Displacement of Fishing Effort by an Imminent MPA Closure: When is it an Issue?

Desplazamiento de Esfuerzo Pesquero Debido a una AMP Inminente: ¿Cuándo es un Problema?

Déplacement de l'effort de Pêche en Raison de l'AMP Imminent: Quand est-il un Problème?

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EXTENDED ABSTRACT

Marine Protected Areas (MPAs) are the most common management tool used for the conservation of marine resources. Although MPAs are well known as a tool for the preservation of biodiversity, there are large concerns about MPA placement due to the resulting displacement of fishing effort, when fishing rights are removed from those who traditionally fished within the area (Charles and Wilson 2009). In general, displacement is a problem that needs to be 'dealt with' even before it is quantified, which represents a large problem, given that the number of MPAs will inevitably increase in the following years in the race to meet the targets of the World Summit on Sustainable Development and United Nations Convention on Biological Diversity. Displacement will have the greatest social, economic, and ecological consequences when closures occur in core fishing grounds (Jennings 2013), which is not always the case. Additionally, in some circumstances, displacement might not incur any great social conflict because the fishery has the ability to fish in other locations, a property that has been called spatial mobility (Cinner 2007).

Here we present an analytical framework based on set theory for supporting reserve placement that quantifies the conflict with the fishing sectors due to displacement and lack of mobility (Figure 1). We began by quantifying the problem and the potential displacement. We then quantified opportunities for accommodating the displacement through inherent and imposed spatial mobility. The simple, repeatable framework presented here can be used to produce a standard baseline that allows establishing dialogue with stakeholders, identifying the most affected fisheries and formulating targeted advice for their management and adaptation.

Implementation of the framework requires solely maps of fishing grounds or effort (McCluskey and Lewison 2008) such as the ones produced from Vessel Monitoring System (VMS) data, increasingly available by fisheries monitoring centres worldwide (Lee et al. 2010). We apply the stepwise method in Honduras, where the largest MPA in Central America (the *Zona Exclusiva de Pesca Artesanal de los Cayos Miskitos Hondureños,* or ZEPA) is being placed and VMS data are available for six fisheries and three fishing seasons (Figure 2, Table I).

In Honduras the MPA closure will have a greater impact (higher displacement index) on shrimp and lobster SCUBA fisheries. These fisheries, however, have little room to accommodate the displacement within existent fishing grounds (low inherent mobility) and will likely be forced to use alternative fishing grounds, which are available (high imposed mobility) but of unknown quality.

KEY WORDS: Displacement, mobility, vessel monitoring system, adaptation

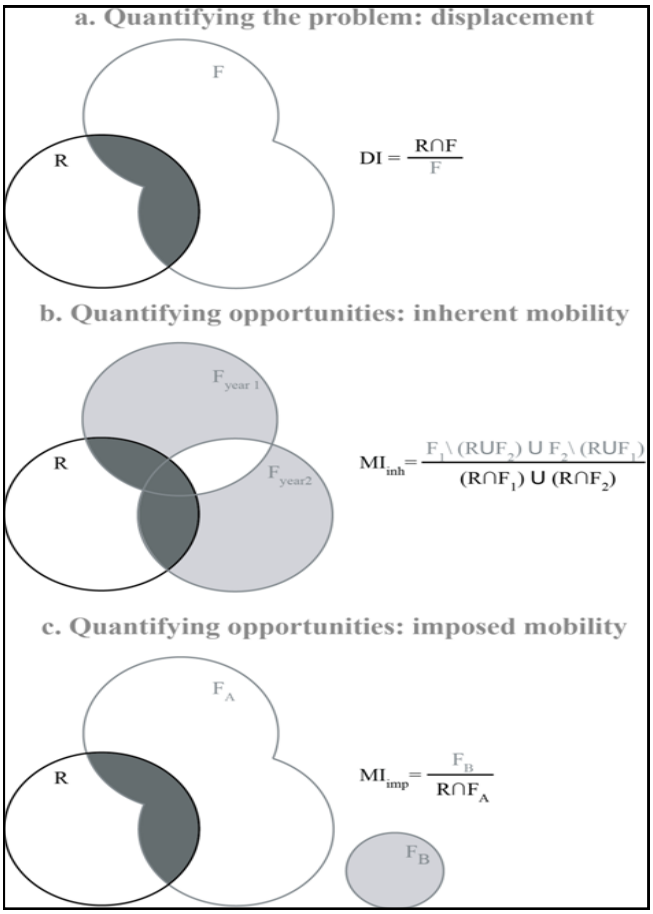

Figure 1. A framework for assessing the impacts of reserve closures by (a) quantifying the problem (displacement, in dark gray) and available opportunities: (b) inherent; and (c) imposed spatial mobility (in light gray).

