



MESSAGE FROM THE CHAIRS

Greetings All!

Well, the last quadrennium certainly flew by. The good news is that the Specialist Group was able to complete several of the major tasks it set for itself, held a workshop to increase capacity in Asia, trialled regional assessments, and made progress on research and conservation-related activities of several threatened species. Importantly, we completed and published on all grouper reassessments. Other activities included feedback on species identifications and assessments, and responses and input on numerous occasions to institutions, governments or researchers on management, conservation and research plans. Our website has developed and grown, moved to a new platform by IUCN. IUCN SGs can be found at <https://www.iucn.org/commissions/ssc-groups>.

The not-so-good news is how little management or conservation has actually been implemented or even planned (although there are some promising developments, for example in the Maldives for groupers, the Caribbean for Nassau and Goliath groupers, and Fiji and Palau for spawning aggregations) despite our original assessments highlighting a number of threatened species. Indeed, our taxa, as is the case for coastal fishes and fisheries across the tropics and subtropics, are poorly managed, if at all. This is true even in most typically U.S. waters where management is considered to operate at a relatively high level and yet grouper stocks continue to decline.

Indeed, management for these taxa is poor overall (with a few noteworthy exceptions) despite their social and economic importance. We certainly have our work cut-out for us!

In closing this period, we are extremely sad to note the passing, last year, of two of our longest-serving members, Phil Heemstra and Patrice Francour. Please see the lovely articles on their lives and achievements on page 17. We miss them very much. We greatly appreciated their contributions to the GWSG. We also wish to thank other 2017-2020 SG members for their support and input over



Nassau grouper (*Epinephelus striatus*) Against The Clock, by BelugaSmile. p.11

the last four years. Matt and I now need to plan for the next quadrennium, 2021-2024, and recognize that the next SG membership will certainly have its work cut out for it.

Looking forwards, we must focus on some of our most threatened species, promote core data collection, capacitate new and broader membership, promote and facilitate better management and understanding of groupers and wrasses, and use our expertise, energies and networks to make a difference for our wonderful fishes. We have a new logo to take us forwards, thanks to an anonymous donor and artist Nicole.

Wishing you all well, Yvonne and Matt



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Management urgently needed

Uncertain future for the red grouper fishery off the northern Yucatan peninsula, Southern Gulf of Mexico

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The fishery of the Red grouper (*Epinephelus morio*) is one of the most important off the northern Yucatan Peninsula, Southern Gulf of Mexico, with high revenues supporting thousands of livelihoods. However, scientific assessments indicate that this fishery is overexploited, and so far the Mexican government has implemented only two management tools in order to cope with the fishing impact: a minimum capture size (36 cm TL) and a one-month ban (February 15 to March 15 each year). These two regulations appear not enough for counterbalancing the fishing impacts on the grouper population that is harvested by both commercial and recreational fishermen.

Due to population declines, the government implemented a management plan for this grouper in 2014 recommending an extension of the ban to two months (February 1st to March 31, each year). In 2015, the

government enacted an official agreement establishing the two-months ban to be implemented in 2016. Unexpectedly, at the beginning of the new ban in 2016 leaders of the fishermen cooperatives from Yucatan, Mexico, requested to the government a modification for the new ban by dividing it into two periods. Fishermen leaders claimed that the best sale grouper season is from March 15 onwards, due to high demand because of the Catholic lent. Consequently, the government enacted an official agreement establishing two periods for the new

ban: February 1 to March 12 and December 15 to January 3rd. In 2017, the official agreement established that the ban would be from February 1st to March 31 as originally established in the management plan. The future of the red grouper fishery is uncertain, since socio-economic reasons mostly prevail instead of securing the biological recovery of this grouper to sustainable levels.

**“The future
of the Red
grouper
fishery is
uncertain”**



The Red grouper (*Epinephelus morio*). Picture by Áthila Bertoncini.

Workshops on Red grouper biology

Fishermen interactive workshops on Red grouper biology and management in Yucatan, Mexico

Often, fishermen do not comply with fisheries management regulation, which is necessary for achieving resource sustainability. Regardless how well designed these regulations are, management is not effectively accomplished if fishermen evade these regulations either through ignorance, misconception or negligence.

According to the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), fishermen must understand the problems of management and conservation of their own resources. Consequently, a campaign of education and training should be implemented in order to promote awareness among fishermen about these problems.

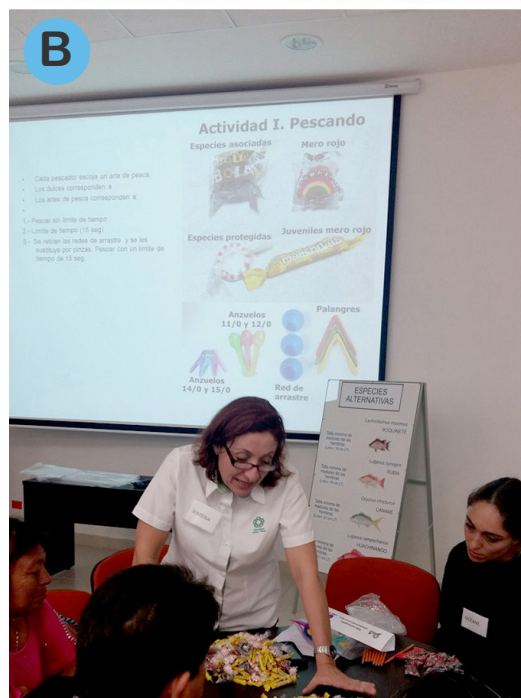
Taking this into account, we conducted interactive workshops on biology and fishery of the Red grouper (*Epinephelus morio*), as part of a project in 2018, in three small-scale fishermen ports in the northern coast of Yucatan Peninsula, Mexico: Celestun, Progreso, and Rio Lagartos (Figure 1A). The Red grouper is considered the most important finfish species in the region due to its abundance. Nevertheless, it is currently overexploited and its fishery overcapitalized and in danger of collapse. Besides, Red grouper is listed as a vulnerable by the IUCN (Burgos and Defeo, 2004; Brulé et al., 2018).

