



The Hammered Hammerheads

Fisheries Dependent and Independent Analyses of Endangered Hammerheads in the MesoAmerican Reef

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Introduction

Hammerhead species, notably Scalloped *Sphyrna lewini* and Great *S. mokarran* have seen dramatic declines in population sizes (Baum 2003) in due to both overexploitation and low survivorship following capture (Piercy et al. 20011). Limited data exist on the status of hammerhead notably outside of developed countries. Recent listing on Appendix II of CITES now requires signatories to develop non-detriment findings for three hammerhead species listed as Endangered. These compiled data suggest that hammerheads will require a region-wide approach to management in the MesoAmerican Reef, notably the restriction of net and longline use.

Study Aims

- Create a baseline for large hammerhead species in Belize as input to the National Plan of Action for Sharks and the CITES Non-Detriment Findings
- Assess abundance, diversity, demography and distribution of *S. lewini* and *S. mokarran*
- Determine threats to and conservation opportunities for hammerheads in Belize.

Methods

- Stratified sampling approach to establish permanent sampling stations across three habitat types throughout Belize.
- In-water transects (UVC): 1 km long x 4 transectors, relative abundance and diversity, density (#/km²)
- Baited remote underwater videos: 1kg bait, 60 minute video, MaxN, CPUE
- Scientific longlines: 500m, 50 gangions, circle hooks, standard bait, CPUE
- Opportunistic landings data collected: images, species, total length, sex, gear, area fished
- Fisher surveys: catch, gear, seasonality of fishing, perception of populations/species



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Results

Using fisheries-independent and -dependent methods, data on hammerheads gathered from 2006-2015 throughout Belize reveal low catch per unit effort using transects, mid-water longlines and baited remote underwater video (BRUV) installations. Captures by fishery-independent BRUVs and longlines were dominated by great hammerheads (*S. mokarran*), whereas fisheries data reveal predominance of scalloped hammerheads (*S. lewini*).

Landings data collected over 18 fishing days in February 2015 from one artisanal fishing boat using nets and based at a single hidden landing site in Belize yielded 26 hammerheads (25 juveniles, 1 adult). Extrapolated out to the site's four boats and 56 days of landings provided an estimate of 639 hammerheads landed. Traditional fishers surveyed about the fishery and status of hammerheads highlighted a preference for the use of nets and for the captures of hammerheads due to the value of their fins. Fishers further perceived declines in abundance and distributional shifts of hammerheads in Belize.

Fisheries-independent monitoring yields low abundance of hammerheads

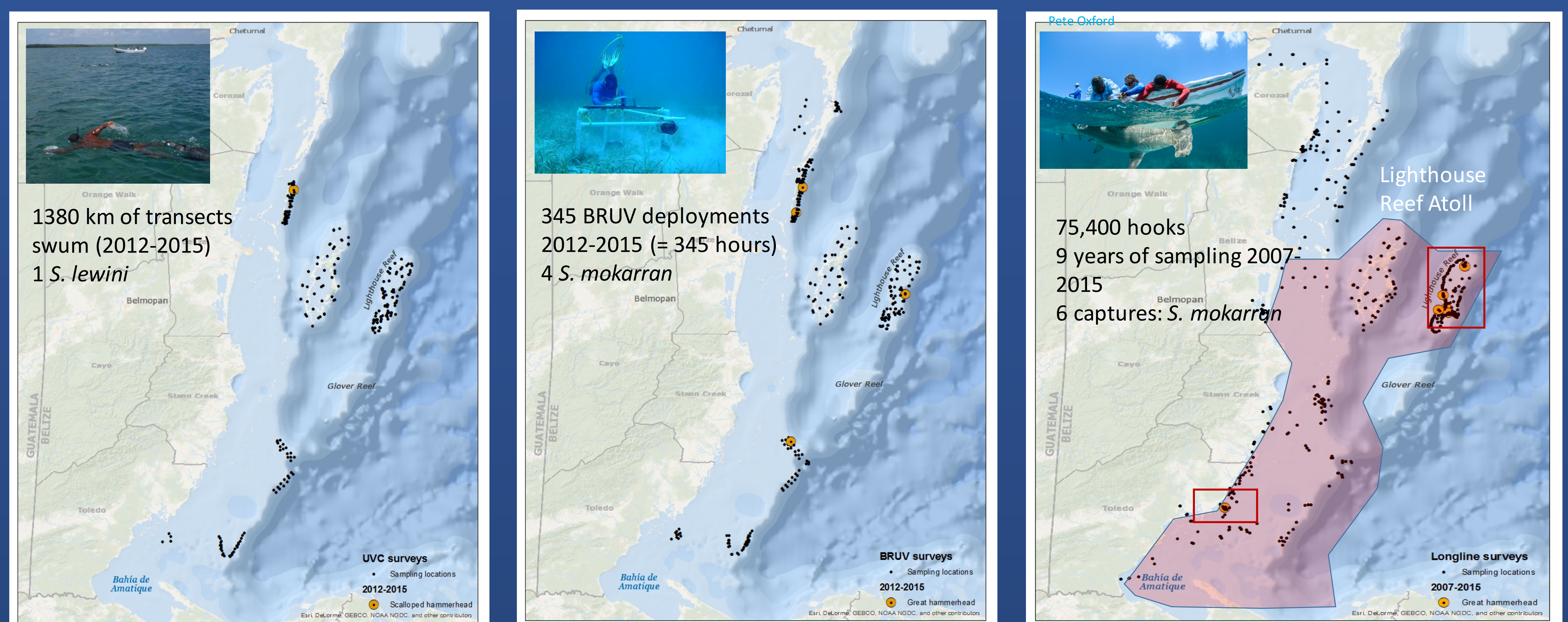


Figure 1. Fisheries-independent monitoring (FIM) efforts across three methods and “capture” of hammerheads with a) UVC snorkel transects, b) Baited remote underwater video (BRUVs) and c) standardized scientific longlines. The highlighted red area in Map “C” encompasses the primary shark fishing areas in Belize used by fishers from Guatemala, Honduras and Southern Belize.

