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Latitudinal distribution of Tridacna spp. along Egyptian coasts of the Red Sea and Gulf of Aqaba

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ABSTRACT

Giant clams that belong to Subfamily Tridacninae are influential members of coral reefs ecosystems in tropical and sub-tropical areas. They provide these ecosystems with multiple ecological roles. Tridacnids are the largest bivalve worldwide and are harvested easily, leading to continual decline in their numbers. Their abundances and geographical distribution urgently need to be assessed if their recovery and restoration efforts are to be successful. Latitudinal distribution and species composition of *Tridacna* were studied within 16 sites along Egyptian coasts of the Red Sea and Gulf of Aqaba, using Underwater visual census surveys. Four species were recorded: *T. maxima*, *T. squamosa*, *T. Squamosina* and *T. rosewateri*. *T. rosewateri* was recorded for the first time in the Red Sea. Abundances and distribution of the explored species varied greatly within the selected sites; *T. maxima* was the dominant species along the study area with abundance of 6.19±2.63/125m^2 transect; meanwhile, only three individuals of *T. rosewateri* were observed in Marsa Egla and Marsa Asalaya. The surveyed species showed significant latitudinal distribution, as the four species exhibited incremental gradual distribution from North to south amongst sites, Marsa Asalaya showed the highest abundance (29.67±9.79 /125m^2 transect); the variation in distribution and abundance of *Tridacna spp.* between and among the studied sites indicated that variable factors might be influencing the distribution and abundance of the giant clams' population along coasts of the Egyptian Red Sea and Gulf of Aqaba.

Keywords: Giant clams, Tridacna, Geographical distribution, Red Sea, Gulf of Aqaba

1. INTRODUCTION

Giant clams (Subfamily Tridacninae), are important members of coral reef ecosystems, playing multiple roles in the framework of these communities. and their productivity. Their presence significantly influences the diversity and richness of fish and other fauna and flora in the degraded coral reef areas, as most of the soft tissues of the clams' bodies are serving as food sources for detritivores and some predators [1]

12 species of giant clams extant at the present time [2, 3], of which 10 species belong to the genus *Tridacna* i.e., *T. crocea* [4], *T. derasa* [5], *T. elongatissima* [6], *T. gigas* [7], *T. maxima* [5], *T. mbalavuana* [8], *T. noae* [5], *T. rosewateri* [9], *T. squamosa* [4], and *T. squamosina* [10] that was previously identified as *T. costata* by [11], 2008. The remaining two species belong to the genus *Hippopus*, i.e., *H. hippopus* [7], and *H. porcellanus* [12]. Old studies suggested that Tridacnids were a dominant feature of the shallow areas they are inhabiting [13]. [14] studied the abundance and distribution of *Tridacna spp.* in the Northen Egyptian Red Sea, clarifying that they have huge abundances within the studied sites as well.

Due to their economic value, tridacnids are immensely harvested, due to their large sizes and easy accessibility which led to the collapse of their natural stocks in different areas worldwide. This is probably the cause that all giant clam species are currently listed on the IUCN Red List of Threatened Species [15] and protected under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Most of them are considered to be at a lower risk/conservation-dependent status; however, according to [13], the IUCN status of Tridacninae is in critical need of updating to give the giant clams their merited conservation values; allowing them to emerge from their perilous state and regain natural abundances within the over-exploited areas.

In the study area, three species of giant clams have been reported in past studies along the Red Sea, (e.g., [17, 11, 18, 19], the three species are *Tridacna. squamosa* [4], *Tridacna. squamosina* [10] and *Tridacna. maxima* [5]. The latter also labelled the small giant clam and is stated to be the most abundant giant clam species in the Red Sea [20, 21, 22]; while only two species of giant clams are reported in the Gulf of Aqaba, *T. maxima* and *T. squamosa*. These *Tridacna* species exhibit different distribution patterns along the Red Sea [20].

Although they are prominent species in coral reef ecosystems along the Red Sea, data on their distribution and abundances in the region are scarce [23]. This study aims to assess the species composition of *Tridacna* populations along the Egyptian coasts of the Red Sea and Gulf of Aqaba and determine their geographical distribution patterns at different latitudes.

2. MATERIALS AND METHODS

2.1. Study area

Five sectors along the Egyptian coasts of Red Sea and Gulf of Aqaba were selected for a survey on *Tridacna* species conducted during 2021. Sector I represents the Gulf of Aqaba including four sites (Light house, Three pools, Sharks Bay and Elfanar beach, from north to south). Sector II represents the northern Red Sea at Hurghada area which includes two sites (NIOF, and Abu Ramada), sector III represents the northern middle Red Sea which includes two sites at Quseer area (Quseer1, and Alzereeb-Quseer2). Sector IV represents the middle Red Sea, and includes four sites (Porto Ghalib, Sataya, Marsa Egla, and Marsa Asalaya), sector V represents proper Red Sea and includes four sites (Ras Baghdadi, Shams Alam, Hankorab, and Qolaan). Sites are Mapped in Fig.1 and their exact latitudes and longitudes are listed in Table.1.

