**GENERAL FISHERIES COMMISSION
FOR THE MEDITERRANEAN
COMMISSION GÉNÉRALE DES PÊCHES
POUR LA MÉDITERRANÉE**

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GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN

Sub-Committee on Marine Environment and Ecosystem (SCMEE)

Workshop on

Algal and Jellyfish Blooms in the Mediterranean and Black Sea (6th/8th October 2010, Istanbul, Turkey)

LIST OF DOCUMENTS & ABSTRACTS*

**As received by the GFCM Secretariat*

MAREM (Marmara Environmental Monitoring) Project

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The project "Changing Oceanographic Conditions of the Sea Of Marmara" MAREM (Marmara Environmental Monitoring) is the longest monitoring project that ever been done for any of the seas. Since 1954 till now, at the Sea of Marmara and the Turkish straits, horizontally at 50 stations, there were about 25 parameters have been observed at the convenient depth cutaways (0.5m.-1200m.). Firstly in 1980, taking the Sea of Marmara into consideration, all the studies about the sea were wished to be put together to have a data base by İlham Artüz. O. Bülent Artüz has developed his applications on system programming and project management software for years also has developed an environment which can be tested and used for this project and he also has developed a project management environment for this kind of researches and also has given an opportunity to use this management and reporting system over internet, for the ones who can freely sign up and use. Researchers can use this database to display their own data through internet, using this system, graphically and positioning on maps. Explorers, can easily enter and seize their data to system and share with other researchers with maximum security, and also distribute their work through internet on this systems web page, if they want and after the latest updates, the system is not only prepared for storing physical data but also for the classification of living matters and measurement results, to store their photos and mass measurements in a new database. So they can use, to watch and calculate the evolution of the environment in years, for the main purpose of this process.

Excessive growth of *Cladophora sp.* in the Southwestern Istanbul Coast (Marmara Sea)

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Over population, pollution, deforestation and natural disasters are among the major problems faced by the world today. Istanbul, which is Turkey's largest metropolitan city with a population of over 12 million, tries to solve its encountered environmental problems such as severe coastal erosion, shoreline recession and over pollution which it has been exposed to primarily in the last 20 years as a result of the coastal response to human activities. The global increase in temperature negatively affects the life in water systems day by day. In recent years, the temperature has been above normal seasonal levels and has started to show its effects in sea water systems too. In July 2010, the excessive growth of *Cladophora* sp. in the southwestern shoreline of Istanbul, which carries great importance for tourism, has drawn major attention. The aim of this study was to investigate the excessive growth of *Cladophora* sp. and ecological parameters of surface waters in the southwestern coast of Istanbul in July 2010. The genus *Cladophora* is cosmopolitan in temperature and tropical in regions like freshwater, brackish and marine habitats. Its metabolism and morphology are related to hydrodynamic conditions. During the period this species multiplied, a mucilage like environment was formed. Due to the lack of available evidence prior to the sampling, it is possible that the excessive mucilage formation may have been trigged by *Cladophora* sp. *Cladophora* samples were collected on different sampling dates in July 2010. On these sampling days, the temperature, salinity and dissolved oxygen levels of the seawater ranged between 26.6-28°C, 14-33 ppt, and 8.2-9.7 mg L^{-1}, respectively. Nitrate+nitrite-N (0.21-0.26 µg-at L^{-1}), ammonium-N (0.43-0.94 µg-at L^{-1}), Phosphate-P (0.53-3.50 µg-at L^{-1}) and Silicate-Si (9.6-15.3 µg-at L^{-1}) concentrations were measured.

Gelatinous macrozooplankton composition and seasonal distribution in Sinop peninsula of the central Black Sea of Turkey between 2002 and 2006*

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Seasonal distribution, biomass and abundance of *Aurelia aurita*, *Pleurobrachia pileus, Mnemiopsis leidyi* and *Beroe ovata* at the central southern Black Sea (Sinop Peninsula) were studied using vertical tows from stations at biweekly or monthly intervals between January 2002 and November 2006. In study period, the most abundant and biomass of gelatinous macrozooplankton were obtained 120 n.m^{-2} on May 2005 and 1073.5 g.m^{-2} on March 2003, respectively. The maximum abundance values of gelatinous macrozooplankton were determined 42.5 n.m^{-2} on September 2002, 91.25 n.m^{-2} on July 2003, 108.33 n.m^{-2} on July 2004 and 95 n.m^{-2} on May 2006. High biomass values were achieved 230 g.m^{-2} on May 2002, 111.3 g.m^{-2} on March 2004, 447.75 g.m^{-2} on May 2005 and 393.33 g.m^{-2} on July 2006, respectively. Minimum abundance and biomass of macrozooplankton amounts were found in winter sampling periods in all years. In terms of annual abundance, *A. aurita* was the dominant group in 2002, whereas *P. pileus* was the highest abundance group in 2004, 2005 and 2006. Moreover, *B. ovata* was found very low density, except 2002. Percentage of *M. leidyi* was showed decreasing from 2002 to 2006.