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Table 1. Number of boats and positional records included in the analyses.

Fishery	Number of boats	Number of records
Conch	7	155,276
Sea cucumber	7	32,617
Lobster SCUBA	47	1,199,188
Lobster traps	93	2,928,136
Shrimp	54	634,930
Finfish	30	308,894

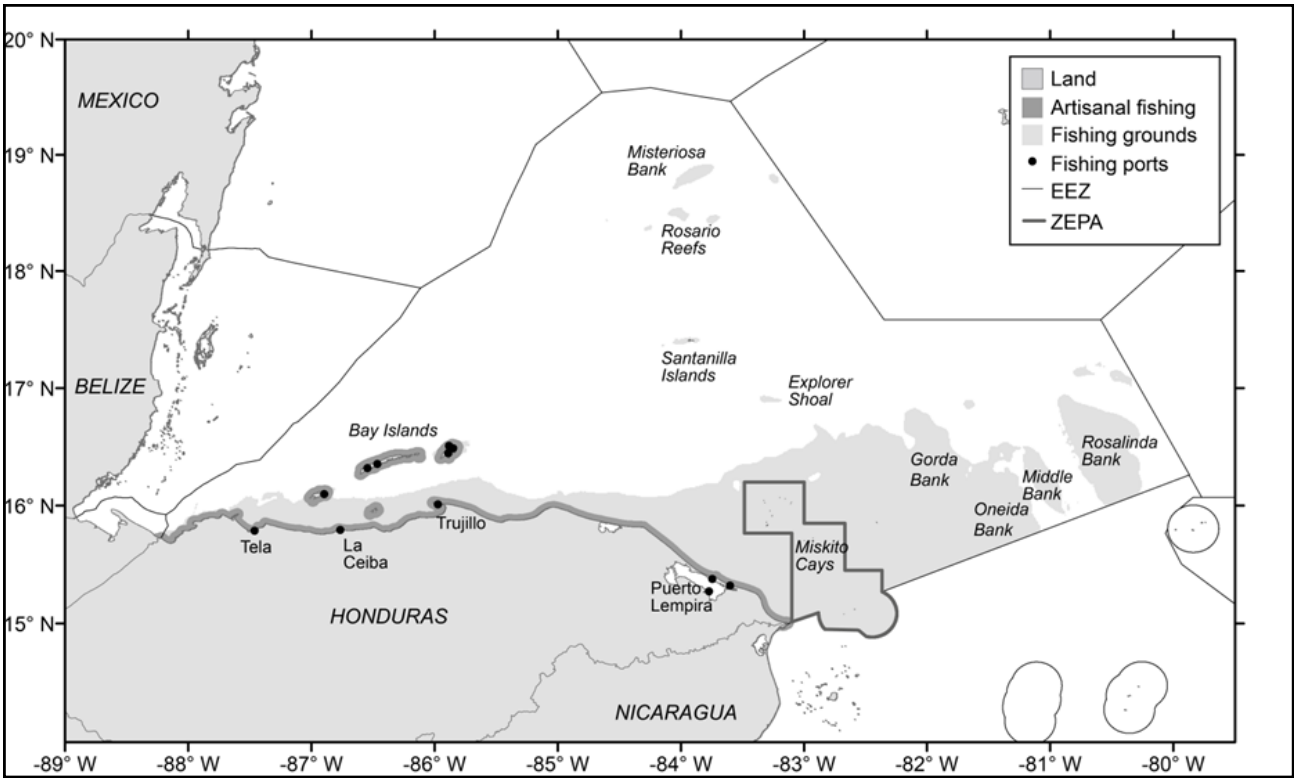

Figure 2. Honduran EEZ showing the location of the MPA (ZEPA), areas reserved for artisanal fishing (3nm buffer around the coastline and main islands), fishing ports and fishing grounds (shallow areas available to fishing). The base map was produced using the Global Self-consistent, Hierarchical, High-resolution, Shoreline database (Wessel and Smith 1996) and the Exclusive Economic Zones of the world (Claus *et al*. 2014), edited to include the revised borders of Colombia (International Court of Justice, 19th November 2012).

