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Trammel net fishing in Jeddah: species composition, relative importance, length-weight and length-girth relationships of major species

Mohamed Hosny Gabr and Ahmad Osman Mal

Abstract
Efficiency and selectivity of trammel nets used in Jeddah fisheries were assessed in terms of species composition and catch per unit effort. The index of relative importance was estimated for each species. Trammel nets of three inner-panel mesh sizes were used in the fishing operations. Moreover, the length-weight and length-girth relationships for ten fish species were described. Results indicated that the catch of trammel nets was composed of 99 species belonging to 36 families. The overall catch per unit effort was estimated to be 244 individuals (34.6 kg)/1000 m net length. Members of four families: Siganidae, Lethrinidae, Scaridae and Acanthuridae represented collectively 75.05% of the total number of fish caught, and 74.6% of the total biomass of fish caught. In these major fish families, four species: *Siganus rivulatus*, *Acanthurus sohal*, *Hipposcarus harid*, and *Lethrinus harak* were the most abundant and important species representing collectively 45.2% of the total catch, and having the highest index of relative importance: 29.2%, 15.4%, 12.7%, and 12.4%, respectively. The length-weight and length-girth relationships were described for the most abundant 10 coral reef species, two species of them: *Rhinocanthus assassi* and *Plectorhinchus gaterinus* have no previous data on length-weight relationships in the Literature.

Keywords: Trammel net Species composition, Index of Relative Importance, Length-Weight relationship, Length-Girth relationship

Introduction
Trammel nets are included as sub-group of gillnets category which are of the oldest types of passive fishing gears that are widely used to harvest diverse marine species [1, 2]. They are consisting of three rectangular walls of netting panels positioned vertical, by means of floats and sinkers, at the surface, at the bottom, or in the midwater [3]. Due to their structure, a fourth catching method; trammeling (forming pocket) is characteristic to trammel nets beside wedging, gilling and entangling characteristic to gillnets [4, 5]. Consequently, trammel nets have low species and size selectivity compared to gillnets [6-11]. Thus, trammel nets are of the most suitable sampling gears used to investigate the species composition in coral reef areas because they catch more species and numbers in less time having the highest coefficient of variation than other sampling gears [7, 12]. Gillnets and trammel nets having different mesh sizes are recommended by Hovgård and Lassen [5] to be used in fishing operations to catch as many species as possible and getting fishes having large size ranges in stock surveys.
For describing the biodiversity and thence its importance in given areas, the first and most often used metrics are the species composition (species richness) and endemism [13]. However, the steep declines in fish stocks and loss of marine habitats due to overfishing reflected an increased pressure on marine biodiversity [14].
Information about the species composition and relative abundance of the different species caught by trammel net fishing in the Red Sea fisheries of Saudi Arabia are not available. The aim of the present study is to determine the percentage composition, estimate the relative abundance (expressed in catch per unit effort) and relative importance 'IRI', and to describe the length-weight and length-girth relationships of the major species caught by monofilament trammel nets in Jeddah coral reef fisheries.

Material and Methods

In Jeddah coral reef fisheries, monofilament trammel nets are the most widely used fishing nets. Trammels nets of 50, 56 and 62 mm inner-panel mesh size (stretched) are usually used by local fishermen to catch different target species. The experimental fishing operations in the present study used the monofilament trammel nets having the three different mesh sizes used by fishermen. The fishing area, net design, mode of action and effort exerted in the fishing operations in the present study is the same as described in Gabr and Mal [15, 16]. The specifications of trammel nets used in the present study are listed in Table 1, and Fig. 1 shows the fishing operation using trammel nets.