* *poster*

HABs incidents and monitoring efforts in Izmir Bay, Turkey

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The first red-tide and mass fish mortalities had been reported in 1950's by Numann (1955) in a harbour region, which is the innermost part of Izmir Bay (Aegean Coast). However, the first record on toxic phytoplankton species was *Alexandrium minutum*, which had been reported in 1983 by Koray (1983) during a red-tide (8 millions celles/l). In 1990's, the pace of research efforts on phytoplankton, and hence, on red-tides, have gradually increased. The ministry of Agriculture and Rural Affairs (MARA) through its responsible authorities, i.e., General Directorate of Conservation and Control, has started an action plan on monitoring HABs. But, the monitoring was restricted with the shellfish production grounds. This includes both collecting and rearing grounds, which comprise the coasts of Northern Aegean Sea, Turkish Straits systems (Dardanelles, the Sea of Marmara and Bosphorus) and the Western Black Sea. This figures out that the considerable incompleteness of the inventory is very likely. A concrete example displaying this incompleteness is the results obtained in one of our research project carried out in Izmir Bay where the phytoplankton is most extensively studied in comparison with the other coastal areas of Turkey. In the research project, the samples could be collected with relatively finer time resolution, i.e., weeks or days. The result was astonishing, because, we could identify almost 40 new records of phytoplankton species in relatively well studied area, Izmir Bay. Such a high number of new records is a reliable evident that the number of species can significantly increase as the sampling efforts are refined in time and space scales. During the period of the research project, the occurrence of some toxic species coincided with a massive fish mortality event after the spring bloom (Bizsel and Bizsel, 2002). When the event of fish mass mortality was observed on April 21,1998, the abundance of *Alexandrium minutum* was high with a maximum value of $4x10^5$ cells/l. If we look slightly in more detail, there were also some discrete cases. For example, some findings from an aquaculture site and another site affected by a chicken farm showed the occurrences of toxic Dinophysis species and the toxic *Prorocentrum lima*, respectively. The latter could not be found and identified throughout the bay during our studies. When we review the literature on causative organisms of red-tide in Izmir Bay in 1983, 1994 and 1998; *Noctiluca scintillans, Prorocentrum micans, Scrippsiella trochoidea,* Thalassiosira, Protoperidinium, Ceratium species were observed generally in each three years, *Alexandrium minutum and Eutreptiella gymnastica* species in 1983 and 1998, *Dinophysis rotundata*, Cryptophyceae, *Ebria tripartita*, Gymnodinium, Katodinium, Heterocapsa, Heterosigma, *Nitzschia longisima* species only once in 1998, *Eutreptiella gymnastica* in May 1999, *Prorocentrum micans* in May 2001, *Scrippsiella spinifera, Gonyaulax sp., Prorocentrum sp.* in the brown tide in August 2006 and finally reddish tide has been observed through the coast line of Izmir bay in August-September 2010 caused by Cyanophycea, *Cylindrotheca closterium, Prorocentrum micans* and *Eutreptiella sp*. The reasons, that make sampling efforts uncoordinated, discontinuous, limited and scattered in space and time, are the chronical insufficiencies in infrastructures and shortages in finance and human resources. There are significant on-going and completed progresses in solving these insufficiencies and shortages. The infrastructure requirements have been updated and upgraded. There are challenges to improve coordination of efforts county wise.However, the drawbacks such as limited experience in data collection, storage and processing, restricted international communications (particularly in institutional basis), have been slowered down the above mentioned progresses and their efficiency. The network a firm and efficient base for the targeted objectives focusing on public health, economics, and social problems that have been faced in Mediterranean coasts. And, its achievements dictate us to improve it in terms of comprehensiveness and promptness so that it will be an efficient tool enabling us to control HABs events and to mitigate the relevant adverse consequences.

Two years of CIESM Jellywatch Project in Italian waters

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The CIESM Jelly Watch Program was set up to gather for the first time baseline data on the frequency and extent of jellyfish outbreaks across the Mediterranean Sea. In summer 2009, we initiated JellyWatch by launching a pilot, citizen-based study in Italian waters. A poster was broadly diffused to draw the attention of coastal users (fishermen, divers, tourists) but also ferry passengers, asking for their report of sightings of jellyfish swarms. The poster presents true-to-life drawings that illustrate the most common species of jellyfish found in the Mediterranean, along with a list of basic questions (formulated for the non-specialist observer) on the location, type and extension of the observed swarms. The poster was successfully tested: records were sent by email to key scientists who acted as focal points in different regions. The media were heavily involved in the campaign, from televisions, newspapers, magazines, to internet websites. The massive presence of jellyfish during 2009 - when Israel was added to the pilot phase with equal success (lead: Dr Bella Galil) - enhanced the value of the initiative, and hundreds of records, documented by photographs, have been received. The campaign continued in 2010 with the aid of the science magazine *Focus* that published the poster and opened a web page where medusa occurrence was shown on a daily basis. Medusa blooms have been documented as never before. Now the Jellywatch project is currently implemented in coastal sectors in France, Greece, Israel, Italy, Monaco and Turkey and will be further expanded to northeast Adriatic, Egyptian, Maltese, Syrian waters.

Jellyfish of Egyptian Mediterranean Waters*

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Jellyfish (also known as jellies or sea jellies) are free-swimming members of the phylum Cnidaria. Jellyfish have several different morphologies that represent several different cnidarian classes including the Scyphozoa (over 200 species), Cubozoa (about 20 species). Jellyfish are found from the surface to the deep sea. Many of the best-known jellyfish, such as Aurelia, are scyphomedusae. These are the large, often colorful, jellyfish that are common in coastal zones worldwide. A group of jellyfish is sometimes called a bloom or a swarm. "Bloom" is usually used for a large group of jellyfish that gather in a small area, but may also have a time component, referring to seasonal increases, or numbers beyond what was expected. Jellyfish are "bloomy" by nature of their life cycles, being produced by their benthic polyps usually in the spring when sunshine and plankton increase, so they appear rather suddenly and often in large numbers. The presence of Jellyfish blooms is usually seasonal, responding to prey availability and increasing with temperature and sunshine. Bloom formation is a complex process that depends on sea currents, nutrients, temperature, predation, and oxygen concentrations. Jellyfish are better able to survive in oxygen-poor water than competitors. Rising sea temperatures caused by climate change may also contribute to jellyfish blooms, because many species of jellyfish are better able to survive in warmer waters. Jellyfish blooms cause problems for mankind. The most obvious are human stings (sometimes deadly) and tourism declines on coasts. The following species are recorded in the Egyptian Mediterranean Waters: *Pelagia noctiluca, Aurelia aurita, Rhizostoma pulmo, Rhopilema nomadica; Nausuthöe punctata, Discomedusa lobata.*

* *document*

Fifteen year of jellyfish blooms in Spanish waters (1996-2010)

