### Informe final\* del Proyecto DS005 A regional initiative for conservation science in the Sea of Cortes

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### Resumen:

Proyecto financiado con recursos de The David and Lucile Packard Foundation En recientes décadas la conservación en la región del Mar de Cortés ha presentado un pobre progreso, una de las principales dificultades para revertir la tendencia de la degradación del ambiente y los recursos ha sido la ausencia de una relación de trabajo efectiva entre científicos ambientalistas y tomadores de decisiones. Es necesaria una iniciativa regional orientada hacia el entendimiento y manejo del Mar de Cortés como un todo, así como la inclusión de la gente que vive en los ecosistemas. Nosotros proponemos una iniciativa regional para: a) sintetizar el conocimiento existente, b) llevar los conocimientos de la ciencia conservacionista a la toma de decisiones, y c) visualizar escenarios alternativos para el desarrollo sustentable de la región. Esta propuesta de un año intenta comenzar tal iniciativa, capitalizando y construyendo, sobre los éxitos de esfuerzos regionales previos, y trabajando bajo el paradigma del Manejo Basado en los Ecosistemas, incluvendo una acercamiento científico robusto, obietivos de maneio a largo plazo. y el establecimiento de sociedades que promuevan la participación ciudadana en la creación de una nueva visión de desarrollo y en establecer los objetivos de manejo regionales. El objetivo de este proyecto es 1) desarrollar una síntesis del conocimiento ecológico y socioeconómico actual del Golfo de California, a través de la búsqueda de principios generales y patrones de predicción, y el desarrollo de un modelo conceptual del sistema del Golfo de California; 2) detectar y comunicar problemas críticos de sustentabilidad de una manera útil para los manejadores de los recursos y los encargados de la elaboración de las políticas, y 3) proveer de lineamientos prioritarios para la conservación de los recursos desarrollados en colaboración con otros sectores. El reporte contendrá un modelo conceptual que presentará un análisis ecológico y socioeconómico integrado del Golfo de California y de sus interacciones entre variables físicas, ecológicas y controladas por el hombre en la región. Para alcanzar este modelo conceptual a gran escala, la iniciativa utilizará en primer lugar la información existente y posteriormente incluirá una serie de estudios específicos que están diseñados para proveer información clave faltante que se requiere para integrar el trabajo.

<sup>• \*</sup> El presente documento no necesariamente contiene los principales resultados del proyecto correspondiente o la descripción de los mismos. Los proyectos apoyados por la CONABIO así como información adicional sobre ellos, pueden consultarse en <u>www.conabio.gob.mx</u>

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David and Lucile Packard Foundation — Grant # 2004-28163

# "A Regional Initiative for Conservation Science in the Sea of Cortés"

**Progress Report** 

Prepared by Exequiel Ezcurra

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# David and Lucile Packard Foundation — Grant # 2004-28163 "A Regional Initiative for Conservation Science in the Sea of Cortés"

### **Progress Report**

Exequiel Ezcurra

### Introduction

This project was started in May, 2005, when I left Mexico City to move back to the Sea of Cortés region and undertook the direction of the project as Principal Investigator. The specific objectives funded under this grant and the ensuing deliverables include, by June 1, 2005, the following items:

(1) Develop a **regional network of scientists and decision-makers** that will lay the foundation for the pursuit of longer-term EBM goals. This network should contribute to the scoping of the synthesis report and potentially serve as an advisory committee for the report, as it develops.

**Deliverables:** report detailing network development progress, including a list of participants

(2) Develop a **summary of the proposed synthesis report**, identifying the main environmental problems that will be examined in the second phase of the project, including refined research questions and hypotheses to be tested, and a framework for the second stage of the project.

### Deliverables:

- Detailed descriptions of research components, including timeline and deliverables (i.e., academic papers)
- Identification of researchers responsible for each research component, and statement of agreement with each organization/individual
- Outline of final report, including draft chapter headings
- Identification of audience and distribution mechanisms for the final report
- (3) Establishment of an **open-access website** for information sharing. This resource will be the hub for EBM-relevant information (i.e.reprints, references, biological databases, digital imagery etc.) and serve to encourage and support collaboration between organizations.

### Deliverables: launch of newly established website

In the following pages, I will describe my progress on each of these three objectives.

# Objective 1. Develop a regional network of scientists and decision-makers that will lay the foundation for the pursuit of longer-term EBM goals.

### 1. Institutional agreements

I have invested a substantial amount of time pursuing this objective. I have established signed Memoranda of Understanding with different research organizations both within the region (CICESE, CIBNOR, UABC), and also with those from outside the region that work in the Sea of Cortés (INE). I have also established a working collaborative relationship with the Center for Biodiversity Conservation at UC Riverside (see the "Affiliated Faculty" list at http://www.ccb.ucr.edu/ccbpeople/affiliated.html). Among these agreements, the Memorandum of Understanding signed with Mexico's National Institute of Ecology was particularly significant, as it was also co-signed by Mexico's Minister of the Environment, José Luis Luege Tamargo, and the event got very good press coverage, both on TV and on the national newspapers. Some news clippings have been attached to this report as Appendix 1.

I have also spent a significant amount of time working with the regional NGOs to explain to them the EBM initiative and what it entails from the point of view of science. Among the many meetings I attended, I want to draw especial attention to the summit of the three international conservation NGOs, held in Guaymas, Sonora, in October 2005. This was intended to be a closed meeting to define some guidelines for joint conservation work in the Gulf of California region, but the three conservation groups decided to invite me to present the basic idea behind the Regional Initiative for Conservation Science.

At present, I am working with two of these large NGOs in cooperative aspects that directly or indirectly deal with the *Regional Initiative for Conservation Science in the Sea of Cortés*, or with some of its aspects. Conservation International is working with me on the development of an electronic version of Brusca and Findley's listing of marine invertebrates and fish species of the Sea of Cortés. When finished, this database will be available on the Internet for the participants of the synthesis study, and for the general public and decision makers. The Nature Conservation science at a really large scale, and we are doing this exercise by trying to understand the distribution of coastal deserts in the world, including Baja California, and the forces that regulate their ecological functioning. It is my belief that this joint exercise will contribute significantly with new insights and new methods for the synthesis study.

### 2. Research networks

a) In September, 2005, I organized a workshop in cooperation with the Center for Biodiversity Conservation at UC Riverside, CICESE, and CIBNOR, to launch a network of conservation scientists working in the Sea of Cortés region. The meeting counted with the participation of 22 researchers working in the region specifically on aspects of conservation science. A full list of all the participating researchers is given in Appendix 2.

Currently I am preparing a workshop that will take place in May 2006, to bring all these researchers, and others, together, and develop a joint ecoregional map of the Baja California Peninsula and the Sea of Cortés. This, I believe, is extremely important for the synthesis work, as it will set up the base for large-scale studies, and it will also define a common nomenclature on the ecological regions of the Gulf of California. Trying to diversify funding for the region, I have obtained a moderate support (12,000 US\$) for this ecoregional project from the ALCOA Foundation. This funding is going

directly to Charlotte González, a young researcher and GIS specialist working out of Ensenada full time on the ecoregional analysis.

b) On the other hand, for the planning of the actual synthesis report I have decided, after a detailed search, to team-up in collaboration with Drs. Saúl Álvarez-Borrego and Rubén Lara, from CICESE. They have accepted to be my collaborators on this project, and are extremely enthusiastic about it. Dr. Saúl Álvarez Borrego was the founding Director of CICESE and is an immensely respected researcher in the region. In 2005, he was honored with the Scientific Research Award for northwestern Mexico (i.e., the Sea of Cortés Region) for his lifelong scientific achievements in the region. Dr. Rubén Lara was one of the founders of the Inter-American Institute for Global Change Research (IAI), and was also the founding Director of Pronatura Noroeste, a conservation NGO in Mexico. Thus, both have superb credentials as scientists, and also an outstanding track record as persons committed to environmental conservation.

The organizing team is also integrated by Dr. Elisabet Wehncke, my postdoctoral associate, who works out of Ensenada. For the last seven months, we have been having regular meetings to plan the organization of the synthesis study. At this stage, we already have a proposed table of contents, and, perhaps more important, a fully developed database of researchers working in the Sea of Cortés. We have not yet sent-out invitations to researchers to participate in the synthesis report, as we do not want to stir the scientific community before discussing with the Packard Foundation the second phase of the project, but by-and-large we are ready to initiate the process. A full description of the proposed table of contents, and of the researcher database, is given in Appendix 3.

Objective 2. Develop a summary of the proposed synthesis report, identifying the main environmental problems that will be examined in the second phase of the project, including refined research questions and hypotheses to be tested, and a framework for the second stage of the project.

### 1. Synthesis report summary

As stated above, I have already spent a substantial mount of time and effort working together with Drs. Álvarez-Borrego, Lara, and Wehncke to define the contents of the synthesis report. We have already developed a full table of contents, and a database of Gulf researchers. Finally, we have identified, from that list, which researchers we would like to invite to participate in the synthesis study. We are now working on the detailing of the project, including a fuller description of research components, timeline, and deliverables. We are also, at this stage, working in the identification of the audience and distribution mechanisms for the final report.

### 2. Other research products

While working on this project, a number of ancillary research products has also been produced, which will help in the development of the synthesis project:

a) The effort to develop collaborative networking has already yielded some products that may help us advance with the synthesis work. On the one hand, I had the opportunity to promote the publication of a very exciting book —*Dry Borders*— that describes the environment in the amazing wilderness corridor that goes from the marine environments of the Upper Gulf, to the coastal environments of the Gran Desierto, to the Pinacate volcanic shield, and into the protected areas of southern Arizona (Cabeza Prieta Refuge, Organ Pipe Cactus Natural Monument, Goldwater Air Force Range, and Sonoran Desert Natural Monument). *Dry Borders* is, in many aspects, a first effort to make a regional scientific synthesis, although at a smaller scale than what we pretend for the whole Gulf. Based on the MOU signed with INE, I was able to get funds from both INE and *Fondo Mexicano para la Conservación de la Naturaleza*, to finish the editorial process. The book is now being printed at the University of Utah Press, and will be out in a month or so (see http://www.uofupress.com/store/product100.html).

b) I also had the opportunity, at the beginning of the startup project, to team-up with Alejandro Robles (grupo NOS) and María de los Ángeles Carvajal (CI-Gulf of California program) to write jointly the chapter on biological conservation for the book on the Natural History of the Gulf of California. Together with the effort to make a synthesized analysis of the Gulf for the book *Defying Ocean's End: An Agenda for Action* (Linda Glover & Sylvia Earle, editors; Island Press, 2004), this new book-chapter synthesizes the history of conservation in the Gulf. A copy of these manuscripts is presented in Appendix 4 of this report.

c) Additionally, I worked very closely with the *Fundación Mexicana de Educación Ambiental* (FUNDEA) and the Mexican Comisión for Protected Natural Areas (CONANP) to achieve the inclusion of the Islands of the Sea of Cortés in UNESCO's World Heritage list. Although this project was started by Rodolfo Ogarrio, from FUNDEA, and myself as former President of INE, I devoted a strong effort already as PI of the *Regional Initiative for Conservation Science in the Sea of Cortés* to make sure that the project was carried to good term. It was also stimulating to see that, among the references cited by the IUCN study to support the declaration, our book *A New island Biogeography in the Sea of Cortés* (Case, Cody, and Ezcurra; Oxford University Press, 2002) played a critically important role, together with the giant screen film *Ocean Oasis*.

d) I also had the chance to participate as invited speaker in the workshop titled "Developing and delivering scientific information in response to emerging needs", organized by the Ecological Society of America in Mérida, Yucatán, January 8–12, 2006 (see http://www.esa.org/mexico/). The specific workshop, organizad by Hague Vaughan (Canada), Manuel Maass (México) and Robert Waide (USA), had as invited speakers Steward Pickett, Ariel Lugo, and myself. In that workshop I presented a talk titled "A Knowledge system for a sustainability in the Sea of Cortes." After my presentation, I had the opportunity of discussing the ideas behind the project with some very prominent members of the ESA, enriching my approach and reflecting from new perspectives on the challenges that this project poses.

e) I also initiated a collaborative initiative with the Institute of the Americas at UCSD. In May 2005, during the International Course "Francisco Ealy Ortiz" for Journalists a whole day was devoted to talks and discussions on the environmental problems of the Sea of Cortés, and issues of regional sustainability.

f) Additionally, I participated in myriad conferences, workshops, talks, and events with the aim of bringing the sustainability issues of the Gulf of California to public attention. Of these, I want to highlight my participation in the *"Fiesta del Mar"* event, organized by the Monterey Bay Aquarium in Monterey, California. I participated as scientist with a talk on the natural history of the Gulf, together with the Mexican music band Maná, and a group of latino film and TV actors that promote nature conservation.

g) Finally, I want to highlight that the project has fulfilled its role as mediator in the resolution of environmental conflicts: When the Natural Resources Defense Council (NRDC) put forward the possibility of initiating a boycott to the Mexican company Ocean Garden, I had the chance of calling and hosting a negotiating table, which started in the San Diego natural History Museum in June 2005, and has continued to this date, under the mediation of Alejandro Robles and Gastón Luken, from the NOS initiative.

# Objective 3. Establishment of an open-access website for information sharing. This resource will be the hub for EBM-relevant information (i.e., reprints, references, biological databases, digital imagery etc.) and serve to encourage and support collaboration between organizations.