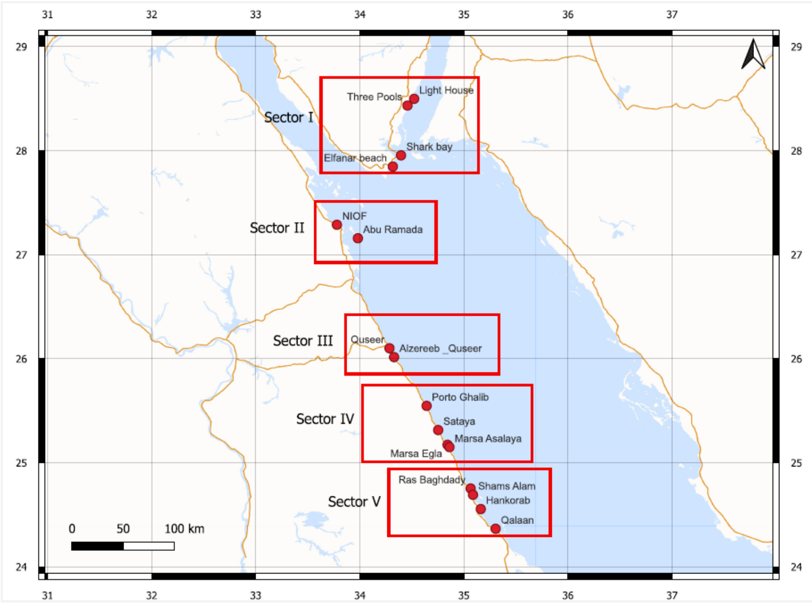


Fig (1): locations of the studied sectors and sites along the Red Sea and Gulf of Aqaba.

Table 1: latitudes and longitudes of the studied sites.

Sector	Site	Latitude	Longitude
I	Three Pools	28°26'3.11"N	34°27'27.07"E
	Light House	28°29'56.03"N	34°31'16.44"E
	Shark bay	27°57'18.84"N	34°23'42.75"E
	Elfanar beach	27°50'51.88"N	34°18'59.80"E
II	NIOF	27°17'16.11"N	33°46'45.61"E
	Abu Ramada	27° 9'30.86"N	33°58'50.93"E
III	Quseer-1	26° 6'3.15"N	34°17'3.64"E
	Alzereeb-Quseer2	26° 0'56.60"N	34°19'42.33"E
IV	Porto Ghalib	25°32'48.96"N	34°38'28.02"E
	Sataya	25°18'52.12"N	34°45'7.53"E
	Marsa Egla	25°10'23.19"N	34°50'31.36"E
	Marsa Asalaya	25° 9'1.54"N	34°51'38.64"E
V	Ras Baghdady	24°45'10.24"N	35° 3'50.96"E
	Shams Alam	24°41'32.01"N	35° 5'12.63"E
	Hankorab	24°33'18.87"N	35° 9'41.50"E
	Qolaan	24°21'56.13"N	35°18'14.07"E

2.2. Data Collection

Underwater visual census (UVC) methods have been used to estimate the abundances of marine animals inhabiting coral reef ecosystems since the 1950s [24, 25]. Those techniques have been used for many years and are regarded as relatively accurate and cost effective [27, 28]. They are usually quick and inexpensive to employ, and non-destructive in nature. These advantages have led to their adoption in many coastal resource studies [29, 30, 31]. The abundance of each species was surveyed at the selected sites along the Red Sea and Gulf of Aqaba by a visual census technique using belt transect, as described in [32]. Three transects of 125 m^2 area (25 m length and 5m width) were surveyed at the reef edge of each site using snorkeling.

Data for abundance and length frequency distribution was collected along the 48 surveyed transects with an overall area of 6000 m^2 along the study area. Relative abundances were later calculated from the collected data as (pooled average abundance of species i at each site/pooled average abundance of all species at all the sites) × 100. Species composition was determined as the proportion each species form from the total number of *Tridacna spp.* within the site as follows: $\mathbf{(n_i/N)*100}$; where $\mathbf{n_i}$ is the number of individuals belonging to species $_i$ within a site, and **N** is the total number of individuals of *Tridacna spp*. within the site.

2.3. Data Processing

Data were visualized and processed using Microsoft Excel; Analysis of variance (One-way ANNOVA) was performed to assess statistical significance of differences among various studied variables using R-Studio software.

3. Results

3.1. Abundance of *Tridacna spp*.

During the present study, four species of Tridacna were recorded; *T. maxima*, *T. squamosa*, and *T. squamosina* that were reported in the previous studies along the Red Sea, and *T. rosewateri* that was reported for the first time in the Red Sea.

A total of 545 individuals were observed during the surveys period. *T. maxima* was the most abundant species with 297 individuals surveyed during the study. Followed by *T. squamosa* that was represented by 181 individuals within the studied area. *T. squamosina* recorded 35 individuals, 29 observed individuals were not identifiable, as they presented the smallest sizes with their shell length not exceeding 5cm, meanwhile *T. rosewatrei* was the least abundant species with only 3 observed individuals at Marsa Egla and Marsa Asalaya.