The workshops contents were: 1) a questionnaire to evaluate fishermen knowledge about the grouper and its fishery, 2) short presentations with scientific data about biology, fishery and management of this grouper (Figure 1C), and 3) hands-on activities with specific materials designed to explain the current fishing regulations applied in Mexico (Figure 1B).

The results showed that although fishermen are aware of, and concerned about, the deterioration of the fishery in Yucatan, not all fishermen know important aspects such as Red grouper reproductive biology (e.g. spawning season and size at maturity), and its relationship with management measures, such as temporary closure (from 1 February to 31 March) and the minimum size limit (MSL: 36 cm total length [TL]) (SAGARPA, 2015, 2017). A total of 30% fishermen were able to identify, among several silhouettes of different sizes (Figure 1D, E), the corresponding MSL silhouette (Table 1).

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The Red grouper interactive workshop conducted in Yucatan, Mexico. A) First workshop in Progreso, B) Activity known as the "candy fishing game".

Fishing port	Number of fishermen	Red grouper silhouettes identified		
		< MSL	= MSL	> MSL
Celestun	22	16 (72%)	1 (5%)	5 (23%)
Progreso	33	15 (46%)	14 (42%)	4 (12%)
Rio Lagartos	38	24 (63%)	13 (34%)	1 (3%)
Total	93	55 (59%)	28 (30%)	10 (11%)

A relevant aspect is that responses were different according to the fishery port of origin of the fishermen. Thus, fishermen from Progreso (42%) and Rio Lagartos (34%) correctly identified the MSL fish silhouette with more accuracy than those from Celestun (5%). The majority of fishermen (59%) underestimated the correct MSL (from 24.4 to 35.8 cm TL) (Table 1). Therefore a ruler, having the correct MSL, was introduced and fishermen received

instructions on how to use it. This ruler is a waterproof, self-adhesive, fish-like, sticker to have readily available on board as they fish (Figure 1F), which shows the correct size for the grouper to be measured according to the established regulations.

To know more about our interactive workshops:
<http://tinyurl.com/yyrgm2os>

Table 1. Results on the visual identification of Red grouper minimum size limit (MSL) by fishermen from three coastal communities of Yucatan based on the observation of different fish size silhouettes.

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The Red grouper interactive workshop conducted in Yucatan, Mexico: C) Presentation sessions on red grouper's biology; D) Red grouper silhouettes used during the workshop, E) Red grouper minimum size estimation by fishermen using fish silhouettes, F) Training fishermen on how to use the ruler for measuring red grouper.

High prevalence of nematodes in groupers

Nematode prevalence in grouper gonads during post monsoon events

During the post monsoon, from September–November, nematode infestation was noticed in gut, abdomen, and gonads in the Yellow-edge lyretail, *Variola louti*. In order to conduct a study, the nodules and cysts in the gonads and mesentery were isolated and transferred to a petri dish and genetic evaluation using cytochrome oxidase 1 (CO1) gene was performed. A total of 140 fishes (380 - 610 mm in length) showed presence of nematodes out of 190 sampled. Of these, 68 fish were females and the rest males. Nematodes showed a high prevalence in female fish, while incidences of parasites in male fish were less. Even though the parasites were present in all gonadal stages, from immature, maturing, mature and spent/recovering stages, nematode infestation was predominant in the mature and spent/recovering stages. Percentage occurrence of parasites in maturing, mature and spent gonad were 35%, 4% and 61%, respectively. Infested adult females had atrophied ovaries. In some groupers, nematodes were red coloured, thin-thread like strands, while in larger gonads nematodes resembled tar deposits or even hardened tar deposits occupying the whole ovary. Nematode size differed in length from 25

mm to 75 mm. Due to heavy infestation, the whole ovary was occupied by nematodes rendering the ovary black and occurrence of ova atrophy. Nematode prevalence was high from September –November 2016, 2017, 2018, and parasitic nodules were located in the gut, in the abdomen attached to the coelenteric wall as well as in the gonad.

Nematodes identified corresponded to *Philometroides* sp., which usually exhibit a high degree of host specificity. This means that a given fish species is parasitized by its own gonad-infecting *Philometra*. This could be the case with *V. louti*, but it is necessary to confirm the species.



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Dead parasites in the gonads of the
grouper Yellow-edge lyretail grouper,
Variola louti.

A new book on Grouper portraits

Face to Face with Groupers – an almost published book

Two weeks or so after our GWSG meeting in Horta, Faial Island, Azores back in November 2016, I went back to my drawing board with this new set of ideas in my mind. It has been a long time since part of my life is in fact “determined” and scheduled by groupers both in science and in scientific illustration. However, and after hundreds of illustrations of groupers and many other fish in their standard left side formal description, I wanted to make portraits instead of “mimicking” a dead fish. Groupers are of course, extremely expressive, and very appealing subjects for both photographs and drawings so there I was with the idea and starting to sketch. From a first selection of about 80 species I chose 50 and produced their lifelike portraits on china ink. That selection, being one of the most difficult parts of the whole idea, was based on several characteristics going from the iconic and emblematic “status” of *Epinephelus marginatus* to the gigantic dimensions of *E. lanceolatus*, or the multiple camouflage patterns of *E. polyphkadion* to the

mysterious and unknown depths of the *Hyporthodus* sp.

The initial project literally began taking shape and an art exhibit became its main goal. However, when discussing the idea with the Director of the Museum of Angra do Heroísmo, I was actually “challenged” to also write a book that would be premiered together with the exhibition’s opening. So, everything was scheduled and prepared for June 13 this year, albeit canceled and postponed for early June or July 2021 because of the pandemic.

More than drawings, the ensemble of these portraits of 50 species of groupers from all over the World may lead – at least I do hope so – the general public to regard groupers and fish as a whole as something more than whatever they might think and regard their black and white portraits as part of a natural heritage that we must preserve even if their use as food is also one of our goals.