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During the last 15 years massive proliferations of gelatinous zooplankton was happened. *Cotylorhiza tuberculata* and *Rhizostoma pulmo,* two species of the adjacent Mediterranean Sea colonized the Mar Menor, a coastal lagoon (Murcia, SE of Spain), and completed his biological cycles inside it. The coastal lagoon is a very important area for tourism and the proliferations of this species of jellyfish force to the local goverment to invest about a million of Euros per year to reduce this economic impact. The especial conditions of closed area of the coastal lagoon, and the nearest Centro Oceanografico de Murcia are two decisive factors that help to the research with this species and this ecosystem during these 15 years. Thanks to the mesocosms experiments we can reproduce completely the biological cycles and we can find all the stages in the lagoon (even the polips) Also, it was very important the system of census that we are developed for this area, and nowadays is a tool of high accuracy. In the presentation we show how is the problem in other places of Spanish waters too. In the last 5 years something are changed. The proliferations are more frequents and some aliens species begin to cause problems by her dangerous stings than *Physalia physalis* and *Caribdea marsupialis.*

The price of change: jellyfish outbreaks along the Mediterranean coast of Israel

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Some recent changes in biodiversity patterns in the Mediterranean littoral may be linked to direct drivers such as climate change and invasive species. The invasive alien jellyfish along the Mediterranean coast of Israel are reviewed and their impact the already teetering fisheries, coastal installations, and tourism discussed. The Erythrean invasion swept ashore the scyphozoan jellyfish, *Rhopilema nomadica* Galil, 1990. Each summer since the mid 1980s huge swarms of the Erythrean jellyfish have appeared along the Levantine coast. These planktotrophic swarms, some stretching 100 km long, must play havoc with the limited resources of this oligotrophic sea, and when the shoals draw nearer shore, they adversely affect tourism, fisheries and coastal installations. As early as the summer of 1987 severe jellyfish envenomations requiring hospitalization had been reported in the medical literature. The annual swarming brings each year reports of envenomation victims suffering burning sensation, eurythema, papulovesicular and urticaria-like eruptions that may last weeks and even months after the event. Local municipalities report a decrease in holiday makers frequenting the beaches because of the public's concern over the painful stings inflicted by the jellyfish. The local newspapers and TV news report during the summer months the presence of jellyfish along the beaches. Coastal trawling and purse-seine fishing are disrupted for the duration of the swarming due to net clogging and inability to sort yield -it is not uncommon that fishermen, especially purse seines, discard entire hauls due to the overwhelming presence of poisonous medusae in their nets. Jellyfish-blocked water intake pipes pose a threat to cooling systems of port-bound vessels, coastal power plants and desalination plants.

Phytoplankton blooming in Gabes Gulf (Tunisia): twenty years of monitoring

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During the past two decades, the phenomena of coloured water generated by phytoplankton are growing both in frequency and by their intensity in some coasts of Gabes gulf (Tunisia). In this work, following a retrospective study of the database collected during twenty years of observations, we investigated the phenomena of blooms likely to emerge from temporal and spatial patterns in the pairing of these episodes and correlate these appearances with the variability of abiotic conditions, mainly represented by temperature, salinity and pH. The results show that the summer is a specific period of blooms of cyanobacteria *Trichodesmium erytreum*. The period from August to January, with peaks in September and January, seems to be favourable to dinoflagellates blooming that are responsible of 89% records. The species *Karenia selliformis* representing 64% of the occurrences. *K. selliformis* fluctuates independently of years and months, but it shows a specific requirement for salinity (higher than 42 g/l). This parameter can be used as a marker to predict the appearance of *K. selliformis* in the Gulf of Gabes. The others phytoplankton species do not have any specific requirements for the studied abiotic variables.

Red tide occurrence in Alexandria (Egypt). A review

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Studies over the past two decades in Alexandria waters (Egypt) offered persuasive evidence for the increased events of harmless/harmful phytoplankton blooms (e.g. Mikhail, 2003a; Labib 2009). *Alexandrium minutum* was the most common red tide species in the Eastern Harbour of Alexandria (Egypt) between its first observation in 1958 (Halim, 1960) and its last massive bloom in October 1994 (Labib and Halim, 1995). The species was replaced by several other harmless/harmful species forming blooms from late spring to early autumn (Labib, 1996 &1998; Labib and Mikhail, 1999; Mikhail, 2003 a & b; Mikhail *et al*., 2005). *A. minutum* blooms appears to have gradually died out from its type locality. Fish and invertebrate mortality accompanied the harmful algal blooms in the harbour during several intermittent periods, more intensive in July-August 2004 and 2005. *Gymnodinium catenatum*, *Alexandrium ostenfeldii*; and *Karenia mikimotoi*, *Chattonella antiqua* and *Prorocentrum minimum* were the causative red tide species. Mex Bay, west of Alexandria is another area of red tide occurrence in Alexandria. Information available (e.g., Labib 1997 & 2000; Mikhail, 1997; 2003a, 2005) strongly suggests the relative importance of nutrient concentrations in the enhancement of its primary production; the bay is a site of intensive phytoplankton blooms, causing recurrent water discoloration from late spring to early autumn, and occasional events of limited invertebrate and fish mortality. Phytoplankton production was characterized by a massive bloom of diatoms-chlorophytes in late spring and of diatoms-phytoflagellates-chlorophytes during summer-early autumn. The physical and phytoplankton dynamics are strongly influenced by the runoff of freshwater from land and the exchange of water with the adjacent open sea. To understand the real situation about what is going on occurrence, invasion and migration of red tide species in Alexandria waters, the previous studies represent attempts to answer some basic questions:

1. What are the newly recorded invading species into Alexandria waters during the last two decades? What is about the reverse?
2. Why some of these invading species can achieve massive blooms in Alexandria waters? Is there any relation with the progressive eutrophication?
3. Are the frequency and intensity of such blooms going on rise? If so, what is/are the explanation/s of such distinct increase?