Table 1: Specifications of trammel nets used in Jeddah coral reef fisheries

Gear Item	Trammel nets
Unit length	45-50 m
Net depth	0.9 m
Number of Units	9
Float line material and diameter	Polyethylene, 4 - 5 mm
Lead line material and diameter	Polyethylene, 4 - 5 mm
Number and material of floats per unit	60-70 Cork (25 gf each)
Distance between two floats	60 - 65 cm
Number of lead sinkers per unit	110 – 120 (35 g each)
Distance between two sinkers	35 - 40 cm
Inner panel mesh size and twine diameter	50 - 62 mm 0.3 mm
Outer panel mesh size and twine diameter	150 - 170 mm 0.4 mm
Twine material	Polyamide, monofilament

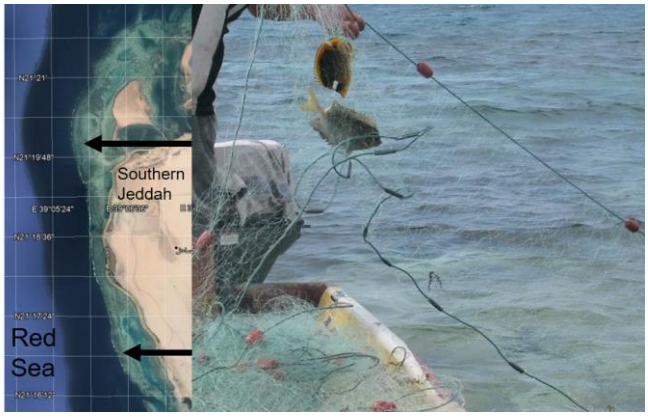

Fig 1: Fishing with trammel net in Jeddah Fisheries

The caught species were separated and identified based on Abu Shusha *et al.* [17] and the global species database information software available online 'Fishbase 2000' [18]. The total fish length (L) and maximum fish girth were measured to the nearest 0.1 cm, and the total body weight (W) was measured to the nearest 0.1 g, for each specimen.

The total number of species was recorded, and the percentage composition of each species was expressed in numbers and biomass relative to the total catch. The following formula, modified from De Metrio and Megalofonou [19]: f = (a'/1000) x g was used to calculate the fishing effort (f) and catch per unit effort (CPUE) for the different species, where a' is the average length of nets used per day (divided by the 1000 m effort unit for gillnets), g is the number of fishing days, CPUE = N /f (N is the number of fish caught).

CPUE = B /f (B is the biomass of fish caught).

The pasgear 2 program [20] was used to estimate the index of relative importance (% IRI) of each species (i) in the catch composition, by the following equation:

$$\%\ \mathrm{IRI} = \frac{(\%W_i + \%N_i) \times \%F_i}{\sum_{j=1}^{S}(\%W_j + \%N_j) \times \%F_j} \times 100$$

Where % W_i is percentage weight,%N_i is percentage number of each species of total catch,%F_i is percentage frequency of occurrence of each species in total net settings, and S is total number of species.

The length-weight relationship for the major ten species, having the largest% IRI values, was described using the power equation: $W = a\ L^{b}$, which can be converted to the linearized form:

$$Ln\ W = Ln\ a + b\ Ln\ L,$$

where *Ln* a is the intercept and b is the slope of the regression analysis between *Ln* W and *Ln* L.

The length-maximum girth (G_{max}) relationship for the major ten species was estimated using the following linear equation: $G_{max} = c + d\ L$, where c is the intercept and d is the slope of the regression analysis.

Results and Discussion

Trammel net fishing in Jeddah occurs mainly in the shallow waters of the coral reef flats. It is of the multispecies nature as it occurs in the coral reef ecosystems which are characterized by high diversity of coral reef fishes. This is due to the heterogeneous nature of the coral reef habitat accommodating large size-ranges and numerous functional niches of reef fishes in relatively small areas [21].

Species Composition

In the present study, results in Table 2 show the names, numbers and weights, catch per unit effort *'CPUE'*, length range and mean length of the different species caught with monofilament trammel nets in Jeddah. A total number of 3297 specimens was caught representing ninety-seven fish species belonging to 34 families and other two molluscan species belonging to two families. The percentage composition of each family, in terms of numbers and biomass, was shown in Fig. 2. However, Gabr and Mal [22] showed that the catch of multifilament gillnet fishing composed of 43 and 53 species belonging to 16 and 23 families in Jeddah and Thuwal, respectively. This means that more species belonging to more families are caught with trammel nets in the present study compared to those caught with gillnets as reported in Gabr and Mal [22].

