

A decade of Sea Cucumber Fishing in Egypt, a Boom and Bust Case Study

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ABSTRACT

Invertebrate's fisheries have expanded both in term of values and catch worldwide in the last few years. Bech-de-Mer or dried sea cucumber (Holothiridae) is highly valuable in the Asian market and the high demand for the Egyptian species led to overexploitation and change in species composition, in this study we assesses the ecological impact of sea cucumber fishing along the Egyptian coast of the Red sea after 10 years (from 2004 to 2014) of sea cucumber fishing, re visiting six different areas along the Egyptian coast of the Red Sea and before and after the overexploitation process. Over 10 year's period, the abundance of 6 commercial sea cucumber species declined dramatically, with some commercial species been totally removed from certain areas. Our results showed a significant change in species composition of sea cucumber and the replacement by non- commercial species to the commercial species as a result of overfishing activities.

Key words: Bech-de-mer. Sea cucumber, Red Sea, Overfishing, Species composition

INTRODUCTION

Beche-de-mer or dried sea cucumber is considered to be a delicacy and aphrodisiac in China and other Southeast Asian Countries, processed bodies are either eaten or used as medicine (Toral-Granda *et al.*, 2008). Most commercial sea cucumber species occupy shallow clear areas of sandy reef flat or seagrass beds, making the harvesting of these sessile animals a relatively simple procedure. The combination of high value plus ease of capture has meant that all species are vulnerable to overexploitation (Bruckner *et al.*, 2003; Toral-Granda *et al.*, 2008; Friedman *et al.*, 2010). In Egypt sea cucumber fisheries have undergone cycles of decreased total catch despite the increased fishing effort (Ahmed and Lawrence, 2007).

Dried sea cucumber products are not part of the Egyptian diets and is only harvested because of the high demand by Asian market that is according to a report by FAO in 2003 is only going to increase (Conand, *et al.*, 2010). The statistics of the mid-90s indicated a world catch of sea cucumbers of up to 120 000 t per year, worth over US\$60 million. In Egypt the fishery is so profitable that despite the Governmental declaration of sea cucumber fishing ban in 2004 along the Egyptian coast of the Red Sea, illegal fishing continue in large scale (Ahmed and Lawrence, 2007). The sea cucumber fishery is characterized by boom and bust cycles with biological overexploitation often occurring before economic overexploitation (Preston, 1993; Conand, 1998).

Despite governmental ban of all sea cucumber fishing along Egyptian Coast of the Red sea and gulf of Aqaba research showed dramatic decrease of total catch and the introduction of new species to the fishing industry after the depletion of the what is so called first class commercial species (Ahmed and Lawrence, 2007). In Egypt six species of sea cucumber are targeted by commercial fishery, Since 2000 sea cucumber fishing industry in the Red Sea showed decrease in the total

catch of first class commercial species including (*H.scabra*; *H. fuscogilva* and *H. nobilis*) and the introduction of other less valued commercial species including (*Actinopyga mauritiana*; *Actinopyga crassa* and *Stichopus hermanni*). These species have broad distributions in the Red Sea, and are abundant in shallow and calm waters with sandy bottoms (Ahmed and Lawrence, 2007).

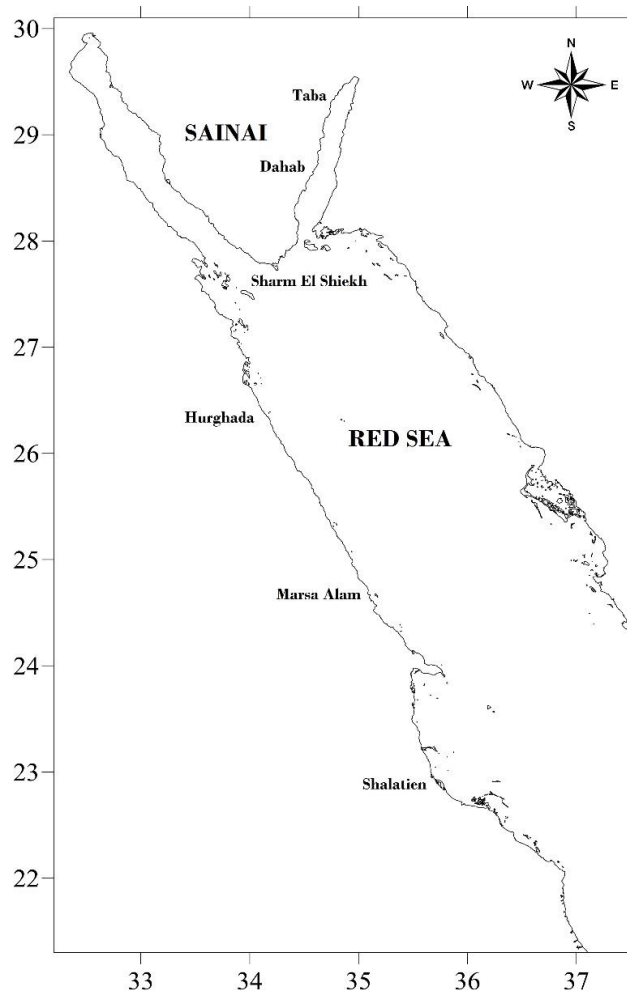
On this paper we present and compare data on the abundance and diversity of commercial sea cucumber species along the Egyptian coast of the Red Sea between 2004 and 2014. The scale of decline is huge and shows a dramatic shift in species composition as a result of overfishing over 10 years period of time.