3.1.1. Species abundance

Fig. 2 and Table (2) illustrate giant clam species abundance expressed as the mean number of individuals belonging to each of the studied species within one transect of 125m^2 area during the present study. As formerly mentioned, *T. maxima* dominated the study area, with an overall mean of 6.19 individuals per transect, Followed by *T. squamosa* that was represented by 3.77 individuals per transect. *T. squamosina* recorded 0.73 individuals per transect. *T. rosewatrei* was the least abundant species with an average of 0.06 observed individuals within the transect. There was a strong correlation between the numbers of individuals and species, which was confirmed with one-way ANOVA, as species variation was found to drive the strongest variations in the abundance of giant clams in the Egyptian coasts of the Red Sea with *P-value* $2e^{16}$.

Table.2: Species abundance along the study area expressed as the mean number of individuals belonging to each of the studied species within one transect of 125m^2 area.

Species	Total number of *clams*	Abundance per transect (125m^2)±SD
Tridacna maxima	297	6.19±2.63
Tridacna squamosal	181	3.77±2.63
Tridacna squamosina	35	0.73±2.63
Tridacna rosewateri	3	0.06±2.63
*Tridacna sp.**	29	0.60±2.63

* *Tridacna sp.* Refers to individuals of *Tridacna* <5cm in shell length.

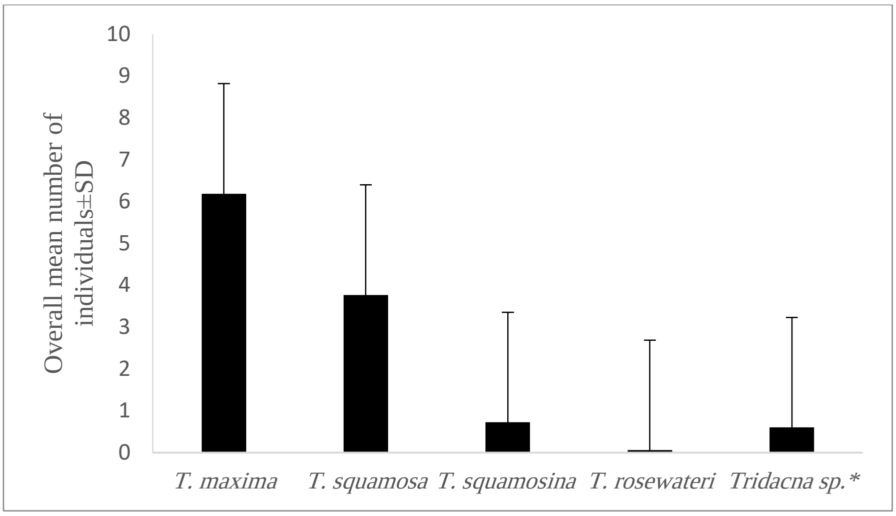


Fig (2): Species abundance expressed as the mean number of individuals belonging to each of the studied species per transect of 125m^2 area along the Egyptian Red Sea and Gulf of Aqaba, *Tridacna sp. refers to the unidentified individuals with shell lengths shorter than 5cm.**

Relative abundance for the different species of Tridacna that were surveyed during the study. T. maxima had the highest relative abundance, it constituted 55 % of the Tridacna population in the study area, followed by T. squamosa that formed 33% of the Tridacna population. T. squamosina and an unknown species of Tridacna composed 6% and 5 % respectively of the Tridacna inhabiting the Egyptian Red Sea and Gulf of Aqaba. Meanwhile T. rosewateri represented less than 1 % of the Tridacna population (Fig. 3)