The number of species recorded (species richness) by family is shown in Figure 3. The largest number of species was recorded in family Labridae (11 species) followed by species of family Lethrinidae (10 species), family Scaridae (9 species) and family Acanthuridae (9 species). Although it has the highest species richness, members of family Labridae represented collectively 1.7% (in numbers) and 2.12% (in weight) of the total catch, whereas family Siganidae with low species richness (3 species) represented 22.29% (in numbers) and 19.34% (in weight) and ranked the first of all families.

Table 2: Species composition, catch per unit effort, and length range of the different species caught with trammel nets in Jeddah fisheries

Family	Species	N	%	Wt (gm)	%	CPUE		Length range		Mean L (cm)
						N/f	B/f	Min.	Max.	
Acanthuridae	*Acanthurus sohal*	318	9.6	50057	10.7	23.6	3707.9	12.6	36.0	20.4
	Ctenochaetus striatus	112	3.4	6772	1.4	8.3	501.6	12.2	18.7	14.6
	Naso elegans	19	0.6	8369	1.8	1.4	619.9	30.0	41.5	36.1
	Acanthurus mata	6	0.2	513	0.1	0.4	38.0	15.0	18.0	16.5
	Naso unicornis	10	0.3	5926	1.3	0.7	439.0	15.5	54.6	32.7
	Acanthurus gahm	5	0.2	631	0.1	0.4	46.7	12.6	21.6	17.5
	Zebrasoma desjardinii	8	0.2	367	0.1	0.6	27.2	9.1	16.0	12.1
	Acanthurus nigricauda	2	0.1	207	0.0	0.1	15.3	16.5	19.0	17.8
	Acanthurus nigrofuscus	2	0.1	94	0.0	0.1	7.0	12.5	13.3	12.9
Albulidae	*Albula vulpes*	2	0.1	849	0.2	0.1	62.9	36.8	37.0	36.9
Balistidae	*Rhinecanthus assassi*	93	2.8	7860	1.7	6.9	582.2	11.8	19.9	14.6
	Balistoides viridescens	6	0.2	2766	0.6	0.4	204.9	15.5	31.5	23.7
	Pseudobalistes flavimarginatus	1	0.0	1900	0.4	0.1	140.7	-	-	49.0
Belonidae	*Tylosurus choram*	1	0.0	25	0.0	0.1	1.9	-	-	56.0
	Tylsurus crocodilus	1	0.0	481	0.1	0.1	35.6	-	-	65.0
Bothidae	*Bothus pantherinus*	2	0.1	86	0.0	0.1	6.4	13.6	16.0	14.7
Carangidae	*Caranx melampygus*	14	0.4	1279	0.3	1.0	94.7	16.2	24.2	19.3
	Caranx ignobilis	2	0.1	6107	1.3	0.1	452.4	42.8	74.0	58.3
	Carangoides bajad	1	0.0	121	0.0	0.1	9.0	-	-	21.6
	Trachinotus blochii	1	0.0	320	0.1	0.1	23.7	-	-	28.2
	Scomberoides tol	1	0.0	233	0.0	0.1	17.3	-	-	34.1
Cirrhitidae	*Cirrhitus pinnulates*	7	0.2	751	0.2	0.5	55.6	14.1	18.5	16.7
	Paracirrhites forestera	5	0.2	690	0.1	0.4	51.1	15.2	22.3	18.2
Chaetodontidae	*Chaetodon auriga*	39	1.2	1559	0.3	2.9	115.5	8.5	13.5	11.2
	Chaetodon fasciatus	17	0.5	907	0.2	1.3	67.2	10.3	15.0	11.9
	Chaetodon austriacus	4	0.1	170	0.0	0.3	12.6	10.5	11.3	10.9
