

## Mating Aggregations In Need Of 'Makeover'

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### ABSTRACT

The effective protection of reef fish aggregations is proving to be more of a challenge than it should be given their critical importance for maintaining many commercial and subsistence reef fish fisheries. Major reasons are a lack of knowledge on local aggregations in many places, relatively little understanding of their role in supporting local fisheries and, as a result, they are assigned a low priority relative to other fisheries issues. Moreover, healthy aggregations still contain many fish and hence can give a misleading 'illusion of plenty' even as the overall population declines. More education is needed on the importance of spawning aggregations in general, and an evaluation should be done of their potential value as 'indicators' of reef fishery health. Success stories of effective aggregation protection and monitoring, and the economic and social benefits these represent, need to be widely disseminated at many levels of society. The key with spawning aggregations is to assign them a much higher profile for conservation and management action proactively rather than wait until they are in such poor condition that recovery is uncertain if not impossible.

KEY WORDS: Spawning, aggregation, reef fisheries, perception, policy

## Agregaciones de Desove Requiere Una Imagen Nueva

La protección efectiva de las agregaciones de peces de arrecife continúa ser un reto no obstante su importancia comercial y por comida. Las razones principales son una falta de información sobre la importancia de las agregaciones y entonces su prioridad baja en comparación entre otros aspectos y necesidades de pesquerías locales y regionales. Además, el gran número de peces que se pescan o que se ven en una agregación da una 'impresión de plenitud' aunque se disminuye la población en general. Hay necesidad de educación a varios niveles de la sociedad con respecto a la importancia de las agregaciones para pesquerías costales, y una evaluación del posible aplicación de agregaciones de desove como índices de la salud de estas pesquerías en general. Los ejemplos exitosos del manejo y monitoreo, a largo plazo, de las agregaciones deben ser documentados y diseminados con respecto a sus beneficios sociales y económicos. Es importante que las agregaciones reciban, proactivamente, una alta prioridad de protección y manejo para que no se disminuyen tanto que la posibilidad de su recuperación sea muy baja, o imposible.

PALABRAS CLAVE: Agregaciones de desove, pesquerías costales, imagen nueva

## Les Agrégations de Ponte ont Besoin D'Une Image Nouvelle

La protection effective des agrégations des poissons récifaux liées à la reproduction est un challenge en dépit de leur importance pour la pêche commerciale et la pêche de subsistance en zones tropicales et sub-tropicales. Les principales difficultés proviennent du manque de connaissances sur les interactions entre les agrégations et la pêche. De ce fait, ces agrégations ne sont généralement pas prioritaires en termes de gestion des pêcheries en comparaison à d'autres problématiques. De plus, les agrégations en bonne santé comptent de nombreux poissons et donnent ainsi "l'illusion de masse", même si le nombre d'individus dans la population tend en général à diminuer. Un effort d'éducation des communautés concernant les agrégations de ponte est nécessaire, alors qu'une évaluation de leur valeur potentielle comme 'indicateurs' de l'état de santé des pêcheries en milieux corallines peut être une approche intéressante. Les exemples de protection et de gestion réussis, ainsi que les bénéfices sociaux et économiques que représentent des agrégations en bonne santé doivent être communiqués. L'élément clé en termes de gestion des agrégations de ponte de poissons est de leur attribuer un statut prioritaire en termes de gestion et de conservation et de le faire de façon proactive plutôt que d'attendre que l'état de santé soit trop faible pour que la résilience soit possible.

MOTS CLÉS: Agrégations des poissons, pêche commerciale, image nouvelle

### BACKGROUND

Reef fisheries make up at least 10% of global fishery landings and support and nourish millions of people around the tropics and sub-tropics. Pressure to exploit them is growing as human populations increase, and as international trade responds to expanding global demand for fish.

Many valuable reef fishes aggregate to spawn at places and times that are often highly predictable, a factor that makes them particularly easy to overfish in the absence of any kinds of controls. Despite the growing awareness of the vulnerability of aggregations to overfishing and documentation of declines in important commercial species partly or largely attributable to aggregation-fishing, their effective protection continues to be a challenge (e.g. Sadovy de Mitcheson et al. 2008). It is timely, therefore, to examine why, despite the obvious need for attention, few aggregations to date are protected and very

few conserved effectively, and to identify the steps necessary to address this situation.

### TOWARDS BETTER PRESERVATION OF SPAWNING AGGREGATIONS

At least four factors impede better management of the spawning aggregations of reef fish species:

- i) Poor documentation of the economic and food value of aggregating species to local fisheries, or occasionally the recreational value to local businesses or communities for fishing or viewing;
- ii) The specific threat of aggregation-fishing as opposed to fishing at non-aggregation times on aggregating species;
- iii) Problems of perception in that aggregations are clearly times of plenty and hence likely to attract less attention (even when close to collapse – see Sadovy and Domeier 2005) than threatened species or than more obviously immediate problems; indeed, aggregations are often a specific target for seasonal fishing activity, and
- iv) Aggregations are typically not considered to be important indicators for reef fish/fishery condition for conservation planning, nor are they the usual focus of conventional fishery management. In many places little is known of the local aggregations, even when these are exploited (e.g. in many western Pacific countries, Pers. observation).

This paper briefly addresses each of these factors and identifies possible means of resolving the issues involved. It is clearly important to document the value of aggregating species in coastal fisheries to illustrate their importance. For example, aggregating fishes make up about 70% of reef fish catches in parts of Fiji according to a survey conducted in 2007 (Nanise Kuridrani, Fiji Fisheries Research Division). Fishing in Fiji, as elsewhere in the Pacific, is conducted both on aggregations and at non-aggregation times on a range of aggregating species of great food and commercial importance of the families Lutjanidae, Acanthuridae, Serranidae, Mugilidae, Siganidae, Lethrinidae, among others. In the insular Caribbean, the Nassau grouper, *Epinephelus striatus*, which aggregates very predictably was once one of the most commonly landed commercial species - it is now of limited commercial value regionally compared with historically high landings and is considered to be threatened according to the IUCN (International Union for Conservation of Nature) criteria for Red Listing ([www.iucnredlist.org](http://www.iucnredlist.org)).

