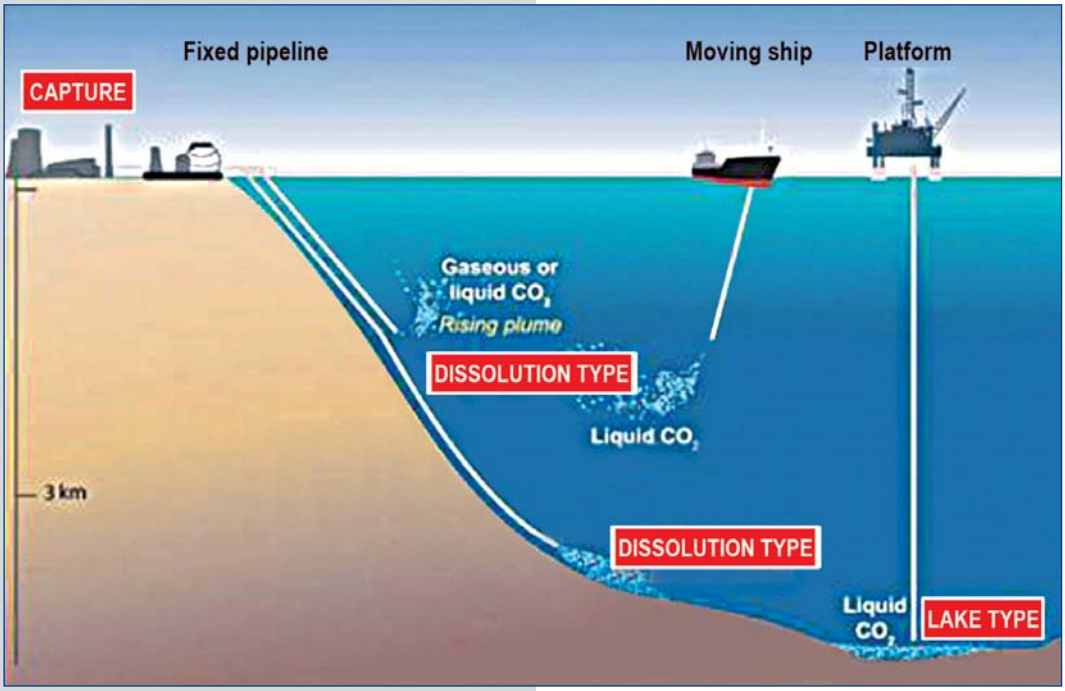
- follow the time-based evolution of the CO_2 in the natural reservoir and compare the behaviour with that foreseen when applying hydrodynamic and geochemical modelling techniques;
- better define the characteristics of the reservoir into which the CO_2 is confined;
- on the basis of this, update the safety criteria and risk analyses;
- update the actual monitoring plans, especially in light of new scientific and technological developments.

The planning and execution of the monitoring

activities should be carried out both for storage sites on land as well as at sea. The latter are becoming gradually more important. In fact, the two sites of Sleipner and Snovit, both in Norway, are at sea, where millions of tons of CO_2 have been stored for several years and many of the candidate sites to be supported with funding from the European NER300 are also at sea, including the one proposed by ENEL for its Porto Tolle plant.

The monitoring of CO_2 in the natural reservoir can be conducted with multi-channel seismic reflection methods, repeated over time, with seabed microgravimetry and with CSEM methods *(Controlled Source Electromagnetic)*. The control for possible leakage of CO_2 from the seabed may be more complex. In addition to the seabed mapping techniques *(such as Sidescan Sonar, Sub Bottom Profiler and Multibeam)*, seabed sensors can be used to measure dissolved or bubbles of CO_2.

Automated systems with periodic retrieval of data or their acoustic transmission have proved to be very useful for basic measurements, before starting storage, and can remain active for several years. The physical measurements are always linked to the chemical ones along the water column and biological on the seabed and in the water column. The sea is in fact a complex system in which the biological component cannot be neglected in its interactions with the physical quantities, therefore biological monitoring is now considered of great importance in controlling CO_2 storage sites at sea.



CSS, (Carbon Capture and Storage)

AIM OF SCIENTIFIC RESEARCH AND OF ENVIRONMENTAL COMMUNICATION IN ECOLOGY

Emilio OLZI - Mareco Laboratory CNR - Bonassola - La Spezia
Mareamico Scientific Committee

Ecology is an extremely complex matter based on the main disciplines related to the science: physics, chemistry, mathematics, biology and many others.

This means that, before treating ecologic matter, a well based scientific knowledge is necessary; such knowledge is normally not well known from the people. Let's have an example on how a scientific analysis in the case of sea ecology can be carried out.

The sea can be polluted in different ways. Let's consider some shifty examples and thus not easily visible without a specific culture:

1) Chemical pollution. This takes place in industrial areas producing wastes which are let into the sea. This is due not only to chemical polluants discharged in the sea as production wastes, but also to a more shifty pollution, so as lead, tin and other heavy metals introduced in the sea, for example, from antifouling paints normally used to protect the ships from fouling. Another type of shifty pollution is, for example, the increase of carbon dioxide which is dissolved in the sea with acidification and related consequences of the living conditions. We will define this kind of pollution as *"bulk pollution"*, regarding the mass of the sea.

2) Factors regarding the sea surface. I mean floating objects, of which the most diffused representative is plastics and hydrocarbons. Such a pollution in the case of plastics is less dangerous for the man's health, but

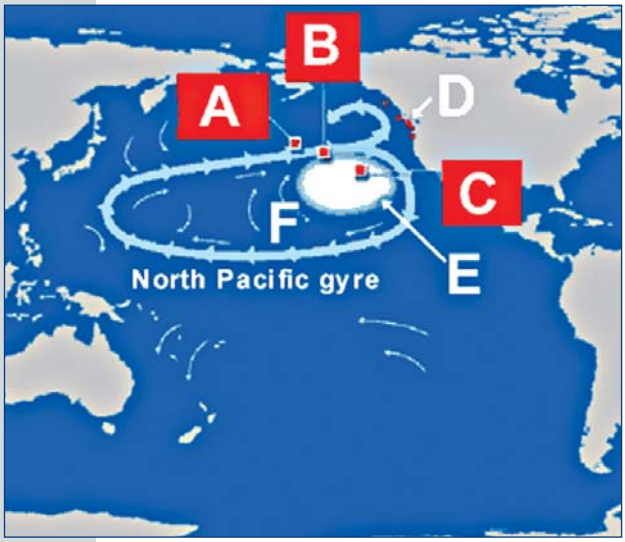
yields a reduced oxygenation of the lower level of the water with consequent death of many living inhabitants like fishes, algae and all those species living in the water which need oxygen to live. At present, for example, in the Pacific Ocean is present a enormous island of plastic wastes named *"Pacific Trash Vortex"* or *"Great Pacific Garbage Patch"* tremendously wide *(some people says the island greater than France or more)*. One can ask how the living *(perhaps!)* lower level biological species can survive without dissolved oxygen. In our Mediterranean sea, at least for the moment, are not present such enormous islands, but anyway plastics are visible in great amount; to put trashes under the carpet, as well as to eliminate plastics by putting in the sea does not solve the problem of plastics elimination, but also shows a very bad aesthetic effect for the users of the sea. In our sea this

effect is not yet dramatic as in Pacific, but it is relevant. But another even more detrimental floating pollution is due to hydrocarbons which, due to incidents, is let in the sea; this kind of pollution is even more serious than plastics because it covers completely the surface of the sea which becomes absolutely air-proof; in addition to that, it yields terrible condition for the seabird and other animals.

What it is possible to do to avoid such disasters? For hydrocarbons it is necessary the use of tankers in good conditions. For plastics and other non biodegradable materials the solution is ecologic education. A rational well educated person will never pollute the environment; for example, in our case, will not treat the sea as a trash bin. The incorrect behaviour is, in the case of Mediterranean, even more detrimental; our sea is like a great lake with a poor communication with the Oceans, then it is a closed system, more fragile than the Oceans. For this reason, it becomes very important the environmental communication.

The communication to the people normally is done from media. This fact caused a very large diffusion of ideas, but often incorrect; the communicators not always are expert in ecology, and very often their knowledge is not scientific. As result, a lot of informations were given to the public but they were not always correct and gave a not scientifically based optimism, but more often of catastrophism , with the diffusion of not true ideas to the public.

In order to correct such a circulation of ideas, the only usable weapon in the knowledge. And the result is only obtainable by the knowledge of the matters on which this very difficult discipline is based. But, in conclusion, also this is not enough: the circulating ideas might be based on the knowledge *(studied and not bawled ecology)* to obtain a better environmental education, based on the knowledge and causing the ecology to become an habit for everyone.



The "Pacific Trash Vortex"

CRYPTIC DIVERSITY IN DEEP MARINE WATERS: THE GIANT RED SHRIMP ARISTAEOMORPHA FOLIACEA

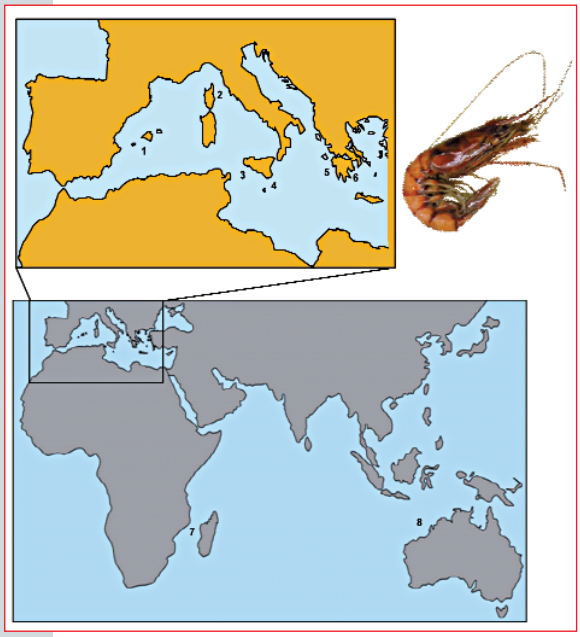
Marina ROLDÁN, Maria Victoria FERNÁNDEZA, Sandra HERAS - Universitat de Girona (Spain) e Ferruccio MALTAGLIATI, University of Pisa

The deep water red shrimps, Aristeus antennatus commonly known as red and blue shrimp and the giant red shrimp *Aristaeomorpha foliacea* have been intensely exploited in the Mediterranean Sea during the last 50 years.

Following FAO statistics in the Mediterranean has been fished an annual average of 2500 tonnes throughout the last 10 years of both species, which reach 100 Euros per kilo in the Spanish and Italian fish markets. The giant red shrimp, A. foliacea *(Risso, 1827)* is a crustacean decapod with high meat quality very appreciated in the Mediterranean cuisine, which commercial fisheries are between 400 and 800 meters deep.

These shrimps inhabit the continental and insular slope as Balearic Islands, Sicily, Sardinia and Corsica, undertaken temporal movements between the slope and the margins of submarine canyons. Also is present in the Indian Ocean, mainly in the Mozambique Channel and Nor-western Australia. Despite of the economically importance of the giant red shrimp, scarce is the knowledge of his biology.

As a part of a research project carry out at Laboratorio de Ictiologia-Genética, University of Girona and with the aim to study the genetic variability and genetic diversity at global scale we analyzed 685 bp of Cytochrome C Oxidase subunit I in 317 specimens from 8 localities at Me-



Aristaeomorpha foliacea. *(Photo by Marina Roldán). 1 Ibiza Channel, 2 Tyrrhenian Sea, 3 Mazara del Vallo, 4 S-W Ionian Sea, 5 S-E Ionian Sea, 6 Egeo Sea, 7 Mozambique Channel, 8 N-W Australia.*

diterranean Sea and Indian Ocean *(Figure 1)*.

The analysis of COI sequences in A. foliacea revealed the presence of high level of within samples genetic variability, with values of haplotipic diversity of 0,511> h <0,990. Results based of different kind of statistical analysis, as AMOVA, network and Bayesian assignment test, showed three strong differentiated lineages: Mediterranean, Mozambique and Australia.
Significant genetic divergence among regions together with a similarity based on morphological characters frequent in decapods, indicate a plausible case of cryptic diversity.
Within the Mediterranean Sea, a moderate genetic diversity was found where both Mesina and Sicily Strait could play and important role to homogenise populations of giant red shrimp.

Passive drift of early life stages and active adult migration, despite limited knowledge of population dynamics exists, could justify these results. From conservation point of view, is necessary to develop policy of independently management of the three lineages associated to regions detected, to avoid lost of species diversity.

PROMOTION OF ECOTOURISM IN TUNISIA: THE JASMINE REVOLUTION (14 JANUARY 2011), THERMALISM AND THE NORTHERN LAKE OF TUNIS

Saloua CHAOUCH - AOUIJ - Tunis Faculty of Science - Tunis El Manar University
Mareamico Scientific Committee

Good morning friends, good morning dear partners, for the well-being and survival of the Mediterranean, let us show solidarity and accept our diversity and our origins for the protection and future of our common heritage, values to be enhanced through vigilance and determination.

So don't let us give up! As scientists it is right that we come together: North Bank/ South Bank, decision-makers and citizens: we have a bridging/mediation role to play using our scientific arguments.

For my part, by offering my students three Masters subjects, including two that relate to this communication, I create a winning formula: the protection of the Mediterranean, the survival of Humanity and the preservation of biodiversity in the context of sustainable development.

Thermalism in Tunisia is not content just to be an ecotourism alternative - health tourism that sees itself as *"green"*, organic or commonly prefixed with the word *"bio"*, as the new trend dictates: it is there to address the requirements of the new concept, an invitation to combine the countless benefits of labelled water with qualities that respect an environment to be preserved and passed down to future generations in the best possible conditions.

Three illustrations underpin this presentation, the details of which are being submitted to the ***Mareamico Scientific Committee***, thanks to

whom we have once again come together and whom we thank and support by belonging to this network of honourable experts. Two of our examples are to be found, respectively, at Hammam Jedidi and at Korbous, Cap Bon, in the Nabeul Governorate, 60km from the capital; the third, also 60km away, is located in the Zaghouan Governorate, at Djebel El Ouest to be specific.

All have advantages that justify our interest. In this sector, where it is twinned with thalassotherapy, which was presented last year, there is good reason to make people aware of the foundations, to underline the fact that Tunisia is ranked second in the world after France for thalassotherapy and second in the world after South Africa for thermalism.

This is because water quality analysis, the conditions on offer and professional training confirm the appeal of these practices and activities; their benefits are countless and are on more than one level, particularly the financial level. Germany also performs well in terms of thermalism.

The Northern Lake of Tunis, scientifically not a very accurate name, belongs to the shallow *(less than one metre in depth)* Tunisian lagoon system and is located between the city of Tunis and the Gulf of Tunis, in the north-east of the country. Furthermore, in our opinion, this subject is a good illustration of ecotourism in both of its aspects, i.e. integrated tourism that respects the environment whilst enhancing our natural and archaeological heritage.

Île Chekli is overlooked by a fort and has a port and now a marina that permits small-scale fishing activities; moreover, this protected wetland, which is home to species such as the pink flamingo, a symbol of the nature reserve, represents an asset of ecological appeal. In the Mediterranean region it has an ecological footprint that makes you forget how close you are to a capital city, where countless anthropogenic pressures seem to create a build-up of pollution that is difficult to avoid.

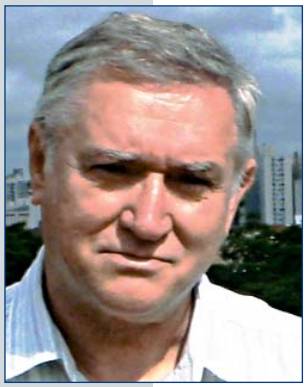
We conclude with just one reference to a third piece of work, again at Cap Bon, which expands the team's horizons: the comparison of natural and social indicators of the Korba reserve with those of a sister reserve in Picardy *(France)*.

These are just some of the contributions of the South Bank and examples on which to build to provide a better understanding of our region and which we should protect, together, by pulling in the same direction. Future occasions, opportunities and meeting themes cannot fail to strengthen the fortress we are building, guaranteeing the history of our people at a difficult time of transition for us all.
Goodbye until the next time.

THE NEW REGULATION FOR THE EUROPEAN COMMON FISHERIES POLICY

Argyris KALLIANIOTIS - Director of the Institute for Research on Fishing - Kavala (Greece) - Mareamico Scientific Committee

Last year, a discussion began regarding the revision of the common fisheries policy within the European Union.



Some measures of the new Regulation are not new to us, since they had already been presented in Regulation 1967/2006, which covered the Mediterranean fisheries. Ideas like the holistic approach to fisheries, in which environmental implications and socio-economic parameters are taken into consideration; the co-management approach, in which the resources of all stakeholders in fisheries are involved, including ship owners, administration and research; and the precautionary approach, in which we seek not to further worsen the current level of biological resources, can already be found in the existing Mediterranean Regulation, despite the slowness of implementation within the administrative practices of each country.

In addition to these well analyzed measures of past years, we have other new measures in the new Regulation, but they require a different approach. The particular characteristics of Mediterranean fisheries should not be a justification for not applying the European regulations.

On the other hand, these characteristics are an existing reality, one that we should not forget when looking for new solutions or when proposing radical changes.

For example, the idea of the possibility of transfer of fishing rights between vessels is a measure that could be applied when we have data that shows the status of biological resources. Such data could be found for species that are massively fished through both trawling and purse seining.

The same provision is unlikely to apply to small-scale coastal fisheries. The reduced output of these boats, the large number of marine species involved, the variety of fishing gear, and especially the socio-economic role of fishing in a large part of the southern Mediterranean, underline these limits of application.
We understand the need for the European Union to establish general rules for all European fisheries, regardless of regional characteristics. But while such measures facilitate administration, especially in Europe, they could worsen the situation for small Mediterranean coastal fisheries.

We must emphasize that the *"Regional Advisory Committee"* for the Mediterranean was instituted a long time ago, in which all parties involved in fishing participate.

Through this organization and others like it, we might find solutions to mitigate the sector's serious economic problems, taking into account the principles of responsible fishing, but with no further reduction in productivity for the Mediterranean fleet.

OFFSHORE GEOLOGICAL STORAGE SITES: POTENTIAL RISKS AND IMPACTS ON THE MARINE BIOSPHERE

Andrew SWEETMAN - Norwegian Institute for Water Research (NIVA) & Center for Geobiology, University of Bergen, Norway

Since the dawn of the industrial revolution, atmospheric levels of CO_2 have been increasing, as a result of the burning of fossil fuels, at a far higher rate than previously experienced in Earth's history.

This rise in CO_2 levels has been implicated as the primary factor behind global warming and the environmental effects associated with climate change. The oceans are a natural sink for CO_2 from the atmosphere and so far, have absorbed approximately half of all anthropogenically produced CO_2.

When CO_2 mixes with seawater, it reacts and alters its chemical properties, lowering the pH and carbonate concentration of the seawater in a process termed ocean acidification, which leads to increasing carbonate dissolution. This is especially detrimental to certain marine fauna that possess calcareous shells and tests, as ocean acidification will lead to shell dissolution, and sometimes lowered rates of cal- cification. Different species vary in their ability to tolerate and counteract these effec- ts and this has implications for biodiversity, eventual trophic structure and ecosystem functioning. Therefore, pressure to reduce CO_2 levels in the atmosphere and prevent ocean acidification has been put on politicians, and led governments to seek new strategies for dealing with rising atmospheric CO_2 levels.

CO_2 capture and storage *(CCS)* is, at present, one of the most promising measures for immediate regulation of CO_2 emissions, while non-

petroleum energy sources are being sou- ght. Norway has taken a leading role in developing and implementing CCS, whilst international conventions, such as London and OSPAR, and regulations *(EU directives)* are defining the regulatory framework for CCS, in particular, for CO_2 storage in geological structures including those under the seabed.

However, leakage of CO_2 from geological storage reservoirs and the resulting acidification of the marine environment may have severe impacts on marine life, reducing diversity and shifting specific ecosystem processes from animals to microbes, with concomitant impacts on higher trophic levels such as fish and other commercially important species. In this talk, the potential risks and impacts on the marine biosphere from leakage of CO2 from offshore CCS reservoirs will be discussed.

OCEAN ACIDIFICATION & ITS EFFECTS

Nick RILEY - British Geological Survey - Environmental Science Centre

Through the burning of fossil fuels, geologically stored carbon is being released as CO_2 into the atmosphere/ocean system at an alarming & accelerating rate, which is unprecedented since at least the Palaeocene Thermal Maximum *(PTM -55million years ago)*.