João P. Barreiros

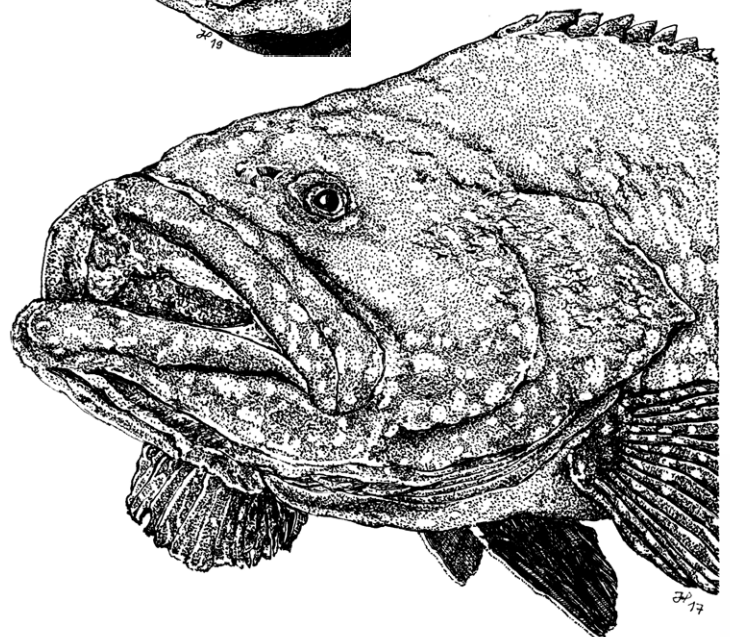
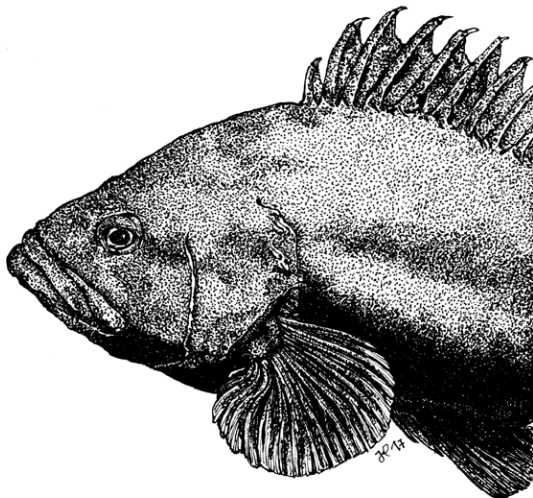
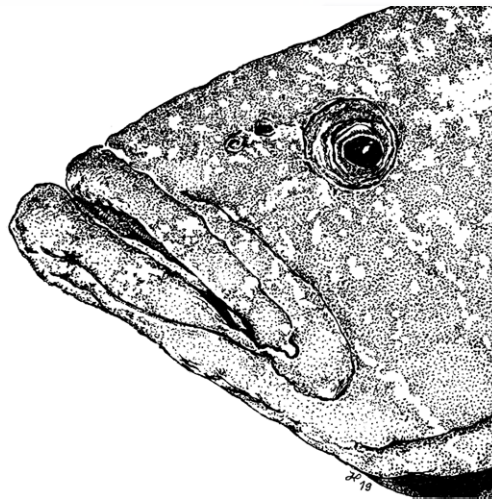
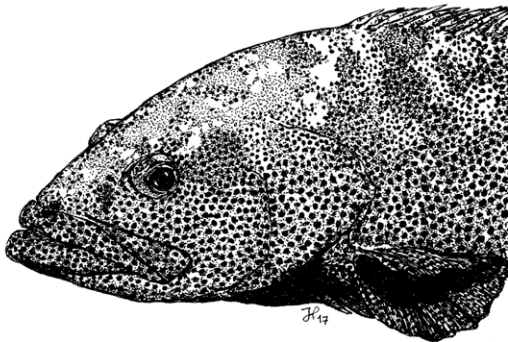
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Lifelike portraits of groupers in china ink. From top right clockwise: *Epinephelus marginatus*, *Epinephelus lanceolatus*, *Hyporthodus haifensis* and *Epinephelus polyphkadion*.



Rainbow parrotfish at Alacranes Reef in the Southern Gulf of Mexico

The Rainbow parrotfish (*Scarus guacamaia*) use alternative habitats as nurseries in the southern Gulf of Mexico

Scientists consider the Rainbow parrotfish (*Scarus guacamaia*) a mangrove-dependent species, because its juvenile stages use mangrove prop-roots as nursery habitats (Mumby et al. 2004; Dorenbosch et al. 2006, Machemer et al. 2012). However, this large-bodied parrotfish is using alternative nursery habitats in the Alacranes Reef in the Southern Gulf of Mexico. The Alacranes Reef is a natural protected area known as the Parque Nacional Arrecife Alacranes (PNAA) located approximately 130 km off the northern coast of the Yucatan Peninsula, Mexico.

In 2010 and 2015, individuals of *S. guacamaia* (adults 30 and 80 cm in total length, TL) (Fig. 1) were recorded on the southeastern zone of the PNAA at depths 5 and 20 m, and juveniles (10 to 20 cm TL) were found

in areas of coral rubble and octocorals (Aguilar-Perera and Hernández-Landa 2017). This finding is remarkable because the mangrove-dependency of *S. guacamaia* documented in Belize (Mumby et al. 2004), Aruba (Dorenbosch et al. 2006) and Florida (Machemer et al. 2012), is not evident in the PNAA where the parrotfish use alternative habitats (e.g., coral rubble, seagrass, octocorals). Closest areas with mangroves in the Mexican Caribbean Sea are 300 km away and separated from the mainland by deep waters, so it is not possible for adult or juvenile individuals to migrate to the PNAA. Limited fishing pressure and a lack of anthropogenic disturbances on *S. guacamaia* in the PNAA has promoted a healthy population of this large-bodied parrotfish.

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Schools of Rainbow parrotfish (*Scarus guacamaia*) (up to 15 individuals, 30-80 cm TL) in reefs of the PNAA, off the northern coast of the Yucatan Peninsula (Photo by Roberto Hernández-Landa). (Photo from Aguilar-Perera and Hernández-Landa, 2017. Springer).

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In the spotlight!

