

# **A summary Review of Wider Caribbean Fisheries and their Relationships to Sea Turtles, Marine Mammals and Seabirds**

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## **ABSTRACT**

There is a growing recognition that trends, status, and fate of sea turtle, marine mammal and seabird populations cannot be understood or managed in isolation from an understanding of fisheries and oceanographic conditions at the basin-scale. This year Duke University, Blue Ocean Institute and WIDECAS (Wider Caribbean Sea Turtle Conservation Network) began partnering with regional fisheries organizations, scientists and NGOs to undertake a preliminary but vital regional review of the interaction of sea turtles, marine mammals and seabirds with Caribbean fisheries. Several important features are already emerging from our preliminary and ongoing synthesis of the peer-reviewed literature, technical reports and discussions with regional experts in fisheries, ocean research, and management. First, while acknowledging the efforts to assess and mitigate bycatch in industrial fisheries, it is clear that few assessments have been carried out for coastal gillnets and artisanal bottom-set longlines, which may have important cumulative impacts from numerous small-scale operations. Second, sea turtle bycatch has the best documented record in this region, and the comparative dearth of information regarding marine mammal and seabird distribution and bycatch represents a serious gap in efforts to construct an ecosystem-level context to sustainably managing the resources of the Caribbean Large Marine Ecosystem. Finally, a coherent network of investigators is needed to analyze bycatch from a multi-taxa, multi-gear, multi-national perspective able to integrate data on bycatch, fishing effort, and oceanography at meaningful scales. We expect the information and recommendations from this compilation will serve as useful background documentation for subsequent multinational activities and action plans

KEY WORDS: bycatch; sea turtles; marine mammals; sea birds.

## **Una Revisión de las Pesquerías del Gran Caribe y su Relación con Tortugas, Mamíferos y Aves Marinas**

Cada vez se reconoce mas que las tendencias, estado y el destino de las poblaciones de tortugas, mamíferos y aves marinas no pueden ser entendidos o manejados en aislamiento de la comprensión de las industrias pesqueras y las condiciones oceanográficas en la escala de las cuencas oceánicas. Este año Duke University, Blue Ocean Institute y WIDECAS (Red para la Conservación de las Tortugas Marinas en el Gran Caribe) comenzó a colaborar con organizaciones pesqueras regionales, científicos y las ONGs para emprender una revisión regional preliminar pero vital acerca de la interacción de las tortugas, los mamíferos y las aves marinas con las industrias pesqueras del Caribe. Varias características importantes están emergiendo ya de nuestra síntesis preliminar y en curso de la literatura científica, los informes técnicos y las discusiones con los expertos regionales en pesquerías, investigación marina y manejo. A pesar de los esfuerzos para determinar y mitigar la captura incidental, las tortugas marinas y su interacción con las pesquerías industriales. Pocas evaluaciones se han realizado para las redes de enmalle costeros y los palangres que pueden tener impactos acumulativos importantes de operaciones artesanales. La captura incidental de las tortugas marinas tiene el expediente lo más mejor posible documentado, y la falta de información con respecto a la distribución y la captura incidental del mamíferos marinos y aves marinas representa un “hueco” de información en los esfuerzos de desarrollar un contexto ecosistema para manejar los recursos naturales importante del ecosistema marina del Caribe. Esperamos que la información y las recomendaciones de esta compilación sirvan como documentación base útil para las actividades y los planes de acción multinacionales subsecuentes.

PALABRAS CLAVES: bycatch; tortugas del mar; mamíferos marinos; aves marinas.

## **INTRODUCTION**

Long-lived late-maturing taxa such as sea turtles, marine mammals and seabirds are vulnerable to population-level impacts from incidental capture in fisheries. There is thus a growing recognition that trends, status, and fate of these populations cannot be understood or managed in isolation from an understanding of fisheries and oceanographic conditions at the basin-scale (Gilman 2001,

Kaschner et al. 2001, Lewison et al. 2004). This integrated approach is congruent and complementary to the attempts at more holistic, ecosystem-based management of the coastal and marine environment, but a lack of data synthesis and quantitative analyses has impeded our ability to assess the impact of fisheries on air-breathing pelagic vertebrate populations (Lewison et al. 2005). This has delayed development of management measures and effective con-

ervation plans. Given the number of species affected, the spatial scale of global fisheries, and the wide distribution of these pelagic species, coordinated efforts that synthesize and analyze data across species, oceans, and fisheries are essential.

