

## BREAKING NEWS

- A recent workshop completed IUCN red list assessments for all 161 grouper species. At least 50% of those listed as 'threatened' aggregate to spawn, further strengthening the case for more management attention for such species.
- A report on the first workshop ever held in Fiji, July 2006, on coral reef-associated fisheries has just been released (see [www.scrfa.org](http://www.scrfa.org)). A follow-up workshop will take place in July 2007, in Suva, Fiji.
- First reports of massive spawning aggregation of the snapper, *Lutjanus fulvus* on p. 7

## CONTENTS

Words from the Chair

SCRFA News

Weblog Partnership

### CARIBBEAN & ATLANTIC

Bahamas

Bermuda

Cayman Islands

Puerto Rico

### INDO-PACIFIC

Australia

Costa Rica

Palau

Pohnpei

United States

IYOR Announcement

Perspectives

New Publications

ACKNOWLEDGEMENTS

# SCRFA

SOCIETY FOR THE CONSERVATION  
OF REEF FISH AGGREGATIONS



NEWSLETTER • NUMBER 10 • MAY 2007

## WORDS FROM THE CHAIR

In November 2007, the SCRFA Board met in San Diego to plan the year ahead. This was an important meeting to discuss the next steps of SCRFA as an NGO, based in the USA but operating globally. SCRFA has achieved many things since beginning in 2000, and is actively seeking further funding and collaborations to expand work on spawning aggregations and related issues.

Two important initiatives have recently occurred. Firstly, an International Coral Reef Initiative (ICRI) statement developed by IUCN (World Conservation Union) on Coral Reef Fish Spawning Aggregations was approved by the ICRI members at the ICRI General Meeting held in Cozumel, Mexico (22-23 October 2006). The statement encourages initiatives and campaigns that promote the conservation and sustainable management of reef fish spawning aggregations. The full statement may be found on [http://www.icriforum.org/secretariat/cozumel/doc/State\\_CR\\_Fish\\_Spawning\\_aggregations2006.pdf](http://www.icriforum.org/secretariat/cozumel/doc/State_CR_Fish_Spawning_aggregations2006.pdf).

Secondly, SCRFA was accepted as a formal member of ICRI at the recent meeting in Japan on 22-25 April, 2007. This provides us with a high-level government and non-government forum to discuss and promote fish spawning aggregation issues. The USA and Mexico Governments have taken over the ICRI Secretariat from Palau and Japan for the coming 2 years.

As you may have heard, 2008 has been designated as the International Year of the Reef (IYOR). SCRFA is proud to support this designation, and there is a brief article in this Newsletter provided by the IYOR Committee (see p.10).

Enjoy the Newsletter, and please feel free to circulate it to help raise awareness for the need for action on managing fish spawning aggregations.

**Martin Russell**  
*Chair, SCRFA*

## SCRFA News

Although progress on the effective implementation of spawning aggregation management, with few exceptions, is proving elusive, awareness is growing and continues to be a major focus of SCRFA's activities. Newly, we have joined the ICRI family, collaborate with the Secretariat of the Pacific Community, a forum covering 22 Pacific island nations, and have joined forces with a bilingual Weblog, coordinated by Alfonso Aguilar (more below). We are also planning, by request, a second coral reef fish workshop in Fiji, to take place in July 2007 in Suva; a report of last July's workshop is on our website.

*Particularly worrying, the Nassau grouper, *Epinephelus striatus*, continues its decline in the Caribbean, despite management initiatives on aggregations in Belize, the Cayman Islands and the Bahamas.*

These initiatives not only focus on aggregations but at the same time seek to encompass many broader aspects of coastal fisheries and related issues of information collection and dissemination. As an example of the latter, we are conducting a public consultation on data sensitivity. Through this, we plan to assemble a set of guidelines (see 'Perspectives', p.11) that can assist workers in balancing the risks and ethics of collecting and releasing details on spawning aggregation location data and proprietary information gained from fishers, against the need for ready access to spatial information for conservation planning.

We were again reminded of the significance of the aggregating habit by the outcomes of a recent workshop, held in February in Hong Kong, to complete the IUCN red-listing of all groupers (Epinephelinae). Of 161 species, 20% are now listed as 'Threatened' with a further 19% 'Near-threatened' (<http://www.hku.hk/ecology/GroupersWrasses/iucnsg/index.html> - see 'Species' section). These species tend to be the larger groupers, many of them threatened by aggregation-fishing. Press coverage for the workshop attracted welcome attention to the need to manage these fishes. Particularly worrying, the Nassau grouper, *Epinephelus striatus*, continues its decline in the Caribbean, despite management initiatives on aggregations in Belize, the Cayman Islands and the Bahamas. Such is the concern that at the last meeting of the Gulf and Caribbean Fisheries Institute in Belize, November 2007, a large group of workers on this species had an impromptu gathering. Convened by the Caribbean Fishery Management Council and lasting an unexpected 4 hours, this side-meeting strongly reaffirmed the need for more action. See accounts from the Bahamas and the Cayman Islands below for recent progress in the management and study of this species. There are calls for a complete moratorium in Belize.