This is a global problem. Policymakers have been unable to set in place global and, in most cases, regional regulation that is effective to stem the increasing rise in fossil fuel emissions. Policy focus in Europe is dominated by the concept of stabilising emissions such that average global temperature rise will be no more than 2° C above pre-industrial levels. Most emission scenarios show that global fossil fuel emissions need to peak around the middle of the present decade and then progressively reduce to achieve this. There are a number of factors that have given rise to policy paralysis regarding CO_2 emissions. Amongst these have been very effective campaigns by the so-called *"climate sceptics"*.

They have long sought to deliberately confuse the public and policymakers about the science of climate change. More recently this campaign strategy has intensified into attacks on the credibility & integrity of climate scientists themselves. One significant casualty of policy failure has been the slow progress in deploying carbon dioxide capture and storage *(CCS)*.

It is the only technology that can decarbonise fossil fuel emissions at the capacity and rate required . Whilst fossil fuel dependency dominates, deployment of CCS as early as possible is crucial to stem emissions and curtail lock-in of fossil based infrastructure that cannot be decarbonised.

So, as things stand it is very likely global CO_2 emission will peak much later in this century than is desirable from a 2°C average global temperature rise perspective. For decades there have been many projections of what a continued increase of atmospheric CO_2 concentrations will have on global average temperatures. In these scenarios it is recognised that absorption of atmospheric CO_2 into the oceans *(currently around 33%)* will continue to moderate (possibly at a decreasing rate) atmospheric CO_2 concentrations and, consequently, average global temperature rise.

It is only in the last decade that serious effort has begun to try and predict how a continued oceanic CO_2 absorption increase from the atmosphere will affect marine biogeochemistry, ecosystems, and consequent feedbacks between the ocean/atmosphere/climate system. The term *"ocean acidification"* embraces the effect of the fall of pH resulting from this CO_2 absorption. So, what can we glean from geological & present day observations that might

inform us about the risk ocean acidification poses to humanity? Current knowledge suggests that we really are venturing into the unknown. In human terms, failure to prevent ocean acidification poses a dangerous & irreversible gamble.

Global emission policy needs not only to take into account the anthropogenic global warming that will ensue if CO_2 emissions are not reduced, but also the cumulative effect on the oceans of a progressive reduction in pH as more CO_2 is emitted to the sky. An early policy/ regulatory response to this has been modifications of the London Convention and it's Protocol & regional international treaties, such as the Oslo Paris Convention *(OSPAR)*, which originally prevented sub-sea bed storage of CO_2 originating from land-based sources, but injected offshore. The spirit of these treaties is to protect the marine environment.

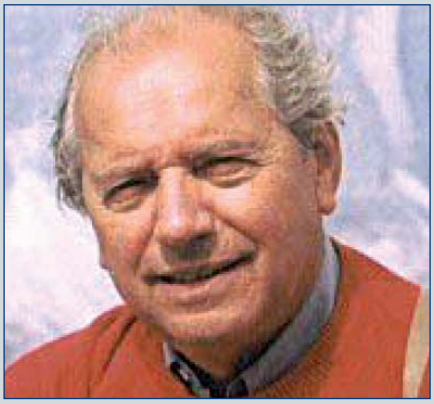
Modification was made on the basis that to allow fossil fuel emissions to emit to the sky *(and therefore acidify the ocean globally)* was a far greater risk than that posed by allowing sub-sea bed storage of CO_2 captured from CCS. Hopefully, this small step in the right direction heralds more policy prominence for ocean acidification risk as a basis for achieving effective global emission reductions of CO_2.

CLIMATE CHANGE: DUE TO HUMAN ACTIVITIES ONLY?

Antonio BRAMBATI - President of the Finance and Development Committee of the International Union of Geological Sciences (IUGS)

Climate has changed without a shadow of doubt. One indisputable fact is the decrease of the glacial surface area observed in most parts of the world.

The surface area of the glaciers in Europe has been halved over the past century; it has declined by about 60% in the United States over the last 150 years; from 70 to 90% in Africa in the



last century; by approximately 50% in the Alps from 1850 to 2005. One wonders if the worsening of the bad weather is an exceptional event or falls within those that have been defined by A. Bruckner as meteorological cycles, lasting about 35 years. Today, scientists debate if and what is the anthropogenic component altering the climate of our planet. Climatic fluctuations have always existed in the geological past as in the last millennia. In fact, the Little Ice Age that hit our planet 11,000 years ago and also that felt especially in the Mediterranean about 3,000 years ago are well known, as well as the Little Ice Age that can be placed from 1550 to 1750. These cold periods alternated with warmer periods *(Climatic Optimum 9,000 to 5,000 years ago, and the Medieval from the ninth to the thirteenth century)*.

Today great emphasis is given to the rising atmospheric temperature of our planet and the consequent climate changes that in these past 150 years have resulted in an anomaly of about +0.7° C, which is attributed to a significant anthropogenic component.

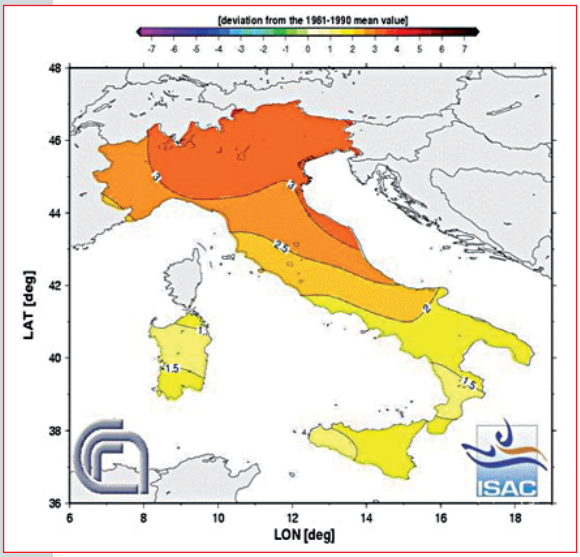
The effects of these changes are confirmed by the increased ***(1)*** number of catastrophic events that have occurred in recent decades, ***(2)*** the resulting economic damages produced and ***(3)*** from the losses suffered by insurance companies that have passed from 1950 to 2000 respectively from 13 to 72, from about 39 to about 396 billion of U.S. dollars and from 6 - 7 to about 91 billion U.S. dollars. The causes of this anomaly have opened a broad debate in an attempt to separate the natural component from the anthropogenic component to which it is attributed: the rise in sea level, the northward shift of land aridity in the northern hemisphere, the increase in rainfall at low and high latitudes, etc. As can be imagined, there are now cold regions that could benefit from this warming, as well as others that could undergo great periods of drought and final desertification. In this regard some fundamental aspects concerning the warming of our planet that are often overlooked must be clarified.

For example, it is not true that the 90s were the

hottest: the 30s, in particular, represent the maximum temperature anomaly without denying similar temperatures even for the 90s. And yet, it omits that the astrophysicists have found an increase in temperature of the planets/moons in our solar system, with values ranging from 0.7° C for the Earth, up to 2° C *(in 15 years)* for Triton, Neptune's moon. In 20 years the temperature of Mars would be increased by 0.6° C while that of Pluto by 1.9° C in 14 years. And yet, the analyses of ice cores in Antarctica show that the increase in temperature on our planet has preceded that of CO_2. Furthermore, the correlation between temperature changes on our planet and solar activity is clear.

This data is sadly neglected, and we tend to attribute, especially to man and the use of fossil fuels, the rise in temperature on our planet to the emission of CO_2. Moreover, it is omitted that in the pre-industrial period a greater percentage of CO_2 was established in the atmosphere than that observed today. Nevertheless, some anthropic responsibility cannot be denied. Maybe due importance has not been given to the growth of world population that from about 300,000,000 in the year 1000 has passed to 6 billion in the year 2000 with a projected 9 billion by 2050. Even more overlooked is the inordinate growth of sheep, cattle, goats, and horses due to generalized farming that today totals over 5 billion units, and the resulting release of methane.

At this point we must ask ourselves what are the forecasts. One cannot exclude a temperature increase of about 1° C for the years to come given that in the last decade, the values have stabilized, with no fear of the proposed 5 to 6° C. Moreover, we are looking at a rise in sea levels of 12 to 14 cm, not decimeters or even meters, and finally, increased rainfall at high and low latitudes.



Variability and climate change in Italy over the period 1961/1990

According to these predictions, our Peninsula would experience this warming, the effects of which are relevant on the environment. This involves for example, the raising of the cultivation limits of the olive, maize and blé de printemps, as of other cereals or vegetables.

What can be done then?

All that remains is to promote a series of actions: first of all environmental education and therefore the protection of the environmental and health, the decrease of atmospheric and water pollution, and last but not least, the correct management of water resources.

Everything will depend on the type of development that we propose, if oriented towards a pure economic growth far removed from environmental problems or in respect of the environment.

"COP 17" OF THE BARCELONA CONVENTION: WHAT'S NEW

Daniela ADDIS - Environmental Legal Consultant - Mareamico Scientific Committee

This year, from February the 8th to the 10th, the **17th Conference of the Contracting Parties to the Barcelona Convention for the protection of the marine and coastal regions of the Mediterranean and its Protocols (COP 17)** was held in Paris.

Several advancements were made in the last two years, in particular the entry into force, on March 24th, 2011, of both the ***"Offshore Protocol"*** for the protection of the Mediterranean Sea from pollution resulting from exploration and exploitation of the continental platform , the seabed and its subsoil, and the ***"ICZM Protocol"*** for the integrated management of Mediterranean coastal areas *(neither yet ratified by Italy)*; not to mention the reduction in the levels of DDT and heavy metals. On the other hand, there has also been a decisive decline in the number of certain species of fish and marine mammals that requires further attention and appropriate action in the next two years.

The Conference of the Parties adopted as many as 14 Decisions, legally binding on the contracting Parties, as well as the policy statement called the *"Paris Declaration"*.

With the ***"Paris Declaration"*** the Parties declare:

- ***to be willing to take all necessary measures to make the Mediterranean a clean, healthy and productive sea in which biodiversity and ecosystems are preserved***, in particular through the ecosystem approach to the management of human activities, the

development of a network of Protected Marine Areas in the Mediterranean, including in high seas, with the goal of reaching the AICHI biodiversity target of 10% of MPAs in the Mediterranean by 2020, cooperation in the scientific evaluation of EBSA consistent with the CBD and UNGA, and the containment of telluric pollution;

- ***to strengthen the integrated management of Mediterranean coastal areas***, in particular through the implementation of the special Plan of Action and of the roadmap, as well as the ratification of the ICZM Protocol by all Mediterranean countries;
- ***to project an increased interest in the marine and coastal environment and to be willing to make a contribution at the United Nations Conference on sustainable development to be held in 2012 (Rio +20)***, in particular through the implementation of a *"blue economy"* for the Mediterranean, which is a version of "green economy" applied to the seas and oceans, that supports

the process within the United Nations General Assembly concerning the conservation and sustainable use of marine biodiversity in areas beyond the national jurisdiction *(ABNJ)* and the so-called *"Implementation Agreement"*; to establish the conditions for a transparent, effective and more efficient institutional *"governance"* of the UNEP / MPA *(Mediterranean Action Plan of the Environmental Programme of the United Nations)*, in particular through the active involvement of civil society and ONG in particular, the adoption of cooperation agreements with the Secretariat of the Union for the Mediterranean, the General Fisheries Commission for the Mediterranean *(GFCM)*, the Secretariat of the Convention on Biological Diversity *(CBD)*, the International Maritime Organization *(IMO)* and other regional Conventions *(RSC)*, as well as the consideration of a proposal for the institutional reform of the Mediterranean Action Plan.

The ***Decisions*** made are as follows:

Decision IG 20/1 regarding the Committee for the respect of the rules of the Barcelona Convention and its Protocols, in particular the amendment to the rules of procedure, providing the opportunity for members to be re-elected for a second consecutive term. The writer was re-elected for a second term of four years;

Decision IG 20/2 regarding the adoption of the Plan of Action for the implementation of the Protocol on integrated coastal zone management *(ICZM Protocol)* for the period 2012-2019, for which the contracting Parties are called upon to prepare and adopt both the ICZM National Strategies as part of the Common Regional Framework for ICZM *(Mediterranean Strategy)*, and cross-border strategies for ICZM. *("Transboundary strategies for ICZM allowing for coordination of national coastal strategies, plans and programmes related to contiguous coastal zones, in accordance with the Common Regional Framework developed under revised MSSD")*.

Paris, the Barcelona Convention for the protection of the marine and coastal regions of the Mediterranean and its Protocols (COP 17)

Decision IG 20/3 regarding the reporting on measures taken to implement the Convention and its Protocols;

- ***Decision IG 20/4*** regarding the application of the Ecosystemic Approach, which includes the initial integrated assessment conducted by MPA, ecological and operational objectives, indicators and timelines. We see a significant convergence of these elements with the provisions of the Framework Directive on the EU Marine Strategy;
- ***Decision IG 20/5*** regarding the amendments to attachments II *(list of endangered or threatened species)* and III (list of species whose exploitation is regulated) of the Protocol on Specially Protected Areas and Biodiversity in the Mediterranean *(SPA-BIO Protocol)* that proposes, among other things, the transfer of ten species from the aforementioned attachment III to attachment II, thus increasing the protection measures;
- ***Decision IG 20/6*** regarding the work program for the conservation of marine vegetation in the Mediterranean Sea for the period 2012-2017;
- ***Decision IG 20/7*** regarding the conservation of Mediterranean sites of particular ecological interest. The decision includes the list of Specially Protected Areas of Mediterranean Importance *(ASPIM)*, three Italian marine protected areas: the MPA of Porto Cesareo, the MPA of Capo Carbonara and the MPA of the Sinis Peninsula - Mal di Ventre Island. The Decision also provides for the RAC/SPA Centre to conduct a routine audit of the MPA of Portofino in 2012-2013. It also encourages the Parties to adhere to the process launched by the SPA-RAC regarding the identification of Ecologically or Biologically Significant Areas *(EBSA)* located on the high seas and asks the Secretariat to contact the Secretariat of the CBD to present the results of EBSA identifications in the Mediterranean, as a regional contribution toward achieving the relevant global objectives of the CBD;
- ***Decision IG 20/8*** regarding Regional Plans for the implementation of the Protocol for the prevention of telluric pollution *(LBS Protocol)*, subdivided into: (1) Regional Plan for the reduction of mercury contributions; (2) Regional Plan for the reduction of Biological Oxygen Demand *(BOD5)*; (3) Regional Plan for the elimination of persistent organic pollutants *(POPs)*;
- ***Decision IG 20/9*** regarding the criteria and standards for the quality of bathing water within the framework of the implementation of Art. 7 of the LBS Protocol;
- ***Decision IG 20/10*** regarding the adoption of the strategic framework for the management of marine debris;
- ***Decision IG 20/11*** regarding the Regional Strategy for the management of ballast water and invasive alien species;
- ***Decision IG 20/12*** regarding the Plan of Action for the implementation of the Offshore Protocol;
- ***Decision IG 20/13*** regarding Governance, which states the principle that the resources of the MTF *(Mediterranean Trust Fund)* must be dispatched to all Regional Centres of activity *(including the INFO-RAC centre based in Italy)*, as well as the need for implementation and application of a "functional review" of the UNEP/MPA system;
- ***Decision IG 20/14*** regarding the MPA Work Programme and the Budget for the period 2012/2013.

HYDROCARBON POLLUTION IN MARINE ENVIRONMENT: SOURCES, FATE, AND BIOLOGICAL EFFECTS

Silvano FOCARDI - Dipartimento di Scienze Ambientali, Università degli Studi di Siena, University of Siena - Scientific Committee of Mareamico

Actually along the Mediterranean coastal areas live about 136 million peoples which directly and indirectly discharge in marine ecosystems different chemical pollutants which accumulate in water, sediments and biota.

Marine ecosystems represent the principal via throughout pollutants are transferred from the abiotic compartments towards organisms accumulating along the trophic web. Among chemicals which are a potential hazard for aquatic ecosystems, polycyclic aromatic hydrocarbons *(PAHs)* represent a particularly ecotoxicological interests. In fact, these compounds are cited by the US Environmental Protection Agency *(US-EPA)* as priority pollutants to be monitored in the framework of environmental quality control. Furthermore are ubiquitous potential hazardous molecules derived both by natural sources and human activities, which are present at measurable levels also in marine protected areas but are of particularly relevance in stressed area like harbours, estuaries and other shallow coastal zones exposed to anthropogenic inputs. PAHs are originated by natural processes such as low to moderate temperature diagenesis of sedimentary organic materials to form fossil fuels *(i.e. coal, crude petroleum)* and biosynthesis by biota. Nevertheless human activities *(e.g. wastes from industrialised and urbanised areas)* represent a relevance.

Marine ecosystems are reached by PAHs directly or indirectly within industrial and domestic effluents, throughout surface runoff from land, deposition of airborne particulates, and spillage of petroleum and petroleum by-products.

Among exposed sources, direct spillage of crude petroleum and refined petroleum products represent a relevance for the Mediterranean basin due to the high boat traffic and the increasing number of occasional accidents and marine oil-spill occurrence.

Total PAHs content ranges within 7-34 weight% of the whole crude oil, while refined oil products contain values ranging within 0.3-3.7%. In the marine environment, PAHs tend to be rapidly ac- cumulated in organic and inorganic particulate matter through chemical and physical complex mechanisms of adsorption, favouring PAHs deposit and accumulation in silty bottom sediments. Therefore sediments can be considered as a pollution reservoir and source from which PAHs may once again be

released into the environment. Sediment resuspension could determine secondary, important, releases towards the water column and biota. On a general basis, due to their properties, levels in marine ecosystems are generally highest in sediments, intermediate in aquatic biota, and lowest in water column.

PAH physico-chemical properties are molecule-dependant and determine their different envi- ronmental behaviour influencing the efficiency of removal processes from aquatic ecosystems such as volatilization, photo-oxidation, chemical oxidation, and microbial metabolism. For example, the naphthalene has a solubility in water of about 30 mgL-1 while five-rings PAHs solubility ranges within 0.5-5.0µgL-1. In the Mediterranean sea levels of 16 µgL-1 of total hydrocarbons, associated to 148 ngL-1 of total PAHs, are recorded in water. In sediments BenzoaPyrene levels ranged within <0.1-5000 µgkg-1 d.w.. PAHs evidenced toxicological effects on adults, juvenile phases or early life stages, gametes and embryos on marine species. Moreover the bioconcentration, bioaccumulation, and biomagnification properties of some of these molecules and their related toxicological effects on algae, invertebrates, and vertebrates are also evidenced by the literature. The intensity of these phenomena is related not only to levels but also to different factors such as: external and local environmental factors, exposure time, species considered and its trophic level, sex, synergic effects with other chemicals.

On the basis of data synthesized in this document is evident as the correct regulation of PAHs and petroleum products must represent a priority target for all of the Mediterranean Nations during planning of the manage- ment strategies for the conservation of the marine environment.

The Costa Concordia shipwreck brings to the forefront the concern for the environment pertaining to the spillage of hydrocarbons in the sea.

CHEMICAL SPECIATION AND BIOAVAILABILITY IN THE EVALUATION OF THE QUALITY OF MARINE SEDIMENTS AND WATERS

Paolo CESCON -Institute for the Dynamics of Environmental Processes CNR

An environmental legislation that correctly manages the environment, as well environmental risk and sustainability is one of the primary objectives of many nations. Current Italian legislation lacks some essential concepts such as elemental speciation, bioavailability and bioaccessibility.

The legislative limits are based on the total concentration of various contaminants *(inorganic and organic)*, without any reference to the chemical form of the contaminant. The use of up to date scientific knowledge, and the application of synergistic and effective monitoring instruments permits the integration of aspects of ecotoxicity with chemical and physicochemical aspects, allowing decision makers to make adequate legislative changes to environmental regulations.

Therefore, environmental monitoring must be based on specific evaluation criteria such as the Biotic Ligand Model *(BLM)* for waters and the Pollution Load Index *(PLI)* for sediments.