4. To what extent newly recorded invading species could be harmful, particularly their biological pollution impacts?
5. What are the expected forming red tide species in Alexandria waters?
6. Processes must be taken in Alexandria?

List of harmful phytoplankton species in Alexandria waters during the last two decade

Alexandrium catenella (PSP)

Alexandrium minutum (PSP, Massive Fish and inv. Mortality)

Alexandrium ostenfeldii (PSP, lower rank)

Chattonella antiqua (Non-toxic to humans, but harmful to fish and invertebrates, 3 Fish killing blooms)

Dinophysis accuminata (DSP)

Gymnodinium catenatum (PSP, Fish Mortality)

Gymnodinium mikimotoi((Non-toxic to humans, but harmful to fish and invertebrates, Massive Fish Mortality)

Heterocapsa circularisquama (Toxic)

Prorocentrum minimum (Toxic)

P. triestinum (common, non toxic)

Pseudonitzschia australis (Toxic)

Skeletonema costatum (Non-toxic, Harmful)

Heterosigma sp. (Recently recorded)

Jellyfish bloom in the Lebanese seawaters: is it a sequence of the "Tropicalization" of the Levantine Basin?

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Among six species of Scyphomedusae present in the Lebanese coastal waters, *Rhizostoma pulmo* and *Rhopilema nomadica* are the most important. This latter is a recent migrant from the Red Sea into the Levantine basin where it appeared in the plankton community during the seventies and overcame later *R. pulmo* in importance and abundance. The stinging and venomous *R. nomadica* became invader in early nineties, showing pronounced multi-annual fluctuations and clear seasonal variations. The released "ephyrules" larvae became young individuals starting to appear by mid-June when seawater temperature rise suddenly to 24-25˚C, reaching a bloom in early July, coinciding with a high phytoplankton standing crop followed with heavy zooplankton abundance community. Heavy populations with high density (1-5/m^{-2}) generate fearing to the tourist swimmers and creating damage in the nets of fishermen; lasting during July and August to disappear completely afterwards. During a long-term survey (1970-2008) on Scyphomedusae, we conclude that the bloom of *R.nomadica* occurring between mid-June and mid-August is not regular every year with regard to the density of the aggregations. It is related to hydrological factors, especially the rise of temperature during early spring and summer and ecological and trophic factors such as the phytoplankton bloom and the abundance of zooplankton. It was clear that the changes in the hydrology of the Levantine Basin due to the increase of seawater temperature and salinity (ΔT= 0.40˚C, S~0.35‰) following the functioning of Aswan High Dam, has induced ecological changes in the whole ecosystem, enhancing biological invasion of Indo-Pacific species. On the other hand, certain "Tropicalization" of the Levantine Basin due to Global warming and Climate change, may also enhance the migration process from the Red sea into the Mediterranean and the occurring of the jellyfish bloom.

Natural eutrophication inducing phytoplankton bloom along Lebanese coastal water (Levantine Basin).

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The Levantine Basin, including the lebanese seawater are highly oligotrophic water body, showing the highest seawater temperature and salinity in the entire Mediterranean. Algal bloom is regularly observed during spring along the coast of Lebanon. Uncontrolled eutrophication of coastal water can lead to undesirable consequences such as algal blooms, appearance of toxic algae, overgrowth, hypoxia, anoxia, fish killing, transformation of sediments, disappearance of macrophytes etc. Enriched nutrients of river, water runoff and liquid urban wastes are the main factors of eutrophication inducing algal bloom. This phenomenon is observed usually in April-May coinciding with maximum freshwater input, corresponding to increased surface temperature and stratification of water layers. Reduced water transparency is noticed during algal bloom, accompainied with discolored coastal seawater leading to phytoplankton bloom and sometimes to the « red tide ». Few species dominate the whole community such as: *Skeletonema costatum, Pseudo-nitzschia pungens, P.fraudulenta, P.delicatissima, Leptocylindrus danicus* and *Chaetoceros spp*. Few dinoflagellates contribute also to the bloom namely *Prorocentrum micans, P.schilleri, Ceratium furca and Dinophysis spp*. Potentially toxic microalgae are noticed in phytoplankton especially during algal bloom Among those we mention :*Pseudo-nitzschia pungens, P.closterium, P.fraudulenta, P.delicatissima* producing ASP« Amnesic shellfish poisoning » ; while toxic dinophyceaa secrete diarrhoetic toxic substances (DSP) Other toxic microalgae like *Gonyaulax polyedra, Gymnodinium sp.*,*Gyrodinium contortum* and *Alexandrium minutum* produce hemolytic hydrosoluble toxines such as Paralytic Shellfish Poisoning (PSP group) .However no cases of intoxication were reported during the period of survey 1990-2008, since the density of toxic species in the sea is very low. Furthermore, consumption of wild mussels, and other bivalves oysters is not very common within local population, and no conchyloculture parks are practiced in Lebanon.

Natural and anthropogenic impact on North Sea gelatinous zooplankton population dynamics: implications for ecosystem structure and functioning

