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SCRFA

SOCIETY FOR THE CONSERVATION OF REEF FISH AGGREGATIONS

NEWSLETTER 13 • DECEMBER 2009

BREAKING NEWS

NGOs disappointed with shortened Nassau Grouper spawning season closure in Bahamas.

South Atlantic Fishery Management Council debate on snapper/grouper fishery overlooks aggregation site management.

For more information, see Newsletter

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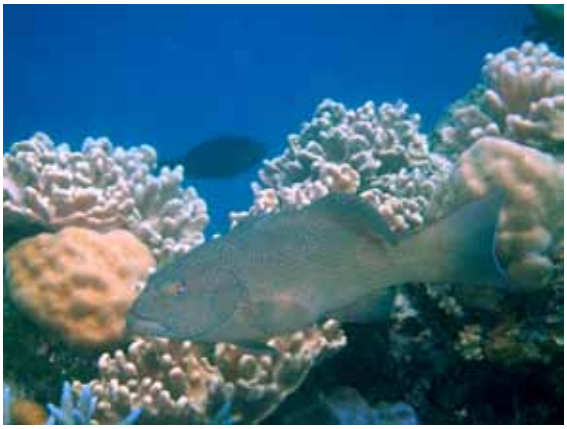
WORDS *from the chair*



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Spawning aggregation issues increasing on the global coral reef radar

The growing number of discussions on aggregation management, and the research and educational projects being conducted, highlight increasing interest in, and awareness of, spawning aggregations globally. The articles in this and earlier newsletters, and the news reports on our website reflect the diversity of this work. Contributing to this, we participate in a wide range of forums and meetings to spread the word.

SCRFA has been active along a number of fronts this year. We recently participated in a "*Live Reef Fish Trade Technical Workshop*", in Hong Kong, facilitated by WWF and Conservation International. The aim of the workshop was to bring together practitioners and stakeholders from the private sector, government, NGOs and the scientific community from the Asia-Pacific region to discuss management and research in relation to the live food fish trade. Top priorities identified at the workshop included the need for biological and ecological data to ensure that biological over-fishing does not occur, and the essential need for aggregation management. Our director, Yvonne Sadovy, recently (30th November) presented in Taipei, Taiwan, at the International Union for Conservation of Nature "*West Pacific Marine Red List Assessment Workshop*" on threats from aggregation fishing, gave a keynote address at the Indo-Pacific Fish Conference in Fremantle, western Australia in June and ran two workshops in the Philippines and Fiji, all covering fish spawning aggregations identification, research and monitoring.

In December, SCRFA will participate in the 5th International Coral Reef Initiative (ICRI) East Asia Regional Workshop in Hoi An, Vietnam. The workshop will progress the implementation of the "*Provisional Plan 2009-2010*", and the development of the "*Regional Strategy on MPA Networks*". Thirteen Southeast Asia countries and several non-government organisations are involved in this working group. More information can be found at http://www.icriforum.org/EARW/EastAsiaRW2009.html.

The SCRFA Board will be holding its annual meeting soon. Our Board of 8 Directors from different parts of the globe all work on management and research of spawning aggregations and associated conservation issues. Please take a look at our newly revised website to see what we are up to.

Martin Russell
Chair/CEO, SCRFA

SCRFA *update*

Since Newsletter 12 in May, we have been extremely busy, particularly in the field but also in further developing educational materials. We have been participating in meetings and projects, ranging from scientific presentations and workshops to modeling the value of aggregating fish to the overall fishery. One major effort has been the upgrading of our website which we are pleased to release at the time of this Newsletter. We welcome feedback on additional materials or information that could be made available on the website. Note also the facelift on our twinned website in Spanish, cared for by Alfonso Aguilar-Perera in Mexico.