Fisheries-dependent landings yields high capture of hammerheads

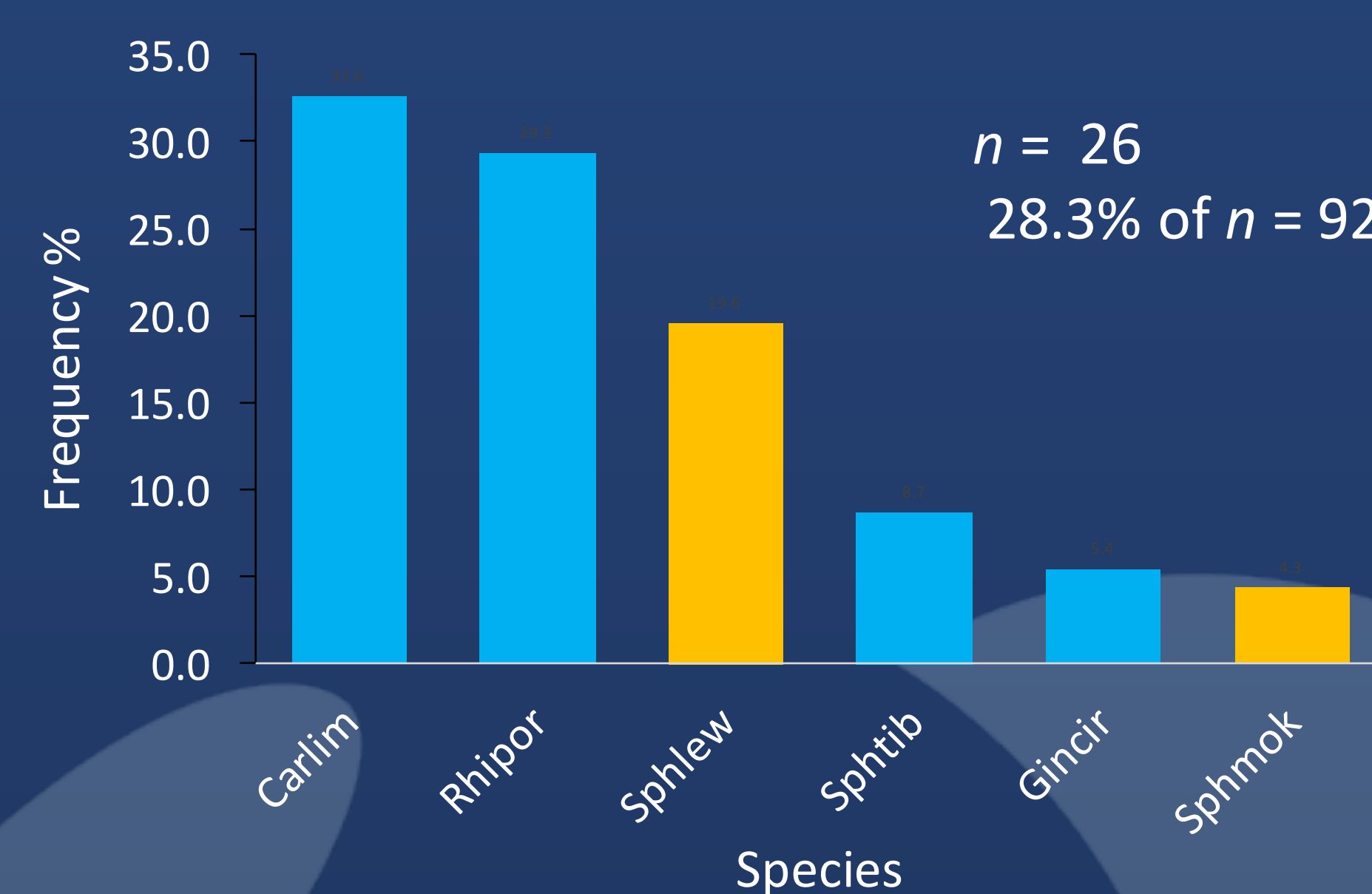


Figure 2. Opportunistic monitoring of fisheries-dependent hammerhead landings by Guatemalan artisanal fishers operating in Southern Belize. All elasmobranch landings were recorded from one boat for a period of 18 days. Data recorded: species, sex, total length, clasper length (if male) and images taken of each with a slate recording information for each capture. Four boats were fishing over the course of 56 days from February-March 2015.

Conclusions

- Our study suggests that fisheries-independent monitoring (FIM) using the current set of methods (UVC, BRUV and hanging/mid-water longlines) underestimates abundances of hammerhead species.
- FIM overestimates the relative abundance of *Sphyrna mokarran* over *S. lewini* due to survey focus on reef-associated habitats whereas *S. lewini* are distributed across deeper mud-bottom and pelagic habitats.
- Fisheries dependent monitoring (FDM) assessments yield highest hammerhead abundance due to high effort and use of gears with high catchability index (nets and bottom longlines) focused at night.
- Sampling measures with the highest effectiveness also yield high animal mortality due to high capture myopathy of hammerheads.
- Data collection for hammerheads represents tradeoffs of data and survey risks versus mortality.
- Harmonized regional legislation and reduction or ban in the use of nets and longlines is needed to restore the country and region's hammerhead populations.