Bioaccessibility refers to the quantity of a metal available in the environment, that can then interact with organisms across cell membranes and/ or other contact surfaces *(skin, mucus membranes etc)* that are potentially available for absorption or adsorption processes. In other words it is quantity of a metal that is exchangeable via physical, chemical or biological processes that is not sequestered or complexed in the environment. The bioavailability is defined as the fraction of a metal to which an organism is exposed under defined conditions for a known time period, and is a measure of how much of the bioaccessibile metal can be effectively absorbed and assimilated across the cell membranes of an organism. It is very important to underline that the chemical speciation of a trace element, which is the number of forms in which it can exist in the environment can determine the bioaccessibility as well as the bioavailability, hugely influencing its destiny and effects on environmental receptors, including humans.

The scientific community, especially from Venice has studied in depth these problems, coming to useful conclusions necessary for adjustment of existing legislation on the control and management of the marine and lagoon environments.

In natural aquatic systems, sediments are a sink for trace elements, the concentrations of which can be several orders of magnitude above those seen in the water column above. When sediments are perturbed especially by human activity, trace elements can be released into the water column.

The trace elements, are bound to different components in the sediment, and these bonds result in different capacities for remobilization resulting in a different bioaccessibility for each element.

Control of water quality in areas affected by dredging operations in the port of Pescara.

The easily exchangeable fraction is bioaccessible, because the elements in this fraction can be released into the water column easily under natural conditions. The trace elements bound to mineral phases present in the sediments are defined as the residual fraction as they are not easily released into the water column under natural conditions.

Within the total metal content of a sediment, this fraction is often the largest. Between these two extremes exist various chemical forms of a metal, whose release can depend on changes in physicochemical parameters such as pH, salinity, redox potential etc.

It is now clear that the concentration of a metal alone does not give sufficient or exhaustive information on the potential bioavailability and toxicity of the element versus organisms. It is therefore necessary to carry out speciation studies to under- stand the distribution of the chemical forms of an element, to evaluate its bioaccessible fraction and eventual toxicity.

This should be done in parallel with studies on the enrichment factors and remobilization in different areas of the environment under study. To study the partition of trace elements between different geochemical phases, a sequential extraction is used to obtain operationally defined geospeciation data.

A more significant environmental legislation should be based on the twin concepts of bioaccessibility and bioavailability using speciation data through the lens of an ecological risk assessment *(ERA)* using flexible predictive instruments such as the BLM for waters.

For an accurate risk assessment and management of the quality of sediments, an approach capable of defining the abiotic and biotic endpoints is fundamental in characterizing the impact of contamination.

Such as approach should integrate the concepts of bioaccessibility, the non observable effect concentration *(NOEC)* and/ or the predictable non effect concentration *(PNEC)*.

MARITIME TRANSPORT AND SUSTAINABLE DEVELOPMENT IN THE ADRIATIC

Roberto PATRUNO - Former Director REMPEC - Malta

The severe economic crisis that struck worldwide in 2008 has heavily and negatively influenced even maritime transport, resulting in: **1)** a significant decline in rentals (which in some areas have reached levels below the break-even point) to the detriment of the quality of services offered; **2)** a decrease in investments by ship owners in the renovation/modernization of their fleets; **3)** a reduction of the budget allocated by shipping companies for retraining sailors and for improving the quality standards of the crew.

Meanwhile, the ever increasing trend of transport by sea, as confirmed by the World Bank in 2005 with a growth forecast of triple the volume transported by 2020, has not undergone appreciable changes, except for a decline in traffic volumes recorded from the second half of 2008 and continuing through 2009, which stabilized and then grew again in 2010, though not at the rate experienced before 2008.

Considering the processes that these two phenomena trigger, we must turn our attention to issues concerning: 1) the safety of navigation, 2) the protection of the marine and coastal environment; 3) the maintenance and enhancement of fishing resources – putting into question the same principle of *"sustainable development of maritime transport"* and asking ourselves whether this principle is more achievable under current conditions, and if it requires further and more decisive action in order to improve protection.

While it is true that, in their respective areas of expertise, the international maritime community, through the IMO and the European Commission, continue their efforts to continually update and upgrade legislation and regulations for safer and more eco-friendly sea transport, exerting EC pressure on Member States especially in regard to the implementation and enforcement of international reference standards, it is also true that, since the Mediterranean, along with the Straits of Malacca and Singapore, is the maritime region with the highest traffic volume, it will require additional effort on the part of the coastal communities of the region to maintain high standards of safety and environmental protection.

In fact, regardless of the negative side effects that maritime traffic itself has on the environment and on fishing resources, particularly in areas of high intrinsic value, the risk of accidents is extremely high, especially in enclosed or semi-enclosed areas like the Mediterranean and, more importantly, the Adriatic.
Human error is the predominant factor in ma-

rine incidents, despite significant developments in the technological components of navigation, navigation assistance, construction quality standards and propulsion systems.

At the same time, of primary importance in terms of prevention are the tools and systems for monitoring, control and ground-based navigational aids, which fall under the responsibility of the Coastal State.

The goods transport sector will be the first to implement comprehensive measures for reducing greenhouse gas emissions.

The VTS and VTMIS total cover systems of the national maritime areas, in slow but steady evolution toward complex MEH systems meant not as national systems but as regional or sub-regional systems, have proven to be the only systems able to guarantee a drastic reduction in accidents, thereby ensuring better protection of the marine environment, fishery resources and economic interests of coastal regions.

Since the Adriatic - whose characteristics render it an inland sea of the Mediterranean region and which has an even greater environmental sensitivity than the region to which it belongs - is affected by high volumes of shipping traffic of all kinds, the urgent completion of the national VTS - VTMIS network is of the utmost importance and cannot be postponed any longer.

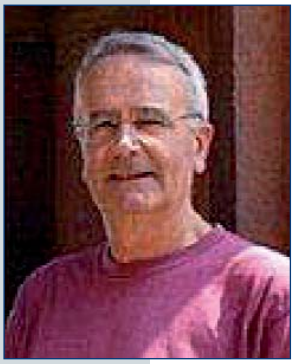
At the same time, the characteristics of the basin dictate that such a realization be extended to the whole eastern shore, assuming the characteristics of a sub-regional system able to ensure the effective protection of the whole area.
The creation of a sub-regional authority could serve as an ideal tool for coordination and support with the goal of stimulating a common policy within the basin.

A revitalization and timely implementation of the *"sub-regional agreement for the prevention, preparation and response to marine pollution between Italy, Croatia and Slovenia "*, signed in Portorose, Slovenia in October 2005 and to be extended to Montenegro and Albania, as well as the recognition within the IMO of some more sensitive areas of the basin as Particularly Sensitive Sea Areas (PSSA), would contribute significantly to improving the level of environmental protection in the Adriatic.

GLOBAL AND MEDITERRANEAN SEA CHANGES

Miroslav GACIC - OGS (National Institute of Oceanography and Experimental Geophysics)

The intervention provides some considerations on the impact of global warming, the changes in equilibrium of the circulation in the Mediterranean and the functioning of its ecosystem.



The Mediterranean Sea receives Atlantic water with a relatively low concentration of salt. During the propagation of this water to the eastern part of the basin, the salt concentration increases due to intense evaporation and, on its return to the Atlantic, the water is therefore characterized by a much higher concentration. Recent studies have shown that over decades, the Mediterranean Sea has gone through a number of equilibrium stages. These stages are due both to climatic changes and the contrast of the salinity *(hence the concentration of salt)* between the water formed in the eastern part of the basin and that entering from the Atlantic Ocean. The climatic variations change the intensity of the heat exchange between the air and the sea. The Mediterranean Sea loses heat during the winter months, which increases the density of the surface water and vertical mixing. This process determines the exchange of water between the surface and deep layers and gives rise to the formation of vertical cells of movement.

There are two sites where dense water forms; one in the western Mediterranean *(Gulf of Lions)* and one in the Eastern Mediterranean *(Adriatic Sea)*. These two sites are the source of deep circulation energy, in turn responsible for the distribution of the biogeochemical characteristics of the water. Global warming may thus change the thermohaline characteristics of the water that propagates in the surface layer, and finally exit through the Strait of Gibraltar, thus affecting global circulation. Furthermore, because of the general lowering of surface heat losses, the cells of vertical circulation will weaken and consequently decrease the vertical mixing and the exchange of the biogeochemical characteristics between the surface water and the deep water.

This would finally lead to an increasingly strong isolation between the surface layers and the deep layers of the Mediterranean.

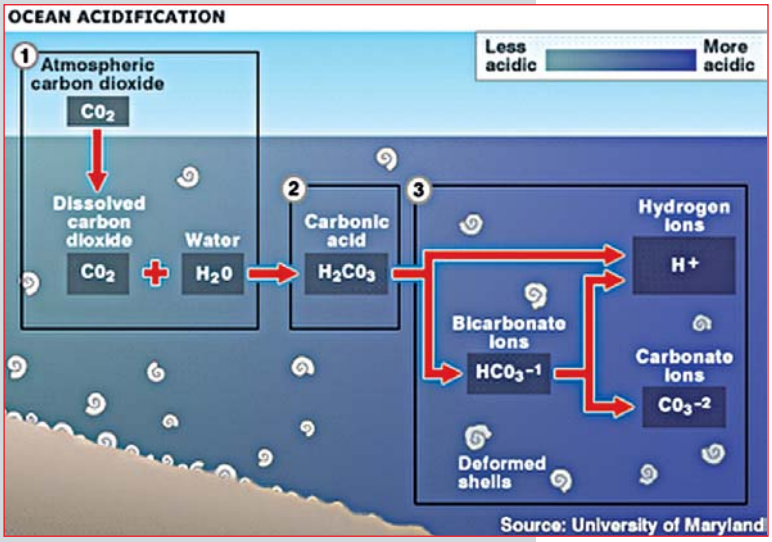
Variability and predictability of the Mediterranean climate, according to research conducted by the Medclivar European programme.

EXCHANGE OF CO_2 BETWEEN THE ATMOSPHERE AND OCEANS

Cosimo SOLIDORO - OGS (National Institute of Oceanography and Experimental Geophysics)

The sea carries out important regulatory work on the concentration of carbon dioxide *(CO_2)* in the atmosphere. The concentrations of CO_2 in air and water are in fact connected to each other by precise laws of physics, so that the sea can act - depending on the condition - as a reservoir which absorbs and stores CO_2, or as a source which releases CO_2 into the atmosphere. The extent of CO_2 fluxes between air and water has an important effect in terms of greenhouse gas concentration, and therefore potential mitigation *(or accentuation)* of global warming. However, they are also important for the marine environment, since the increase of CO_2 dissolved in water causes a shift in the balance of the carbonate system and ultimately an increase in the acidity of the water. Ocean acidification is a relatively little known phenomenon, but potentially very important for a variety of aquatic organisms, as well as socio-economic importance, so that studies on this subject, sometimes referred to as *"the other problem of global change"*, are receiving increasing attention in all industrialized countries.

The sea still has the ability to absorb significant quantities of CO_2 through solubilisation and physical transportation mechanisms and through biogeochemical mechanisms.
The workshop intervention will describe some of these processes, even in reference to the Italian seas in which the biological component cannot be neglected in its interactions with the physical quantities, therefore biological monitoring is now considered of great importance in controlling CO_2 storage sites at sea.



MARINE RESOURCES: CHEMICAL DIVERSITY AND BIOSYNTHESIS

Guido CIMINO - Istituto di Chimica Biomolecolare, CNR - Pozzuoli (Napoli)
Scientific Committee of Mareamico

Mareamico with its precious series of Conferences was able to join experts of different disciplines but all interested in studying marine environment. The work of many years led to construct an extraordinary series of qualified experiences that could be better exploited in the frame of a multidisciplinary scientific project.

Because of this, I indicated in previous Conferences the studies on ***"Biological Active Molecules from Marine Organisms"*** as a very attractive topic to investigate.

Protection of the marine biodiversity is accepted and supported by many scientific organisms. The main objective of these projects is an exhaustive scenario of all marine species living along our coasts with particular attention for the invasive species. But, if our interest shifts from the marine organism to its metabolic content additional benefits could be obtained.

The biodiversity is closely related to the chemical diversity which controls many functions of the marine organisms. In particular, organisms apparently scarcely protected *(algae and invertebrates)* use some of their chemical weapons against potential predators. Generally the presence of these molecules is highly selective and their structural peculiarities are completely absent in other natural organisms.

Because of this, the loss of a marine species leads to the loss of a unique chemical patrimony. Recently, many molecules from marine organisms display interesting pharmacological properties. Three molecules have been approved to be used either to mitigate extreme pains or as antitumor.

Considering that it needs a long time *(almost 20 years)* from the first studies on a potential

drug to the market and considering that the chemical studies on marine organisms started only at beginning of '70, it is possible to predict that many new marine drugs will be characterized in the near future.

Finally, it is of great interest to know the origin of the bioactive molecules. This knowledge could allow a better availability of the new drug without using the producer organism. The main strategies adopted by marine organisms are: bio-accumulation, bio-transformation and bio-synthesis. All these aspects will be better described by selecting some of the most significant studies realized at ICB.

FISHING ACTIVITY IN THE PORT OF ANCONA

Luciano CANEPA - President of the Ancona Port Authority

The Port Authority has very limited competence on the theme covered in the *"port activity and impacts on marine biodiversity"* workshop, especially if we restrict its scope to the field of marine resources and fisheries.

The theme in fact is more concerned with environmental authorities for the regulatory aspect and the academic world for research and innovation. The Port Authority is in fact primarily called upon to oversee port activities performed by operators active in the port, and to enhance public land and port infrastructures. The environmental impact of port activities therefore concerns other aspects, such as dust, air pollution from emissions, noise, and the prevention of pollution risks.

That said, I wish to briefly present in my address the fishing industry operating at the port of Ancona, and how the Port Authority intends to support the work.

The fishing fleet in Ancona is a prestigious industrial segment, representing the second in Italy after that of Mazara del Vallo for engine power and tonnage of vessels.

At least 50% of the latter exceed 100 tons, compared with a national average of 2%. There are some 500 fishermen belonging to various associations which are within the Cooperativa Pescatori Motopescherecci *(Trawler Fishermen's Cooperative)*, which represents them in institutional settings. The Fishermen's Cooperative is also the body that arranges the working methods that in Ancona has gradually taken on characteristics not found in other ports and that basically consists in exercising fishing activities while taking into account the need to preserve fish stocks, the correct compensation for fishermen and the requirements dictated by market demands. The Fishing vessels find historical and traditional mooring in the small harbour of Mandracchio and surround the Mole del Vanvitelli, a treasured historic building.

A fish market is located near Mandracchio where the marketing of fish takes place.
However, today this location is increasingly showing its limitations: between the fish market and the moorings of the vessels passes the link road from the historic port to the commercial port, with the frequent passage of heavy vehicles and a lack of shortage space for fishing operators. For this reason the Port Authority has agreed, in the Development Plan of the Port, along with other institutions and the fishermen, the displacement of the fishing fleet, the support and maintenance facilities, and the fish market to a new dedicated marina.

This will provide the port of Ancona with an area specifically dedicated to the fishing industry, for the better organization of work, the recovery of the treasured historic port area and the full exploitation of the Mole del Vanvitelli.

PROSPECTS FOR FISHING IN THE MEDITERRANEAN

Mario FERRETTI - CIRSPE - Italian fishing study and research centre
Mareamico Scientific Committee

Fishing in the Mediterranean is currently undergoing a radical, severe and incisive transformation. This is down to a number of factors, including the transfer of legislative power from EU member states to the European Commission, an awareness that, if there is to be sustainable fishing conducted on a responsible and rational basis, measures need to be adopted that protect the marine environment and the organisms that make it their home, and increased management costs, which are gradually eating away at potential profit margins.

The European Union has adopted a series of regulations which, in part, are without doubt necessary and acceptable and which result in a complete overhaul where the rules governing fishing are concerned, establishing quotas and bans and prompting a traditional world instinctively resistant to change to embrace a new way of life.
Regulations concerning fishing in the Mediterranean (Reg. EU No. 1976/06) and those regarding control (Reg. EU 1212/10 and Commission Regulation 104/11) introduced notable groundbreaking potential which, given the complex application of these provisions, is, in some cases, difficult to accept. It cannot be denied that there was mileage to be had from a specific regulation governing fishing in the Mediterranean and rules establishing a system for controlling fishing that apply to all member states of the EU. It might be argued, however, that examining the fishing business down to its tiniest detail and unsettling traditional fishing methods practiced by our forefathers, as well as the practices adopted during and after actual fishing itself, which should perhaps have been subject to changes introduced on a more gradual basis, could be interpreted as venturing a step too far.

There has been increasing talk more recently of responsible fishing, of sustainable fishing, and of protecting the sea's resources. And these are topics of discussion even amongst the fishermen themselves. Not so easy to understand, however, are the measures taken as a result of not having adequately put the spotlight on what are in fact the best solutions, and which often differ from the steps in fact taken.

The fact that these problems still come up for discussion is certainly useful, despite that fact that there is little sign at this point of any agreed solutions that may be of benefit to the fishing industry.

The considerable increase in the price of diesel has meant that these problems need addressing as a matter of urgency, given that costs are unfortunately inching ever closer to earnings and fishing finds itself close to becoming an unprofitable business. With the current position regarding the sea's resources not being anything

to celebrate, and with production costs on the increase, those in the fishing business find themselves in an extremely uncomfortable position and under considerable strain, struggling at times to maintain an entirely rational approach, which is, after all, completely understandable.

With all of this already providing more than enough food for thought, another topic has joined the list in the form of discussions on a European Commission level on how to change the common fishing policy, given that the one currently in place has failed to reap satisfactory results in recent times.

Whilst it cannot necessarily be said that they will have no positive implications in themselves, the measures now being discussed are even more difficult for those in this industry to grasp; if adopted, they will prompt a transformation of fishing at an even faster pace that fisherman will find even harder to follow and to comprehend.

Perhaps there is no choice but to follow this route, despite the fact that it will give rise to tension and resentment within the industry, but it is important to ensure that the industry itself properly understands the developments taking place and the reasoning behind them.

Resistance to change will reap no rewards. There is a need to move with the times and to adapt to new ideas that are introduced, in the hope that at least some good will come of them.

THE ROLE OF SCIENTIFIC RESEARCH IN MARINE PROTECTED AREAS

Luigina FATTOROSI - University of Siena - Mareamico Scientific Committee

Firm support for the principles of sustainable development, which are associated with the multifunctional role of environmental resources, calls for a clear extension to the framework in relation to information available, with this being based on indicators capable of monitoring the amount of resources and the changes that they undergo in relation to management decisions that it is proposed be taken.

The research world is therefore being called upon to carry out an essential role in ensuring that new methods and monitoring tools are available, as well as contributing to the establishment of a pool of professional skills and resources that public sector decision makers and businesses can draw and rely upon.

Within the Marine Protected Areas, monitoring work, research, education and training are essential in order to have a more detailed understanding of the coastal marine environment and raise awareness of environmental issues.

Rather than for scientific research carried out for its own sake, support is being granted for scientific research needed in order to be able to manage the area properly. This explains the reasoning behind the help offered in connection with periodic impact monitoring sessions and research programmes carried out as part of the official objectives of a Marine Protected Area and its management programmes, which are designed to assess the impact of pleasure boating, diving and fishing.

Pursuant to the most recent laws introduced, a management body is required to monitor environmental and socio-economic conditions in a Marine Protected Area on an ongoing basis and, in line with directions issued by the Ministry for the Environment and the Protection of Land and Sea, is to draw up a *'Report on the Marine Protected Area'* each year, based on the monitoring work carried out.

Research in order to protect species and habitats that are listed as a priority is required. One example is the *'Preservation of Corallium rubrum in shallow sites'* research programme carried out in the *'Capo Caccia- Isola Piana'* Marine Protected Area; another is the assessment carried out of the Posidonia oceanic fields in a number of areas.

Scientific research plays a fundamental role in establishing the effects of the management of a Marine Protected Area on its species and habitats. Where the impact of the work connected with the actual use and enjoyment of a Marine Protected Area is concerned, a monitoring programme has been launched at the Miramare

Natural Marine Reserve. This has shown that where pebbles are disturbed and trampled on during the course of teaching work conducted in the reserve, this leads to a change in the distribution and abundance of species that is limited in space and in time, demonstrating constancy in the macrostructure of the community in the site visited as well as in the control site. In addition, biocoenosis mapping has proved to be essential in assessing the environmental conditions and in planning any environmental protection work and management work to be carried out in the Marine Protected Areas.

These are just a few examples. Scientific research can in fact provide answers to important questions concerning the management and enhancement of marine ecosystems. Assessing the extent to which management has been effective, for example, is one of the basic tasks to be completed if the protected areas are to be properly preserved and managed; such an appraisal provides the managing body itself, as well as the stakeholders, with a basis on which to work in partnership and exchange knowledge and information.