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Gelatinous zooplankton taxa are a diverse group of ctenophores, cnidarians and pelagic tunicates. Most of these animals exhibit brisk population dynamics and opportunistic lifestyles. Sudden outbreaks of gelatinous zooplankters occur regularly in most coastal, estuarine and open-ocean ecosystems worldwide. There is mounting evidence that in recent decades the impact of these outbreaks has been increasing causing serious plagues, invasions, and episodes of various socioeconomic setbacks to fisheries, aquaculture, coastal industries and tourism. Chronic eutrophication, climate change and overfishing are hypothesised to have created a situation in which soft-bodied zooplankton species may proliferate better or even conquer a dominant role in the ecosystem by significantly outcompeting other species and organisms. The dramatic increase in numbers of certain gelatinous zooplankters may prove to be a good indicator of the quality of our seas. The more of them we find, the stronger the signal that something in our seas is changing. According to leading scientists, gelatinous zooplankton abundance and composition in the Northern seas will most likely alter. Seeing the recent development in adjacent seas (North-East Atlantic, Baltic, Mediterranean, and Black Sea) an impact on ecosystem functioning, its goods and services, and related socioeconomics may consequently be probable in the North Sea as well. Currently, a lack of critical knowledge on the success and activity of important North Sea Zooplankters hinders the full integral assessment of the North Sea production structures and functioning. Therefore, with gelatinous zooplankton increasingly competing with fish, either for food or acting as predator, a more comprehensive understanding of their role and place within the North Sea foodweb is urgently needed for reassessing its overall trophic structure and functioning now and in the future, both prerequisites in assessing the production potential at higher trophic levels including shellfish, fish, birds and mammals. This study aims to advance our understanding of the role of gelatinous zooplankton in steering and determining the structure and functioning

of the North Sea ecosystem. The new insights will modernise monitoring and risk assessment instruments as well as identify measures needed to protect the North Sea environment and its valued ecosystem services. The presently proposed study will be carried out by a research group formed by experts from the *Royal Netherlands Institute for Sea Research (Royal NIOZ)* and *the University of Groningen (RUG)* in close cooperation with *DELTARES*.

Red Tide outbreaks in Alexandria (Egypt) causing occasional fish and invertebrate mortality

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Studies over the past two decades in Alexandria waters (Egypt) offered persuasive evidence for the increased events of harmless/harmful phytoplankton blooms, their intensity, magnitude, and the number of causative species. The spring bloom is a characteristic feature of the seasonal cycle of phytoplankton in Alexandria coastal water. It characterized by the recurrent massive occurrence of the centric diatom *Skeletonema costatum* Cleve, followed in succession by the dinoflagellate *Prorocentrum* spp. 16 algal species (9 diatoms, 5 dinoflagellates, 1 euglenophycean and 1 raphidophycean species) were responsible for the massive blooms at 8 intermittent periods from mid-May to late October 2001. The reported killing species; *Chattonella antiqua*, *Gymnodinium mikimotoi*, *Heterocapsa* sp., *Pseudonitzschia australis* and *Prorocentrum minimum* were of major contribution. Fish and invertebrate mortality accompanied the harmful algal blooms during several intermittent periods, more intensive in July-August 2004 and 2005. *Gymnodinium catenatum*, *Alexandrium ostenfeldii*, *Karenia mikimotoi*, *Chattonella antiqua* and *Prorocentrum minimum* were the causative red tide species. A monospecific bloom of *Chattonella antiqua* that occurred in Alexandria waters during late August/early September 2006 with very high density, and of wide spatial distribution, was accompanied by mass fish and invertebrates mortalities. Few cells of *Heterosigma* species have been reported for the first time in the Alexandria waters. Except *Prorominimum* spp. the reported species are considered new records in Alexandria waters.

Basin-Wide Black Sea *Mnemiopsis Leidyi* Database (MLDB)

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The database was created in 2008 in framework of the FP6 Black Sea SCENE project and further supported by the Permanent Secretariat of the Black Sea Commission. A team of scientists studying the *M. leidyi* in the Black Sea organized a consortium on a voluntary basis with purpose to maintain the database and provide their data and metadata on jellyfish in the Black Sea to common use. At the moment database contains ML metadata and data covering all the Black Sea for period 1989-2009.

Algal blooms in the Mediterranean and Black Sea: a brief review

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Blooms of autotrophic algae and some heterotrophic protists are increasingly frequent in coastal waters around the world. Algal blooms are natural events that occur seasonally due to the renewed availability of nutrients in the ocean waters; nevertheless, it has been demonstrated that these events are occurring more frequently where human activities are highly concentrated. Phenomena such as pollution and human-related nutrient enrichment can favour the expansion of algal bloom events. The Mediterranean and Black Sea basins have been experiencing several algal blooms events during the last 50 years mostly in areas such as bays, lagoons, ports beaches and estuaries. Algal blooms, frequently grouped as harmful algal blooms (HABs), not only lead to a deterioration in water quality but they also cause fish kills and high risks to human health due to specific toxins that may enter the food chain. Thus, national and regional water quality assessment efforts and routine coastal monitoring programmes to detect species, toxins, and toxicities are increasing worldwide.

Jellyfish blooms in the Mediterranean and Black Sea: a brief review

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Although it has never been demonstrated so far that jellyfish population – if affected by human-related pollution, eutrophication, aquaculture activities, overfishing, etc., – can increase or give rise to blooms, there are many evidences worldwide that gelatinous zooplankton (Cnidaria and Ctenophora) is proliferating and high densities of these animals are more and more reported to be infesting coastal waters of the Mediterranean and Black Sea. Medusae stings can be very painful for swimmers and fishermen; moreover jellyfish, as top predators, can dramatically reduce food availability for fish. A classical example of negative effects induced by sudden gelatinous zooplankton blooming is the striking alteration of the Black Sea ecosystem due to the introduction and consequent blooming of the ctenophore *Mnemiopsis leidyi*. Therefore, a deep understanding of the reasons of jellyfish outbreaks is necessary in order to forecast blooming and/or take adequate measures to limit their negative effects on tourism and fishery industries.

Decreasing methods of jellyfish bycatch on the trawl fishery

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Fishery by-catch and discards are old issues in fishing history but have become one of the most significant problems currently encountered by many fisheries. Large quantities of jellyfish are discarded in the anchovy, horse mackerel, bluefish and bonito fisheries in Turkish waters. The devices varied depending on the need of the particular fisherman. Some fishermen developed grids to exclude turtles, rays, sponges, and jellyfish, because these animals were caught frequently or because the value of their target catch could be increased markedly. Several fishermen took an interest in developing devices to reduce fishery by-catch in Black Sea. Grids are used to expel sea turtles and jellyfish. Grid practice could be preventing to catch of these species, on trawl fisheries in Black Sea. Additional, it is possible more quality of target species and selectivity by grid systems in trawl net.