Newsletter 10 reports on a range of news, from novel findings on the sounds made by an aggregating species to new records of species that aggregate to spawn. We also learn about some of the unforeseen consequences and challenges of managing a few vulnerable aggregators within a context of multi-species fisheries. New calls and initiatives for management are reported for species that are heavily targeted while concentrated during the vulnerable spawning season. On the home front, and in collaboration with our weblog partner, we plan for much more frequent news updates and have reorganized our website and upgraded our GIS with species information. I hope that readers will find both to be useful and easier to navigate ([www.scrfa](http://www.scrfa)). Finally, look out for our 2008 calendar available soon and featuring some novel photos of aggregating fishes.

**Yvonne Sadovy** (University of Hong Kong) [scrfa@hku.hk](mailto:scrfa@hku.hk)  
*Director, SCRFA*

## **Weblog Partnership: Promoting Knowledge on Fish Spawning Aggregations in the Wider Caribbean**

Weblogs are a relatively new platform experiencing an increasing demand and considered to be among the main promoters of knowledge on the internet through the use of the rapid syndicate system. This platform, in turn, allows quick access to a tremendous amount of information. Weblogs are a chronological sequence of brief postings of information organized by categories linked to the main information source. Also, they allow for uploading publications, images, videos, sounds, link on-line publications and other files, and have the versatility to receive feedback from readers submitted as comments to individual postings.

*Importantly, the weblog is bilingual, Spanish and English, thereby reaching a very wide audience throughout the Americas and Caribbean region.*

In October 2005, as an initiative for disseminating knowledge on progress in the science, management, and conservation of fish spawning aggregations in the western Atlantic, a weblog was created: “Agregaciones Reproductivas de Peces Arrecifales del Caribe y Golfo de Mexico” (Reef Fish Spawning Aggregations from the Caribbean and Gulf of Mexico). This weblog is supported by the Centro Interdisciplinario de Estudios del Litoral in Puerto Rico, the College of Arts and Sciences of the University of Puerto Rico, and the Caribbean Coral Reef Institute, and recently entered into collaboration with SCRFA. The initiative aims to compile information on scientific progress of people working in the region by submitting aspects of their research, management regulations, and/or conservation issues. Importantly, the weblog is bilingual, Spanish and English, thereby reaching a very wide audience throughout the Americas and Caribbean region.

According to Webstats records (an internet counter service of visits), since its creation to date (October 2005 to March 2007) the weblog 'Agregaciones Reproductivas' (Spawning Aggregations) is widely consulted, with approximately 7,500 visits (by early May 2007), of which 28% correspond to Mexico, 18% USA, 13% Puerto Rico, 8% Venezuela, 6% Spain, 4% Colombia, and 2% Canada. Despite these numbers, the weblog needs more promotion. I urge more people to participate through expressing their points of view, criticisms (constructive) and recommendations of postings related to fish spawning aggregations. This weblog is a window for communication and represents an ideal link updating and promoting progress on the knowledge of fish spawning aggregations in the region. See <http://www.amp-pr.org/spag>

*There is a growing public acceptance and support for the management measures; last year, there was even an exam question about Nassau grouper spawning aggregations in the national public school standardized exams.*

**Alfonso Aguilar-Perera** (Universidad Autónoma de Yucatán) [alfaguilar@gmail.com](mailto:alfaguilar@gmail.com)

### **CARIBBEAN AND ATLANTIC**

#### **Bahamas**

##### **Nassau grouper update**

The Department of Fisheries of the Bahamas protected the Nassau grouper, *Epinephelus striatus*, from December 1, 2006 to end of February 2007, during its spawning season, further building on protective action first implemented in 2004. The legislation prohibits the landing, processing and sale of Nassau grouper during this season, or fishing at the High Cay Andros aggregation site. Also, any

grouper landed during the closed period must have head, skin and tail intact. The Bahamas Reef Environmental Educational Foundation (BREEF) is active in public education, and notes that, while there is still some poaching, there is a growing public acceptance and support for the management measures; last year, there was even an exam question about Nassau grouper spawning aggregations in the national public school standardized exams. Enforcement continues to be critical to the success of the protective legislation but seems to be improving, with the police's fisheries enforcement sting operation dubbed "Operation Eat Beef" in reference to BREEF's public awareness campaign. For more information see <http://www.breef.org/Default.aspx?tabid=56>.