Field studies were conducted in Fiji and Palau, where we work with the Fiji Fisheries Research Division and the Palau Conservation Society (PCS), respectively. In Palau, which I will report on in more detail in the next Newsletter since we will wind up the project early in 2010, we have been working on a well-known spawning site in a protected area. Specifically, our task was to enhance the existing monitoring programme for one year to then be able to design a simple and practical scientific protocol for reduced sampling in future. We now have a very good understanding of the site, total fish numbers and distribution of the different species, as well as the temporal patterns. With these we can design a sub-sampling methodology and will model the relative contribution of this site to the fishery. This will provide an indication of the importance of this site to the national interest. In Fiji, we are working in another marine protected area. For further news on this project see the article on p.9. We were joined by fish tagging experts Rick Nemeth (University of the US Virgin Islands) and Michael Domeier (Marine Conservation Science Institute, USA). For the Nassau grouper in the Bahamas, we are working with a fishery scientist and local groups, as well as the Fisheries Department to determine the value of protecting aggregations by looking at their contribution to non-aggregation fishing. This kind of question is important to better understand the tangible benefits of protecting aggregations.

Bumper sticker produced by PCS and SCRFA. All our educational materials are downloadable from our website http://www.scrfa.org.

We held two workshops, one in May in the Philippines, the other in October in Fiji; both workshops included practical hands-on experience and lectures. In the Philippines, we worked with WWF-Philippines to train fishery officers, researchers and NGO workers on basic biological and fishery techniques for managing the live reef food fish fishery, especially the coral trout, *Plectropomus leopardus*. In Fiji, SCRFA joined with the Secretariat of the South Pacific (SPC) to conduct a workshop on the identification, monitoring and management of aggregations (see article on p.10). Both of these workshops clearly highlighted a need for the development of simple guidelines for collecting basic fishery-related information (such as size of sexual maturation, species diversity, spawning season) and, as a result, I am developing a document to address this need. SPC is producing a film on aggregations that will incorporate the workshop.

We continue our strong focus on education materials and in outreach in general. Our English language Manager's Handbook was translated by Alfonso Aguilar-Perera (Universidad Autonoma de Yucatan, Mexico) into Spanish and is being distributed by Brad Erisman (Scripps, USA) as part of his group's work on aggregations; apparently it has been very well-received. With PCS we have developed a range of educational materials, from Palauan/English fliers to posters, bumper stickers, life cycles and modules for children. We continue to contribute to newspaper articles and to management planning.

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Bahamas

Shortened Nassau Grouper Spawning Season Ban

Information extracted from The Nassau Guardian ("*BREEF disappointed with shortened grouper ban*" October 31, 2009 and "*Group protesting shortened grouper ban*" November 17, 2009)

The Bahamas will only implement a two month seasonal closure for Nassau Grouper *Epinephelus striatus* in January and February 2010. In recent years, the ban lasted December through February. Citing the unprecedented decline in crawfish sales over the past two years that apparently came as a result of the downturn in the economy, the Bahamas Government decided to allow fishermen to fish for extra time in December, which typically was included in the Nassau Grouper closure. The Department of Fisheries revealed a 30 percent revenue decrease in the local fishing industry over the last two years. Such decline is expected to continue this year. The 2008 figures from the Department of Statistics show that the fishing industry value is about $5 million less than in 2007, and nearly $25 million less than in 2006.

The Bahamas Reef Environment Educational Foundation (BREEF), which for years lobbied for the grouper ban before it finally came into effect, expressed its disappointment at the government's decision to shorten this year's seasonal closure. It regards the Nassau Grouper as an important species for the Bahamian fishing industry and Bahamian consumers, thus a protection to make sure that this fish persists well into the future is critical. BREEF was disappointed to hear that the closed season may be shortened this year to only give protection to the Nassau Grouper for less than half of the total November to March spawning period. **While BREEF acknowledged that allowing people to catch spawning Nassau Grouper may provide economic relief in the short term, it could be harmful in the long term and could induce serious negative economic implications for people who intend to fish for years into the future.** BREEF believes that policymakers should explore other avenues to help local fishermen recoup lost sales instead of opening the door to over-exploit a vulnerable marine species. It has started a letter writing campaign in protest of the government's decision to shorten the grouper ban to two months.

