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The status of the fisheries of the sea cucumber in Sudan red sea coast

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Abstract

This study was conducted to highlight the status of the fisheries of sea cucumber in Sudanese Red Sea Coast, with an attempt to cooperate management between some government institutions and fishing sea cucumber private sector companies. Experimental fishing of sea cucumber for 12 month along Sudanese Red Sea Coast have been conducted in 2010 (April to June). In the Southern part of Red Sea coast (Ashad) and Northern part (Arkayai and Salak), which (Ayed, Najil, Buttan and Aramsk). Sea cucumber fisheries production data were taken from the Red Sea Fisheries Administration office. The results showed that catch per diver is highest in Ashad (2229 pieces) than Salak (229 pieces), but the dried sea cucumber production was highest in Salak (840 tons) than Ashad (754 tons). Nine species were mentioned during study period. *H. atra*, *H. lessonothuria* and *H. scabra* more are more abundant in Ashad in lower depth (5 to 15m). While in Salak *A. miliaris* and *T. ananas* are more abundant. In Ashad Seabed was covered by sea grass, while in Salak all species of sea cucumber were present in coral habitat. The study results indicate that sea cucumber annually production is facing instability in the range of (2.5-45 tons), urgent management plan is needed to organize the harvesting of sea cucumber along the Sudanese Red Sea coast.

Keywords: Sea cucumbers, red sea coast, sea cucumbers status, sea cucumbers production

1. Introduction

Globally, sea cucumbers fisheries contribution in maintaining livelihood and food security for large scale of local coastal communities and fishers (Steven, 2010). The use of sea cucumbers as a food item and a commodity began in China about 1000 years ago, which encouraged the development of capture fisheries in the region. However, the rising demand of the markets in Asia led to the depletion of local sea cucumber populations and prompted Asian traders to solicit sea cucumbers from locations further afield (Bruckner, 2006 and Purcell, 2010) ^[1, 9]. Currently, sea cucumber fishing occurs all over the world with some populations reportedly over-harvested (Lovatelli *et al.*, 2004). This increased demand is the primary cause of inflated prices of sea cucumbers globally and the driver of increased exploitation of stocks. Sea cucumber fisheries differ greatly in the scale of the fishing activities, status of stocks and the capacity of the management agency. Consequently, some management measures will be appropriate in some fishery scenarios but not others. The conservation and management of sea cucumbers are of paramount importance because these animals fulfill an important role in marine ecosystems and are a significant source of income to many coastal communities worldwide (Steven, 2010). At least 60 species are fished from more than 40 countries and most of the harvests are processed then exported to Asian markets (Steven, 2010). Beside that its vital role in marine ecosystems. In Sudanese Red Sea coast revenue from practicing of Sea cucumber fishing high than traditional fishing fisheries. Ibrahim (2000) recorded 6 species, of which the *Holothuria atra* (black lolly fish) is the most common. The major fishing grounds are Agig, Ashad, Suakin, Aros, Arakya and Dongonabbay. The high price of sea cucumber has enticed fishermen and traders to over fish (Red Sea Fisheries Administration, 2020) ^[6]. This high price encouraged illegal fishing practices, which has obliged the Fisheries Administration to ban the harvesting of the sea cucumber in January 2009. The vulnerability of sea cucumber populations to local extinction and the risk of long-term loss of fishery productivity prompted to consider the improved management of sea cucumber fisheries. The aim of this study is to highlight the status of sea cucumber fisheries in Sudanese Red Sea Coast and better way to manage this huge resource.

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2. Material and Methods

2.1 Fishing Companies practices

This study was based on an agreement between the Red Sea Fisheries Administration and Red Sea Fisheries Research Station and four companies to conduct an experimental harvest of sea cucumber for 12 month along the Sudanese Red Sea Coast in 2010 (April to June) in the southern area (Ashad) and northern area (Arkayai and Salak), the four companies are; (Ayed, Najil, Buttan and Aramsk). Water Depth in Ashad not exceeded 20m, where all depths average range between 5 to 15m but in Arkayai and Salak the depths exceed those in Ashad. Sea cucumbers were then measured to nearest (mm) and weighted to (g). Data of the production and export prices were collected from the Red Sea Fisheries Administration. Data required from the harvesting areas during the activity period were focusing on catch per species, days, and hours of diving. All these information was taken by two observers sent from the Fisheries Administration and the Fisheries Research Station, to the four companies. In Ashad, three companies participated the harvesting (Ayed, Najil and Aramsk), while Butan company didn't work for logistic reasons.