Mycteroperca acutirostris

(Valenciennes, 1828)

Comb grouper (E), Bادهچه peigne (F), Cherna peineta (S), Badejo-mira (P)

Maximum Recorded Size

80 cm TL

Population Trend

Stable

Rico; Saint Barthélemy; Saint Kitts and Nevis; Saint Martin (French part); Sint Maarten (Dutch part); United States; Venezuela, Bolivarian. Republic of; Virgin Islands, British; Virgin Islands, U.S.

Population

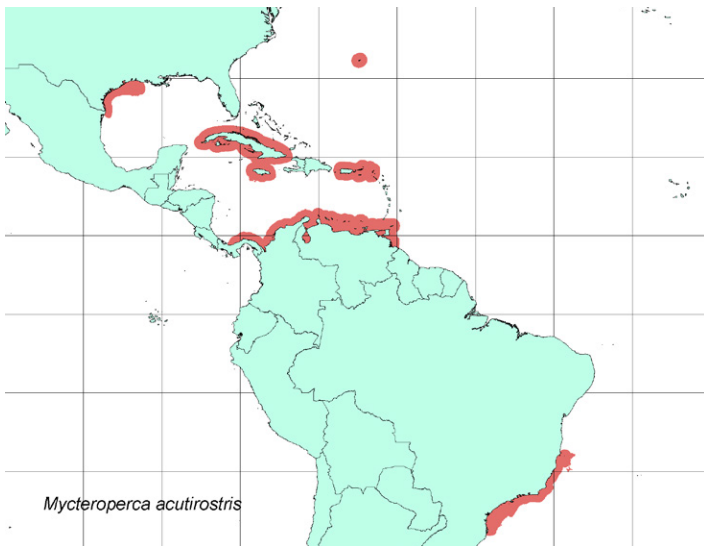
This species is relatively common through most of its range, but is rare in the Gulf of Mexico.



Picture by Áthila Bertoncini | shot in Cagaras Natural Monument | Rio de Janeiro | Brazil

Distribution

Anguilla; Aruba; Bonaire, Sint Eustatius and Saba (Sint Eustatius, Saba, Bonaire); Brazil; Colombia; Cuba; Curaçao; Jamaica; Mexico; Panama; Puerto



Source of information: Bertoncini, A.A., Sadovy, Y., Craig, M.T., Barreiros, J., Aguilar-Perera, A., Rocha, L.A. & Padovani-Ferreira, B. 2018. *Mycteroperca acutirostris*. The IUCN Red List of Threatened Species 2018: e.T132830A46918685.

Map: Craig M, Sadovy de Mitcheson, Heemstra PC 2012. h. 356 p. Boca Raton: CRC Press.

Habitat and ecology

Adults of this species inhabit rocky bottoms with high relief, including artificial reefs. It frequently occurs in groups comprised of dozens of individuals. Juveniles inhabit intertidal rocky shore tide pools, shallow areas of rocky reefs, turtle grass beds, mangrove areas and shallow water soft coral and coral reef areas. Early stage juveniles measuring two to five cm are often associated with floating objects. It exhibits aggressive mimic behaviour of the Blackear wrasse *Halichoeres poeyi*. Adults feed in the water column on sardine schools, but also planktonic items, squids, crustaceans and molluscs. Its maximum weight is about 4 kg, although reports up to 10 kg exist and maximum length is 80 cm. Preliminary results of a reproductive biology study indicate that 2 kg fish are still juveniles. It is suggested that it spawns during spring in Brazil.

Major Threat

Overfishing is a localised threat to its population in southern Brazil. Unexplained disease events that killed a large number of this species in summer have been reported from southern Brazil. It is potentially a prey item of the invasive Lionfish; however, only juveniles are consumed and it is not likely that this will drive significant population declines on a global level.

2018 IUCN Red List Status

Least Concern

Challenges in the management of multi-species grouper fisheries

Aligning grouper management with science to promote conservation and fisher-supported management goals

Groupers form the basis of small- and large-scale fisheries throughout the tropics and sub-tropics and are integral to food and economic security in many small-island countries. However, as recent IUCN Red List assessments have shown, many species central to these securities have declined, particularly those that form spawning aggregations (Sadovy de Mitcheson et al. 2020). In the western and central Pacific, the Squaretail coral grouper (*Plectropomus areolatus*), the Camouflage grouper (*Epinephelus polyphekadion*) and the Brown-marbled grouper (*Epinephelus fuscoguttatus*) commonly aggregate simultaneously on coral reefs, and are frequent targets of small-scale commercial fisheries. In areas where these fisheries have been examined, declines in fish size and abundance are common, along with shifts in catch composition (Rhodes et al. 2018). This trend has raised concerns among scientists and marine management agencies in the region, where these latter have instituted conservation measures including size-at-catch limits, catch, sale and export bans, and area protection around spawning sites. However while these measures are well intentioned, they have generally fallen short of achieving conservation goals by leaving aggregations fully

or partly unprotected (Hughes et al. 2020) or allowing greater pressure on equally vulnerable non-target species (Rhodes et al. 2008). In some cases, management measures have placed undue economic burdens on the fishing communities needed to support conservation efforts by banning the catch of species perhaps not in immediate need of management.

For example, in Solomon Islands, the Ministry of Fisheries and Marine Resources imposed an October to January grouper catch and sales ban to stem reported losses at a number of sites where declines had been shown. However, recent investigations (Hughes et al. 2020; Hamilton et al. 2012) along with traditional ecological knowledge surveys have shown variation in the seasonal timing of aggregation formation throughout the country. Thus, the current ban period may protect some aggregations but leaves many others open to fishing. Instead, conservation goals could be greatly enhanced by imposing a 2-week sales ban prior to each new moon, when aggregations commonly form, and expanding community-based area protection at known spawning sites. In another example, Pohnpei (Micronesia) extended its 1 March- 30 April grouper catch ban to 1 January through

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The Squaretail coral grouper
(*Plectropomus areolatus*). Photo by
Kevin Rhodes.