The process of monitoring and carrying out checks in relation to the environmental components, the socio-economic components and the official and legislative components is essential if management is to be carried out in the proper fashion.

Where monitoring and checks are carried out, these contribute to an increase in transparency and responsibility where the management of a protected area is concerned. Adaptive management is in fact based on a circular management process: the role of past experience is to provide continual feedback on current management, in order that future management methods can be improved upon.

The assessment takes the form of a review of the results of steps taken and assessing whether those steps have produced the desired results. This produces feedback that works in a positive way and which results in performance being improved on an ongoing basis and brings us closer to achieving our goals; it also ensures that levels reached are maintained.

Scientific research takes on a leading role when used as the basis for strategic decision making on the part of the managing body. Data is provided on the quantity of focal species, the structure of populations of focal species, the distribution and complexity of habitats, the composition and structure of communities, the level of recruitment within communities, the complete nature of the trophic network, the type and level of fishing and its return, water quality, analyses of signs of *'recovery'* and assessments of human impact. All of these are potential biophysical indicators of whether a Marine Protected Area is being managed effectively.

With governments, managing bodies, NGOs and others expressing an ever growing amount of interest in developing and implementing management assessment systems in order to tailor management in the future, scientific research is being required to supporting this style of operation by providing an increasing number of innovative tools and precise data that is up-to-date and on a par with that of other enterprises on an international level.

CNR MARINE RESEARCH POLICY

Enrico BRUGNOLI - Director of the Department of Land and Environment - CNR Rome

The sea is a great resource. To step in with coordinated efforts and appropriate policies is essential.

From pure research to applied research, the development of technology and research facilities

The sea is a multidisciplinary field that ranges from ecology to marine geology, from fisheries to marine and coastal planning and oceanography, from monitoring through observation and forecasting systems to the study of sea-related risks. The field calls for the development of innovative technologies concerning the environment and eco-economy, the so-called *"blue-technologies."*

The potential of CNR's scientific network is evident at high levels in many fields: biology and marine geology, operative and observational oceanography, fishing and aquaculture, development of new technologies and the development of systems to support policies, with studies ranging from the Mediterranean Sea to the exploration of the Arctic and Antarctic seas.

Relations with stakeholders

These research activities may be regarded as finalized when taken within the context of dialogue and relationships with stakeholders: other research institutions, universities, local authorities, port authorities, Civil Defence Department, factories, dockyards and even local citizens, who are the end users of the research results and, in turn, the promoters of new initiatives.

The national framework

Considering the above, the current CNR policy on marine research is in line with the needs of the scientific community and society. As part of the National Research Plan, the flagship program **RITMARE**, financed for 5 years with 250 million euro, will perform most of the tasks, including training new skills and renewing the national research fleet. Among other CNR leadership programs is the three-year project Decision support system for the management of sustainable fisheries in Southern Italy, developed to optimize relationships with various stakeholders, from fishermen to local authorities.

Relationship between the national and international research plans

The national programs are part of a complex European framework *(dictated by the Marine Strategy Framework Directive and the European Strategy for Marine and Maritime Rese-*

arch) to which the CNR researchers contribute more and more actively. Just to name a few sea-related projects: SEAS-ERA, JERICO, COEXIST, COCONET, EUROFLEET, MyOcean, IODP ... not to mention the many Consortia *(e.g., EuroGOOS EurOcean)*, networks *(e.g., LTER, Eur- Oceans)* and Advisory Boards *(e.g., Marine Board)* that CNR takes part in, and its presence in the Secretariat of the long-term Joint Programming Initiative Healthy and Productive Seas and Oceans. It should also be mentioned the participation in the Italian Oceanographic Commission *(IOC)*.

Given the launch of the new European program Horizon 2020 and, on a global level, the commencement of work for Rio+20, it will be increasingly important to oversee international activities in order to influence research policies, including those in non-EU Mediterranean countries with which the National Research Council has established research and collaborative relationships.

Research infrastructures

Another fundamental issue is the matter of physical infrastructure *(oceanographic research vessels, buoys, platforms)* and data sharing: the existing ones are in need of maintenance and restoration, while others need to be built to meet the needs of the marine community. This challenge will be met by the national program RITMARE and through some ad hoc financing measures on the part of CNR.

Distribution

Finally, it is worth mentioning the importance of the distribution of research results which, given the various stakeholders interested in the sea and its resources, plays the dual role of both source of information and vehicle for attracting new resources.

This task is also fully accomplished by the CNR, as evidenced, for example, by the recent publication *"Marine Research @ CNR"* and by its participation in the activities of the new Aquarium of Rome.

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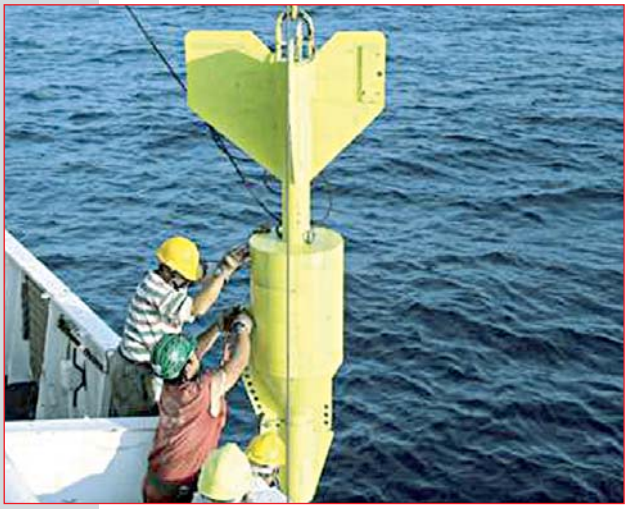


Operational phases of core drilling conducted on the N/O Urania during an IGM-CNR campaign in Bologna.

AN AUTHORITY FOR TRANSPORTATION: THE FREE MARKET AND SOCIAL INTEREST

Fabio CROCCOLO - Ministry of Infrastructure

The integrated transport system is structurally essential to the development of maritime tourism.

In fact, whether for cruise ship activities or for recreational boating, the accessibility of ports and the subsequent possibility of connections that allow the use of multimodal tourist itineraries are becoming increasingly critical factors for success.

Rather than being focused on the transience of the cruise ship or the small marine space of the pleasure craft, the future will be increasingly oriented toward research into integrated recreational-historical-gastronomic itineraries, themed or otherwise, that enrich and diversify tourism.

In this vein, the approach to transport service planning - not of the simple infrastructures, which are often redundant - should be multimodal to allow both the optimization of resources and the improvement of delivery.

The public system, because of both the fragmentation of responsibilities between central government and local authorities and the pressure from typically modal lobbies, has shown itself incapable of implementing a strategic vision, so the only possibility of success must now be placed with the laws of the market which, perhaps, will be better able to steer responsibilities and resources toward the best objectives.

Here, then, is why the keyword in the transport sector has now become *"liberalization"* - liberalization not as an asset in itself, but as a tool to achieve optimum transportation that has thus far eluded us.

Liberalization, however, cannot mean the absence of rules: what happened in rapidly developing countries clearly shows that the transition from a centralized system to a commercial system, if not managed gradually and with the public purpose of the transport sector kept intact, leads to a general impoverishment of the initiative not accompanied by other social benefits, since the interest of private entities given the freedom to act as they wish is to maximize profit.

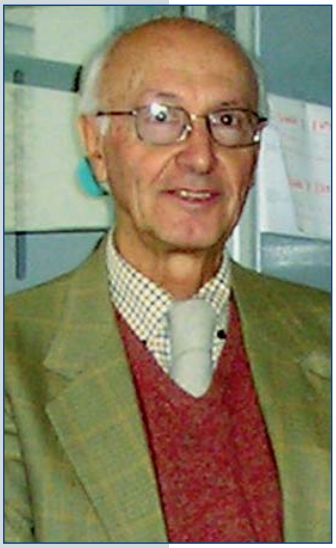
It is therefore essential, as requested by Parliament and provided for by the Government, to quickly establish an independent authority that regulates the sector and ensures an adequate balance between economic and social objectives and that allows us to reach the ambitious but possible objective of reducing costs while improving services.

CAN SCIENTIFIC EXPERIENCE ACQUIRED IN ALPINE PARKS GIVE US USEFUL POINTERS FOR RESEARCH IN MARINE PROTECTED AREAS?

Guido BADINO - University of Torino

With a number of alpine national parks dating back some considerable way in time, it would appear that their scientific research is managed on the basis of well-established and generally accepted principles.

But when it comes to the management of marine national parks, where scientific experience is much *'younger'*, there is some benefit to be had in revisiting certain errors in these methods, and, more importantly, in looking at the more recent and correct trends, in order to analyse the protected ecosystems. Scientific research conducted in Italian alpine parks, and predominantly that carried out in the past, has focussed on acquiring a more detailed ethological and ecological understanding of the animals that are *'on the flag'* of the protected area. These are the animals that stand as the symbol of a park *(e.g. the ibex for the Gran Paradiso National Park, or the eagle for the Stelvio National Park)* or, more generally, the animals that visitors are mostly interested in seeing and are, therefore, of strategic importance if ecotourism is to be encouraged. This eco-ethological research into individual animal species is carried out in depth and is scientifically sound; invariably done in partnership with research bodies from Italian and foreign universities and supported by EU funding, it is often published in the specialist international press. Trends in the population of individual species are set against factors in relation to the climate, the availability of resources, the extent of disease and the impact of man's use of the land *(mainly where grazing and tourism are concerned)*.



Leafing, for example, through the bibliography for the Gran Paradiso Park, which has a scientific research centre working in partnership with a veterinary clinic dealing mainly with ungulates, the results of etho-ecological research can be found that concern not only the ibex but also the marmot and the golden eagle, two species which, respectively, provide an indication of the quality of grazing and general conditions regarding the entire food chain. The presence or otherwise of the eagle, which is an apex predator commonly found where there are open spaces or areas with sparse forest cover, can also indicate, in negative terms, the extent to which forests have expanded as a result of farming and animal grazing gradually being abandoned.

The eagle is the symbol of the Stelvio National Park where, however, research work instead

focuses on conservation and management plans in relation to ungulates *(deer in particular)* and in connection with which the Park has for some years now been monitoring individual population numbers.

Ungulates and birdlife have also been the subject of demographic research in the other, more recently established, Italian national alpine park, the Valgrande, which boasts the title of *'kingdom of the wilderness'*. Here, however, research tends to take the form of a study of animal communities, rather than focussing on individual species, with these communities being treated as an integrated part of the typical forest eco-system of the area. This approach reflects the opinion held by scientists over the last few decades that individual species can only be preserved if the communities and the ecosystems of which they form part are revived and protected. It is as a result of complex exchanges that take place between all its various components that, compared to individual species, an ecosystem is better placed to take care of itself, thereby reducing the cost of conservation work.

Biodiversity, or the wealth of animal and vegetable species and the complexity of the trophic networks, is of course the best gauge of the ecological quality of a protected area. Italian alpine parks have, therefore, recently extended their scientific work to include an assessment of biodiversity in particular patches of their eco-mosaic.

EU financed research projects concerning the valleys of the Gran Paradiso are underway *(with butterflies, other insects and birds being used as indicators)* as are other projects in relation to wetlands, woods and ridges *(looking at pastures and grassland, the borders of moorland and rhododendron and blueberry shrubs)* in the Valgrande, the habitat for a vast number of both endemic and rare species of Carabidae beetle.

The results at various levels of this research are made known chiefly via the environmental study centres and teaching laboratories that can be found in all the parks and which are open to visitors, in particular to school groups. Unfortunately, the public in general get to hear little about this work unless they visit the parks themselves: a reading of the collection of press cuttings kept by the Valgrande Park, for example, shows that it is in fact the local press that reports news concerning the protected areas, with the spotlight being more on matters relating to ecotourism than the scientific issues being tackled by the park itself.

GENETIC DIVERSITY IN ITALIAN PORTS. II. PHYLOGEOGRAPHY OF STYELA PLICATA, A SOLITARY ASCIDIAN INTRODUCED INTO THE MEDITERRANEAN

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It is well known that, since ancient times, the progressive increase of ports and maritime traffic favoured insomuch the diffusion of exotic species, that for some of them the exact original distribution range as well as the diffusion routes remain unknown.

One of such species is the pleated ascidian, *Styela plicata*, a component of fouling communities, whose world-wide diffusion in the marine environment is due to ship-mediated transport. Its exact distributional range is unknown, even thogh it is thought to come from eastern Pacific.

Nonetheless, the first Italian record dates back to about forty years ago in the port of Genova but, presumably, it arrived to the Mediterranean much time before. *S. plicata* is a solitary ascidian easily found in port environments of tropical and temperate regions, where it thrives with high-density populations.

Under experimental conditions (26ºC and salinity 34‰), the larva takes on average 4.5 hours to attach to the substrate after the hatching from its egg.

However, larvae can actively swim for up to two days without compromising their metamorphosis or post-larval development. *S. plicata* is characterised by a high adaptive potential, being capable to tolerate wide variations of water temperature and salinity, as well as to cope with highly polluted waters.

With the present work we studied species' genetic structure along Italian coasts, by means of a molecular marker. We employed a region of the mitochondrial gene coding for the subunit I of the cytochrome c oxidase *(COI)*.

Our work was aimed at assessing genetic diversity of indroduced populations and to estimate the connectivity among them. Sampling design provided 13 Italian ports (Genova, La Spezia, Viareggio, Livorno, Portoferraio, Civitavecchia, Olbia, Siracusa, Taranto, Manfredonia, Ancona, Ravenna and Trieste) and the port of Montecarlo. In laboratory 149 individuals were analysed through the sequencing of a 613 base pairs region of COI gene. In total, we detected nine haplotypes, of which two were high-frequency haplotypes and present in all populations, with a few exceptions. Moreover, we found two private haplotypes (one at Portoferraio and another at Olbia), namely haplotypes found in only one

population. In general, southernmost populations exhibited higher levels of within-population genetic diversity than northernmost counterparts.

Moreover, the median-joining haplotype network and Bayesian cluster analisys allowed to detect two main haplogroups, which were separated by 16 mutational steps.
As expected for invasive exotic species, patterns of genetic diversity are not consistent with the geographical distribution of populations, as species' genetic structure is heavily determined by gene flow due to the vessel-mediated transport of adult indi- viduals.

Results of the present work represent a contribution to the knowledge of biodiversity within port environments and, as expected, show the major importance of the role played by maritime traffic in shaping the genetic architecture of species living in port environments on local or regional, as well as global spatial scale.

A specimen of Styela plicata.

AGRICULTURE AND WATER POLLUTION PROBLEMS

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Claudio CIAVATTA - Dip. di Scienze e Tecnologie Agroambientali, University of Bologna

Often people speaking of problems of pollution of marine waters, or more generally of water pollution caused by agricultural practices, falls into contradictions and errors due also to the existing legislation.

The most serious errors depend on the most serious anti-scientific persuasion shown by legislators: the one that led them to establish concentration threshold established for individual substances. Each undesirable substance is such as a function of its characteristics in the medium in question, but its degree of danger or harmlessness varies depending on its concentration in the medium in which it can be transferred.

The examples that it is possible to take are many, but suffice it to say that from an aqueous environment to another huge changes can arise in volume resulting in proportional changes in concentration.

A basic principle may be the one that starts from a distinction between point and diffuse sources, respectively, which change depending on the hazard being concentrated or dilute, and these processes may involve both biological input or output and physico-chemical subtraction and/or exchange of relevant fractions of organic and inorganic materials by adsorption, desorption and precipitation processes.

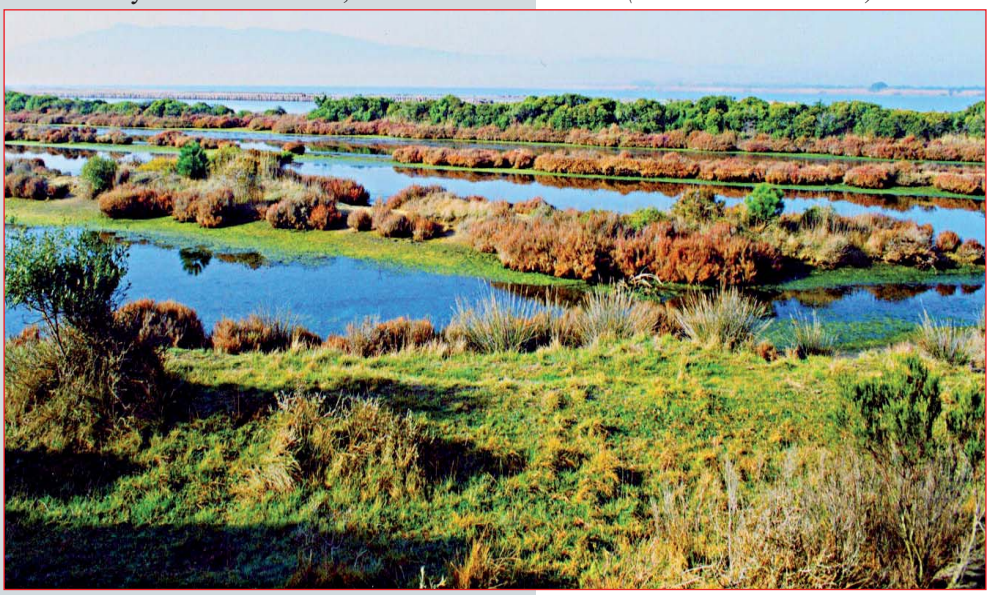
Another error which leads to unpredictable consequences is the persuasion that the optimal concentration of everything must be at a very low level, let us say a zero level, for most and virtually all the substances or elements present. This is not really distinguish the desirable concentrations depending on whether the macro, meso, micro-nutrients or biologically unnecessary items.

On the other hand, according to the results of those who have studied the effects of processes due to hormesis models, zero concentrations are really not desirable for noxious substances such as dioxins or cadmium salts!
It is necessary, in other words, to eliminate the concepts that underlie the precautionary principles, where nothing more than sources of arbitrariness can be often found. We will consider some cases that can quickly illustrate

some general principles, such as those that certainly opposed to each other can be exemplified by:

- an absolutely undesirable toxic metal that easily transfers in different trophic levels of food chains;
- a metal whose properties dramatically change according to the number of oxidation: the only number common in the soil can hardly be mobilizable; the metal in question is essential for human and animal nutrition, and totally innocuous in soil;

deliver fertilizer to the soil and plants are employed organic chemicals produced by complex chemical synthesis *(curiously accepted in organic farming even if they have defects such as photolability [such term refers to substances which are are subject to degradation in response to the effect of light] which also produces organic products little studied)*, while the distribution of others, whose function is unknown, their intake by plants and animals is virtually assured by the available natural sources, although little studied *(and little understood)*.



The Orbetello lagoon

- an alkali metal that is harmful for the soil fertility and dangerous for many plants, but essential for human and animal nutrition;
- cases of other elements that have different degrees of toxicity only if they exceed certain concentrations and others whose function is unknown, but which are extremely useful in plant and animal metabolism. To

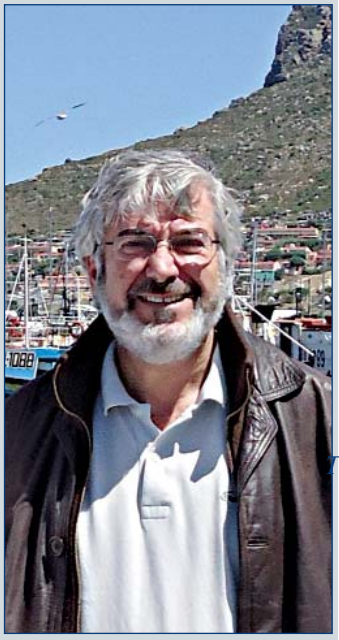
When these considerations are related to the science of fertilization, we understand how and how often the practice of agriculture, human activity that mainly depends on water availability, is one that requires a thorough knowledge and extensive experience to evaluate the involved effects and use any arising positive potential.

RESEARCH AND INNOVATION IN SUPPORT OF A NEW PHASE OF DEVELOPMENT IN FISHING

Salvo MAZZOLA - Institute for Coastal Marine Environment CNR, Mazara del Vallo (TP)

For some years now, Italian fishing has found itself in the midst of a structural crisis on an enormous scale, brought about by the combined effect of various factors such as the over-exploitation of the principal fish stocks, the advancing age of fishing vessels and the increase in fuel costs, catching procedures that are inadequate, shortcomings in the conservation, processing and trading system and difficulties encountered in attempting to secure careful and effective management of the *'chain'*.