We have made a comprehensive compilation of information on the Gulf, a large proportion of which is ready for uploading into the Internet. Among the information compiled, we have (a) an updated and comprehensive database on the biota of all the Gulf islands; (b) marine fauna database for the Gulf of California, developed by Lloyd Findley and Richard Brusca, and supported by the "*Regional Initiative for Conservation Science*" for its electronic edition; (c) full digitalization of all the glass-plate photographs of the environments in Baja California, taken by Edward W. Nelson in 1905, as a precious resource for long-term ecological research on ecosystem change in the region; and (d) the full and most updated listing of Baja California plants, including a detailed listing of plants from estuaries and coastal lagoons, of great relevance for the project.

This information has not yet been uploaded to the Internet, expecting to discuss with the Packard Foundation the second phase of the project (i.e., implementation). I decided that there was a risk of putting all that information on line, and consequently generating regional expectations, without knowing for sure how the next phase of the project will develop.

### **APPENDICES**

### Appendix 1. News clippings related to the project



# Collaboration raises hopes for Gulf of California

**S** ix months after a leading U.S. environmental organization criticized Mexico's government-owned scafood marketing company for promoting destructive fishing in the Gulf of California, the firm has agreed with the green group to collaborate on species protection in the 700-mile-long water body.

The accord, reached in a mid-June meeting at San Diego's Museum of Natural History, involves not only the Natural Resources Defense Council (NRDC) and Mexico's stateowned Ocean Garden Products, but also representatives of large- and small-scale gulf fishing interests.

The parties planned to gather late this month in Puerto Peñasco, Mexico to draft a memorandum of understanding.

"We don't know if it's going to work or not because it's too early to tell, but it was the first time we heard something like that," says NRDC attorney José Yunis."I'm giving them the benefit of the doubt. If this can be solved in a positive way, taking all the parties into consideration, it could be a worldwide example."

Last January, NRDC targeted Ocean Garden and Mexican officials in a campaign in which it charged little is being done to improve fishing practices and enforce species-protection regulations in the Gulf of California.

Known also as the Sea of Cortez, the water body is one of the main fisheries from continued on page 8 \$

# In Colombia, a turning point for Andean condor

**C** ircling silently on rising columns of air, two Andean condors glide above a narrow canyon in Colombia's Chingaza National Park looking for a deer or tapir carcass below. At the edge of a cliff on this glittering June day, soldiers from an anti-guerrilla mountain battalion whoop and cheer.

"We never used to see these magnificent creatures," says one soldier. "Thank God, they're here again."

Educational initiatives stressing bird conservation and an ambitious breeding initiative coordinated by the San Diego Zoo in the United States have brought the Andean condor (Vultur gryphus), the world's largest raptor, back from the brink of extinction here. From fewer than 10 individuals in the mid-1980s. Colombia now has more than 130 Andean condors flying in their native habitat in the high cloud forests and mountain plains, known as páramos. But the bird's survival here is

not assured. Since 2001, funding cutbacks and a

lack of attention from government environmental agencies have posed renewed risk for the condor, a national symbol featured on Colombia's currency; stamps and government seal.

Environmental authorities here acknowledge they have lost track of nearly all of the 65 condors bred at U.S. zoos and liberated in national parks here since 1989. There have been no releases into the wild of captive-bred condors for more than a year, and bureaucratic holdups related to quarantines for Avian flu have delayed the delivery of eight other U.S.-raised Andean condors for months.

Now, faced with withering criticism from Colombian biologists and the local press, the Ministry of Environment, Housing and Territorial Development is prioritizing the endangered condor again so the repopulation program's progress isn't squandered. Says Leonardo Muñoz, the ministry's ecosystems director:"The condor is not only our national symbol, but also one of

continued on page 10  $\oplus$ 

A monthly report on development and the environment in

Latin America

# **July 2005** Vol. 7 - No. 9 Inside 2 Around the region Controversial dam in Brazil gets its 3 operating permit Forest-protection movement gains force in Argentina 4 Amid uncentrelled cutting, Nicaragua 5 eyes logging ban CENTERPIECE: Forest-concession program in Maya Biosphere seen to 6 boost conservation 0&A: Meet a leader of campaign to curb region's lucrative 12 wild-animal trade



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Política y botín

Golfo de California como un ecosistema regional.

"Y es un ejemplo más de la dimensión que la Semarnat le da a esta región y de su interés por considerar la mejor información científica disponible para la toma de decisiones, fortaleciendo y diversificando las actividades de cooperación".

Por su parte, el Director de la División de Investigación Científica del Museo de Historia Natural de San Diego, Exequiel Ezcurra, calificó al Golfo de California como un ecosistema modelo, con grandes posibilidades de manejo sustentable, debido a la riqueza biológica con que cuenta.

"Y yo siempre he creído que si podemos imaginar un futuro sustentable para el Golfo de California, a lo mejor eso abre puertas de esperanza para poder concebir manejar de manera ambientalmente sustentable todo el país y propiciar un mejor futuro para la sociedad".



AA

Jueves 17 de noviembre de 2005

# Aumentan acciones para proteger a la vaquita marina

Angélica Enciso L.

Además de la ampliación del polígono de la reserva de la biosfera del Alto Golfo de California para conservar la vaquita marina, que aumentó en 126 mil hectáreas, que se suman a las 934 mil con que contaba, se busca establecer acuerdos con los pescadores para que utilicen artes de pesca menos agresivas y se buscan mecanismos para la recuperación del delta. Durante la firma del memorando de entendimiento entre el Instituto Nacional de Ecología (INE) y el Museo de Historia Natural de San Diego, California, que contará con recursos de la fundación Packard, y con el que se establecerán proyectos de conservación, el secretario de Medio Ambiente, José Luis Luege Tamargo, dijo que este es un caso en el que las decisiones se toman con fundamentos científicos, ya que dichos criterios históricamente han sido ignorados en México.



Búsqueda Rápida



### Búsqueda avanzada









# INE y Museo de San Diego al rescate de la vaquita

marina (Raúl Cruz)



La vaquita marina, que es la única especie de marsopa endémica del Alto Golfo de California —una pequeña región de mar al norte de México— se encuentra en grave peligro de extinción pues se calcula que sólo tiene una población que oscila entre 600 y 800 ejemplares. Además su reproducción es lenta ya

(2005-11-17)

que la hembra tiene una sola cría durante la primavera cada dos años o más y después de una gestación de alrededor de once meses, sin contar que su periodo de vida es de 22 años.

Por tal motivo el Instituto Nacional de Ecología (INE) y el Museo de Historia Natural de San Diego firmaron el convenio de Entendimiento para la Cooperación Científica en el Área de Interés Compartido del Golfo de California, el cual protege el hábitat de esta especie.

Uno de los puntos sobresalientes del convenio es la ampliación del polígono de protección de la vaquita marina, mismo que registró un crecimiento sustancial y quedó en poco más de mil 260 kilómetros cuadrados, 897 de los cuales están dentro de la Reserva de la Biosfera Alto Golfo de California y Delta del Río Colorado.

Adrián Fernández Bremauntz, presidente del INE, explicó que el propósito principal del Memorándum de Entendimiento es sentar las bases para facilitar y promover los esfuerzos de cooperación entre las instituciones, a fin de generar mecanismos orientados a preservar el Golfo de California como un ecosistema regional.

"Es un ejemplo del interés que tenemos por la región, además de demostrar nuestro interés por considerar la mejor información científica disponible para la toma de decisiones, fortaleciendo y diversificando las actividades de cooperación".



Lunes 5 de diciembre de 2005

• El ecosistema, barrera de contención de huracanes y tsunamis, expone especialista

# Acelerada destrucción de manglares deja inermes a poblaciones costeras

• La voracidad de empresas turísticas, principal factor por el que se degradan estas zonas

ANGELICA ENCISO L.



Zona de manglares en Punta Chueca, Sonora, reducto de la cultura seri FOTO José Carlo González

El manglar es el ecosistema que más rápido desaparece en México, debido a los desarrollos turísticos y la acuacultura. En el Golfo de México queda 50 por ciento de la superficie original de la vegetación, que funciona como barrera natural contra los huracanes; en el sureste prácticamente ya no existe, y en el Golfo de California hay lagunas costeras con 90 por ciento de pérdidas. Es una situación "potencialmente trágica", señala el investigador Exequiel Ezcurra.

Ezcurra, director de la División de Investigación Científica del Museo de Historia Natural de San Diego, es especialista en manglares. En entrevista con *La Jornada* señala que el mangle no crece en cualquier lado. "Siempre hay un río, está la laguna costera, la ribera del mar y la barra arenosa, sin la cual no puede existir, ya que no tolera la erosión de las olas". Se trata, precisa, de un ecosistema complicado que se formó hace 12 mil años, cuando acabó el último periodo de glaciación.

La destrucción de los manglares, agrega, va asociada a la devastación de lagunas costeras: "se abren las barras arenosas para dragado, se modifica el curso del agua, se cortan los mangles y se rellenan, por necesidades de los hoteles y la acuacultura. No sólo se destruye el mangle en sí mismo, sino todo el ecosistema y los procesos que ahí mantienen la vida".

Es dramática la velocidad a la que desaparece esa vegetación en México por la expansión agrícola, la actividad hotelera y la acuacultura. En el Golfo de California se ha perdido 80 por ciento de los manglares en sitios como laguna de Lobos, aunque hay áreas, como las marismas nacionales, que están bien conservadas. En el Golfo de México, desde la Laguna Madre de Tamaulipas, hasta la Laguna de Términos, en el sur, se ha perdido 50 por ciento de los manglares por la contaminación, la tala y las granjas acuícolas.

"En este momento en México es el ecosistema que más rápido está desapareciendo, más que el bosque mesófilo o la selva tropical; necesitamos de manera urgente normas para proteger los manglares".

El ex presidente del Instituto Nacional de Ecología advierte que la crisis por los humedales costeros la acabamos de ver con los huracanes, ya que buena parte de sus estragos se debe a que en los 20 años recientes la expansión urbana en esos lugares se ha dado sobre ecosistemas costeros frágiles, en manglares y en las barras costeras que los sustentan.

"Es el ecosistema que protege al continente de los embates del mar; al desaparecer y construirse grandes hoteles o centros urbanos, el impacto de los huracanes llega completo a esos centros urbanos. Si se construyen hoteles en donde había una barra arenosa llena de manglares, como es el caso de Cancún, ¿cuál es la sorpresa de que la zona sea afectada por los ciclones?"

El especialista expresa su preocupación porque a pesar de esto el año pasado se puso en marcha la tercera etapa de Cancún, que trae consigo una mayor devastación del ecosistema. Recordó que en el caso del impacto del *tsunami* en el sureste de Asia, las regiones más afectadas fueron aquellas donde se habían talado los manglares, mientras donde había una franja costera de este ecosistema el fenómeno perdió energía y no llegó a impactar las regiones costeras.

"Lo veo como un problema potencialmente trágico: la repercusión en Cancún ya se vio, en el delta del Mississippi también. Lo que preocupa es que no parecemos estar aprendiendo. A pesar de que tenemos la información científica, las presiones individuales de los desarrolladores para rellenar manglares y erigir complejos turísticos, o para hacer granjas acuícolas, siguen siendo muy fuertes", señala Ezcurra.

El cambio a la norma 022 de manglares, que se dio en 2004, fue un error, evalúa. "La norma habla de compensar, pero el problema es que los manglares no están en cualquier lado; están en una angosta franja entre la tierra y el mar. Entonces si vas a ocupar una parte de esa franja para construir hoteles, ¿cómo compensar?"

En el caso de selva, puntualiza, se puede cortar una hectárea y en un potrero sembrar árboles, "pero si se corta una hectárea de mangle para hacer un hotel, no hay otro lugar donde se pueda plantar. Lo que se hace es un cambio de uso de suelo. Hay un problema conceptual muy serio alrededor de la norma. No es posible ni restaurar ni compensar manglares, porque una vez que se tala se pierde para siempre".

Dice que esto es lo que se hace en la tercera etapa de Cancún; se rellenarán mangles para hacer campos de golf y más hoteles. Menciona que se plantea la posibilidad de compensar económicamente, pero "yo honestamente me opongo ferozmente a eso, porque sería dar autorización a las empresas para que talen y den dinero para hacer conservación en otro lado, mientras la destrucción del ecosistema ya ocurrió".

Reconoce que hay zonas, como Baja California, donde la única opción de la economía es el turismo, pero debe haber claridad sobre el tipo de modelo a seguir, porque hay experiencias de turismo sustentable, como la observación de ballenas en San Ignacio o de pinturas rupestres en la sierra de San Francisco.

En el otro extremo "está el turismo con enormes canchas de golf y hoteles, que demanda servicios y con gran impacto ambiental". Si bien el turismo es la vocación de varias regiones de México, indica, "falta una discusión seria acerca de qué es turismo sustentable, sin que se pierdan los recursos naturales".

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# Gulf of California given spotlight as U.N. World Heritage site

### By Sandra Dibble

UNION-TRIBUNE STAFF WRITER

July 17, 2005

With its rich marine life and numerous endemic species, the Gulf of California has been called "the world's aquarium." Last week, the region joined an exclusive club – that of U.N. World Heritage sites.

As development pressures increase along the gulf's shores, conservation groups in the United States and Mexico are celebrating their role in bringing about the distinction to 244 uninhabited islands, islets and their surrounding waters.