	Chaetodon trilobatus	11	0.3	1317	0.3	0.8	97.6	14.3	21.0	17.5
	Heniochus intermidius	1	0.0	16	0.0	0.1	1.2	-	-	8.0
Chanidae	*Chanos chanos*	9	0.3	5093	1.1	0.7	377.3	35.5	44.9	40.9
Ephippidae	*Platax orbicularis*	2	0.1	403	0.1	0.1	29.9	15.0	26.0	20.5
Fistularidae	*Fistularia commersonii*	2	0.1	656	0.1	0.1	48.6	79.0	93.0	86.0
Gerreidae	*Gerres longirostris*	127	3.9	13814	3.0	9.4	1023.3	11.5	33.1	20.1
	Gerres oyena	34	1.0	3123	0.7	2.5	231.3	15.1	26.8	18.7
Haemulidae	*Plectorhinchus gaterinus*	72	2.2	14143	3.0	5.3	1047.6	14.6	39.0	21.7
	Plectorhinchus schotaff	35	1.1	7514	1.6	2.6	556.6	20.1	33.7	23.4
Holocentridae	*Sargocentron spiniferum*	21	0.6	3809	0.8	1.6	282.1	16.1	32.4	21.3
	Neoniphon samara	28	0.8	1863	0.4	2.1	138.0	11.5	19.5	16.6
	Myripristis murdjan	14	0.4	1264	0.3	1.0	93.6	14.5	19.8	17.1
	Sargocentron rubrum	2	0.1	109	0.0	0.1	8.1	14.1	14.7	14.4
	Sargocentron caudimaculatum	2	0.1	189	0.0	0.1	14.0	16.8	19.0	17.9
Labridae	*Novaculichtys taeniourus*	8	0.2	982	0.2	0.6	72.7	17.4	24.0	19.4
	Cheilinus undulatus	7	0.2	811	0.2	0.5	60.1	16.5	21.0	17.9
	Epibulus insidiator	3	0.1	415	0.1	0.2	30.7	16.1	24.8	19.3
	Cheilinus lunulatus	26	0.8	5053	1.1	1.9	374.3	16.0	31.6	20.7
	Hemigymnus melapterus	3	0.1	1749	0.4	0.2	129.6	14.6	37.5	27.9
	Gomphosus caeruleus	1	0.0	68	0.0	0.1	5.0	-	-	19.2
	Thalassoma reuepelli	3	0.1	285	0.1	0.2	21.1	16.6	20.4	18.3
	Thalassoma purpureum	2	0.1	275	0.1	0.1	20.4	19.4	21.2	20.3
	Halichoeres hortulanus	1	0.0	123	0.0	0.1	9.1	-	-	20.3
	Halichoeres scapularis	1	0.0	28	0.0	0.1	2.1	-	-	12.5
	Thalassoma lunare	1	0.0	130	0.0	0.1	9.6	-	-	19.9
Leiognathidae	*Leiognathus fasciatus*	13	0.4	940	0.2	1.0	69.6	13.3	17.5	15.8
Lethrinidae	*Lethrinus mehsena*	154	4.7	15611	3.3	11.4	1156.4	13.3	24.0	17.5
	Lethrinus harak	264	8.0	42082	9.0	19.6	3117.2	15.5	29.5	19.9
	Lethrinus obsoletus	157	4.8	17078.8	3.7	11.6	1265.1	15.1	25.0	19.7
	Lethrinus borbonicus	97	2.9	8655	1.8	7.2	641.1	13.6	20.8	17.2
	Lethrinus xanthochilus	21	0.6	3164	0.7	1.6	234.4	17.4	39.9	22.4
	Lethrinus lentjan	10	0.3	1273	0.3	0.7	94.3	17.1	26.0	19.9
	Lethrinus microdon	9	0.3	1471	0.3	0.7	109.0	14.2	30.1	21.6
	Monotaxis grandoculis	4	0.1	1345	0.3	0.3	99.6	19.0	34.2	25.5
	Lethrinus olivaceus	1	0.0	237	0.1	0.1	17.6	-	-	26.4
	Lethrinus nebulosus	4	0.1	1688	0.4	0.3	125.0	28.6	33.3	31.3
Lutjanidae	*Lutjanus monostigma*	32	1.0	3148	0.7	2.4	233.2	16.6	23.4	18.5
	Lutjanus lunulatus	4	0.1	540	0.1	0.3	40.0	17.8	22.4	20.0
	Lutjanus fulviflamma	14	0.4	2105	0.5	1.0	155.9	14.5	26.5	20.9

