

# Gulf of Mexico Large Marine Ecosystem

## *Planeando el futuro sostenible del Gran Ecosistema Marino del Golfo de México*

El año 2011 será dedicado a la construcción del Programa de Acción Estratégico del Gran Ecosistema Marino del Golfo de México. Los talleres de trabajo y foros colaborativos de expertos realizados en el 2009, 2010 y recientemente en el mes de febrero de 2011 en el Puerto de Veracruz, permiten tener algunas líneas de acción preliminares que los expertos de ambos países coinciden en impulsar para garantizar el futuro sostenible y la salud del ecosistema marino del Golfo.

Este boletín está dedicado a presentar algunos de los resultados más significativos o el grado de avance de los diversos componentes del proyecto y las acciones realizadas a lo largo del Golfo. Se destaca una activa y amplia participación de muchas instituciones regionales que colaboran en el desarrollo del proyecto. Asimismo, se presenta el resumen del Foro Internacional para el Manejo Sustentable de los Recursos Marinos Vivos del Golfo de México, realizado del 21 al 23 de Febrero de 2011 en el Puerto y Ciudad de Veracruz, México. Sin duda este Foro se destacó por la numerosa participación binacional, las excelentes aportaciones de los expertos de México y Estados Unidos, que en conjunto lograron establecer los parámetros y líneas de acción de interés binacional para mejorar el manejo sostenible y bajo el enfoque de la administración de recursos basada en el ecosistema, es decir, una visión integral que considere la visión ecosistémica y la necesidad de cooperación de forma continua. Agradecemos a todos los participantes al Foro por su gran entusiasmo y valiosas aportaciones.

El Proyecto del Golfo de México y la Organización de las Naciones Unidas para el Desarrollo Industrial (ONUDI) invitó a una reunión de trabajo binacional el 22 de Febrero donde se presentó el plan de trabajo dedicado a la construcción del Programa de Acción Estratégico (PAE) binacional para esta región, que deberá presentar su primer borrador en Diciembre de 2011.

En consideración a la importancia de este programa estratégico, el Gobierno Federal de México por conducto de la SEMARNAT y la Comisión Intersecretarial para el Desarrollo Sustentable de Mares y Costas (CI-MARES) por conducto del Dr. Antonio Díaz de León invitó a esta reunión a los representantes y autoridades ambientales de los estados costeros mexicanos del Golfo, a manera de reunión preparatoria conjunta con los representantes y socios del proyecto de los Estados Unidos para presentar dicha iniciativa y considerar los puntos de vista de los estados costeros de toda la región Golfo de México.

El resultado de dicha reunión fue sumamente exitoso, y el estado de Veracruz, como anfitrión de ésta reunión por conducto del Maestro Victor Martínez, Secretario de Medio Ambiente del Estado de Veracruz, coincidió en la importancia de trabajo conjunto con autoridades federales y del proyecto binacional del Gran Ecosistema Marino del Golfo de México como modelo de colaboración. Dr. Antonio Díaz de León confirmó la invitación a todos los representantes asistentes al Foro a participar de estas actividades para asegurar la máxima representatividad y congruencia de los temas prioritarios regionales.

En el seno de esta reunión de trabajo, uno de los socios del Proyecto del Gran Ecosistema Marino del Golfo de México más importantes, el Harte Research Institute de Corpus Christi, presentó a través de su Director Ejecutivo el Dr. Larry McKinney la iniciativa para la realización de la Cumbre del Golfo a celebrarse en la Ciudad de Houston, Texas en Diciembre del 2011. Esta Cumbre representa una gran oportunidad para fortalecer la colaboración regional, y para visualizar el futuro del desarrollo del Gran Ecosistema Marino del Golfo de México. El Comité Organizador Directivo de la Cumbre del Golfo solicitó a la coordinación del Proyecto Gran Ecosistema Marino del Golfo de México hacerse cargo de la construcción y seguimiento de la Agenda internacional de esta cumbre.





# Gulf of Mexico Large Marine Ecosystem

## *Planning the Sustainable Future of the Gulf of Mexico Large Marine Ecosystem*

Year 2011 will be dedicated to the construction of the Strategic Action Program of the Gulf of Mexico Large Marine Ecosystem. The technical workshops and forums previously conducted during 2009, 2010 and recently in February 2011 in the Port of Veracruz, allowed the Project to have preliminary action guidelines proposed by experts from both countries of US and Mexico, towards planning the Gulf's sustainable future and healthy marine ecosystems.

This newsletter presents some of the most important results or advances in the diverse Project components done in the Gulf. It is highlighted the active and enthusiastic participation of many regional institutions, that are collaborating in the GoM LME project. Additionally, a summary of the results of the discussions at the International forum for the Sustainable Management of the Gulf's Living Marine Resources is presented. This forum was successfully conducted in the Port and City of Veracruz, México 21-23 February 2011. Without any doubt, this forum represents the intense participation and valuable input of experts from both countries, Mexico and the United States, that together addressed the parameters and basic guidelines for the ecosystem based management of living marine resources, considering the integrated scope and continuous cooperation needed. We are deeply thankful with all Forum participants for their enthusiasm and valuable input.