Summarized by
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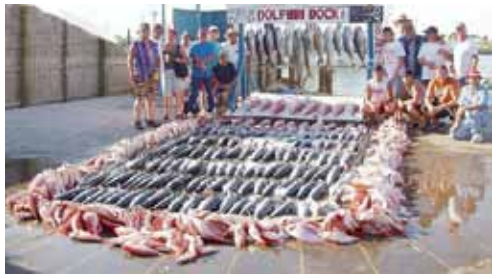
New and Proposed Regulations
for the
South Atlantic Snapper-Grouper Fishery
Ignore Spawning Site Protection



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Anglers' catch including snappers (in red) in August 2004

[Original Documents can be found: http://sero.nmfs.noaa.gov/sf/SGAmendment16.htm]

In June 2009, the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service published a final rule to an amendment of the Fishery Management Plan (FMP) for the Snapper-Grouper Fishery of the South Atlantic Region. The amendment includes introduction of a 4 month seasonal ban for groupers and a 5 month ban for a snapper and modification of commercial quotas and bag limits. The amendment has become effective on 29th July 2009.

Vermillion snapper (*Rhomboplites aurorubens*), gag (*Mycteroperca microlepis*), black grouper (*Mycteroperca bonaci*) and red grouper (*Epinephelus morio*) are overfished while other shallow-water grouper species are sometimes taken incidentally when targeting the aforementioned species. To address this situation, the amendment protects 12 species by establishing a January-April prohibition on recreational and commercial harvest of all shallow grouper species and a November-March prohibition on recreational harvest of vermillion snapper.

Shallow-water grouper species are vulnerable to overfishing due to their life histories; they are long-lived and some form spawning aggregations and undergo sex change. The amendment to the FMP extended the spawning season closure of gag and black grouper to other shallow-water groupers. Expected biological benefits include protection of spawning aggregations, increasing the percentage of males, enhancing reproductive success, and improving recruitment. However, spawning aggregations sites are not explicitly protected despite the fact that many of the species involved are aggregation-spawners.

To address overfishing, the amendment also reduces commercial catch quotas of vermilion snapper, establishes one for gag grouper, and reduces recreational bag limits for vermillion snapper and groupers, for a total of 17 species. The quota was recommended by the Scientific and Statistical Committee of the South Atlantic Fishery Management Council, based on the acceptable biological catch limits. Furthermore, dehooking tools shall be applied by fishermen when necessary.

This amendment is the 16th revision to the FMP which was first implemented in 1983. The current FMP consists of minimum sizes, gear restrictions, vessel permits, designation of special management zones and marine protected areas, and also addresses management for specific species. Further amendments, 17A 17B & 18 were discussed on Dec 6, 2009 but again did not specifically recognize spawning areas. SCRFA Submitted comments for consideration at these hearings requesting attention be paid to the protection of spawning areas.

Red snapper underwater


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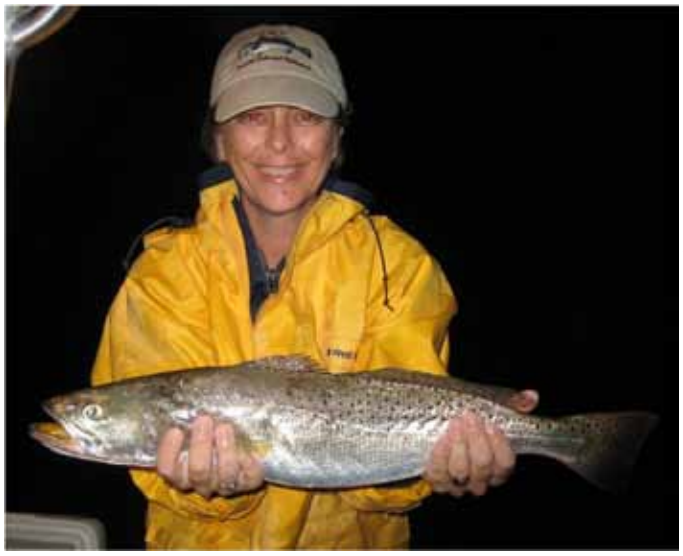
USA


© Sarah Walters

Researcher holding spawning condition female spotted seatrout

Mapping Estuarine Spawning Aggregations in Tampa Bay, Florida

The spatial distribution of spawning activity can affect the reproductive success of certain fishes (DeYoung and Rose 1993; Begg and Marteinsdottir 2002) and locating these key areas is critical to accurately assess and manage their populations (Rowe and Hutchings 2003). To determine estuarine spawning locations for spotted seatrout (*Cynoscion nebulosus*) and sand seatrout (*Cynoscion arenarius*) in Tampa Bay, Florida, a passive acoustic survey, using a random stratified design, was conducted over two spawning seasons (2004-2005). This sampling method provided an effective means of detecting spawning aggregations over a large spatial scale and across a wide variety of habitats.