The effect of jellyfish on the small scale fishery in the Black Sea

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By-catch in fisheries has been considered a serious problem. Horse mackerel is a most of the economic fish in the Turkey small scale pelagic trawl fishery. Jellyfish are important by-catch pelagic trawl fisheries in the Black Sea coast of Turkey such as inedible, damage to target species, decreasing catch amount and mean length of fish. The experiments were carried out Black Sea coast (Sinop-Samsun) in October 2008; total 11 night and 11 daytime pelagic trawls were towed. Horse mackerel (*Trachurus mediterraneus*) and moon jellyfish (*Aurelia aurita*) were caught by pelagic trawl in the study 19540 kg and 8220 kg respectively. In the present study the effect of moon jellyfish (*Aurelia aurita*) on the catch efficiency and length composition of horse mackerel caught by the midwater trawl were established. The results showed that moon jellyfish catch amount increased, horse mackerel catch amount decreased in pelagic trawl fishery in the fishing region at night on the other hand jelly fish ineffective on horse mackerel catch and size composition at daytime. Differences between mean length of horse mackerel in the hauls are significant ($p<0.05$).

Harmful benthic algal species in the Mediterranean Sea: genetic diversity and ecological aspects

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Recently, toxic benthic dinoflagellates have been responsible of higher frequency of harmful events in the temperate coastal areas of the Mediterranean Sea. In particular, the epiphytic genus *Ostreopsis* high-biomass proliferations have been related to harmful episodes of human intoxication by toxic aerosol and skin irritation, and water quality deterioration causing the benthic invertebrate and fish mortalities. *Ostreopsis* produces palytoxin-like compounds that can be transferred through the food web of benthic herbivore invertebrates or filter bivalves potentially causing death or highly sufferance in these benthic communities. In general, the *Ostreopsis* occurrences developed in late spring to early autumn with maximum epiphytic concentrations above 10^6 cells g^{-1} fw on seaweeds during the summer period. In the last decade, *Ostreopsis* blooms became more intense, frequent and widely distributed or in expansion in many Mediterranean areas (www.bentoxnet.it). The dynamic and consequences of the *Ostreopsis* outbreaks occurred in the Mediterranean Sea pose serious concern for the public health, environment quality and also for the economic activities in those coastal regions, which are mostly dependent on tourism, fishing and aquaculture services. Further, *Ostreopsis* is associated with other potentially toxic benthic dinoflagellate as *Coolia monotis*, *Prorocentrum lima* and *Amphidinium* cf. *carterae* that co-occur in lower abundances. Up to date, in the Mediterranean Sea, molecular phylogenetic and morphological investigations based on the sequence analyses of concatenated ribosomal genes, showed that all *Ostreopsis* spp. isolates grouped into two distinct species, *Ostreopsis* cf. *ovata* and *O.* cf. *siamensis.* Few identified genetic species, as *O.* cf. *ovata*, *O.* cf. *siamensis*, *O. lenticularis* and *O. labens*, were analyzed based on the phylogeny and nucleotide diversity at inter- and intra- species level especially at the Mediterranean area. In the *O.* cf. *ovata* different genetic lineages correlated with macrogeographical distribution are present; they are represented by the Mediterranean/Atlantic and Indo-Pacific clades. *O.* cf. *ovata* is found to be widely dispersed, while the other species turn out restricted to just one of the two main warm-water oceanic basins. *O.* cf. *siamensis* was found only in the Mediterranean Sea and eastern coast of Atlantic, and strains identified as *O.*

lenticularis and *O. labens* were found only in the Indo-Pacific region. In the Mediterranean Sea, genotype of *Coolia monotis* was identified and phylogenetic position was clarified in comparison with other *Coolia* spp. ribosomal sequences worldwide. The most widespread and toxic abundant species of *Prorocentrum* is *P. lima* reaching abundance up to 10^5 cells g^{-1} fw of macrophytes. It is always found in association with *Ostreopsis* blooms along the Mediterranean coasts and its records have also increased. Finally, genus *Gambierdiscus* was detected along Greek coasts. This genus includes toxic species producing ciguatoxins that are the causative agent of CFP disease in the tropical areas. The presence of *Gambierdiscus* sp. also in the Mediterranean Sea may imply the onset of ciguatera disease in this area. This fact posed new and serious hazard for human health and sea-related activities. In this context, morphological, genetic and toxicological analyses are underway to clarify the origin and the toxicity of this taxon in the Mediterranean Sea.

Jellyfish outbreaks: do we know enough?

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The understanding of complex ecological phenomena, such as the recurrent occurrence of jellyfish outbreaks, require large-scale integrative approaches to couple ecophysiological optima of key outbreaking-forming species (OFS) with their environmental envelopes. Mechanisms boosting jellyfish proliferations can be overlooked without a comprehensive knowledge of their biology and ecology. This is the case not only for rare or alien species, but also for most popular taxa, like *Aurelia* spp. or *Pelagia noctiluca*. The developmental plasticity of cnidarian jellyfish if proverbial and the ecological potential of their diverse life cycle adaptations grants their ecological success and persistence in worldwide ecosystems. Resting stages, high regeneration potential, reverse development are all shared features within Medusozoa, leading to rapid jellyfish population growth in narrow time windows. A combination of traditional methodologies, innovative technologies and multisciplinary approaches (from natural history observation to video-acoustic behavioural records from biochemical investigations of trophic relationships to molecular taxonomy and phylogeography) will be required to a) understand the roles of jellyfish in the health of our seas , b) analyse causes and consequences of outbreaks, c) foresee environmental envelopes and hot spots of jellyfish occurrences, and d) eventually developing mitigation countermeasures against OFS negative impacts. Besides the common negative perception of outbreak events, jellyfish can be a resource for humans, as they have a number of properties that may be of benefit to society as a source of healthy molecules in cosmetics (e.g. collagen), pharmacology (e.g. free radicals scavengers and antioxidant proteins, anti-cancer drugs), nutraceutics (food for humans, feed for animal farming and aquaculture). In my talk, I briefly summarized some of the potential outcomes that might be achieved by a recently established network of 15 Mediterranean laboratories from 10 different countries dedicated to the study of jellyfish biology (the JELLYMED consortium).