In areas such as Sicily and Puglia, the effects of the crisis are even easier to see, given the considerable extent to which a large percentage of the population in these regions relies, from a social and economic point of view, on this industry.



The Orbetello lagoon

Research and innovation are to be considered essential in the role that they can play in overcoming the current crisis and modernizing the sector. With fishing representing one of the last remaining activities carried out by man that uses the productivity of natural resources to draw food from the sea and make an income, there is no option for research and innovation to make a contribution in scenarios that are anything other than clearly in support of sustainability on an ecological, economic and social level.

Research and innovation need to be integrated and made available as a support role for management, and contribute towards:

- understanding the dynamics of fishing resources in response to changes in environmental conditions and to catching procedures;
- assessing the impact of fishing on resources and on the communities that sustain them;
- encouraging environmental sustainability by being more selective in the choice of fishing equipment;
- facilitating the exploitation of the sea's biological resources on a sustainable basis, improving fishing's cost/benefit ratio;
- increasing the added value of fishing;
- improving comfort and safety on board, including in relation to the actual work of fishing itself;
- ensuring the socio-economic sustainability of the fishing sector by installing ICT on board in order to exploit resources on a rational basis and to have direct access to market outlets;
- improving governance where fishing is

DEVELOPMENT PROSPECTS FOR MARITIME TOURISM

Antonio DI MONTE - Assomarinas (Italian Marinas Association)

When it comes to the vast topic of how tourism, the sea and the land interrelate and the prospects of economic and social development in the maritime sector, two specific segments take on importance: nautical tourism and pleasure boating on the one hand and cruise tourism on the other.

Both segments have recently attracted a degree of attention from the press, but the views expressed are not always the result of a strictly scientific approach.

The data set out in the IV Report on the Economy of the Sea published in October 2011 by Censis *(the Italian Social Studies and Research Institute)* and by the Sea Federation, when put together with the data in the XVII Italian Tourism Report for 2010-2012 recently published by the CNR *(Italy's National Research Council)*, illustrates what is, on the whole, a particularly interesting scenario, both in terms of the contribution made to GDP by the two segments analyzed and in terms of their potential for further growth. Despite this, recent decisions made by the government where economic and fiscal policy is concerned do not appear designed to make the most of the opportunities arising out of a consolidation of the positions secured and their further improvement.

Pleasure boating, nautical tourism and cruise tourism are segments of the maritime tourist sector that can still prove to have sizeable development margins, with all the spin offs for the areas concerned that this brings, not just of a socio-economic nature but also in terms of employment, and within limits of sustainability from each and every point of view.

An analysis of the data available shows somewhat different situations for each of the two segments in question. Pleasure boating and nautical tourism have been severely affected not only by the general economic crisis on an international level and the related downturn in consumer spending, but also by the negative impact of the government's recently introduced fiscal po- licies, which are not always targeted at growth and development. And the forecast is that the climate will remain difficult in the short term. Sea cruises, however, present a different picture: despite all the recent controversy and the media's attempts to turn the spotlight on this market as a source of enter- tainment, it is betraying no signs of any negative reaction and in fact is experiencing a period of steady growth, with further development prospects for the short and medium term.

Italy's mountainous terrain and geographical location, twinned with its environmental, historical and cultural heritage as well as the legacy of its landscape, are a unique case without parallel anywhere on the planet and one which, if utilized correctly and properly turned to account, could represent a huge attraction, boosting the development of maritime tourism and the economy of the entire country.

THE CRUISE SECTOR IN THE MEDITERRANEAN SEA AND IN ITALIAN PORTS: RECENT TRENDS, PROBLEMS AND OPPORTUNITIES

Stefano SORIANI - Università Ca' Foscari di Venezia

In recent years the Mediterranean cruise market has showed continuous growth. With respect to demand, the number of passengers has increased from 500,000 in 1970 to 18 millions in 2010 *(European Cruise Council)*; and 25 million passengers are expected for 2015.

The most important demand segment is the North America one *(about 59% of total demand, 2010 data)*, followed by Europe *(29%)* and Asia *(almost 12%)*. Growth rate is particularly high for European and Asia markets *(76% and 86% respectively, in the period 2005/10)*, while it is relatively low in North America. As far as supply is concerned, total capacity *(lower berths)* has increased from 93,000 in 1990 to 461,000 in 2010. About 35% of total capacity (in terms of bed-days) is deployed in the Caribbean, 6% in Alaska, 12% in the Rest of America, 18% in the Mediterranean Sea, 9% in North Europe and almost 20% in Asia-Pacific.

The sector is characterized by a high concentration, with 4 world cruise companies (Carnival Corporation & PLC, Royal Caribbean Cruise Ltd, Genting HK *(Star Cruises and MSC)* that hold about 80% of cruise ships.

Gigantism is another important feature of the industry. This is an important factor affecting port competition as well as a conditioning element for many ports, which have to cope with the continuous need for infrastructural modernization and to improve organization and logistic services. This is a very critical point particularly for ports located in *'delicate'* coastal settlements.

Against this background, Italian ports play a basic role in the Mediterranean market, thanks to the recent scale-ups occurred to most of them, the appeal of the Country in the tourism market, and the higher and higher attractiveness of cruises for the European demand, which continues to prefer Mediterranean routes. With regard to passengers, the top-10 Mediterranean ports are Barcelona, Civitavecchia, Venice, Palma de Majorca, Pireus, Naples, Dubrovnik, Tunis, Leghorn and Santorini *(European Cruise Council)*. When it comes to consider problems and opportunities for future development, what follow are the most important issues worth pointing out.

The importance of vertical integration processes for port competition. Relationships between cruise companies, port terminals and port agents & ground operators play a fundamental role in port competition. In fact, these relationships are key-drivers in the integration between products and services, thus defining new potential inland resources for the development of the sector.

Quality of infrastructures, equipment and

services, also with respect to gigantism. There is a general need for improving intermodal connections and services in cruise ports. Cruise companies are placing more and more demands on the quality of logistic services provided by ports, due to the need for efficient organization of inland products and services. The issue poses many problems particularly for Mediterranean ports that are located in historic urban settlements. Gigantism is causing this issue to become more and more crucial.

The need for managing territorial and environmental problems. With respect to territorial problems, the most important challenge is to adopt new port and urban plans that enable the harmonization of scale-up programs *(port expansion programs)* with modernizing *in-situ* options, on the basis of the different cruise products and market segments.

With respect to environmental problems, other than these related with safety in navigation *(particularly in the most sensitive coastal ecosystems)*, the most important issues for ports to deal with, are those related to air pollution and energy supply. In relation to these, many ports are defining and implementing new initiatives and programs based on the mix between more severe local regulatory frameworks and voluntary tools *(for example, blue flag programs, new audit schemes and monitoring programs, etc.)*. Moreover, many ports are involved in initiatives aimed at 'greening' the local port business, through technological and organizational improvement *(cold ironing, renewable sources and energy efficiency, etc.)*.

The integration of products and services, and the issue of local economic and social impacts of cruise market development. To design and promote an integrated system of inland *(urban and regional)* products and services is of the highest importance in order to make ports and cities more attractive for cruise companies. At the same time, this issue is relevant for social and economic reasons. In fact, the risk that increasing private benefits for the companies involved in the sector are not matched by social benefits is not to be underestimated, in particular because of the increasing externalities posed by the dramatic dynamism of the cruise industry. In this perspective, the local economic impact of the cruise sector *(particularly in the mass-tourism market, mainly based on the 'budget' and the 'contemporary' demand segments)* is often questioned.

With no doubt, the development of cruise market has played a key role in Mediterranean port-cities' evolution, and still does. What we need, however, is a more critical and pro-active approach to the relationships between market dynamics on one side, and the local economic, social and environmental impacts on port-cities and coastal regions on the other side.

ITALIAN SPACE TECHNOLOGIES FOR MONITORING COASTAL AREAS

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Coastal and inland aquatic ecosystems are characterized by dynamic and extremely complex processes. Ecological studies of these environments require spatial and temporal scales hardly observable using traditional methodologies. Remote sensing technology has become a useful support for the study of aquatic ecosystems and represents a fundamental tool to enable multitemporal and spatialized monitoring, adequate for management purposes.

In recent years, the technological evolution of Earth Observation from space has greatly improved the ability to obtain bio-geophysical parameters of the territory with adequate accu- racy and timing, optimal spatial resolution and revisit times, leading to scientific applications and benefits for the population.

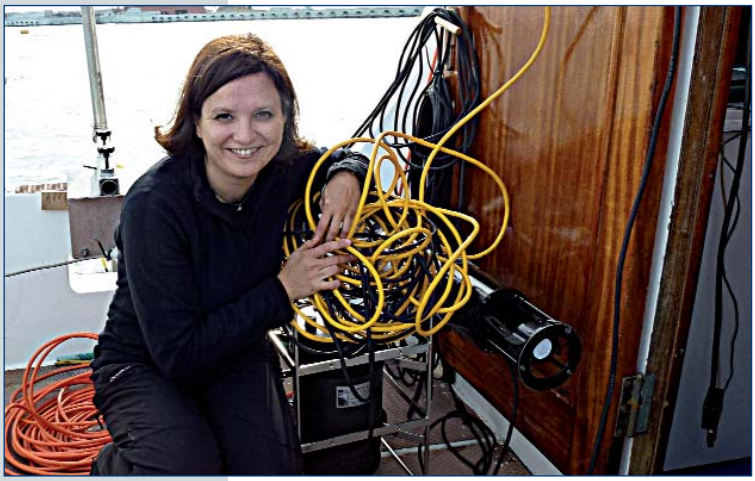
The ASI, Italian Space Agency, is strongly committed to the implementation and management of satellite platform systems for earth observation.

An example is the Italian COSMO-SkyMed constellation, which allows observing the Earth's surface regardless of solar illumination and in all weather conditions.

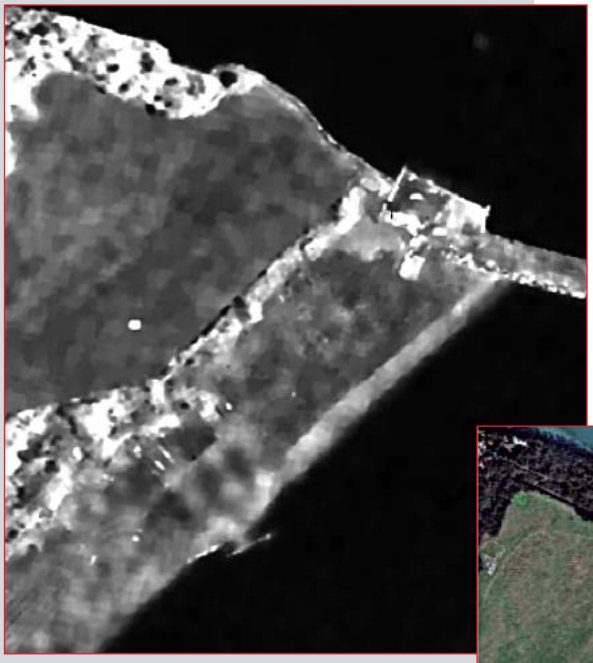
COSMO-SkyMed has provided an important contribution to emergency management as evidenced by the observations made in collaboration with international agencies during the most serious emergencies in recent years: the floods in Burma and Albania, the earthquakes in Haiti, of Van in Turkey, the tsunami in Japan, the monitoring of the oil spill in the Gulf of Louisiana.

Currently, COSMO-SkyMed in emergency mode is activated at the request of the Italian National Department of Civil Protection to monitor the area of the Costa Concordia cruise ship to control any spill of oil into the sea and, through the interferometric processing, to assess the stability of vessel to integration of the monitoring system to the ground.

Among the research programs sponsored by ASI for the implementation of radar data applications, especially for marine environments, coastal and inland waters, it cited a recently completed project carried out by the Politecnico di Milano *(BEST and DEI)* and



CNR-ISMAR. This project was focused on mapping of coastal areas in relation to tide level, which is especially sensitive to actions of territorial control, including the response to major disasters that have recently hit several coastal areas of our Peninsula.
In the field of hyperspectral images, aimed at more extensive monitoring of water quality, the activities are continuing on the simulation of sensor data produced for the PRISMA mission and on the implementation of specialized algorithms for the extraction of biophysical parameters. The mission involves putting a satellite into orbit in 2013 and this is an Italian realization.



COSMO-SkyMed image of Lido Island (Venice)
(Image courtesy of ASI project 1160)

Geo-Eye image of Lido Island (Venice)
(Image courtesy of ASI project 1160)

OBSERVING GLOBAL CHANGES TO DIAGNOSE IMPACTS ON MARINE ECOSYSTEMS

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Every scientific discipline has its own specific methodologies and tools, which allow to quantitatively investigate the founding aspects.

However, broader scientific topics that are inherently interdisciplinary in nature such as the study of global changes in marine ecosystems reveal the limits of the common investigation tools. The spatial dimension is of foremost importance here: oceans cover 7/10 of the Earth's surface and therefore the investigation tools must forcibly involve the larger scales. A major breakthrough has been achieved by the availability of satellite sensors, which by means of onboard radiometers allowed to *"see"* the ocean colour from space *(the spectrum of the water-leaving portion of incident light)*.

Yet this important technological step is capable of revealing only a fraction of the marine ecosystems. Satellites are indeed able to only measure surface phytoplankton, also considering that phytoplankton biomass is derived from the empirical reconstruction of photosynthetic pigments of which chlorophyll a is generally the most abundant. It is therefore required to have several observation stations where in situ chlorophyll data are continuously gathered to calibrate the algorithms used to translate radio- meter data to chlorophyll concentration. It is also worth mentioning that the number of calibrating stations is necessarily limited, that satellite data are spatially limited to the illuminated summer hemisphere and that the inherent optical properties of the different oceans require a further specific calibration that reduces the applicability of the algorithms at the global scale. Despite all these caveats, satellite data represent a major advancement in science of Earth observation, and since the '80s allowed us to quantitatively assess the variability of the primary producers that are at the base of marine ecosystems.

It is clear that these data are not sufficient to give an overall measure of on-going changes in global marine ecosystems. *"Classical"* measurements obtained during marine cruises still represent the ultimate investigation method that allows to sample other components of the ecosystem, by means of water sample collections, in situ incubations and laboratory analyses. However, these data are snapshots of marine ecosystem status, and only rarely it is possible to have repeated measurements at the basin scale. This is the case of the Atlantic Meridional Transect *(AMT)* that covers a track from UK to South America about twice a year collecting important data from the northern to the south Atlantic. In addition to this there exist about 10 Eulerian observatories in the world ocean, where data relevant to understanding marine ecosystems *(such as CO_2 primary production, plankton composition and bacterial activity)* are routinely collected with roughly a monthly frequency over the last 30 years.

To complete the information on marine ecosystem data, we should mention the methods

used to analyse the fishery sector, which has a recognized substantial impact on human socio-economical aspects. Oceans sustain a continuously growing human population thanks to the high protein content of fish. The overall estimates of fish stock are based on landings and thus are tightly linked to commercial species. Scientists have found evidences of a correlation between fish stock and the major indices of climate variability. It is thus likely that a variation of mean climate conditions induced by the anthropogenic activities may affect these stocks, with additional impacts caused by an indiscriminate fishing pressure that is not aware of these tight connections between climate and populations.

A question arises whether the current observational network is capable to diagnose ongoing changes in global marine ecosystems and attribute them to human actions. Based on the available data, the answer addresses four major topics: the increase of inorganic carbon concentration that makes oceans more acidic, the increase of sea surface temperature, the decrease of ecosystem production due to reduced nutrient availability and the expansion of the minimum oxygen zones in the oceans.

Ocean acidification is caused by the direct invasion of atmospheric carbon dioxide through the ocean surface. Oceans can adsorb large amounts of CO_2 and this capability regulated the fluctuations of the natural carbon cycle. The CO_2 dissolution increases water acidity *(measured with a reduction in the pH scale)*, and the observed reduction of pH over the last 250 years is unprecedented in the Earth geological history of the last 60 million years. Recently, this variation has been demonstrated to be distinguishable from any known natural climate fluctuation.

The first 24 hours of data from the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) on Sept. 16, 1997 (source: http://ocean-color.gsfc.nasa.gov).
Red colour indicates high chlorophyll concentration, blue colour low concentrations and black indicates lack of data.

The other CO_2 problem is thus likely to become the first problem that we will need to face in the ocean ecosystems. The common action of several stress factors can have substantial impacts on the physics, chemistry and biology of the marine environment. Ocean acidification can reduce species tolerance to temperature increases. On the other hand, the enhancement of vertical stratification due to surface heating reduces the surface availability of nutrients with an eventual reduction of surface production that may impact on higher trophic levels. In addition, some regions of the ocean are characterized by low-oxygen conditions due to the lack of surface ventilation and a continuous supply of organic matter. The ongoing and projected increase of surface temperature is likely to exacerbate these conditions, with an expansion of the minimum oxygen zones. In coastal regions, this effect may am-

plify due to the land input of nutrients and organic matter driven by the population increase.

The direct consequences on marine ecosystems are clearly difficult to assess due to our incomplete picture of the system. Yet, we need to recognize the existence of significant perturbations in the mean state of the system as we know it. Recently, the analysis of the satellite data on primary producers have given indications of a generalized decrease, particularly in the temperate regions. The scientific debate on this issue is however still open.

The 2 continuous open-ocean observatories *(the Hawaii Ocean Timeseries and the Bermuda Atlantic Timeseries)* indicates an increase in surface primary production although there are clear evidences of upper ocean warming. Therefore, we need to consider the presence of sub-basin differences, discriminating between the medium/high latitudes where the impacts on surface production are more evident and the sub-tropical ocean where the consequences are less certain. There are however more direct evidences as for instance in the North Atlantic.

The Continuous Plankton Recorder is a towed underwater vehicle used since the '30s to collect plankton samples along ship tracks. The data analyses over the last 70 years has evidenced a clear shift in the areal distribution of warm water zooplankton species toward the higher latitudes. There is an ongoing likely adaptation of predators to these changes in prey availability, although the long term consequences are difficult to be predicted.

How is it possible to connect these information with the well-known variability of ocean physical dynamics? Dynamical models are one of the key tools for carrying out this task, especially the usage of the Earth System Models *(ESM)*, that bring together the physics of climate with the dynamics of the major biogeochemical cycles and the mass transfer along the principal components of marine ecosystems. ESMs are necessarily an approximation of the Earth System functioning, but allow us to perform scientific experiments on scenario responses and to assess consequences.

For instance, recent results indicate that the equatorial Pacific ecosystem is likely to be less vulnerable to the impacts of surface warming, while it is confirmed the currently observed reduction in surface nutrient availability in the northern Pacific with a lowering of net community production. Some models are also capable to simulate the impacts on sea ice ecosystems, which are particularly sensitive to climate change as for instance observed in the Arctic. The impact of an earlier shift of the sea ice melting period is anticipated to affect not only the sea ice ecosystem but also the pelagic component, as the post-melting bloom would occur under less favourable light conditions.

The future scientific challenge involves the inclusion of more plastic and realistic biological components in dynamical models, which will provide the capability of the modelled system to adapt to simulated changes in the physical environmental conditions. This will allow future models to consider also the resilience, a key property of marine ecosystems, that will hopefully reduce the impacts of the observed changes. Current studies indicate that without these self-organizing properties that are central to resilience, the current planktonic ecosystems are likely to be substantially impacted by global climate changes, even in the case of a dramatic mitigation of anthropogenic emissions.

NOVEL POLYMER FILMS FOR NON-TOXIC, ENVIRONMENT BENIGN COATINGS FOR MARINE FOULING RELEASE

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Biofouling is a process of nanoscale adhesion, occurring at the interface between fouling organisms and all the man-made surfaces, in both marine and freshwater environments. It is a worldwide problem of high practical and economical relevance.(1)

In the case of ship hulls, the adverse effects caused by biological settlement include high frictional resistance, due to generated roughness, which leads in turn to an increase in fuel consumption. Moreover, hull cleaning, paint removal and repainting, and associated environmental compliance measures contribute to the cost of biofouling. A recent analysis of the economic impact of biofouling for the Arleigh Burke DDG-51 destroyers, which comprise 30% of the ships in the US Navy fleet, estimates the overall cost associated with hull fouling at $56 million per annum. If the analysis is extended to the entire US Navy fleet, the approximate cost of hull fouling is between $180 and 260 million per annum.