Spotted seatrout aggregations were distributed throughout the bay with the highest concentration at the estuary mouth. If the population were to become stressed and area closures deemed an effective way to manage the spawning stock, this lower bay area would be the most critical to protect. Spawning areas of spotted seatrout occurred most frequently near the shoreline in areas of relatively high dissolved oxygen and in association with submerged aquatic vegetation (Walters et al. 2009).

In 2005, an intense red tide (*Karenia brevis*) entered Tampa Bay three months after the start of the spawning season. Red tide concentrations were at levels associated with fish mortality and sand seatrout spawning aggregations were significantly impacted. A paper-in-preparation named "Effects of red tide (*Karenia brevis*) on the spatial distribution of sand seatrout (*Cynoscion arenarius*) spawning aggregations in Tampa Bay, Florida" documents the dramatic decline in sand seatrout spawning aggregations in the areas of the bay exposed to red tide. Only 28 % of stations (n=624) in the lower/middle zones of the bay had aggregations during 2005, a significant decrease from the 44% (n=611) detected in the same area during 2004. Before the red tide entered the bay in 2005, aggregations were detected at 47% of sampled stations. After fish were exposed to the bloom toxins, aggregations were only detected at 12% of stations. Typically, it is difficult to assess the effect of environmental alterations on marine fish populations due to complexities in measuring the extent of the perturbation and the magnitude of the loss to the population. However, by using a spatially explicit sampling technique and sampling over multiple years, we were able to measure the magnitude of loss to a spawning fish population.

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Australia

Aggregations of milkfish on the outer Great Barrier Reef

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The milkfish, *Chanos chanos*, is found near continental shelves and around oceanic islands throughout the tropical Indo Pacific (Bagarino, 1994). They are generally found in coastal waters and are well-known for broad euryhaline tolerances and migration behaviour. Milkfish are popular food fish in the tropics and as a result of their ecologically robust characteristics the species has been heavily used for aquaculture. *Chanos chanos* are thought to spawn pelagic eggs offshore with larvae advected swimming to the shallows of lagoons and mangrove forests (Bagarino, 1994). In contrast, some spawning of milkfish is recorded year-round in landlocked lagoons (salinity 60-130 ppt; Crear 2009). On the Great Barrier Reef (GBR) there is strong evidence from collections of fish larvae that *Chanos chanos* spawn at the outer edge of the reef. Leis & Reader (1991) sampled larvae across the continental shelf near Lizard Island. They found the youngest milkfish larvae near Ribbon Reefs, close to the shelf break, and larger larvae closer to shore. There was, however, no direct evidence that milkfish were aggregating on the outer GBR to spawn.

On 11th December 2007, at 1545, I observed a big probable spawning aggregation of large adult milkfish at Day Reef on the outer GBR. Hundreds of fish were observed swimming in a tight spiral, which got tighter as I drew close to photograph them. Total depth of the water column where I first observed the fish was 15 to 20 m. The observation date was two days after the new moon which was on 9th December 2007, at 0540. While it could not be confirmed that the aggregation was for spawning, milkfish are not normally seen on outer Ribbon Reefs and the timing of the observation conforms with other indications of spawning at this time for this species in the region, so reproduction is the likely reason for the gathering. Although there are some data that indicate fluctuations in numbers of larvae in nearshore waters according to new and full moons, I have found no direct data on lunar spawning of adults. Knowledge of spawning sites, therefore, will help to elucidate the periodicity of aggregation and spawning.

