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IOC-UNESCO
OCEAN OBSERVATION AND MONITORING

COI-UNESCO

In humanity's struggle to achieve sustainable development and use of the Earth's resources, the sciences are increasingly called upon to provide specific information 'products' that address specific needs. With respect to the global marine environment, these products include ocean observations, measurements, and data that can be used by governments, industries and scientists to assess, understand, forecast and manage trends in the global ocean-atmospheric system. Examples of these products include:

Información tomada del sito oficial de la Comisión oceanográfica Intergubernamental COI-UNESCO

http://ioc.unesco.org/iocweb/index.php

- Sea level measurements
- Details of currents
- Size, location and travel of sea ice and waves
- Tsunami monitoring
- Data on living marine resources (population, recruitment, mortality, etc)
- Measurements of coastal attributes (erosion, flooding, etc)
- Monitoring of the health of the oceans (pollution, eutrophication, HABs, etc)
- Data on non-living resources (oil, gas, etc)

This represents a shift in the purpose of oceanographic research from that of general enhancement of knowledge to the application of knowledge and technology to the understanding of the dynamic relationships between the different elements that comprise the global ocean-atmosphere system, and how this system affects and is affected by human activities. Furthermore, understanding these dynamics in the current context of global climate change complicates the challenges of oceanographic assessment, and marks it with an urgency resulting from the uncertainty that surrounds the consequences of global warming.

The development data and information that meets the needs of marine resource users is called operational oceanography, and the production of this data and information requires a global, coordinated, interdisciplinary, observing and monitoring system. The IOC has developed and is continuously implementing such a system – the Global Oceans Observing System (GOOS). Currently, standard GOOS products include regular measurements of: wave height and direction, salinity, sea surface temperatures, wind velocity, currents and tides. However, GOOS is being further developed to be able to monitor and forecast: indicators of marine pollution and contamination, movement of oil slicks, prediction of water quality, concentrations of nutrients, primary productivity, subsurface currents, temperature and salinity profiles, sediment transport and erosion (Oceans 2020, 2002). Finally, GOOS provides information products that are of critical importance to all of the issues the IOC is concerned with – coastal area management, marine environmental protection, disaster mitigation, fisheries and ecosystems, climate change and information management strategies.

GOOS

GOOS is a permanent global system for observations, modelling and analysis of marine and ocean variables to support operational ocean services worldwide.

GOOS will provide accurate descriptions of the present state of the oceans, including living resources; continuous forecasts of the future conditions of the sea for as far ahead as possible; and the basis for forecasts of climate change.

The "GOOS 1998" Prospectus originated from discussion at the Third Session of the Joint Scientific and Technical Committee for the Global Ocean Observing System in April 1996 (J-GOOS III, Decision, para. 8.1). J-GOOS III concluded that, in view of the many documents and material that existed in the name of GOOS, originating from both within and without, it was timely to draft a document that consolidated this information, and pointed the way ahead.

A Planning Committee was convened intersessionally to oversee the drafting of the document, and a consultant engaged to undertake the gathering and consolidation of information and draft the document. An initial outline was reviewed at J-GOOS IV. J-GOOS IV formally endorsed the activity and agreed on a timetable for completion of the report, targeting the Year of the Ocean and the GOOS Agreements Meeting. In summary:

- J-GOOS constituted the Planning Committee.
- Enforce consistency with Principles and Strategy document.
- Publish GOOS 98 as a J-GOOS document.
- Implicitly recognised the document is going beyond consolidation and information by raising issues which have not been resolved by J-GOOS.
- J-GOOS (GSC) should address these intersessionally.
- J-GOOS IV, April 1997, recognised that GOOS 1998 would need to be published as a document of the new GOOS Steering Committee (GSC). Resolution 3 by I-GOOS III (June 1997) states that GOOS 1998 be reviewed by the GSC for publication in summer 1998.

The GSC agreed the document is a valuable contribution to the GOOS background literature. The document represents a consolidation of existing material and has a content suited to the task of informing, and detailing the prospects of GOOS for governments, agencies, commercial companies, etc.

To do this, it is important that the document takes a form which is accessible and truly informative, rather than representing a reference for scientific and technical detail. The document covers both existing systems and planned and developing systems, and the links to other organisations, for the purposes of providing information and aLerting potential participants and users to the potential and relevance of GOOS.

The GSC stresses that the document is a summary document, rather than a definitive prescription for GOOS. It is a document which, for GOOS itself, consolidates the information contained in the many existing documents, and for the external community, provides an accessible and reliable account of the prospects for GOOS and the framework which is being developed to implement GOOS. The document contributes to the task of convincing governments and agencies to participate in the implementation of GOOS.

OOPC

Tropical Moored Buoys - The Tropical Moored Buoy Implementation Panel (TIP) is be responsible for development, co-ordination, and implementation of moored buoy programs in the tropical ocean regions as part of an integrated approach to observing the climate system to address the research needs of CLIVAR and the operational strategies of GOOS and GCOS.

WCRP / SCOR Working Group on Air Sea Fluxes - The main goals of the Joint JSC/SCOR Working Group on Air Sea Fluxes 1 were to review the requirements of different scientific disciplines for surface flux data sets, to catalogue available surface flux data and flux-related data sets, and to review the strengths and weaknesses of each.

VOS Climate Project - The primary objective of the project is to provide a high-quality subset of marine meteorological data, with extensive associated metadata, to be available in both real time and delayed mode. Eventually, it is expected that the project will transform into a long-term, operational programme. Specifically, the project gives priority to the following parameters: wind direction and speed, sea level pressure, sea surface temperature, air temperature and humidity. Data from the project will be used: to input directly into air-sea flux computations, as part of coupled atmosphere-ocean climate models; to provide ground truth for calibrating satellite observations; and to provide a high-quality reference data set for possible re-calibration of observations from the entire VOS fleet.

