

# Emerging Deep-water Fisheries of the Mesoamerican Barrier Reef

## Nuevas Pesquerías de Aguas Profundas del Arrecifal Mesoamericano

### La Pêche en Eau Profonde de la Barrière de Corail Méso-américain Émergents

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#### ABSTRACT

Coastal fisheries along Mesoamerican Reef (MAR) countries are generally overfished and under-managed. As coastal fish stocks decline, select fishers are expanding into deep sea-fisheries. The topography of the MAR enables deep-sea fishing (> 200 m) very close to shore, easily attainable in small vessels. Fishing effort in the deep-waters varies substantially among countries, with exploitation based on the use of both vertical and horizontal bottom-set longline gear. Captured species include gulper sharks (*Centrophorus* sp.), sixgills (*Hexanchus griseus*), smoothhounds (*Mustelus* sp.), and occasionally chimaeras. Although deep longline fishing targets sharks in Guatemala, most fishers in Belize target snappers, and deep-water sharks are landed infrequently. Fisheries-independent sampling in Belize and Honduras has been undertaken to develop species diversity and abundance trends for deep-water sharks and teleosts. Fisher surveys from Belize have also exposed a fishery on the brink of expansion. Results from fishery-independent monitoring, fishery-dependent landings data, and fisher questionnaire surveys will be presented.

KEY WORDS: Deep sea, shark, snapper, grouper, fishery-independent

#### INTRODUCTION

Deep-sea fisheries (> 150 m) in the Mexican, Belizean, Guatemalan, and Honduran Caribbean Sea have been expanding in recent years. Fishing methods, gear types, and effort varies considerably among countries, with Guatemala and Honduras likely having the highest fishing effort in the region. Deep-sea snappers and groupers are the main target of the fisheries, but sharks are also targeted and landed, mostly for the Guatemalan market. Ongoing territorial disputes make these fisheries controversial and complex. Fishery-independent surveys indicated that wenchman snapper were the most abundant species, followed by queen snapper. Groupers and amberjacks were more rare, but were the largest teleost fish species captured. Sharks were very rarely encountered, with only three smoothhound sharks captured.

#### METHODS

A number of fishery-dependent and -independent surveys were conducted in the MAR in 2015. Fisher surveys were conducted in fishing communities throughout Belize. Fishers were interviewed about their backgrounds, fishing habits, catches, and the economic viability of deep-sea fishing.

Fishery-dependent longlines were deployed at Turneffe Atoll, Lighthouse Reef Atoll, and along the barrier reef north and south of Gladden Spit. Gear was modeled after that used by commercial fishers in the deep-water fishery: vertical longlines terminating in 5 or 10, 10/0 or 13/0 hooks. Locations were chosen in a haphazardly random fashion, and when possible sets were made at three depth strata: 150, 250, and 400 m. Temperature-depth recorders measured the depth and temperature at the bottom for most lines deployed. Sharks captured were measured in-water, identified, sexed, sampled for genetic tissue, then tagged and released. Teleost fishes captured were retained, and therefore further samples such as tissue for stable isotope analysis and otoliths were taken. Fishery-dependent surveys were conducted in Guatemala and Honduras to assess landings.

#### RESULTS AND DISCUSSION

##### Fishery-dependent Surveys

Forty-two fishers were interviewed from Belize City, Dangriga, Hopkins, Placencia, Punta Gorda, Riverdale, and San Pedro. Of these, 25 were identified as deep-water fishers, and 21 of those fished commercially in the deep-sea. The average age of the deep-water commercial fishers was 47 years, though younger fishers are moving into the fishery. Fishers spend an average of four days at sea, using offshore atolls and cayes as basecamps. The deep-sea fishery in Belize is largely artisanal and labor-intensive; fishers use mostly vertical longlines deployed by hand or with a hand crank. Of the coastal fishers interviewed, 59% indicated that they were considering moving into deep waters. Deep water snapper is the main target of the fishery, with queen snapper *Etelis oculatus* being the most highly sought after species. Sharks are generally not targeted and the vast majority of fishers stated that they did not keep or land sharks when they were caught. Smoothhound sharks *Mustelus* sp. (“green eyes”) were the most commonly captured shark species, and sixgill *Hexanchus* spp. (“white tips”), spiny dogfishes *Squalus* sp., and night sharks *Carcharhinus signatus* have been reported as captures in the fishery. Market demand for large, high quality fish filet was listed as the main driver of fishing effort in the deep sea in Belize.

Landings surveys in Livingston and Quetzalito, Guatemala showed that sharks are heavily targeted, and rare deep-sea species were documented in the landings at Quetzalito (Figure 1). Fishers in Guatemala rely on bottom longline and gillnet to capture fish in the deep sea, and fishing effort is concentrated along the deep edges of Belize and Honduras. Honduran

fishers also bring deep-sea sharks across the border to sell in the Guatemalan markets. The demand for shark meat in Guatemala is high and culturally significant, with the highest demand concentrated around the Lenten Season (Semana Santa).