As reported by **Casuarina McKinney** [casuarina@breef.org](mailto:casuarina@breef.org)

## **Bermuda Grouper Update**

Two pieces of legislation are of interest in relation to aggregation-spawners. First, the minimum legal size of black grouper (*Mycteroperca bonaci*) has been increased from 75 cm TL (about 6 kg) to 95 cm TL (about 13.5 kg). The legislation is being amended. Because the species is a protogynous hermaphrodite, this measure will protect a larger proportion of the spawning females in the population than previously. However, this new minimum size is still below the size at sexual transition. Black groupers are targeted by both commercial and recreational fishers and, although there is a bag limit of one fish per boat per day, there has been a dramatic increase in landings recently as a result of increased fishing effort for this species. Two spawning aggregation sites for black grouper have been seasonally closed since 2005 (May 1<sup>st</sup> – August 31<sup>st</sup>). An acoustic tagging program to determine movement patterns at one of these sites is due to commence in June.

A new fisheries regulation has gone into effect that allows the Minister responsible for fisheries to declare an Emergency Closure of an aggregation site for a maximum of 90 days. The Minister must define the geographic boundaries of the area to be closed and must publish the notice in the official Government gazette. The regulation is not species-specific and so may be applied whenever an aggregation is discovered. This new legislation has been used for the first time since it became law to close an area believed to contain a spawning aggregation of blue-striped grunts. A nearshore area of almost 200 hectares (1 ha=10,000 m<sup>2</sup>) has been closed to all fishing for two months (May 1<sup>st</sup> – June 30<sup>th</sup>). Monitoring of the site began in early May and will continue throughout the closure period.

**Brian Luckhurst** (Department of Environmental Protection) [bluckhurst@gov.bm](mailto:bluckhurst@gov.bm)

## **Cayman Islands Nassau grouper update**

Work continues apace on a spawning site in the Cayman Islands, with thousands of Nassau grouper turning up again at the Little Cayman spawning aggregation in January 2007. This project is run by the Reef Environmental Education Foundation and the Cayman Islands Department of Environment and is known as the 'Grouper Moon Project'. It has been running yearly since 2002 and includes not only the monitoring of Nassau grouper numbers but also acoustic tagging and studies on juvenile habitat. Importantly, the dedicated group conducting this work publishes its findings and keeps the public updated, using a mixture of research, public education, website and film-making.

**Grouper Moon Project** <http://www.reef.org/data/groupermoon.html>

*A new fisheries regulation has gone into effect that allows the Minister responsible for fisheries to declare an Emergency Closure of an aggregation site for a maximum of 90 days.*

## **Puerto Rico**

### **Red hind calls for love**

Many fishes make sounds associated with courtship and reproduction. A new project, funded by the Caribbean Coral Reef Research Institute (CCRI), was recently launched to study sound production by red hind (*Epinephelus guttatus*) at spawning aggregation sites off Puerto Rico. The ultimate goal of this project is to determine whether species-specific sound production can be used to identify and monitor aggregation sites over large spatial scales and to study variation in sound production over time. A three-pronged approach was applied. First, aggregations were identified by CCRI diver surveys over the past four years. On one occasion, divers with underwater video cameras and external hydrophones (underwater microphones) filmed male red hind in aggregations as they patrolled their territories.

*Preliminary analysis of these recordings showed a strong diel pattern to sound production, with a peak at dusk and monthly peaks possibly related to the timing of spawning.*

Results revealed that the males produce a unique sound (now known colloquially as the 'Whoot-woo') during displays. This sound is distinct from known sounds produced by other fishes, such as the longspine squirrelfish and bicolor damselfish, at the same site. At the same time, several long-term underwater acoustic recorders were placed to record red hind sound production over the course of a month. Preliminary analysis of these recordings showed a strong diel pattern to sound production, with a peak at dusk and monthly peaks possibly related to the timing of spawning. Passive acoustics shows great promise for studying spawning aggregations of soniferous fishes, especially at remote locations.

**David Mann** (James Locascio University of South Florida) [dmann@marine.usf.edu](mailto:dmann@marine.usf.edu)  
**Richard Appeldoorn, Michelle Scharer** and **Michael Nemeth**,  
(CCRI, University of Puerto Rico)

## *INDO-WEST PACIFIC*

### **Australia**

#### **Grey mackerel in trouble in Far North Queensland**

Local fishers are worried that recent gill-netting of grey mackerel inshore spawning grounds near Port Douglas, Far North Queensland, Australia, commencing 2003, has seriously depleted a local line fishery. In August 2006 they presented their local MP with a petition of 658 signatures, including those of all seven Douglas Shire Councillors, requesting a ban on the netting of grey mackerel in local waters. Also known as the broad-barred king mackerel (*Scomberomorus semifasciatus*), grey mackerel (greys) favour inshore waters, being endemic to coastal areas of northern Australia and southern New Guinea (Froese and Pauly, 2007). They grow to over 120 cm, are excellent eating and are a good sports fish.