Surface Reference Sites - The Surface Flux Analysis Project (SURFA), an initiative of the WCRP Working Group on Numerical Experimentation, is a project to institutionalize the valuation of near real-time Numerical Weather Prediction (NWP) fluxes (and related fields) with high quality reference data. Read Project SURFA: A WGNE Pilot Study, Gleckler and Polcher (pdf download 209Kb)

SST / Sea-Ice Working Group for GCOS - The Terms of Reference for this group are to record and evaluate the differences among historical and near-real-time SST and SST/SI analyses; identify the sources of differences in the analyses; on the basis of comparison of those differences with the expected climate signals in the SST patterns, recommend actions needed to ensure the quality and consistency of the SST and SST/SI analyses; establish criteria to be satisfied by SST and SST/SI analyses to ensure the quality and consistency required by GCOS; and report annually to AOPC and OOPC on progress and recommendations.

Global Eulerian Observatories - The Ocean Observations Panel for Climate (OOPC), together with the CLIVAR Ocean Observations Panel (COOP) have recommended launching an international effort led by a science team to identify support for time series observations and to shepherd the implementation of that element of the global observing system. The Partnership for Observations of the Global Ocean (POGO) expressed interest in aiding the process, with the further input that planning for oceanographic time series stations should be responsive to the need for biological and chemical observations. This recommendation was echoed by groups developing plans for carbon cycle observing systems and reinforced by the success of existing multidisciplinary time series stations such as those near Bermuda. Finally, in the last several years there has been gowing interest in time series stations that include ocean bottom observations, and this interest has been advanced by the Dynamics of Earth and Ocean Systems (DEOS) planning groups in several countries. A brochure, a "white paper" and a web site are being developed to promote the time series program. More - GEO Web-site.

Observing System Sensitivity Experiments - The OOPC is encouraging the development of a framework and action plan for objectively evaluating the performance of the Ocean Observing System (OOS) within the JCOMM framework. The Panel is currently discussing OOS sensitivity and evaluation experiments, including potential approaches and potential pitfalls to be avoided in undertaking such experiments. Under the new CLIVAR oversight structure, the SSG concluded that CLIVAR Ocean Observations Panel should be replaced by an activity that was more focused on analysis, diagnostics, assimilation and re-analysis. The CLIVAR OOP would continue to exist but its remaining task would be to plan a workshop that was dedicated to these issues. The OOPC will cosponsor this workshop.

Observing System Evaluation - The Global Climate Observing System (GCOS) is undertaking a review and assessment of the state of the climate observing system - the 2nd Adequacy Report on Global Observing Systems. This will be a major undertaking for GCOS and the OOPC for 2002-2003. The Chairs of the GCOS Science Panels will organise the analyses to meet the goals of the report. Scientific experts, including those previously engaged in the work of the IPCC, will refine the objectives and define the metrics for analysis in light of the needs of the UN Framework Convention on Climate Change in preparation for development of the specific analyses. Former OOPC Chair Neville Smith and current Chair Ed Harrison are participating in the preparation of the report and will base their approach on the rationale outline. Annex III of the OOPC-7 Draft Report lists the questions to be addressed and the approach adopted for parameters being covered in the report. More - the GCOS Second Adequacy Report on the Climate Observing Systems.

Ocean Climate Indices - The OOPC is working to develop a set of reliable physical and biological measurements of climate change and variability that are easily observed and that can be used to demonstrate to the general public how ocean observations can be used to understand and predict climate change. OOPC is pursuing the indices concept because of their high degree of societal relevance as well as their scientific relevance in that they are good proxies for certain important phenomena. This is the first step in a process that will lead to the development of a set of ocean state indices that may become part of an annual state-of-the-ocean report to WMO, IOC, and the UNFCCC. Annex IX of the OOPC-7 Draft Report lists the indices suggested to date.

Ocean Carbon - The OOPC is considering appropriate approachs for integrating carbon measurements into ongoing operational activities. One approach is to treat carbon measurements as a "Pilot Project" activity. This would be a finite length activity with specific objectives; it would aim to test and evaluate candidate systems, test and evaluate routine operation and data delivery mechanisms, and develop standards and formats for data exchange, etc. The OOPC will work with the SCOR-IOC Advisory Panel on Ocean CO2 to further develop detailed plans to initiate this pilot project and to report on progress on ocean carbon observation programmes while more formal mechanisms emerge. More - SCOR-IOC CO2 Panel Web and News of upcoming ocean carbon coordination workshop.

Data and Information Technology Project - OOPC is developing an Ocean Information Technology Project (OIT). An initiative to prepare a GOOS- wide workshop is under development. Failure to meet the challenge of providing effective data management for the growing network of operational oceanographic services would result in a serious limitation to future progress. Increasing demands of providing routine, reliable and sustained services are of equal importance. Only real-time data streams can provide data and products needed for ocean forecasts that allow managers to react effectively. In the past, too little priority has been placed on the complex field of data management. The planned evolution of the OIT is to split it into a number of work packages. Their contents are to be refined in workshops with a broad consensus whenever possible, leading to an integrating Conference on implementation. Key issues will include effective telecommunication, needs for agreed standards and protocols, provision for innovative data inquiries,interoperability independent of individual platforms, and involvement of developing countries and countries in transition. The Panel learned that a first meeting towards an OIT is planned in Brussels in November 2002. More - OIT site and OIT Prospectus (Word download 157Kb).

Sea Ice - The capability to monitor sea ice variables from space and in situ is rapidly developing, but there does not yet exist a stragey to provide guidance for a monitoring program. OOPC is working to develop such a strategy, building on the information contained from a number of documents including the OceanObs99 book Observing the Oceans in the 21st Century, the WCRP Climate and Cryosphere plans, and the OOPC V Report. A rough outline for a strategy document includes a brief description of the rationale, what the system aims to deliver (operational and climate analyses, data sets), how the data will be obtained (for example: microwave imagers for distribution, radars for ice thickness and distribution, upward looking sonar (ULS), SCAT and SAR, historical data), how data are assembled to create products, and when and where data are available.