There are very limited data on the deep-sea fishery in Honduras, but preliminary market surveys indicates that the fishing effort is more similar to that in Belize than Guatemala. Snappers are the main target of the fishery (Figure 2), and while technically a “shark sanctuary,” deep-sea sharks are also landed in Honduras.

#### Fishery-independent Surveys

A total of 91 deep-water vertical longline sets were completed from April - December 2015. In all, 830 hooks were deployed. Fifty-two individuals from at least eight different species of teleosts and sharks were captured, with species identification uncertain for the smoothhound sharks

(*Mustelus* sp.). Wenchman (*Pristipomoides aquilonaris*) were the most often captured species, followed by queen snapper (*Etelis oculatus*) (Figure 3). The largest teleost species captured were yellowedge grouper (*Hyporthodus flavolimbatus*) and greater amberjack (*Seriola dumerili*) (Figure 4).

#### Deep-sea Fisheries along the Mesoamerican Reef

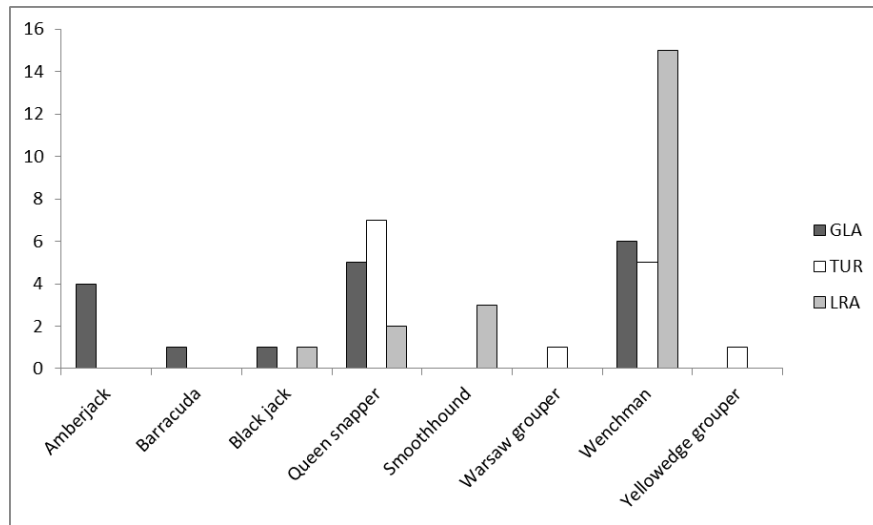
It is clear that deep-sea fisheries are expanding in the region, with demand increasing both from the hospitality and tourism sector for high quality fish, and in demand for protein among the region’s expanding population. Coastal fisheries are in decline in many part of the MAR, and deep-sea fishing is a likely alternative for coastal fishers in these countries. Very little is known about the species diversity, abundance, and life history of the fishes that are being landed in the deep-sea of the MAR; therefore, more research is needed for sustainable management of these fisheries.



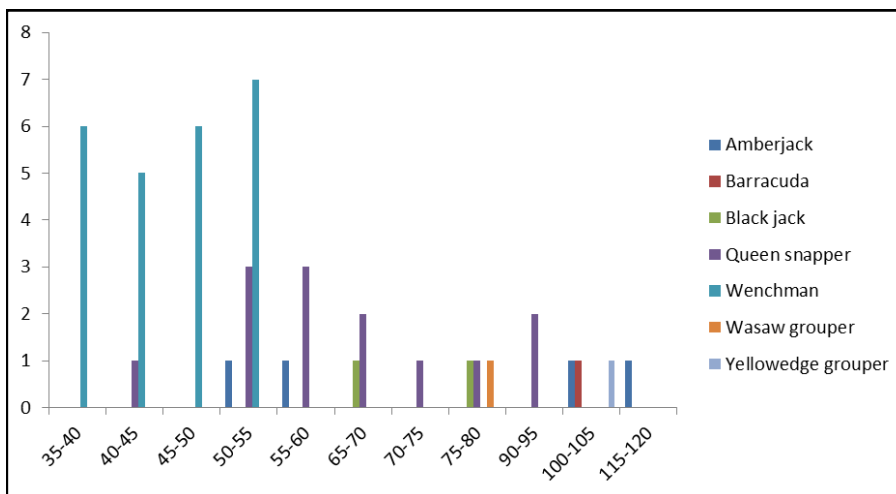
**Figure 1.** A rare chimaera (top) and a night shark *Carcharhinus signatus* and gulper shark *Centrophorus* sp. (bottom) ready to be processed in Quetzalito, Guatemala.



**Figure 2.** Queen snapper *Etelis oculatus* at a fish market in Puerto Cortes, Honduras.



**Figure 3.** Total number of each species captured at Lighthouse Reef Atoll (LRA), Gladden Spit (GLA), and Turneffe (TUR) during deep-water vertical longline sets in 2015.



**Figure 4.** Size frequency of all teleost species caught in fishery-independent deep-sea vertical longlines.