



BELIZE FISHERIES PROJECT

Case Study

Nassau grouper (*Epinephelus striatus*)
“...too little, too late but possibilities for recovery”

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Historically important

The Nassau grouper (*Epinephelus striatus*) is a large species of reef fish, ranking among top predators, found in the Western Atlantic Ocean and Caribbean Sea. It can grow up to a maximum of 122 cm (4 feet) in length, weigh up to 25 kilograms (55 pounds) and live approximately 30 years [1]. This species has very distinctive coloration with a black saddle at the base of the tail, five tawny brown bars on the body and diagonal bars across the snout over a pale background (Fig 1a). Historically, it was known as one of the most widespread and abundant grouper species in the Caribbean region and one of the most commercially important food fish within the tropical Western Atlantic including Belize [1-5]. However, its population declined significantly during the last century due to overfishing and habitat loss [1]. Nassau grouper are currently listed as a critically endangered species by the IUCN (Fig. 1b) due to declining populations throughout its range [6]. Within Belizean waters, consistent and significant exploitation generally [7], and on spawning aggregations in particular, has severely reduced numbers and eliminated spawning sites [8] resulting in very low catches of mostly immature individuals [9-11] (Fig. 1c). Historically very high abundances [4, 5], followed by drastic declines [12, 13] in Nassau grouper are well illustrated at the multi-species site of Caye Glory (a.k.a. Emily) along the main Belize barrier reef (Fig. 2) [14, 15]. The fishery around Caye Glory alone played a significant role in Belize’s economy with salted fish being exported to neighbouring countries for decades [4, 5]. In 1966, at a time when the fishery had already been in operation for over 40 years, it was reported that over 300 boats fished the aggregation during spawning season, and over 90 metric tonnes (200,000 lbs) were caught annually [5]. Concerns around the fishery grew, with Jacques Cousteau, in 1976, saying, *“I think it would be very important to protect this area against any [fishery] improvement as a way to protect the [livelihoods] of these fishermen for years to come.”*



Figure 1: (a) Nassau grouper coloration, max. length and weight, (b) recent upgraded IUCN listing to critically endangered, (c) abundance (n=18) size frequency of landings 2017 – 2019 in Belize [11].

The spawning aggregations [16] for Nassau grouper are a crucial component of the complex reproductive biology of the species as well as many other reef fish species [1, 16, 17]. Every year, these fish migrate to specific locations on the reef to spawn, with large-scale movements of Nassau grouper, as great as 250 km, having been reported along large barrier reef systems, including Belize, where fish can maintain close contact with continuous habitats [18, 19]. Offshore sites may therefore take many years to replenish, if at all, after being exterminated, given the limited potential for migrations and recruitment from other sites. The formation of these fish spawning aggregations (FSAs) involves complex social and reproductive behaviors, such as vocalizations and courtship display [20, 21] at sites with specific environmental and geomorphological characteristics [20, 22]. Spawning aggregations are particularly vulnerable to overfishing as large numbers of fish can be caught easily over many seasons without an obvious decline in catch. This is due to the relatively consistent density of these reproductive formations; declines masked by “hyperstability” [17, 23].