The Gulf of Mexico LME Project (GoM LME) and the United Nations Industrial Development Organization (UNIDO) invited to a binational working session on February 22nd, to present the project work plan in regard the Strategic Action Program (SAP) for this region, which will present its first draft in December 2011.

In due consideration to the importance of the mentioned SAP, the Mexican Federal Government through Dr Antonio Díaz de León on behalf the Ministry of Environment and Natural Resources and the Interministerial Commission for the Sustainable Development of Oceans and Coasts invited representatives of the six coastal Mexican states in the Gulf and Caribbean Sea, as a preliminary working table to meet with the US authorities and partners, and to present the initiative of the SAP, and to ensure inclusion of their point of view in the process.

The result of this meeting was greatly successful, and the State of Veracruz, being the hosting state of the meeting through its Secretary for Environment, Mr Victor Martínez, agreed on the importance of collaborative work and actions with the federal government agencies and with the GoM LME project as a model. Dr Díaz de León confirmed the invitation to all participants and representatives to join these activities to ensure maximum representation and congruence with the regional topics and priorities.

In this meeting one of the main partners of the GoM LME Project, the Heart Research Institute of Corpus Christi, through its Executive Director, Dr. Larry McKinney introduced the Gulf Summit, to be held in Houston, TX in December 2011. The Gulf Summit represents a great opportunity to strengthen the regional collaboration, and to visualize the future development of the Gulf of Mexico Large Marine Ecosystem. The Gulf Summit Organizing Committee has requested the GoM LME project to support the development of the international segment of the Summit.





## *Resumen del Foro Internacional sobre el Manejo Sustentable de los Recursos Marinos Vivos del Golfo de México*

**D**el 21 al 23 de febrero de 2011 se llevó a cabo el Foro Internacional: "Manejo Sustentable de los Recursos Marinos Vivos del Golfo de México", en la ciudad de Veracruz, México.

A través de la participación de colegas nacionales y extranjeros, de diversas instituciones académicas, agencias de gobierno, organizaciones no gubernamentales y de la sociedad civil de México y los Estados Unidos de América, se abordaron diferentes temas relacionados con el estatus y la tendencia de los recursos marinos vivos (RMVs) del Gran Ecosistema Marino del Golfo de México.

Se hizo hincapié en que el Golfo de México presenta grandes retos para el manejo de los RMVs debido a los dos enfoques contrastantes que se presentan: la conservación y la generación de recursos económicos. Se enfatizó en que la única forma de asegurar un Golfo de México saludable y sustentable es verlo como un ecosistema único y trabajar en forma holística y coordinada sumando los esfuerzos de los países involucrados. Los principales problemas que se deben enfrentar y resolver son: la pérdida de hábitat, el sobre-enriquecimiento de nutrientes, la sobreexplotación pesquera, las especies invasoras y el cambio climático.

Los participantes también destacaron algunos puntos fundamentales a tomar en consideración para el manejo de los RMVs: 1) se debe involucrar a la sociedad civil, 2) es necesario centrar los esfuerzos hacia la educación ya que una sociedad educada es más participativa y 3) la sobreexplotación de las especies comerciales debe atenderse a la par de los factores sociales que afectan a la población y que ocasionan una fuerte presión sobre el ecosistema.

En cuanto a las iniciativas prioritarias binacionales de manejo de los RMVs se consideró que deben enfocarse hacia: la calidad del agua, el monitoreo de especies en riesgo, el monitoreo de las especies migratorias, los efectos de la exploración y explotación de petróleo y gas natural en aguas profundas y aprovechar los esfuerzos de todos los interesados compartiendo las experiencias a nivel científico, técnico y de gobernanza.

Se recalcó que para contribuir a largo plazo en el manejo de los RMVs es necesario contar con información y bases de datos de calidad, de fácil acceso y públicas. Es indispensable crear un programa nacional de monitoreo que incorpore a todas las instituciones y que sea de acceso libre. También se requiere difundir la información científica en un lenguaje claro y sencillo que facilite la toma de decisiones.

Respecto al monitoreo se enfatizó que:

1) Debe ser constante y estar disponible en tiempo real

2) Debe tener mecanismos de estandarización de calidad y procedimientos para diferentes escalas

3) Es necesario establecer comunicación entre los diferentes grupos de cada país para después hacer los vínculos internacionales.

4) Los resultados de monitoreo deben tener un carácter público.

También se comentó que sería muy útil tener un registro centralizado de la información y superar la idea de resguardo personal de la información para lo que se requiere un gran esfuerzo de comunicación entre los grupos de investigación y contar con plataformas para disponer casi en tiempo real de la información. Un medio para conseguirlo es destinar más recursos a la ciencia y dar incentivos para hacer públicos los datos.