"It should have been there from the start," said Ernesto Enkerlin, head of Mexico's National Commission for Protected Areas. "If there's some kind of aggressive development, we would hope that this will help us curtail or prevent it."

The Mexican government in 1978 conferred protected status on the archipelago of more than 900 islands in the Gulf of California, also known as the Sea of Cortez. The World Heritage Committee's designation, limited to the most closely studied islands, does not create additional safeguards, but proponents say it puts an important spotlight on the region.

"It's creating responsibility. It's creating visibility. It's creating international attention," said Enkerlin. "In the future, we need to do at least as well as now or better."

The designation can be a powerful tool. Environmentalists used the 1993 World Heritage designation of Baja California's coastal lagoon of San Ignacio to help defeat a proposed salt plant in 2000.

"This will make it much easier for government officials as well as others to help keep it as pristine as it is," said Michael Hager, executive director of the San Diego Natural History Museum.

The designation was made last week in Durban, South Africa, by the World Heritage Committee of the U.N. Educational, Scientific and Cultural Organization, known as UNESCO. It is the third natural area in Mexico with the status: the other two are Sian Ka'an, a biosphere reserve on the Yucatan peninsula that includes tropical forests, mangroves and marshes; and the lagoons off the Baja California peninsula frequented by migrating whales.

Turquoise waters, brilliant desert reflection and the "striking natural beauty in a dramatic setting formed by rugged islands with high cliffs and sandy beaches" are described in the islands' designation.

The site is home to 695 plant species, more than any other on the World Heritage list. It contains 891 fish species, 90 of them endemic or native, according to the designation; it includes 39 percent of the world's species of marine mammals and a third of the world's marine cetacean species.

"Almost all major oceanographic processes occurring in the planet's oceans are present in the property, giving an extraordinary importance for study," a UNESCO statement says.

The effort to include the region in the World Heritage list was suggested by a Mexican nongovernmental organization, the Mexican Foundation for Environmental Education, or FUNDEA.

But crucial support also came from north of the border. An important player was the San Diego Museum of Natural History, through its scientific studies, educational programs and the acclaimed IMAX film "Ocean Oasis" funded by the museum and the Mexican conservation group Pronatura.

In Mexico, the recognition "sends a very strong message," said Exequiel Ezcurra, the museum's director of scientific research and former director of Mexico's National Institute of Ecology. "It tells the nation that their government and committed NGOs (nongovernmental organizations) want to protect this site."

Ezcurra said much of the scientific information presented for the designation came from research at the museum. A crucial document was the book "A New Island Biogeography of the Sea of Cortés," produced by the museum, the University of California Los Angeles and the University of California San Diego.

Another San Diego-based supporter of the designation has been the International Community Foundation, which worked with other conservation groups to purchase a Gulf of California island, Isla Espiritu Santo, in 2003 from a land cooperative to protect it from development.

The World Heritage site designation can bring more funds to the area and more tourists, both of which can present benefits and challenges, said foundation President Richard Kiy. "It will bring new opportunities for the whole region, but communities will have to be good stewards,"



### **Exequiel Ezcurra**

#### By Pete Rowe STAFF WRITER

February 15, 2006

### QUESTION: Congratulations on receiving the Pew Fellowship.

**ANSWER** : In many ways it is a dream come true for me because it is a very prestigious award ... . The people who have gotten this award are really important people who have really made a difference in science and conservation.

Doesn't this great honor come with a large sum of cash?

The Pew Fellowship will provide \$50,000 each year for three years. What I want is to use that money to network with regional scientists.



Enriqueta Velarde has been working for 25 years now on Rasa Island (in the Sea of Cortez). She has the most fantastic long-term data set on seabirds in the world, the relationship with El Niño, La Niña, cyclones, what happens with the nesting of seabirds. She spends three months each year on the island. She's like the Jane Goodall of seabirds.

She's been telling me she'd like to come to San Diego for a year to write and do number crunching. What I intend to do is use these dollars for projects like that."

### Projects focusing primarily on seabirds?

No. I am embarked on a project at present which is, at least personally, quite a challenge. The project is to produce a scientific synthesis on what we know about the natural history and the ecology of the Sea of Cortez.

### You've been hired twice by the San Diego Museum of Natural History. How did that happen?

The big miracle is why did the San Diego Natural History Museum decide to hire me the first time, in 1997. I didn't apply directly for this job. I was invited to apply.

### What was the museum seeking?

Someone who was bilingual, as well as positively bicultural, and had researched in this area or was a desert biologist. Also, someone who had experience in management, etc., etc.

### Given your research in the Sea of Cortez and graduate studies in England, weren't you a natural choice?

Desert biologists in North America, there's not a large number. Bilingual, even less. Those who have studied in Baja California, smaller still. Management experience? You start readying the list and you get down to two or three.

### Why did you leave the museum in 2001 and then return last year?

In 2001, I got put under very strong pressure to take a position with the Mexican federal government. It is very difficult to say no to the office of the president of a federal republic – especially your own federal republic. When I got the invitation from the Mexican federal government, from President Fox's office, the museum was kind enough to give me a leave of absence.

### Why is science so often ignored by policy makers?

Some philosophers of science believe that scientists are surrounded by a protective jargon and write in inaccessible journals. There is an abyss between things that happen in the natural world and where scientists publish their work. Some people say that we need more scientists who can attempt to work on that boundary.

### For instance?

One of my favorite examples is Jared Diamond. I was amazed at how many decision makers had read his books ("Guns, Germs and Steel" and "Collapse: How Societies Choose to Fail or Succeed") and are aware of his ideas. . .

I'd like to bring scientific people into the boundary between science and the actual world, the social world where real people live and make decisions.

### How did you reach this conclusion?



NELVIN CEPEDA / Union-Tribun Exequiel Ezcurra heads to Sea of Cortez.

A number of things shaped my thinking. One was here at the museum, being involved with the IMAX film "Ocean Oasis." I was working with the director and the producer on the story line for the film. For me, that was a life-changing experience for sure.

### Why?

The movie played for six months at the Smithsonian, in Mexico City and other large Mexican cities. It gives you a totally different feeling when people on the street ask you questions about the environment because they've seen the film.

### Based on your time in the Fox administration, would you say that politicians are receptive to scientific research?

Very often, government officials don't make the right decision because they are ignorant of the magnitude of the problem. Unfortunately, it is also often the case that government officials will make decisions on short-term factors, ignoring the fact that it will have detrimental long-term effects."

### What can be done about that?

This also has to do with society. If you are able to show society that some short-term actions really damage society in the long term, some societal groups may want to put pressure on government officials to make wiser decisions.

Bringing science to common citizens, not only government officials, is something that is desperately needed.

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# Appendix 2. List of participants in the Baja California/Sea of Cortés conservation network

# Appendix 3. Proposed table of contents for the synthesis report, and basic listing of researcher database for the Gulf of California

### a. Proposed table of contents for the synthesis report (in Spanish, at this stage).

### Título tentativo: EVALUACION Y SÍNTESIS DEL ESTADO AMBIENTAL DE LOS ECOSISTEMAS DEL NOROESTE DE MEXICO

Última Reunión: 10 Marzo 2006

Participantes: Exequiel Ezcurra, Saúl Álvarez-Borrego, Ruben Lara y Elisabet Wehncke

**Propósito del proyecto**: Hacer una síntesis del conocimiento sobre el estado ambiental de los ecosistemas marinos y terrestres del Noroeste de México. Se propuso la posibilidad de dejar abierto el desarrollo a futuro de una serie de volúmenes, los cuales se podrían generar durante los próximos cinco años.

### Temas identificados para el contenido, y autores posibles:

Capítulo 1. *Historia de la investigación ambiental* Saúl Alvarez, Richard Schwartzlose y Exequiel Ezcurra

Capítulo 2. Geología y Geofísica

Javier Helenes, Reginaldo Durazo, Alfonso Mascarenhas y Rubén Castro

- Capítulo 3. Paleoecología
  - 1. Juan Carlos Reguera (últimos 9.000 años)
  - 2. Jose Carriquiri (Antropoceno)
  - 3. Juan Contreras, Arturo Barajas y Timothy Baumgartner (escamas)
  - 4. Javier Helenes (últimos 50.000 años) y María Cristina Peñalba (palinología)

5. Tom Deméré (paleobiología de pinípedos y cetaceos), Brett Riddle y Cynthia Riginos (paleobiogeografía)

- Capítulo 4. *Meteorología y clima* Edgar Pavia y Teresa Cavazos
- Capítulo 5. Oceanografía física Silvio W. Marinone
- Capítulo 6. Variabilidad temporal y anomalías de la dinámica física Miguel Lavin y Antonio Badán

Capítulo 7. Procesos biogeoquímicos marinos Stephen Smith, Ruben Lara y Saúl Alvarez

Capítulo 8. Procesos biogeoquímicos terrestres Manuel Maass y Victor Jaramillo

Capítulo 9. <i>Ecosistema pelágico</i> Oscar Sosa y Miguel Angel Cisneros Mata
Capítulo 10. <i>Ecosistema bentónico</i> Elba Escobar Briones
Capítulo 11. <i>Mamíferos</i> Erik Mellink y Ricardo Rodríguez Estrella
Capítulo 12. <i>Aves</i> Adolfo G. Navarro Y Enriqueta Velarde
Capítulo 13. <i>Anfibios y reptiles</i> M.C. Blázquez y Bradford D. Hollingsworth
Capítulo 14. <i>Plantas</i> Steve Bullock
Capítulo 15. <i>Manglares</i> Francisco Flores
Capítulo 16. <i>Fondos marinos</i> Rick Brusca
Capítulo 17. <i>Estuarios y Lagunas costeras</i> Saúl Alvarez y Rick Brusca
Capítulo 18. <i>Arrecifes coralinos</i> Luis Calderón
Capítulo 19. <i>Arrecifes rocosos</i> Phil Hastings
Capítulo 20. <i>Matorral costero</i> Illiana Espejel
Capítulo 21. <i>Oasis</i> Ernesto Franco y Elisabet Wehncke
Capítulo 22. <i>Islas</i> Alfredo Zavala González y Lorena Linacre
Capítulo 23. <i>Ventilas hidrotermales</i> Luis Soto y Elba Escobar Briones
Capítulo 24. <i>Sistemas de agua dulce</i> Aurora Breceda, Luis Segura Vernis, Wurl Jobst
Capítulo 25. <i>Migraciones de aves</i>

Eduardo Palacios

- Capítulo 26. *Migraciones de murciélagos* Rodrigo Medellín ó Sergio Ticul Alvarez Castañeda ó Roberto Martínez Gallardo
- Capítulo 27. *Migraciones de calamares* Unai Marcaida
- Capítulo 28. *Mamíferos marinos* David Aureoles, Gisela Heckel
- Capítulo 29. *Polinización* Ted H. Fleming, Gary Nabhan, Karen Krebbs
- Capítulo 30. *Dispersión* Carlos Martínez del Río
- Capítulo 31. *Herbivoría* Elisa Serviere Zaragoza
- Capítulo 32. *Granivoría* Exequiel Ezcurra, Van Devender, Dimmitt
- Capítulo 33. Montes marinos, agregaciones reproductivas, conectividad ambiental Jesús Rodríguez Romero, Richard C. Brusca, Marco Octavio Aburto Oropesa, Karen Stocks, Lisa Levin
- Capítulo 34. *Socioeconomía* Jose Luis Moreno Vazquez, Sergio Francisco Moreno Salazar
- Capítulo 35. *Demografía social* Elizabeth Mendez Mungaray, Juan Guzman, Trujeque Díaz José Antonio
- Capítulo 36. *Economía regional* Alfredo Hernández Llamas, Ismael Rodríguez Villalobos, Alvaro Bracamonte Sierra, Sergio Hernández Vázquez, Felipe de Jesús Ascencio Valle, Roberto Enríquez Andrade, Miguel Angel Hernández Vicent
- Capítulo 37. Contaminación

José Jesús Bustillos Guzmán, Leopoldo Mendoza Espinoza, Efraín Gutierrez Galindo

- Capítulo 38. *Plaguicidas* Víctor Camacho, Susan Gardner
- Capítulo 39. *Eutrofización* David Javier López Cortés
- Capítulo 40. Conservación y uso sustentable de los recursos naturales

César A. Salinas Zavala, Ricardo Pérez Enriquez, Elizabeth Mendez Mungaray, Jose Luis Moreno Vazquez, Sergio Francisco Moreno Salazar, Leonardo Huato Soberanis, Gustavo Danemann, Maria de los Angeles, Genaro Martínez Gutierrez, David Fischer Millar

Capítulo 41. Escenarios / Proyecciones / Tendencias al futuro del uso del habitat y los recursos naturales Exequiel Ezcurra, Saúl Alvarez, Ruben Lara, Gary Nabhan

### b. Basic listing of the researcher database being developed for the Gulf of California

Database fields: Institution, Departament, Researcher, Subjects for the Book, Contact, Telephone, Subjects of Interest

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### Ecological conservation in the Sea of Cortés

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### **INTRODUCTION**

The Gulf of California, or Sea of Cortés, is a large semi-enclosed sea covering approximately 260,000 square kilometers. It contains some outstanding natural features such as deep ocean basins with hydrothermal vents in its central and lower portions, expansive tides in its upper reaches, over a hundred large islands, myriad islets and offshore rocks, and strong upwellings of cold, nutrient-rich waters that make it extraordinarily productive. In the surrounding coastal deserts, rainfall and terrestrial productivity are tightly coupled to oceanographic variations (Polis et al. 1997, Velarde and Ezcurra 2002). The great diversity of topographic and bathymetric features has produced a variety of habitats for marine life and island species (Case and Cody 1983, Case et al. 2002, Robles and Carvajal 2001). The Sea of Cortés is a sort of "marine peninsula," isolated from the rest of the Pacific by the 1,500 km of land of Baja California. Within the Gulf, habitat heterogeneity, geographic isolation, endemism and rarity have been the driving force of evolution in the fragmented coastal lagoons and wetlands, in the oceanic islands of the Gulf, and in the reefs of the underwater sea-mounds (Fig. 1).