MATERIAL AND METHODS

In 2004 six sites along the Egyptian coast of the Red Sea were surveyed in order to assess status of commercial sea cucumber along the Coast, same sites were re-visited in 2014. A total of six sites the Gulf of Aqaba (Taba; Dahab and Sharm Elkshiekh) and Egyptian Red Sea coast (Hurghada; Marsa Alam and Shalaten) (Map 1). The survey employed modified rapid marine assessment techniques that have applied to bech-de-mer surveys in Torres Strait (Long *et al.*, 1999; Skewes *et al.*, 2000) and Moreton Bay (Skewes *et al.*, 200). Field work was undertaken by two teams of divers (all diving under the PADI safety regulation).

A Belt Transect method was used in the survey to determine the density and abundance of Holothuria at each site. The belt consisted of a 50 m line transect with a 5 m width (2.5m each side of the line) and was surveyed by two divers, one each side of the transect line. On the reef flat three belt transects running parallel to the shoreline were surveyed by snorkelling or walking at low tide in order to determine the holothurians density and composition. All the sea cucumbers within each transect were identified and counted.

A decade of sea cucumber fishing in Egypt



Map (1): surveyed sites along Egyptian coast of the Red Sea and Gulf of Aqaba

RESULTS

Species composition

A total of 23 different species of sea cucumber were recorded in the study area between 2004 and 2014, of which total of 6 commercial species and 17 non-commercial sea cucumber species. The change in species diversity in all sites is shown in table (1) and figure (1), where the decrease was mostly related to the disappearance of the commercial species. All studied sites showed the same pattern of decreasing commercial species diversity between 2004 and 2014 mostly related

to illegal overfishing activities. Another pattern shown in figure-2 that was found in all site was the increase of non-commercial sea cucumber species in relation to the commercial species. In Taba percentage reduced from 33% in 2004 to 14% in 2014; in Dahab all commercial species disappeared in 2014; while in Sharm el Shiekh it was reduced from 38% in 2004 to only 17% in 2014. In the Red Sea on the other hand the commercial species dropped from 28% in Hurghada in 2004 to only 8% in 2014; in Marsa Alam from 38% in 2004 to 17% in 2014; and in Shalatien from 40% in 2004 to 18% in 2014.

Table (1): comparison of species diversity in the study area between 2004 and 2014.

Site	Species Diversity		Commercial species	
	2004	2014	2004	2014
Taba	12	07	4	1
Dahab	16	10	4	0
Sharm El Shikh	16	12	6	2
Hurghada	18	13	5	1
Marsa Alam	16	12	6	2
Shalatien	15	11	6	2

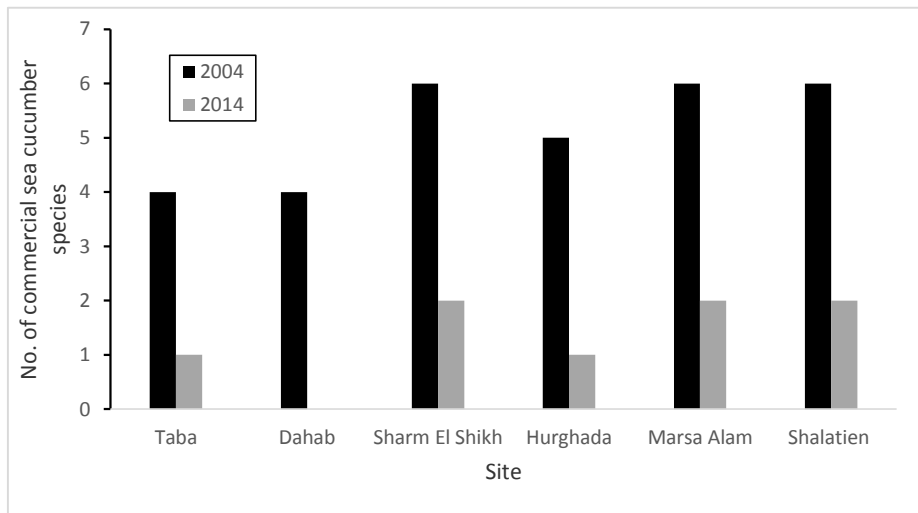


Figure (1): change in commercial species composition between 2004 and 2014 due to overfishing.