Particularmente para México, se mencionó que las principales amenazas de los RMVs en el Golfo de México son: la existencia de políticas nacionales sectoriales no integradas, el incumplimiento de ley, las sinergias gubernamentales débiles, el crecimiento de la industria petrolera, las pesquerías ilegales, la infraestructura turística sin ordenamiento, el tratamiento de aguas residuales insuficiente y la falta de oportunidades y fuentes de empleo. Una forma de resolver estos problemas es a través de las áreas naturales protegidas (ANPs) donde, además de la conservación, se han impulsado proyectos de cooperación internacional. El mejoramiento de las condiciones dentro de las ANPs podría aumentar la resiliencia de los ecosistemas ante impactos ambientales. También es necesario aumentar la red de las ANPs esencialmente marinas de manera que incluyan algunos de los ecosistemas altamente prioritarios y que no tienen representatividad en las actuales ANPs del Golfo de México.

Adicionalmente, es importante integrar los conocimientos regionales a las políticas nacionales con el objetivo de crear un Plan de Acción Estratégico para el manejo del Golfo de México.

Uno de los principales retos es la consolidación de alianzas estratégicas para elaborar este plan de acción.

Se enfatizó la conformación de programas de educación ambiental como una herramienta que contribuirá significativamente al fortalecimiento de acciones para abatir las diferentes amenazas que enfrentan los RMVs del Golfo de México. También se recalcó que es necesario involucrar a pescadores en los programas de manejo de los RMVs para que posteriormente sean ellos quienes difundan la información en su comunidad.

Los participantes reconocieron que el Proyecto del Gran Ecosistema Marino del Golfo de México constituye una plataforma para impulsar la colaboración y el diálogo. Agradecieron el esfuerzo de reunir a expertos de México y EEUU, lo cual ayudará a crear los puentes de colaboración necesarios para impulsar el manejo sustentable del Golfo de México.



## *The International Forum: “Sustainable Management of the Gulf of Mexico Living Marine Resources” was held in the city of Veracruz, México, from February 21-23, 2011.*

Through the participation of national and foreign colleagues from diverse academic institutions, government agencies, NGOs and civil society from both Mexico and the US, various issues related to the status and trends of living marine resources (LMRs) of the Gulf of Mexico Large Marine Ecosystem were addressed.

It was emphasized that the Gulf of Mexico presents great challenges for the management of LMRs because of the two contrasting approaches presented: the conservation and generation of economic resources. It was highlighted that the only way to ensure a healthy and sustainable Gulf of Mexico is seeing it as a unique ecosystem and work in a holistic and coordinated efforts by adding the countries involved. The main problems to be faced and resolved are: habitat loss, over-enrichment of nutrients, overfishing, invasive species and climate change.

Participants also stressed some key points to consider for the management of LMRs: 1) it must involve civil society, 2) is necessary to focus efforts on education, an educated society is more participatory and 3) over-exploitation of commercial species should be addressed at the same time of social factors that affect the population, which in turn causes a severe pressure on the ecosystem.

It was considered that binational priority initiatives of management of LMRs must be focus on: water quality, monitoring of species at risk, monitoring of migratory species, the effects of exploration and exploitation of oil and natural gas in deep water and harness the efforts of all stakeholders to share scientific, technical and governance experiences.

It was emphasized that quality data bases and public and easily accessible information is needed to contribute to the long-term management of the LMRs. It is essential to create a national monitoring program (open access) that includes all institutions. Also is required to transmit scientific information in a clear and simple language to facilitate decision-making.

Regarding the monitoring, was emphasized that:

- 1) must be constant and be available in real time,
- 2) must have mechanisms for the standardization of quality and procedures for different scales,
- 3) is necessary to establish communication between the different groups in each country and then make international links
- 4) the results of monitoring must have a public character. Also

was mentioned that it would be very use-ful to have a centralized registry of information and overcome the idea of safeguarding the information as personal to what is required a great deal of communication between research groups, as well as have platforms to provide almost real-time information. One way to do that is to devote more re-sources to science and give incentives to make public the data.

Particularly for Mexico, it was mentioned that the main threats to the LMRs in the Gulf of Mexico are: the existence of non-integrated national sectoral policies, breach of law, weak government synergies, growth of the oil industry, illegal fisheries, tourism infrastructure without order, inadequate wastewater treatment and lack of employment opportunities. One way to solve these problems is through natural protected areas (NPAs) which, in addition to conservation, have helped to promote international cooperation projects. Improving conditions within the NPAs could increase the resilience of ecosystems to environmental impacts. It is also necessary to increase the network of marine NPAs to include some high-priority ecosystems that have no current representation in the NPAs of the Gulf of Mexico.