Surface Salinity from Space - The Soil Moisture and Ocean Salinity (SMOS) mission is planned for launch in 2005/2006. Over the ocean, the goal of the SMOS mission is to observe the sea surface salinity (SSS) with adequate accuracy and resolution as emphasized in major international scientific initiatives (i.e., GEWEX, GODAE and the Global Ocean-Atmosphere-Land System (GOALS) component of CLIVAR). It employs an L-band passive microwave radiometer and can recover sea surface salinity (SSS) from a single pass observation with a precision of 1 psu in 30 km resolution cells. The OOPC considers salinity measurements from space to be of critical importance to the development of operational oceanography, and maintains an active watch on these development. OOPC has noted that the GODAE requirement of 0.1 psu at 200 km squares for an averaging time of 10 days remains a significant challenge.

GLOSS

The Global Sea Level Observing System (GLOSS) is an international programme conducted under the auspices of the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) of the World Meteorological Organisation (WMO) and the Intergovernmental Oceanographic Commission (IOC). GLOSS aims at the establishment of high quality global and regional sea level networks for application to climate, oceanographic and coastal sea level research. The programme became known as GLOSS as it provides data for deriving the 'Global Level of the Sea Surface'.

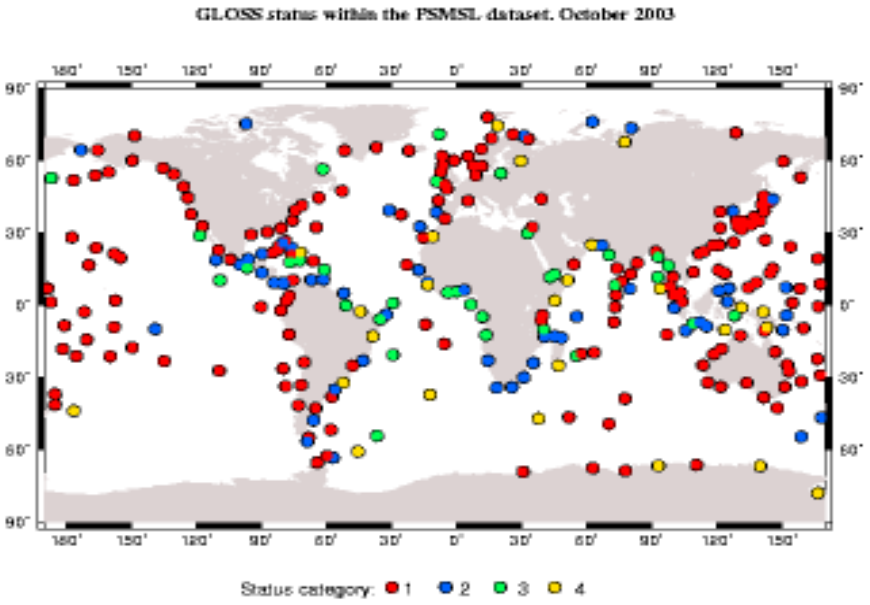
The main component of GLOSS is the 'Global Core Network' (GCN) of 290 sea level stations around the world for long term climate change and oceanographic sea level monitoring. The present definition of the GCN (the definition is modified every few years) is called GLOSS02.

The Core Network is designed to provide an approximately evenly-distributed sampling of global coastal sea level variations. Another component is the GLOSS Long Term Trends (LTT) set of gauge sites (some, but not all, of which are in the GCN) for monitoring long term trends and accelerations in global sea level. These will be priority sites for Global Positioning System (GPS) receiver installations to monitor vertical land movements, and their data will contribute to long term climate change studies such as those of the WMO-UNEP Intergovernmental Panel on Climate Change (IPCC).

The GLOSS altimeter calibration (ALT) set consists mostly of island stations, and will provide an ongoing facility for mission intercalibrations. A GLOSS ocean circulation (OC) set, including in particular gauge pairs at straits and in polar area, complements altimetric coverage of the open deep ocean within programmes such as WOCE and CLIVAR.

GLOSS can be considered a component of IOC's Global Ocean Observing System (GOOS), and particularly as a major contributor to its Climate and Coastal Modules. Information on the links between GLOSS and other IOC activities can be obtained from IOC's own web pages.

GLOSS Core Network Status as of October 2003 can be summarised in terms of the latest data received by the PSMSL for each station in the network. An overview of the network divided into four 'Status Categories' (Category 1 being the most "operational and up-to-date") is shown in the next figure.



GLOSS status can also viewed via the JCOMMOPS status web pages along with maps showing the status of other JCOMM programmes (DBCP, Argo, SOOP etc.).

Training courses and workshops on sea level measurement and interpretation have been held at least annually since 1983 covering tide gauge installation, maintenance and operation; data reduction of sea level observations; geodetic fixing of tide gauge benchmarks; uses of sea level data in scientific analysis and practical coastal applications; and data exchange. Since 1993, the emphasis has been given to the training in computer-based data analysis within HOTS (Hands On Training Sessions), and to the application of the results to studies of regional and local processes and for practical purposes.

Training courses/workshops have been held in the United Kingdom (annually 1983-1990 and 1997), China (1984), France (1990), Brazil(1993), India (1995), Argentina (1996), UK (1997), South Africa (1998), Brazil (1999), Saudi Arabia (2000) and Chile (2003). Course reports on paper are available via the GLOSS Technical Secretary at IOC, while those available electronically are:

- Survey of India Dehra Dun course 1995
- Buenos Aires, Argentina course 1996
- Proudman Oceanographic Laboratory course 1997
- University of Cape Town course 1998
- University of Sao Paulo course 1999
- PERSGA/ALESCO training workshop, Jeddah, Saudi Arabia 2000
- Servicio Hidrografico y Oceanografico de la Armada de Chile course 2003

GCRMN

The GCRMN is tasked by national governments, United Nations agencies, international NGOs and marine institutes to promote monitoring of the coral reefs of the world. The aim is to raise awareness on their current status and provide data to assist resource managers in coral reef conservation.