Mucilage events in the Sea of Marmara and the associated processes: Field and laboratory findings

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Four major mucilage event were recorded in the İzmit Bay (Marmara Sea); October 2007, January 2008, September-October 2008 and December 2009 where all were connected to similar occurances in the Sea of Marmara. A research project (TUBITAK-108Y083), based on laboratory experiments and field studies, was initiated in 2008 to investigate the conditions that may activate these events. Laboratory batch culture studies under controlled light and temperature were established with different N/P ratios using four target phytoplankton species: *S. costatum, C. closterium, P. micans* and *G. fragilis*. Field studies were organized in two ways; monitoring at a fixed station in front of the Marmara Research Center (outer İzmit Bay) every 1-3 weeks, supported with monthly monitoring activities in the whole İzmit Bay (supported by Greater Municipality of Kocaeli) and patchily visiting other sites (e.g. Erdek Bay) during the events periods. Field investigations were designed basically to monitor the phytoplankton distribution and standard oceanographic and meteorological features to understand better the occurring conditions of the mucilage events. In almost all the recorded events, dinoflagellates either were more abundant or at comparable numbers with diatoms (all target species were recorded comparatively in higher numbers). Among them Gonyaulax fragilis or Gonyaulax sp. was distinctive. However, the assemblage could rarely be blooming by any of the species whereas the numbers of Gonyaulax fragilis getting increased before the aggregate formations. Temperature, light and nutrient controlled laboratory experiments were designed for 3-7 weeks to monitor DOC and carbohydrate accumulation and observe aggregate formations in the design medium. A considerable accumulation of DOC and total dissolved-CH at *P. micans* cultures was observed at maximum cell numbers and during the death phase. CH-C increased about 20-fold towards the end of the experiments. DOC and CH increase in batch cultures of target diatoms was less pronounced, however, decrease in exposure concentrations of nutrients without changing the N/P ratios caused marked CH accumulation. FTIR spectra of field mucilage aggregates and laboratory formations

obtained in phytoplankton cultures have had similar features. These were supported with FTIR spectra reported for other mucilage aggregates in the literature that are related to phytoplankton. These results indicate that the mucilage formations are closely linked with CH-rich exudates of phytoplankton in the Marmara Sea.

Retrospectives of two decades of the Harmful Algae Bloom monitoring in Morocco

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Extending over 3500 Km with two façades, Atlantic and Mediterranean, the Moroccan coasts contain the valuable resources for fish and shellfish. However, these products are subject to recurrent threats caused by Harmful Algae Bloom (HAB). Given this fact, National Fisheries Research Institute was established a monitoring network of coastal safety, which include eight regional stations located to cover the national level and conduct regular monitoring of the coast safety and the appearance of HAB. After two decades of intensive monitoring, a substantial body of information on the occurrence of HAB and negative impact that generate were obtained. The obtained outcomes allowed localising the favourite sites of HAB occurrence and the identification of responsible algae species. In this communication we will talk about various episodes of HAB recorded on Mediterranean and Atlantic shores of Morocco, which appear to be different in nature and problem they pose.

Recurrent blooms of a common heterotrophic dinoflagellat *Noctiluca scintillans* in the Dardanelles (Turkish Straits System)

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The study focuses on the short time (weekly) variations in the density and bio-volume of dinoflgellate *Noctiluca scintillans* between March 2001 and January 2004 in surface waters of the Dardanelles. An analysis of temporal distribution of *N. scintillans* population size with respect to various ecological parameters was discussed. It was also discussed vertical distribution of this species in very excessive bloom time periods during the sampling period. While cell density of *N. scintillans* variated between 0.00E+00 and 2.20E+05 cells L^{-1} (1.59E+04 ±3.01E+04 cells L^{-1}), cell volume variated between 0.00E+00 and 1.31E+12 μm^3 L^{-1} (9.81E+10 ±1.84E+11 μm^3 L^{-1}). March-June and October-December periods were very excessive bloom periods during the year. Late spring periods during the three years were more important than late autumn and early winter periods both in view of cell density and cell volume. However, the bloom in early winter period (December 2001) occasionally revealed to be higher (7.33E+04 cell L^{-1}) than late spring periods. Contribution of *N. scintillans* to total Dinophyceae and phytoplankton cell density was lower (0-33.3 and 0-3.70% respectively) than contribution to total Dinophyceae and phytoplankton cell volume (0-99.5 and 0-99.0%, respectively). This situation was supported by correlation data. As a result, high production capacity of *N. scintillans* during the year and it's high contribution to total phytoplankton has revealed that the Dardanelles and thereby the Sea of Marmara are hypereutrophic ecosystems due to the Black Sea surface waters and waste waters of some megacities such as Istanbul and Izmit around the Sea of Marmara.

The use of trichloroacetic acid fixation and propylene phenoxetol conservation in quantitative sampling of ctenophores*

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We successfully modified the fixation and preservation method for individual ctenophores developed by Adams, Flerchinger and Steedman (1976) and used it for quantitative sampling of ctenophores, including *Mnemiopsis leiydi*. Advantage and disadvantages are described.