Additionally, it is important to integrate regional knowledge to national policies in order to create a Strategic Action Plan for the management of the Gulf of Mexico. One of the main challenges is the consolidation of strategic alliances to develop this action plan.

Emphasis was given on the establishment of environmental education programs as a tool that will contribute in strengthening actions for tackling down the different threats faced by LMRs in the Gulf of Mexico. Also was highlighted the need to involve fishermen in LMRs management programs, who then will be those who transmit the information in the community.

Participants recognized that the Large Marine Ecosystem Project of the Gulf of Mexico provides an appropriate platform to foster collaboration and dialogue. Also it was appreciated the effort of the project to bring together experts from Mexico and the US, which will help to build bridges of collaboration necessary to promote the sustainable management of the Gulf of Mexico.





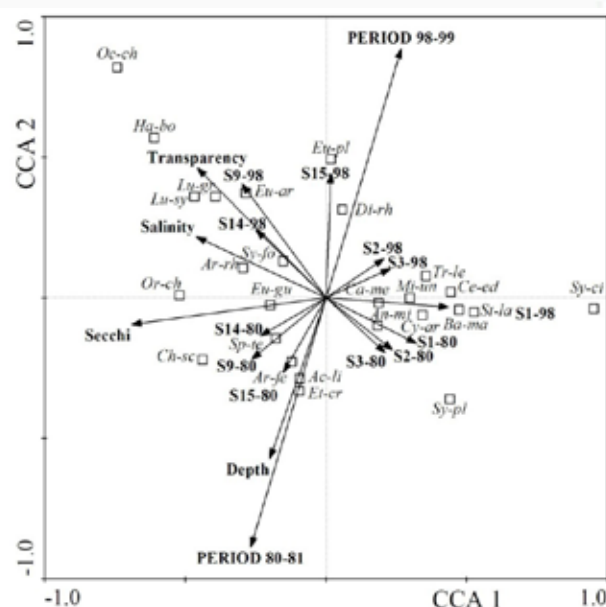
During 2010, several assessments and studies were carried out in Terminos Lagoon as part of the activities of the Pilot Project Enhancing Shrimp Production through Ecosystem Based Management. A general assessment that included an analysis of land use in watersheds of rivers draining into Terminos Lagoon, hydrodynamics in that lagoon and pertinent adjacent zones, coastal erosion and deposition patterns, benthic habitats and fauna, trophic status and pollution and artisanal fisheries trends was carried out by a bi-national team that included researchers from the Metropolitan Autonomous University, Iztapalapa Campus (Universidad Autónoma Metropolitana-Iztapalapa, UAM-I) and the Institute de recherche pour le developpement (IRD) was delivered. Another report on changes in composition of the fish assemblages in Terminos lagoon, was also delivered.

This report was carried out by a researcher of the EPOMEX research center of the University of Campeche. The report dealt with differences in the fish assemblage in Terminos Lagoon recorded during two periods, a decade apart, in relation to changes in abiotic variables.

Specifically about the shrimp fishery, an assessment of the artisanal white shrimp and sea bob lagoon fisheries was carried out (also by researcher working in EPOMEX). An analysis of previously recorded data on juvenile shrimp distribution, relationship with the habitat, and isotopic composition was also presented as a basis for the work to be carried out in 2011 on these topics, by a National Autonomous University of Mexico (UNAM) researcher. These complementary studies, one based on fishery-dependent and independent data and the other analyzing spatial distribution in relation to habitat give information relevant to management and the need to protect certain key areas.

An assessment of the fisheries management framework in the Mexican zone of the Gulf of Mexico Large Marine Ecosystem (that was incorporated into the TDA) and an analysis of the institutional and government framework in the Terminos Lagoon National Protected (TLNPA) Area were also developed as a first stage of a stakeholder analysis (by a researcher, formerly at UNAM's Marine Sciences and Limnology Institute).

An economic analysis of the industrial shrimp fleet was presented (by a SEMARNAT's expert). This analysis, relevant to understanding stakeholders' decision making and useful in management policy design, is part of an assessment of the status of the off-shore fishery.



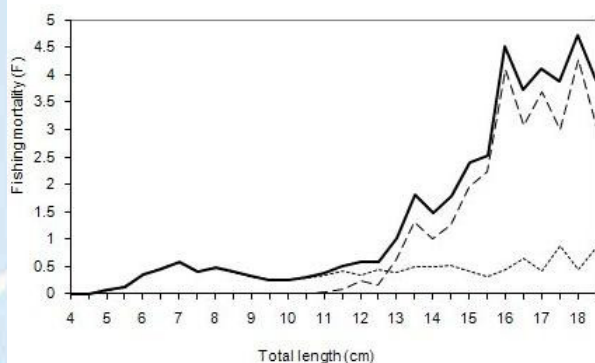
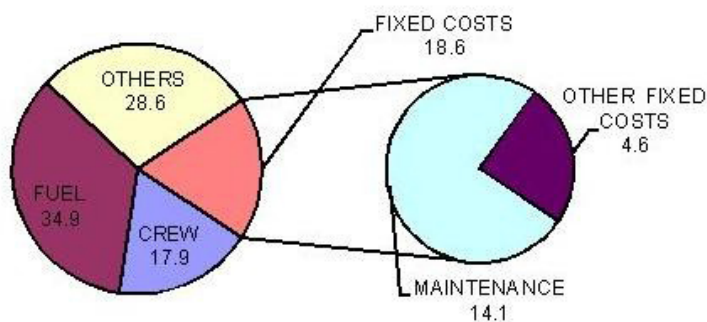


