

Part Three

THE ECOSYSTEMS OF THE GULF OF MEXICO

THE GULF OF MEXICO – PAST, PRESENT, AND FUTURE: A UNITED STATES, MEXICO, AND CUBA COLLABORATION

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INTRODUCTION

The Gulf of Mexico is one of the world's most ecologically and economically productive bodies of water. Known as America's Sea or the American Mediterranean, it is surrounded by three countries, the United States, Mexico, and Cuba. Knowledge and management of this large marine ecosystem (Kumpf *et al.* 1999), however, has generally and historically been independently operated from the three separate countries. Although some collaboration and cooperation has existed, it typically was along topical research lines or specific regions of interest. Advanced 21st Century communication and transportation warrant better cooperation and collaboration for both knowledge and management of the Gulf of Mexico. The newly endowed and developing Harte Research Institute for Gulf of Mexico Studies has launched a new initiative, *The Gulf of Mexico – Past, Present, and Future*, to assist in achieving tri-national knowledge synthesis and expansion, new and exploratory research, outreach and education, as well as management of the Gulf of Mexico.

The Harte Research Institute (HRI) for Gulf of Mexico Studies was endowed in September 2000 at Texas A&M University-Corpus Christi (TAMU-CC) in Corpus Christi, Texas. A world-class Advisory Council of business, academic, and conservation leaders are assisting TAMU-CC with development of the new research institute.

The vision of HRI is to be a research center of excellence providing international leadership in generating and disseminating knowledge about the Gulf of Mexico ecosystem and its critical role in the economies of the North American region. The mission of HRI is to support and advance the long-term sustainable use and conservation of the Gulf of Mexico. This mission will be accomplished by:

- Providing an environment to conduct meaningful and successful programs in research and education with highly qualified faculty, staff, and students.
- Promoting excellence and innovation in interdisciplinary scientific research, public policy initiatives, and education of the public concerning the Gulf of Mexico.
- Encouraging a tri-national responsibility and approach to understanding the Gulf of Mexico ecosystem, involving the United States, Mexico, and Cuba.
- Collaborating and cooperating with other organizations that are dedicated to addressing issues related to the Gulf of Mexico, in order to achieve common goals.
- Freely disseminating research results to the scientific community, management agencies, the general public, and policy makers, in order to foster wise and appropriate use of the Gulf of Mexico.
- Construction of a new three-story, 55,000 sq. ft. research facility that began in June 2003 and will be completed in early 2005.

NEW INITIATIVE COMPONENTS

The Harte Research Institute (www.hri.tamucc.edu) is promoting and sponsoring *The Gulf of Mexico – Past, Present, and Future* initiative in its formative years to get an early start on its mission of long-term sustainable use and conservation of the Gulf of Mexico. Components of this multiyear, tri-national initiative involving the U.S., Mexico, and Cuba include:

1. design and maintenance of a Gulfwide internet accessible research database on the Gulf of Mexico;
2. collaboration with other institutions and organizations to co-sponsor annual exploratory expeditions to the Gulf of Mexico;
3. sponsorship of a “State of Knowledge Workshop”, including leading scientists, managers, and conservationists from around the Gulf of Mexico in October 2003;
4. inventorying the biodiversity of the Gulf of Mexico by preparing a checklist of all species, including habitat, distribution, and key references for each species;
5. preparation of a 50-year update of “Bulletin 89” – *Gulf of Mexico – Its Origin, Waters, and Marine Life*, U.S. Fish and Wildlife Service (Galtsoff 1954);
6. sponsorship of a “State of the Gulf of Mexico Conference” in October 2005, involving all users and entities (scientists, managers, policymakers, industry, business, tourists);
7. sponsoring regular, thematic working conferences annually at HRI on timely topics of need or interest;
8. establishing a Gulf of Mexico Alliance of all stakeholders; and,
9. using all of the above to develop public policy initiatives that will positively impact the “state” of the Gulf of Mexico.

HRI is attempting to be as inclusive as possible, in cooperation and collaboration with other institutions, to accomplish these components. A Gulfwide, strategic planning and steering committee is assisting in the development of certain elements of the initiative. Some of the above items are already functional (#s 1 and 2) or have occurred (#3), some are in the planning phase (#s 4-6), and the remainder will develop as HRI becomes fully operational. Further information is found below and more will be forthcoming as plans are developed (see HRI Website at www.hri.tamucc.edu).