* *document*

First Observation of the Mucilage/Gelatinous Formation in the Sea of Marmara in October 2007

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Mucilage formation was first observed in the Sea of Marmara in October 2007 as dozens of square kilometers of the sea surface was covered by mucilage. It has caused not only visual pollution but also economical damage on fisheries by continuing for months and blocking fishing nets. Within this study, meteorological and hydrographical conditions as well as chemical and biological changes were examined to determine the causes of mucilage phenomenon observed in the Sea of Marmara in October 2007. As a part of monthly water quality monitoring project conducted by the Institute of Marine Sciences and Management, sea water samples were taken before and after the aggregate formation from the stations located in the northern part of the Sea of Marmara. Results from August to September have been compared with the previous years' data for a better understanding of the aggregate formation. Replies of fisherman to questionnaires, which were designated to find out information on the mucilage formation in the Sea of Marmara, showed that no obvious change was occurred on the sea surface in autumn 2006. These replies also show that the aggregate formation was first encountered by fishermen through smeared fishing nets which became heavier due to the mucilage aggregation. Purse seiners also reported that they realized thick gelatinous formation while setting around the fish although this formation was not detected by equipped echo sounders. Questionnaires results showed that fishermen associated this phenomenon with the invasive species Mnemiopsis leidyi which caused a very significant damage and sharp decline on fisheries in the Sea of Marmara in 1994. In August 2007, abnormal conditions were gradually observed by fishermen as fishing nets became extremely heavier. Aggregate formation took place in whole Sea of Marmara in late October 2007 and fishermen had serious problems. Some previous work on aggregate formation focus on the role of phytoplankton and therefore qualitative and quantitative phytoplankton analysis were also carried out on monthly basis. Results showed that there was a decreasing pattern in phytoplankton abundance from August till October in 2007, thus pointing to the presence of a planktivorous species in high amounts. Zooplankton of the Sea of Marmara also displayed significant differences in 2007 when compared to the

previous periods. With the dense aggregate formation zooplankton abundance decreased sharply. During the aggregate formation the most important change has been witnessed in macro gelatinous zooplankton distribution. During the basin wide research conducted in the Sea of Marmara in 2005, dense distribution of *Liriope tetraphylla* has been detected particularly at the northern parts. The dominance of the species over other macro gelatinous species was 63%. The species outnumbered the most common and dominant species *Aurelia aurita,* and also *Mnemiopsis leidyi* which caused a drastic collapse in Turkish fisheries in 1990's. On the other hand the frequency of occurrence of the species was 85% in the Sea of Marmara and this can be taken as a proof that the aggregate formation event occurring at regions having different ecological conditions and species compositions, such as Izmit, Erdek, Bandırma and Gemlik bays, should be originated by the same species. When underlying factors beneath the rapid increase of the species has been investigated, it is seen that neither chlorophyll a, nor phytoplankton abundance has increased. This strengthens the idea that a significant shifts in the pelagic food web has occurred. With the decrease in planktivorous fish abundance and hence lack of competition, this new medusa has increased exponentially. Nitrogen/phosphate ratio increased prior to the aggregations and phytoplankton abundance decreased significantly, together with a drastic reduction in zooplankton abundance. Invasive *Liriope tetraphylla* abundance increased exponentially in August and died in masses as a result of starvation and oceanographic conditions. The region witnessed dense mucilage formation during the period characterized with low phytoplankton abundance and high *L. tetraphylla* biomass in 2007. In October, following the mucilage matter production another new species for the region *Gonyaulax fragilis* was observed through the basin. The species was a frequent member of phytoplankton in December 2009, however its abundance was relatively lower. In conclusion, our works in 2007 links mucilage production and breakdown of food chain. Overfishing in the Sea of Marmara provided a ground for invasive and/or opportunistic species and an increase in abundance of planktivorous species. As a result, *Liriope tetraphylla* became more dominant in the disturbed environment of the Sea of Marmara. Nutrient concentrations are high in the Sea of Marmara as a result of the surface inputs, and mucilage phenomenon therefore occurs as a result of not exactly known processes in the highly productive system. Therefore, biological and chemical treatment of domestic and industrial wastewater input to the Sea of Marmara may be important steps in preventing these kinds of outcomes of pollution To understand and prevent mucilage formation; a nation-wide monitoring network should be established, and also radical measures to protect planktivorous small pelagic species stocks (such as anchovy, mackerel, sardine and sprat) should be implemented immediately. As an example, fishing may be banned 10 miles around the entrance and exists of Çanakkale and İstanbul straits.

Effects of mucilage bloom on the fisheries of the Sea of Marmara through the 2007/2008 fishing period

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In this study, the effects of a kind of musilage that has been firstly appeared in the second half of 2000s (2006) and densely bloomed in 2007 and 2008; on commercial fish stocks and activities. The study was realized on fishery localities those are differently characterized but representing the overall fisheries in the Sea of Marmara by means of a stratified sampling procedure regarding the vessel size and the method of fishing. In this study, a comparison was made between the usual fishing period (2006/2007) and the period within musiage bloomed and caused a great loss in fisheries production (2007/2008). According to obtained data, the loss in amount of the landings and its corresponding cost was nearly three times of the one in usual period. The rate of loss was the highest in small pelagic fishes (purse seine fishery). This was followed by the fisheries of shrimp and benthopelagic fishes (beam trawl and bottom trawl fishery). The last one was the coastal/artisanal fishery (bottom/surface gill nets, long lines and hooks). The jellyfish or algal blooms may be resulted in gelatinous masses affected the fishery areas of all the different levels which are inshore, offshore, surface, pelagic and benthic in the Sea of Marmara and a significant depletion occurred in fishery economics. It is certain that the following proposals are worth to consider, in order for reducing the effects of gelatinous organisms on fish stocks and fisheries. Firstly, it is required to decrease the fishing effort in the Sea of Marmara. On the other hand, the uncontrolled and unconscious fishery should be taken under control. The depletion in fish stocks creates a negative feeding competition between small pelagic fishes and gelatinous organisms that shares the same trophic food chain in the ecosystem. In order to come over this case, it is necessary to develop a long-term fishing strategy for small pelagic stocks and firstly; (1) the fishery of small pelagic stocks should be completely banned for a certain period, a quota system which designs a reduction in the negative effect of over-exploitation should be applied after the stocks renewed and reached a significant biomass.