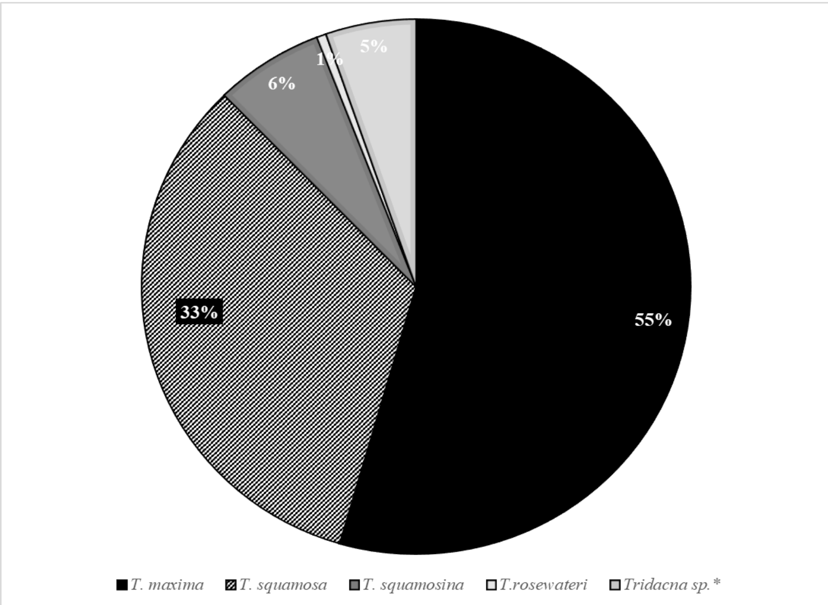


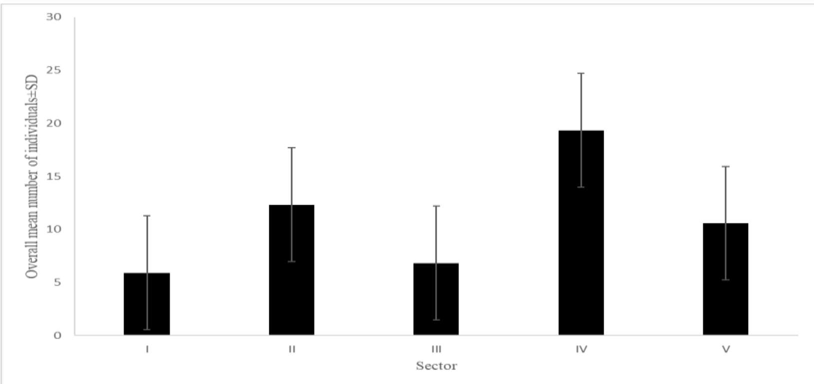
Fig (3): Relative abundance of *Tridacna* species expressed as (Mean abundance of each species /pooled average abundance of all species at all the sites)*100.

Abundance within sectors

Table(3) and Fig. 4 demonstrate the variations in abundance of *Tridacna* population in the study area along the Egyptian coast of the Red Sea and Gulf of Aqaba expressed as the overall mean number of clams observed within one transect of 125m^2 area. The lowest abundances are in the first sector (I) along the Gulf of Aqaba with only 71 individuals recorded during the study which accounts for 5.92 individuals per one transect of area of 125m^2; followed by the third sector (III) with an overall abundance of 6.83 individuals per transect; the significant low abundances within the Gulf of Aqaba and Quseer sectors can be derived by the fact that these two sectors are associated with high diving and fishing activities. abundances of Tridacna increase as we move from North to South, till it reaches its maximum in the fourth sector (IV) in the middle of the Red Sea with 232 individuals observed resembling an abundance of 19.33 individuals per transect unit, afterwards, abundance decreases to become 127 individuals in sector V leaving the proper Red Sea with an abundance of 10.58 individuals per transect. The variation within the studied sectors controlled the abundance of *Tridacna spp.* significantly with a *P-value* 6.04e^{-05}.

Table.3: Sector abundance of Tridacna, expressed as the mean number of clams observed within one transect of 125m^2 area for each of the studied sectors along the Egyptian coast of the Red Sea and Gulf of Aqaba.

Sector	Total number of *Tridacna*	Abundance per transect (125m^2)±SD
I	71	5.92±5.35
II	74	12.33±5.35
III	41	6.83±5.35
IV	232	19.33±5.35
V	127	10.58±5.69



Fig(4): The abundance of *Tridacna spp*. within the five sectors along which surveys were conducted. Abundance is expressed as the mean number of clams observed within one transect of 125m^2 area for each of the studied sectors along the Egyptian coast of the Red Sea and Gulf of Aqaba.

3.2. Abundance and Species composition within sites

The distribution pattern of *Tridacna spp.* across the studied sites is identical to that across the sectors described beforehand. As it is shown in Table 4 and Fig.5. *Tridacnids* are scarcer in the Northern most sites, their numbers increase gradually heading south. The lowest abundance was obtained in the Three pools site on the Gulf of Aqaba with only 7 individuals recorded counting for abundance of 2.33 individuals per transect. The highest numbers obtained of *Tridacna* was recorded in Marsa Asalaya, Marsa Egla and Shams Alam with 89, 83, and 82 individuals observed respectively, making Marsa Asalaya the site with the highest abundance of giant clams with 29.67 individuals per transect.

Regardless of the incremental gradual distribution from north to south, some sites in the southern sectors showed low abundances of *Tridacna spp.* e.g. Porto Ghalib, and Hankorab; meanwhile along the Northward sites, Abu Ramada -the offshore site- has significant higher abundance of *Tridacna* compared to its neighboring Northern sites with 61 individuals resembling an abundance of 20.33 individuals per a

$125m^2$ transect. Similarly, to the sector influence, variations within the sites lead to significant variations in the abundance of *Tridacna* along the Red Sea, the abundance decrease significantly from north to south, *P-value* <0.005.

Table 4. Abundance of *Tridacna spp*. within the studied sites along the Egyptian coast of the Red Sea and Gulf of Aqaba, expressed as the number of individuals of Tridacna spp. within a unit transect of $125m^2$.