In 2005, Duke University and Blue Ocean Institute launched Project GloBAL, the Global Assessment of Long-lived Species. Our goal, simply stated, is *to reduce global bycatch of endangered sea turtles, seabirds, and marine mammals, while promoting sustainable fisheries and fishing practices*. Our initiative will undertake a global review of bycatch of the air-breathing marine vertebrates. Previous analyses have focused upon a particular ocean region (e.g., the Southern Ocean), a species group (e.g., albatrosses), or fishing gear (e.g., pelagic longlines). Such a perspective does not provide the comprehensive approach necessary for rational management of multinational resources. By taking a large-scale approach to understanding bycatch of seabirds, marine mammals and sea turtles, we hope to facilitate international collaboration and coordination of bycatch mitigation and management. Project GloBAL therefore aims to:

Develop a global network of investigators and donors to understand bycatch

Analyze bycatch from a multi-taxa, multi-gear, multi-national perspective

Integrate data on bycatch, fishing effort, oceanography on regional, ocean-wide, and global scales.

Developing a global network of investigators and donors.

This global assessment is a worldwide task and cannot be accomplished without the support and collaboration of regional experts. To achieve this goal, we seek regional partners to generate a large scale picture of the interaction between the taxa of concern, fisheries, and the oceanography of the particular ocean basin. The success of such regional cross-taxa, cross-gear syntheses is entirely dependent on forging collaborative relationships. Project GloBAL will adopt several approaches to build international partnerships, including providing useful resources such as a spatially-referenced global database on bycatch research and analytical and quantitative skills to aid large-scale syntheses.

Analyze bycatch from a multi-taxa, multi-gear, multi-national perspective.

Project GloBAL will begin its large-scale assessment using FAO ocean regions, modified to provide a more rele-

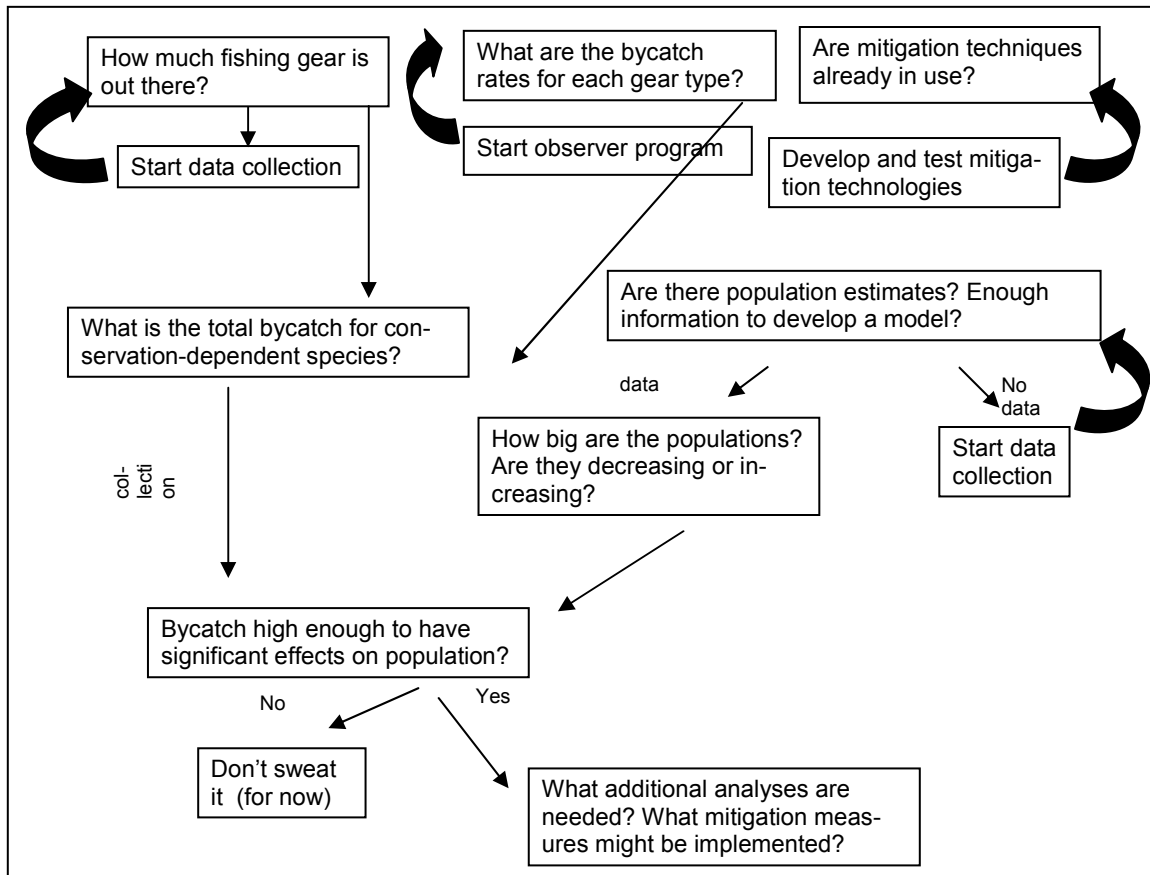


Figure 1. Flow chart of decision-support framework for assessing population-level impacts of bycatch

vant group for distribution of the marine taxa and key fisheries and ocean basin characteristics. Pilot studies using observer data have provided a testing ground for the Project GloBAL team to examine some issues and challenges central to analyzing bycatch data, including the impact of spatial scale, the sources of variability in bycatch data, the relationship between fishing effort, landings, and bycatch, and the effect of different methods of spatially distributing effort in sets extending over long distances.