Fragmentation also yielded unique human cultures: Separated from the rest of Mesoamerica, the Cochimí Indians of Baja California developed one of the most incredible prehistoric assemblages of cave paintings in the world. Later, during the Spanish colony, the Jesuit fathers established here a system of missions in Baja California that evolved in complete independence from the harsh rules of the mainland conquistadores. Other coastal indigenous nations, such as the Seri, the Yaqui, or the Cucapá, also developed unique lifestyles as fishers and sailors, with cultures finely adapted to their ocean and coastal resources (Bowen 2000, Bahre and Bourillón 2002, Felger and Moser 1985, Nabhan 2002).

Biologically, the Gulf of California is one of the most productive and diverse seas in the world (Álvarez-Borrego 1983, 2000; Brusca et al. 2006). Its high biodiversity levels, biological productivity, and 857 endemic species of fish, seabirds, marine mammals and macroinvertebrates give it one of the highest coastal ecosystem conservation priorities on the planet. Unfortunately, it also faces growing threats mostly as a result of overfishing and degradation of the coastal

habitats: 39 of its marine species are listed in the IUCN Red List as threatened or vulnerable (Brusca 1980, Brusca 2004, Carvajal et al. 2004, Thomson and Gilligan 2002, Thomson and Eger 1966, Thomson et al. 2000, Finley et al. in press).

This vast natural wealth is not only of biological and conservation interest; it also yields some 30-60% of the national catch of Mexican fisheries and provides the socioeconomic sustenance of the inhabitants of the region, who have developed systems of natural resource access, use, and appropriation, that often put the long-term sustainability of the resources in peril. The most important threats to biodiversity are driven by the growth of economic activities in the region, which has caused the deterioration of coastal marine ecosystems due to decreasing freshwater flows, pollution by agrochemicals and urban waste, sedimentation, overfishing, and the use of inappropriate fishing technologies such as bottom-trawling nets and gillnets. Critical habitat of mangrove forests is being lost at an annual rate of 9 percent per annum from sedimentation, eutrophication, and changes in water flows caused by the construction of shrimp ponds, marinas, inland channels, and deforestation (Fig. 2). Invasion of exotic plant and animal species is putting at risk the native and endemic species of the Gulf's islands and the Sonora and Baja California deserts regions (Carvajal et al. 2004).

In the 1930s, outboard motors and gillnets came into use in the Gulf, permanently transforming the once-abundant regional fisheries. The highly-prized totoaba —an endemic fish— saw significant population declines (Cisneros-Mata et al. 1995b, 1997; Román-Rodríguez and Hammann 1997), while inshore fishing efforts started to heavily impact the estuaries and lagoons. In 1933, the shrimp fishing industry introduced the use of bottom trawling gear on soft sea-beds which have since been sweeping the sea bed clean on an annual basis. Everything in the path of the trawling dragnet — fish, octopus, conch, sponges, starfish, etc. — is harvested and, judged to be of lesser economic value, the bycatch is returned dead to the sea. As the 20<sup>th</sup> Century progressed, the shrimp fishery became the most important economic activity in the fishing industry. In 1997, the five States of the Gulf of California produced 57,000 tons of shrimp, approximately 70% of the Mexican national shrimp production, while destroying in the process the Gulf's soft seabeds and wiping out hundreds of thousands of tons of bycatch. The use of bottom trawlers had become one of the greatest threats to marine biodiversity in the Gulf (García et al. 2000).

Today, the Gulf region represents a large, still sparsely-populated area of Mexico, with human densities of only one-third of the national average. It is also a relatively wealthy region of the country. The per capita income of Baja California and the State of Sonora is 22% higher than the national average (Ezcurra 2003, Carvajal et al. 2004). The region produces around 70% of the value of national fisheries, and 40% of the national agricultural production is harvested in its high-technology irrigated fields. In recent decades, however, depletion of natural resources and new macro-economic opportunities have led to major shifts in the economic structure, leading the economy away from its traditional base on the primary sector, particularly agriculture, fisheries and mining, and moving it towards export-oriented manufacturing and industry, and services such as tourism.

### **REGIONAL ENVIRONMENTAL CHALLENGES**

The rapid growth of the regional economy has brought a large demographic increase from immigration, with ensuing pressures on its natural resources. While open-access, extractive use of

natural resources seems to have reached a limit in the region, the fast development of the manufacturing and services sectors is putting an additional strain on natural resources. The implications of this economic change for biodiversity conservation are significant. Decision-makers have an important opportunity to reduce the pressure on natural resources in the region by supporting the reorientation of the economy away from primary sector activities associated with the over-exploitation of natural resources if, at the same time, they promote the establishment of a sustainable industry of low-impact environmentally-minded tourism. In this section we discuss some of the major regional environmental challenges brought about by regional agriculture, industrial and small scale fisheries, and massive tourism in the environmentally sensitive areas of the Gulf of California.

### **Fisheries**

With 39 species listed on IUCN's Red List, it seems clear that ecological degradation has already hit the Gulf's biodiversity hard. The endemic vaquita porpoise (<u>Phocoena sinus</u>) and the totoaba (<u>Totoaba macdonaldi</u>) are near extinction, while populations of five species of sea turtles have all but disappeared from the Gulf. The International Committee for Vaquita Recovery (CIRVA) estimated the current vaquita population in the range of 268–464 for 2004, contrasting with a previous estimate of 567 vaquitas for 1997. This new estimate takes into consideration an annual growth rate of 4% and the loss of 39 to 78 individuals per year (D'Agrosa et al. 2000), and makes the vaquita the most endangered marine cetacean in the world.

Over-harvesting of the fishing stocks has become a strongly limiting factor for the success of the regional fisheries. Twenty years ago, there was a correlation between catch and effort in most of the regional fisheries — the more days the fleets fished, the higher the catch they achieved. Now that correlation is largely gone, and the total landings in most fisheries are chiefly independent of the (generally excessive) fishing efforts, and the catch-per-unit-effort has decreased severely for many species. In short, the fishers of the Sea of Cortés are often over-harvesting, and in some cases even depleting, their stocks (Sala et al. 2004, Velarde et al. 2004). Additionally, there is clear evidence that coastal food webs in the Gulf of California have been "fished down" during the last 30 years (i.e., fisheries have shifted from large, long-lived species belonging to high trophic levels to small short-lived species from lower trophic levels), and that the maximum individual length of the landings has decreased significantly (about 45 cm) in only 20 years (Sala et al. 2004).

In some fisheries, the tragedy of common-access resources is hitting the Gulf very hard. For example, thirty years ago, the shrimp trawling fleet in the Gulf was around 700 boats, each of which captured about 50 tons of shrimp per season. Today, the fleet is almost 1500 boats, and the annual catch scarcely surpasses 10 tons per boat. In spite of governmental transfers of about 30 million dollars each year —provided in the form of discounted fuel prices— many boats of the fleet are facing economic collapse.

Environmentally, the situation is also discouraging, especially in the case of the shrimp trawlers. The bottom trawlers exterminate some 200 thousand tons of bycatch every year for a meager annual catch of some 30 thousand tons of shrimp. In so doing, the dragnets destroy some 30–60 thousand square kilometers of sea bottom (Garcia et al. 2000), many of which lie within the Upper Gulf Biosphere Reserve, and the boats emit collectively some 30–40 thousand tons of greenhouse gases derived from the cheap fuel that keeps their inefficient business going. Sea beds have been so depleted in some areas that local artisanal fishers in places such as Loreto Bay and

Bahía de los Ángeles have been demanding the establishment of no-take zones and marine protected areas. In open conflict with the local communities, the larger fleets want no protected areas and demand permits to trawl inside federal reserves —such as the Upper Gulf Biosphere Reserve— to increase their scanty earnings. In the Gulf, conflict between sectors and between particular interests has been, increasingly, the rule at sea.

However, in the Sea of Cortés not all stories of common resource use are despairing tales of unsustainability and collapse. There are also many success stories, and learning from them is fundamental for future conservation efforts. For example, local artisanal fishers have started to work with local researchers in the Sea of Cortés to understand the phenomenon of spawning aggregations, to identify and protect reproductive areas. As a result of pressures from these local resource users, the Bay of Loreto is now a marine park (DOF 1996a), and the fishers of Bahía de Los Ángeles are supporting the creation of a similar marine protected area. In San Ignacio Lagoon, fishers from a previously unsustainable fishery have organized to preserve the environment and train their people in basic natural history to organize whale watching tours.

The abalone and lobster cooperatives of the Pacific coast of Baja provide yet another example of long-term sustainable use. With no support from the Federal Government, they have established strict rules for resource extraction and have developed their own law enforcement system. Many generate their own electricity, run their own canneries, and finance their own schools. More than forty years after their establishment, their productivity is still high and their resources seem to be used in a sustained manner.

But not only small communities and conservationists are critical of some of the region's unsustainable modes of development; a growing number of entrepreneurs and business people are also becoming committed supporters of the environmental cause. As a result of growing environmental concerns, a cluster of committed business leaders has organized an action and opinion group called <u>grupo NOS</u> (for <u>Noroeste Sustentable</u> or Sustainable Northwest) to promote the appropriate use of resources in the Sea of Cortés region. Even large fishing fleets can maintain sustainable landings when their leaders and operators work in cooperation: In contrast with the continuing crises of the shrimp bottom-trawling fleet, the sardine fishery has been capable of controlling its own fishing effort, and —after a past collapse— their fishery is healthy and productive (Cisneros-Mata et al.1995a, 1996, Lluch-Belda et al. 1986). In short, although the Sea of Cortés is undergoing extreme pressures of overfishing in many parts, with the consequent collapse of some of its resources, it also harbors a number of successful and encouraging experiences of communities that are trying to maintain their resources healthy and productive, looking into the future.

# Coastal tourism and recreational activities

The magnificent landscapes and the amazing density of marine wildlife make the Gulf of California a superb place for visitors. The first tourists coming into the Gulf in the first half of the 20<sup>th</sup> Century where driven by the extraordinary catches of sport fish. Nautical tourism developed later, partly driven by the success of sport fishing and partly by the beauty of the area. Soon the idea of connecting the region through a series of marinas with the states of California, Oregon and Washington in the Unites States became a vision for developers. During President Fox's administration this idea materialized in the form of a regional project, the <u>Escalera Náutica</u> or Nautical Stairway, with the goal of detonating boat tourism in the Gulf. The project was

developed by the National Fund for the Promotion of Tourism (FONATUR, a Federally funded development agency).

Following its announcement in 2001 and for the following years the Escalera Náutica became one of the most debated projects in the region. On the one hand, the project tried to generate a shift in the regional economy from unsustainable fisheries and water-intensive agriculture towards the services sector in the form of boat tourism. Considering the undeniable evidence that the primary sector of the economy has reached its limits in the Gulf (and in some cases it is even facing a collapse), this seems, in principle, a desirable move. However, experiences in Mexico with resource-intensive, unsustainable tourism (and its sequel of failed and abandoned projects, dredged mangrove swamps, and exhausted aquifers) have left a deep scar of mistrust in local groups and communities. Thus, the Escalera project presented a dilemma for conservation groups: On the one hand, it represented a positive shift in the local economy, moving it away from consumptive resource use. On the other, it failed to assure the ecological sustainability of the project and opened the door for environmentally-disruptive development. For regional conservation groups, the big challenge in the Sea of Cortés is to promote environmentally sustainable tourism while ensuring the preservation of the natural beauty and biodiversity of the region, the very attributes that initially triggered tourism in the region.

ALCOSTA (<u>Alianza para la Sustentabilidad del Noroeste Costero Mexicano</u>, an alliance of several environmental organizations), was born in the wake of the Escalera Náutica project. Together with other players, ALCOSTA became instrumental in bringing a voice of alarm and concern into the development plan. The group spearheaded important efforts to reduce the environmental impacts of the project and to reform the initiative making it more open to environmental conservation issues. As a consequence of these efforts, FONATUR was compelled to prepare a regional Environmental Impact Statement, and public hearings were held around the initiative—the first hearings ever held in Mexico around a development project of regional dimensions. ALCOSTA developed a critical analysis of the project and presented it to the Federal authorization of the project were taken into account in the final resolution. Additionally, the discussions drove President Vicente Fox recently to designate the Gulf of California as a joint priority for tourism development and for conservation. As a result, the <u>Ordenamiento Ecológico Marino</u> (Marine Habitat Use Plan) program was initiated, and a promise to enlarge the protected areas in the Gulf islands to include surrounding waters was made.