31 May to coincide with known spawning times for the aforementioned species. In doing so, the state removed an additional 24 grouper species from the fishery, resulting in shifts in fishing effort to equally vulnerable non-grouper species, namely parrotfish (Rhodes et al. 2008). A more effective approach would be to focus protection on known aggregation spawners, thereby reducing the impacts to other non-target species and creating better management buy-in within the fishing community. Similarly, in Chuuk (Micronesia), the Department of Marine Resources imposed a total grouper catch, sales and export ban from 1 January to 30 April. In Chuuk, groupers form the basis of a small-scale export fishery valued at between \$1 and \$2.5 million annually (Cuetos-Bueno and Houk 2018). However, as in Pohnpei, few species are known to aggregate to spawn during the ban period (Rhodes et al. 2018; Rhodes et al. 2020), suggesting that targeted management of aggregating species might mitigate economic hardship. Similar blanket grouper bans are in place in Fiji, although the economic and biodiversity impacts are still unknown.

These case studies highlight the need to focus management on grouper species where life history informa-

tion exists and to document reproductive life histories for species where management is still needed. When enforced, MPAs remain an important tool for spawning aggregation protection, however aligning seasonal bans with actual spawning times with a narrower focus on known aggregation-spawners is likely to result in greater conservation gains and better cooperation within the fishing communities. As highlighted by these various fishing and management scenarios, for conservation to be successful there is a need to tailor management policy to local political, biological, and cultural needs and characteristics, and identify science-supported measures that can be community-sponsored and effectively enforced.



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Fishers outside Winipiru pass, in Chuuk (Micronesia, USA). Photo by J. Cuetos-Bueno.

ITAJARA: A documentary on the life of the Atlantic Goliath Grouper

Itajara was released in 2019 at the Penedo Film Festival (circuitopenodecinema.com.br), during the Environmental show, and later at the 73rd Gulf and Caribbean Fisheries Institute meeting at the Virtual Film Screening event in November 2020. Itajara is a film about Goliath Groupers, their biology, ecology and threats. It is a history about the huge importance they have for a balanced environment where they live. Taking a documentary perspective, our “spokesfish”, a BOFFF (big old fat fertile female) Goliath Grouper, presents the sea bottom to a documentarian diver. She swims along the Brazilian coast where Goliath Groupers live, presenting other threatened species, ecosystems and revealing the peculiarities of their lives. It advocates that protecting a threatened species is a way to protect huge coastal marine environments.

- Film type: short documentary
 - Film makers(s): Máira Borgonha & Flávia Moreira
 - Length of film: 16’26”
 - Link to the film: <https://tinyurl.com/ybvrxrdj>
- Projeto Meros do Brasil is sponsored by Petrobras.



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Countries committing to protect spawning aggregations

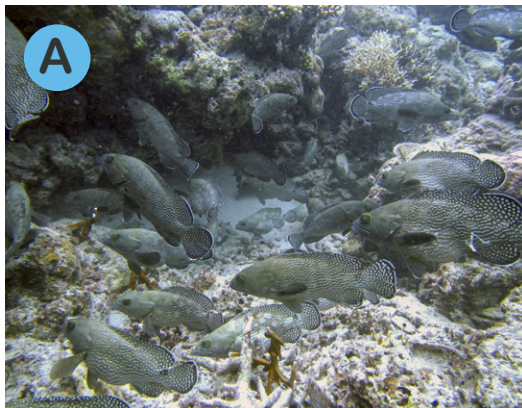
Promising news for grouper spawning aggregations

One of the major threats for reef fishes that aggregate to spawn, and highlighted in the grouper reassessments, is the uncontrolled fishing on aggregations. Decline and extirpation of these gatherings have been frequently reported and can happen within just a few years of aggregation discovery. On the other hand, effective management can lead to remarkable recoveries, although it may take a decade or more to see numbers turn around. The good news is that more and more countries are committing to protecting their spawning aggregations and that success stories are increasing. Recent examples come from the Caribbean and Pacific regions.



In the Caribbean, in Little Cayman, one of the Cayman Islands, over 15 years the Nassau grouper, *Epinephelus striatus*, has been carefully managed and its numbers have more than tripled: <https://www.pnas.org/content/117/3/1587>.

The Western Central Atlantic Fishery Commission of FAO (Food and Agriculture Organization) has recommended a sustainable management plan for spawning aggregations and aggregating species, and just approved



a management plan focusing, initially, on the Nassau grouper and the mutton snapper, *Lutjanus analis*: <https://tinyurl.com/ycbrgvvo>

As part of the multi-year project of management plan development and supporting education materials, a short film about the Nassau grouper has just been rolled out by BelugaSmile productions: Nassau Grouper Against The Clock targeted mainly at decision makers and enforcement officials.

- a. English: <https://vimeo.com/482818460>
- b. Spanish: <https://vimeo.com/482828314>
- c. French: <https://vimeo.com/483013272>



In Palau, western Pacific, increases in groupers, especially the squaretailed coral trout, *Plectropomus areolatus*, were recorded over a decade, during which time local communities carefully enforced protection at one site: <https://doi.org/10.3389/fmars.2020.571878>. Fiji has committed to protecting its grouper spawning aggregations during the reproductive season; <https://oceanconference.un.org/commitments/?id=14327>. In Japan, the only known spawning aggregation of white-streaked grouper, *E. ongus*, is well protected in the country and showing signs of possible recovery: <https://tinyurl.com/ydyxc2xs>



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Nassau grouper (*Epinephelus striatus*)
Against The Clock, by BelugaSmile.

A) The spawning aggregation of the white-streaked grouper (*Epinephelus ongus*) at the Yonara Channel, Yaeyama Islands, Okinawa.
B) A female of the white-streaked grouper (*Epinephelus ongus*) with expanded abdomen due to developed ovaries. Photos by Atsushi Nanami.
For more information on the species: <https://tinyurl.com/yxsmpr8m>

Citizen science for the biological conservation of the Atlantic Goliath Grouper in Brazil

Scientists, fishermen and divers joint efforts

The Atlantic Goliath Grouper (*Epinephelus itajara*), one of the largest bony fish in the Atlantic Ocean, is endangered although protected in Brazilian waters since 2002. The Projeto Meros do Brasil relies on citizen science as a powerful source to gather data on population, areas of occurrences, and genetic connectivity, of this grouper.