The GCRMN is maintained by the Australian Institute of Marine Science drawing on our expertise in monitoring in cooperation with the U.S. National Oceanic and Atmospheric Administration's Coral Health and Monitoring Program and in association with WorldFish Center (ICLARM) in Penang.

The GCRMN, partnered with Reef Check, produces data and information on coral reef health for ReefBase.

The GCRMN is a component of the US Coral Reef Task Force strategy.

The GCRMN is an operational unit of ICRI - the International Coral Reef Initiative reporting on the status of coral reefs and raising awareness on the need for urgent action.

The GCRMN is a network of people, governments, institutes and NGOs monitoring coral reefs in 80 countries and also a partnership of other monitoring programs including: Reef Check, Coral Reef Degradation in the Indian Ocean (CORDIO), Caribbean Coastal Marine Productivity Program (CARICOMP), and Atlantic and Gulf Rapid Reef Assessment (AGRRA)

The GCRMN works with communities, volunteers, governments and scientists and produces Status of Coral Reefs of the World reports every 2 years (1998, 2000, 2002 etc.)

The GCRMN assists monitoring by providing manuals, some equipment, databases, training, problem solving and help with finding funds for monitoring - all coordinated in a global network.

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POLICLOROBIFENILOS (PCBs) EN ECOSISTEMAS COSTEROS DE MÉXICO Y BRASIL

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Los compuestos orgánicos persistentes (COP´s) presentan una alta persistencia ambiental, son bioacumulables y pueden ser transportados y depositados en sitios distantes de donde fueron empleados. Los COPs se desplazan a grandes distancias desde zonas tropicales en forma de vapor o adherido a partículas atmosféricas y depositarse paulatinamente a altas latitudes llegando a los polos terrestres. De los COP´s más importantes mundialmente se tiene a diez plaguicidas, de los cuales destaca el DDT, y a los policlorobifenilos (PCB´s) que son productos de uso industrial.

PCBs

Los PCBs son una familia de productos sintéticos que está constituida teóricamente por 209 compuestos denominados congéneres, en cuya molécula de bifenilo varia el número y posición de los átomos de cloro lo cual determina el nombre del congenero y sus características físicas, químicas y toxicológicas. Las principales características de los PCBs es que son de gran estabilidad química, baja flamabilidad, baja conductividad eléctrica y una alta resistencia a la degradación térmica. Estas características permiten a los PCBs usarse como refrigerantes, lubricantes y aislantes, empezando su fabricación comercial en 1929. Los PCBs generalmente se encuentran como una mezcla de congéneres, y la mezcla comercial más común se le llama Aroclores.

Aunque la aplicación de los PCBs es muy amplia a nivel mundial, algunos de sus usos los hace productos tan cotidianos que su presencia pasa desapercibida, debido a que el conocimiento de los PCBs no se encuentra tan generalizado dentro de la población. Así, los PCBs se encuentran en los capacitadotes eléctricos, transformadores, balastros, aceite industrial, pinturas, sistemas hidraulicos y de transferencia de calor, papel de copia sin carbón, adhesivos, plásticos y, principalmente, como retardantes de flama.

EXPOSICIÓN Y EFECTOS TÓXICOS

El gran uso y alta persistencia de los PCBs en el ambiente ha ocasionado que estos compuestos se encuentren presentes virtualmente en todas partes; agua superficial y subterránea, suelos, atmósfera, y tejido graso de organismos silvestres y del ser humano. Una de las fuentes más comunes de PCBs es la de posibles fugas de transformadores viejos.

La toxicidad de los congéneres esta relacionada a la presencia o ausencia de cloro en las posiciones orto en el anillo de fenol. Los congéneres con un gran numero de átomos de cloro presentan un coeficiente de partición octano/agua (Kow) alto por lo que tienden a degradarse mas lentamente y principalmente a biomagnificarse, o sea, a incrementar sus concentraciones conforme se pasa de un nivel trófico a otro.

Los efectos tóxicos de los PCBs son variados y dependen de la dosis y tiempo de exposición. Se conoce que la exposición crónica a PCBs puede ocasionar daño a hígado, depresión del sistema inmunológico y desordenes neurológicos.

Además de los efectos agudos y crónicos que pueden ocasionar los COP´s, se ha identificado que estos pueden imitar la acción de las hormonas y enviar mensajes erróneos a las células, o no enviarlos a tiempo. A nivel de vida silvestre se ha observado que estos productos ocasionan alteraciones en el desarrollo reproductivo, cambios de conducta sexual, y defectos congénitos. Por ejemplo, se ha observado que algunos cormoranes (*Phalocrocorax auritus*) que han estado expuestos a PCBs han nacido con picos deformes y, en el mar Báltico, se han observado malformaciones en órganos reproductivos de algunas focas que presentaban altas concentraciones de PCBs en sus tejidos.

En personas expuestas a PCBs se ha observado que manifiestan alteraciones en la piel, tales como el cloracne y dermatitis. Asimismo, la Agencia Internacional para Investigación sobre Cancer (IARC) ha clasificado a los PCBs como probables carcinógenos para el ser humano, ya que algunos estudios apuntan que los PCBs producen melanoma maligno en trabajadores expuestos a estos compuestos (Sinks *et al.*, 1992. A. J. Epidemiology 136).

Con el fin de proteger la salud humana, la Agencia de Protección al Ambiente (EPA) de los EUA ha establecido como límite 0.0005 mg/L para la presencia de PCBs en agua potable y, por su parte, la Administración de Alimentos y Medicamentos (FDA) establece que los alimentos no contengan mas de 0.2 a 3 ppm de PCBs.

PCBs EN MÉXICO

Aunque no hay fácil disponibilidad de información sobre las cantidades usadas de PCB´s en México, se estima que se importaron, antes de su prohibición, por lo menos entre 11,000 y 22,000 toneladas de Aroclor de los E.U. y Europa.