	Lutjanus kasmira	1	0.0	120	0.0	0.1	8.9	-	-	19.7
Monacanthidae	*Cantherhines pardalis*	1	0.0	102	0.2	0.1	7.6	-	-	15.5
Monodactylidae	*Monodactylus argenteus*	2	0.1	234	0.1	0.1	17.3	16.5	19.0	17.8
	Monodactylus falciformis	1	0.0	87	0.0	0.1	6.4	-	-	16.3
Mugilidae	*Valamugil seheli*	13	0.4	3078	0.7	1.0	228.0	25.1	33.5	28.2
	Liza subviridis	4	0.1	2984	0.6	0.3	221.0	38.1	43.0	40.7
Mullidae	*Mulloidichthys flavolineatus*	70	2.1	7895	1.7	5.2	584.8	12.5	31.0	20.6
	Parapenaeus forskali	18	0.5	1769	0.4	1.3	131.0	13.1	22.8	19.9
	Parapenaeus macronemus	1	0.0	89	0.0	0.1	6.6	-	-	19.1
Nemipteridae	*Scolopsis ghanam*	5	0.2	479	0.1	0.4	35.5	15.6	19.5	17.8
Pomacentridae	*Stegastes nigricans*	3	0.1	128.5	0.0	0.2	9.5	10.8	12.9	11.8
Scaridae	*Hipposcarus harid*	253	7.7	42923	9.2	18.7	3179.5	14	26.7	19.7
	Scarus psittacus	118	3.6	17474	3.7	8.7	1294.4	15.3	23.4	18.9
	Scarus frenatus	56	1.7	10641.7	2.3	4.1	788.3	14.5	28.3	20.5
	Calotomus viridescen	51	1.5	7892	1.7	3.8	584.6	14.2	22.5	19.0
	Scarus ferrugineus	28	0.8	7084.6	1.5	2.1	524.8	18.7	26.3	21.9
	Leptoscarus vaigiensis	8	0.2	1801	0.4	0.6	133.4	21.5	25.7	23.3
	Scarus ghobban	12	0.4	2041	0.4	0.9	151.2	16.3	26.8	20.4
	Scarus nigar	7	0.2	1318.5	0.3	0.5	97.7	16.5	29.0	20.9
	Cetoscarus bicolor	1	0.0	135	0.0	0.1	10.0	-	-	19.0
Serranidae	*Epinephelus Latifasciatus*	1	0.0	306	0.2	0.1	22.7	-	-	28.2
Siganidae	*Siganus rivulatus*	656	19.9	80094	17.1	48.6	5932.9	14.7	26.5	19.1
	Siganus luridus	70	2.1	8466	1.8	5.2	619.9	13.6	23.4	18.1
	Siganus stellatus	9	0.3	1825	0.4	0.7	135.2	16.6	26.5	22.0
Soleidae	*Paradachirus mamorates*	1	0.0	78	0.0	0.1	5.8	-	-	17.6
Sparidae	*Crenidens crenidens*	12	0.4	1188	0.3	0.9	88.0	14.9	20.5	17.3
	Rhabdosargus sarba	3	0.1	1357	0.3	0.2	100.5	29.0	29.8	29.4
Sphyraenidae	*Sphyraena baracuda*	6	0.2	2002	0.4	0.4	148.3	26.1	42.5	36.6
Synanceiidae	*Synanceia verrucosa*	1	0.0	63	0.0	0.1	4.7	-	-	13.0
Synodontidae	*Saurida gracilis*	1	0.0	39	0.0	0.1	2.9	-	-	15.8
Teraponidae	*Terapon jarbua*	1	0.0	60	0.0	0.1	4.4	-	-	16.3
Tetradontidae	*Arothron diadematus*	1	0.0	271	0.1	0.1	20.1	-	-	18.5
Loliginidae	*Loligo forbesii*	2	0.1	840	0.2	0.1	63	-	-	-
Octopodidae	*Octopus vulgaris*	1	0.0	950	0.2	0.1	70	-	-	-
Total		3297		467425		244	34624			
Total number of species (S)		99								