Since 2002, the Projeto Meros do Brasil has considered the traditional knowledge of fishermen and participation of divers who have reported sightings through our web platform (www.merosdobrasil.org). Since 2018, the citizen science component has increased efforts to involve commercial and recreational fishermen to enable them to provide data on both small and large *E. itajara*.

Initially, first contacts were done directly with the fishermen and divers using images in social media (Facebook and Instagram), and through the app FishEye (@fisheye_brasil), which were developed by our team.

Additionally, experienced recreational fishermen, who follow good conservation practices by releasing groupers, were contacted and received a special collection kit in order to sample (non-lethally) groupers for genetic studies.

Between July 2017 and December 2020, about 334 grouper samples, including pictures, videos, date and place, were obtained. Based on each picture, the total length of each grouper was estimated. Every participant received orientation to provide adequate images from both sides of the grouper's head whenever possible. All images are integrated into an image bank which is processed to provide analyses of photo-iD.

According to our records, people from 13 coastal Brazilian states have provided data, with São Paulo leading with 43.4%, from Santos and São Vicente cities, which harbor the largest seaport in South America, a highly impacted area by anthropogenic activities. After São Paulo follow Alagoas (25.4%), Paraná (17.3%) and Sergipe (10.4%) with the rest of the records.

Most of the records obtained so far come from estuarine environments and groupers showed a body mean size of 43 cm with a range of 20 to 200 cm. Our data showed an abundance of juveniles from the main Brazilian estuaries, highlighting the importance of these areas for the biological conservation of this grouper.

Our study reinforces the importance of considering fishermen and divers as citizen scientists in order to join efforts, uniting different stakeholders to use a simple, yet powerful tool, to help scientists to obtain data, identify threats and actions for the conservation of the Atlantic Goliath Grouper in Brazil



Find more information about FishEye (@fisheye_brasil), available at IOS and Android platforms.

Projeto Meros do Brasil is sponsored by Petrobras, and Fundação Grupo o Boticário (ID: 1131_20182).

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São Francisco river estuary. Luiz Henrique is a sport fishing guide, collaborator of Projeto Meros do Brasil.

Juan Manuel Loureiro a professional photographer and partner of Projeto Meros do Brasil, in a stunning selfie, at Pescador shipwreck, Costa dos Corais Marine Protected Area/AL.



Capture-Based Aquaculture (CBA): implications for groupers

How aquaculture can contribute to overfishing

It is often said that aquaculture is one of the solutions to overfishing. This is not yet the case for groupers, among many other species, because as culturing increases, fishing does not decrease. Moreover, as currently practiced in some areas the opposite is true and culturing can intensify fishing pressure on wild fish populations.

There are two reasons for this. The first is the source of 'feed' for many carnivorous species in aquaculture, which still depends heavily on fishing a wide range of prey species taken from the wild to feed directly caged grouper or other cultured fish or invertebrate carnivores, or ground into fishmeal before being incorporated with other ingredients into fish pellets. In either case, large volumes of wild fish are used and many such fisheries are unmanaged.

Small groupers are even themselves sometimes used as animal feed. For example, small Spinycheek grouper juveniles are regularly caught in trawl fisheries and ground into fish meal for poultry and fish feed, especially in Mangalore, India (Nair 2018). There is a minimum legal size of 18 cm for this species. However, due to lack of coastal policing in 2020 (police were otherwise preoccupied due to serious covid-19 situation in the area), landings of juvenile Spinycheek grouper, *E. diacanthus*, increased in certain pockets of northwest India during November and December. Large volumes (10-12 t daily) of this species, well below the minimum legal size, were landed (thanks go to Mumbai fishers for information).

The largest known impact from aquaculture on grouper populations, though, comes from the ongoing and extensive practice of wild grouper seed collection. This involves juvenile grouper, ranging in size at capture from

a few to over tens centimetres in total length, captured with a diverse array of gears (depending on species, location and body size), which are grown-out in captivity to market size.

Cultured in this way is a wide range of *Epinephelus* species; even if species can be hatchery-produced, if it is cheaper and easier to take wild seed the practice continues, as for *E. fuscoguttatus*, *E. malabaricus* and *E. coioides*, among many others. Juvenile grouper seed capture for grow-out is sometimes even promoted as a fishing alternative once the larger fish of the species have



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Circular net cages suspended from floating rafts hold the fish during grow-out of leopard coral trout (*Plectropomus leopardus*) in Taytay, Palawan, Philippines. Photo by Yvonne Sadovy.

Many tonnes of the Spinycheek grouper (*E. diacanthus*) daily landed from trawlers. Photos provided to Rekha Nair by colleagues.

gone from the area. For example, in Palawan, southern Philippines, about 70% of the exported live leopard coral trout, *Plectropomus leopardus*, is produced by CBA of wild-caught juveniles (ICRI 2019). When this grouper was first exported live all fish were caught at market (adult) size.

This highly valued red grouper was once common in the area but is now overfished in the northern Palawan reefs with little chance of recovery due to lack of management and ongoing high juvenile capture. It is difficult to see how this lucrative fishery can be sustained much longer as currently practiced. In the long-term, grouper CBA will need to be managed, as for any other wild capture fishery.



Small traps and hook and line are used for catching juvenile leopard coral trout (*Plectropomus leopardus*) in TayTay, Palawan, Philippines. Photo by Yvonne Sadovy.

North-east Atlantic wrasse fishery

Live pot-caught fishery for wrasses in England

In southwest England, a fishery for live pot-caught wrasse (Labridae) has developed during the last three years. This fishery is being driven by the Scottish salmon farming industry which uses the wrasse as cleaner fish to tackle the problem of salmon infestation with sea-lice; the salmon have slowly become resistant to different chemical treatments.

The wrasse fishery is small-scale and well managed by the local Inshore Fisheries and Conservation Authorities responsible for the management of coastal fisheries in England. Minimum and maximum landing sizes have been established for five wrasse species: the Rock cook (*Centrolabrus exoletus*), the Goldsinny-wrasse (*Ctenolabrus rupestris*), the Ballan wrasse (*Labrus bergylta*), the Cuckoo wrasse (*Labrus mixtus*) and the Corkwing wrasse (*Symphodus melops*), along with a closed-season to allow spawning to occur. Catches and landings are documented in order to assess Catch/Landing Per Unit Effort, and thus monitor for sustainability of fish stocks.

