Local examples of beche-de-mer overfishing: An initial summary and request for information

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Introduction

It is generally agreed that holothurians are now overfished in many areas of the Indo-Pacific. This conclusion has generally been drawn from export statistics, movements on the import market, and case studies (Conand 1989, 1990, 1998, 2001, 2004).

In examining the literature, we noticed that there is a dearth of data and observations from single regions. These data could be crucial for future improved management and we aim to initiate a database on both positive developments (e.g. sustainable fishing in local areas or observed recovery of stock), which seem rare or poorly documented, and negative examples (overfishing, absence of recovery).

Because of their slow rates of movement and easy access to fishermen, most holothurians are vulnerable to overfishing. Several characteristics of holothurians make them a particularly vulnerable species. Some of these characteristics are currently only inferred, however initial biological data on at least some species suggest that these are quite long lived and have naturally low recruitment rates (e.g. black teatfish – Uthicke et al. 2004).

Reduced breeding and/or recruitment success occurs when population density is reduced below a critical level. Because holothurians are broadcast spawners, they rely on the proximity of other animals for successful fertilisation. Simply stated, male and female beche-de-mer must be close enough to each other to enable eggs and sperm to meet in the water column. When population density is too low, individuals may be too far apart for this to occur in sufficient numbers.

Unless it can be shown that animals occur at densities higher than those required for a 100 per cent fertilisation rate of each oocyte produced, reduction of densities through fishing will also reduce the number of larvae produced. A disproportional reduction in breeding success caused by reduced population densities has been dubbed the Allee effect. The effect of this is likely to be larger than that through direct take; for example, if densities are reduced by 50 per cent it can be expected that recruitment is reduced by more then 50 per cent.

Overexploitation is a concept in fishery science that is still debated. The application to the sea cucumber fisheries needs to be based on local data, which must be detailed enough and take into account several parameters. Basically, overexploitation can be of either a biological or economic origin and has therefore different characteristics. (Conand 1990) Examples are:

1) biological overexploitation: sandfish *Holothuria scabra* and *H. scabra versicolor* and teatfish *H. nobilis H. whitmaei* and *H. fuscogilva* (Uthicke and Benzie 2000)
2) economical overexploitation: when the investment costs increase without increase of captures or with increased dive-accidents.

Surprisingly, it is not just data on overfishing that are missing, but also data on potential recovery of stocks after the fishery has been closed or is no longer economical. To our knowledge, the only studies that survey stock recovery after overfishing are Lincoln-Smith et al. (2000) in the Solomon Islands, Skewes et al. (2000) on sandfish recovery in the Torres Strait, and Uthicke et al. (2004) on black teatfish on the Great Barrier Reef.

In this brief paper, we first summarise some data on local overfishing known to us from the literature, as reports from colleagues and fishermen, or searches on the Internet. Then, we ask for your participation to enhance our knowledge on these important issues by providing us information on local overfishing or stock recoveries from the area you live in or other areas you are familiar with.

Local examples of overfishing in the Indo-Pacific region

Many tropical areas in the Indo-Pacific region are heavily overfished for holothurians (see Fig. 1). Many areas are overfished for sandfish, but other examples are often cited, the evidence for this is anecdotal because the fishery has not been adequately managed, and no scientific data on stock size before or after fishing are available. The list given below is very preliminary and it is the aim of this request to gather further information.

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Galapagos

After six years of uninterrupted legal commercial exploitation, the Galápagos sea cucumber (*Isostichopus fuscus*) fishery is showing signs of severe depletion. Every year, before and after each fishing season since 1999, teams of managers, scientists, nature guides and fishers have surveyed sea cucumber populations at sites off six islands where legal fishing occurs. The last population survey (April 2004) revealed an alarming continuing decline. Population densities of *I. fuscus* declined to a historical minimum, although populations were "presumably robust" after a five-year fishing ban ended in 1999. The 2000–2001 recruitment pulse is now almost fished out, with no new recruitment pulse evident (Toral-Granda in this issue) These islands are a good example of fishery development and decline due to recruitment overfishing, accompanying political and socioeconomic issues. This fishery has attracted much attention and *I. fuscus* is listed on CITES Appendix III (Toral-Granda and Martinez 2004).

Ashmore Reef

This Australian reef is heavily fished by Indonesian fisherman. In 1988, Russell and Vail reported the presence of sandfish and golden sandfish from this reef. Subsequent surveys by CSIRO (Skewes et al. 1999) and AIMS (Smith et al. 2001, 2002; Rees et al. 2003) more than 10 years later failed to detect any animals of these species.[3]

Indonesia

Indonesia is probably one of the main exporters of sandfish. However, minimal fisheries management exists, and fishing takes place on many islands and often in small communities. Although it is suspected that overfishing is widespread, not many documented examples exist.

