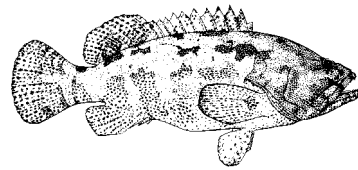


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## Grouper spawning aggregations need protection

by R.E. Johannes

Many coral reef food fishes aggregate in large numbers at specific locations, seasons and moon phases in order to spawn. Such fishes include groupers, the main objects of the live reef food fish trade.

These aggregations are prime targets for fishers, who often take large catches from them. Groupers have been virtually eliminated by overfishing in at least five Pacific Island locations within Palau, the Cook Islands, the Society Islands, the Tuamotus, and on the Great Barrier Reef. Fishing over spawning aggregations at three of these locations has been specifically implicated in their demise. It may also have been a factor in the other two cases.

One aggregation fished by Palauans for centuries was eliminated by a live reef fishing operation in just three years. It is very likely that a great many other aggregations of groupers have been eliminated without written record because the slowness with which Indo-Pacific marine biologists have recognised and acted upon the need to locate, characterise and protect them, even although descriptions of their importance and vulnerability have been in the scientific literature for almost 20 years.

Although details are hard to come by in many areas, it is clear that grouper spawning aggregations are under increasing pressure because of the live reef food fish trade and because of the ease today with which aggregation sites can be pinpointed and relocated with global positioning systems. In the Solomon Islands one Hong Kong company was even described by an ex-employee as using spotter planes and expert Chinese fishermen to locate likely grouper spawning sites using reef topography.

Accounts obtained from fishers in the Philippines and Indonesia reveal that they, also, are discovering increasing numbers of grouper spawning aggregations as the depletion of shallow-water resources forces them to dive deeper and further from shore.

One group of Indonesian fishers said they got such high catches from spawning aggregations they recently discovered that they no longer bother to fish for the trade during the non-spawning season. Such fisheries are not sustainable.

Marine resource managers should consider banning fishing on grouper spawning aggregations for a second reason. Gravid females are reportedly subject to significantly higher mortalities during shipment. (Most shipped groupers are females because they are the ones in the size range preferred by restaurants.)

The fish are treated with the anaesthetic MS222 prior to air shipment. This often causes gravid females to release eggs into the water of the shipping containers. The eggs clog their gills and probably also remove oxygen from the water. This appears to be one of the reasons for the higher mortalities, according to shippers, even among fish that are in prime condition.

Reducing transport mortality is in everyone's interests; every fish that dies means another must be caught to supply consumer demand for live fish. Some Australian live reef fish companies operating on the Great Barrier Reef have recognised that targeting of spawning aggregations is not in their own long-term best interests and actively support closing the fishery during spawning months.

The most widely discussed marine conservation measure in shallow tropical waters is the marine reserve. Proponents often assert that the most important function of marine reserves is to protect spawning stock biomass and ensure recruitment to fished areas by means of larval dispersal.

Clearly, for that reason, the boundaries of such reserves should, wherever practical, encompass spawning aggregation sites. There is little evidence in the literature, however, that spawning

aggregation sites were given any consideration when the boundaries of most Indo-Pacific tropical marine reserves were drawn. Palau is a rare exception; the presence of an important spawning aggregation site is the main reason that the Palauan Government set up the Ngerumekaol marine reserve.

Spawning aggregations and associated sites are very poorly documented in the Indo-Pacific, except for certain Pacific Islands such as Palau. There is a great need for marine biologists in the region to locate reef fish spawning aggregations and to determine local spawning seasons (which vary from place to place within the region). There seems to be no scientific literature at all on grouper

spawning aggregations in South-East Asia, although reports from South-East Asian fishermen indicate that they are well known to some.

This is an example of the fact that fishers often know far more about the location and timing of spawning aggregations than researchers. Indeed more than 20 different researchers have acknowledged in their publications that it was fishers who enabled them to locate the reef fish spawning aggregations that they subsequently studied. For this reason help from the latter should be sought when searching for and characterising these aggregations. Spawning seasons can often be determined simply by sampling at the market.

## Live reef fisheries activities in the Republic of the Marshall Islands

by Dr Andrew J. Smith <sup>1</sup>

The following is based on information collected during a brief visit to Majuro, Republic of the Marshall Islands (RMI) in late June 1997, and subsequent communications with the Marshall Islands Marine Resources Authority (MIMRA) and RMI Environmental Protection Authority (RMIEPA).

Since late 1994 there have been three known live reef fish (LRF) operations in the Republic of the Marshall Islands. The first involved the arrest and prosecution of a LRF vessel operating illegally, and its subsequent re-arrest for possession of cyanide after obtaining a fishing licence. The other two are on-going joint-venture operations with local partners: one a Hong Kong-based company, the other based in Taiwan. From the perspective of the Director of the MIMRA, these two operations are still on a trial basis, and MIMRA is continuing to assess the fishery to ensure that maximum benefit accrues to RMI, with the minimum of negative effects.

*Ocean Glory / Trekrona Ltd.:* The M/V *Ocean Glory II* was arrested in early November 1994 near Ujelang (the westernmost atoll of RMI) by the RMI patrol boat for fishing without a licence. It was also suspected of fishing with cyanide, due to the way

the vessel was set up, but none was found on board. The owner was fined US\$ 250,000 and the vessel released after payment was made. The owner then applied for local government fishing permits (for Ujelang and Enewetak atolls) and a Foreign Fishing Agreement from the RMI Government in late 1995 and early 1996. Before it could start fishing, cyanide was found stored in plastic bags inside 55 gallon drums of oil, and the vessel was re-arrested in May 1996. The owner forfeited the vessel to the RMI Government. The vessel was built in 1968, has a steel hull, gross tonnage of 219.51 t, a length of 40.3 m, an engine capacity of 950 hp, fuel capacity of 110,000 l, a speed of 10.5 knots, and can carry a crew of up to 36.

Pacific Marine Resources Development Inc. (PMRD) is a locally incorporated company and was approved for a Foreign Fishing Agreement in November 1996 for an experimental live reef fish operation. It has a local government fishing permit for Maloelap, and is proposing to obtain a permit for fishing Ujelang in the near future. With this operation, PMRD charts a vessel from the Hong Kong partner, catches the fish, and transports it to Hong Kong for sale. To date two shipments have been made.

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1. The Nature Conservancy, P.O. Box 1738, Koror, Palau