Until about 2003, a few shallow, inshore areas of the Douglas Shire coastline used to hold large schools of grey mackerel from June to September. Since the 1970's and during lulls in the, normally, fairly fresh SE winds, up to 20 dinghies would line troll the regular grey mackerel grounds during the reproductive season and make good catches. Line trolling did not appear to disrupt schooling behaviour and weather significantly limited fishing effort by the small dinghies.

#### **More Information**

For further information or materials, see [www.SCRFA.org](http://www.SCRFA.org), or contact [SCRFA@hkucc.hku.hk](mailto:SCRFA@hkucc.hku.hk)

*Grey mackerel line fisher, Mark Harris, notes a steady drop in catches for relatively consistent search effort between 2002 and 2006 to only about 10% of his 2002 catch.*

Grey mackerel line fisher, Mark Harris, has reported his landings of grey mackerel to Queensland State Department of Primary Industry and Fisheries (DPI&F) for many years. He notes a steady drop in catches for relatively consistent search effort between 2002 and 2006 to only about 10% of his 2002 catch. Local fishers attribute the drop in catches to the high level of “out-of-town” netters fishing the area since 2003.

Douglas Shire commercial line fishers have long been aware that only three years of netting apparently wiped out similar aggregations of grey mackerel off the Queensland town of Bowen, about 500 km further south, in 1971. The demise of this fishery is vividly reported in the memoirs of a commercial fisher (De Lacey, 2005). Local line fishers therefore made a gentleman’s agreement back in the 1970’s never to net “their” local sites for greys and so are dismayed by the recent, legal, netting by fishers from other areas. Now relatively large, non-local, boats (to 15m) use hydraulic net drums to haul 600 m of monofilament nets, set over the shallow, inshore areas where grey mackerel aggregate. The fishery is seasonal because the species is available to netters only during a few months of the year, there being no closed season to allow for spawning. DPI&F manage the fishery as one stock down the entire Queensland coastline.

Douglas Shire residents are concerned they are observing a classic case of ‘hyperstability’ in action (i.e. the aggregating habit, combined with a fishery focus, on aggregated fish makes it seem that fish numbers are constant when they are actually declining). They have formed the Network for Sustainable Fishing in Douglas Shire and are pushing for the Queensland Minister to use his executive powers, under Section 46 of the State Fisheries Act and the precautionary principle on grounds of sustainability, to introduce an emergency ban on all netting within 6 nm (1 nm = 1.852 km) of the Douglas Shire coast by 1 June, 2007.

De Lacey, R. (2005). North Queensland Fishing Eldorado. Pp 372. Published in Australia by Temple House Pty. Ltd., T/A Sid Harta Publishers, ACN 092 197 192, Hartwell, Victoria. ISBN 1-877059-87-0

Froese, R. and Pauly, D. Editors. (2007). FishBase. World Wide Web electronic publication. [www.fishbase.org](http://www.fishbase.org), version (04/2007).

**David C. Cook** (Douglas Shire resident, Australia) [davecook@bigpond.com](mailto:davecook@bigpond.com)

## **Costa Rica** **Spawning in the leather bass, *Dermatolepis dermatolepis***

*Talina Konotchick observed and recorded spawning behaviour in the leather bass in November 2006 at a seamount near Cocos Island, Costa Rica.*

Talina Konotchick, a graduate student from the Scripps Institution of Oceanography in San Diego, California, observed and recorded spawning behavior in the leather bass in November 2006 at a seamount near Cocos Island, Costa Rica. While ascending from depth inside a 3-person submersible, 70 adult leather bass were found hovering as an aggregation over the top of the seamount at a depth of 50 m. Spawning was documented at 4.30 pm local time, and occurred in subgroups of 22 to 32 individuals that separated briefly from the main aggregation. These observations mark the first descriptions of aggregated spawning behaviour in this species. Brad Erisman, a fellow graduate student at Scripps, will be visiting Cocos Island in the Spring of 2007 to document other reef fish aggregations in the area.

*Editor's note: the documentary series "Secrets of the Ocean Realm", shot in the 1990s, shows a sequence of spawning by this species at Cocos Island.*

## **Palau** **Spawning aggregation of *Lutjanus fulvus***

A spawning aggregation of many thousands of blacktail snapper, *Lutjanus fulvus*, was discovered in a reef channel in Palau a few months ago. This aggregation was initially encountered by chance in the course of other work. For at least three months the snappers have aggregated along about 150 m of the channel edge on a lunar cycle. They appear on the day before the full moon and remain until three days after the full moon. By day four most have disappeared.