While the English pot-caught wrasse fishery is well managed and well studied, perhaps more so than any other inshore fishery in southwest England, the fact that the Scottish salmon industry is increasingly relying on wrasses must ring alarm bells about possible wrasse over exploitation in Scottish waters. Similar issues are being noticed in wrasse caught to supply the Norwegian salmon farming industry, further increasing concerns.

Scientific research on this issue is needed to assess whether concerns about wrasse over exploitation are justified and whether this is the tip of an international iceberg

in relation to the impacts of wrasse fisheries related to pest control, such as salmon, in fin-fish farming. Over the next few months we will be developing work to answer key questions in relation to:

- Possible impacts of the wrasse fishery on Scottish wrasse populations
- Trends in the Norwegian wrasse fishery
- Wider ecological impacts of removing wrasse from reef habitats
- Possible implications for wrasses in the future with cultivation of other fin fish species



The Ballan wrasse (*Labrus bergylta*). Photo by Diego Delso.



Salmon cages in Norway. Photo by Diego Delso.

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Asia Red List Workshop

28 representatives from 9 countries/territories meet

After much delay, due to administrative and COVID-19-related challenges, a 2-day online workshop was conducted on 10 – 11 May 2020. The workshop was aimed at expanding the GWSG connection to grouper and fishery researchers and managers in Asia, to initiate the collection of existing but otherwise untapped grouper data, to identify the need for data collection and highlight data gaps, and to undertake regional assessments on a number of grouper species relevant to the region. These species include *Cephalopholis igarashiensis*, *Cromileptes altivelis*, *Epinephelus akaara*, *E. awoara*, *E. bruneus* & *E. moara*, *E. ongus*, *Plectropomus laevis*, *P. leopardus*, *E. polyphkadion*, *P. areolatus*, and *E. fuscoguttus*.

The workshop had the participation of 28 representatives from 9 countries/territories in the region, includ-

territories to tackle some of the same monitoring and management issues that they might be facing in their own regions for groupers, while sharing and discussing challenges from local perspectives. Many of those working on groupers in the regions have few other colleagues in their country with similar interests. The workshop also discussed actions that could be taken for fishery monitoring and management in this region.

The workshop did not end at the close of day two. In the weeks that followed, participants divided themselves into sub-groups to conduct regional assessments on shortlisted grouper species, applying what they learned from the workshop and contributing data from their own regions. These regional assessments are currently being finalized and will undergo the same review process as

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Group discussions during the workshop. From left to right: Allen To (GWSG member and co-ordinator of the meeting); Yvonne Sadovy; Stanley Shea and Kathleen Ho, both of Bloom Association.

ing Hong Kong, India, Indonesia, Japan, Malaysia, the Maldives, Philippines, Sri Lanka, and Taiwan. The two days were packed with information presentations and expert sharing sessions, including training in the IUCN Red List assessment and its relevance to marine fishes, a brief categories and criteria, and an overview of grouper fisheries and management in Asia. The sessions helped participants to quickly grasp the essence of the IUCN red list assessment process and key issues in Asian grouper fisheries. A massive thank you to Gina Ralph of the GMSA who made presentations and took everyone through the categories and criteria in the middle of her night in the United States.

Apart from sharing sessions from experts, the workshop also included presentations on the monitoring and management of grouper fisheries by participants from each of the represented countries/territories. This part was of particular value, as it allowed participants to understand more about practices in other countries and

global species assessments, aiming for eventual publication online.

We hope to share more news on the publication of these regional assessments as they are completed. Last but not least, a massive thank you to Howard, Matt, Allen, Gina (again!) and Yvonne, who contributed greatly to this workshop as expert trainers and reviewers, and in the planning and execution of the workshop. Our gratitude also goes to ADM Capital Foundation for providing the venue for setting up the online workshop, to Bloom Association Hong Kong for coordinating the workshop and participants, and the Ocean Park Conservation Foundation Hong Kong for funding this project.

MARINE MOTIONS FOR WCC

New resolutions on marine issues approved

The IUCN World Conservation Congress is the biggest gathering of conservationists, held every four years. It was due to be held in Marseille, France in June 2020 but is currently on hold for Covid reasons.

The more than 1400 IUCN Member organizations from 170 countries have gone ahead, however, and approved many Motions (after a four month electronic discussion period and an e-vote). These now become Resolutions (to the IUCN) and Recommendations (to other organizations and agencies) that guide policy for all Members.

Take a look at the new Resolutions on marine issues, which were formally approved on 4 November 2020, and are now in effect at: www.iucn-sscmarine.org/marine-motions. Voting on a few controversial or complicated marine Motions will need to happen in person when the Congress finally takes place (see future events section).



Aquatic biodiversity conservation of shallow marine and freshwater systems is among the motions already approved. *Millepora alcicornis* (top) and *Mussismilia hartii* (bottom) corals at Abrolhos National Marine Park, Brazil. Photo by Áthila Bertoni.

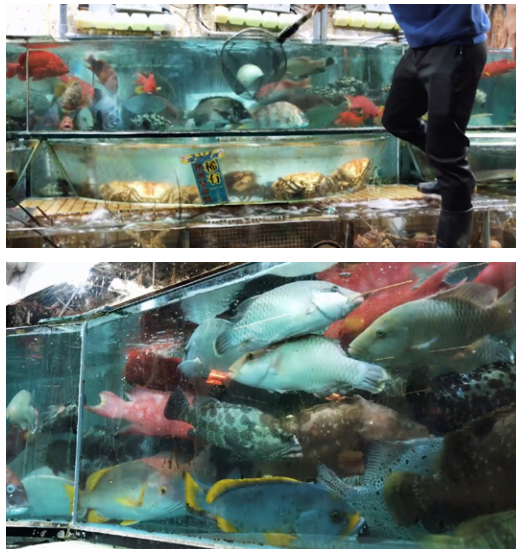
Losing Colour

The lucrative trade in colourful reef fish

High demand for luxury seafood, such as live reef fish, is reflected in volumes of about 20,000 mt annually of live reef fish mainly traded between Southeast Asia and China. Currently, Indonesia is the major and only legal exporter of the threatened Napoleon (Humphead) wrasse, *Cheilinus undulatus*. Hong Kong, which is the major importer, and Indonesia are trying to ensure that this species, included in the App II of the CITES (Convention on International Trade in Endangered Species of Flora and Fauna), is traded legally, i.e. within the quotas that Indonesia has assigned as part of the CITES non-detriment findings that permit its export.

