An Obituary for a Traditional Aggregation Site of Nassau Grouper in the Mexican Caribbean

Un Obituario para el Sitio Tradicional de Agrupación del Mero en el Caribe Mexicano

Une Notice Nécrologique pour un Site Traditionnelle de Regroupement de Merou des Caraïbes Mexicaines

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ABSTRACT

The Nassau grouper, *Epinephelus striatus*, is a commercially important fish included in the IUCN´s red list as endangered species. During full moon days in winter, this grouper migrates along coral reefs in the Western Atlantic to reach traditional sites to spawn in aggregations of thousands of groupers. Such predictable behavior - tracked down by fishers for decades - has put at risk the persistence of aggregations, in cases to the level of extirpation. In Mexico, the oldest and shallowest aggregation site was located off the Mahahual - in the eastern Yucatan Peninsula - the Mexican Caribbean. After more than 60 years of timely arrivals to the site, by 1996 the Nassau grouper aggregation stopped arriving. At that time, fishery authorities established a temporary ban for protection, but the aggregation did not recover. This work explored the possibility of recovery during January 2013. The survey included interviews to veteran fishermen and visual inspections to the site. A combination of non-responsible fishing (overfishing, illegal fishing) and cruise ships influence may have severely affected the aggregation persistence to the traditional aggregation site.

KEY WORDS: Nassau grouper, reproduction, Mexico, conservation, management

INTRODUCTION

The Nassau grouper, *Epinephelus striatus*, is a commercially important fish in the Western Atlantic (Sadovy and Eklund 1999) but listed as endangered species by the International Union for Conservation of Nature´s Red List (IUCN) (Albins et al. 2009). In fact, it is among the 20 grouper species under risk of extinction if current fishery trends continue (Sadovy de Mitcheson et al. 2013). While particularly vulnerable to fishing due to its life history characteristics (large body size, long lifespan), the Nassau grouper is fished mainly during its reproductive season at predictable locations where it forms spawning aggregations of thousands of individuals during full moon days of December, January, and February (Sadovy and Eklund 1999).

In the Western Atlantic, management failures such as lack of enforcement and compliance have promoted the fishery extirpation of many Nassau grouper spawning aggregations (Sadovy and Eklund 1999). In fact, fishing on spawning aggregations tends to reduce or even eliminate these gatherings at some point in time (Sadovy and Domeier 2005), which in turns put at risk the fish population persistence (Sadovy de Mitcheson et al. 2008). Examples abound where Nassau grouper spawning aggregations sites have turned out to be no longer used by this grouper, such as those in The Bahamas (Colin 1992), Belize (Sala et al. 2001), Cuba (Claro and Lindeman 2003), Cayman Islands (Whaylen et al. 2004), and Mexico (Aguilar-Perera 2006).

In Mexico, the Nassau grouper is more abundant in the eastern coast of the Yucatan Peninsula (Mexican Caribbean) where it has been fished since 1950s mainly from its spawning aggregations (Aguilar-Perera 1994, 2006). However, the Mexican fishery authority (CONAPESCA) has focused primarily on managing another commercially important grouper, the Red grouper (*E. morio*), which attains a higher abundance and economic importance in the Southern Gulf of Mexico (Hernández and Seijo 2003, López-Rocha and Arreguín-Sánchez 2008). Unfortunately, the fishery situation of the Nassau grouper in Mexico is currently unknown (Aguilar-Perera et al. 2009) because reliable fishery records are not available at species level. The common name "mero" (grouper) in the official fishery records apply for many grouper species, and mainly for the red grouper *E. morio*.

In the Yucatan Peninsula (eastern and northern coasts), at least 20 Nassau grouper aggregation sites (Sosa-Cordero et al. 2002, Aguilar-Perera et al. 2008) have been reported, but only eight sites remain scientifically verified (Aguilar-Perera and Tuz-Sulub 2012). Little is known of the persistence of many of these aggregations, and unfortunately at least one has been reported as disappeared (Aguilar-Perera 2006). Less even is known about the current situation of many other aggregations, and whether any evidence exists of their recovery. Consequently, the objective of this work was to verify the possible recovery of one of the most traditional Nassau grouper aggregation sites off Mahahual, Quintana Roo, Mexican Caribbean, after 18 years of supposed management regulations by local fishery authorities.