Project GloBAL has also initiated efforts to integrate fishers' knowledge into bycatch assessment for data-deficient regions. These surveys are modifications to the rapid catch and effort survey protocol of the Gomez-Muñoz model (Gomez-Munoz 1990). Project GloBAL has supported in-country partner organizations to conduct these surveys. The first surveys are being undertaken in the western Indian Ocean and eastern Atlantic.

#### Integrating data on bycatch, fishing effort and oceanography on a regional, ocean-wide, and global scales

Linking multi-species bycatch patterns to spatially-explicit data on fishing effort and oceanographic features will generate a spatial understanding of environmental conditions related to bycatch patterns in time and space. These kinds of analysis will help decision makers avoid errors such as closing an area to protect a species only to divert fishing effort so that bycatch of another species is increased (for example, closing billfish grounds to prevent sea turtle bycatch and diverting effort onto seabirds).

#### **The Caribbean Regional Assessment**

From a starting point that generally corresponds to the FAO fishing regions, our wider Caribbean region is FAO 31. Our regional assessment does not however include the fisheries off the continental shelf, which treated separately in the global assessment. Project GLOBAL is partnering with regional fisheries organizations (Caribbean Regional Fisheries Mechanism), scientists at the University of the West Indies and WIDECAS (Wider Caribbean Sea Turtle Conservation Network) to undertake a preliminary review of the state of knowledge of sea turtle, marine mammal, and seabird bycatch in Caribbean fisheries. This territory by territory synopsis summarizing known information on key fisheries and bycatch is a starting point for both a gap analysis as well as developing a region-specific profile of bycatch by oceanographic province, taxa and gear. We developed a series of questions relating to fisheries and bycatch which we answered with the information available to us. Having done the background research, we continue to seek inputs from regional stakeholders as a vital step toward producing a thorough and complete review.

Several important features are already emerging from our preliminary and ongoing synthesis of the peer-reviewed literature, technical reports, and discussions with regional experts in fisheries, ocean research, and management. Bycatch research and management activities in non-US territories in the region have focused primarily on in-

dustrial fisheries (longline and trawl fisheries, and on the southern regions of the basin (Trinidad and northern South America). Studies of artisanal fisheries in the near-shore zones are beginning to emerge (Lum 2006); but face unique problems including the financial, logistical, and social constraints of placing observers on small fishing vessels.

Given the relative data-deficiency, the Caribbean will be one of the focal regions (along with the western Indian Ocean and eastern Atlantic regions) for rapid assessment surveys. We anticipate funding 2 such assessments in the Caribbean.

#### **DISCUSSION**

There are few studies in the wider Caribbean on fisheries and marine vertebrates beyond those sub-regions previously identified. However, an absence of information or research cannot be adjudged as a positive indicator of absence of a problem, unless the appropriate questions have been asked and an objective review has been undertaken. We have limited information on bycatch in artisanal fisheries. There is relatively more information regarding sea turtle bycatch than the other taxa and the dearth of information regarding either marine mammals or seabird distribution and bycatch easily stands out as another gap in the efforts to place an ecosystem-level context to sustainably managing the resources of the Caribbean Large Marine Ecosystem.

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#### **LITERATURE CITED**

- Gilman, E. 2001. Integrated management to address the incidental mortality of seabirds in longline fisheries. *Aquatic Conserv: Mar. Freshw. Ecosyst.* **11**:391-414.
- Gomez-Munoz, V. M. 1990. A model to estimate catches from a short fishery statistics survey. *Bulletin of Marine Science* **46**:719-722.
- Kaschner, K., R. Watson, V. Christensen, A. W. Trites, and D. Pauly. 2001. Modeling and mapping trophic overlap between marine mammals and commercial fisheries in the north Atlantic.
- Lewis, R. L., L. B. Crowder, A. J. Read, and S. A. Freeman. 2004. Understanding impacts of fisheries bycatch on marine megafauna. *Trends in Ecology & Evolution* **19**:598-604.
- Lewis, R. L., D. C. Nel, F. Taylor, J. P. Croxall, and K. S. Rivera. 2005. Thinking big—taking a large-scale approach to seabird bycatch. *Marine Ornithology* **33**:1-5.
- Lum, L. L. 2006. Assessment of incidental sea turtle catch in the artisanal gillnet fishery in Trinidad and Tobago, West Indies. *Applied Herpetology* **3**:357-368.