RESEARCH DATABASE

The HRI database website, GulfBase, at www.gulfbase.org, was opened in October 2002. At present, GulfBase is a searchable and sortable website for all Gulf of Mexico researchers, research institutes, and research projects. It will continue to expand with further databases.

EXPLORATORY EXPEDITIONS

Annual, collaborative exploratory cruises to various parts of the Gulf of Mexico will become a hallmark of HRI. The first HRI co-sponsored exploratory expedition went to the coral reefs of Veracruz, Mexico, during 2002. This cruise, which used the Mexican Navy’s oceanographic research vessel *Antares*, was a collaborative effort between HRI, the National Geographic Society’s Sustainable Seas Program, and the Mexican Navy’s Institute of Oceanography. Future

exploratory cruises are being planned to northwestern Cuba and the topographic highs of the northwestern Gulf of Mexico.

STATE OF KNOWLEDGE WORKSHOP

The State of Knowledge of the Gulf of Mexico Workshop was held during 14-15 October 2003 in Corpus Christi. Our new HRI research database website, GulfBase, at www.gulfbase.org, will be used to encourage cooperation and collaboration between workers in the boundary countries of the Gulf in Cuba, Mexico, and the United States.

The purpose of this workshop was to initiate a plan to determine the state of knowledge of the Gulf of Mexico. Leading marine scientists from all three countries will begin the process of synthesis and determination of knowledge from a holistic viewpoint of the entire Gulf. It has been almost 50 years since a single volume (*Gulf of Mexico - Its Origin, Waters, and Marine Life*, Fishery Bulletin 89, Galtsoff 1954) synthesized what was known at that time about the Gulf of Mexico. Over 50 scientists contributed to this work on the history, geology, meteorology, physical and chemical oceanography, biota, and pollution of the Gulf. Although coverage on each topic varied greatly in depth and length, and its focus was mainly northern Gulf of Mexico, Bulletin 89 remained as a strong reference for Gulf of Mexico researchers for several decades. Most of the knowledge gained and presented in Bulletin 89 was from research cruises and expeditions to the Gulf during the late 19th and early 20th century and from a few fledging marine science labs and oceanography programs started in the late 1940s and early 1950s. During the intervening 50 years, a number of published works have focused on certain topics, regions, or taxa. Table 11.1 summarizes some of the more prominent works.

At the dawning of a new century, researchers at marine labs and universities encircle the entire Gulf in Cuba, Mexico, and the U.S., and instrumentation, technology, and communication have greatly expanded our knowledge of the Gulf. The U.S. Environmental Protection Agency's Gulf of Mexico Program (www.epa.gov/gmpo/) has identified priority problems affecting the northern Gulf of Mexico, and they recently published the research needs of that region (EPA 2002). A network of United Nations' organizations declared the Gulf of Mexico as one of 64 large marine ecosystems in the world (Kumpf *et al.* 1999). HRI facilitated this State of Knowledge Workshop to begin establishing our current state of knowledge for the entire Gulf of Mexico. The workshop of leading scientists from all three nations will initiate the formal organization and preparation of a new digest of information on the Gulf of Mexico (see below).

BIODIVERSITY PROJECT

A peer-reviewed inventory of the biodiversity of the Gulf of Mexico will be accomplished by preparing a checklist of all living species. The checklist will include habitat, distribution and key references for each species. Appropriate taxonomic personnel for each major taxon are now being assembled. At present, it is estimated that one to two years will be necessary to prepare the checklist. The final product will be a book (or books, see Item #5 below) of all species with a short summary preceding each major taxon. Additionally, this project is an affiliated regional ecosystem survey of the U.S. Census of Marine Life program (www.coml.org), and the list will be included in the Ocean Biogeographic Information System (OBIS) (www.iobis.org) as a dynamic digital taxonomic atlas of the Gulf of Mexico.

Table 11.1. List of major synthesis works on selected topics, regions, or taxa within the Gulf of Mexico in the past 50 years (1954-2003), since the publication of Galtsoff (1954).