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AUSTRALIA

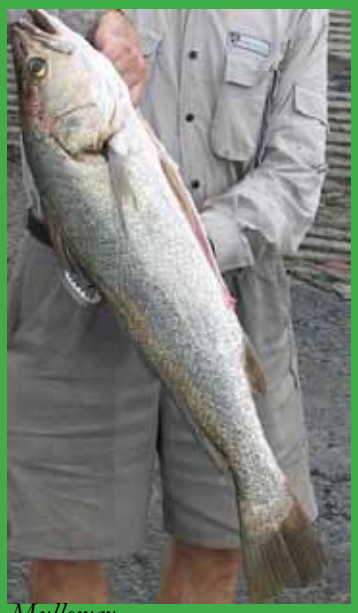
Management and Monitoring of Fish Spawning Aggregations in Western Australia

The Department of Fisheries of Western Australia released a fisheries research report on the management and monitoring of fish spawning aggregations (FSA) in the West Coast Bioregion (WCB) in March 2009. The research identified fish species that aggregate to spawn within the WCB, and established protocols for FSA monitoring and proposed management. They also investigated the Samson fish *Seriola hippos* (Carangidae), particularly in relation to the sports fishery targeting deep water spawning aggregations. The research also examined techniques for studying and monitoring FSAs within the WCB. Baited remote underwater cameras and acoustic techniques were examined in relation to different behaviours of species, and habitat type. Passive acoustic techniques to survey noise produced by aggregated fish were considered a possible effective means of monitoring the size and dynamics of aggregations.

The study identified 22 aggregating species of fisheries interest through fisher interviews and research. Detailed reviews were conducted on five key species, dhufish ***Glaucosoma hebraicum*** (Glaucosomatidae), pink snapper ***Chrysophrys auratus*** (Sparidae), bight redfish ***Centroberyx gerrardi*** (Berycidae), king george whiting ***Sillaginodes punctatus*** (Sillaginidae), and mulloway ***Argyrosomus japonicas*** (Sciaenidae). These 5 species are exposed to high commercial fishing pressure and are targeted during spawning aggregations leading to depletion of pink snapper and dhufish stocks. For instance, FSAs used to consist of hundreds of dhufish in the 1960s, but numbers have recently declined to a few tens of individuals.

Pink Snapper

©Moon Fish



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Mulloway

Due to concerns raised by charter boat operators over the potential impact of recreational catch and release fishing on the survival and spawning activity of deepwater Samson fish, due to high mortality rates of fish brought up from deep-water and then released, the biology, ecology, and impact of the sports fishery were studied. This species forms large, relatively immobile spawning aggregations annually at predictable times and places. About 7,500 Samson fish were tagged in collaboration with recreational anglers, thereby establishing partnerships and encouraging a sense of stewardship.

The research highlighted the importance of considering FSAs in fishery management and a programme for monitoring the abundance of key species within the WCB was recommended along with means to incorporate FSAs into stock assessments. Alternative management options would consider species characteristics (e.g. vulnerability to release mortality), social impacts (e.g. loss of income), and value of the fishery (e.g. costs associated with enforcement and monitoring, and the overall value of the fish).

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[Original documents: http://www.fish.wa.gov.au/docs/frr/frr187/index.php?0401]

FIJI

Fiji Spawning Aggregation Baseline Study
A Progress Report

SCRFA and the Fiji Fisheries Department's Research Division have been working in partnership at a well-known spawning aggregation site situated on the island of Kadavu. This site is in a marine protected area established in 2004. It is popular with divers and patrolled by local village stewards although poaching is believed to occur. In addition to Fisheries Research Division staff, staff from the Wildlife Conservation Society and biologists Dr. Rick Nemeth from the University of the (U.S.) Virgin Islands and Dr. Michael Domeier of the Marine Conservation Science Institute, California joined us on the study this summer.

The objectives of this study are to establish the baseline conditions of the aggregation site, in terms of timing of spawning, species, numbers, etc., provide training in aggregation research and monitoring, develop a sampling protocol, and use the project to provide information to local communities that complements other marine conservation and management initiatives in Kadavu. We also introduced this year a small tagging component to determine the catchment area of *Epinephelus polyphekadion* (or the *kawakawa* locally) between spawning seasons. An external tag with high retention designed by Dr. Domeier was used.