The control of biofouling has imposed environmental burdens through the use of toxic self-polishing tributyltin-based antifouling paints, which are now banned. Although current commercially available copper-based antifouling paints are moderately toxic against marine fauna and poorly toxic against mammals, they are much less effective than TBT-based coatings and so require additional co-biocides to enhance their effectiveness.

However, the current legislation has imposed a stricter evaluation and regulatory regime on the use of biocides. *'Green'* alternatives to biocide-based technologies are therefore urgently sought by the marine coatings industry and there is considerable interest in developing biocide-free coatings.

Two general strategies *(Fig. 1)* are typically followed in the design of novel, non-biocidal, non-fouling surfaces:

- antifouling coatings, in which the objective is to deter the recruitment stages of fouling organisms from attaching in the first place
- fouling-release coatings, which do not prevent organisms from attaching, but the interfacial bond is weakened so that attached organisms are more easily removed by the hydrodynamic shear forces generated by movement of the ship through the water or by gentle *'grooming'* devices

In both cases the objective is to achieve the desired result through manipulation of the physicochemical and/or materials properties of the coating *(for example, elastic modulus, frictional coefficient)* so that the organism either perceives the surface as unconducive to settlement

or the intermolecular interaction forces between the surface and the polymeric adhesives produced by the fouling organism are weakened, promoting adhesive failure. These two general approaches are not mutually exclusive and in fact the distinction is overly simplistic.

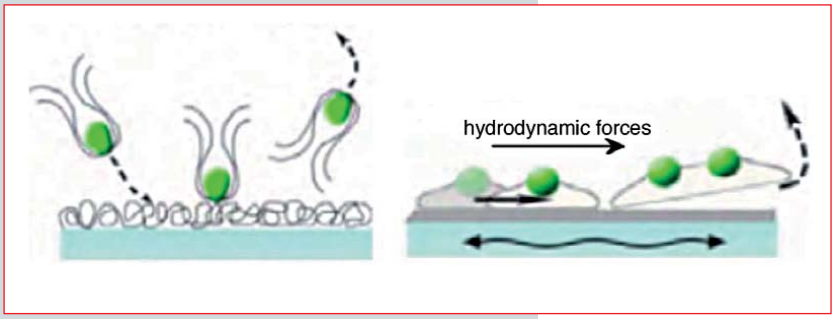

Figure 1. Illustrative scheme of antifouling and fouling release processes.

The most successful and commercially widespread fouling release coatings are those based on polydimethylsiloxane *(PDMS)* elastomer.

The basis of low adhesion of fouling organism to PDMS coatings is due to a number of factors, including low surface energy, low bulk modulus and thickness of the coating.

However, these coatings suffer from the disadvantage to require relatively high cruise speed *(> 15 knot)* that makes them less suitable for vessels that spend long periods in port or which cruise at lower speeds to maintain fuel efficiency. Therefore, there is a *'technology gap'* demanding innovation. On one side, the great diversity of foulants and their mechanisms of adhesion on a surface impose the use of protective coatings that are sufficiently versatile and robust to resist adhesion and settlement under different conditions without recurring to toxic biocides. On another side, the complexity of the interfacial interactions and processes between the living organisms and the sensed structure and morphology of the outermost surfaces of the material requires a multidisciplinary appro- ach focusing on the ability of the film to respond at micro -and nano-size levels.

In this context, our research aims to the development of novel polymeric coatings with a *'complex'* and *'imperfect'* surface.

The ability to tune such *'imperfections'* at the micro/nano scale level, by appropriately varying the mechanical, chemical and structural properties of the polymeric film, is an excellent strategy to control the biological response of the coating surface, thus minimizing the interactions with the organisms for an effective inhibition of their settlement and/or promotion of their release.[2,3]

We briefly highlight the major results of fouling release performance of such newly developed coatings in laboratory tests and field trials.

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ECOTOXICOLOGICAL RISKS RELATED TO PERFLUORINATED ORGANIC COMPOUNDS DISPERSION IN AQUATIC ENVIRONMENTS

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Environmental sustainable development is a process characterized by the fulfillment of human needs while maintaining the environmental quality indefinitely. This process involved meetings the present needs of humans without endangering the welfare of future generations.

The Stockholm Convention recognized that POPs are chemical substances that persist in the environment, bioaccumulate through the food web, and pose a risk of causing adverse effects to human health and the environment. Recently, emerging pollutants like brominated flame retardants *(polybrominated diphenyl ethers, PBDEs and perfluorinated organic compounds, PFCs)* have been included in Annex B of the Stockholm Convention due to their bioaccumulation, biomagnification, and toxic properties.

As a consequence of their increasing use, environmental levels of PBDEs and PFCs have risen since their first application, and recent literature have reported that PBDE concentrations are increasing in the environment and in wildlife's tissues and human blood. In some areas PBDE levels in wildlife and humans have surpassed the levels of PCBs. Among perfluorinated organic compounds *(PFCs)*, the sulfone acid perfluorooctane sulfonates *(PFOS)* and the carboxylic acid perfluorooctanoic acid *(PFOA)*, represent the major environmental concern.

represents the predominant compound found in biota, whereas a type of surfactant, is dominant in environmental matrices. Transitional waters are located between the land and the open-sea and represent important accumulation sites of the pollution charge coming from different terrestrial and aquatic human sources so these areas are highly exposed to PFCs pollution and to associated effects than others aquatic ecosystems.

PFOA *(C8HF15O2, CAS n. 335-67-1, S36, S37, S39, R22, R34, R52/53)* evidence high water solubility *(3400 mgL-1)* whereas PFOS (C8HF17O3S, CAS n. 1763-23-1, S61, R61, R20/21, R40, R48/25, R64, R51/53) have lower water solubility which increases with temperature (519 mgL-1 a 20 ± 0.5 °C e 680 mgL-1 a 25 °C) and an higher solubility in organic substance *(56 mgL-1, octanol)*. These compounds tend to bind proteins producing as consequence an alteration of the physiological metabolic pathway affecting reproductive success.

The physico-chemical properties of PFCs favour the occurrence of long-range transport dynamics, as they are more volatile than chlorine or bromine analogues. Humans are exposed to risk from these chemicals due to the diet uptake. Even if the most significant contributor to the dietary PCB and PBDE intake in humans is represented by the fish and sea- food consumption, these molecules are not included in European Policy performed, on the contrary, for many persistent organic pollutants from human origin as well as dioxin-related compounds *(CE/13/2006)*.

Furthermore, data concerning levels and behaviour of such compounds in coastal systems are not available by the scientific literature but major treated ecosystems are represented by marine areas. In fact this environment accumulates inputs coming from the air, river, sediment transport of chemicals spread from terrestrial and coastal human sources affecting marine species and, in particular, marine mammals and humans feeding fishes and marine-products.

AREE MARINE PROTETTE: SITI PILOTA PER LA GESTIONE INTEGRATA DELLE ZONE COSTIERE, STRATEGIA NAZIONALE PER LA BIODIVERSITÀ E DIRETTIVA QUADRO PER LA STRATEGIA MARINA

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Il nuovo Protocollo della Convenzione di Barcellona valuta la zona costiera quale *"risorsa"* ecologica, economica e sociale insostituibile, e considera la Gestione Integrata delle Zone Costiere *(GIZC)* lo strumento indispensabile per la sua conservazione ed il suo sviluppo sostenibile. A questo proposito va ricordato che la GIZC è un processo adattativo di gestione delle risorse, che prevede lo sviluppo sostenibile delle zone costiere mediante il raccordo delle diverse politiche che su di esse incidono e la pianificazione e gestione delle risorse e degli spazi costieri. Ovviamente il raggiungimento di questi obiettivi richiede l'adeguato coinvolgimento di tutti i responsabili delle politiche locali, regionali, nazionali e sopranazionali e, più in generale, di tutti i soggetti che con le proprie attività influenzano le regioni costiere.

In estrema sintesi, l'obiettivo primario del nuovo Protocollo è di fare in modo che la GIZC divenga l'approccio di riferimento per la gestione della zona costiera in Mediterraneo, anche con l'elaborazione di legislazioni pertinenti a livello nazionale o sub-nazionale, e definendo o potenziando le capacità istituzionali.

Le aree marine protette *(AMP)* sono riconosciute da numerosi accordi internazionali, tra i quali la Convenzione di Barcellona, strumenti essenziali per una conservazione dell'ambiente marino che consenta l'uso ecologicamente sostenibile delle risorse marine e un concreto contrasto alla perdita di biodiversità. Nello specifico, le AMP sono strategiche per la GIZC, perché *"strumenti ideali"* per rispondere a tre necessità prioritarie per lo sviluppo sostenibile delle aree costiere e marine: conservare la biodiversità marina, mantenere la produttività degli ecosistemi e contribuire al benessere economico e sociale delle comunità umane.

La CEE con la Direttiva Habitat *(92/43/CEE)* ha previsto la creazione di una rete ecologica europea coerente di Zone Speciali di Conservazione *(ZSC)*, denominata *"Natura2000"*, per conservare la biodiversità, considerando nel contempo le esigenze economiche, sociali, culturali, regionali e locali, e riconoscendo il valore della presenza storica dell'uomo e delle sue attività tradizionali. La Direttiva prevede che gli Stati Membri o, in casi eccezionali, la stessa Comunità Europea, designino specifiche

aree protette, Siti di Importanza Comunitaria *(SIC)* e Zone di Protezione Speciale *(ZPS, in riferimento a quanto stabilito dalla Direttiva Uccelli Selvatici 79/409/CEE)*. La designazione dei SIC deve avvenire sulla base della valenza del singolo sito per gli habitat e le specie di importanza comunitaria; nello specifico i SIC devono essere istituiti in funzione della presenza di habitat e di specie di cui agli annessi I e II della Direttiva Habitat, mentre le ZPS devono essere stabilite sulla base delle specie elencate nell'allegato I della Direttiva 79/409/CEE.

L'Italia, dal canto suo, prevede inoltre l'istituzione di aree marine protette nazionali, create a fini conservazionistici *(a partire dalla legge 979/1982* ***"Disposizioni per la Difesa del Mare"****, seguita nel 1991 dalla Legge 394 e da successive)*. Per questo motivo nel 1992, anno di pubblicazione della Direttiva Habitat, l'Italia disponeva già di un quadro normativo in materia di aree marine protette *(AMP)* che, ad oggi, ha portato all'individuazione di oltre 51 aree marine di reperimento, all'istituzione di 27 AMP, 2 parchi sommersi ed alla ratifica dell'accordo per il Santuario Pelagos, per la protezione dei Cetacei.

Attualmente la rete *Natura2000* ed il sistema delle AMP nazionali costituiscono due realtà parallele, ed è necessario che sia definita una soluzione che consenta maggiore organicità.

A questo proposito l'Italia può ispirarsi a quanto fatto da altri Stati dell'Unione come, ad esempio, Germania e Gran Bretagna, integrando inoltre quanto previsto a livello nazionale ed europeo con le valenze conservazionistiche propriamente mediterranee, che trovano specifico riscontro in quanto definito dalla Convenzione di Barcellona.

Quanto detto va considerato alla luce di un altro importante strumento definito dall'Italia nel corso del 2010: la Strategia Nazionale per la Biodiversità. Questo documento, è basato su una *"visione"* emblematica: ***"La biodiversità e i servizi ecosistemici, nostro capitale naturale, sono conservati, valutati e, per quanto possibile, ripristinati, per il loro valore intrinseco e perché possano continuare a sostenere in modo durevole la prosperità economica e il benessere umano nonostante i profondi cambiamenti in atto a livello globale e locale"***.

La Strategia nazionale individua tre *"obiettivi strategici"* fra loro complementari, che mirano a garantire la permanenza dei servizi ecosistemici necessari alla vita, ad affrontare i cambiamenti ambientali ed economici in atto e ad ottimizzare i processi di sinergia fra le politiche di settore e la protezione ambientale. In ragione della trasversalità del tema biodiversità, strettamente interconnesso con la maggior parte delle politiche di settore, la Strategia Nazionale prevede il conseguimento dei 3 obiettivi strategici di cui sopra considerando 15 distinte aree di lavoro. Di queste vale la pena ricordare l'area di lavoro 2 ***(Aree protette),*** la 7 ***(Ambiente marino)***, la 8 ***(Infrastrutture e trasporti)***, la 12 ***(Turismo)*** e la 13 ***(Ricerca e innovazione)***. Ciascuna area di lavoro è a sua volta articolata in più parti. Tutto ciò evidenzia la rilevanza delle aree marine protette quali siti privilegiati anche per questo importante strumento normativo.
Ancora, l'Italia con il D.L. 190/2010, di attuazione della direttiva 2008/56/CE *"Direttiva Quadro sulla Strategia per l'ambiente Marino" (MSFD)*, si è dotata di uno strumento normativo per garantire un uso sostenibile delle risorse, prevedendo che ***le strategie per l'ambiente marino:***

a) applicano un approccio ecosistemico alla

gestione delle attività umane per assicurare che la pressione complessiva di tali attività sia mantenuta entro livelli compatibili con il conseguimento di un buon stato ambientale;

b) salvaguardano la capacità degli ecosistemi marini di reagire ai cambiamenti indotti dall'uomo;

c) considerano gli effetti transfrontalieri sulla qualità dell'ambiente marino degli Stati terzi situati nella stessa regione o sottoregione marina;

d) rafforzano la conservazione della biodiversità dell'ambiente marino, attraverso l'ampliamento e l'integrazione della rete delle aree marine protette previste dalla vigente normativa e di tutte le altre misure di protezione;

e) perseguono la progressiva eliminazione dell'inquinamento dell'ambiente marino;

f) assicurano che le azioni di monitoraggio e la ricerca scientifica sul mare siano orientate all'acquisizione delle conoscenze necessarie per la razionale utilizzazione delle sue risorse e potenzialità.

Il D.L. 190/2010 prevede che entro il 15 luglio 2012, sia elaborata una valutazione iniziale dello stato ambientale attuale e dell'impatto delle attività antropiche sull'ambiente marino; detta valutazione dovrà essere basata anche sulla stima dei singoli descrittori, criteri ed indicatori, al fine di giungere, mediante un processo aggregativo, alla valutazione globale dello stato ambientale.

Questa valutazione deve essere prodotta seguendo quanto indicato dalla Decisione della Commissione del 1° settembre 2010, che ha definito i criteri ed i relativi indicatori per ciascun descrittore, per la determinazione del buono stato ambientale, ovvero lo stato ambientale di riferimento, per singolo bacino. Attualmente siamo quindi in una fase di particolare *"delicatezza"*:

- vanno individuati gli indicatori più efficaci per consentire il necessario collegamento tra la valutazione iniziale e la determinazione del *"buono stato ambientale"* e dei relativi traguardi ambientali *(stato, pressione, impatto)*;
- devono essere identificati i set di dati più adeguati per alimentare gli indicatori e le *"realtà"*, i sistemi più idonei per mettere a disposizione dati già presi e, in prospettiva, per le future attività di raccolta dati.

In questo contesto le AMP possono ulteriormente enfatizzare il loro ruolo entrando a far parte di un sistema nazionale, standardizzato, di raccolta dei dati che consenta di valorizzare quelli già raccolti dalle AMP, necessari per monitorare l'efficacia delle loro misure gestionali, ufficializzandone il ruolo di siti di riferimento per valutare il *"buono stato ambientale"* previsto dalla MSFD.

ISPRA è stato incaricato dal Ministero dell'Ambiente di catalizzare l'implementazione della MSFD in Italia ed è impegnato ad avviare una collaborazione con le AMP per favorire la creazione di un sistema nazionale di raccolta di dati concepito in modo da poter alimentare diverse tipologie di indicatori. Infatti gli impegni sopra ricordati evidenziano la necessità di disporre di dati utili a scala locale, nazionale ed europea; in questo contesto la rete delle AMP *(o almeno di alcune di esse)* può costituire la componente strategica di un sistema nazionale di raccolta dati in grado di rispondere a molteplici impegni, nazionali ed internazionali, consentendo inoltre un'ottimizzazione delle risorse.

ADVANCED PHYSICAL-CHEMICAL CHARACTERISATIONS HAS TOOLS IN HARBOR DREDGED SEDIMENT MANAGEMENT

Ivano VASSURA - Dip. Chimica Industriale e dei Materiali - University of Bologna

Maintenance, construction and remedial works, within harbor areas imply the production of a huge amount of dredged sediment that must be managed. In Italy, until 1999 the main option, for managing of millions of cubic meters of harbor yearly dredged sediments, was offshore dumping *(over 3 miles from the coastline)*.

Due to the high marine environmental impact, both national and mainly international tendency was towards the promotion of alternative management options, furthermore has been slowly introduced the concept of sediment as *"resource"* instead of *"waste"*.

Today's there are available several technologies for sediment treatment. A deeply knowledge of chemical and physical properties of the contaminants and the matrix is essential for an economic and ecological management strategy.

Our studies are focused on the investigation of heavy metals mobility in harbor sediments before and after mechanical separation by means a soil washing treatment.

Beside the analysis of total metals content in the whole samples, were determined their release in water under singular experimental condition. Two different leaching tests were carried out:

1) pH-stat leaching test CEN/ TS 14997;

2) up-flow percolation test CEN/ TS 14405.

The first leaching test gives information about the influence of environmental pH on solubility of pollutants. Whereas, the second leaching test is useful to simulate what happens when a waste is stored upland and the water *(for example rain)* goes throw the material in a sort of piston flow mode. In this way it is possible to find out which mechanisms govern the leaching, for example washing out versus solubility, and how they may change during the test, which take place during about a month. This preliminary research, other an assessment of soil washing efficiency like a sediment decontamination treatment, shows that many heavy metals increase their mobility in the separated fine fraction compared to the whole sediment.

GENETIC DIVERSITY IN ITALIAN PORTS.II. PHYLOGEOGRAPHY OF THE BARNACLE AMPHIBALANUS AMPHITRITE

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The barnacle *Amphibalanus amphitrite (Pitombo, 2004)* is one of the main organisms of the fouling. The fouling community includes all marine organisms, animal and plants, that settle on artificial substrates immersed in water such as: ship hulls, mooring ropes, structures in stone, metal, wood and concrete, directly washed by the sea.

Fouling organisms are able to disperse far, not only through larval dispersal, but also by mean of passive transport on ship hulls or in ballast waters. Ships, in fact, have been identified as one of the main vectors in the translocation of organisms from one region to another, so to make ports key areas for the introduction of alien species.

The port environment, therefore, carries out two contrasting actions on the gene flow of its colonizing species: on one hand, being the port constructed to protect the internal mooring area, it limits the water exchange between the inner and the outer part and promotes the isolation of the organisms living there so reducing gene flow, on the other hand, as ports receive ships coming from far, they favor gene flow of organisms taking advantage of passive transport.

Due to the anthropogenic impacts, the port environment is strongly altered in its structure and its chemical, physical and biological composition. Port communities are constituted by marine species having various grades of opportunism, that react to different types of pollution based on their grade of adaptability and on their ability in developing detoxification systems. Tolerance to contaminants is developed also through genetic mechanisms that promote the possible loss and/or alteration of the genetic variability that, in extreme situations, can bring to the decline of the evolutionary potential of the species.

The aim of the present study is to investigate the genetic variability of *A. amphitrite*, barnacle with panglobal distribution and characterised by a planktonic larval phase that lasts approximately 20 days.

Within this project, samples of *A. amphitrite* were collected from 13 Italian ports *(Genoa, La Spezia, Viareggio, Livorno, Portoferraio, Civitavecchia, Olbia, Siracusa, Taranto, Manfredonia, Ancona, Ravenna and Trieste)* and from the port of Montecarlo, to investigate the

patterns of connectivity among the various ports. Once the DNA extraction protocol was optimized, we proceeded with the study of the genetic structure of the species employing as molecular marker sequences of the mithocondrial DNA region coding for the subunit I of the Cytochrome Oxidase gene *(COI)*.

Genetic analyses highlighted a high degree of variability both at haplotypic and nucleotidic level, indicating differentiation among individuals from the same port and total absence of genetic structuring on a wide geographical scale. The main component of the molecular variance was allocated to differences among individual within ports, while the other components resulted to be negligible. The Mantel test did not highlight isolation by distance and on the overall results indicated the presence of a unique large population present in all sampled ports. A similar result is in agreement with the hypothesis that, thanks to passive transport on ship hulls or in ballast waters, the investigated A. amphitrite populations are subjected to an efficient gene flow.