Date	Authors	Subject/Comments
By Topic		
1970	Pequegnat and Chace (eds.)	Primarily deep-sea biology; Volume 1 of 3-part series
1972	Capurro and Reid (eds.)	Physical oceanography; Volume 2 of 3-part series
1972	Rezak and Henry (eds.)	Geological and geophysical oceanography; Volume 3 of 3-part series
1989	Britton and Morton	Shore ecology, primarily northwestern Gulf, some southern
1991	Salvador (ed.)	Geology of the Gulf of Mexico Basin
1999	Bianchi <i>et al.</i> (eds.)	Biogeochemistry
1999	Kumpf <i>et al.</i> (eds.)	Large marine ecosystem series
By Region		
1973	SUSFIO	Summary of knowledge of the eastern Gulf
1981	Flint and Rabalais	Ecosystem study of South Texas Outer Continental Shelf
1983	Darnell <i>et al.</i>	Northwestern Gulf shelf distribution atlas of selected fish and shrimp
1985	Ehler <i>et al.</i>	Data atlas of northern Gulf coastal and ocean zones
1987	Berryhill <i>et al.</i>	Atlas of late Quaternary facies and structure, northern Gulf
1987	Darnell <i>et al.</i>	Eastern Gulf shelf distribution atlas of selected fish and shrimp
By Taxa		
1998+	McEachron and Fechhelm	Volume 1 (1998) contains 40 of the 44 orders of fish and about ½ of the 1,468 species; Volume 2 is <i>in press</i>
2000	Würsig <i>et al.</i>	Covers all 31 species of marine mammals known to occur in the Gulf

Fishery Bulletin 89, mentioned above, listed over 25 major taxa (phyla or large classes) and almost 50 total taxonomic groups. Sixty five percent of the book was dedicated to biota and biotic communities. By comparison, 6% covered history of exploration and research, 7% geology/geological oceanography, 1% meteorology, 10% physical and chemical oceanography, and 4% pollution.

For natural resource managers to properly manage the living resources of the Gulf of Mexico, an accurate assessment of species by habitat and distribution is imperative. A benchmark or baseline at the beginning of the 21st Century is an appropriate timeline.

“Bulletin 89”, 50-Year Update

By combining the outcomes of the State of Knowledge Workshop and the Biodiversity Project we will produce an update of Bulletin 89, *Gulf of Mexico – Its Origin, Waters, and Marine Life* (Galtsoff 1954). It will likely be expanded from one volume to at least four.

Background—Just over fifty years ago, a group of prominent marine scientists agreed to begin work on a digest of existing knowledge on the Gulf of Mexico. The effort was proposed by Lionel A. Walford of the Fish and Wildlife Service and Waldo L. Schmitt of the U.S. National Museum during a meeting of the Gulf and Caribbean Fisheries Institute in Miami. Paul S. Galtsoff of the Fish and Wildlife Service agreed to coordinate the project, the magnitude of which he subsequently found to far exceed his expectations. However, three years of effort by 55 contributors and additional months of editing resulted in the 1954 publication of a classic reference work entitled *Gulf of Mexico – Its Origin, Waters, and Marine Life* as Fishery Bulletin 89, Fishery Bulletin of the Fish and Wildlife Service, Volume 55 (Galtsoff 1954). The title page of this work notes that it was “Prepared by American scientists under the sponsorship of the Fish and Wildlife Service, United States Department of the Interior” and that the effort was “Coordinated by Paul S. Galtsoff”, who is generally indicated as the editor in bibliographic references to this work.

This reference volume, commonly referred to as simply “Bulletin 89” by hosts of marine scientists, agency personnel, and students who are familiar with it, has for 50 years provided a benchmark on which to build. Treatments on the history of exploration, geology, meteorology, physical and chemical oceanography, biota, and human impacts remain extremely valuable as reference works, some now primarily for historical context. Counted among the contributors were the most distinguished American marine scientists of their day, and visibility for a number of these was further enhanced by the extensively cited chapters they contributed to this volume. The group included the most qualified federal agency scientists, museum curators, marine laboratory investigators, and university professors that could be assembled. It broadly represented taxonomic authorities selected to cover almost every possible biotic group, with acknowledged omission of some groups for which willing expertise could not be found.