During a faunal survey in Sulawesi, Massin (1999) noted that sandfish had been overfished, and that in some locations it was regarded as a rare species. The author of the present report could only obtain few and small specimens during a field trip to Bali and Lombok in 1998. According to fisherman and scientists contacted during that trip, stocks on both islands are also extremely depleted.

Philippines

The Philippines are one of the largest beche-de-mer exporters (Gamboa et al. 2004). Similar to Indonesia, the fishery takes place in many areas. Reports on fishing are insubstantial, but a report by Heinen (date unknown: http://www.ozamiz.com/earthcalls/seacucumber.html) implies that overfishing is severe and widespread, and that poaching in marine protected areas is common.

Malaysia

Overfishing of *H. scabra* stocks in Malaysia was demonstrated by Forbes and Ilias (1999, cited from Hamel et al. 2001) and Poh-Sze (2004). According to the latter source, curryfish (*Stichopus hermanni*) is exploited close to the point of extinction.

Torres Strait

Warrior Reef in the Torres Straight was fished both from the PNG and the Australian side. Heavy fishing between 1994 and 1998 lead to severe overfished stocks of sandfish (Skewes et al. 2000). The fishery was closed in 1998, and the stock recovery has been monitored since then. There are only very limited signs of stock recovery, providing support for the proposed low recruitment rates in holothurians. More recently, black teatfish and surf redfish fisheries also had to be closed.

Papua New Guinea

The first reports of a sandfish overfishing to near extinctioncame from the Togak region in 1988 (Lokani 1990). Total catch rates (for several species) in PNG have slowly declined over recent years (Polon 2004). Recent stock surveys in Milne Bay failed to detect any sandfish and it was recommended that the fishery for this species be closed (Kinch 2002).

Solomon Islands

The export of sandfish was banned because of indications of severe overfishing. Although this export ban was lifted several years later, there is no evidence that stocks had actually recovered.

New Caledonia

Overfishing of sandfish in New Caledonia has been demonstrated by Conand (1989, 1990, etc.) based on captures and CPUE data. *Holothuria fuscogilva* was "scientifically overfished" by Conand due to her monthly sampling of this species, and this was shown by a strong decrease in CPUE.

3. It is currently not known if sandfish (*H. scabra*) and golden sandfish (*H. scabra* var. *versicolor*) are distinct species or varieties. However, recent genetic research (Uthicke, Purcell and Blockmans, unpublished research) shows that these two are indeed separate species.

Hervey Bay, East Coast Australia

The sandfish fishery on the east coast was closed in 2000 because of a severe stock decline. A developmental fishery now takes place further south in Moreton Bay. Some deeper-occuring stocks of golden sandfish are fished along the east coast.

Great Barrier Reef, Australia

The black teafish fishery (*H. whitmaei*) had to be closed in 1999 due to overfishing. Stocks on reefs fished were reduced to less than 25 per cent of that found in no-take zones (Uthicke and Benzie 2000), and had not recovered two years after a fishery closure (Uthicke et al. 2004).

Fiji Islands

The reports on overfishing from Fiji are mainly anecdotal. However, it was already reported in 1993 (Steward 1993, cited from Hamel et al. 2001) that catches of sandfish had declined by 80 per cent when compared to 1979.

Egypt – Red Sea

A beche-de-mer fishery in Egypt began in 1998. After only two years after the opening, however, the first signs of overfishing became apparent (Lawrence et al. 2004). A survey conducted in 2002 and 2003 suggested low densities for most commercial holothurians and overfishing for the most valuable species such as *H. scabra*, *H. nobilis*, *H. fuscogilva* (Lawrence et al. 2004). Based on these results, the holothurian fishery in the Red Sea was closed in 2003.

Madagascar

Detailed information on overfishing is available (Conand et al. 1998; Rasolofonirina and Conand 1998, Rasolofonirina et al. 2004). Fishing pressure appears to be very high nowadays, a fact that is also supported by market and FAO data. Evaluation and management programs have started locally through the collaboration between administration, traders and scientists, and a National Trepang Traders Group (ONET) was set up in 1996. This experience is of interest to other countries. In a regional context, holothurians are one of the resources studied in order to develop a durable management system. Some qualitative indications are apparent from these fisheries:

1) all species available on reef flats or in shallow waters, regardless of size or commercial interest, are collected, including rare and unidentified species;
2) scuba divers complain that they must dive deeper and look for other fishing grounds; in addition, diving accidents have increased markedly;
3) the sizes of the different species (and the processed products) are diminishing; and
4) a strong competition appears among collectors, leading to a decline in processing quality. These observations, found at different levels of the "fishery system" (Conand 1998) are indicative of overexploitation.