Studies on genetic diversity in port environments, besides having their intrinsic scientific relevance, attract special interest in consideration of the growing attention paid to biodiversity protection at European level and to the continuous development of maritime traffic.

The barnacle crustacean (Amphibalanus amphitrite), the keel of a boat colonized by fouling organisms and the port environment.

PROPOSAL: DISUSED OIL PLATFORMS IN THE MEDITERRANEAN SHOULD BE GIVEN AN ENVIRONMENTAL ROLE

Vanna FORCONI - ISPRA - Mareamico Scientific Committee

Where the enhancement of marine resources within the framework of sustainable development is concerned, there is an important contribution potentially on offer from a rather particular source. The proposal concerns fixed oil platforms that operate in the Mediterranean, and in particular in the Italian sea, which are no longer carrying out mining work, and putting these to alternative use.

The situation is an extremely complex one that has already been raised in the past in connection with specific aspects of particular importance, as seen from certain parliamentary documents, including a motion presented to the Senate on 3 July 2010 by Senator Antonio D'Ali, and his speech at the meeting held by regional authorities and local bodies in the Mediterranean *(EMPA)* in Palermo in 2010 and chaired by the Sicilian Regional Authority.

It has in fact been calculated that there are as many as 115 fixed mining platforms off-shore *(operating beyond national territorial waters)* in the Italian seas, in particular in the Adriatic and in the Canal of Sicily, and which are subject to international law. 99 of these platforms belong to Italian oil and gas company ENI, and 16 belong to Edison, the Italian energy company. In addition, there are 16 mobile platforms working on energy exploration *(90% gas and 10% oil)*, the majority of which belong to foreign companies such as Northern Petroleum, Petroceltic and Puma.
The average distance of these platforms from the coast is 21km *(ranging from a minimum of 2km to a maximum of 59 km)*, while the seabed is on average 55m deep *(ranging from a minimum of 9 m to a maximum of 820 m)*. These platforms are, therefore, very close to the coast. Also of interest is the age of these mining platforms: on ave- rage they are 22 years old *(with the oldest dating back to 1968, with the most recent having arrived on the scene in 2009)*. To complete the overall picture, there are currently 54 platforms that were retired from service some time ago.
At conferences and in the main proposals put forward on this topic, the problem on the agenda mainly regards the safety of this mining work in the marine environment, with awareness and concerns on the part of the experts, the various associations involved and the public in general centring on this issue. This is particularly the case in the wake of the serious accident on British Petroleum's Deepwater Horizon in the Gulf of Mexico *(April 2010)*.
The matter of safety in fact remains one of the main problems to be tackled, and is a problem that comes hand in hand with another, that is the impact that these structures and their mining operations have on the marine environment. But there is another issue yet to be resolved, namely the final destination of these platforms once their mining days are over.
International and national legislation is very clear on this point, requiring that these platforms be dismantled and removed, an operation referred to as *'decommissioning'*, and that the area mined be restored to its previous natural state. This in rea-

lity is done infrequently, mainly on the basis of the astronomical costs involved *(for which reason legislation often provides exceptions).* It has in any event yet to be established whether the dismantling of structures of this type is in fact certain to result in the relevant area being completely restored: having undergone extensive alternation over a lengthy period of time, a whole new scenario is in place, with entirely new environmental balances. This particular aspect represents a real challenge from a scientific and technical point of view.

This proposal aims at finding an alternative solution, one that could be backed by specific domestic legislation and, if necessary, by specific moves on a European level, and which involves putting these decommissioned platforms to use for environmental purposes. Instead of being decommissioned, these rigs could instead be adapted to a variety of alternative roles in production work, business, science or education, or as a tourist attraction.

These technological islands could, for example, be adapted in order to:

- produce renewable energies such as wind power or photovoltaic energy, linked to the exploitation of wave energy;
- marine studies, research and experimentation centres;
- laboratories used for teaching purposes in relation to the understanding and sustainable use of marine resources;
- hotels and tourist accommodation that is completely self-sufficient in terms of energy requirements and food supply, and which can provide multiple services linked to the best possible use of marine resources.

A scheme along these lines would, of course, have to be drawn up in partnership with the companies that own the platforms and presented to the legislator and also to the public for consultation in terms of its symbolic and experimental value, with the ultimate aim of being to raise awareness where the culture of the sea is concerned. In addition, the scheme could well be drawn up as a practical example of a Euro-Mediterranean partnership. There is no doubt that a project of this type would have to be based on a painstaking analysis of the costs involved and of the overall advantages. Given the extremely high costs of decommissioning a platform, however, such a plan could represent an appropriate exit route, particularly for rig operators, who currently find themselves having to battle with an extremely difficult economic climate.

Finally, scientific experimentation is another possible alternative that a scheme such as this could encourage. The creation, on a decommissioned platform, of a prototype for the production of energy from renewable sources in a multiple and integrated system could provide useful indications in terms of whether it is economical (looking at how much energy can be produced by such a system) as well as from the point of view of scientific analysis and its applications (working out the positive changes that the application of such a system could cause).

Scientific experimentation could also reap unexpected positive results where the organization of self-sufficient hotels and tourist accommodation as mentioned above is concerned: it would involve identifying the most suitable technology for ensuring that a hotel offering high standards of service and customer care is totally self-sufficient (with this self-sufficiency also being based on tank farming, using water desalination methods with photovoltaic solar plants through nano membranes).

THE MEDITERRANEAN FOOD CULTURE TO STIMULATE SUSTAINABLE DEVELOPMENT.

Roberto RUSSO - FISPMED - Venice, President

Quality of life, and not just for humans, is directly dependant on the quality of the environment, air, water, earth and food.

Man's health can be defined not merely by the absence of disease or infirmity, but, more positively, as a general state of physical, mental and social well-being *(WHO)*. The processes giving rise to the effects of the environment on health are not simple and in a large number of cases still require clarification. Nevertheless, the quality of the environment is clearly seen by people as a determining factor in one's well-being. The Mediterranean diet is in fact a union of skills, knowledge, practices and traditions that stretch from the land to the table, involving farming, harvesting, fishing, conservation, processing, preparation and, in particular, the consumption of food.

This is a diet based on a nutritional model that has remained unchanged in time and in space; its principal ingredients have been handed down in their purest form, making up the fabric holding the civilizations around the Mediterranean basin together, affording full respect without fail for the beliefs and convictions held by each individual community.

The Mediterranean Diet *(the word 'diet' comes from the Greek word 'diaita', meaning lifestyle)* is much more than a mere reference to food. It encourages social interaction, given that meals eaten together as a group represent the cornerstone of social customs and celebrations. It has given rise to an extraordinary incredible body of knowledge which, if interpreted correctly, can bring about harmonious lifestyles that respect the surrounding environment.

The authenticity of agri-food products and their distribution are, most importantly, a social necessity, as well as being important for the economy. The land plays a central role, with the quality and authenticity of food running hand in hand with established tradition where farming and the raising of people and

local communities are concerned. And in this modern world, we graft groundbreaking scientific and technological developments onto the fruit of this age-old experience.

In this context it follows that we need to develop a culture of sustainable tourism: cultural, environmental and social resources are to be afforded due recognition for their potential to

attract tourism and are therefore to be protected, managed and enhanced, and protected from being exploited inappropriately.

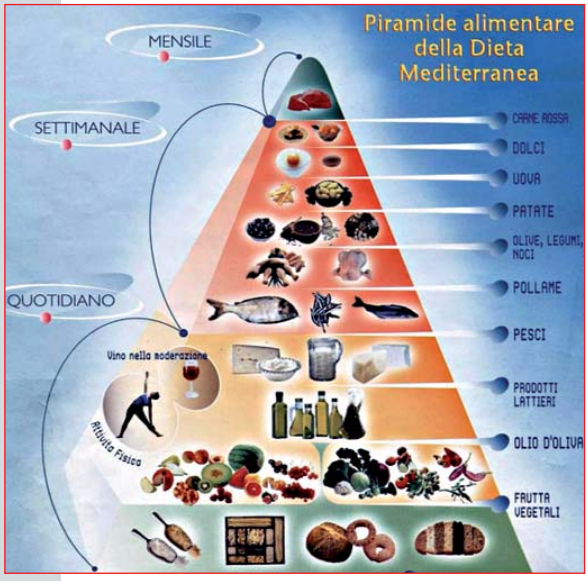
In a Euro-Mediterranean sphere, the Mediterranean diet and wine-and-food tourism are the two main points on which to focus in order to revive interest in and promote a heritage rich in traditions, habits and customs which have, since ancient times, influenced and affected the cultures of other peoples'. Against this backdrop, Italy can be described as the leader: the strong links that our country has with agricultural and food production mean that its roots are embedded deep in historical culture.

At a time when uniformity is becoming increasingly widespread and is eating away at diversity and wiping out local traditions and customs, it appears all the more important to have pockets of land and areas which, given their history and culture, their traditions and customs and the particular features of their environment, can be described as genuine *'foodscapes'*.

Food and wine that is special to a particular area will in some way have to take the form of much more than local produce that can be taken home or exported.

This is a tourist strategy that could aim at launching anew the network of ports, bringing the various regions of Italy in the central-south and the Mediterranean together to become one single tourist project, including food footpaths. In addition, the range of visitor attractions could be extended by reappraising the work done by craftsmen and the crafts steeped in time and tradition. An alternative idea is to re-evaluate environmental and cultural assets, possibly by making use of valuable buildings that have very often been decommissioned and sit in many ports along the Mediterranean Diet route: locations offering catering and refreshments could be set up, offering taster menus and sales points in the form of food boutiques or tasting halls where local produce is made.

The focal point of the scheme being suggested, and its pioneering feature, is in the food tours, designed around the local specialties on offer within the network and providing the visitor with the chance to discover how local produce can delight the palate with its traditional flavours. For a project on such a scale to succeed,



it is essential to raise awareness on the part of those local to the area, as well as the farming communities, of aspects such as the value represented by local produce, the fostering of strong links between food and the land, and the development of a tourist experience where visitors can experience first-hand the local way of choosing, cooking and eating good food.

THE MARINE NATURAL RESOURCES: LEGAL FRAMEWORK AND POSSIBLE PERSPECTIVES

Giuseppe GARZIA - University of Bologna

In the wide theme of the sea ecosystems, the natural marine resources legal system has showed a remarkable evolution - particularly at european policy level - since '80s *(law. n. 979 of 1982 "Disposizioni per la difesa del mare")*.

The aim of the law is to favour a sustainable management of the activities and natural/biological resources. More precisely, the regulations of the common european political of fisheries and the so - called directives *"habitat"* and *"wild birds"* are very important.

From a juridical point of view, the evolution of the legal system is significant because it has favoured the overcoming of the conception of sea as a *"res nullius"* through a progressive definition of it as a legal *"thing"* which must be protected in respect of the sustainable development principle.

In this context, with specific reference to the marine ecosystems, the most outstanding legal institute in the Italian national law *(but referable to the "command and control" european principle)* is the MPA *("marine protected area")*, which was introduced and disciplined first by the law n. 979 of 1982, later by the law. n. 394 of 1991 *("Legge quadro sulle aree naturali protette")* and finally by further specific laws.

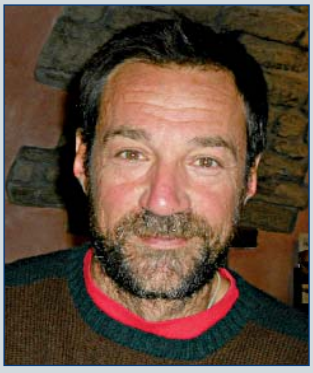
These ones, despite of the *"logic of emergency"* peculiar of the Italian environmental law, have contributed to set out the features of the institute, especially in order of the possible management forms.

Although MPA is an institute that undoubtedly has a central role *(in particular for the most complex marine ecosystems)*, considering the decrease of the public funds, the completing of the legal framework through the introduction of a more integrated public-private system and some marked-based institutes *(for example: ITQ, "habitat banking" and voluntary agreements)* could be important; indeed such institutes are - in theory - able to favour the economic *"valorization"* of the marine ecosystems by economical activities which are *"compatible"* with the full protection of the resources,

THE INVASION OF MEDITERRANEAN SHALLOW ROCKY REEFS BY THE INTRODUCED SEAWEED CAULERPA RACEMOSA

Fabio BULLERI - Dipartimento di Biologia, University of Pisa, CoNISMa, Italy

Biological invasions are among the most serious threats to biodiversity and ecosystem functioning. Assessing the mechanisms through which alien species can establish and spread outside of their native range and their impacts on native communities is, therefore, a priority for ecologists. In particular, it is important to determine whether an invasive species acts as a driver or a passenger of ecological change.



In the first case, it is the invasive species that cause a degradation of native habitats. In the second case, the alteration of natural habitats is due to other human activities, with exotic species taking advantage of these changes.

The green macroalga, *Caulerpa racemosa*, is one of the most invasive seaweeds in the Mediterranean Sea. I experimentally assessed whether this invasive alga should be viewed as a driver or a passenger of change in macroalgal assemblages on rocky reefs. If *C. racemosa* is a driver of change, native assemblages should recover following its removal.

To test if a lack of recovery after the removal of *C. racemosa* was due to the persistence of assemblages that developed in its presence, plots were cleared to bare rock and allowed to be re-colonised.

In pristine habitats, canopy removals and sediment additions were executed to assess if degradation of algal assemblages could influence the establishment and spread of *C. racemosa*. Neither the removal of *C. racemosa* nor clearing quadrats resulted in a considerable recovery of resident assemblages.

Conversely, the removal of macroalgal canopies enhanced the spread of this invader.

These results suggest that assessing whether an exotic species is to be viewed as a passenger or a driver of change could inform strategies for managing biological invasions and conserving marine biodiversity.

A specimen of Caulerpa racemosa

EMERGING CONTAMINANTS

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The Marine Strategy Framework Directive *(2008/56/EC)* is the essential component of future EU maritime policy, designed with the intent to give impetus to the development of all forms of marine resource management in agreement with the dictates of sustainability.

The Marine Strategy Framework Directive states that each Member State, in cooperation with other Member States and non EU countries, has to ensure the development of water management plans, following a detailed assessment of the state of the environment that includes the definition and objectives to pursue *"good ecological status"*, the articulation of goals and environmental monitoring programs. Referring to Annex 1 of the Directive, one of the elements of characterization of *"good environmental status (GES)"* provides that *"concentrations of contaminants shall be present at levels not giving rise to pollution effects."*

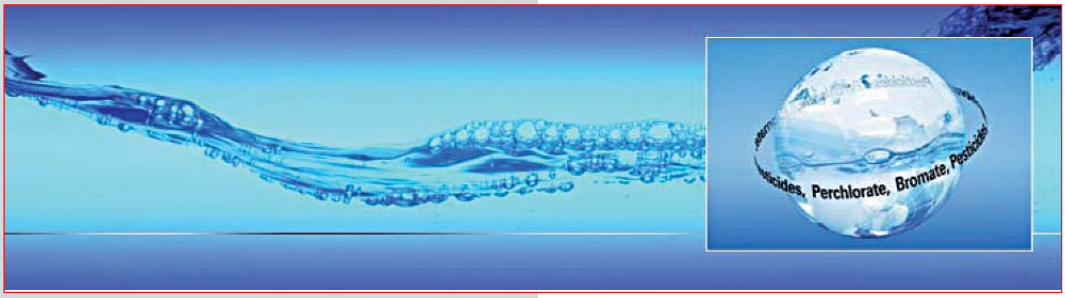
The directive is joined with the Convention for the protection of the marine and coastal Mediterranean *(Barcelona Convention)* which was adopted in 1976 and entered into force in 1978. To date, the program is going on for evaluation and control of marine pollution in the region Mediterranean *(MED POL)* and represents an element of the *"Mediterranean Action Plan"* launched in 1975, which includes the protocol for the protection of the Mediterranean Sea, which entered into force in June 2008. The protocol includes a list of compounds to which must be provided the action plans, programs and measures to control the effects of pollution.

The compounds identified are: organohalogen compounds, giving priority to pesticides, dioxins and furans, hexachlorobenzene, PCBs and organochlorine compounds, organotin compounds, PAHs, heavy metals and their compounds *(priority is given to mercury, cadmium, lead and their compounds)*, used lubricating oils, radioactive substances, biocides and their derivatives; pathogens, crude oil and petroleum hydrocarbons, cyanides and fluorides; detergents and surfactants, compounds that can cause eutrophication *(NP)*, waste, thermal waste, toxic substances unknown but potentially interferring with the oxygen content or which may adversely affect the physical or chemical properties of sea water.

Given the already substantial list and in front of more extensive investigations in the field of environment and health, through updated analytical techniques, there is need to expand the

investigation of emerging contaminants, as has often been found also in the JRC-European Commission report *"Marine strategy framework directive. TG8 - Contaminants and pollution effects "*

The term *"emerging contaminant"* is generically referred to any natural or synthetic substance or any microorganism that is not currently been monitored, which expresses the potential to cause adverse environmental effects, also suspicions towards environment, human and animal health. EUGRIS-portal for soil and water management in Europe, contains a list of some classes of human and veterinary pharmaceutical aids, products for hygiene and personal care and animal endocrine disruptors *(hormones and steroid products)*, surfactants and metabolites, igneous retardants, additives and industrial products derived from petroleum. Of particular interest are compounds of the first three classes, which are present more frequently, and in remarkable quantities, in which the wastewater treatment process does not guarantee, to date, the abatement of hazardous compounds whose fate is most likely the discharge on the sea.



LIMITATIONS TO THE MARITIME NAVIGATION IN PARTICULARLY SENSITIVE OR VULNERABLE AREAS

Greta TELLARINI - University of Bologna

Navigation, as other activities at sea, can have some limitations in marine protected areas, given the level of protection being assigned to these areas.

If the navigation, including recreational one, should be conducted within a marine protected area it is necessary to refer to the regulations established by the framework law on protected areas of December 6, 1991, n. 394 and that provided by the decrees and regulations governing the activities within these areas *(the so-called "disciplinari")*.

The approach taken by the Italian legislature to divide the marine protected area in different zones *(A - strict nature reserve;*

B - general reserve; C - partial reserve), which give different degrees of protection, involves the identification of prohibitions or limitations of navigation, with the consequent expectation of a sanctions regime different depending on whether the navigation is recreational or not recreational *(for other purposes)* belonging to a different category and subject to registration in the registers under Article 146 cod. nav.

The need to intervene more heavily, both at EU and national level, on the limits of navigation in marine protected areas or in particularly sensitive and vulnerable ones, to ensure the highest safety standards and more effective protection of the marine environment, has been moti- vated from the sinking of the Costa Concordia ship off the island of Giglio.

The expected adoption in a short time of a ministerial regulation whi- ch control the restriction or the banning of the transit of vessels for the protection of sensitive areas in the territorial sea, with special emphasis for specific highly vulnerable areas such as the Lagoon of Venice and the Sanctuary of Cetaceans, has its legal basis both in the international and domestic law:

a) the United Nations Convention on the Law of the Sea *(Montego Bay, 1982)* gives to the coastal States the authority to take measures within their territorial sea to protect the safety of navigation, conservation of marine biological resources, the protection of marine environment and prevention and control of the pollution of the sea and coastlines;

b) Law no. 51/2001, amending Article 83 cod. nav., gives authority to the Minister of Transport and Navigation to restrict or prohibit the transit and stopping of commercial ships in the territorial sea, for reasons of public security, safety of navigation and, in consultation with the Minister for Environment, for reasons of protection of the marine environment, determining the areas to which the prohibition extends.

Further limitations to maritime navigation in order to preserve and protect the marine environment and to prevent and repress marine pollution by ships are set by Law n. 61/2006, which establish zones of ecological protection, and by the recent regulation, which establish ecological protected areas of north-western Mediterranean, the Ligurian Sea and the Tyrrhenian Sea *(DPR Oct. 27, 2011, n. 209)*.

OFFSHORE ACTIVITIES AND POLLUTION RISK ASSESSMENT IN THE MARINE ENVIRONMENT

Guido PEVERIERI - Saipem S.p.A:

Despite the enthusiasm about finding alternative sources, petroleum and its derivatives are still the main fuel for global development.

For a long time, the search for new oilfields has turned to offshore areas which, considering the particular technological challenges involved and the potential impact on the marine and coastal environmental balance, takes on special significance *(consider the consequences of the sinking of the platform in the Gulf of Mexico or the wreck of the Costa Concordia)*. Given the situation, problems of marine pollution must also be addressed and dealt with scientifically in accordance with current directives and industry changes.