This is a relatively small species of snapper, with most fish within in the aggregation ranging between 17 and 23 cm standard length and weighing 180-300 gm each. There appears to be no size difference between males and females, nor any external characters that indicates sex. Gonadal Somatic Index (GSI) for aggregating fish is generally about 5-9%, however in the late afternoon prior to spawning the GSI of females zooms up to 10-16% as the eggs hydrate. Males have a GSI generally of 1-4% and individuals captured from the aggregation are running ripe.

The fish may number as many as 100,000, but due to the relatively large area of the channel edge that they cover, the limited visibility of the water (about 15 m generally) and the shyness of the species, this figure is tentative. There are several subgroups within the larger aggregation, appearing as dense schools along 10-20 m of channel edge from 6 to about 15 m depth (the channel edge is about a 45 degree angle, so the distance between these depths is about 12 m). The numbers of fish in each subgroup were estimated at about 1-20 fish per meter square). The fish are quite shy of humans. Estimates of aggregation size were made by snorkeling above the groups, because SCUBA diving caused all fish to flee rapidly in front of a diver. Four subgroups, each numbering about 20,000 fish, were documented and additional smaller groups were believed to add another 20,000 to the total.

Spawning was not observed, although SCRFA criteria for identifying this aggregation as a spawning aggregation were met. Females exhibit hydrated oocytes in late afternoon and the density of fish present is considerably higher than during non-aggregation periods.

The entire length of both sides of the reef channel where the fish aggregate has been searched repeatedly at the times aggregation is occurring without locating any other major concentrations of the species in the channel. It therefore appears there is only one major aggregation site in this channel. The site lacks some characteristics widely believed (without supporting evidence) as associated with reef fish aggregation sites (reef promontory, currents moving offshore), emphasizing the risk in making unsupported assumptions about locations of spawning aggregation sites. There is still a tremendous amount that we do not know and the fish often have to remind us that we are dreadfully ignorant of their life histories. There is evidently no traditional knowledge of aggregation in this species.

*A spawning aggregation of many thousands of blacktail snapper, *Lutjanus fulvus*, was discovered in a reef channel in Palau a few months ago.*

*The site lacks some characteristics widely believed (without supporting evidence) as associated with reef fish aggregation sites (reef promontory, currents moving offshore), emphasizing the risk in making unsupported assumptions about locations of spawning aggregation sites.*

Work is continuing on this aggregation, including searching for additional aggregations in Palau in the coming months, delineating the lunar and seasonal patterns of the one known aggregation and examining the micro-oceanography of the aggregation site.

**Pat Colin** (Coral Reef Research Foundation, Palau) [crrf@palaunet.com](mailto:crrf@palaunet.com)

## **Pohnpei Challenges of protecting mature active serranids in a multi-species fishery**

*However, to maintain catch volume and thus income levels during closed periods for serranids, fishers switched efforts to other species, primarily scarids, lethrinids and mullids, whose contribution to overall monthly weight volume increased*

*The paucity of life history data creates a management paradox - - enact piecemeal legislation with possible negative consequences on other species (or areas), or wait until comprehensive management can be achieved.*

The protection of reproductively active fishes at and away from spawning aggregation sites is considered important for the persistence of certain coral reef fishes. In Pohnpei, measures to protect reproductively active coral reef fishes began in 1985 when the state government instituted a March-April sales ban on serranids, and later in 1995 when a marine protected area was established at a well-known multi-species spawning site the Kehpara Marine Sanctuary (KMS). Both measures were primarily directed at protecting camouflage grouper, *Epinephelus polyphkadion*, brown-marbled grouper, *E. fuscoguttatus*, and squaretail coral grouper, *Plectropomus areolatus* that co-aggregate to spawn between January and May each year.

Monitoring has shown both measures to work effectively in achieving their respective goals of protecting grouper at the KMS and for reducing the sale of serranids during the peak (March-April) spawning period. However, a recent 5-month (January-May) market survey of coral reef fishes revealed some unintended consequences of this management approach. Specifically, in open sales periods during the survey serranids constituted approximately 16.5% of total weight of all marketed coral reef fishes, and less than 0.1% in closed sales periods. However, to maintain catch volume and thus income levels during closed periods for serranids, not surprisingly, fishers switched efforts to other species, primarily scarids, lethrinids and mullids, whose contribution to overall monthly weight volume increased by 7.1%, 4.7% and 1.8%, respectively. During closed periods, orangestripe emperor (*Lethrinus obsoletus*), longface emperor (*L. olivaceus*) and longfin emperor (*L. erythropterus*) were also frequently observed in markets with hydrated eggs. According to fishers, both orangestripe and longfin emperor were taken from aggregations. During the same period, hundreds of Pacific longnose parrotfish (*Hipposcarus longiceps*) were likewise marketed, with single catches often composed of 50-100 individuals and reported to come from large schools. Fishers reported spawning for Bleeker's parrotfish, *Chlororus bleekeri*, and surf parrotfish, *Scarus rivulatus*, in March and both species were observed in markets with milt.