The field season was conducted over 6 weeks in July and August, 2009, later and longer than in 2008, and during the main spawning season for the three groupers that use the spawning site, according to previously conducted interviews. A total of 40 *E. polyphekadion* were tagged with yellow tags marked with individual numbers and contact details to the Lami Fisheries (see photos). T-shirts were provided as rewards for returned tags and for the tagging team. Tagged fish ranged in size from 420 to 544 mm total length, all within the mature size range of the species. *E. fuscoguttatus* and *Plectropomus laevis* were also observed in good numbers this year. *P. areolatus* were not seen this year although they were numerous last year during a slightly earlier period.

We paid visits to the coastal communities both north and south of the spawning site, with *sevusevu* traditional gift of kava (*'yaqona*', the dried root of the plant *Piper methysticum*), to provide information on the tagging project and its relevance to the fishery and marine protected areas, and to invite community members' participation by returning the tags. Discussions were also made addressing issues concerning marine conservation and management.

Several interesting patterns were found by surveying the full extent of the aggregation site. First, the three species peaked in numbers at different phases of the moon. The most abundant species, as last year, was *E. polyphekadion* which peaked at almost 300 fish. *E. fuscoguttatus* peaked at about 120 fish, at the same time and a pair-spawn was observed. *P. laevis* occurred in much smaller numbers (maximum counted on any one day was 34) and peaked at a different time; large males displayed some wonderful colour changes including an intense black/white pattern with white lips while they patrolled high above the substrate among groups of 9-10 fish (probable females). We also noted that the three species were consistently found within specific depth ranges and differed in their occurrence on either side of the channel spawning site; this highlights the need to carefully check the entire aggregation area. A few of the tagged fish remained at the same locations of the study site for at least 2 week after spawning finished and their space use was characterized. Fish behaviour returned to normal shortly after tagging.

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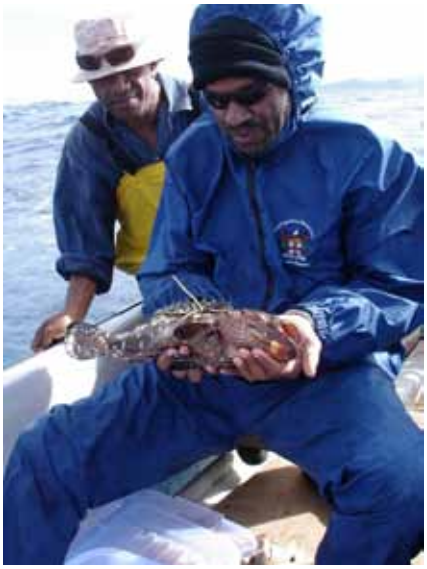

Mr. Aisake Batibasaga, head of Fisheries Research, examining a tagged *E. polyphekadion*

FIJI

Training Pacific Island Countries how to Monitor and Manage their Reef Fish Spawning Aggregations for Sustainability: A First Step

Over 4 days, from the 7th to 10th October 2009, the Secretariat for Pacific Community (SPC) and SCRFA jointly organized a sub-regional training workshop at the University of the South Pacific in Suva, Fiji. The workshop was a response to a request to SPC for assistance from 5 Pacific Island Countries' (PICs) Fisheries Departments that wanted to start monitoring and managing their reef fish spawning aggregations (FSAs).

Within the last decade, FSAs have been targeted for live fish as part of the Live Reef Food Fish Trade. Setting up effective management measures is becoming an urgent need for the Pacific region since these aggregations support important nearshore fisheries critical for peoples' livelihoods. Management, however, requires a good understanding of these annual spawning aggregations in terms of their timing, periods of formation (season), and sometimes location, by species. Unfortunately, the fisheries research skills to address this challenge are largely lacking in PICs.

The purpose of the workshop was to address the identified need for training and was designed to give participants an understanding of major issues in coastal fisheries, in particular FSAs. Training was provided through a series of lectures, exercises, discussions and documentary films. To highlight the reality of the problems and issues of monitoring FSAs in the field, hands-on experience was gained and shared based on work in Palau and Fiji. Asap Bukurrou from the Palau Conservation Society talked about their aggregation work with SCRFA in Palau. The workshop was the first to cover such an important fisheries issue in the Pacific. In total, 22 PIC fisheries officers participated; 11 from the Cook Islands, Kiribati, Palau, and Tuvalu, Samoa and Vanuatu, the rest from Fiji (Fisheries Department and marine conservation and management NGO's).