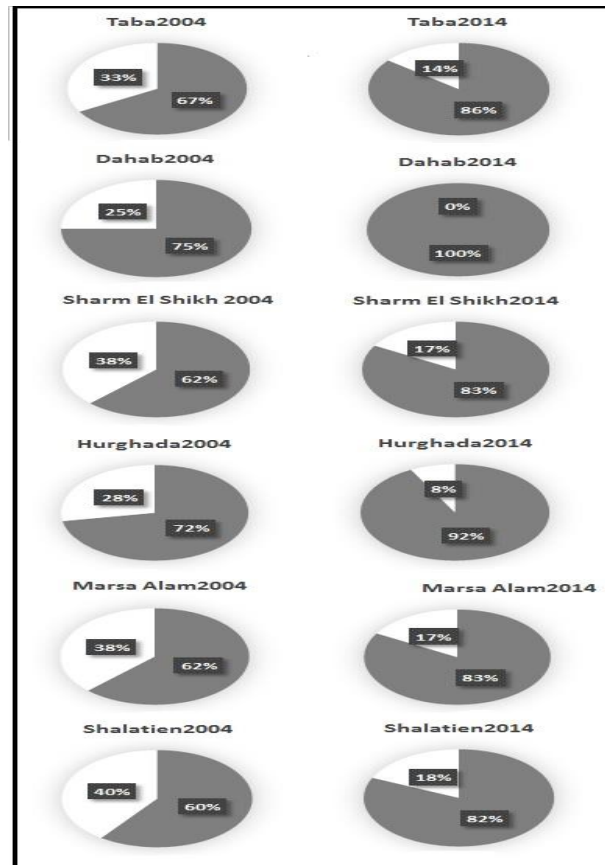


Figure (2): change in percentage abundance of commercial to non-commercial sea cucumber species composition between 2004 and 2014 in all studied sites.

Considering the number of animal/ ha. estimated in 2004 the original stock of commercial sea cucumber in the Red Sea, the number of animals estimated in 2014 which represents the remaining percentage of the stock

after 10 years of overfishing. The numbers and percentage represented in (table 2). Figures (3) and (4) shows change in commercial species abundance.

Table (2): estimated number of commercial sea cucumber species in 2004 and 2014 represented as number of animals/ hectare.

	2004	2014	% Remain from original stock
<i>Actinopyga Crassa</i>	133.0	29.0	21.8
<i>Actinopyga Mauritiana</i>	612.0	7.50	1.20
<i>Holothuria Scabra</i>	397.0	1.10	0.30
<i>Holothuria Nobilis</i>	18.40	0.00	0.00
<i>Holothuria Fuscogilva</i>	32.00	2.00	6.30
<i>Stichopus hermanni</i>	105.0	8.00	7.60

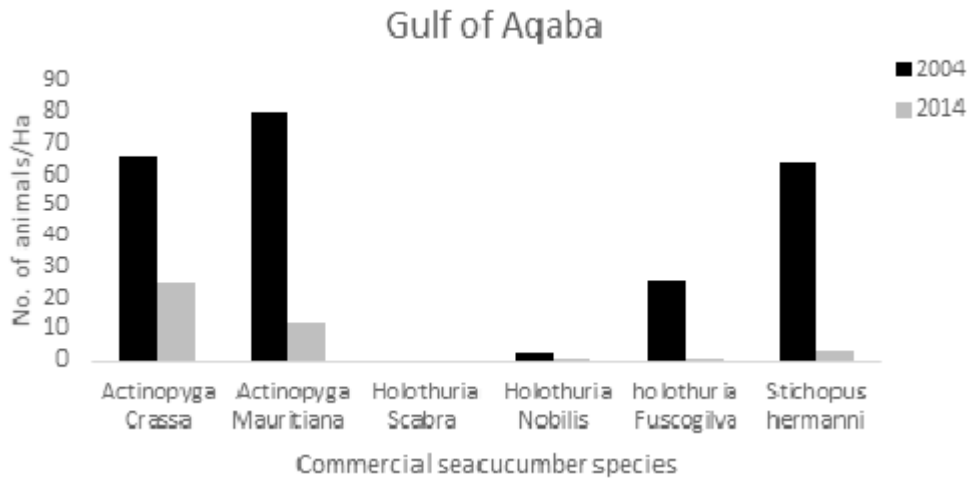


Figure (3): change in commercial sea cucumber abundance between 2004 and 2014 in the Gulf of Aqaba represented as number of animals/ hectare.