These results demonstrate some of the complexities and consequences of using single species or species-group management approaches, particularly when fishers' primary concern is maintaining catch volume. While comprehensive management is the primary goal of marine resource managers in Pohnpei and elsewhere, the paucity of life history data for most species makes that goal largely unachievable and creates a management paradox -- enact piecemeal legislation with possible negative consequences on other species (or areas), or wait until comprehensive management can be achieved. These results suggest that, until comprehensive



management is attained, future management decisions based on individual or groups of species will likely continue to have unintended consequences.

**Kevin Rhodes** (University of Hawaii at Hilo) and **Mark Tupper** (WorldFish Center, Malaysia) [klrhodes\\_grouper@yahoo.com](mailto:klrhodes_grouper@yahoo.com)

## **United States – Gulf of California** **Reproductive patterns in the leopard grouper, *Mycteroperca rosacea***

The leopard grouper, *Mycteroperca rosacea*, is one of several grouper species known to form spawning aggregations in the Gulf of California, and the most heavily targeted grouper by commercial and recreational fishers of the region (Sala et al., 2003). Adults form spawning aggregations of hundreds of individuals from March to June, with spawning occurring earlier in southern locations (Sala et al., 2003). Leopard groupers are currently listed as ‘Threatened’ by the World Conservation Union (IUCN) due to increases in fishing pressure, and significant declines in both fisheries landings and population abundances over the past few decades (Sala et al. 2004).

Details on the sexual pattern of leopard groupers were gathered from behavioral observations and the collection of specimens at several sites in the Gulf of California from 1998 to 2005 (Erisman et al., 2007a). Histological and population data indicated a gonochoristic (separate sexed) sexual pattern. Some juveniles passed through an immature bisexual phase of gonadal development, but no evidence of adult sex change was found. The size distribution and size at sexual maturity were similar for both males and females. Prior to this study, evidence for gonochorism in epinepheline groupers had only been identified in the Nassau grouper, *Epinephelus striatus* (Sadovy and Colin, 1995).

*Aggregations of 150 to >700 individuals were observed at two sites near Loreto, in southern Baja California... spawning was not restricted to certain lunar phases, but rather it occurred daily at these sites from late April through June.*

Leopard grouper spawning patterns were documented from April to June 2005 and observations of non-spawning behaviour from 2003 to 2005 (Erisman et al., 2007b). Aggregations of 150 to >700 individuals were observed at two sites near Loreto, in southern Baja California. Behavioural and histological data confirmed that spawning was not restricted to certain lunar phases, but rather it occurred daily at these sites from late April through June. Courtship was intermittent throughout the day, but spawning was restricted to the evening hours. Adults spawned in groups of 6 to 40 fish, and pair-spawning was not observed. From our observations, and those from past investigations (Hobson, 1965; Parrish, 1992), it appears that aggregating behaviour in adult leopard groupers occurs throughout the year, and that large feeding aggregations are very common during the summer and fall months.

The distinctive sexual and spawning patterns of leopard groupers have important implications for management. Since leopard groupers evidently do not change sex, their population dynamics may respond quite differently to certain fishing practices compared to protogynous groupers. However, the extensive duration of spawning aggregations and the propensity to aggregate year-round may increase the vulnerability of this species to overfishing. Policies that limit catches from both feeding and spawning aggregations are needed for proper management of

Erisman, B. E., Rosales-Casián, J. A. and Hastings, P.A. (2007a). Evidence of gonochorism in a grouper, *Mycteroperca rosacea*, from the Gulf of California, Mexico. *Environmental Biology of Fishes*. *In press*

Erisman, B. E., Buckhorn M. L., and Hastings, P. A. (2007b). Spawning patterns in the leopard grouper, *Mycteroperca rosacea*, in comparison with other aggregating groupers. *Marine Biology*: 151:1849-1861

Hobson, E. S. (1965). Diurnal-nocturnal activity of some inshore fishes in the Gulf of California. *Copeia* 1965:291-302

Parrish, J. K. (1992). Levels of diurnal predation on a school of flat-iron herring, *Harengula thrissina*. *Environmental Biology of Fishes* 34:257—263

Sadovy, Y. and Colin, P. L. (1995). Sexual development and sexuality in the Nassau grouper, *Epinephelus striatus* (Bloch) (Pisces: Serranidae). *Journal of Fish Biology* 46:961-976