Data collection, previous to the construction of a multi-species ecosystem model, continued during 2010 (made by researchers at CICIMAR). An analysis of trends of the most important fisheries in Terminos Lagoon and adjacent zones was part of this data-collection activity. The development of an ecosystem model is part of an assessment on how the integration of scientific assessment and management decision making is made.

Data and information gathering activities (for the construction of the ecosystem model, on juvenile shrimp distribution, biomarkers in shrimp, the updating of observations made on the male shrimp reproductive system) will continue in 2011. Field activities, some built upon the socio-economic analysis made in 2010, related to the stake-holder analysis and alternative livelihoods activities contained in the project will begin during this year.

The integration of the information generated by the several assessments in the first year reports will also begin this year. This Pilot Project is an opportunity to integrate analysis not usually made together, incorporating more than just the fishery in the assessment including natural (ecosystem) and human (stakeholders) components. It is also considered that assessing the management of the fishery (and that of the ecosystem) is at least as important as assessing the status of the fishery itself.

#### MEXICO (2007) STRUCTURE OF COSTS (%)



## *GOVERNANCE FOR THE GULF OF MEXICO*

The recent tragedy that destroyed the Deepwater Horizon oilrig and the environmental, economic and social impacts the resulting oil spill has created in the Gulf of Mexico highlight the need for a new view for how we use, protect and manage the Gulf's marine resources. Ecosystems, invasive species, contaminants and fisheries declines cross the boundaries that define interagency, national and international jurisdictions. Effective management in the Gulf of Mexico shall overlook the multiple physical and ecological connections, but also create a multi-stakeholder platform to enhance and preserve these connections.

Indeed, managing the environmental connections that link all Gulfs' surrounding areas is a big challenge in terms of international relations and policy. The levels of authority at federal, state and municipality levels among the Gulf countries and their management structures suggest complexity in terms of environmental compliance; in addition to the different political structures and different social compositions that each of these countries embraces. To our days, there is no integrated strategy for marine policies and environmental conservation in

the Gulf of Mexico region (U.S., Mexico and Cuba). Thereafter, there is a need to identify and resolve problems associated with governing a transboundary body of water.

All nations sharing the Gulf recognize the importance of working together to protect and manage ecosystems that depend on biological exchanges and species migrations between different parts of the region.

In the aim of consolidating an integrated and comprehensive Strategic Action Plan (SAP) the GOM LME project should have a clear view of most of all these partnerships in order to identify "strategic" alliances and synergies to pursue what has been called as the National Action Plan for the region.

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The Governance dimension within the GOM LME Project aims to integrate knowledge to assimilate at national policies for a common goal. Being the latter: to build upon this knowledge and all other successful experiences to develop a Strategic Action Program and thereafter consolidate National Action Plans for USA and Mexico (potentially Cuba in the long term).

The most influential groups and stakeholders working for strengthening regional collaboration identified within the Transboundary Diagnostic Analysis (TDA) where the following:

- The GoMx Large Marine Ecosystem International Project
- The U.S based, Gulf of Mexico Program (EPA)
- The Gulf of Mexico Alliance
- The Tri-national Initiative for the Conservation of the Gulf of Mexico



**Priority issues for the Governance division to work on include**

The definition of the concept of governance under an LME perspective described as: "a political process that involves building consensus to carry out a program in an arena where many different interests are in play and where problems require joint action in areas where the state does not or cannot play a leading role (Hewitt de Alcantara 1998). The areas can be found at many levels of society, from the most local to the supranational level. Therefore governance means the expansion of boundaries of responsibility widening the range of alternatives and arrangements to be considered when confronting transdisciplinary, multi-stakeholder, multi-national problems.

**Some 2011 Actions**

Strengthen strategic alliances in the region for the development of a binding document called the Strategic Action Plan for the Large Marine Ecosystem of the Gulf of Mexico.

Elevating the marine environmental protection issue on government's agenda.

Develop and enhance different approaches to building environmental governance, performance and compliance indicators for the Gulf region



***A perspective of the HAB's in the Gulf of Mexico***

Almost all coastal countries of the world are affected by harmful algal blooms (commonly called "red tides") that lead to poisoning, disease and death in fish, marine birds and mammals, reaching affect humans. In Mexico the official records of the past 22 years indicate at least 500 hospitalizations and 20 deaths, however, is believed to have been more cases, but diagnosis not was associated with this phenomenon.