At this writing, only 4 of the 55 original contributors remain alive. Of those 4, all of which are retired, only 2 remain active in research. However, the 55 original contributors, and especially the far larger number of students they mentored, have contributed to a massive body of information on the Gulf of Mexico since 1954. In addition to this core group, a number of other workers – many now in laboratories, agencies, and university programs that did not exist 50 years ago – have made tremendous contributions to baseline knowledge of the Gulf of Mexico since publication of this volume.

While the challenge is daunting, an update of “Bulletin 89” is overdue. As the fiftieth anniversary of its publication approaches, the range and scope of primary literature sources on the Gulf of Mexico have become so expansive as to be all but unmanageable for most workers. For almost all subject areas, no authoritative digests centered on the Gulf of Mexico have appeared since “Bulletin 89”. Yet, many treatments in the latter are clearly so dated as to be of limited value other than as historical starting points. Furthermore, there would appear to be an urgency for beginning of compilations for this updated digest, before the marine science community sustains further loss of continuity in expertise. While we have already lost all but a few of the original contributors to “Bulletin 89”, the passage of 50 years has also claimed a large number of the subsequent generation of workers, and others are already late in their careers. This is perhaps most evident in what has become a very limited pool of qualified systematists to draw upon for expertise concerning diversity and taxonomy of Gulf of Mexico biota.

Herewith, we will co-chair an effort to identify contributors, formulate research procedures, establish contribution formats, and set timetables for what we envision as a 50-year update of *Gulf of Mexico – Its Origin, Waters, and Marine Life*. Our efforts will be augmented

by oversight committees to include additional representation from the National Museum of Natural History, Smithsonian Institution, Washington D.C., varied institutions in U.S. states bordering the Gulf of Mexico, and key institutions in Cuba and Mexico. It is our intent to depart from one constraint of the original volume in that the envisioned contributors will not be limited to U.S. scientists.

We propose that each contributor in this effort build upon the 1954 volume by thorough survey of published literature and other verifiable archives, to integrate relevant records and data through the year 2003. Given the scope of this coverage, and the now massive literature that must be surveyed, we propose that this new digest appear in the form of at least four volumes, one to focus on “Origin” (history, archaeology, geology), another on “Waters” (chemical and physical oceanography), another on “Marine Life” (biota, habitats, and communities), and a fourth on “Anthropogenic Effects”. We propose that these be published in no particular order, but that they simply carry volume numbers and publication dates in accord with the sequence of completion. We further propose, pending development of mutually agreeable publication arrangements, that these volumes be published under the auspices of the Harte Research Institute for Gulf of Mexico Studies, which has given endorsement to this plan. It is also intended that this information constitute a baseline resource for simultaneous development of a Gulf-wide database, to be maintained and updated by the Harte Research Institute.

State of the Gulf of Mexico Conference

In October 2005, the State of the Gulf of Mexico Conference will be a major event to publicly address and present the “state” (condition or health) of all aspects of the Gulf of Mexico (biota, biotic habitats and communities, fisheries, water and sediment quality, coastal development, oil and gas exploration and development, tourism, natural resource management, etc.). This conference will be the first in an on-going series that will occur every five years in a different major city around the Gulf of Mexico. Ten indicators of ecosystem health will be established that will allow measurement of progress (positive or negative) on the state of the Gulf of Mexico. These criteria are currently under development.

Annual Thematic Working Conferences

HRI will annually sponsor a small working conference with leading scientists concerning important, current issues affecting the Gulf of Mexico (e.g. invasive species, harmful algal blooms, coastal development, dead zones, etc.). These conferences will be held in the new HRI conference center at Texas A&M University-Corpus Christi in Corpus Christi, Texas.

Gulf of Mexico Alliance

An alliance of all stakeholders or entities with concern, interest, use or jurisdiction will be established. This alliance will include members from private business (fisheries, tourism, oil and gas, etc.), state and federal government agencies, academia, conservation and other non-governmental groups, and private citizens. The alliance will work cooperatively and collectively for the long-term sustainable use and conservation of the Gulf of Mexico.

Public Policy Initiatives

As HRI develops and grows, it intends to be a leader in encouraging and achieving cooperation with multiple partners in influencing public policy for the long-term sustainable use and conservation of the Gulf of Mexico.

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