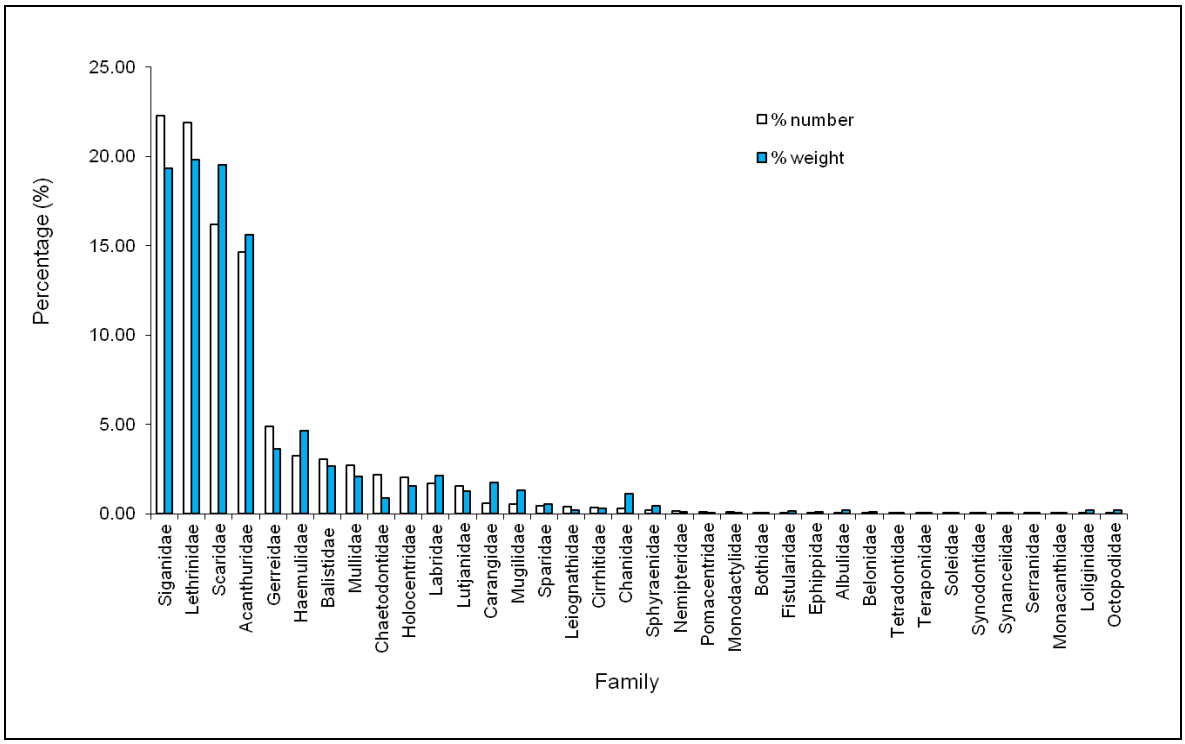

Fig 2: The percentage composition of each family, in terms of numbers and biomass in the catch of trammel net fishing in Jeddah coral reef fisheries