Recently, the State Governments surrounding the Gulf have adopted aggressive plans to promote tourism by creating infrastructure. In their vision, tourism is an opportunity to create much needed jobs and foster economic development, compensating for job losses in other sectors and perhaps also easing the growing demands for subsidies by farmers and fishers. The crisis of the primary sector makes tourism an increasingly attractive alternative for regional governments. This, in turn, will demand growing attention from conservation groups to address the issue at a regional scale.

### Freshwater resources

Water is a vital development resource in desert regions such as the Baja California Peninsula and the State of Sonora. However, the rapid growth of activities such as agriculture, industry, tourism and urban development and its associated demographic growth have brought an increasing pressure on regional water resources during the last decades, both through an increase in demand,

but also due to an increase in pollutants that result from unplanned economic growth and from growing pressures on the deficient sanitary infrastructure and limited water-treatment facilities. Thus, the rapid expansion of the more successful sectors of the regional economy has been mostly done at the expense of depleting underground aquifers, disrupting watershed flows, and destroying natural wetlands around large urban conglomerates.

By the end of 19th Century, all regional rivers still ran free into the Gulf waters. In the early decades of the 20<sup>th</sup> Century major agricultural developments were established in the lower basins and deltas of the Fuerte, Mayo, and Yaqui rivers of Sinaloa and Sonora, and in the Colorado River valley in the Mexico-US border, giving birth to the fast growth of settlements along the coastal plains and permanently modifying the ecological landscapes, the process, and the services that the deltas provided.

A good illustration of the above is the Colorado River, which until the 1930s was the largest river flowing into the Gulf of California with a vast delta covering 300 km<sup>2</sup> of wetlands (Sykes 1937, Fradkin 1984, Ezcurra et al. 1988, Felger 2000). The development of steamboat traffic on the Colorado River during the 19<sup>th</sup> Century, from the Sea of Cortés into the Yuma trail, was made possible partly because of the dense cottonwood forests on the river banks, which were intensely logged for charcoal. The devastation of these forests brought the first significant environmental impacts on the delta; only a prelude of the devastation that the estuary had yet to see. In 1905 major infrastructure projects that diverted the waters of the Colorado gave birth to the Imperial and the Mexicali agricultural valleys. In the early 1940s, the Hoover dam and the International Water Treaty signed between the United States and Mexico brought the irremediable demise of the great delta. In the same manner, in the same decade dams and channel works were initiated along the Fuerte, Mayo, and Yaqui rivers as part of a regional project for agricultural development that brought a dramatic reduction in the supply of freshwater to downstream ecosystems, with the ensuing degradation of the riparian corridors, estuaries, wetlands and coastal lagoons (Robles et al. 1999). Economically, all these irrigation projects were extremely successful during their first decades. At present, however, the once fertile soils of these manmade agricultural valleys are showing clear signs of exhaustion. Soil salinization and decreasing profit margins have forced farmers to abandon many fields, leaving behind a substantial ecological footprint of salinized and vegetation-denuded coastal plains, and further compounding the problems to the already heavily impacted areas.

The decline of water and soil resources for agriculture has encouraged a reorientation towards high value horticultural crops that provide better returns. And opportunities seem also to be appearing for the restoration of the once lush coastal wetlands: The abandonment of lands due to salinization, together with the changes on the Mexican Law of National Waters (<u>Ley de Aguas</u> <u>Nacionales</u>), have both opened the opportunity to buy water rights to restore the deltas.

### The need for effective conservation

If effective conservation in the region is to be achieved, a strategy that addresses these critical regional environmental challenges needs to be developed. Such a strategy should allow for the protection of critically endangered species, spawning aggregation areas, and critically endangered ecosystems such as seamounts, coastal lagoons, coral reefs, estuaries, and marine mammal habitats (Sala et al. 2002a, b). Expansion or establishment of new protected areas is one of several approaches needed to ensure long lasting conservation efforts but other alternative approaches are also needed. In order to be effective, any successful conservation effort will

require the support of the local communities and regional stakeholders. If conservation initiatives are not able to win the hearts and minds of local people by generating alternative livelihoods, future efforts are not likely to succeed.

The degradation of coastal wetlands is one of the Gulf's most serious threats. With little consideration to the ecological services they provide, mangrove forests are being cut for the development of aquaculture (mostly shrimp farms) and tourism projects. Furthermore, coastal wetlands in general are threatened by consumptive water use upstream, and by pollution of rivers and waterways. Because water is a mobile resource, the protection and the restoration of coastal wetlands demands comprehensive large-scale plans involving upstream and downstream habitats. The ecological services provided by estuaries and lagoons are critical for the survival of the Sea of Cortés fisheries, and for the health of the large marine ecosystem as a whole. Comprehensive plans to effectively protect coastal wetlands, stop mangrove deforestation, and maintain the ecological services of coastal lagoons and estuaries must be developed and implemented for the long-term survival of the whole Gulf.

### A BRIEF HISTORY OF CONSERVATION EFFORTS

Possibly the first efforts to protect the ecosystems of the Sea of Cortés started in 1951 with the publication of Lewis Wayne Walker's popular paper on the seabirds of Isla Rasa in the National Geographic magazine. Walker was at that time a researcher at the San Diego Natural History Museum, and later became Associate Director of the Arizona Sonoran Desert Museum. He was very knowledgeable on the natural history of the region, and possessed first-hand field experience in Baja California and the islands of the Sea of Cortés, and especially on Isla Rasa. He wrote many popular articles on the natural history of the region, and through these publications he popularized the plight of Rasa (Walker 1951, 1965).

In the early 1950s the Audubon Society donated 5,000 dollars for the preservation of Rasa. This started Walker's research on the island, which was later also supported with a grant from the Belvedere Scientific Fund from San Francisco. Part of this financial support reached Dr. Bernardo Villa's laboratory at the Institute of Biology in the National University of Mexico (Universidad Nacional Autónoma de México, or UNAM). The funds were used to maintain a biologist and a field station on the island. The work at Rasa was later supported with donations from the Roy Chapman Andrews Fund to the Arizona Sonoran Desert Museum.

The results of these investigations soon reached the Direction of Forestry and Wildlife in the Mexican Federal Government, which in the late 1950s was headed by Dr. Enrique Beltrán, an eminent Mexican conservationist. Beltrán's own interest on the issue —and the public notoriety that Isla Rasa had achieved through popular publications and through the field trips of many biologists— helped to prepare the way for the first Federal Decree protecting the insular ecosystems of the Sea of Cortés: In 1964 the official governmental federal register (Diario Oficial de la Federación) published a decree declaring Isla Rasa a nature reserve and a refuge of migratory birds (DOF 1964).

In 1973, a natural history expedition was organized, using a chartered Catalina flying-boat to fly the Sea of Cortés and visit small and remote islands. The group included George Lindsay, Director at that time of the California Academy of Sciences, together with Charles Lindbergh, the legendary aviator, Joseph Wood Krutch, a celebrated American nature writer, and Kenneth Bechtel, a philanthropist from San Francisco. Lindbergh had become a committed conservationist, interested in the conservation of nature, and Joseph Wood Krutch had written <u>The Forgotten Peninsula</u>, a sparkling natural history description of Baja California. George Lindsay had previously organized a series of scientific explorations into the Sea of Cortés and the Peninsula of Baja California (Banks 1962a, b; Lindsay 1962, 1964, 1966, 1970, and Wiggins 1962). Kenneth Bechtel had given financial support to the Audubon Society in the 1960s to study the seabird rookery at Isla Rasa. Two or three months later, both Lindbergh and Lindsay traveled to Mexico City and met President's Echeverría top-level cabinet to promote the conservation of the Sea of Cortés. Although the cause-and-effect connection between these events has not been definitely established, the fact is that four years after Lindbergh's appearance in Mexico City, a decree was issued protecting all of the islands of the Gulf of California (SDNHM 1996, DOF 1978).

### The Seri people and the protection of Tiburón Island

Chronologically, however, Isla Tiburón was the first part of the Sea of Cortés to receive official status as a protected area, through a decree published a year before that of Isla Rasa. The largest island of the Sea of Cortés, Tiburón occupies 120,756 ha. In pre-Hispanic times it was an important part of the territory of the Comcaác or Seri Indians (Felger and Moser 1985). Because of this, the island is not only an important natural site, but also harbors important historic, archeological, and cultural elements. Although during the 20<sup>th</sup> Century the Seri have not lived permanently on the island, they have always used it as their main fishing camp, hunting ground, and plant collecting territory, and have always considered it part of their tribal land.

On March 15, 1963, Tiburón was decreed a wildlife refuge and nature reserve by President Adolfo López Mateos (DOF 1963), as a result of an initiative by Enrique Beltrán. The declaration, however, was based on biological and ecological grounds, and failed to take into consideration the needs and demands of the Comcaác themselves. Twelve years later, in 1975, the Secretary of the Agrarian Reform gave the Seri formal possession of Tiburón Island as part of an <u>ejido</u> (communal land) allotment for the tribe, recognizing for the first time the Seri's right to their ancestral homeland. On February 11, 1975, a decree was issued by President Luis Echeverría, restituting Tiburón Island to the Seri People as part of their communal property. Although this decree was basically issued as part of a series of governmental actions to empower native peoples within their traditional lands, it also had conservationist implications for the island could be only used by the Seri, and by their Fishing Cooperative, the <u>Sociedad Cooperativa de la</u> <u>Producción Pesquera Seri</u> (INE 1994), and declared it off-limits for other fishers.

# The development of Mexican conservation efforts

Increasingly, the Mexican government and civil society have shown a growing concern for these regional environmental issues. New legal and institutional frameworks have been adopted and innovative institutional arrangements have been created among various governmental agencies and stakeholders to face the mounting problems. In the second half of the 20<sup>th</sup> Century, several regulations were adopted to avoid the overexploitation or to prevent the extinction of a number of species. Perhaps, the most notable effort was the declaration in 1955 of a protection zone in the Delta of the Colorado, aimed at protecting the breeding habitat of many marine species including the totoaba. In the 60s, efforts were made to protect the seabird colonies of the islands. The failure of the protection zone of the Colorado River delta and the persistent decline of the totoaba

population, forced the government to implement even more drastic measurements, declaring a total ban on the totoaba fishery by 1975.

The modest but continued funding provided by the Audubon Society, the Roy Chapman Andrews Fund, and Conservation International and others along the years to Bernardo Villa's laboratory at UNAM contributed to maintain the presence on Isla Rasa of Mexican researchers and students. Many of these students later became leading conservationists in the Sea of Cortés. Dr. Villa's work in the early 1980s effectively combined research with conservation. One of his young students at that time, Dr. Enriqueta Velarde, decided to extend the idea to other islands of the Sea of Cortés. With the scientific support of George Lindsay from Cal Academy, and Daniel Anderson from the University of California at Davis, and also with the support of Spencer Beebe from The Nature Conservancy, which provided financial assistance, Enriqueta Velarde launched the first conservation project for the islands. The project produced, among many other applied results, the book Islas del Golfo de California (Bourillón et al. 1988), which was extremely influential in bringing attention to the islands and their conservation problems.

Many of the biologists that participated in this early team are now crucial players in conservation efforts throughout the Sea of Cortés. The team included, among others, Alfredo Zavala, now Baja California regional director for the Protected Area of the Islands of the Gulf of California; the late Jesús Ramírez Ruiz, who in the early 1990s eradicated introduced rodents from Isla Rasa; together with Luis Bourillón and Antonio Cantú, who head now conservation NGOs in the region. In many ways, it can be said that the conservation work at Isla Rasa was the catalyst that started many of the more recent conservation efforts in the Sea of Cortés (Velarde and Anderson 1994).

### The Biosphere Reserve concept

In the early 1970s many changes were occurring within the Mexican scientific and conservation groups that also helped to protect the ecosystems of the Gulf of California. In 1974 the Instituto de Ecología, a non-profit research organization was created in Mexico City, and soon-after it started to promote the concept of biosphere reserves in the country. Although widely accepted at present, the idea of Biosphere Reserves, which had been developed by UNESCO's Man and the Biosphere Program (MAB), was radically new in 1975. Biosphere Reserves were conceived as natural protected areas where the indigenous populations living inside the area or in the surrounding "buffer zones" were encouraged to use their natural resources in a sustainable manner. The new approach departed radically from the natural park concept, which basically advocates for pristine areas free of human influence. Rather, biosphere reserves promoted sustainable use as an effective tool for conservation.

Many of the concepts of global ecology and conservation were already operational in MAB's concept of Biosphere Reserves almost 20 years before, including: (a) the global approach to conserve biodiversity through a planetary network of protected areas; (b) the preservation of cultural diversity together with natural diversity; (c) the involvement of local populations in the protection of natural resources, and (d) the promotion of the sustainable use of nature. Although the Islands of the Gulf of California were initially not conceived as a Biosphere Reserve but rather as a Wildlife Refuge (<u>Refugio de la Vida Silvestre</u>), it was in the wake of these changes that the decree protecting them was issued in 1978 (DOF 1978).

## The establishment of SEMARNAP

In December 1994 a revolutionary transformation occurred within the Mexican Federal Administration. The newly-elected president, Ernesto Zedillo, decided to create a ministry of the environment in charge of pollution control and natural resources management. The creation of the Secretaría de Medio Ambiente, Recursos Naturales y Pesca (SEMARNAP) opened the door for many impressive changes in the establishment and management of protected natural areas. In the most important reserves, among them, the Upper Gulf of California and Colorado River Delta Biosphere Reserve, "paper parks" gave way to "hands on" resource management. Also, this decade saw a steady increase of funding by the Mexican government and human resources dedicated to the management of nature reserves.