THE NASSAU GROUPER FISHERY OFF MAHAHUAL

Historically and traditionally, one of the most important Nassau grouper aggregation sites in the Mexican Caribbean was located off Mahahual, Quintana Roo. This locality is very close to Belize and used to be a small fisher village, but today it is a flourishing touristic cruise ship destination. The importance of the aggregation site off Mahahual relied on its rapid access from the coast (less than 400 m), the shallow condition (15 m), and the high volumes of grouper capture per reproductive season with up to 24 tons per reproductive season (Aguilar-Perera 1994). This site began to be fished by the 1950s, and fishers who used hook and line only at that time came not only from Mexico but also from Belize (Aguilar-Perera 1994).

Based on veteran fisher´s accounts, during the 1950s the grouper landings from Mahahual reached up to 24 tons per reproductive season. However, no official fishery records existed, and the fishers kept all the landing records for their own. During the regular fishing season (December to February each year), all the catch of the day was commonly kept in "live pens" at shore while fishers processed and salted the groupers (ice was not available at that time) and traded them mainly in Belize and Guatemala (Aguilar-Perera 1994). It was a flourishing fishery similar to that of the Nassau grouper in Belize (Carter 1994)

The Nassau grouper aggregation off Mahahual was progressively fished out. This aggregation experienced a heavy and persistent fishing for more than 80 years under different gears (hook and line, spear gun, gill nets, dynamite). For decades, the fishery authority (CONAPESCA) was not aware of the situation until scientific studies began in the early 1990s when the first scientific documentation on the magnitude of the spawning event was elaborated (Aguilar-Perera 1994). At the beginning of the 1950s, at least 50 small 23 feet-outboard boats fished the aggregation while fishers used hook and line only. However, during the early 1990s, while there were less small boats (around 15), at least 4 skin divers per boat used spear gun to catch groupers selectively. Hook and line no longer was used. During the next years, at least 4 boats introduced two 200 m long gill nets per boat during mid-1990s mainly in southern areas to the traditional sites with the intention of intercepting the migrating aggregation (Aguilar-Perera 2006).

Veteran fisher accounts pointed out to the fact that during 1970s some fishers even used dynamite to catch the aggregating groupers in Mahahual (Aguilar-Perera 1994). The influence of Belizean fishers was crucial for the Mexican fishers in deciding to change from hook and line to spear guns. When the mask and fins were available, various Belizean fishers ventured to Mahahual using spear guns. The exploitation for decades with many fishing gears and the absence of a fishery regulation resulted in the aggregation disappearance from the traditional aggregation site off Mahahual by 1996 (Aguilar-Perera 2006).

A proper management of the Nassau grouper fishery has never existed. There were no effective or specific fishery records at that time to follow up the grouper landings or even to establish a ban. The local fishery authority never paid close attention to the fact that this grouper was being fished during its reproductive season. Fishers, on the other hand, always considered the "corrida del mero" (grouper run) for December as a "precious gift from the sea for the holidays". None of them felt worried about the possibility that the aggregation could disappear at some point. The fishers traded not only the whole grouper and its fillets, but also the grouper´s "hueva" (mature female gonad). This "hueva", reaching up to 1.5 kg per fish (Aguilar-Perera 1994), had a special price in the market as a delicacy and was sold for about 2 USD per lb.

NASSAU GROUPER RESEARCH

Scientific research on the Nassau grouper aggregation in Mahahual began in the early 1990s through a combination field surveys at the area and interviews to local veteran fishers (Aguilar-Perera 1994). In December 1988, an aggregation of more than 1,000 groupers was detected five days before the full moon of December with grouper weights ranging 5 - 12 kg (approximately 40 to 80 cm in size). Years later, a fishery dependent monitoring for three consecutive years (1991 to 1993) began to document the population structure (sex ratio, abundance) and body size (39 - 86 cm) with females larger than males. (Aguilar-Perera and Aguilar-Dávila 1996, Sosa-Cordero and Cárdenas-Vidal 1996). During this time, the aggregation was smaller compared to that of 1988 and fishers did not allow the aggregation get through the traditional aggregation site because fishers were tracking the aggregation in the southern areas to the site. A length-weight relationship of aggregating grouper was calculated. A whole analysis of the aggregation was done consequently (1991 - 1996) with larger females outnumbering males for the whole study, body size (for both) sexes declining, magnitude of the aggregation was lower (Aguilar-Perera 2006), and the aggregation was practically disappeared from the traditional site.

For more than 18 years, the Nassau grouper spawning aggregation off Mahahual remained unmonitored and no efforts were given to assess the possibility of any recovery as consequence of apparent protection to fishing. Other aggregations located to the southern areas, mainly in Xcalak and Banco Chinchorro were sporadically monitored by personnel of the Comision Nacional de Áreas Naturales Protegidas (CONANP) (Medina-Quej et al. 2004).

