

It usually takes a lengthy volume to describe a complex reef fishery where overfishing is epidemic and poverty-stricken destructive fishing is taking its toll. Author Mark Erdmann spent three years studying the largest coral reef fishery in Indonesia and came up with this unique, hard-hitting way of highlighting the variety of resources, fishing methods and problems there.

# An ABC Guide to Coral Reef Fisheries

## in Southwest Sulawesi, Indonesia

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*Hookah divers collect spiny lobsters from a blast-damaged reef.*

### Introduction

The Spermonde Archipelago in southwest Sulawesi, a 16,000 km<sup>2</sup> carbonate shelf encompassing over 160 low coral islands and numerous additional patch reefs, is considered the largest coral reef fishery in Indone-

sia. Also known as the Sangkarang Archipelago, this area has supported intensive fishing activity since at least the days of the 14th century Makassarese kingdom of Gowa. Today, this fishery employs 200-300 households per km of coastline and is arguably on the verge of collapse as the human population bur-

geons and destructive fishing techniques proliferate.

During the past three years, the author has lived among these fishers while conducting his PhD dissertation research in coral reef ecology. The following is an anecdotal directory to the major fisheries, techniques and problems faced by

these people, with 1994 market prices quoted for the various catches described. Although not exhaustive, this guide should serve to highlight the remarkable diversity of gears and techniques used in this area, as well as the gravity of the situation as this ecosystem is strained by increasingly unsustainable fishing activities.

### The ABCs of Spermonde Reef Fisheries

**A**quarium fish trade. Until recently, most ornamental fish collection was done using small seines, and supplied local markets only. Cyanide use is now on the rise as exports to international markets expand.

**B**last fishing. Strictly illegal, blast fishing was once limited by supplies of explosives from such disparate sources as dynamite from international aid road projects and ammunition shells recovered from sunken WWII warships. Now, explosives are hand-made by local fishers and limited primarily by supplies of illicit waterproof wicks. Larger fishing vessels (10-15 m length, crew of 10-14) embark on week-long voyages around the archipelago and into the Makassar Strait, and post comparatively large profits of 6-10 million rupiah<sup>a</sup> (≈US\$2,800-4,650) for a full hold. Explosives are detonated at 5-30 m depth, normally on patch reefs or fringing reefs of uninhabited islands, and the resulting "catch" collected by free-diving or hookah (compressor) diving. As a result, most patch reefs in the area are little more than rubble fields punctuated by occasional massive coral heads.

**C**yanide fishing. Besides its use in the aquarium trade, potassium cyanide is now used extensively for the collection of live groupers for export to Hongkong restaurants. Hookah divers stun the fish using squirt bottles of cyanide solution and then store them in large floating cages for pickup and export every two

weeks in live-hold vessels. Fishers collect mostly *Plectropomus* spp., but also *Cromileptes altivelis* and *Cheilinus undulatus*, and receive (for *Plectropomus*) Rp14,000 per large (>2 kg) fish and Rp3,000 kg for smaller individuals.

**D**ecompression sickness (DCS) is a common affliction of hookah divers involved in cyanide and blast fishing, and especially in *trepang* collection. With no awareness of the dangers of DCS, *trepang* divers often make up to five, 20-30 minute long repetitive dives per day to depths of 40-60 m, with no decompression stops.

**E**lectroshock fishing. Using automobile batteries or small generators, fishers use electric currents to stun large schools of small fishes, such as clupeids and atherinids, which are then collected using handnets.

**F**inching of whitetip, blacktip and grey reef sharks is very profitable, fetching Rp25-50,000/kg of fin. Larger operations practice live finching, while individually owned vessels usually save the carcass and dry the meat. With local shark populations exhausted, ships often range to north Kalimantan or Maluku. Long lines and gill nets are gears of choice.

**G**iant clams. Four species of *Tridacna* (*T. gigas*, *T. squamosa*, *T. derasa*, and *T. crocea*) as well as *Hippopus hippopus* and *H. porcellanus*, are all gathered and stored on the reef flat until eaten. The local university, Hasannudin, is now operating a hatchery to replenish diminishing wild stocks.

**H**awksbill turtles, and occasionally green turtles, are captured illegally and sold at the public market for Rp5,000-10,000. Hatchling are also collected and sold for Rp300 each. Adult carapaces are sold as wall decorations, and the costal scales are removed and used in turtleshell jewelry and ornaments.

**I**ndividual small-scale fishers still practice handlining in dugout canoes, although this appears to be a dying trade.

