Historical fishery targeting spawning migrations of yellowfin grouper (*Mycteroperca venenosa*) in the Turks and Caicos Islands

Pesquería histórica dirigida a las migraciones de desove de bonaci de piedra (*Mycteroperca venenosa*) en las Islas Turcas y Caicos

Pêche historique dirigé vers les migrations de frai du le badèche de roche *(Mycteroperca venenosa*) aux îles Turques et Caïques

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EXTENDED ABSTRACT

The Turks and Caicos Islands (TCI) have some of the highest densities of groupers in the Wider Caribbean Region. Typically, this is explained by the fact that local fisheries focus on spiny lobster (*Panulirus argus*) and queen conch (*Aliger gigas*), and up until the advent of tourism in the 1980s, reef fishes were only caught opportunistically. Thus, it is assumed that historical fishing pressure on groupers and their spawning aggregations remained relatively limited. Between December 2014 and March 2015, unstructured interviews were conducted throughout the TCI to assess fishers' ecological knowledge of spawning aggregations of Nassau grouper (see Calosso and Claydon 2015). However, during these interviews, 13 fishers, all from the island of South Caicos, also spoke about an intensive fishery that specifically targeted yellowfin groupers (*Mycteroperca venenosa*), locally know as 'rockfish'. The fishery was reportedly in operation for about 30 years, ending in the late 1970s or early 1980s, with one respondent stating that the fishery dated as far back as the 1940s. All interviewees identified 'Fish Rock' as the specific site where fishing concentrated, a location less than 500m from the south coast of the island of South Caicos, in an area that is now included in the Admiral Cockburn Land and Sea National Park, a no-take marine protected area established in 1992. In the early years, the fishery operated without motorised vessels, and fishers rowed flat bottomed boats or sailed sloops from the town of Cockburn Harbour in South Caicos to Fish Rock, a distance of approximately 3km. Fishers carried sacks full of waste products from the lobster and conch fisheries and laid these at Fish Rock to attract the yellowfin groupers and catch them with handlines. In the years before refrigeration was available, rockfish were 'corned', a process to preserve fish through salting and drying in the sun.

Despite the large quantities of fish seen gathering at Fish Rocks (reportedly 1000s), and fish often being caught full of roe, no fishers stated that Fish Rocks was where yellowfin grouper spawned. Instead, they distinguished the behaviour of *M. venenosa* at Fish Rocks from groupers seen at spawning aggregation sites elsewhere. One fisher concluded that the bait temporarily halted the migrations of yellowfin groupers to and from a spawning aggregation site to the north (the existence of which is corroborated in Tupper 2002). This fisher added that the bait also brought fish from deeper water and stimulated them to feed, making it easier to catch them with handlines. Nine of the interviewees were able to identify a season during which the fishery operated, with remarkable consistency focusing around February (n = 9), March (n = 9) and April (n = 8). Two of them also stated that fishing occurred around the full moon. Both the season and lunar phase corroborate fishing that targeted spawning migrations of yellowfin grouper.

Two fishers reported catching so many groupers that no room was left in their vessels and they would have to tie fish through the gills and drag them behind their boats. Estimates of catch included 'tons', '100s', '50 to 150', '70 to 100', and '100 to 200' per boat per trip, with another fisher stating that a boat could catch 400 to 500 rockfish in a season. Only two fishers gave estimates of the number of boats fishing at Fish Rocks, with one saying six boats operated and the other stating 11 to 12. Through a coarse process of converting these estimates to a range of numbers and giving equal weight to each respondent, total catch per season was estimated by the following formula:

$$\text{Toal catch season}^{-1} = \text{Number of fish caught boat}^{-1}\ \text{season}^{-1} \times \text{Number of boats} \times \text{Number of trips season}^{-1}$$

A median estimate of total catch per season of 1772 yellowfin groupers (495 - 5389, 95% CIs) was calculated from all possible combinations from the range of estimates given. This catch was almost exclusively yellowfin grouper, with only one fisher mentioning any other species being landed, stating that goliath groupers (*Epinephelus itajara*) were also occasionally caught. Two alternate hypotheses were presented by fishers as to why the rockfish fishery ended: predominantly older fishers stated that free-diving fishers were no longer interested in the more arduous form of fishing that involved staying out overnight, whereas younger interviewees concluded that yellowfin grouper had been 'fished out', and despite free-diving on a near daily basis they did not see enough yellowfin grouper anymore to believe that such a fishery could persist at Fish Rock. Nonetheless, one older fisher was adamant that yellowfin grouper had not been extirpated, because he

saw the same quantities of fish being caught for decades. However, this observation could reflect a form of hyperstability seen in other aggregation fisheries where declines in underlying populations remain hidden to fishers (Erisman et al. 2011).

Although the historical level of catch at Fish Rocks cannot be verified, and fishers' recollections may reflect peak landings rather than sustained catch over time, it is likely that the intensive nature of this previously undocumented fishery caused a substantial decline in the population of yellowfin grouper in the TCI. The low densities of *M. venenosa* found in TCI today may be a continuing legacy of this fishery. Our study illustrates the importance of historical data and traditional ecological knowledge and how they can be used to inform contemporary management. This is particularly true for a species such as *M. venenosa* that is considered near threatened (IUCN Red List) throughout the region and where other forms of data are limited.

KEYWORDS: Small-scale fisheries; Traditional ecological knowledge; Historical ecology; *Mycteroperca venenosa*; Grouper fishery

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