NASSAU GROUPER MANAGEMENT AND CONSERVATION

After more than five years of monitoring, the NG aggregation stopped arriving at the traditional aggregation off Mahahual by 1996 (Aguilar-Perera 2006). As a result of this finding, the local fishery authority enacted, for the very

first time, a local prohibition of speargun and gill nets for fishing the aggregation from December to February but allowing the possible use of hook and line. However, in 1997 CONAPESCA enacted a total ban for whole the reproductive season not allowing any type of fishing. This regulation only lasted one year because of a lack of enforcement and surveillance. Consequently, fishers advocated to exploiting the remaining of the aggregation in southern areas to the traditional site. Until 2005 (updated in 2007), CONAPESCA established the "Veda del Mero" (Grouper Ban), from February 15 to March 15, for the Red gouper, *E. morio* and associated grouper species to the fishery in the Campeche Bank (DOF 2007). Fishers were following this ban but only for the aforementioned period. Unfortunately, this period does not cover the reproductive season for Nassau grouper in the Mexican Caribbean (December to February). Consequently, fishers kept exploiting the remaining of the aggregation. There has not been any government initiative to consider protecting the Nassau grouper sites close to Mahahual other than those located within natural protected areas (NPAs). Many NPAs´ management plans include brief mention of the existence of any given aggregation. Unfortunately, many of these aggregations, such as that off Mahahaul, are outside of the NPAs so it is the traditional site off Mahahual. Not only fishers but also scientists forgot the traditional site off Mahahual. The site remained unmonitored and unprotected for 18 years.

In 2007, The Nature Conservancy (TNC) formed the first Working Group to address the Nassau grouper Aggregations in the Southern Gulf of Mexico and Mexican Caribbean. This initiative emerged in Mérida, Yucatán, México, emulating other groups such as those in Belize and other countries. TNC helped to move forward the research on this species in the Alacranes reef off the northern Yucatan Peninsula since this location is a priority area for conservation. Unfortunately, the Nassau grouper aggregation site off Mahahual was not a priority area for conservation since it was not established within a NPA. The Working Group dissolved in 2010, and now TNC no longer has funded any work on the aggregations in the Southern Gulf of Mexico and Mexican Caribbean.

FAREWELL TO THE NASSAU GROUPER AGGREGATION SITE OFF MAHAHUAL

During the spawning season of January 2013, information on the current status of the Nassau grouper off Mahahual was collected based on field surveys on site and interviews to veteran fishers. A total of 10 hours SCUBA diving and snorkeling on the site and interviews to four veteran fishers (with more than 50 years of experience) were done. Based on *in situ* surveys on site and on southern and northern areas (up to 3 km away from the site) along the fore reef and the drop-off, for five days, no Nassau grouper were detected.

Interviews revealed that the aggregation never recovered from its past magnitude (more than thousand fish) at the traditional site off Mahahual as shown 40 years ago. Fishers argue that fishing pressure has intensified along the years, because more people now live in Mahahual. Also, the construction of a cruise ship pier half mile north to the aggregation site may have had affected. Fishers recognized they never paid close attention to the fact they were fishing out a grouper during reproduction and that sooner or later fishing would affect the aggregation. They said they knew that possibility would come, but many of them felt if they did not catch the grouper at that time then the revenue would not come and other fishers would take it. Fishers argue that fishery authorities do not apply proper surveillance and enforcement when needed. The Nassau grouper off Mahahual is no longer a revenue fishery as in the past, so they need now to invest much more money for travelling distant journeys to find out the aggregation in southern areas, but success to find the aggregation is not guaranteed. Despite the disappearance of the aggregation in the traditional site, interviews also revealed that small aggregations are caught in deeper and southern areas and also in northern areas. In fact, fishers caught about 700 kg of Nassau grouper in February, but from southern areas at least 30 km away from the traditional aggregation site of Mahahual.

PROBABLE REASONS WHY THE NASSAU GROUPER AGGREGATION NO LONGER USE THE TRADITIONAL SITE OFF MAHAHUAL?