Outputs from the workshop include the need for outreach and educational materials as well as simple guidelines for conducting monitoring and long-term sampling protocols. Participants can now engage their countries to better understand the threats that FSAs present to the sustainability of their reef fish stocks and explain the need to monitor and manage them. The PICs will require policy advice guidance and follow-up meetings, preferably at the national level (this may be part of SPC work). A regional communication network was developed by compiling a contact list of participants for further discussing and sharing issues and experiences. A CD compilation of up-to-date reference and educational materials was also provided to each participant.

The workshop was jointly funded by the SPC Coral Reef Initiative of the Pacific, the MacArthur Foundation, and the Packard Foundation.

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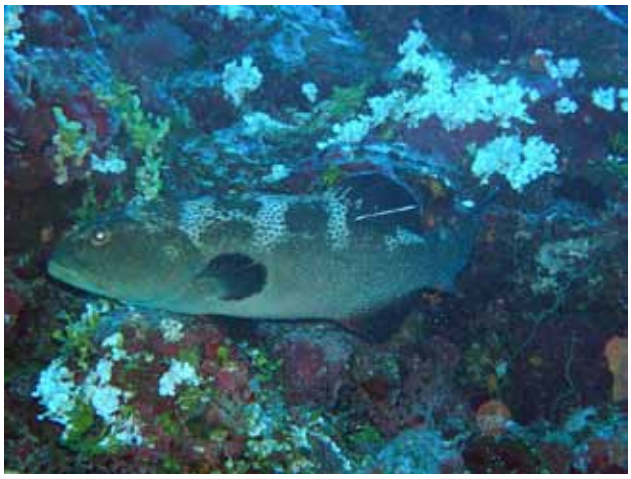
Aggregation Fishing and Tag-Recapture in Ayau, Raja Ampat, Indonesia



P. areolatus underwater ©Kevin Rhodes

The Nature Conservancy-Indonesia (TNC) and Conservation International-Indonesia (CI) recently conducted a Packard-funded training workshop to assess grouper spawning aggregations at Ayau, Raja Ampat, Indonesia, currently under a system of traditional management based on local marine tenure. The cruise (8th to 17th October) was initiated to train local TNC and CI staff, local community members and government partners (Department of Fisheries-West Papua and Department of Nature Conservation-West Papua) in conventional and acoustic tag-recapture and fisheries monitoring, and demonstrate how this information can be used in fisheries management and MPA design. In Raja Ampat, grouper (fish) spawning aggregations (FSA) have been targeted by local fishers for the Southeast Asia-based live reef food fish trade (LRFFT) since the 1980s.

Nine potential FSA sites were identified during previous surveys. Based on advice from local fishers, one was selected for the training. This site was confirmed as an FSA for brown-marbled grouper *Epinephelus fuscoguttatus* and squaretail coralgrouper *Plectropomus areolatus* from observations of courtship, temporary colour changes and the presence of many gravid females. In addition, aggregations of bigeye trevally *Caranx sexfasciatus,* barracuda *Sphyraena* sp., Humpback unicornfish *Naso brachycentron*, Longface emperor *Lethrinus olivaceus*, Ringtail surgeonfish *Acanthurus blochii* and sea chub Kyphosus sp. were observed. Large (≥1 m) Blacksaddled coralgrouper *Plectropomus laevis* and Humphead wrasse *Cheilinus undulatus* were also seen although they were not confirmed to be spawning aggregations. Spawning was confirmed for *C. sexfasciatus,* with frequent colour changes and courtship, and a spawning rush observed at ca. 1600 hr, 2 days prior to new moon.

At the FSA, fishery trainees and participants tagged 40 *P. areolatus*, including 20 with acoustic tags, to examine sex-specific residency and movement. Ten acoustic receivers will remain moored in and around the FSA site until March 2010, including three aggregation months. Timing and specific locations of aggregations are kept confidential to reduce the potential for increase in commercial exploitation.