**J**urisdiction over individual reefs applies only to inhabited islands, and seems to be respected only in cases of blast fishing. Most island communities actively discourage blast fishing of their own reefs. However, this seems to be for reasons other than sound ecological practice (see entry Q).

**K**erosene lantern night fishing is conducted primarily from large catamarans from the last quarter until the first quarter moon. Schools of clupeids and atherinids are lured to the lights and captured by raising nets suspended below the catamarans. Cuttlefish and the reef squid, *Sepioteuthis lessoniana*, are caught in a similar manner.

**L**obsters are collected live by hookah divers using cyanide, primarily for export to Japan. *Panulirus cygnus* and *P. versicolor* bring Rp20,000/kg, while *P. ornatus* fetches Rp60,000/kg. Juveniles as small as 15 cm are taken, decimating local populations.

**M**other-of-pearl (*Trochus* spp.) is collected and sold for Rp7,500/kg, while winged pearl oysters (Family Pteriidae) are sold for Rp2,000/kg. Both are extremely rare in the archipelago, and most are gathered incidentally by *trepang* or lobster boats which venture further afield.

**N**ets of every shape and size are used, including trawl nets, gillnets, driftnets and beach seines. Interestingly, *muro-ami* fishing, widely reported from other Southeast Asian fisheries, is conspicuous in its absence in the Spermonde. The author has only observed this method once, and this was a very small-scale effort involving two young boys.

**O**verfishing is epidemic. Many of the fisheries mentioned herein are nearing collapse, with boats now forced to go great distances, often to Maluku and as far as Australia (~1,600 km).

**P**oisoned-bait fishing. Traditional poisons from plant alkaloids are mixed with pulverized crab or fish, and this bait is handcast over reef flats and seagrass beds. The target species are mostly siganids, which are stunned or killed within minutes of eating the bait. These are then collected by free-diving.

**Q**uestionable understanding of reef ecology is demonstrated by local fishers. For example, although it is commonly acknowledged that local stocks have declined over time, no connection is made with fishing effort; the fish have simply "moved elsewhere." Likewise, fishers seem to have no appreciation of the role a healthy intact reef has in supporting a fishery, and have difficulty comprehending why blast fishing is illegal.

<sup>a</sup>According to the South Sulawesi Chamber of Commerce, the average daily income for fishers in this area is less than Rp4,000. As of November 1994, the exchange rate was approximately US\$1=2,150 Rp.



Fisher sorts black coral and trepang gathered from one 20-minute dive.

Regulation of fishing activity is sporadic at best. Traditional means of self-regulation of overfishing are lacking, and official regulation of illegal techniques such as blast and cyanide fishing consists mainly of the payment of "fees". This regulation may actually be effective in a perverse way; these "fees" have now reached such exorbitant levels as to force many smaller fishers to take up more honest means of fishing.

Sea cucumbers are one of the oldest export commodities from the Spermonde, and the most valuable species are now virtually extinct locally. *Trepang* ships from this area regularly travel as far as Maluku and Timor, and 25 local boats were recently incarcerated near Darwin, Australia, for illegal fishing. The most valuable *Actinopyga* spp. fetch Rp19,000 each, while *Holothuria* and *Stichopus* spp. garner only Rp100-1,300 each.

Traps of many varieties are used, including submerged, cage-like bamboo traps, large, above-water bamboo structures from which suspended nets can be raised, and giant "arrow traps" in inshore waters which entrap fish on the falling tide.

Unemployment is becoming a common problem in these densely-populated fishing communities, and will only increase as stocks dwindle.

Vicious circles result when underemployed fishers feel pressured into more damaging and nonsustainable practices, further enhancing the overfishing problem.

Women and children actively harvest reef resources as well. During low spring tide exposures, the reef flats are scoured for every edible gastropod, bivalve, and crustacean present, as well as holothurians and seaweeds. Children "spearfish" using straightened wire coat hangers and rubber bands, collecting chaetodontids and pomacentrids from the reef flats. At night, women hand-seine for larval milkfish, *Chanos chanos*, which are sold to aquaculture companies for Rp40 each.

Yellowfin tuna and other reef-associated scombrids are still caught in substantial numbers, mostly from the western edge of the shelf and into the Makassar Strait.

Zoantharia of many kinds are collected live for the aquarium trade, primarily anemones and small, colorful

coral colonies such as those of the genus *Catalaphyllia*. These bring Rp1,000-2,000 each for the collector. Additionally, antipatharians are gathered by hookah divers, cut into one-meter lengths, and sold for Rp5,000/kg for black coral jewelry.

### Acknowledgment

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### Further Reading

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