A few decades ago only a few countries were affected by this phenomenon, now the HAB's are present in most of the costs being caused by two or more species (Fig. 1). The causes of this expansion are being discussed with possible explanations ranging from the natural mechanisms of dispersal of species, climate change, increased human activities in coastal areas, mainly related to nutrient enrichment (eutrophication) air pollution and transport of alien species (ballast wa-ter), making this phenomenon in a trans-boundary problem (Fig. 2).

The problem of harmful algal blooms in the Gulf of Mexico is a major concern due to impacts on the economy of many coastal areas. There is a dif-



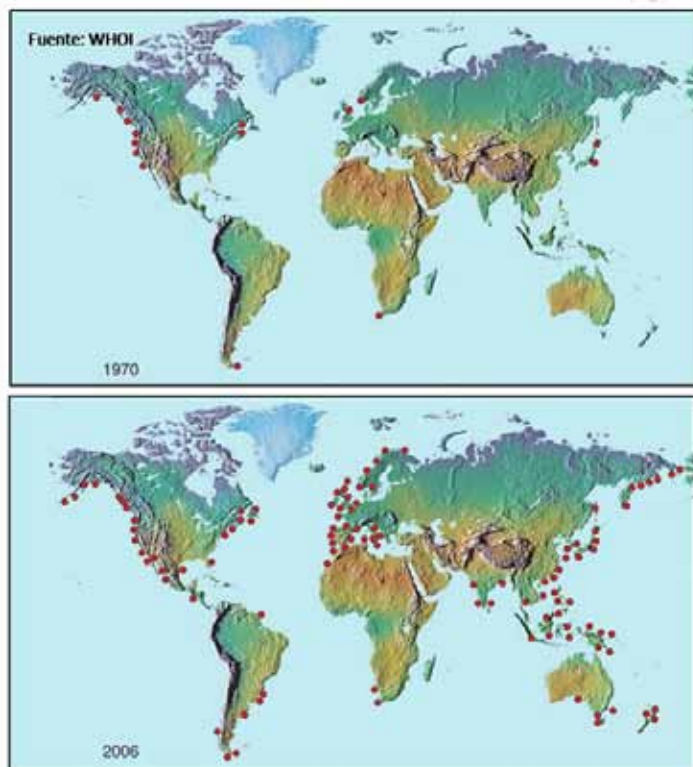


Figure 1- Map of the global spread of HABs, updated to 2006

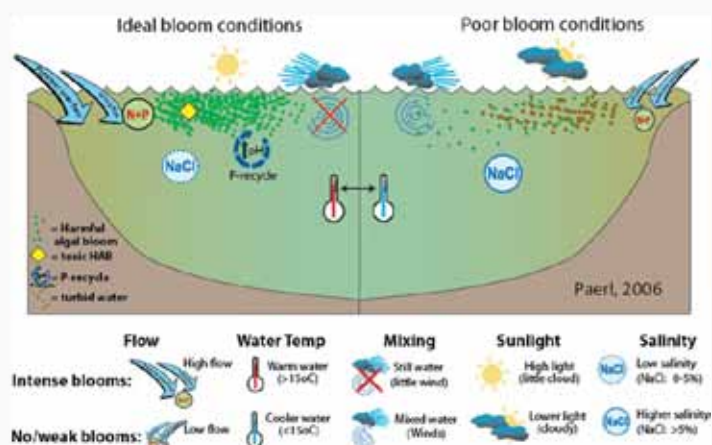


Figure 2 Conceptual diagram of HABs under favorable and unfavorable conditions

ference of information between U.S. and Mexico on HAB's on the coast (Fig. 4). This is mainly because there is not a coordination pro-gram among Mexican institutions. Among the recorded species, *Karenia brevis* has been considered as a trans-boundary problem, considering that the marine waters of the Yucatan Peninsula and Veracruz could play an im-portant role as seed source *K. brevis* toward U.S. coast Therefore, a binational project to develop a joint program of monitoring, which is in harmony with the methods used in the U.S. is of great importance.

Since 1996, COFEPRIS monitor algal blooms and their impacts on *K. brevis* in Tamaulipas, Veracruz and Ta-basco. In Yucatan, the "Monitoring Program of the Harmful Algal Blooms" was launched since 2000 by the CIN-VESTAV-IPN, Unidad Mérida. More recently, satellite images of chlorophyll was used as an additional tool for this purpose. A formal evaluation of the impact of HAB's in Mexico is not available, despite an increase in the number, frequency, and impact of harmful algal blooms are widely acknowledged

The level and quality of information that every organization involved in the study of HAB's in the states of the Gulf of Mexico is diverse and in many cases it is not open to the public. The standardization of methodology and evaluation criteria are a key points to have a harm-onized monitoring program among all states and these in turn with states of the Gulf.