The establishment of some key marine protected areas in the Gulf shortly before or after the creation of SEMARNAP (namely, the Upper Gulf Biosphere Reserve, and the Cabo Pulmo and Loreto Bay National Parks; Table 1) was an act of immense conceptual importance, as it opened the way for other marine reserves in Mexico where, as a result of a long-standing feud between conservationists and the fisheries authorities, no marine protected areas had been accepted before. Specifically, it facilitated current efforts by various NGOs to extend the decreed protection into the waters adjacent to some important islands such as Islas Marías, San Pedro Mártir, San Lorenzo–Las Ánimas–Salsipuedes, Rasa, and Partida. However, in spite of their paramount conceptual gravitation, the establishment of protected areas in the Gulf during the 1990s only covered less than 4% of the Gulf's marine area.

The creation of SEMARNAP brought an additional management tool to ongoing discussions on the Gulf's sustainability, in the form of Mexico's territorial-use planning regulations or <u>Ordenamiento Ecológico</u>. The <u>ordenamiento</u> is a process established in the Mexican environmental law to regulate the spatial use of natural resources and land-use at different scales. It demands the best available scientific knowledge, the participation of the regional stakeholders, and a series of comprehensive hearings and negotiations with local governments, local businesses, and non-governmental organizations. The planning studies for the Sea of Cortés started in 1997 but, because of its sheer complexity, the hearings and discussions around the negotiating table are still ongoing. Almost a decade after it was started, the territorial-use planning of the Sea of Cortés is still to be accomplished, and appears in the conservation agenda as one of its most important pending objectives.

# LEGAL STATUS OF PROTECTED AREAS IN THE SEA OF CORTÉS

Mexico's environmental legislation, the <u>Ley General del Equilibrio Ecológico y la Protección al</u> <u>Ambiente</u> (DOF 1988, 1996b) recognizes eight categories of natural protected areas that can be established by the Federal Authority. These are: (1) biosphere reserves (<u>reservas de la biosfera</u>), (2) national parks (<u>parques nacionales</u>, including both terrestrial and marine parks), (3) natural monuments (<u>monumentos naturales</u>), (4) areas for the protection of natural resources (<u>áreas de</u> <u>protección de recursos naturales</u>), (5) areas for the protection of wildlife (<u>áreas de protección de</u> <u>flora y fauna</u>), and (6) natural sanctuaries (<u>santuarios</u>).

Because the name "Biosphere Reserves" is used both for protected areas as defined by the Mexican Law and for areas integrated within UNESCO's Man and the Biosphere (MAB) network of protected areas, some reserves in Mexico are considered Biosphere Reserves under Mexican Law but have not yet fulfilled the conditions to be incorporated under MAB's

international system, while other Mexican protected areas are formally recognized by MAB as Biosphere Reserves but do not have formal Biosphere Reserve status under the Mexican legislation (see Gómez-Pompa and Dirzo 1995, and SEDUE 1989).

Within the Gulf of California Region, UNESCO's MAB Program has designated three protected areas as part of its international network of Biosphere Reserves: (1) El Pinacate y Gran Desierto de Altar, in the core of the Sonoran Desert and designated in 1993, (2) Alto Golfo de California y Delta del Río Colorado, in the upper Sea of Cortés, designated in 1995 and also dedicated as a site of global significance within the Ramsar International Convention of Wetlands, and (3) Islas del Golfo de California, the islands of the Sea of Cortés, which were designated in 1995. The latter, however, do not have a formal recognition as Biosphere Reserves under Mexican Federal Law. Originally decreed as a reserve zone and refuge for wildlife and migratory birds, the islands were re-categorized in June 2000 as an Area for the Protection of Wildlife (Área de Protección de Flora y Fauna Islas del Golfo de California; see DOF 2000 and Table 1).

As a wildlife protection area, the islands do not enjoy the same strict restrictions that are imposed on Biosphere Reserves. The reasons to nationally designate the islands within a different category to the one they hold internationally is possibly related to the large size and spatial complexity of the whole archipelago, and the difficulties involved in law enforcement within the larger protected area. In spite of their less-restrictive status under Mexican law, the Islands of the Sea of Cortés are in practice managed as a large reserve and substantial efforts are devoted to their protection (Breceda et al. 1995, INE 1994). The relevance given by federal authorities to the Islands of the Sea of Cortés is possibly the result of an effort to fulfill the Mexican Government's commitment with the UNESCO-MAB network and with the Global Environmental Facility (GEF), which has funded part of the conservation work on the islands. In 1996 the administration of the islands was divided into three regional headquarters: (a) the southern islands are managed from an administrative office at La Paz, (b) Tiburón and San Esteban are managed from an office in Guaymas, and (c) the western midriff islands area managed from headquarters in Ensenada.

Additionally, there is an explicit policy on part of the Mexican Commission for Protected Natural Areas (CONANP) to re-decree many of the Gulf islands as smaller protected areas with a "donut" ring of marine protected waters around them. This policy, which was established in the late 1990s, has already yielded a number of islands with protected adjacent marine territories, such as Archipiélago de Revillagigedo (decreed in 1994), Islas Marías (2000), Isla San Pedro Mártir (2002), and Isla Guadalupe (2005) as Biosphere Reserves, and Archipiélago de San Lorenzo (2005) and Islas Marietas (2005) as National Parks (Table 1).

# THE CASE OF THE ALTO GOLFO

There are myriad stories of dedicated work and heated debates around each one of the protected areas of the Sea of Cortés. In a previous paper (Ezcurra et al. 2002) we analyzed eight of these case studies, the conflicts behind their creation, and the ongoing discussions about their future land use. In this section, we will concentrate in one case where discussions and debate have been and continue to be especially heated—the <u>Alto Golfo</u>, the Upper Gulf of California in the northernmost tip of the Sea of Cortés. The history and the evolution of conservation efforts in the Upper Gulf provide an outstanding case study to reflect upon how the conservation movement has evolved in the region, and how it has matured in Mexico as a country. Understanding the past and ongoing conflicts in the Upper Gulf is of great importance to understand the viability of the

conservation movement in Mexico. In this section we present some historic facts and discuss the events that lead to the creation of this important reserve and of the conflicts that ensued.

### Background

The Upper Gulf of California and Colorado River Delta Biosphere Reserve is formed by part of the surrounding Sonoran Desert, the northern marine waters of the Gulf of California, and the lowermost part of the Colorado River. Its high marine biological productivity is based on the churning of nutrients in Colorado River sediment deposits by one of the biggest tidal fluxes on the planet (Thomson et al. 2000). This productivity makes the Upper Gulf an extremely important area for the reproduction, nursery and growth of many resident and migratory species. Currently, the total number of marine species recorded for the reserve is 1,438, of which eleven are in danger of extinction, notably the vaquita, (Phocoena sinus) or Gulf of California harbor porpoise, and the totoaba (Totoaba macdonaldi) a giant corvine-like croaker, both of them endemic to the Upper Gulf (Findley et al. in press).

The Upper Gulf's marine richness is reflected in its highly valuable fisheries, especially shrimp, which make the Alto Golfo one of the most important fishing grounds in Mexico. Historically, the most significant economic activity for the reserve's inhabitants, and for some outsiders as well, has been gillnet and trawler fishing (McGuire and Greenberg 1993). At the beginning of last century fishers began to establish camps in the Upper Gulf of California, and by the 1940s the totoaba fishery was at its maximum and enjoyed a well developed and profitable export market.

In the 1950s it became well known that the Upper Gulf and the delta of the Colorado River were important sites for the reproduction and breeding of many species of birds and fish. For that reason, in 1955 the Mexican Fishing authority first declared the area as one of protection, reproduction and nursery. As years passed, however, it also became apparent that this very productive region was still suffering growing and unsustainable fishing pressure. By 1975, the totoaba was facing extinction through over-fishing. This problem forced the Federal Government to decree a moratorium for totoaba harvest in the Sea of Cortés. Thus, the area was re-decreed in 1974 as a reserve zone for fisheries resource restocking, but in spite of this decree the depletion of natural resources continued (DOF 1974). In 1975, the Ministry of Fisheries established a permanent ban for totoaba captures, which remains in force today.

Other problems, however, kept mounting. In the mid-eighties marine mammalogists started showing a strong concern on the population status of the vaquita harbor porpoise in the Upper Gulf. The vaquita is indeed a unique and extremely rare marine mammal. Described in 1958, only a few specimens have been studied to date. The occurrence of vaquita specimens as incidental take in gill nets in the Upper Gulf started to signal an alert to Mexican and international conservation groups.

In the early nineties, the vaquita population was estimated to be less than five hundred animals. The vaquita was classified as endangered, and the International Whaling Commission labeled it as one of the highest priority marine mammals in the world. It was then that the Mexican Federal Government created, through the Secretary of Fisheries, the "Technical Committee for the Protection of the Totoaba and the Vaquita" (Comité Técnico para la Preservación de la Totoaba y la Vaquita), with the purpose of evaluating and studying the issue, and recommending adequate measures for the conservation of both endangered species. After a few sessions, it became evident that serious discrepancies existed between various constituents of the Committee. While some members favored immediate action to protect the Upper Gulf of California from the

devastating effects of overfishing, others were of the opinion that regulating fisheries in any way would harm the local economy. As a result of these conflicts, it was decided to request two of the most recognized research centers in Sonora —the Centro Ecológico de Sonora (CES) and the Centro de Investigación y Desarrollo de los Recursos Naturales de Sonora (CIDESON)— to develop and elaborate upon a feasibility study for a Biosphere Reserve.

Towards the end of 1992 the study was completed. It argued in favor of the establishment of a reserve in the Upper Gulf (CTPTV 1993). The first months of 1993 were employed by different research and conservation groups in discussing the costs and benefits of a protected area with local communities (El Golfo de Santa Clara, Puerto Peñasco, and San Felipe, as well as the ejidos in the delta of the Colorado River). Slowly, the people in the area started first to accept and later to support the idea. With the support of local businessmen, scientists, conservationists, social leaders of the small-scale fisheries, and traditional authorities of indigenous peoples around the Sea of Cortés, the project was presented to the Secretary of Social Development in the Federal Government, Luis Donaldo Colosio, a native of Northern Sonora and much interested in the idea. With the support of Colosio, the project moved forward.

In June 10th, 1993, the President of Mexico, Carlos Salinas de Gortari, decreed the establishment of the Biosphere Reserve of the Upper Gulf of California and Delta of the Colorado River (<u>Reserva de la Biosfera del Alto Golfo de California y Delta del Río Colorado</u>, see DOF 1993). At that time the project had strong support from both the local population and conservation groups. Important decision makers attended the ceremony, including many cabinet members from the Mexican Federal Government, the Governors of Sonora, Baja California, and Arizona, the U.S. Secretary of the Interior Bruce Babbitt, and the traditional governor of the Tohono O'Odham (Papago) people, whose lands extend on both sides of the Mexico-US border.

This reserve was the first one established including parts of the territory of two States, Baja California and Sonora, as well as Federal marine waters (INE 1995). Thus, coordination between these entities became a critically important factor from the very beginning to pursue the reserve's objectives.

# The political juncture

It is interesting at this point to reflect on the particular political juncture that drove the establishment of the reserve. If the area had been previously decreed twice (1952 and 1973) as a protected area using different arguments and the decrees had not become operational, why did a third decree carry so many expectations, so much support?

The main motives brandished by Federal authorities to officially decree it for conservation were the uniqueness of its ecological attributes and the catastrophic depletion of natural resources in the Upper Gulf. On the one hand, the problem of overfishing in the Sea of Cortés had started to appear in the international arena, harming Mexico's reputation on environmental conservation and appropriate natural resource management.

On the other hand, in 1992 a severe crisis had struck the fishers of the Upper Gulf of California (El Golfo de Santa Clara, Puerto Peñasco, and San Felipe). Their shrimp catches had fallen precipitously (Arvizu 1987), and the fishers blamed the federal authorities in general, and the Secretary of Fisheries in particular, for failing to enforce fishing bans to allow the recovery of the resource. The idea started to grow among the fishers themselves that the sea had to rest and its fisheries had to recover, that things had to change in some way. A decree establishing a protected

area seemed to affirm this imminent change and offer an opportunity to start again (McGuire and Greenberg 1993).

Additionally, in 1992, biodiversity conservation and natural resource sustainability had become high-profile international priorities for most countries due to the Rio Summit (also known as UNCED or the United Nations Conference on Environment and Development), from which the specific commitments of Agenda 21 emerged (Cicin-Sain et al. 2002). For the Mexican government it was a priority to give externals signals of willingness and resolution to comply with Agenda 21, and the Upper Gulf was being identified both internally and internationally as a significant conservation problem, and hence a potential stumbling block in international affairs.

Finally, the signature of the North American Free Trade Agreement (NAFTA) between Mexico, Canada and the U.S. in 1992, had raised a number of environmental objections in all three countries, and the Mexican government was eager to give positive signals of environmental commitment. Because of its proximity to the U.S. border, the Upper Gulf Biosphere Reserve seemed an ideal proposition. Through this federally protected area Mexico improved its international environmental image and attained a more favorable position in the NAFTA negotiations. At the same time, much international expectation was raised.