Site	Total Number of *Tridacna*	Abundance per transect ($123m^2$) ±SD
Light House	13	4.33±9.79
Three Pools	7	2.33±9.79
Shark bay	22	7.33±9.79
Elfanar beach	29	9.67±9.79
NIOF	13	4.33±9.79
Abu Ramada	**61**	20.33±9.79
Quseer-1	10	3.33±9.79
Alzereeb-Quseer-2	31	10.33±9.79
Porto Ghalib	9	3±9.79
Sataya	**52**	17.33±9.79
Marsa Egla	**82**	27.33±9.79
Marsa Asalaya	**89**	29.67±9.79
Ras Baghdadi	19	6.33±9.79
Shams Alam	**83**	27.67±9.79
Hankorab	10	3.33±9.79
Qolaan	15	5±9.79

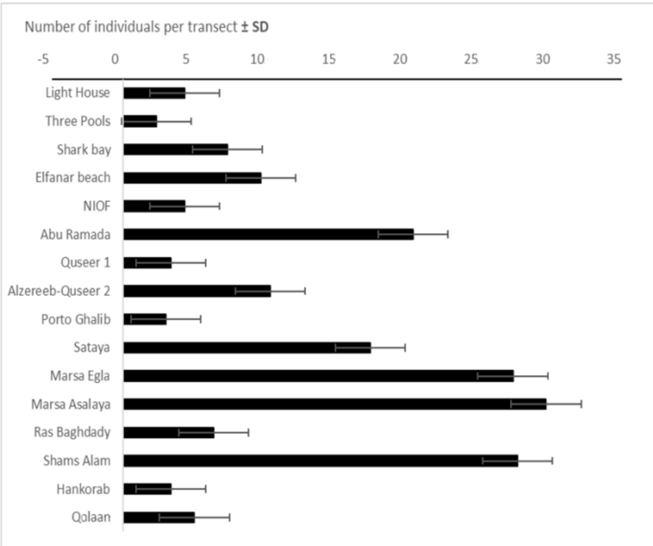


Fig (5): The abundance of *Tridacna spp.* along the 16 studied sites along the Egyptian coast of the Red Sea and Gulf of Aqaba, expressed as the mean number of individuals observed per a unit transect of $125m^2$.

Table (5) and Fig. 6 demonstrate the species composition of *Tridacna* population within the studied sites. *T. maxima* was the dominant species along the study area, representing most of the giant clams' populations in all the sites particularly the Northern most sites, it represented 100% of the population in the light house site, it constitutes 86% and 96 % in the Three Pools and the Shark Bay sites, however it was the only identified species in these two sites; while its least contribution was at Marsa Egla as it represented 41.5% of the population. Although *T. squamosa* was completely absent from the Northen sites at the Gulf of Aqaba, it was the second largest contributor to the Tridacnids populations in the Egyptian Red Sea, it showed contrary distribution to the *T. maxima* as the later had higher dominance in the North and their percentages decreased slightly towards the South, on the other hand, *T. squamosa* showed incremental distribution from North to South; it's highest input was 40.4% of the Tridacnids population in Marsa Asalaya. *T. squamosina* only appeared from the sites in the middle of the study area, it was completely absent from the North, and its highest percentage was recorded in Ras Baghdadi with 21% of the *Tridacna* population. Only 3 individuals of *T. rosewateri* were encountered within the surveys in the two convergent sites Marsa Egla and Marsa Asalaya.

Table 5. Species composition of Tridacna population within the 16 studied sites along the Egyptian coast of the Red Sea and Gulf of Aqaba, expressed as the percentage each species composes of the Tridacna population within the site.

Species / Site	***T. maxima***	***T. squamosa***	***T. squamosina***	***T. rosewateri***	***Tridacna sp. <5cm.***
Light House	100.	0.0	0.0	0.0	0.0
Three Pools	85.7	0.0	0.0	0.0	14.3
Shark bay	95.5	0.0	0.0	0.0	4.5
Elfanar beach	55.2	37.9	0.0	0.0	6.9
NIOF	69.2	30.8	0.0	0.0	0.0
Abu Ramada	52.5	36.1	0.0	0.0	11.5
Quseer-1	50	30.0	20.0	0.0	0.0
Alzereeb-Quseer-2	64.5	32.3	3.2	0.0	0.0
Porto Ghalib	66.7	22.2	0.0	0.0	11.1
Sataya	57.7	32.7	0.0	0.0	9.6
Marsa Egla	41.5	36.6	18.3	1.2	2.4
Marsa Asalaya	49.4	40.4	4.5	2.2	3.4
Ras Baghdadi	47.4	26.3	21.1	0.0	5.3
Shams Alam	48.2	39.8	6.0	0.0	6.0
Hankorab	50.0	40.0	10.0	0.0	0.0
Qolaan	46.7	26.7	20.0	0.0	6.7