Sala E, Aburto-Oropeza O, Paredes G, Thompson G (2003). Spawning aggregations and reproductive behavior of reef fishes in the Gulf of California. *Bulletin of Marine Science* 72:103-121

Sala, E., Aburto-Oropeza O., Reza M., Paredes G. and López-Lemus L. G. (2004) Fishing down coastal food webs in the Gulf of California. *Fisheries* 29:19-25

**Brad Erisman** (Scripps Institution of Oceanography) [berisman@ucsd.edu](mailto:berisman@ucsd.edu)

## ANNOUNCEMENT

### **2008 is the International Year of the Reef**

The International Coral Reef Initiative (ICRI), at its General Meeting in Cozumel (Mexico) designated 2008 as the International Year of the Reef (IYOR 2008). IYOR 2008 is an international effort to raise awareness and understanding about coral reefs and the threats they face, and to support related conservation, research, and management efforts.

ICRI is a partnership of nations and organizations seeking to implement the recommendations of the Rio Earth Summit (Agenda 21, Ch.17) and other international conventions and agreements for the benefit of coral reefs and associated ecosystems, such as mangroves and sea grasses. ICRI was established in 1994 to halt and reverse the global degradation of these important ecosystems.

The first IYOR was declared and implemented in 1997 to help increase awareness about the increasing threat to and loss of coral reefs among the general public. IYOR 97 made great strides towards this mission. However, despite this success, ten years later we still face an urgent need to educate the public around the world about ongoing efforts to conserve and manage these critical ecosystems, about actions they can take to help with these efforts, and about how we can all better appreciate the value of coral reefs to humanity.

The ICRI partners are committed to ensuring that IYOR 2008 is a success, and activities are already underway in many countries. For more information, visit [www.iyor.org](http://www.iyor.org) <<http://www.iyor.org>> or contact [info@iyor.org](mailto:info@iyor.org) <mail to: [info@iyor.org](mailto:info@iyor.org)>.

## PERSPECTIVES

In January, we posted on the bilingual weblog and SCRFA website ([www.scrfa.org](http://www.scrfa.org); <http://amp-pr.org/spag/?p=44>, January 2007) a short multi-authored opinion piece entitled “Spawning Aggregations and Confidentiality: Balancing Research Products and Conservation Realities” and solicited feedback.

*“When is it beneficial to the conservation and management of spawning aggregation sites and species, and in the best interests of fishing communities, to release detailed information on spawning aggregation locations into the public domain?”*

*We received very constructive and interesting feedback on the article from 12 workers, ranging from managers to biologists, and I briefly summarize a few of the key issues raised to stimulate further responses. We will be using these and any further input to develop a set of guidelines later in the year.*

The purpose of the article was to ask “When is it beneficial to the conservation and management of spawning aggregation sites and species, and in the best interests of fishing communities, to release detailed information on spawning aggregation locations into the public domain?”. We concluded that a set of guidelines for decision-making/discussion would be useful and that a precautionary position was to keep aggregation sites confidential or released at low spatial resolution to avoid the risk of further exploitation, unless there is good reason to reveal more detailed information publicly. Such caution is particularly relevant when the species involved has a ‘threatened’ conservation status.

We received very constructive and interesting feedback on the article from 12 workers, ranging from managers to biologists, and I briefly summarize a few of the key issues raised to stimulate further responses. We will be using these and any further input to develop a set of guidelines later in the year.

- Fishers are concerned about giving out proprietary information and researchers may wish to guard data until it is published, but if a project is publicly funded, management and conservation are needed and site information would be useful, how can the common good prevail if contrary to individual interests?
- To what extent does a better understanding of an aggregation location lead to better ability to manage it, or conversely, a greater ability to exploit it?
- To what extent has dissemination of research data resulted in increased exploitation?
- Should ‘threatened’ species that aggregate be treated differently to those that are not threatened?
- Site information should only be widely released once effective management is in place.
- There was agreement from several respondents on a 1 x 1 degree minimum resolution for general site information release, combined with restricted release of more detailed information for planning and local management; but how is the latter most effectively achieved and who decides?
- Knowledge does not always lead to effective management; in fact effective management is still largely elusive for aggregating species.

We are by no means the only ones considering such issues, and other organizations or projects have had to deal with similar questions. Ultimately who is to decide what is released, when and how and to whom has to be considered? Should there be a time limit applied in relation to data release and what ultimately is in the best interests of the species, locations and communities involved? What happens to large, potentially sensitive, datasets assembled from multiple sources in the long term? SCRFA and other organizations have to address this question. As just one example, the Global Biodiversity Information Facility has conducted an on-line survey on Dealing with Sensitive Primary Species Occurrence Data, the results and summary of which are available on <http://www.gbif>.

