Facts on sea cucumber fisheries worldwide

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Sea cucumber fisheries occur worldwide, from monospecific temperate fisheries to multispecific tropical ones. These fisheries currently involve 49 species (Table 1) that yield products such as beche-de-mer and which provide an important source of income to coastal communities. The trade in sea cucumbers has resulted in many species being overharvested, which endangers their natural viability, and which has lead to debates about their conservation and sustainability in various fora in recent years (e.g. ASCAM and CITES workshops).

With the main objective to provide scientific tools aiming towards the conservation of sea cucumber populations worldwide, the Food and Agricultural Organization of the United Nations (FAO) developed a project aimed at collating and disseminating information on the global status of commercially exploited sea cucumber populations, and helping to improve capacity within selected developing countries for the conservation and sustainable use of sea cucumbers. This project has different activities that include the preparation of a comprehensive guide of commercially valuable sea cucumbers to help research, management, enforcement and control, both at the national and international level. Although the original idea for this FAO publication was a simple identification guide, it has now become a compilation of available scientific information on the biology, ecology, marketing and processing of sea cucumbers, and includes photos and descriptions of commercially valuable species at different processing levels. This project is currently under the overall coordination of the author of this paper.

The relevant information was collated by means of a questionnaire developed jointly by the author and FAO. The questionnaire included information on habitat, reproductive biology (size at maturity, reproductive season, mean fecundity, larval development type, egg diameter), type of fishery (subsistence, artisanal, semi-industrial and industrial), the author's knowledge on the population's status (overfished, stable, in decline, unknown), main market, main use (beche-de-mer, medicinal, fermented intestines, dried gonad), management strategies implemented (none, minimum size, fishing season, permits, no-take zones, moratorium/ban, gear restrictions, other), fishing methods used, and domestic consumption. A brief description of this project, including a call for information, was published in the SPC *Beche-de-Mer Information Bulletin* #24 (Toral-Granda 2006).

Table 1. List of commercially important sea cucumber species in the families Cucumariidae, Holothuriidae and Stichopodidae.

Cucumariidae		
Athyonidium chilensis	***Cucumaria frondosa***	*Pattalus mollis*
Holothuriidae		
Actinopyga agassizi	***A. echinites***	***A. lecanora***
A. mauritiana	***A. miliaris****	*A. palauensis*
A. serratidens	*A. spinea*	***Bohadschia argus***
B. atra	***B. marmorata vitiensis****	***B. similis***
B. subrubra	***B. vitiensis****	*Holothuria arenicola*
H. (Halodeima) atra	*H. cinerascens*	***H. coluber***
H. edulis	***H. fuscogilva****	***H. fuscopunctata***
H. impatiens	***H. hilla***	*H. leucospilota*
H. mexicana	***H. nobilis****	***H. scabra***
H. scabra versicolor*	***H. spinifera***	***H. whitmaei***
Pearsonothuria graeffei		
Stichopodidae		
Astichopus multifidus	***Isostichopus badionotus***	***I. fuscus***
Parastichopus californicus	*P. parvimensis*	***Stichopus chloronotus***
S. herrmanni (*S. variegatus*)*	***S. horrens***	*S. (Apostichopus) japonicus*
S. mollis	***S. ocellatus***	***S. vastus***
Thelenota ananas	***T. anax***	*T. rubralineata*

Species names in bold are those that provide information used in the present publication.
* species that need taxonomic review.

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The present document aims to summarise the information provided in such cards in areas of interest to scientists and managers of sea cucumber populations and to encourage fellow colleagues to provide information on their species of expertise and areas of interest. The card template is available upon request.

Results

Based on personal communication with 19 sea cucumber researchers worldwide, 66 cards have been received, representing 34 species of sea cucumbers from 18 countries (Table 2). Mauritius appears in two columns as two authors presented cards for that country (Prof C. Conand and Dr A. Laxminarayana). Further evaluation of the cards presented will allow for the identification of the final number of species present in Mauritius.

Information on the reproductive biology of the 34 species reported by the authors is spotty: there is no information for 22 species, information for 5 species coming from only certain parts of their geographical distribution, and complete information for only 7 species (e.g. *C. frondosa* in Canada or *B. marmorata* in Mauritius). For some species there is information on the reproductive season, mean

Table 2. Cards received per species of commercially important sea cucumbers.