Un reporte del Instituto Nacional de Ecología (INE) menciona que puede haber entre 11,500 y 13,600 toneladas métricas de PCB líquidos y alrededor de 32,000 toneladas métricas en equipos contaminados. En este inventario incompleto se tiene que son las empresas paraestatales las que cuentan con un mayor volumen de PCB, tales como Petróleos Mexicanos (petroquímica 179.22 ton y refinación 688.77 ton), Comisión Federal de Electricidad (CFE) (2,058.38 ton), Luz y Fuerza del Centro (3,422.25 ton), Metro de la Ciudad de México (576,93 ton) y otros (datos extrapolados: 6,045.14 ton).

Por diferentes razones, algunos accidentes químicos han pasado desapercibidos, sin embargo, en México se presentó un evento de contaminación por PCBs debido a que las fuertes lluvias que se presentaron en el 2000 ocasionaron inundaciones que, en la ciudad de Perote, Veracruz, lavaron una bodega semiabierta que tenia 2500 tambos con askareles o PCBs. Aunque hay muchas preguntas de carácter ecológico, normativo y político con respecto a la situación de los askareles depositados en Perote, lo principal es que muy probablemente estos compuestos se hayan dispersado, y que sus efectos tóxicos se manifiesten en algunos años.

PCBS EN BRASIL

En Brasil no se tienen datos de producción de PCBs, pero se conoce que el sector eléctrico es el principal consumidor de PCBs. En 1997, las compañías eléctricas Eletropaulo y Furnas contaban con 562 y 136 toneladas de ascareles o Aroclores respectivamente. Hasta ahora, no se tiene el número de quipos que contienen PCBs que están todavía en uso y operación, tanto por parte del Estado como de la iniciativa privada.

Al igual que en México, en Brasil se han presentado accidentes en los cuales se han liberado PCBs al ambiente. Por ejemplo, en 1987 se reportó la fuga de 10 mil litros de ascareles en una subestación de la empresa Furnas Centrais Elétricas S.A. y, en 1996, en la ciudad de Irajá en Río de Janeiro, accidentalmente se fugaron 400 litros de ascareles en una subestación del metro.

PCBS EN COSTAS DE MÉXICO Y BRASIL

Aunque los PCBs se utilizan ampliamente en los ecosistemas terrestres, los residuos de estos compuestos son lavados por la precipitación pluvial y transportados por los escurrimientos y, posteriormente, se integran a los ecosistemas costeros, en donde se bioconcentran y biomagnifican. Así, se conoce que las concentraciones de PCBs en mamíferos marinos son mas altas que las reportadas en mamíferos terrestres, por lo que el ecosistema costero se encuentra en mayor riesgo.

Como ya se había mencionado, la información que se ha generado acerca de la presencia de residuos de PCBs ambientalmente en México y Brasil ha sido muy escasa.

En México, se reportó en 1979 (Rosales *et al.*) que todos los ostiones (*Crassostrea virginica*) de nueve lagunas del Golfo de México presentaron residuos de PCBs cuyas concentraciones fluctuaron entre 14 y 90 ppb, y los valores mas bajos se presentaron en lagunas que estaban en áreas poco pobladas. Como un valor de referencia, los valores más bajos de PCBs en países industrializados se encuentran alrededor de 14 ppb en sedimento.

Por otra parte, a lo largo de la Bahía de Todos os Santos, Brasil, se llevó a cabo un estudio en 1988 (Tavares *et al.*) en el cual se reporta por primera vez residuos de PCBs y otros contaminantes principalmente en el bivalvo *Anomalocardia brasiliana* (fam. Veneridae). La gran mayoría de las muestras en el estudio mencionado tuvieron una concentración de PCBs menor a los 10 ppb, aunque también se presentaron concentraciones mayores a 30 ppb.

Uno de los estudios más completos con relación a las concentraciones de PCBs y otros contaminantes orgánicos en zonas costeras es el de Sericano *et al.* (1995). En este estudio se realizó un muestreo de bivalvos en las costas del Atlántico y del Pacifico de Latinoamérica y, debido a la amplitud del área, se tuvieron diferentes especies de bivalvos. Sin embargo, la información generada en el estudio es valiosa ya que se realizó por un solo laboratorio y, principalmente, de obtener un panorama general de los residuos de Σ-PCBs dentro de un periodo muy corto de muestreo (1991-1992), por lo que se puede realizar una comparación espacial y temporal.

El estudio comprendió trece sitios costeros de México y doce de Brasil, los resultados indican que las concentraciones más altas de Σ-PCBs se encontraron en Recife y en Bahía Guanabara, Brasil con 280 ng/g y 210 ng/g respectivamente, seguido de Laguna Madre, Tamaulipas, México con una concentración de 110 ng/g (Figura 1). Estas concentraciones de PCBs indican la alta industrialización que tienen estas áreas, ya que para la Laguna Madre en Tamaulipas, se tienen mas de 400 maquiladoras en la zona de Reynosa y Matamoros, de las cuales muchas son de componentes eléctricos, y cuyos desechos generados en estas ciudades son transportados por drenes que desembocan en la laguna Madre.

Entre las costas que presentaron concentraciones entre 10 y 100 ng/g de Σ-PCBs en bivalvos se tienen a las localizadas en Sao Luis, Fortaleza, Salvador, Vitoria, Cabo Frío, Bahía de Todos os Santos y Lagoa dos Patos en Brasil, y en Tampico, Laguna del Ostión, La Ventosa, Altata-El Pabellón, San Felipe, San Carlos, Ensenada y Punta Banderas en México.

Es importante resaltar que, aunque hay sitios costeros con una actividad industrial muy baja, se llegaron a encontraron residuos de Σ-PCBs en concentraciones menores de 10 ng/g como fue el caso de Laguna de Términos, Puerto escondido y Mazatlán en Mexico, y en Bahía de Paranagua en Brasil.

Como se puede observar, prácticamente en todas las lagunas de México y Brasil estudiadas se encontraron residuos de Σ-PCBs lo cual nos indica la gran dispersión que tienen estos compuestos, por lo que el evaluar es importante evaluar el riesgo que conlleva su presencia.