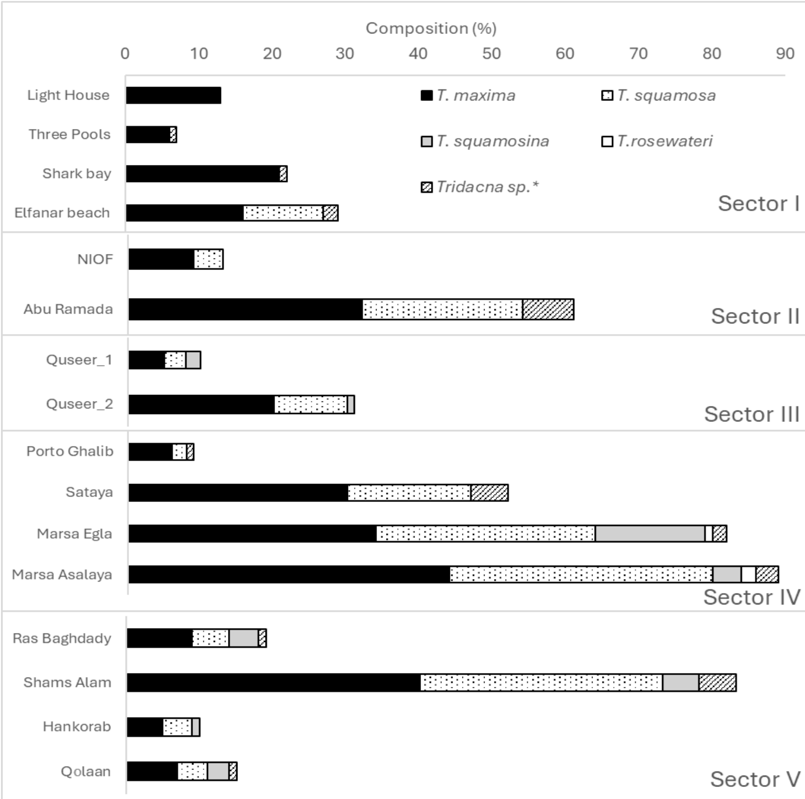


Fig (6): Species composition of *Tridacna* population within the 16 studied sites along the Egyptian coast of the Red Sea and Gulf of Aqaba, expressed as the total recorded number of individuals belonging to each species within each site and sector.

2. Length Frequency distribution

Individuals surveyed were classified into 6 length groups according to the total shell length. The smallest size group contained clams smaller than 5 cm, while the largest group composed of clams larger than 25 cm in shell length, the inbetweener groups ranged from 5-25 cm and the range of each class was 5 centimeters. Table (6) and Fig. 7 exemplify the length frequency distribution of Tridacna. The middle groups have higher frequencies, while the smallest and largest group were recorded fewer times during the study. The size group 11-15 cm was the most recorded category with 187 individuals, whereas the size classes >5cm and <25 cm had the lowest rate of recurrence with 29 and 25 individuals recorded respectively. The size of the clam represented as the total shell length contributed vastly to the abundance of *Tridacna spp*. *P-value* <0.005.

Table 6. Length frequency distribution of individuals of Tridacna belonging to different size classes, within the studied sites along the Egyptian coast of the Red Sea and Gulf of Aqaba.

Size-classes (Cm)	Frequency
<5	29
5-10	177
11-15	187
16-20	86
21-25	40
>25	26

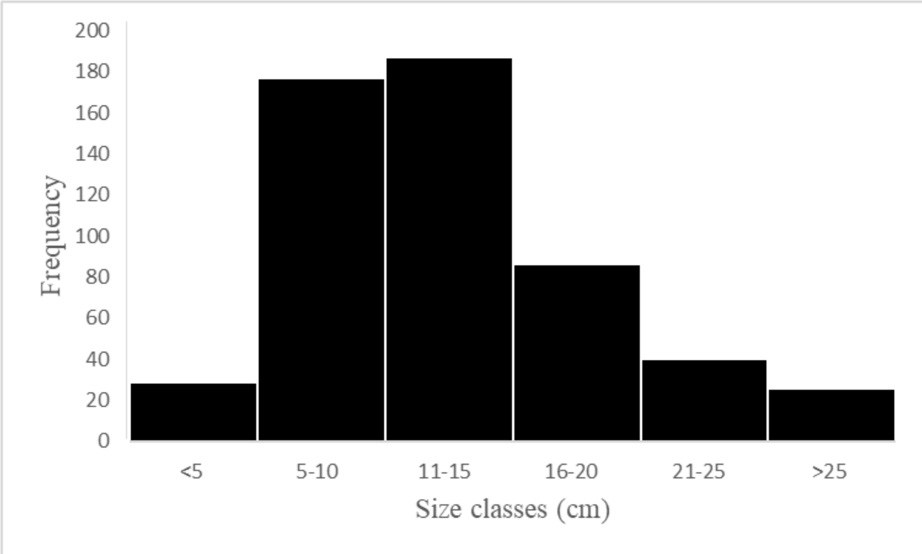


Fig (7): length frequency distribution of *Tridacna spp*. expressed as the total number of individuals belonging to each size class along the entire study area.