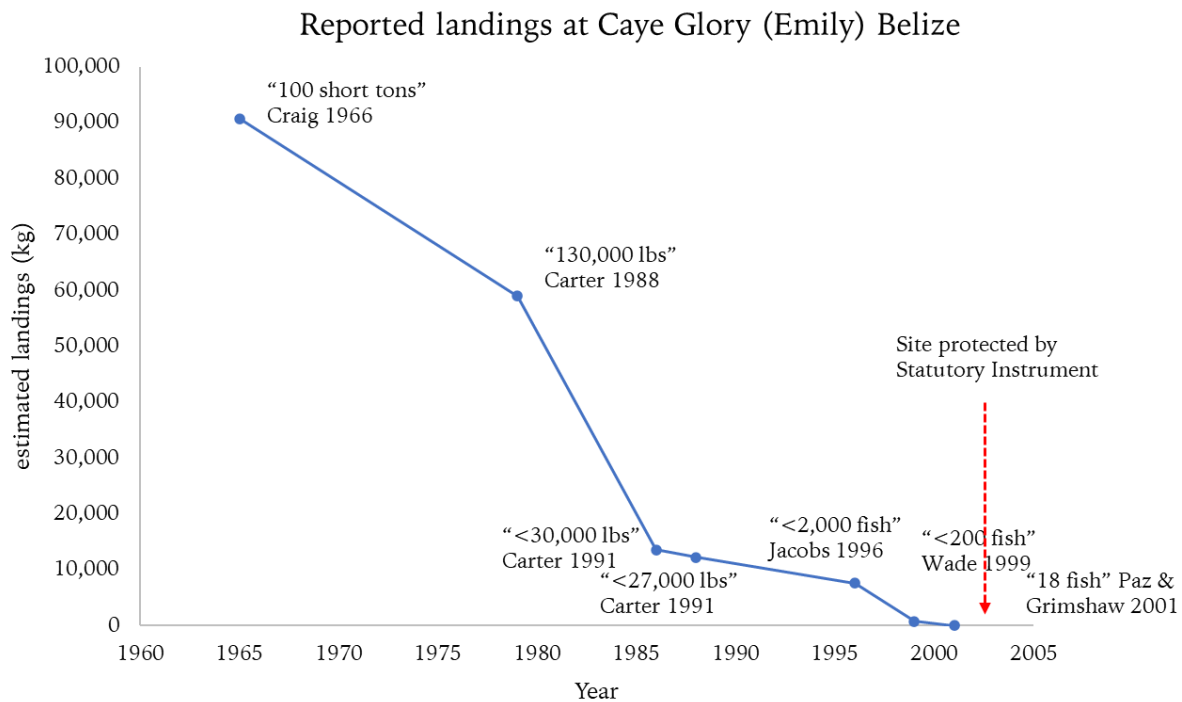


Figure 2: Record of declining catches of Nassau grouper at Caye Glory, Belize.

Attempts at Management

By the late twentieth century clear declines in Nassau grouper landings motivated extensive surveys across Belize revealing that only two of nine traditional spawning sites had aggregations of Nassau groupers numbering in the thousands (NE Point, Glover's Reef and Sandbore Caye, Lighthouse Reef) with the remaining sites having very low numbers or no fish at all [8, 12, 13, 24]. As concerns grew around the Caribbean about the populations of Nassau groupers, Belize became a pioneer for the protection of the species. By 2009, Belize had protected areas of reef around 13

spawning aggregations and implemented a Nassau grouper closed season (1st December-31st March) that covers the majority of the species' known spawning period [1, 20]. In addition Nassau grouper needed be landed whole when in season and measure more than 20 inches (50.8 cm) and less than 30 inches (76.2 cm) where Nassau grouper reach maturity at approximately 19 inches (48 cm), with the upper limit protecting the largest, most fecund mega-spawners [25]. Many of the fish spawning aggregation sites are multi-species, and although Belize does not have regulations for other grouper or snapper species, much of the spawning of these similar species is also spatially protected [16].