Figura 1. Concentraciones de PCBs en México y Brasil

PERSPECTIVAS

Aunque se sabe que, aun cuando el uso de PCBs se diera de manera tajante, tendrían que pasar muchos años para que las concentraciones de PCBs presentes en el ambiente fueran casi indetectables. Debido a lo anterior, es importante

que se empiecen a utilizar otros compuestos alternos al uso de los PCBs, así como cambiar a tecnologías limpias y seguras de destrucción de PCBs.

En el caso particular de México, como miembro del Tratado de Libre Comercio para Norteamérica el aspecto ambiental es importante y, por lo tanto, en la Comisión para la Cooperación Ambiental (CCA-NAFTA), México se comprometió a reducir paulatinamente, el uso de varios compuestos organicos persistentes, y en especifico hay un compromiso de una virtual eliminación de PCBs y a su manejo seguro. Asi, con el fin de verificar si se cumple con lo establecido en la CCA y, principalmente, para conocer los posibles riesgos a la salud, es necesario establecer una red de monitoreo de COP´s en los ecosistemas acuáticos de México y Brasil.

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IMPACTO Y DETERIORO DE LOS ECOSISTEMAS DE MANGLAR: ESTUDIOS DE CASOS

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Los manglares de México presentan una rápida transformación hacia ecosistemas de baja productividad y biodiversidad. Los bosques de manglar, a pesar de ser reconocidos como ecosistemas altamente productivos, presentan un creciente deterioro. Para México se estima una pérdida en la cobertura del 14% (De 1993 al 2000). La información sobre la pérdida manglar en cada uno los estados no se encuentran disponibles en las estadísticas oficiales. Sin embargo, se estima que durante el periodo de 1966 a 1991, el litoral del Golfo de México presenta el mayor porcentaje de deforestación (12.68%) con respecto al litoral del Pacifico (9.3%). En ese entonces los estados del litoral del Golfo de México que tenían mayor pérdida eran Campeche, Tabasco y Veracruz con 29%, 26% y 22 % respectivamente y su deterioro se atribuye Estos cambios son causados por actividades agropecuarias, los desarrollos urbanos, turísticos y portuarios, el desarrollo acuícola y los problemas ocasionados por la apertura artificial de bocas, construcción de termoeléctricas, asentamientos humanos, descargas de aguas urbanas, construcción de carreteras y actividad petrolera.

Para el Litoral Pacífico, las mayores pérdidas de manglar son registradas para los estados de Sinaloa (14.4%), Nayarit (11.8%) y Guerrero (12.5%). Esta deforestación básicamente se debe a las actividades de la expansión de la frontera agrícola y ganadera, acuacultura (en particular la camaronícultura), construcción de carreteras, asentamientos humanos y descargas de aguas urbanas y agrícolas.

Con el propósito de mostrar de una manera más explícita las causas y efectos de la deforestación de los bosques de manglar en México, a continuación se describen cuatro estudios de caso

CASO 1: LAGUNA EL PESCADERO, NAYARIT

CAUSA: MODIFICACIONES EN EL LITORAL POR LA APERTURA DE UNA BOCA ARTIFICIAL (CANAL DE CUAUTLA, NAYARIT)

CONSECUENCIAS: Cambio en el patrón hidrológico de la laguna. La condición del agua en la laguna antes de las modificaciones en el litoral adyacente era dulceacuícola-estuarina y posterior a la condición se convirtió estuarina-marina con tendencias hipersalinas. Se asume que los manglares que existían eran, predominantemente mangle blanco (*Laguncularia racemosa*), especie adaptada a escasa influencia de mareas y baja salinidad. Como consecuencia los parámetros físicos y químicos del agua de la laguna e intersticial del bosque de manglar cambiaron (Alta concentración de taninos, condiciones anóxicas, alta salinidad y sulfuros).

IMPACTO: ~ 20, 000 ha de mangle muerto, sin presencia de plántulas y de vegetación característica de estos sistemas (*Salicornia* sp., *Batis* sp.).

CASO 2: PLAYAS DE NOVILLERO, ESTERO DEL MAÍZ (TEACAPÁN, SINALOA-NAYARIT)

CAUSA: CONSTRUCCIÓN DE UNA CARRETERA PARALELA AL ESTERO QUE INTERRUMPIÓ EL FLUJO DE MAREAS.

CONSECUENCIA: El bloqueo de canales de mareas afectó el prisma de marea. Lo cual alteró el drenaje natural exacerbado por la escasa pendiente topográfica y lo somero del cuerpo de agua. Como consecuencia los parámetros físicos y químicos del agua intersticial del bosque de manglar cambiaron (alta salinidad, alta concentración de sulfuros, y baja concentración de oxígeno)

IMPACTO: Pérdida de estructura de la vegetación e incluso la mortalidad de 600 hectáreas de manglar en el complejo lagunar.

Manglar muerto (20,000 ha) de la Laguna del Pescadero, Nayarit, por el incremento continúo del ancho de la boca de la Laguna Cuautla, Nayarit

CASO 3: BOCA CEGADA, NAYARIT

CAUSA: CONSTRUCCIÓN DE ESTANQUES EN 1995 Y EL BLOQUEO TEMPORAL DE UNA VENA DE MAREAS POR LA CONSTRUCCIÓN DEL CANAL DE DESCARGA DE LA GRANJA EN 1998 (FIG. 1).

CONSECUENCIA: Cambios del patrón hidrológico, tala de manglar y en el paisaje (la sustitución directa de ciertos ecosistemas).

IMPACTO: En 1995, la construcción de estanques provocó la deforestación de 42 ha de manglar en el canal de marea "Vena la Culebra". Para 1998, se afectaron 58.6 ha de manglar, en la misma región, así como otros canales tributarios. El efecto conjunto dio como resultado la pérdida de 100.6 ha de manglar entre 1995 a 1998.