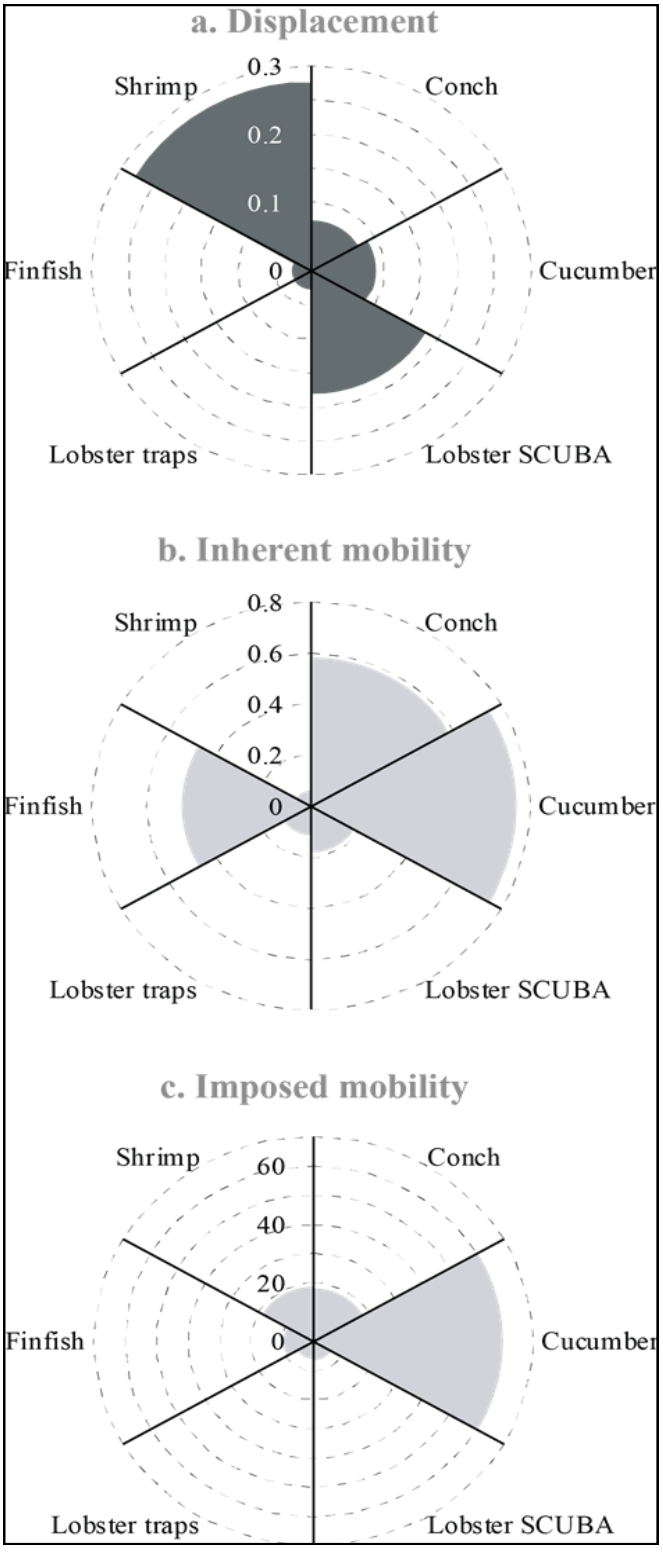

Figure 3. (a) Displacement (*DI*); (b) inherent mobility (MI_{inh}); and (c) imposed mobility (MI_{imp}) indices for each fishery.