### The aftermath

In 1993, when the Biosphere Reserve was established, the Upper Gulf was facing a deep historic and socioeconomic crisis. Perhaps for this reason, the fishing communities of the region initially supported the reserve project. In retrospect, however, the fishers' support seems now to have been based on the expectation of a temporary resolution that would ban trawling and harmful gillnet sizes for three or five years and allow the recovery of the Upper Gulf. After a few years, as the restrictions imposed by the reserve on natural resource started to become clear, the initial enthusiasm waned off.

Additionally, in 1993 the administration of protected natural areas in Mexico was very small, and most of the reserves existed only on paper. There was no governmental field experience and very little budget for conservation and management of protected areas, and the Environmental Attorney General (PROFEPA, the federal authority in charge of environmental enforcement) had just been created and did not have the capacity to operate enforcing regulations in remote protected areas.

In short, it seems now that neither the local communities nor the federal government were prepared for the long-term commitment that the establishment of this reserve meant. Many things, however, have changed since 1993: the National Commission for Natural Protected Areas (CONANP) was created in 1999, and the reserve now prides itself with a management plan, core funding for its field operation, staff, and a reserve director. The Mexican Fisheries authority was briefly moved to SEMARNAP between 1995 and 2000, but was then moved back into the Ministry of Agriculture (SAGARPA) where it now resides. As a result, the coordination between the environmental and the fisheries federal administrations has become difficult and complex.

At present, hence, the biggest obstacles to achieve the objectives of the Upper Gulf reserve are the poor intergovernmental coordination, the conflicts between sectors, the low institutional capacity of conservation organizations, and the lack of political will to enforce the law. This is allowing an increase in illegal fishing in the reserve, and with it an increment in vaquita mortality, among many other species that reproduce in this unique and fragile area. The dice are still in the air, and the future of the Upper Gulf is still under question.

# Learning from conflict

During the past fifty years the challenge has been the same: All of the conservation and protection efforts for the Upper Gulf have hinged around the need to design and instrument a program that may guarantee the preservation of the biological and ecological value of the area, as well as the sustained use of its natural resources by the local inhabitants. The socio-political responses that both authorities and conservation-minded organizations have been able to articulate in order to develop such a program have been the three decrees already mentioned, but the true achievements in conservation, however, have been poor. Three important lessons can be derived from this experience:

1. <u>The objectives of a new protected area need to be balanced with capacity and experience</u>. It is difficult to imagine a better juncture to establish a protected area in the Upper Gulf than 1993, but the decree, however, reveals an immense lack of awareness —almost a certain naiveté) of the long-term commitments needed to consolidate an operational reserve in an area as conflictive as the Upper Gulf. After eleven years, this is still the reserves weakest point, and much work is needed on it.

2. <u>The raised expectations of different actors need to be met</u>. Because of the seventy years of open access fishing without any type of resource management, the Upper Gulf of California is one of the most complex areas in Mexico to achieve conservation and sustainable management. The creation of the Upper Gulf Biosphere Reserve raised great expectations, but the high social pressure on the area's natural resources, the historical bi-national conflicts around Colorado River water, and the convergence of several authorities taking decisions within the area have all created a sense of disillusionment in the local people that is now working against the aims of the reserve.

3. <u>Implementation of alternative solutions is important</u>. For more than fifty years the conservation and management of the Upper Gulf have been tackled through federal decrees, but these have proved to be insufficient. Alternative solutions, based on the active participation of the local stakeholders, are of paramount importance to resolve the regional conflicts. Among these, the fishers' own proposals for a sustainable use of their resource should be taken more seriously by authorities and social organizations.

But, despite the current impasse in the Upper Gulf Biosphere Reserve, it is essential to recognize that this was the first marine reserve established in Mexico, and for this reason only, it represented an initiative of immense transcendence. In spite of the opposition of Mexican fisheries authorities, it opened the way for new marine protected areas in the Sea of Cortés, in the Mexican Pacific Ocean, and on the other coasts of Mexico. Specifically, it opened the door for discussions on the possibility of protecting the waters surrounding each of the islands in the Sea of Cortés. The Upper Gulf debate established these discussions as an ongoing process and showed that conservation at sea and the establishment of marine protected areas, albeit difficult, can be achieved in Mexico.

# TOWARDS A REGIONAL CONSERVATION AGENDA

In spite of some local successes, the depletion of the Gulf and its marine and coastal resources remains a predominant driving force and has serious economic consequences. The perceptions of national and foreign investors of this depletion are already driving investment and economic opportunities away. It logically follows that the maintenance of fundamental ecological processes

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and ecosystem functions is critically needed to protect long-term economic investments as well as biodiversity in the region, encouraging lasting economic development and improvements in quality of life. Today, a growing number of leaders from different sectors are becoming more aware of the need to come together and jointly address these issues.

The region is governed under a complex mix of authority emanating from the federal government, the surrounding five states, and 40 coastal municipalities, and there is often little synergy between them. Poorly planned economies, often the result of poor coordination between authorities, are one of the greatest threats underlying to ecosystems in the Gulf of California. As a consequence, the Gulf is facing serious contradictions in the definition of priorities for regional development among the three levels of government, with poor coordination among authorities and increasing dispersion of resources and actions. Thus, although political change —in the form of open elections— has swiftly taken place around the Sea of Cortés, the reformed institutions have not yet been capable of tackling the urgent issues of resource degradation in a coordinated fashion.

Furthermore, there is a notorious absence of a well-developed, consolidated relationship between environmental scientists and decision makers. Indeed, the region is one whole complex, an interconnected set of biological communities; but governance is fragmented and most of the research done in it has been based on specific, simple aspects of conservation, small disintegrated parts of the complex functioning of the whole regional ecosystem. Few of the regional research and conservation efforts have concentrated on a multidisciplinary approach, and little effort has been placed on large-scale, ecosystem-based research and management.

On the other hand, regional cooperation among non-governmental agencies has yielded plentiful products in the past. As described previously, through their rich network of cooperation, ALCOSTA, the regional alliance of NGOs, was capable of bringing a voice of alarm and concern into the Escalera Náutica development project, thereby transforming the project by making it much more open to environmental conservation issues. Other cooperative efforts have also yielded successful results for conservation: In December 1997, a group of scientists and conservationists teamed together in a joint project known as the Coalition for the Sustainability of the Gulf of California and, after three years working together, produced a comprehensive map defining areas of biological importance in the region (CSGC 2004, Enríquez-Andrade et al. 2005, and Fig. 3), which became a milestone document in regional planning and a tool to assist in the determination of regional priorities. Among other uses, the documents and the maps produced by the Coalition became critically important inputs in the governmental land and ocean-use plans for the Sea of Cortés and the surrounding coasts.

And, finally, cooperation between regional NGOs and research groups allowed the presentation of a regional agenda at the "Defying Ocean's End" meeting in Los Cabos, in 2003 (Carvajal, Ezcurra, and Robles 2004, and Fig 4). This cooperative agenda established seven specific objectives to approach sustainability in the Sea of Cortés:

1. <u>Improve the management of regional marine and coastal protected areas</u>. Although impressive progress has been attained during the last decade by the Mexican government in the funding and management of its protected natural areas, many of them still subsist as "paper parks", with inadequate funding and little effective management and facing increasingly difficult conflicts among sectors. If the regional protected areas are to be effective in their conservation goals, they

must improve in their capacities to address these complex issues as well as enhance their funding, equipment and staffing.

2. <u>Enlarge the system of marine and coastal protected areas</u>. Although some marine protected areas have been created in the Gulf (namely, the Upper Gulf, Islas Marías, and San Pedro Mártir Biosphere Reserves, and the Cabo Pulmo, Islas Marietas, San Lorenzo, and Loreto Bay National Parks), these cover 4% of the Gulf's marine area. If effective conservation in the region is to be achieved, the protection of spawning aggregation areas, critically endangered species, and endangered ecosystems such as sea-mounds, coastal lagoons, coral reefs, estuaries, and marine mammal habitats, needs to be secured (Sala et al. 2002a, b). Therefore, a significant increase in the marine protected areas must be obtained, probably reaching 15% of the Gulf's marine and coastal areas.

3. <u>Develop a comprehensive plan to manage and protect priority coastal wetlands</u>. The degradation of coastal wetlands is one of the Gulf's most serious threats. With little consideration to the ecological services they provide, mangrove forests are being cut for the development of aquaculture (mostly shrimp farms) and tourism projects. Furthermore, coastal wetlands in general are threatened by consumptive water use upstream, and by pollution of rivers and waterways. The ecological services provided by estuaries and lagoons are critical for the survival of the Sea of Cortés fisheries, and for the health of the large marine ecosystem as a whole. A comprehensive plan to effectively protect coastal wetlands, stop mangrove deforestation, and maintain the ecological services of coastal lagoons and estuaries must be developed and its actions urgently implemented.

4. <u>Reduce the ecological impact of shrimp trawling</u>. Many of the strongest issues of unsustainability in the Gulf stem from the destructive effect and the economic inefficiency of the current shrimp bottom-trawling fleet. The only alternative to solve this growing problem is to reduce fleet size in at least 50% by means of a legal buyout. If effective legal means are put in place to ensure that no new fishing permits will be issued in the future —and hence that the fleet will not grow again to unsustainable levels— an action of this sort would allow the negotiation of effective enforcement of the existing no take zones, and of the introduction of exclusion-efficient fishing gear that will reduce by catch by 40 percent.

5. <u>Implement a regional plan regulating the use of land, coasts, and waters</u>. The main instrument in the Mexican legislation to regulate the use of space within environmental guidelines is the "Ordenamiento Ecológico", or Ecological Planning of the Territory, which demands full and comprehensive hearings and negotiations with local governments, local businesses, and nongovernmental organizations. Because of its complexity, effective territorial planning has been difficult to achieve in the Sea of Cortés, and is now one of the most urgent objectives to reach. For this purpose, the participation of civil society, and local conservation alliances is of critical importance.

6. <u>Re-orient regional tourism towards low-impact, environmentally sustainable resource use</u>. The Escalera Náutica has become one of the most debated projects in the region. On the one hand, most environmentalists agree that in the Gulf the primary sector of the economy has reached its limits and that a shift in the economy from unsustainable fisheries and water-intensive agriculture into the services sector (including tourism) seems a desirable move. But, on the other hand, experiences in Mexico with unsustainable tourism have made environmentalists wary of the

dangers and impacts behind development projects. The development of a culture of environmentally sustainable tourism is still one of the biggest challenges in the Sea of Cortés.

7. <u>Articulate and implement a common regional development vision</u>. The last point of the agenda, the development of a regional vision, is possibly the most crucial aspect of the Gulf's conservation agenda. The various sectors involved —including government, private business, communities, conservation organizations and civil society at large—need to transcend their own agendas and move into the development of a joint way of seeing the region. A new, proactive paradigm is needed that may allow different sectors and social groups to propose in the future new and sustainable modes of development more than defending unsustainable alternatives. Regional conservation will be successful if, in collaboration with local business and political leaders, a regional development vision based on the long-term protection of the Gulf and its resources can be pieced together collectively, and agreed upon.

Aware of the growing problems that the Gulf is facing, a cluster of socially and environmentally concerned leaders, that recognize conservation as essential to create long lasting economic and social prosperity, came together and gave birth to the Sustainable Northwest Initiative (NOS). NOS is working under the model and inspiration of the Chesapeake Bay program and the Great Barrier Reef, and adapting the lessons learned in those places to advance an agenda for sustainability for the Sea of Cortés. As a first endeavor, NOS is promoting the development of a common societal vision that would allow envisioning a sustainable future and a shared journey towards a mode of development that also allows the conservation of the region's rich natural heritage.

# CONSERVATION AND THE SEARCH FOR A VIABLE FUTURE

Hopefully, the increasing pace of conservation efforts will be able to stall the environmental degradation that the Sea of Cortés has been suffering, and diminish the threats to its long-term sustainability. There seems to be in the region a growing awareness, as never seen before, of the need to take urgent action to protect the environment and develop in a sustainable manner. Conservation groups, research institutions, federal and state governments, conscientious businesspersons and eco-tourism operators have all been contributing to the growing appreciation of the environment, and to the attendant conservation actions.

In the past, conservation in the Sea of Cortés has progressed through the support of researchers, non-governmental organizations, local communities, and local, state and federal governments. The involvement of local groups as allies in conservation has possibly been the single most important element in successful conservation efforts. Local commitment has been the driving force of environmental protection and the key to the success of conservation programs such as the Bay of Loreto or the proposed Biosphere Reserve at Bahía de Los Ángeles.

At this stage in time, environmental conservation needs to become part of a larger vision, developed jointly by all sectors, which may drive regional development for years to come with ever-increasing consideration for the growing social needs and for the environment, for the Gulf's natural resources, and for their sustainability. The Sea of Cortés receives what remains of the discharges of the Colorado River Basin, and the survival of the Upper Gulf is a challenge for both Mexico and the United States. Thus, its larger basin is part of a binational wilderness, where both Mexico and the U.S. share the responsibility of protecting their joint natural heritage. To achieve this, both countries need to develop further and continuing efforts, to promote true

cooperative work. The region is but one large continuum, with shared watersheds and estuaries, species, and natural resources. The protection of these unique environments is of the uttermost importance for the survival and wellbeing of all of us, now and for generations to come.