2.1. Length Frequency distribution for species

Table (7) and Fig. 8 demonstrate the length frequency distribution for each of the studied species. The size group >5 cm was only identified to Genus's level. The *Tridacna* species with higher abundances presented larger size range, while the infrequent occurring species showed to a lesser extent size groups. *T. maxima* that was the dominant *Tridacna* species within the study area exhibited wide range of shell lengths, the length frequency distribution showed a declining trend, the larger the shell length, the lower the frequency, the most occurring class was the size group 5-10cm, and the least occurring class was the size group >25. *T. squamosa* showed a similar distribution pattern with a slight difference that the most occurring size group was from 10-15cm, and the size class >25cm was not recorded at all. *T. squamosina* which is regularly a larger clam and is found at higher depths, it showed significantly different pattern as the largest size classes were more frequently occurring, and the smallest surveyed individuals belonged to the size class 16-20cm, and the most frequent size class is the largest groups with individuals greater than 25cm in shell length. As for *T. rosewateri*, it was the rarest species with only three individuals recorded, all of which had a shell length of 11-15cm.

Table 7. Length frequency distribution for the different *Tridacna spp.* along the Egyptian coast of the Red Sea and Gulf of Aqaba, expressed as the total number of individuals belonging to the different size classes for each studied species.

Length (cm) / Species	<5	5-10	11-15	16-20	21-25	>25
T. maxima	0	118	116	43	15	5
T. squamosa	0	59	68	41	13	0
T. squamosina	0	0	0	2	12	21
T. rosewateri	0	0	3	0	0	0
T. sp. <5cm	29	0	0	0	0	0

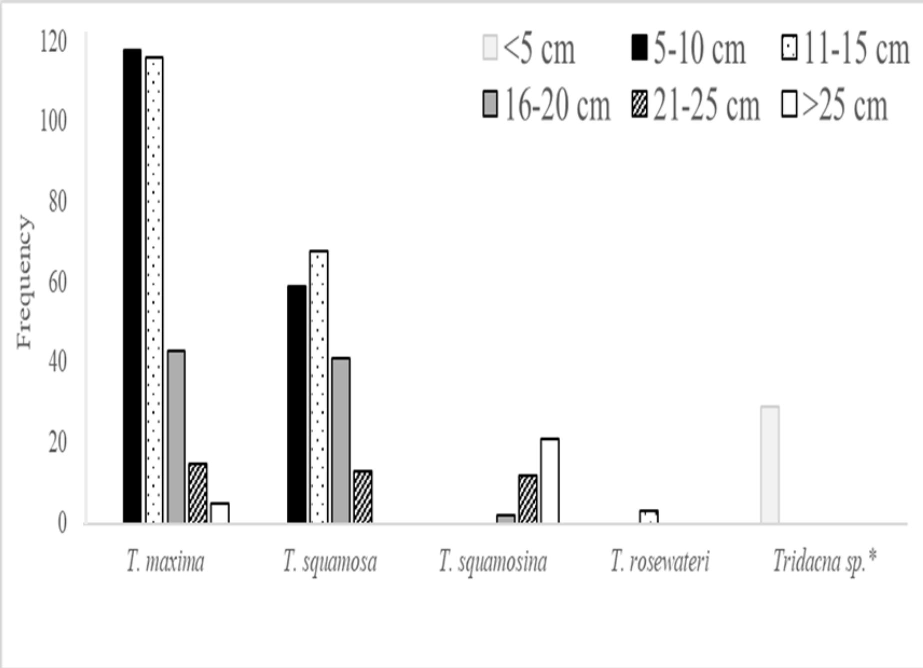


Fig (8): Length frequency distribution for the different *Tridacna spp*. along the Egyptian coast of the Red Sea and Gulf of Aqaba during 2021, expressed as the total number of individuals belonging to the different size classes for each studied species.

2.2. Length Frequency distribution within sectors

Table 9 and Fig. 8 display the length frequency distribution of *Tridacna* within the Five studied sectors. Notably regarding the length frequency distribution of individuals belonging to Genus *Tridacna*, all the sectors exhibited comparable patterns where the middle-sized groups have the greatest frequencies, while the terminal classes on the larger and smaller sides have significantly lower frequencies. Nevertheless, the northern sectors (first and third sectors) on the Gulf of Aqaba and the Northern Middle Red Sea showed less replicates of clams belonging to the larger size classes i.e. classes with shell length larger than 15cm compared to the southern sectors at the middle and proper Red Sea. Analysis of variance test proposed that both sectors and size of the clam control the abundance and abundance of *Tridacna* in the Red Sea, their interaction significantly influence the abundance of *Tridacna* as well (P-values <0.005).

Table 8. Total and overall mean Abundances of the individuals *Tridacna* belonging to different size classes, along the five surveyed sectors along the Egyptian coast of the Red Sea and Gulf of Aqaba.