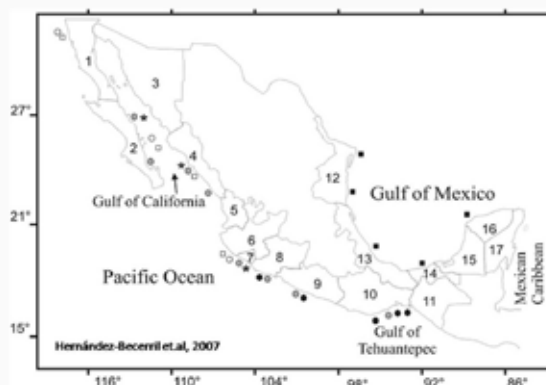


Figure 3. – Map of the Mexican states of the Gulf and Pacific Ocean showing distribution of harmful species and /or toxic. . 1: Baja California, 2: Baja California Sur, 3: Sonora, 4: Sinaloa, 5: Nayarit, 6: Jalisco, 7: Colima, 8: Michoacán, 9: Guerrero, 10: Oaxaca, 11: Chiapas, 12: Tamaulipas, 13: Veracruz, 14: Tabasco, 15: Campeche, 16: Yucatán, 17: Quintana Roo. Circulo gris: *Gymnodinium catenatum*, circulo negro: *Pyrodinium bahamense* var. *compressum*, circulo blanco: *Lingulodinium polyedra*, cuadro blanco: *Alexandrium catenella*, cuadro negro: *Karenia brevis*, asterisco: *Cochlodinium polikrykoides*.



## *Assessment of the fisheries management framework in the Mexican zone of the Gulf of Mexico LME and assessment of the institutional and government framework in the Terminos Lagoon National Protected Area*

This document presents in three sections updated information about fisheries and fisheries management on Mexican GoM waters, and some recommendations of improvement. First section, describes fish-ing catch trends for the last twenty years and fisheries status of resources. Results, based on landing registers, show a very evident substitution effect of catches by states and management units. While an overall “constant” catch level at global scale seems to exist; increasing catches of oyster compensate shrimp, octopus and mullet catches decrements. More in depth analysis of these findings and an improvement of quality and organization of official landings information is recommended. Official status information is available only for 20% fisheries management units (fmu); moreover, for particular stocks in littoral states, only is available status information for less than 5% fmu. Overall, 90% of fmu are considered at or close to MSY, damaged or overexploited, while the rest 10% have possibilities of development. From the summary information about control strategies of fishing activities, it is clear that while variety of output and input

(FAO) measures are combined to gear specifications to control or avoid collapse of fishing resources, there is a major need of more coordinated and strict enforcement measures, added to strategies that incorporate fishers inputs.

Second section describes administrative and legal aspects of Mexican fisheries. Major results are: Fishing Impact control has been defined to maintain target resource producing; however, more critical and indirect problems such as by-catch, discards, waste, catch by lost or abandoned gear and, mortality of other alive resources ecological linked to target species have not been addressed properly. Other sources of improvement are: the attention to restoration of collapsed stocks, the elaboration of strategies with a more integral and complete view which include ecological, social, institutional and economic aspects (such as Programs of fishing ordinance and Management Plans) and the need to build management capacities in States to address responsibilities given by the Sustainable Fisheries and Aquaculture Law. A coherence analysis among legislative instruments of fisheries sector and environmental

sector using quantitative methods showed that overall legal framework present with a 45% sustainability criteria compared to the ideal legislative scenario. Sustainability attributes that show major weaknesses are aspects related to high seas, estuaries, mangroves, reefs, and ecological processes. On the other hand, fishing sustainability criteria (such as those described by Charles 1995) are covered only by 10%, being impacts of places of boarding piers and wastes the least represented.

In the third section, a governance analysis for Terminos Lagoon National Protected Area (TLNPA) is presented. A major need to increase institutional coordination to address illegal activities and environmental impact management was found. Strategies to incorporate diverse users and inhabitants in management of natural resources and habitats are needed. Management of increasing activities in aquatic areas will require better staff training, equipments and funding to address increasing problems and changes in those areas.



## *Environmental Education and public participation*

During the meeting of the Steering Committee on February 24th a presentation to remark the importance of education on the GoM LME Project was made and main activities during 2010 were presented and subsequent activities planned for 2011 were also introduced to the members of the Steering Committee (S.C.) Firstly, the workshop for environmental education and public participation was described. This workshop aims at promoting more collaboration between different institutions for the integration of regional strategies for environmental education and public participation. Secondly, the diploma course for management of wetlands in collaboration with CECADESU and different Universities in Mexico was also described as one of the important activities to develop during 2011.

Thirdly, several workshops planned for community involvement at Laguna de Términos and the necessity of a closer collaboration with experts working for the GoM LME Project were also mentioned.

