Meta-Database of Marine Research in Mexico: Trends and Applications

Introduction Draft

Palacios-Abrantes, J; Cisneros-Montemayor, AM; Arreguín-Sánchez, F; Cisneros-Mata, MA; Rodríguez, L; Cheung WWL

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# Introduction

Climate change has been globally reshaping the marine ecosystem for the last century in different ways {Poloczanska:2013kj, Weatherdon:2016fx}. Increases in surface water temperature have been linked to both biomass change and distribution shifts of marine fishes {ArreguinSanchez:2015ba, Cheung:2010dt}; coral bleaching on most reefs in the world {Hughes:2017bs}; and predator-prey mismatch in the water column {Edwards:2004ct}. Such effects are projected to continue and intensify if anthropogenic emissions are not mitigated [IPCC, 2015]{Cheung:2016tt, Gattuso:2015jz}. As *human society* depend on natural resources, the production and availability of natural and socio-economic data is a key component of the actions needed to adapt to climate change {Mertz:2009fu, Moser:2010kf}. As a result, data availability has been identified as a common barrier in many steps of the adaptive management process, from the planning stage to outcome evaluation {Moser:2010kf}. This lack of data availability is often perceived in developing nations [cita]. However, in many cases this is largely a result of a lack of access to these data, rather than a complete (or partially) lack of it {CisnerosMontemayor:2016jn}. Hence, a meta-dataset of marine research is key to foster collaboration and data accessibility, better understand Mexico's marine and coastal environments, identify knowledge gaps so that research can be prioritized, and better inform public policies that will foster adaptation and resilience to a changing climate {Reichman:2011kv} [CITA].

Ecosystem changes are already having repercussions on human populations, especially on those that directly rely on marine resources {Pershing:2015gq, Weatherdon:2016fx}. Some coastal communities depending on fish have seen their catch change {ArreguinSanchez:2015ba}; and global projections suggest it will continue to shift {Cheung:2016tt}. Climate change is also expected to further reduce ecosystem services provided by mangrove forests and coral reefs, diminishing their mitigation efficiency and hence increasing the risk of natural catastrophes in coastal communities [cita]. These changes will impact coastal communities on both economic and food security aspects, particular those on developing nations {Lam:2016dy, Vermeulen:2014ut}. Because of their relatively lower adaptive capacity (e.g., x, x, x), developing countries must be at the forefront of initiatives to anticipate ocean impacts and more carefully plan adaptations, leveraging cross-disciplinary and cross-sectoral cooperation {Mertz:2009fu, Pershing:2015gq, Rice:2011fb}.

In 2016 Mexico's government worked with the UNFCCC to produce a climate change adaptation strategy for mid-century [SEMARNAT-INECC, 2016]. This strategy is supported by the Mexican National Climate Change Law (*Ley General de Cambio Climatico*) that serves as a framework for the development and implementation of public policies for adaptation to climate change and the mitigation of greenhouse gases [DOF, 2012]. As part of a cutting-edge initiative, Mexico government has recently created an information system solely devoted to data related to climate change [SICC]. Parallel to this effort, numerous information covering the seas and coasts can be found in academic institutions (CICESE; UCSD) and NGOs (COBI; TNC) located (physically) both inside and outside the country, as well as government agencies (CONABIO; CONAPESCA). However, it is possible that these repositories do not capture all the information available in Mexico, and it is not clear where this missing information is located. The creation and management of a public meta-dataset (the information about every aspect of the data that is required to understand it) is a huge step to increase access to information, ensure proper data preservation, and stewardship {Michener:1997hk} Vincent et al., 2010]. Having publicly accessible description on existing data (and metadata) will allow increasing collaboration for innovative research {Michener:2006wg}. And while diverse barriers often compromise the exchange of data among stakeholders {Reichman:2011kv}, having proper metadata increases data longevity, fosters collaboration, and help examine analysis of the data itself; all important aspect of climate change studies {Michener:2006wg}.

Several initiatives in different levels of society in Mexico are currently working on grouping data-sets and information in single repositories (e.g. CONABIO, GoMexSi, Datamares, Monitoreo Noroeste). These initiatives are examples of successful efforts to make marine data in Mexico available. However, most of the repositories available cover geographic areas or are topic specific. Those that are nation-wide are often limited or also topic-specific. Hence, the current project aimed to create a meta-database for oceanographic, ecological, economic, fisheries and social data for all marine ecosystems and marine-related sectors of Mexico. Metadata relevant to Mexico was compiled, including highlighting existing repositories; the information gather was then used to (*i*) highlight key trends, data strengths and gaps, and (*ii*) a basic evaluation of capacity (in terms of data availability) for robust climate change projections. Finally, key steps that could be taken to further strengthen existing data are presented.

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