3. Results and Discussion

3.1 Abundance and distribution of Sea Cucumber

From tables 1, 2 and 3. It is appeared that the substratum of the two locations of experimental fishing of sea cucumber (Ashad and Salak) in the southern and the northern coast lay to be sandy with sea grasses and mangrove beds in southern area. while of the northern coast was covered with dead and live coral. Same findings were recognized by Mishrigi *et al.* (1993) and Randall (1992). Vital role governing the abundance and distribution of sea cucumber in Sudanese Red Sea coast is the type and topography of the Seabed's cover (Elgasem, 2000). First indicator of the abundance species in Sudanese red sea coast that the records from harvesting survey was that there are nine species inhabit in Sudan, rather than 6 which mention later by Elgasem (2000). Also from table (2), it is clear that *Holothuria atra* (lolly fish) and *Holothuriacabra* (sand fish) are more abundant in Southern coast of Sudan (Ashad) in lower depth (5 to 15m). While in Northern part (Salak) the most abundant one was *Actinopygamiaris* (brown sand).

3.2 Production of Sea Cucumber in Sudanese Red Sea coast

Fisheries of Sea cucumber production in Sudanese Red Sea Coast is showing instability and fluctuations from year to year, depending on the number of operating fishing companies since the year 2000 to 2020, and also due to many reasons: Return to excessive exploitation of sea cucumber fisheries by private companies and local fishers community near the coast, and also for the high price per kg (dried) of Sea cucumber that has enticed the fishers and traders for more excessive fishing of these fisheries globally (Purcell, 2010) ^[9]. Out of 2000 fishers in Sudanese Red Sea Coast, 100 are practicing sea cucumber fishing (Red Sea Fisheries Administration, 2020) ^[6]. El awad (2009) ^[12] found that the production of sea cucumber fisheries in the Sudanese waters was (about 60 tons). Until 2018 there were 8 companies worked in the fisheries of sea cucumber with slight increase in production (11 tons in 2019) and clear decreased in production from 2009 until 2018 not more than

5 tones (Red Sea Fisheries Administration, 2020) ^[6]. Sea cucumber fisheries in Sudanese Red Sea coast activities usually considered as a seasonal practices, joint individually or on groups by companies described as small scale fisheries (Elgasem 2000). Absent of a management plan to operate the sea cucumber fisheries in Sudanese Red Sea coast led to established sea cucumber forum from fishers, traders, and government institutes, they agreed to a 10 points plan that shares management responsibility with forum members also they have agreed to limit fishing effort and to share data on a controlled and limited harvest that will operate for 12 months from Jun 2010. So for that four companies had been practiced experimental fishing of sea cucumber in southern area of Sudanese Red Sea coast (Ashad) and northern coast (Salak and Arkayai), during the first June to July 2010. The actual days that spent in fishing, ranged between 20 to 23 days, because they spend the remaining days in fetching the sea cucumber. From tables (4) and (5), catch per diver in trip seems to be highest by Nijil Company (2229 individual) compared to less number by Ayed Company (1066 individuals). Number of sea cucumber per day for all companies ranged between 300 to 400 individuals in Ashad. In Salak, the number of sea cucumber per diver and per day were more different than Ashad, in Salak catch per day 40 individuals to 22 only, while catch per divers in whole trips high with Buttan (229), the lower with Ayed 33. Sea bed in Ashad cover with sea grass and high number of sea cucumber are recoded and low number of sea cucumber were present in Salak, which is covered with coral rock, But in Arkayai and Salak the depths increase, so no available data about population of sea cucumber on that depth, only one species was available there. This agrees with Steven (2012) ^[8] who find that the types of seabeds cover and depth play an important role in distribution and abundance of sea cucumber species.

3.3 Dried production

Processing fresh sea cucumbers into dried bech-de-mer for export has a long history practiced by sea cucumber fishers and companies in Sudanese Red Sea coast (Elgasem 2000). Sea cucumbers are eaten primarily by Asians as luxury seafoods for festive meals and as medicinal foods (Purcell, 2014). Once collected, sea cucumbers must be handled and processed carefully to achieve a dried product that has the best color, shape and appearance for Asian consumers. Well-processed sea cucumbers fetch high prices but a lack of care in processing will result in low prices for fishers and exported products. Different sea cucumber species lose different proportions of their body weight through processing, so conversion ratios are best calculated on a species by-species basis (Ngaluafé and Jessica Lee. 2013) ^[5]. These values were converted to wet weight based on dry weight corresponding to 10% of wet weight (Tsfamichael and Mohamud 2012). In the present investigation results showed that sea cucumber processing in Sudan is done by using salting method and sun drying to achieve a moisture content of 8-10% (SPC, 1994) ^[7]. Dried sea cucumber production by working companies in Salak 4200 fresh pieces were converted to dry 840 kg highest than that of Ashad 33974 fresh pieces, which were converted to 754 kg dry. Types of the sea cucumber, species and size are playing vital role in governing of converting the wet weight into dry weight (Purcell, 2014).