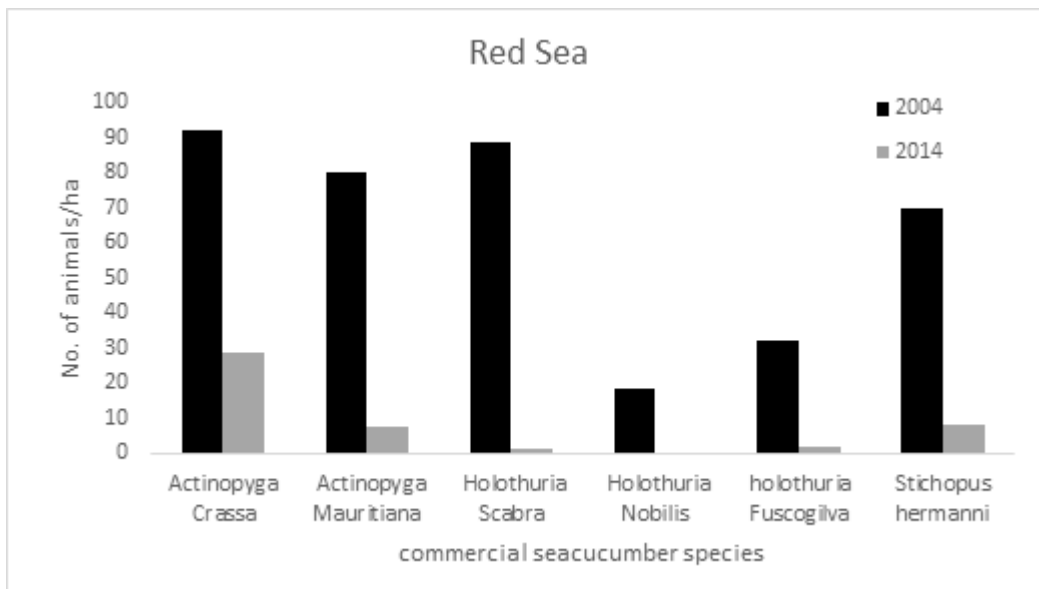


Figure (4): Change in commercial sea cucumber abundance between 2004 and 2014 in the Red Sea.

DISCUSSION

The current strong demand for dried sea cucumber products from the Asian markets led to the search for regions to exploit and new species to target (FAO, 2003). The commonly exported product is the dried body wall known as beche-de-mer or trepang. Fisheries around the world have undergone boom and bust cycles since 1950s, with catches have increased 13-16 folds in the past 3 decades. And the recent development has been unsustainable and too rapid for effective management response. 16 species of sea cucumber placed in the IUCN red list of which 9 are vulnerable and 7 are endangered. Sea cucumber fisheries started in Egypt in small scale in 2000, and then expanded to large commercial fisheries from 2004 to 2014; despite governmental ban of fishing sea cucumber in 2004 the illegal fishing continues and eventually led to overfishing of commercial species.

In this study a comparison was made between sea cucumber species diversity and abundance in the Red Sea and Gulf of Aqaba between 2004 and 2014. The results indicate that the sea cucumber fisheries in Egypt followed the same global pattern of boom and bust cycle. In six different sites the species diversity decreased during 2004 and 2014. In Taba species diversity dropped from 12 species to only 7 in 2004 while in Dahab and Sharm El Shiekh species diversity dropped from 16 species to 10 and 12 species in 2014. The same scenario was recorded in Hurghada; Marsa Alam and Shalatién, the reduction in species diversity is related to overfishing activity and the disappearance of commercial sea cucumber species. In Dahab for example not a single individual of commercial seacucumber species was recorded in 2014.

A change in species composition in all sites were observed with the non-commercial sea cucumber species replacing the commercial species because of lack of competition over food and space resources, with commercial species usually bigger in size, their disappearance allowed much smaller species to flourish and increase in numbers.

Significant change in species abundance was also recorded between 2004 and 2014, with the disappearance of *Holothuria nobilis* from the selected sites along the Egyptian coast of the Red Sea. The species according to our result might be under threat of extinction. Considering the number of animals per hectare in 2004 as the original stock the first class commercial sea cucumber species including *Holothuria scabra* population were reduced to 0.3% while *Holothuria fuscogivla* were reduced to 6.3% of original stock. Second class commercial species including *Actinopyga mauritiana* were reduced to only 1.2% of original stock. The overfishing of highly valuable commercial sea cucumber species not only led to change in species composition in all studied sites but also led to the introduction of some new species into the

commercial catch, the introduction of *Actinopyga crassa*; *Holothurian atra* and *Holothuria spinefra* will result in a significant decrease in these species abundance along the Egyptian coast of the Red Sea unless proper management to be placed.

CONCLUSION

The stock of commercial seacucumber species in Egypt have been overfished and species are under threat of extinction because of fishing activities, restoration projects might be the only way to restore these species to their original habitat in addition to regular patrolling and harder punishment for illegal fishermen.

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