Provincial government representatives and local stakeholders also participated in catch-per-unit-effort (CPUE) data collection from the FSA fishery. Over 5 days, 39 local FSA fishers, who fish for the commercial Asian live reef fish market, used hook-and-line to remove 564 *P. areolatus* from the FSA, with a CPUE of 0.7 fish per hour per fisher Two acoustically tagged fish and one conventionally tagged fish were re-captured and re-released, including one that was re-captured twice.

Underwater visual census (UVC) identified the distribution and abundance of fishes on the FSA site. On the final cruise day, monitors counted *ca*. 80 *E. fuscoguttatus,* and *ca*. 300 *P. areolatus*. Combined CPUE data and UVC monitoring suggest more than 800 *P. areolatus* were present during the aggregation monitoring period, with >70% of those removed for the LRFFT. Findings will be shared with the local community, stakeholders and relevant fisheries agencies to advise them further on the vulnerability of this and other FSAs to commercial fishing for the LRFFT.

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PERSPECTIVES

The Costs and Benefits of Aggregation Exploitation versus Protection

AGGREGATION FISHING PERMITTED

Benefits

- Reduced Search Time
- Cost savings on fuel
- Large predictable catches
- May take pressure off other reef resources temporarily
- A ready periodic larder for social/cultural events
- Regular seasonal event for community activities

Costs

- Market gluts of fish so lower price per fish
- Taking risks in bad weather because competitors are fishing
- People do not need to think about making best economic use of the fishery overall
- Gluts can lead to wastage of unsold fish or those that cannot be stored for long time periods
- Management to control catch volume
- Inequality of resource access, if some can reach aggregation and some cannot, because overfishing of aggregation can lead to lower catches between aggregations
- Possibility of overfishing resulting in loss of resource in the long term and for all months of the year

AGGREGATION COMPLETELY PROTECTED FROM FISHING

Benefits

- Biological benefits for the target population for long term sustainable use
- Higher catches at non-aggregation times and into the long-term
- Protection relatively easy to enforce as limited in time and space
- Possible use for recreational diving benefits

Costs

- Possible increase in pressure on other reef resources temporarily
- Could be expensive to manage an aggregation and enforce regulation
- Could lead to irregular/low supply of target species at certain times of the year in retail markets
- Could disrupt social or cultural activities

Expense of monitoring can be costly, and is needed for both options

The enormous appeal of fishing on large groups of temporarily assembled fish is that many can be caught quickly and easily, with important economic and social benefits. Fish spawning aggregations around the world have long formed the basis of seasonal 'jackpot' fisheries, often involving whole communities, large business interests, or for special occasions.

From an economic perspective, aggregations represent excellent sources of large numbers of fish that can be taken efficiently, a welcome saving of time and operation costs from a commercial or operational perspective, and an attractive opportunity for recreational anglers. They can also be appealing to sports fishers, through dive tourism. Given the benefits and appeal of aggregation-fishing on the one hand, and the long-term problems created by their uncontrolled exploitation on the other, it is timely to add economics to the mix in assessing aggregation-fisheries and objectively compare cost and benefits of protection.

As one example, regular fish gatherings are an obvious target for fishing. However, when commercial pressures come into play, the economics of having gluts of fish in markets resulting in lower value per fish, which often occurs, combined with the negative biological implications of heavy aggregation-fishing (i.e. aggregations losses), make aggregation fishing much less appealing as a long-term good use of natural resources. This situation calls for a closer look at the economics of aggregation versus non-aggregation fishing. The table examines just some of the various costs and benefits of aggregation exploitation versus protection. I would welcome further input to the table.

Economic analyses of the possible costs and benefits of significant aggregation fisheries, and the short- and long-term implications of aggregation protection, can determine the best overall social and economic value of aggregations that is also consistent with good biological management of the target population. Analyses could address fishing volume and value on and off aggregations, with and without aggregation fishing and would need to consider market conditions of supply and demand, fisher responses to management, costs, catchability, profitability, etc. to fully understand the implications of managing aggregations… or not.

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NEW PUBLICATIONS

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