CASO 4: BAHÍA DE PETACALCO, GUERRERO.

CAUSA: URBANIZACIÓN E INDUSTRIALIZACIÓN EN HUMEDALES.

CONSECUENCIAS: Cambio en las condiciones hidrológicas, aportes de aguas residuales al bosque y deforestación.

IMPACTO: Para la zona de Petacalco adyacente a la planta de tratamiento, se registro el cambio en la dominancia, frecuencia y ausencia de las especies características. En el estero Sorcúa, se presento un cambio en la estructura forestal, dando lugar a un patrón característico de manglares bajo condiciones de estrés. Asimismo, se presentó un tipo de bosque monoespecífico (*L. racemosa*) con gran cantidad de ramificaciones, lo cual indica el efecto de alguna alteración natural o artificial.

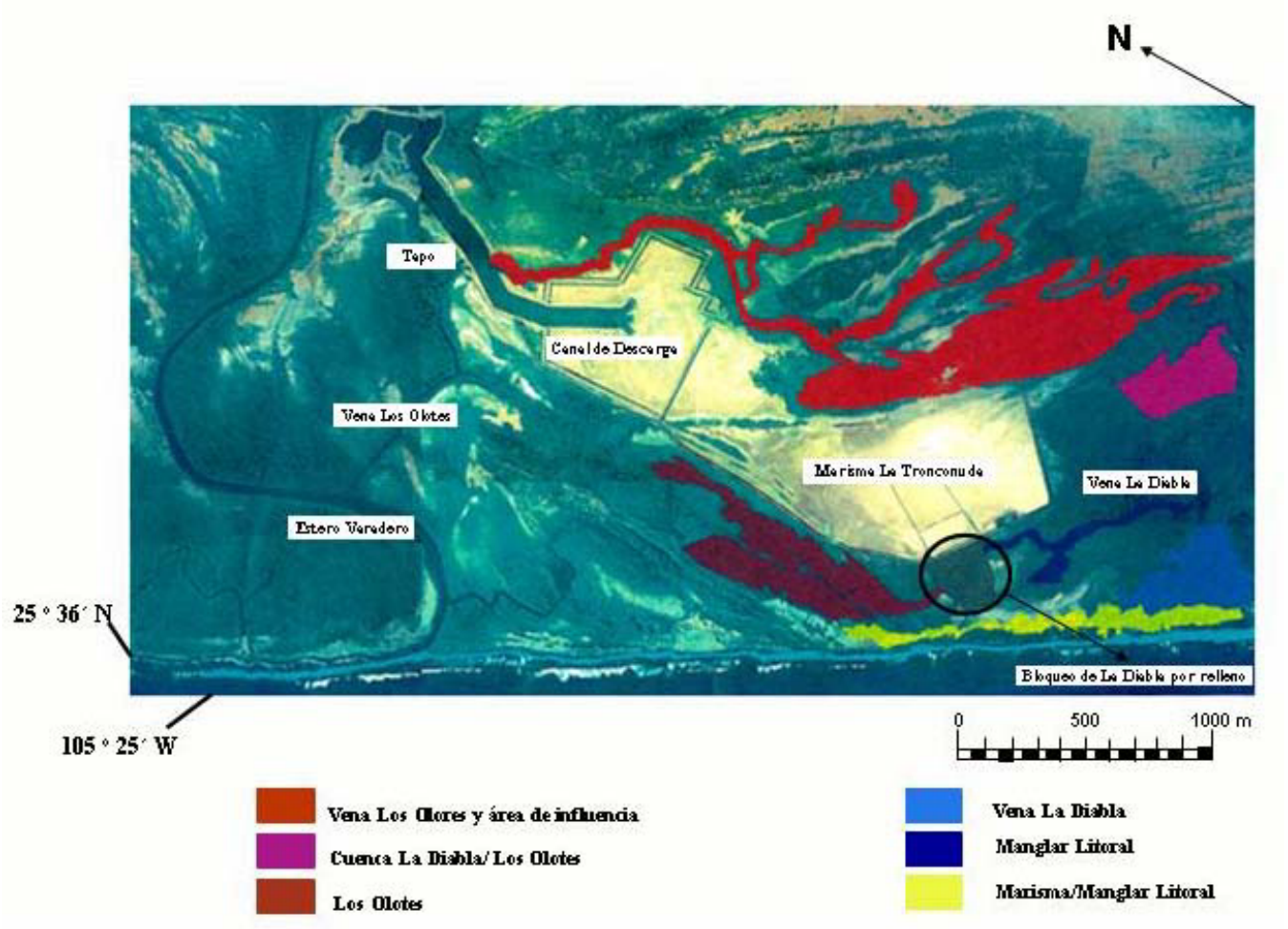

Figura 1. Cambios en el patrón hidrológico y en el paisaje por la costrucción de un granja camaronera (100.6 ha de manglar muerto)

Ex-libris

GLOBAL CARBON CYCLE. INTEGRATING HUMANS, CLIMATE, AND THE NATURAL WORLD

While a number of gases are implicated in global warming, carbon dioxide is the most important contributor, and in one sense the entire phenomena can be seen as a human-induced perturbation of the carbon cycle. The Global Carbon Cycle offers a scientific assessment of the state of current knowledge of the carbon cycle by the world's leading scientists sponsored by SCOPE and the Global Carbon Project, and other international partners. It gives an introductory over-view of the carbon cycle, with multidisciplinary contributions covering biological, physical, and social science aspects. Included are 29 chapters covering topics including: an assessment of carbon-climate-human interactions; a portfolio of carbon management options; spatial and temporal distribution of sources and sinks of carbon dioxide; socio-economic driving forces of emissions scenarios.

Throughout, contributors emphasize that all parts of the carbon cycle are interrelated, and only by developing a framework that considers the full set of feedbacks will we be able to achieve a thorough understanding and develop effective management strategies.