Based on the information recorded through interviews and observations recently done on the area, these are the probable reasons why Nassau grouper does not reach the traditional site off Mahahual:

i) Veteran fishers mentioned that Nassau grouper now migrate beyond the reef drop-off, in deeper areas (more than 50 m) along the coast. This could be a viable possibility since it has been found that this grouper is able to resist incursions up to 250 m deep (Starr et al. 2007).

ii) Veteran fishers assured that some other fishers travel long distances to southern areas (30 km along the coast) to intercept the migrating groupers in the reef before the aggregation could be arriving to the traditional site. Nassau groupers the fore reef border as "pathway" to migrate to reach northern areas to reach the traditional site. In fact, this grouper is able to travel long distances for up to 240 km (Carter et al. 1994).

iii) The Nassau grouper catch is no longer profitable as in the past (4 to 5 tons per reproductive month compared to less than 1000 kg today with more investments). Fishers need to invest large amounts of money (for gasoline and ice) to find the ever-smaller aggregation of smaller groupers in a decreasing aggregation.

iv) In 2001, a cruise ship pier was built at less than 800 m north to the aggregation site. This pier received up to 400 cruises each year until 2007 (when hurricane Dean damaged the pier), so the number of cruises reduced. Fishers argue that cruise ship noise scare away the Nassau grouper aggregation remains.

v) Nassau grouper is exploited throughout the year, except during the Grouper Ban (February 15 to March 15). While this ban applies to all grouper species in the Southern Gulf of Mexico and Mexican Caribbean, the reproductive season of Nassau grouper goes from December to February each year so it is not fully protected by the ban.

vi) Fisher´s population in Mahahual has grown exponentially during the last 20 years, so the access to catch Nassau grouper has increased.

vii) In 2007, a new legal instrument was enacted through a federal document called Official Mexican Standard (NOM-065-PESC-2007) in which the fishery authority (DOF, 2010) describes the how the regulations upon the grouper fishery, mainly that of the Red grouper (*E. morio*) and associated grouper species (remaining 16 species, including *E. striatus*) are managed. This OMS includes gear type restrictions, season and area closures, legal size limits, quotas, and bycatch excluding devices.

viii) There is not a minimum size of capture for *E. striatus*. The only grouper species in the Southern GOM for which a minimum size has been established is *E. morio* (30.9 cm TL). There is not any highlight for the fishery of *E. striatus* or any mention of its spawning aggregations in fishery documents.

ix) Additionally to the OMS, there is another legal instrument known as the National Fishery Chart (NFC) enacted by CONAPESCA in which the statistics of all fishery and aquaculture resource are established. In this NFC, there is a section for Groupers (especially *E. morio*) from the Southern Gulf of Mexico in which the main fishery indicators are established and the trends of the fishery described. There is not any highlight for the fishery of *E. striatus* or any mention of its spawning aggregations in this NFC.

x) There is a lack of outreach campaigns to educate consumers at restaurants about what grouper species eat, when groupers reproduce, and that this fish must be under protection. Some minor efforts have been promoted by the authority of natural protected areas (CONAPESCA) in the Mexican Caribbean to explain fishers about the importance of not fishing groupers during their reproductive period.

COULD THE NASSAU GROUPER AGGREGATION OFF MAHAHUAL RECOVER?

While the Nassau grouper spawning aggregation has not recovered at the Mahahual site, there could be possibilities not only for the recovery of this aggregation but also for protection of the other detected Nassau grouper aggregations in the Mexican Caribbean. While the Nassau grouper still has a relative commercial importance, the volume of captures are not profitable anymore; thus, there is not a high economic dependence of a given fisher community on the fishery. The Nassau grouper fishing is opportunistic in this sense. Consequently, aside of applying a survey to determine the level of preference of consumers at restaurants, the Nassau grouper is not as economically important as the Red grouper. The first step would be to call the government attention to regulate the fishery situation promptly. A first step has been proposing a special ban for Nassau grouper in the Mexican Caribbean from December 1 to January 31. Unfortunately, this proposal has not been approved yet. Another important step would be to propose the establishment of a marine reserve. Recently (September 2013), an initiative by several partners among NGOs and fisher communities achieved a proposal and approval of establishing what they called "fishery shelter zones" within the Sian Kaan Biosphere Reserve and the Chinchorro Bank Biosphere Reserve, both protected areas in the Mexican Caribbean. At least one shelter within the Sian Kaan reserve considered the existence of fish spawning aggregations. The importance of establishing bans and even marine reserves may help partially, but if the active collaboration of fisher community is not taken into consideration, the opportunistic fishing will continue permanently. Another step that could be radical but necessary would be to include Nassau grouper within the Mexican´s Red List (NOM-059-SEMARNAT-2010) within the category of threaten. In this list, two iconic fish have been included for some time: the whale shark (*Rhincodon typus*) and the Totoaba (*Totoaba mcdonaldi*).

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