There are plenty of opportunities and creative solutions to the problems the Gulf is facing today. Though, in the end, the solution lays in the hands of the local actors of all sectors, and in their ability to come together. If we are to conserve the amazing beauty, the remarkable biological productivity and the magnificent biological richness of this unique place of the planet, we must find new ways of coordinating and cooperating among ourselves. We need to change the way we work, combining forces and using our extraordinary collective knowledge, creativity, abilities and capacities to achieve our common goals.

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Table 1. Protected natural areas in the Sea of Cortés region, including the Mexican northwestern Pacific Ocean. Areas marked with an asterisk (\*) contain open marine waters decreed as part of the reserve, and are hence true marine protected areas. Reserves showing a second date of creation in parenthesis were decreed in some other category and re-categorized later to their current status.

Name	date of creation	area (ha)	location (State)
Biosphere Reserves			
Complejo Lagunar Ojo de Liebre	14 Jan. 1972	60,343	Baja California Sur
El Vizcaíno	30 Nov. 1988	2,546,790	Baja California Sur
Alto Golfo de California y Delta del Río Colorado <sup>(*)</sup>	10 Jun. 1993	934,756	Baja California and Sonora
El Pinacate y Gran Desierto de Altar	10 Jun. 1993	714,557	Sonora
Sierra La Laguna	6 Jun. 1994	112,437	Baja California Sur
Archipiélago de Revillagigedo (*)	6 Jun. 1994	636,685	Colima
Islas Marías <sup>(*)</sup>	27 Nov. 2000	641,285	Nayarit
Isla San Pedro Mártir <sup>(*)</sup>	13 Jun. 2002	30,165	Sonora
Isla Guadalupe (*)	25 Apr. 2005	476,971	Baja California Sur
National Parks			
Sierra de San Pedro Mártir	26 Apr. 1947	72,911	Baja California
Constitución de 1857	27 Apr. 1962	5,009	Baja California
Isla Isabel	8 Dec. 1980	194	Nayarit
Cabo Pulmo <sup>(*)</sup>	6 Jun. 1995	7,111	Baja California Sur
Bahía de Loreto (*)	19 Jul. 1996	206,581	Baja California Sur
Archipiélago de San Lorenzo (*)	25 Apr. 2005	58,442	Baja California Sur
Islas Marietas <sup>(*)</sup>	25 Apr. 2005	1,383	Nayarit
Wildlife protection areas			
Cabo San Lucas	29 Nov. 1973 (7 Jun. 2000)	3,996	Baja California Sur
Islas del Golfo de California	2 Aug. 1978 (7 Jun. 2000)	358,000	Baja California, Baja California Sur, Sonora and Sinaloa
Valle de los Cirios	2 Jun. 1980 (7 Jun. 2000)	2,521,776	Baja California
Sierra de Álamos-Río Cuchujaqui	19 Jul. 1996	92,890	Sonora

Table 2. List of acronyms used in the text.		
ALCOSTA	<u>Alianza para la Sustentabilidad Costera del Noroeste Mexicano</u> , an alliance of several environmental organizations promoting coastal conservation	
CES	Centro Ecológico de Sonora, a research center in Sonora	
CIDESON	Centro de Investigación y Desarrollo de los Recursos Naturales de Sonora, a research center in Sonora	
CONANP	Comisión Nacional de Áreas Naturales Protegidas, Mexico's National Commission for Protected Natural Areas	
DOF	Diario Oficial de la Federación, Mexico's Governmental Federal Register	
FONATUR	Fondo Nacional de Fomento al Turismo, Mexico's National Fund for the Promotion of Tourism	
GEF	Global Environmental Facility, an international funding organization created as a result of the Rio Summit (UNCED)	
INE	Instituto Nacional de Ecología, Mexico's National Institute of Ecology	
IUCN	International Union for the Conservation of Nature	
MAB	UNESCO's Man and the Biosphere Program	
NAFTA	North American Free Trade Agreement	
NGO	Non-Governmental Organization	
NOS	Noroeste Sustentable, or Sustainable Northwest, a Mexican conservation initiative	
SAGARPA	Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación, Mexico's Ministry of Agricultura	
SDNHM	San Diego Natural History Museum	
SEDUE	Secretaría de Desarrollo Urbano y Ecología, Mexico's first Environmental Ministry acting between 1983–1992	
SEMARNAP	Secretaría de Medio Ambiente, Recursos Naturales y Pesca; Mexico's Ministry of the Environment 1994–2000	
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales, Mexico's Ministry of the Environment 2000–2006	
PROFEPA	Procuraduría Federal de Protección al Ambiente, Mexico's Environmental Attorney General	
UNAM	Universidad Nacional Autónoma de México, Mexico's National University	
UNCED	United Nations Conference on Environment and Development (also known as the Rio Summit)	
UNESCO	United Nations Educational, Scientific and Cultural Organization	

### FIGURE CAPTIONS

Figure 1. Marine and terrestrial habitats in the Gulf of California (source: Conservation International, Gulf of California Geographic Information System, compiled from CEC 1997, CONABIO 1999, Sala et al. 2002, Garcillán and Ezcurra 2003, and Riemann and Ezcurra 2005).

Figure 2. In the coast of the Yaqui Valley in southern Sonora, between Estero Lobos and Estero Tobari, most of the mangrove forests have been cut to develop shrimp farms and the lush subtropical Sonoran Desert scrub has been cleared for agriculture. Only the briny meanders of the salt-flat hinterland remain of what was once one of the most luxuriant coastal ecosystems of the Gulf of California (source: Google Earth image bank, August 2005).

Figure 3. Conservation priorities for the Gulf of California as developed by <u>Coalición para la</u> <u>Sustentabilidad del Golfo de California</u> (sources: CSGC 2001, 2004, and Enríquez-Andrade et al. 2005).

Figure 4. Regional conservation agenda for the Gulf of California, developed by a group of conservationists and presented at the "Defying Ocean's End" (DOE) Conference (source: DOE's Gulf of California Working Group, compiled by Carvajal, Robles, and Ezcurra 2005).









### Appendix 5. Other contributions

### WORLD HERITAGE NOMINATION - IUCN TECHNICAL EVALUATION

ISLANDS AND PROTECTED AREAS OF THE GULF OF CALIFORNIA (MEXICO) - ID N° 1182

### 1. DOCUMENTATION

- Date nomination received by IUCN: April 2004
- ii) Dates on which any additional information was officially requested from and provided by the State Party: IUCN letter requesting supplementary information sent 26 October 2004. State Party response received on 7 December 2004.
- iii) IUCN/WCMC Data Sheet: 10 references.
- iv) Additional Documentation Consulted: UNESCO, 2002, Proceedings of the World Heritage Marine Biodiversity Workshop, Hanoi, Vietnam, World Heritage Papers 4; UNEP-WCMC, 2002, Coral Reefs Atlas of the World; UNEP-WCMC, 2003, Seagrass Atlas of the World; GBRMPA, WB, IUCN, 1995, A Global Representative System of Marine Protected Areas. Vol. III; Bezaury-Creel, J.E. (in print), Las Áreas Protegidas Costeras y Marinas de México; Walter, B.W., 1960. The distribution and affinities of the marine fish fauna of the Gulf of California, in Systematic Zoology, Vol. 9, No.3; Sala, E.O, Aburto.G, et al, 2002, Marine Conservation at a regional scale: developing a science-based network of marine reserves in the Gulf of California, in Scince, Vol. 298; WWF-Mexico. Base de datos de biodiversidad, procesos ecológicos, físicos y socio-económicos para la definición de prioridades de conservación de biodiversidad en el Golfo de California; Case. T.J, Cody.M, Ezcurra. E, 2002; A New Island Biogeography of the Sea of Cortés.
- v) Consultations: 10 external reviewers consulted. Staff from the National Commission for Protected Areas of Mexico (CONANP); Staff from Regional Divisions of CONANP; Staff from the Regional Division of the Navy; experts from WWF, TNC working in the nominated area; local communities and representatives of the Seri Indigenous Peoples; and other national and local institutions involved in the management of the property.
- vi) Field Visit: Pedro Rosabal, September / October, 2004.
- vii) Date of approval of report by IUCN: April 2005

### 2. SUMMARY OF NATURAL VALUES

The nominated serial property comprises 244 islands, islets and coastal areas that are located in the Gulf of California in North-eastern Mexico, extending from the Colorado River Delta in the north to 270 km southeast of the tip of the Baia California Peninsula. All the component sites included in this serial nomination lie within nine protected areas declared by law. The total area of the nominated property is 1,838,012ha, of which 460,788ha are terrestrial and 1,377,224ha are marine areas, which represents 5% of the total area of the Gulf of California. The property's marine extension is smaller than that of the Great Barrier Reef in Australia and the Galapagos Marine Reserve in Ecuador, but it is the largest of all the others marine properties on the WH List. The nine protected areas clusters included in the nomination are outlined in Table 1 below.

The Gulf of California extends 1,557km from the Colorado River delta to a line between Cabo San Lucas and Cabo Corrientes on the mainland, well to the south. It averages about 175km wide overall, widening towards the south. The Baja California Peninsula parallels the mainland for about 1,130km. The Gulf and its islands are a result of the crustal movement which began to detach the peninsula from the continent 17 to 25 million years ago. As a sea it is only about 4.5 million years old. The separation is continuing, and faulting in the

northernmost part of the Gulf related to tectonic movements has thrown up many plant, coral and animal fossils dating from a warmer past. It also represents a unique example in which, in a very short distance, there are simultaneously "bridge islands" (populated by land in ocean level decline during glaciations) and oceanic islands (populated by sea and air).

The geological and oceanographic processes occurring in the Gulf trapped a portion of the Temperate Eastern Pacific marine waters in its upper part, isolating it from the rest of the region's water mass. This process resulted in the formation of a gradient of habitats that go from temperate, in the Upper Gulf and Colorado River Delta in the north, to tropical, in the south, where the gulf opens up to the influence of the Eastern Pacific marine waters. This unique marine ecoregion, named the Sea of Cortez Ecoregion (Case et al. 2002), contains a variety of benthic (both deep and shallow) and pelagic environments that range from coral reefs to wetland to upwelling areas. The ecoregion sustains a wealth of ecosystems and populations of numerous species of macro algae, bony and cartilaginous fish, marine mammals, and sea birds, among other taxonomic groups

There are some 900 islands and islets in the Gulf, 244 of which are included in this serial nomination. Most are barren, volcanic and mountainous with mainly rocky

# **Ecological Society of America**

International Conference

# **Ecology in an Era of Globalization**

Merida, Mexico, January 8 - 12, 2006

Special workshop: "Developing and delivering scientific information in response to

emerging needs."

Organizers: Hague Vaughan (co-organizer, Canada)

Manuel Maass (co-organizer, Mexico)

Robert Waide (co-organizer, United States)

**Highlights**: Steward Pickett (confirmed) - Interactions between scientists and managers in Baltimore: Connecting LTER science and societal needs.

Ariel Lugo (confirmed) - The use of visualization to help the general public understand the complexities of urban development.

Exequiel Ezcurra (confirmed) - A Knowledge system for sustainability in the Sea of Cortes.

Public concerns and issues are increasingly place-based and related to ecological sustainability: the measure of science success is, as a result, no longer simply "developed new information and made it available" but something like "developed and delivered information so as to improve/inform decisions and outcomes". This new focus means that some enhancements are required in the way we plan and manage our science programs. The proposed workshop will address better ways to deliver information effectively to decision-makers including the public, stakeholders, research personnel, and managers so informed decisions and choices can be made. In many cases, decisionmakers receive information well past the desirable point of intervention. This leads to a lag in policy decisions that may ultimately result in choices that are no longer timely or effective. This is only one of the issues that affect our capability to deliver information in an effective and timely way. Other points include the ability to communicate science and the assumption of a responsibility to do so, the ability to deliver information that is specifically tailored to the decision-maker, and the development of public capacity to use that information.

The nature and characteristics of information to influence policy process/people are not entirely consistent with that routinely provided by research and monitoring. It should be:

- Relevant to problems and players;
- Useable in form and for a specific context;
- Targeted, accessible and understandable to its audience;
- Integrated, and suggest a course of action;
- Timely;
- Allow decision-makers to weigh choices, trade-offs and consequences;
- Ensure those involved continue to be in control of the problem.

The nature of the information, which best informs decision-makers is somewhat different than that which science routinely provides. The provision of information, which is timely, integrated, and non-confrontational is required in support of adaptive management. Such information comprises an additional product line for science: one that trades off certainty for timeliness but in delivering feedback, albeit risk based, fuels sustainability, a process of iterative adaptive decisions based on timely information. Such a view does not alter the fundamental importance of the solid peer-reviewed science required for understanding, predictive modeling, and the management of critical issues. Quite the opposite: such science is enhanced through a focus on its effective delivery and both aspects are arguably required in order to achieve some of society's broader goals such as sustained ecosystem services, resilient industrial development, policy decisions adequately reflecting interacting economic, social and environmental factors and an engaged public making increasingly informed choices.

The proposed workshop will bring together scientists and administrators experienced in delivering scientific information to policy makers. The workshop will employ overview presentations based on a common needs framework developed before the meeting. This framework will guide the content of presentations that provide examples of what is presently being done to deliver scientific information to policy makers. The needs framework will guide workshop participants in identifying gaps in knowledge and developing recommendations to address those gaps.