The Global Carbon Cycle edited by Christopher B. Field and Michael R. Raupach is part of the Rapid Assessment Publication series produced by the Scientific Committee on Problems of the Environment (SCOPE), in an effort to quickly disseminate the collective knowledge of the world's leading experts on topics of pressing environmental concern.

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GREAT BASIN RIPARIAN ECOSYSTEMS ECOLOGY, MANAGEMENT, AND RESTORATION

Established by the USDA Forest Service in 1993, the Great Basin Ecosystem Management Project for Restoring and Maintaining Sustainable Riparian Ecosystems is a large-scale research study that uses an interdisciplinary approach to examine the effects of climate change and human disturbance on riparian areas. Structured as a collaborative effort between management and research, the project focuses on understanding the geomorphic, hydrologic, and biotic processes that underlie riparian structure and function and the interrelated responses of those processes to disturbances, both natural and anthropogenic.

Great Basin Riparian Ecosystems, edited by Jeanne C. Chambers and Jerry R. Miller, presents the approach used by the researchers to study and understand riparian areas in the Great Basin region. It summarizes the current state of knowledge about those areas and provides insights into the use of the information generated by the project for the restoration and management of riparian ecosystems. Because semi-arid ecosystems like the Great Basin are highly sensitive to climate change, the study considered how key processes are affected by past and present climate. Great Basin Riparian Ecosystems also examined the processes over a continuum of temporal and spatial scales.

Great Basin Riparian Ecosystems addresses restoration over a variety of scales and integrates work from multiple disciplines, including riparian ecology, paleoecology, geomorphology, and hydrology. While the focus is on the Great Basin, the general approach is widely applicable, as it describes a promising new strategy for developing restoration and management plans, one based on sound principles derived from attention to natural systems.

The Author JEANNE C. CHAMBERS is research ecologist with the USDA Forest Service, Rocky Mountain Research Station in Reno, Nevada; she served as the team leader of the Great Basin Ecosystem Management Project. JERRY R. MILLER is the Blanton J. Whitmire Distinguished Professor of Environmental Sciences at Western Carolina University in Sylva, North Carolina.

NOAA FISHERIES ANNOUNCES AVAILABILITY OF IDENTIFICATION GUIDE FOR SHARKS, TUNAS AND BILLFISHES

NOAA Fisheries, in partnership with Rhode Island Sea Grant, released a "Guide to Sharks, Tunas & Billfishes of the U.S. Atlantic & Gulf of Mexico." The book presents 44 of the sharks, tunas and billfishes commonly found in these waters.

"We are very proud to be a part of this project," said Chris Rogers, chief of NOAA Fisheries' Highly Migratory Species. "The guide will help fishermen and fish dealers in their efforts to obey the laws, while at the same time supporting conservation efforts."

Developed for use in the field, the water-resistant guide highlights external features to expedite the identification of these fishes. It provides descriptions of physical features, diagnostic photographs and habitat information to help with species recognition. The book is not a definitive key, but it does offer a quick reference for identification for commercial and recreational fisherman, scientists and others that frequently come in contact with these fish. Careful identification is the first step toward appropriate management and conservation.

The book also includes information about reducing the risk of shark attack as well as procedures for the protection, handling and release of entangled marine mammals and turtles.

The book is available for $25 from Rhode Island Sea Grant, with discounts offered for multiple purchases. You can purchase the book online or by calling (401) 874-6842.

NOAA Fisheries is dedicated to protecting and preserving the nation's living marine resources, and the habitat on which they depend, through scientific research, management and enforcement. NOAA Fisheries provides effective stewardship of these resources for the benefit of the nation, supporting coastal communities that depend upon them, while helping to provide safe and healthy seafood to consumers and recreational opportunities for the American public.

Rhode Island Sea Grant is part of the national network of 30 Sea Grant Colleges and institutional programs located in coastal and Great Lakes, states, Hawaii and Puerto Rico. Located within NOAA Research, the National Sea Grant Program encourages the wise stewardship of marine resources through research, education, outreach and technology transfer. Sea Grant is a partnership between the nation's universities and NOAA that began in 1966, when the U.S. Congress passed the National Sea Grant College Program Act.

NOAA is dedicated to enhancing economic security and national safety through the prediction and research of weather and climate-related events and providing environmental stewardship of the nation's coastal and marine resources. NOAA is part of the U.S. Department of Commerce.

Bitácora

QUANTITATIVE ECOSYSTEMS INDICATORS FOR FISHERIES MANAGEMENT

The Symposium will be held from 31 March to 3 April 2004 at the UNESCO Headquarters, 7 Place de Fontenoy, 75352 Paris, 7th Arrondissement, France.

Fisheries are deeply imbedded within ecosystems, which are now rightly viewed as an integrative level for fisheries management. The effects of fishing on marine ecosystems have been widely recognized, as has the need to move toward an ecosystem approach to fisheries (EAF). Such an evolution is being sought by society for all exploited natural resources. Fisheries are no exception.

To meet this new challenge, we need a strategy that will elaborate operational frameworks. This will require the development of quantitative indicators at the ecosystem level, and the definition of innovative reference points to provide bridges between scientific results, society's needs, and an effective EAF.

The SCOR/IOC Symposium is planned to support scientific aspects of using indicators for an EAF, and aims to review existing indicators as well as to develop new indicators reflecting the exploitation and state of marine ecosystems. The Symposium is also aimed at evaluating the utility of indicators relative to specific objectives. A session on the Symposium's last day will be devoted to summarizing the major themes and conclusions of the Symposium.

The Symposium will deal with two major themes. The first theme will provide an overview of the vast range of indicators of exploitation and state of ecosystems that are being developed for fisheries management from an ecosystem perspective. The second theme will cover the scientific basis for integrating indicators into an effective EAF. This comprises the evaluation of indicators, the definition of operational frameworks and the communication to stakeholders of inferences based on indicators.

1. Indicators for an Ecosystem Approach to Fisheries

2. Evaluating, Implementing, Communicating and Using Indicators

http://www.ecosystemindicators.org/program.htm