Overfishing of sandfish has also been documented in India and Mozambique (summarised in Hamel et al. 2001). There are currently no examples of a sustainable fishery anywhere in the Indo-Pacific region.

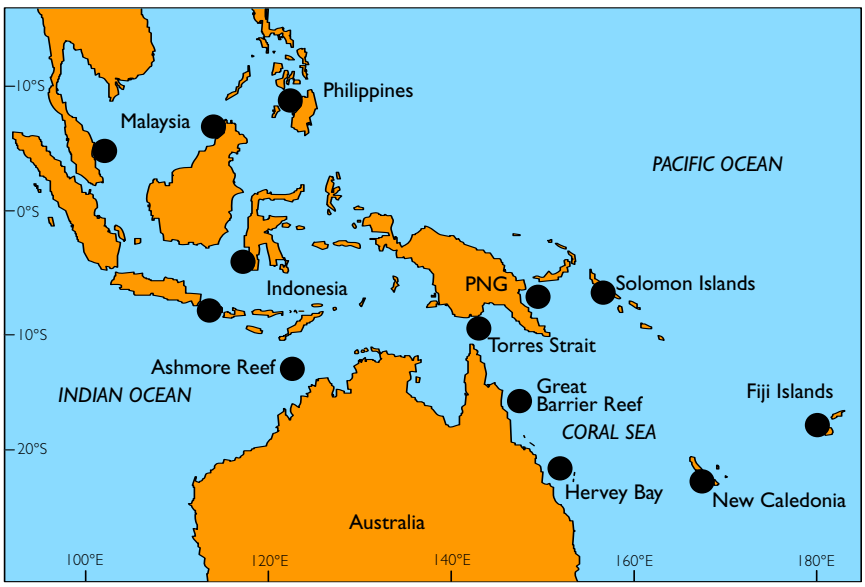

Figure 1. Reported areas of overfishing in the West Pacific region.

A call for information on local cases of beche-de-mer overfishing

Figure 1 is a preliminary example of data already available. In the following, we would like your help in providing more detailed information to draw a more complete picture and to assist with the final aim of managing this resource sustainably.

The parameters listed below (others may be necessary) that are needed to better understand local overexploitation and thus to better manage the fisheries . They are also based on recommendations made during sessions I and II on fisheries and management of the ASCAM meeting (Lovatelli et al. 2004):

Biology

1) Species exploited (note the trading name, local name and/or scientific name). Which species are recovering/being overfished?
2) Site description with information about bottom surface, habitat and depth and time-scale.. Could you name the location and area as precisely as possible (name of the island or individual bay, or even GPS positions).
3) Catch (give unit for numbers or weights).
4) Densities and biomass of the species in the site and their evolution.
5) Size of the specimens, specifically changes in sizes of species. and their evolution
6) Changes in species fished, sites, depth, etc.
7) Did you observe any other changes in the environment that may be related to stock recovery/overfishing? Examples: (e.g. changes in seagrass beds, development of algal mats, etc.)?

Socioeconomics

1) Changes in local situation, for example, war the availability of a more profitable exploitation opportunity (e.g. nickel mining in New Caledonia has sometimes been more profitable than fisheries – Conand 1989), etc.
2) Changes in the local economic situation of the fishermen.
3) Changes in local management such as laws, management measures, or aquaculture.
4) How does the stock recovery or decline affect the community economically?

Useful information for this purpose would include any details on the points above. In addition, to catalogue data in databases and analyses the data, we would appreciate the following information:

1) What is your involvement with the beche-de-mer fishery: Are you a fisherman, trader, manager, community member, fisheries staff?
2) Are you reporting on a stock recovery or a stock decline?
3) How did you come to the conclusion the area is overfished, or stocks are recovering:
   - Declining/increasing catch rates?
   - Available historic data?
   - Observation by elders?
   - Different species caught, animals smaller or deeper dives required?
4) Did the government respond to the overfishing? (e.g. were areas closed to fishing or were certain species protected?

We hope that you agree that this subject this subject is important and that you will contribute, sending your information to us at:

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Please indicate if you wish to remain anonymous, we would also appreciate photographic material of local species or varieties, habitats, fishing and trading practices,

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