Table 1: The seabed nature of the southern area (Ashad) and northern area (Salak).

Substrate	Ashad	Salak
Sand	60%	10%
Sea grass	1.9%	0%
Coral	13.5%	0%
Dead coral	24.2%	40%
Mangrove	0%	0%
Live coral	0%	60%

Table 2: Abundance of sea cucumber species along the Sudanese red sea coast.

Species	English name	Abundance	
		Ashad	Salak
<i>Holothuria atra</i>	Lolly fish	++	+
<i>Opheodesomagrisee</i>	Black	+	+
<i>Stichopus horrens</i>	Curry fish	+	+
<i>Holthurialessonothuria</i>	Pardalis	++	+
<i>Actinopyga miliaris</i>	Brown sand	+	++
<i>Holothuria scabra</i>	Sand fish	++	+
<i>Personothuria graeffei</i>	Graffes sea cucumber	+	+
<i>Actinopyga echinites</i>	Deep water redfish	+	+
<i>Thelenota ananas</i>	Red prickly fish	+	++

More abundance = ++

Less abundance = +

Table 3: Annual production of Sea Cucumber of Sudanese Red Sea Coast 2021.

Year	Production (tones)	Percentage %
2001	37	15.3
2002	45	18.7
2003	31	12.8
2004	19	7.9
2005	20	8.3
2006	10	4.1
2007	15	6.2
2008	17	7.0
2009	3	1.2
2010	0.0	0.0
2011	5	2.1
2012	6	2.5
2013	2.5	1.0
2014	0.0	0.0
2015	0.0	0.0
2016	5.8	2.4
2017	4.25	1.8
2018	4.3	1.8
2019	11	4.6
2020	9.7	4.0
Total	241.25 tones	100

Table 4: Harvesting per number of sea cucumber, number of divers, total days for companies in Ashad

Companies	<i>H. atra</i>	<i>H. scabra</i>	<i>A. echinilis</i>	<i>T. ananas</i>	days	No. species/diver
Aramsk	-	7975	-	67	20	1340 (6 diver)
Nijil	155	14828	601	25	23	2229 (7 diver)
Ayed	39	6331	-	27	20	1066 (6 divers)

Table 5: Total number of S. Cucumber Catch per day for companies in Ashad

Companies	Total number of S. cucumber	Catch per day
Aramsk	8042	402
Nijil	15609	678
Ayed	6397	319

Table 6: Harvesting of sea cucumber species in Salak per Days and diver.

Companies	<i>H. atra</i>	<i>H. scabra</i>	<i>A. miliaris</i>	<i>T. ananas</i>	<i>P. graeffei</i>	<i>A. echinites</i>	C/ Days	C/diver
Aramsk	7	-	1118	13	-	2	40	142 8 diver
Nijil	25	22	880	12	20	-	31	119 6diver
Buttan	15	-	1700	58	3	59	42	229 7 diver
Ayed	7	4	230	23	2	-	22	33 6 divers

Table 7: Total number of S. cucumber Catch per day for companies in Salak.

Companies	Number of days	Total number of sea cucumber
Aramsk	28	1140
Nijil	31	959
Ayed	12	266
Buttan	43	1835
Total	114	4200

Table 8: Product by Dried weight for the companies working in Ashad and Salak.

Companies	Area			
	Ashad		Salak	
	No. of S. cucumber	Dry weight (kg)	No. of S. cucumber	Dry weight (kg)
Aramsk	10481	239	1140	228
Najil	17106	350	959	191.8
Ayed	6387	165	266	53.2
Buttan	0.0	0.0	1835	367
Total	33974	754	4200	840

Table 9: Size of sea cucumber in Ashad.

Figure	No. of sea cucumber	No. of sea cucumber per kg.	Weight by (gm)	%
Big	3397	55.4	100-120	10-3
Medium	13589	221.6	55-70	40-44
Small	16987	277	25-50	50-55
Total	33974	554		

Conclusion

The results of this study sets clearly that there are an urgent need to organize the harvesting of sea cucumber in Sudanese Red Sea coast, either in southern area (Ashad) and northern area (Salak). Effective management measures must be applied to conserve the sea cucumber fisheries. The experimental fishing management of sea cucumber fisheries through partnership between government fisheries institutions related and the private sector has proven its feasibility and must be applied with more regulation, control and evaluation.

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