While it is usually difficult to clearly demonstrate that aggregation-fishing, as opposed to fishing pressure in general on an aggregating species, has been a major factor in population declines, available information is strongly suggestive of the former. Comparative data among fisheries with different levels of targetting on aggregations for a single species are valuable for teasing out such effects

as the case of the Nassau grouper, *Epinephelus striatus*, indicates; where aggregation-fishing prevails the fishery of the species in general is in a much reduced state compared to areas where aggregations are not typically a focus of fishing (Sala et al. 2001, Sadovy de Mitcheson and Erisman In press). In fisheries that target multiple species with different degrees of aggregating behaviour (i.e. predictability in terms of timing and location), as among reef fishes in Cuba, the suggestion is strong that the most predictably aggregating species are those that have declined the most over multiple decades (Claro et al. 2009). Differential responses to fishing within a single phylogenetic lineage that contains both aggregating and non-aggregating species, such as the Epinephelidae or Sparidae, likewise provide qualitative indications of the role of aggregation-fishing in declines (Sadovy de Mitcheson and Erisman In press). Important recreational and commercial species that aggregate in the Gulf of California, Mexico, have undergone marked declines compared to species that aggregate less intensively; examples include the leopard grouper *Mycteroperca rosacea* and the Gulf grouper *M. jordani* (Sadovy de Mitcheson and Erisman in press, Sala et al. 2003, Sala et al. 2004, Saenz-Arroyo et al. 2005, Aburto-Oropeza et al. 2008). While none of these perspectives discounts possible confounding factors of life history differences or relatedness among species, or of the relative importance of non-aggregation fishing, examining the question of the specific role of aggregation-fishing from different perspectives does at least provide a semi-quantitative means of evaluating the importance of aggregation-exploitation *per se* on fisheries.

A major challenge in moving towards proactive, precautionary, and effective aggregation protection is the general human tendency to ignore issues until they unequivocally become problems. For this reason, international statements of concern are valuable in drawing attention to issues, including in the case of aggregation protection. The International Coral Reef Initiative and the IUCN, among other international platforms, have issued such statements of concern or resolutions for protection. Unfortunately, the high seasonal catches or the large numbers of fish seen by divers at aggregation sites understandably obscures need for protection because such large numbers give 'illusions of plenty' to those unaware of the larger role that aggregations play in population replenishment and that a few aggregations may hold the majority of adults in an area. With so many pressing issues in fisheries these days, it is easy to see how healthy aggregations do not immediately attract the attention. Yet we know that aggregations can quickly collapse with uncontrolled commercial exploitation and that their recovery potential is uncertain once much reduced. So we are aware that proactive management is essential. Getting this message out to communities and management authorities should be a major goal of scientists and NGOs that work in tropical marine ecosystems. As a general rule

it is becoming apparent that the default should be management of aggregations if they are fished beyond anything other than light subsistence levels with, ideally, complete protection from commercial exploitation.

The importance of success stories in management and conservation cannot be overstated. They act as inspiration for action and also as evidence that success is possible. They are also of much value for learning why and how things do, or, conversely, do not, work and for planning to ensure that protection stays in place. For example, success in the United States Virgin Islands led to larger and more red hind, *E. guttatus*, at aggregations (Nemeth 2005) but not all fishers were convinced by the success.

It is clear that we need a major shift in perspective to viewing spawning aggregations as important life history events to be fully protected for benefit of the young they produce. In this model, the adults can be viewed as capital in the bank and the young, the eggs/larvae produced, the interest. Best fishery management, as for economics, is to safeguard the capital and live off the interest by fishing only at non-aggregation times. Fishery analysis that examines such a scenario from both social and economic perspectives would be valuable.

Aggregations have considerable potential to be used as 'indicators' of general fishery health, which would both highlight their importance and attract greater attention to them. Aggregations are good candidates as 'indicators' because they can signal:

- i) Pressures on fishery resources caused by human activities, in this case fishing,
- ii) Environmental state i.e. aggregation condition relative to some baseline, and
- iii) Societal response by the degree to which they are managed effectively.

While there are both advantages and disadvantages to using aggregations as indicators, on balance they appear to signal well the condition of associated fisheries: where there is heavy overfishing, aggregations are small or non-existent, whereas in relatively unfished or managed areas, aggregations persist. The extent to which intermediate conditions in both cases are correlated remains to be determined (Sadovy de Mitcheson et al. 2008, SCRFA Newsletter No. 12, May 2009 [www.scrfa.org](http://www.scrfa.org)).

### SUMMARY

In conclusion, change, in this case effective aggregation protection, is only possible when people have sufficient knowledge and understanding of an issue to recognize and appreciate its importance and relevance to themselves and to the wider community. The issue needs to be considered a high enough priority for sufficient manpower and funds to be assigned to address it, while a realistic hope of success, from experience elsewhere, helps to stimulate action. Therefore, the dissemination of information, experiences and successes to different sectors of

society is important to get protection in place. Sufficient follow-up to ensure that implementation is effective through monitoring and continued oversight are also essential to assess outcomes. Aggregation protection needs to become a standard consideration for conservation organizations and fishery departments alike. Their potential value as indicators of fishery health, especially in parts of the Indian and Pacific Oceans where there is much need and potential to preserve aggregations, represent exciting opportunities for successful interventions.

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