Species	Australia	Canada	Cuba	Ecuador	Egypt	India	Mad, Com, Ken, Mau, May, Sey*	Malaysia	Mauritius	Mexico	New Zealand	Philippines	PNG**	Total
Actinopyga echinites						1			1				1	3
Actinopyga lecanora						1							1	2
Actinopyga mauritiana					1	1							1	3
Actinopyga miliaris						1							1	2
Actinopyga serratidens						1								1
Bohadschia argus						1							1	2
Bohadschia atra							1							1
Bohadschia marmorata						1			1					2
Bohadschia similis													1	1
Bohadschia vitiensis						1							1	2
Cucumaria frondosa		1												1
Holothuria atra					1	1			1				1	4
Holothuria coluber													1	1
Holothuria edulis						1							1	2
Holothuria fuscogilva					1	1							1	3
Holothuria fuscopunctata													1	1
Holothuria hilla												1		1
Holothuria nobilis					1			1	1					3
Holothuria scabra	1				1	1			1				1	5
Holothuria spinifera						1								1
Holothuria versicolor	1													1
Holothuria whitmaei													1	1
Isostichopus badionotus			1											1
Isostichopus fuscus				1						1				2
Parastichopus californicus		1												1
Pearsonothuria graeffei					1	1							1	3
Stichopus chloronotus						1			1				1	3
Stichopus hermanni					1	1							1	3
Stichopus horrens						1							1	2
Stichopus mollis											1			1
Stichopus ocellatus	1													1
Stichopus vastus	1					1								2
Thelenota ananas						1			1				1	3
Thelenota anax													1	1
Grand total	4	2	1	1	7	19	1	1	7	1	1	1	20	66

* Madagascar, Comores, Kenya, Mauritius, Mayotte and Seychelles

** Papua New Guinea

fecundity, size at maturity, type of larval development and egg diameter (e.g. *Isostichopus fuscus* in the Galapagos islands), while for others, information is available on certain biological aspects only. The most common information is the time of the year that a species reproduces.

On the management strategy, there are only two species — *Bohadschia atra* and *Holothuria hilla* — for which there is no management plan in place. Other species are managed in some countries, but not everywhere (e.g. regulations for *A. echinites* include a ban in India, a minimum landing size, a fishing season, permits, TACs, and gear restrictions in Papua New Guinea, but the same species is not regulated in Mauritius). Minimum size limit is the most common type of management strategy reported, appearing in 28 cards, followed by a limited fishing season (25 cards), and gear restrictions (23 cards). Sea cucumber fishing activities have been banned in India since 2001. There is one record of the use of individual transferable quotas (ITQs) for *P. californicus* in Canada.

On the type of fishery, seven species are exclusively under artisanal exploitation (i.e. *T. anax* and *H. whitmaei* in PNG, *H. hilla* in the Philippines), three under industrial (*P. californicus* and *C. frondosa* in Canada, and *H. versicolor* in Australia), and one under semi-industrial exploitation (*S. mollis* in New Zealand). In the case of *H. spinifera* and *A. seraratidens* in India, these species sustained a semi-industrial fishery until this activity was banned by the government in 2001. The remaining species are under different types of fisheries, with one species (*H. scabra*) under four types of exploitation depending on the country.

Sea cucumbers are mostly harvested to supply the beche-de-mer market (63 cards), but also for the use of their fermented intestines (*H. hilla* in India), their muscle strips (*P. californicus* in Canada), or for medicinal purposes (*C. frondosa* in Canada, *P. graeffei* and *S. hermanii* in Egypt). Some species have several uses. The main market is Asia with Singapore, China and Hong Kong Special Administrative Region as the main importation ports. Domestic consumption was reported only for *H. hilla* in the Philippines, *H. nobilis* in Malaysia, *H. scabra* in Australia, *P.graeffei* in Egypt, *P. californicus* in Canada, *S. mollis* in New Zealand, and *S. herrmanii* in Egypt.

Based on the information provided by the authors, a total of 28 species are considered to be overexploited, 11 in stable condition, 3 in decline, and 24 in unknown conditions. Some species reportedly have different population status in different countries (e.g. *H. atra*, is classified as stable in Mauritius, in decline in Egypt, overexploited in India and in unknown condition in PNG).

More contributions needed

From the total number of species identified as being commercially important, there are still 16 species for which there is no information. Additionally, there are several other species that have wider distribution ranges that, ideally, we would like to cover.

I urge fellow colleagues who have information on any of the above-mentioned species, or on other species of commercial interest, to provide the information requested. If you do not have the template, please contact me so I can send it to you. Filling in the template should take no more than 30 minutes of your time, and it will be a great help for the overall success of this project.

For further information, please contact:

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Conclusions

These cards have yielded important information on the current status of knowledge and management of commercially important sea cucumber populations. Upon completion, the final product could become a useful guide to improve current management practices that will help conserve sea cucumber populations worldwide. Authors who have not contributed so far are encouraged to send their information in order to provide the first up-to-date global summary of information of sea cucumber species of commercial interest.

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Reference

Toral-Granda M.V. 2006. Fact sheets and identification guide for commercial sea cucumber species. SPC Beche-de-Mer Information Bulletin 24:49–52.