## ACKNOWLEDGEMENTS

Alfonso Aguilar-Perera  
Pat Colin  
David Cook  
Brad Erisman  
Janet Gibson

org/prog/digit/sensitive\_data. The question of confidentiality of spawning aggregation site data needs to be discussed and we would be most grateful for further feedback from readers interested in or concerned by this important question.  
*Yvonne Sadovy*

## NEW PUBLICATIONS *(also see citations above)*

Aguilar-Perera, A. (2006). Disappearance of a Nassau grouper spawning aggregation off the southern Mexican Caribbean coast. *Marine Ecology Progress Series* 327: 289-296

Colin, P. L. (2006). Study of reef fish spawning aggregations and connectivity on the Palauan reef tract: Final Report and Addendum prepared for the Pacific Island Countries Coastal Marine Program, The Nature Conservancy. TNC Pacific Island Countries Report No. 2/06

Eristhee, N., Kadison, E., Murray, P. A. and Llewelyn, A. (2006). Preliminary investigations into the red hind fishery in the British Virgin Islands. *Proceedings of the 57th Gulf and Caribbean Fisheries Institute* 57:373-384

Frisch, A. J., McCormick, M. I. and Pankhurst, N. W. (2007). Reproductive periodicity and steroid hormone profiles in the sex-changing coral-reef fish, *Plectropomus leopardus*. *Coral Reefs* 26:189-197

Hamilton, R. J. and Matawai, M. (2006). Live reef food fish trade causes rapid declines in abundance of squaretail coral grouper (*Plectropomus areolatus*) at a spawning aggregation site in Manus, Papua New Guinea. Secretariat of the Pacific Community Live Reef Fish Information Bulletin #16, December 2006 13-18 [http://www.spc.int/coastfish/news/LRF/16/LRF16\\_13\\_Hamilton.pdf](http://www.spc.int/coastfish/news/LRF/16/LRF16_13_Hamilton.pdf)

Hannah, R. W., Parker S. J. and Fruh, E. L. (2002). Length and age at maturity of female petrale sole (*Eopsetta jordani*) determined from samples collected prior to spawning aggregation. *Fishery Bulletin* 100:711-719

Luckhurst, B.E., Hateley, J. and Trott, T. (2006). Estimation of size of spawning aggregations of Red Hind (*Epinephelus guttatus*) using a tag-recapture methodology at Bermuda. *Proceedings of the 57th Gulf and Caribbean Fisheries Institute* 57:535-542

Nemeth, R. S., Herzlieb, S. and Blondeau, J. (2006). Comparison of two seasonal closures for protecting red hind spawning aggregations in the US Virgin Islands. *Proceedings of the 10<sup>th</sup> International Coral Reef Symposium* 4:1306-1313

Nemeth, R. S., Kadison, E., Herzlieb, S, Blondeau, J., and Whitement, E. A., (2006). Status of a yellowfin (*Mycteroperca venenosa*) grouper spawning aggregation in the US Virgin Islands with notes on other species. *Proceedings of the 57th Gulf and Caribbean Fisheries Institute* 57:543-558

Russell, M. (2006). Leopard coral grouper (*Plectropomus leopardus*) management in the Great Barrier Reef Marine Park, Australia. Secretariat of the Pacific Community Live Reef Fish Information Bulletin #16, December 2006 10-12 [http://www.spc.int/coastfish/news/LRF/16/LRF16\\_10\\_Russell.pdf](http://www.spc.int/coastfish/news/LRF/16/LRF16_10_Russell.pdf)

Sedberry, G. R., Pashuk, O., Wyanski, D. M., Stephen, J. A. and Weinbach, P. (2006). Spawning locations for Atlantic reef fishes off the southeastern U.S. *Proceedings of the 57th Gulf and Caribbean Fisheries Institute* 57:463-514

Tuz-Sulub, A., Cervera-Cervera, K., Espinosa Mendez J. E., and Brule, T., (2006). Primeras descripciones de la agregacion de desove del mero colorado, *Epinephelus guttatus*, en el Parque Marine Nacional "Arrecife Alacranes" de la plataforma yucateca. *Proceedings of the 57th Gulf and Caribbean Fisheries Institute* 57:525-534

## BOARD of DIRECTORS

Martin Russell (Chair)  
*Great Barrier Reef  
Marine Park Authority,  
Australia*

Yvonne Sadovy  
(Director/Secretary)  
*The University of  
Hong Kong, China*

Terry Donaldson  
*The University of Guam*

Pat Colin  
*Coral Reef Research  
Foundation, Palau*

Janet Gibson  
*Wildlife Conservation  
Society, Belize*

Brian Luckhurst  
*Government of Bermuda*

Michael Domeier  
*Marine Conservation  
Science Institute, USA*