This address summarizes the methodology followed by Saipem SpA in assessing the possible risks associated with the leakage of contaminants in the marine environment before, during and on completion of offshore projects. The areas of investigation, which build one upon the other, are:

- **monitoring;**
- **hydrodynamic modelling and diffusion of pollutants;**
- **characterization of the marine and coastal environment;**
- **risk assessment.**

The goal of monitoring is to detect the presence of contaminants in the marine environment. Oily substances, surface mixtures of gas, oil and water, chemical compounds, and suspended solid particles *(turbidity)* can spread in the marine environment for several reasons: failure attributed to the structural weakness of subsea pipelines, collisions with sinking objects, anchorages, collisions or trenching and pipeline laying activities.

To monitor these types of events, we use various systems: ***1)*** real-time observation of vessel traffic *(VTMS – AIS systems)*, ***2)*** digital interferometry techniques from radar images for mapping spills on the sea surface and turbidity caused by digging on the seabed *(satellites with optical sensors or SAR)* and ***3)*** monitoring of the structural integrity of offshore pipelines by analysing the signal carried by optical fibres on the pipes *(OF)*.

The identification of correlations between the results obtained with these methods, which are significant in statistical terms, allows us to trace the locations and causes of spills from the evidence of the effects of such spills.
Once the monitoring has detected the location, form, quantity and time of the initial spill *(or even assumed if doing assessments and/or feasibility studies)*, we first use hydrodynamic modelling and then diffusion modelling to simulate the dynamics of the deformable continuous system represented by the pollutants in

the marine environment. By applying hydrodynamic modelling it is possible to estimate the behaviour of the tides and the direction and intensity of winds and currents, including currents in the water column.

The time series derived from such models occupy the vertices of 2D or 3D geographic grids with varying resolutions:
1) large scale for limited pipeline and/or offshore plant areas when we study sealine fields near the coast and
2) small scale when we study entire basins *(e.g., the Mediterranean Sea)* or relatively large portions of sea in order to analyze the risk from the presence of contaminants caused by vessel traffic.

Once we know the hydrodynamic conditions in a certain area of the sea, we continue to apply diffusion models to the contaminants in order to identify:

1) diffusion in the sediment in cases of leaks from a sealine buried under the seabed,

2) diffusion in the water column above when part of the loss rises to the surface and

3) diffusion of contaminants that appear on the surface caused by winds and surface currents.

Repeating diffusion modelling and monitoring allows us to predict/correct the behaviour of the contaminants which, depending on their chemical-physical composition, decay or dissolve in different ways in the marine environment *(weathering)*.
Then, in order to prepare all the necessary elements to assess the risk faced by the general

The Mariner Energy oil rig disaster
in the Gulf of Mexico, off the coast of Louisiana.

area of investigation, we continue with a characterization of the marine and coastal environment. Characterizing the environment means to assign scores to the potential targets of the contaminants.
The coasts and sea areas closest to them, due either to their own characteristics *(geo-morphology, exposure, vegetation)* or to the activities they host *(tourism, fisheries, civil and industrial facilities)*, are the areas most exposed to spills and therefore the most vulnerable. The scores assigned to these areas characterize, usually in a semi-quantitative form, the level of vulnerability.

Similarly to modelling, when assigning the scores we take into account the scale of investigation *(resolution of the data)*, which depends on the size of the offshore field being investigated.

For stretches of coast and sea areas, national environmental departments and agencies, supranational Commissions *(e.g., the Helsinky Commission)* and organizations like USGS, REMPEC, EMSA, NOAA and UNEP generally follow an approach that aims to develop and update appropriate geo databases from which to extract the values and which, when it comes to risk assessment, allows them to consider the vulnerability of targets.

For risk assessment, after completing the steps described thus far, we always refer to the equation in which the risk equals the product of the probability of an event times the damage it causes to a given target.

In the case of a sea or coastal area hit by contaminants, the risk is better expressed by the sum of the products of the probabilities of spills times the damage they cause to individual portions *(pixels)* of the area in question.

The equation becomes ***Risk = Σ (Probability x Damage)***, and the addends that appear in the sum lend themselves to easy interpretation through thematic representations of probability *(or frequency)* of risk or harm.

Useful insights are then obtained by crossing all the possible classes of frequency of events with all those matching the consequences: the result is the risk matrix.

IMPACTS OF DIFFERENT KINDS OF HARBOR POLLUTION OF THE CITY OF ROVINJ (CROATIA)

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Polychaetes are, considering their abundance, species richness and functional diversity, the most important macrobenthic group in soft bottom benthic communities and can be considered as representative group in describing their diversity and dynamics.

They are also proven to be very good indicators of natural and anthropogenic stress in benthic communities. The aim of this research was to estimate the impacts of different harbor pollution on benthic communities of the city of Rovinj *(northern Adriatic Sea, Croatia)* by accessing the composition and structure of polychaete assemblages. Samples were taken in two harbors subject to different kinds of pollution and compared to those taken on two control stations.

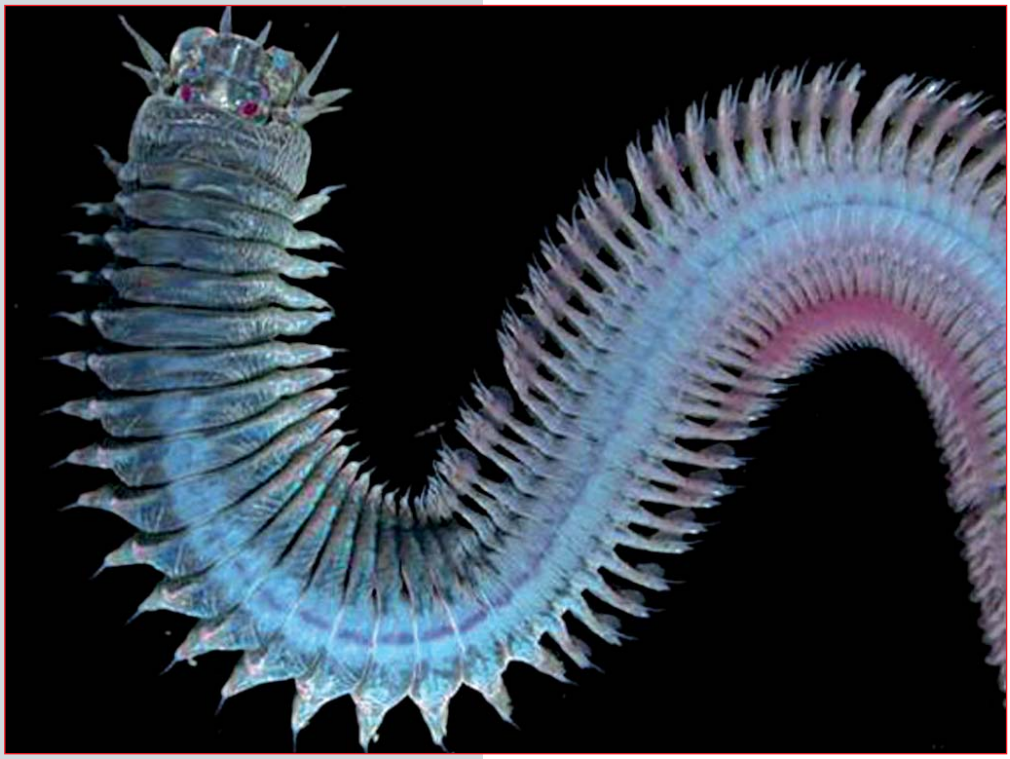
Harbor 1 is influenced by high organic load coming from the discard fish thrown from the commercial fisherman's boats as well as from the fish factory waste water discharge; harbor 2 is shal- low sheltered city harbor influenced by the pollution from hundreds of harbored recreational vessels and artisanal fisherman's boats. In each port three sampling stations were chosen, while two control stations were situated in the area not influenced by the harbor pollution.

At each station soft bottom samples were taken by Van-Veen grab *(0,1 m2)* in four replicates, sieved through 1 mm mesh size, fixed in 4% buffered formalin and after sorting preserved in 70% ethanol. Polychaetes were determined to the species level. Structure of polychaete assemblages was analyzed by multivariate techniques *(Primer, Plymouth)*. Altogether 162 polychaete species were found.

Diversity (number of species and Shannon-Wiener index), abundance *(number of individuals)* and Pielou's evenness index were the highest in the polychaete assemblages within the harbor 1 subject to fisheries waste discharge indicating favorable effects of organic enrichment on both diversity and abundance of polychaete fauna.

The lowest abundances and number of species were found within the harbor 2 indicating that this kind of harbor pollution might have negative impacts on the analyzed communities. Cluster analyses indicated higher similarity *(Bray-Curtis)* of the polychaete fauna from the control stations and harbor 1, while polychaete fauna from the harbor 2 seems to be more different from the other two. Observed differences might also be due to the granulometric composition of the sediment influencing polychaete assemblages.

SIMPER analyses indicated polychaete species



A specimen of Polychaeta (Annelida)

mostly characterizing different sites.

The species greatly characterizing both harbor sites but absent on the control ones is Capitella capitata, typical indicator of disturbed environment and organic enrichment.
Other polychaete species indicators of organic enrichment such as *Sigambra tentaculata*, *Polygordius triestinus*, *Paradoneis lyra* and *Cirrophorus furcatus* were also representative of harbor stations.

Our results indicated that harbor pollution on two investigated sites did not cause disastrous changes in the polychaete assemblages such as drastic drop of species diversity or abundance but it influenced assemblages' composition and structure favoring the development of *polychaete* fauna compound of many tolerant species typical for polluted environment.

REUSE OF WASTEWATER: A BIG OPPORTUNITY FOR AGRICULTURE AND MARINE PROTECTION

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How many times have we read or heard that there is no life without water? All the living organisms are *"water dependent"*. Photosynthesis with the conversion of light energy into chemical energy takes place only in the presence of water.

Water resources are the most valuable asset on Earth, more than the energy sources *(oil, gas, carbon)*. Too many areas of our planet suffer the lack or absence of water, and unfortunately they are increasing. In addition, the reduction in rainfall in some areas, the requirement of increasing amount of drinking waters of high quality, increases the competition between the different sectors for the use of available water resources.

Agriculture is the major user of water at least in Mediterranean climates and it is currently engaged in numerous acts of saving water.

The reuse of treated waters can represent an important factor to reduce consumption of deep waters. It is also a common practice in many countries since long time and it is diffusion is forecasted in increasing given by the growing need for water resources. This practice must be understood not as a simple second best solution, but as good agricultural practice because the so-called waters of *"poor quality"*, when evaluated with the parameters set for drinking water, are agronomically excellent and they fit into the bed of the reuse of natural resources.

At European Community level, the only legal reference, in absence of specific guidelines on the use of wastewater in agriculture, is given by the Directive 91/271/EEC that recalls the need to reuse wastewater whenever possible.

This concept, later taken up in the Directive 2000/60/EC which established a framework of actions for the water protection, was implemented in Italy with the Legislative Decree n. 152/2006.

The Emilia-Romagna, in turn, made it in his plan for water protection (PTA) with the insertion of standards and measures to promote water recycling and reuse of treated wastewater.

The Ministerial Decree (DM) n. 185/2003 *"Regulations on technical standards for wastewater reuse"* is intended to govern Italy in the reuse of wastewater treated in order to limit the taking of surface and groundwater, thus pro-

moting water conservation. Among the possible uses, the DM 185/2003 identifies the irrigation, fixing quality requirements and specifying the reuse procedures, paying particular attention to environment, avoiding alterations to ecosystems, soil and crops, and hygiene risks and health for the population. In addition, the reuse of wastewater must be done to ensure water savings within the Code of good agricultural practice.

It is understood that should be excluded the hygienic-sanitary, environmental, technological, economic and logistical problems associated with the reuse of treated wastewater for irrigation. However, in Italy having focused almost exclusively on the potential risk of introducing diseases, has led to the reuse of wastewater treated for irrigation are major obstacles. In fact the current Italian legislation is too restrictive, especially for parameters sanitation, and because focusing on security aspects of the environment have neglected the economic ones. Moreover, the reuse of wastewater in agriculture would the recovery of the nutrients, nitrogen first off all, avoiding the costly treatment of denitrification.

The recovery of potassium and phosphorus, whose reserves are in alarming decline, as well as other items, are additional factors that should promote the destination of wastewater in agriculture.

The scientific and technical literature published as result of experiments carried out with a wide range of crops in different soil and climatic conditions, leave no doubts about the goodness of this choice. Choice that should be allowed for irrigation *(fertigation)* of all crops with the exception of those vegetables for fresh consumption just for sanitary reasons.

What advantages might have the sea from this strategy?

Enormous benefits, especially for really shallow water. The waters, even the best softener, spilled into surface water bodies undergo direct the sea, are enormously rich in nutrients that will cause inevitably hypertrophic phenomena. The algal bloom in the summer is a direct consequence. Therefore, limit or better yet preclude the arrival of treated wastewater into the sea during the summer months should not be random, but an intended act.

In some publications written by the authors at the end of the '90s, has been shown that the waters of the Marecchia river (RN) were able to dilute the strong output by the excellent wastewater treatment plant of the city of Rimini and they had an important role of the particulate in the adsorption of phosphates of treated water. The Region Emilia-Romagna itself in the late '80s encouraged for ***"the recovery of the principles contained in fertilizers, municipal wastewater, reducing the contribution of these nutrients to surface water bodies and reduction of microbiological water courses with its advantages for bathing "****(Idroser, 1989, Reuse of municipal wastewater irrigation - Design Study for the implementation of operations in Romagna)*.

In conclusion, using properly treated wastewater and irrigation methods that avoid direct contact with the products or operators, the safe use of purified waste water in agriculture is a practice not only possible, but we have to encourage for human and animal health and for of our sea.

PORTS AND CITIES: CONFLICT OR SYNERGY?

Waterfronts, environmental regeneration and cultural projects: communication in port cities

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Our peninsula has eight thousand kilometres of coastline and nearly one hundred and fifty ports. Our main Italian cities face the sea, capitals of maritime regions that enjoyed culture and wealth thanks to trade.

In some cities, the port is considered a resource, while in others the port isn't considered at all. In other cities, the port is seen as an annoyance, the cause of road congestion and pollution, something that blocks access to the sea. What, then, is the relationship between port and city? How can their physical and ideal boundaries be overcome? How can piers be turned into launch pads of opportunity for an entire community?

It's only been in recent years that we have recognized the need for a cohesive and homogeneous environment - the maritime cluster - that encompasses a supply chain, or a set of both public and private entities whose usefulness and efficiency directly influence the port's compe- titiveness.

The idea of green ports has also been noted: port areas in which good environmental practices are applied, both for the preservation of the *"sea as an asset"* and the prevention of noise or air pollution in the cities. Cold ironing, the use of renewable energy sources, the reclaiming of monuments, the renovation of port areas meant for tourism and cruise liners and the new environmental regulations issued by the Port Authority are changing ports into locations where environment, quality and security go hand in hand.

The role of the Port Authorities

Supporting this new port culture are the Port Authorities to which Law n. 84/94 assigns the task of promotion aimed at increasing traffic, including tourism traffic and fostering relationships with the region. In 2012 cruise passengers alone will exceed two and a half million in Civitavecchia, two million in Venice, a million and a half in Naples and around one million in Livorno, Genoa and Savona. The search for new routes leads cruise ships into ports that, until recently, were engaged in other activities: La Spezia, Bari, Brindisi, Portoferraio, Olbia, Cagliari and the ports of beautiful Sicily.

Indeed, Italy, cradle of civilization and accessible from every angle, offers itself to tourists who arrive by sea.

The enhancement of artistic and cultural heritage, communication in its various forms, participation in trade fairs, production of promotional materials, events, educatio- nal activities, museum tours, recreational opportunities and cultural and social activities, sponsored and promoted by the Italian Port Authorities and other institutions serve as ways to open port areas to the public, citizens and young people and as opportunities for the cities, promoting

them as tourist destinations rather than just places for the transit of goods and people and as places to live, respecting the coastal and marine environment.

Some best practices: Genoa, La Spezia, Livorno, Trieste, Civitavecchia

Genoa, Italy's most important port, has been a pioneer in its redevelopment of the *Old Port* and its many attractions, especially the *Aquarium*, an excellent example of the defence of the marine ecosystem. The city staked everything on maritime culture, on the sea as an asset and on its traditions in order to develop the port it is today with its terminals, latest technologies and activities.

The *Galata Museo del Mare* is Liguria's leading museum in terms of attendance and multimedia exhibits and is eighth in Italy in popularity. The Genoa Port Centre, nicknamed the *"Terminal of Knowledge"*, opened its doors to thousands of visitors to show, using the latest multimedia tools, how a port works through original, engaging and interactive display techniques: from navigation simulators and live radio broadcasts to control towers to the large digital screens that use images to show the arrival and departure of ships.

La Spezia is another port city that is renovating the quality of urban life through port, civil and military activities, thanks to the Waterfront project designed by Valencia architect Jose Maria Llavador. The project will be the dream and the *"sign"* of a city that is more modern and more alive, vital and liveable, a city that is changing by raising its profile as a tourist town and offering green areas, new docks and new accommodation options.

Even if you can't always see it, the port in **Livorno** is there, entering the city through its canals, which the locals call *"ditches"*.

For the last three years the *"Open Port Open Doors"* project has allowed many Tuscan students, from nursery school to high school, to get to know the port city. The museum-laboratory, currently in the design phase, will be housed in the former port warehouses with the aim of maintaining the memory of the work done by generations of Livorno's inhabitants - enclosed in a place full of symbols - and on the financial, environmental and social impact of that work, developing the tangible value of port structures and processes and the intangible value of organizational, technical and professional knowledge, without losing sight of the environment.

Other initiatives have been undertaken to enhance the *"port as an asset"*, including the *Port Museum Centre* in **Trieste** which includes the recovery of two masterpieces of industrial archaeology unique to Europe, the Electrical Substation and the Hydrodynamic Centre, which powered 170 plants between 1920 and 1930.

Civitavecchia has become an open air museum thanks to redevelopment works on the waterfront and with the magnificent ruins of the port of Trajan and the Renaissance Fort. Inside Forte Michelangelo the Coast Guard has set up a library and museum to highlight the unrecognized work of thousands of people whose most important duties are the preservation of the sea and the protection of our coasts.

Green ports

Ports act as gates to vast regions and growth boosters for the local and national economy. Besides their commercial and industrial activities, ports assume a major importance also in the realm of touristic-nautical activities and activities related to the use of maritime resources, such as fisheries. The growing environmental awareness typical of evolved social systems has led, even in the world of ports, to a focus on environmental protection combined with economic

growth. The subsequent expansion of infrastructure and road and rail connections have rendered the Italian transportation system competitive and in step with European plans, meaning the awareness is not just about mere preservation, but also about the sustainable development of the *"sea factories"*.

It's important that logistical and economic development and the growing use of the sea as a means of communication and transportation, especially of products with a high pollutant potential, are accompanied by the protection of port areas from various sources of pollution and by the minimization of the environmental impact of port infrastructure on the surrounding area.

The need to combine and balance environmental protection with the need for constant adaptation and development of ports as an economic reality, in conjunction with the logistics of sustainable development, was already established at the 1992 United Nations Conference on Environment and Development, which stated that *"Port management must be involved in sustainable development models"*. Great strides have been made since then.

How much of an impact a port has varies depending on many factors: the size of the port, the volume of traffic, its functional characteristics *(passenger port, fishing port, container port, oil or industrial port, or multifunctional port, etc.)*.

A simplistic approach might lead one to say that the greater the traffic of a port, the greater the air pollution, noise pollution, waste production and so on. But only a detailed analysis of the type of goods handled is useful to understand a port's activities and the related problems.

A port with high solid bulk traffic could have problems related to the dispersion of dust into the atmosphere, which would therefore affect air quality, while a port with high traffic of petroleum products or bulk liquids in general could have problems with accidental spills into the sea, which would therefore affect water quality.
The use of the conditional *"could"* is a must because the quantitative data alone does not account for other significant factors like the geography of the particular place *(winds, currents, etc.)*, the equipment used, the level of specialization of the operators, the technical characteristics of the vessels, the services offered by the port and so on.

These are all subjects that will be discussed extensively during this ***Sea Conference***, which brings together leading experts on a topic that unites people around the world: that of preserving our most valuable asset: the sea.

Genoa: the old port