Sector / Size (cm)	Sector I	Sector II	Sector III	Sector IV	Sector V
<5	4	7	0	11	7
5-10	27	35	7	77	38
11-15	27	42	10	80	38
16-20	9	20	14	34	23
21-25	1	9	8	19	11
>25	3	2	2	11	10

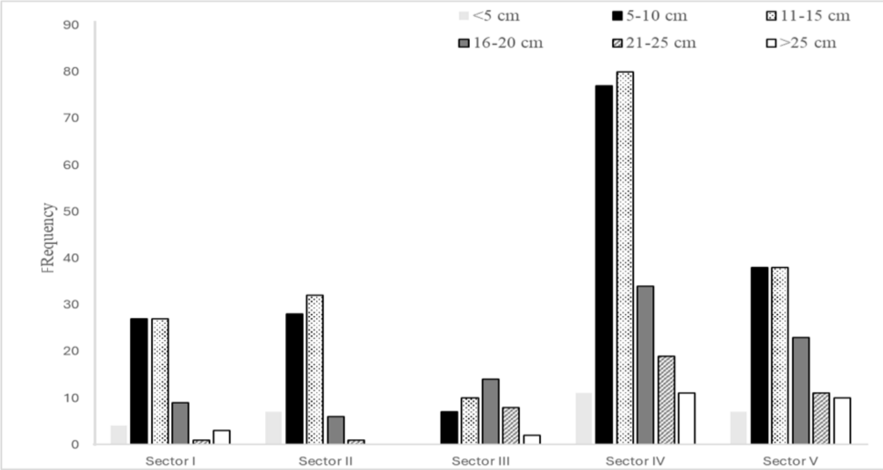


Fig (9): length frequency distribution of *Tridacna spp.* expressed as the overall mean of number of individuals observed within the studied sectors classified into different size classes.

4. DISCUSSION AND CONCLUSION

Giant clams are among the most astonishing and endangered marine invertebrates due to the ease of their fishing [11] . Based on the worldwide surveys, the lowest abundance of giant clams was estimated at 0.06 individual/100 m^2 that was recorded in the Philippines during 2007, while the highest abundance was documented in Matira, French Polynesia with 2006583.75 individual/100 m^2; previous studies worldwide proposed that high abundances were found in protected areas or sites with low human-related disturbance [33, 34].

During the surveys on our Study, four species of *Tridacna* were observed. *T. maxima*, *T. Squamosa*, *T. squamosina* and *T. rosewateri* that we recorded for the first time in the Red Sea. The overall number of species of *Tridacna* varied among the few previous studies that were carried out within the Red Sea and Gulf of Aqaba which considered the distribution and abundances of *Tridacna spp.* communities within the Red Sea, e.g. [14, 35, 11, 3, 23]. [14] focused on the Northern Red Sea and Gulf of Aqaba, reported only two species, i.e. *T. maxima*, *T. Squamosa.* [35] studied the benthic communities associated with coral reefs along the Gulf of Aqaba and reported only one species which is *T. maxima,* the most common species. [11] Recorded both *T. maxima,* and *T. Squamosa* and was the first to record *T. squamosina* in the Gulf of Aqaba. [3] confirmed the presence of the same three species previously reported by [11] in the Red Sea.

[23] performed a large-scale survey along the coast of Saudi Arabia of the Red Sea, they found that *T.* maxima represented 89% of the *Tridacna* populations, while *T.* squamosa represented only 11% of the population. They also reported that *T. squamosina* had sporadic sightings with only 6 individuals observed that were found at a single reef of their study. The present study found that *T.* maxima represented 55% of the *Tridacna* population, while *T.* squamosa represented about 33% of the giant clams' population in the Red Sea, meanwhile, *T. squamosina* contributed to a higher percentage of the population with 6%, while *T. rosewateri* was tremendously rare with only 3 individuals observed at Marsa Egla and Marsa Asalaya.

This research suggested a progressive increase in the abundance of *Tridacna spp*. along the Coast of the Red Sea and Gulf of Aqaba from North and South; Previous studies [35, 36, 23] agreed that there is a significant latitudinal gradient in the abundances of *Tridacna spp.* nevertheless, they stated that abundances of *Tridacna spp.* in the Red Sea showed decrease in the abundance of nearly 5-fold from North to South which was contrary to our Results. It might be due to locations and environmental differences between East and West of the Red Sea.

Despite the decreasing gradient of abundance and abundance of *Tridacna spp.* along the study area, some of the studied sites in the southern sectors showed low abundances*;* meanwhile, Abu Ramada in the North has a significantly higher abundance compared to its neighboring Northern sites. [23] also highlighted the occasionally strong alterations between and among different sites they studied. Results of the analysis of variance confirmed that both species and size of the clam play a major role in affecting the abundance of *Tridacna* in the Red Sea as discussed previously, it also suggested that the interaction between both species and size drive immense variations in the abundances of *Tridacna*.

The variation in *Tridacna spp.* distribution and abundance between and among the studied sites indicate that variable factors might control this distribution, species composition and abundance of the giant clams' population along the Red Sea and Gulf of Aqaba. Further investigations and more intense conservation efforts are recommended to study giant clams in the Red Sea for their important ecological and economic values.

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