Main suggestions from members of the S.C. were:

- Integrate mechanisms for more efficient diffusion of the activities developed in the GoM LME Project such as facebook, twitter and different tools.
- Involve more organization and institutions in the process of making people more aware of what is happening in the Gulf of Mexico Large Marine Ecosystem.
- Ask for supports from different Semarnat Delegations for attend meetings and workshops in coastal states of the Gulf of Mexico.

### **International Forum: Sustainable Management of Living Marine Resources in the Gulf of Mexico**

The International Forum counted with a panel discussion for tackling the importance of environmental education and public awareness in the sustainable management of living marine resources. Representatives from GCOOS, University of Veracruz, Wildlife Conservation Society, Veracruz Aquarium, and CONANP discussed the importance of managing efficiently commercial and non commercial marine species through well defined programs and disseminate the risk of invasive species in the Gulf of Mexico such as the Lionfish that is exponentially increasing his population. Finally, it was pointed out that there is a gap on information regarding formal education programs for the sustainable management of living marine resources.

## *Coastal Ecosystem Health Indicators*

The monitoring pilot project was presented in March 24-27, 2010 for stakeholder validation of the coastal ecosystem health indicators proposed for this project. The presentation was made during the “Décimo se-gunda sesión del Organó Técnico del Comité de Ordenamiento Ecológico Marino y Regional del Golfo de México y Mar Caribe”. Stakeholders showed interest in the monitoring pilot project progress. They found very useful the monitoring pilot project activities, such as the beginning of a monitoring program for the Mexican portion of the GoM





## *Capacity building and needs enhanced*

During this period the monitoring pilot project prepared the materials and organized three training courses to stakeholders in Merida, Yucatan:

a) Quality Assurance and Quality Control (QA/QC) Training Course (March 18-19, 2010).

The participants are pilot project experts, researchers from all the Mexican States of the Gulf of Mexico, and members of the National Water Commission (CONAGUA).

## *Coastal Ecosystem Health Indicators*

The objectives of this training course were:

- Define the Quality Assurance and Control program to develop the baseline sampling of the monitoring pilot project.
- Provide the knowledge and the guidelines to design the detailed protocols for each analysis and determination during baseline sampling, sample and data analyses, database preparation and results preparation.
- Strengthen capacity and enhance integrated ecosystem based management in the region.

The training course product was:

Quality control and assurance (QA/QC) not only for chemical and physical measurements, but also for bio-logical measurements, number and type of sampling stations, timing of the sampling, etc were discussed. For that reasons the national experts received the tools to develop detailed protocols for QA/QC. They incorporated unified information in the protocols of their analysis and sampling methods to assess QA/QC. They had time to incorporate the new knowledge to their own programs before they sent the draft of the document.





b) Introduction to Monitoring Techniques and Sampling Design Training Course (August 4-6, 2010).

The participants are members of the National Water Commission (CONAGUA) from different States of the Gulf of Mexico.

The objectives of this training course were:

- Provide the stakeholders with the basis and criteria for developing an adequate monitoring sampling design.
- Provide the stakeholders with the theoretical and practical knowledge of statistics to begin training advanced probabilistic sampling design.
- Strengthen capacity and enhance integrated ecosystem based management in the region.

The training course product was:

The participants are members of the National Water Commission (CONAGUA). They all work daily on monitoring studies in the Gulf of Mexico. For that reason they were brought together to strengthen their capacity and enhance integrated ecosystem based management in the region.

c) Probabilistic sampling design Training Course (November 22-25, 2010).

The participants are pilot project experts, researchers from all the Mexican States of the Gulf of Mexico, and members of the National Water Commission (CONAGUA).

The objectives of this training course were:

- Provide the basis for robust, scientifically defensible sampling protocols.
- Implement the theoretical and practical basis on probabilistic sampling design to develop the sampling design in the work regions of the stakeholders.
- Provide the knowledge and the guidelines for developing an adequate monitoring sampling design.
- Strengthen capacity and enhance integrated ecosystem based management in the region.





## *The training course product was:*

The sampling design of the baseline sampling in Terminos Lagoon was prepared prior to the course. However, the participants had the opportunity to simulate a sampling design and understood the process for obtaining the design used during the baseline sampling.



### **Baseline Sampling (November 14-21, 2010).**

The baseline participants were researchers from the work group of pilot project experts and researchers from local institutions (UNACAR, CETMAR and CONAGUA) that collaborated with the pilot project.

The objectives of this activity were:

- Coordinate the activities of the pilot project participants and experts during the baseline sampling of the monitoring pilot project.
- The experts took samples of sediments, water, and fish and made measurements of seagrass, and mangrove to provide the assessment of the health condition of the Terminos Lagoon.

## *The baseline sampling product was:*

Samples were collected for the five modules (Water quality, sediment quality, benthic community structure, biomarker and contaminant in fish, and coastal habitat) that constitute the basis of the pilot project to generate the coastal condition assessment in Terminos Lagoon was completed.