For wild Napoleon wrasse, an annual export quota is below 2,000 individuals per year and for 'ranch' fish (juveniles produced by capture-based aquaculture) the annual quota is currently less than 8,000 individuals. However, the 'ranch' quota is not scientifically justified (unlike the 'wild' quota which has undergone a fishery assessment) and there is ongoing illegal laundering of wild fish through the larger ranching quota. Since 'ranch' and 'wild' fish (R and W codes under the CITES) cannot be distinguished from each other after export (they are not tagged or otherwise marked), the Hong Kong government is finding this dual quota system

challenging to enforce (Hau and Sadovy de Mitcheson, 2019). Currently, within both the CITES and Indonesia, there is some confusion about what is considered a 'ranch' or cultured fish and what a wild fish (even though all are actually taken from the wild). The film 'Losing Colour' (<https://tinyurl.com/y9jxs2ph>), sponsored by ADM Capital Foundation, shows something of these issues and the challenges in the conservation and sustainable trade in this live fish trade in general.



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Images from the documentary:
Losing Colour - the lucrative trade in colourful reef fish.

In memoriam

It is with great sadness that we report the passing, in 2019, of two of our longest-standing members, both highly respected grouper experts and biologists. Patrice Francour, University of Nice, had a passion for fish, particularly groupers and

especially *Epinephelus marginatus*, and for the Mediterranean ecosystem. Phil Heemstra, JLB Institute of Ichthyology, was a highly acclaimed taxonomist, with groupers as one of his key fish taxa. Both colleagues are deeply missed.



Patrice Francour



Phil Heemstra

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Future events

2022 Fifth International Marine Protected Areas Congress (IMPAC5)

When: from 23 to 29 June, 2022

Ministerial Summit: 30 June 2022

Where: Vancouver, Canada

Visit: <http://www.IMPAC5.ca/>



14th International Coral Reef Symposium

When: from 18 to 23 July, 2021

Where: Bremen, Germany

Visit: <https://www.icrs2021.de>



8th Annual World Ocean Summit & Expo

When: from 2 to 4 March, 2021

Where: Lisbon, Portugal

Visit: bit.ly/3bPiPPI



IUCN World Conservation Congress

When: from 3 to 11 September 2021

Where: Marseille, France

Visit: iucncongress2020.org



Reef Futures 2021

When: from 12 to 17 December, 2021

Where: Azores (Faial Island)

Contact: reeffutures.com



The United Nations Environment Assembly (UNEA-5)

When: from 22 to 26 February, 2021

Where: Nairobi, Kenya

Visit: environmentassembly.unenvironment.org



XXII Congresso Brasileiro de Ictiologia

When: from 30 January to 04 February, 2022

Where: Gramado, Brazil

Visit: www.ebi2021.com.br

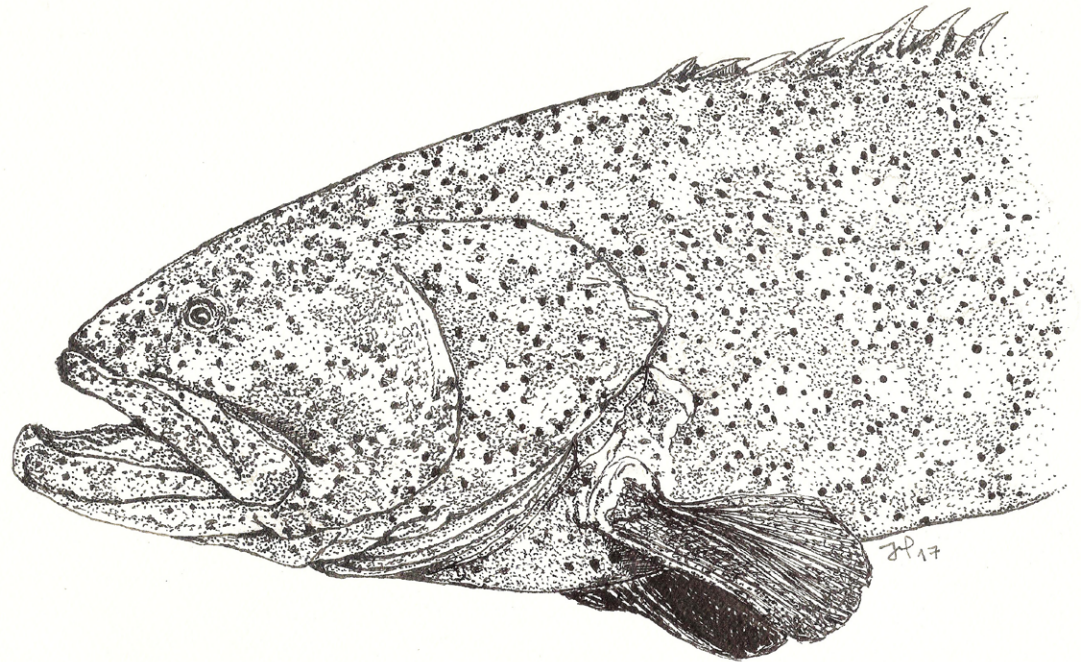


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Groupers & Wrasses Art Gallery

Send your visual art work to gwsg.iucn@gmail.com for our next newsletter!



Epinephelus itajara • © João P. Barreiros & G.W.S.G.

巨石斑鱼

This fine indian ink drawing depicting the Atlantic Goliath Grouper, *Epinephelus itajara*, was prepared by Dr. João Pedro Barreiros in 2017. Dr. Barreiros is a passionate scientist, who lives in the Azores (Portugal) and has a talent for painting/drawing arts. He also plays the guitar.

Editorial GWSG Newsletter Issue 14



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