Current Status & the future

Belize's efforts to understand the extent of Nassau grouper aggregations and warn of significant declines at the beginning of the 21st century [12-14] as well implementing important steps to protect Nassau grouper in 2009 [8] from overfishing through various policies were significant. Of the thirteen fully protected spawning aggregations sites in Belize eight have had some level of direct population monitoring for Nassau grouper conducted over the last 15 years (Figure 3). These include the previously described site at Caye Glory (a.k.a Emily) as well as Rocky Point (Ambergris Caye) on the Northern Barrier Reef. The Caye Glory aggregation has gone through significant variation with a recent high of several thousand Nassau Grouper while Rocky Point appears to be extinct. The Southern Barrier Reef sites of Gladden Spit and Nicholas Caye have had consistent monitoring but consistently low numbers reported since 2001 with both having less than 100 individuals in 2015. The two sites at Turneffe Atoll, Maugre and Dog Flea Cayes, have been monitored rather infrequently but indicate a possible extinction at Dog Flea as late as 2013 but slight increases at Maugre between 2013 and 2015. Sites at Sandbore, Lighthouse Atoll and Northeast Point, Glover's Atoll have been continuously monitored since 2001 and indicate significant fluctuations (Figure 3). The current state of Nassau grouper as a fishery is extremely limited with the species ranked 64th most landed (N = 18 individuals – Fig. 1c) and often caught immature [9-11] while their aggregations are mostly limited with none having the numbers recorded in the early 20th century. Implementation of a full moratorium on harvesting of critically endangered Nassau grouper in Belize is paramount until the species shows broad recovery. Expanding such a moratorium to other large grouper species such as goliath (*Epinephelus itajara*) and black (*Mycteroperca bonaci*), which also show limited numbers in the catch and at spawning sites, is also highly recommended. Spawning aggregations can recover and should continue to be protected until species show significant recovery [23].

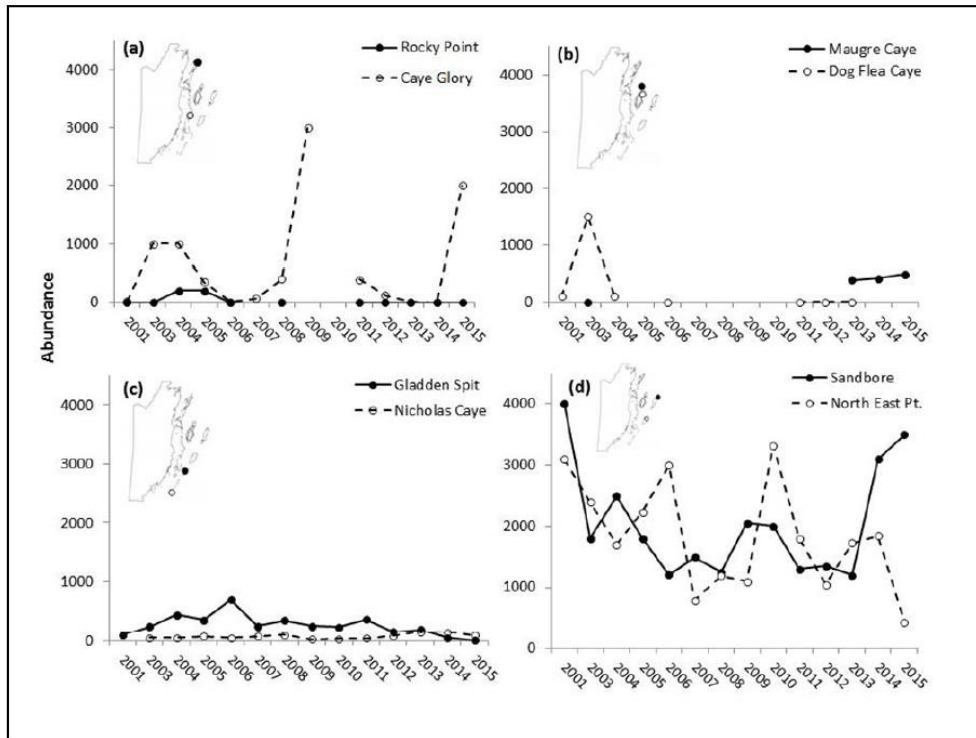


Figure 3. Monitoring data (2001 – 2015, excluding 2002) of eight fully protected Nassau grouper spawning aggregation sites across Belize divided into geographic sub-areas: (a) Northern barrier reef; (b) Turneffe Atoll (c) Southern barrier reef and (d) Outer Atolls (Lighthouse and Glover's). Data source: Belize Spawning Aggregation Database

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