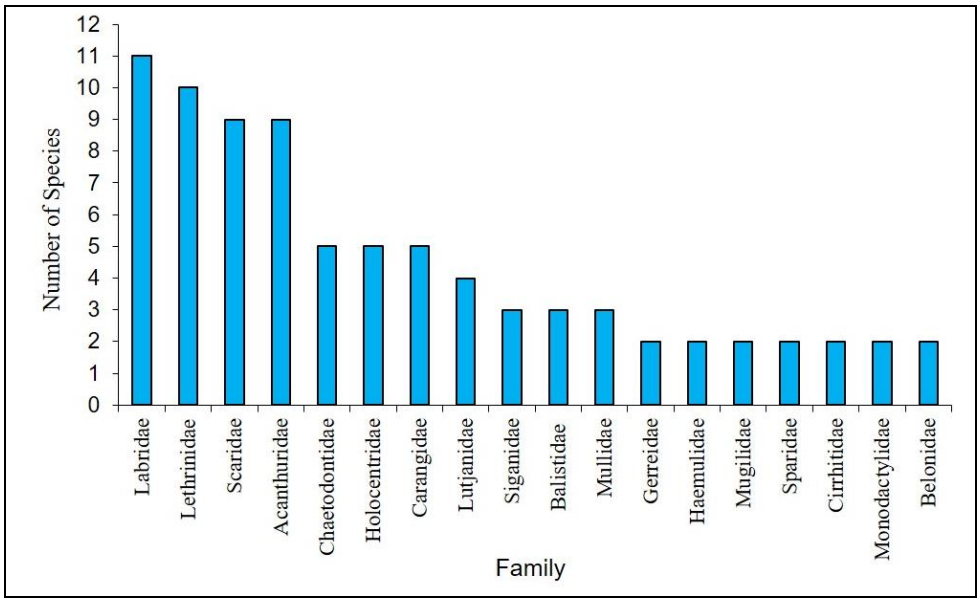

Fig 3: Species richness by family (having more than one species) in the catch of trammel net fishing in Jeddah coral reef fisheries.

Catch per unit effort (CPUE)

The percentage composition (%) and catch per unit effort (CPUE) expressing the relative abundance of the different families showed that members of four families: Siganidae, Lethrinidae, Scaridae and Acanthuridae predominated the catch of trammel nets in Jeddah coral reef fisheries. They represented collectively about 75% (183.1 individual/1000 m net length) and 74.3% (25.721 kg/1000 m net length) in terms of numbers and biomass, respectively. In these major four families, the catch per unit effort was found to be the highest for four species: *Siganus rivulatus*, *Acanthurus sohal*, *Lethrinus harak and Hipposcarus harid*, where they are the most abundant species in their respective families as shown in Fig. 4-7.

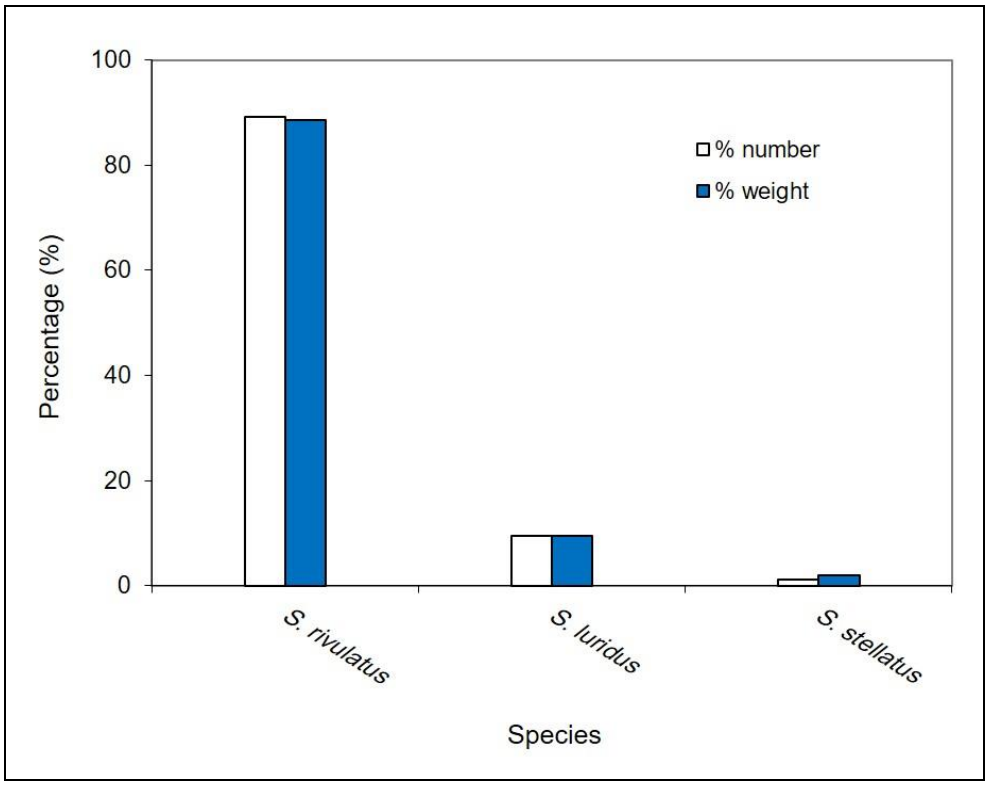

Fig 4: Species composition of family Siganidae caught in monofilament trammel nets in Jeddah coral reef fisheries

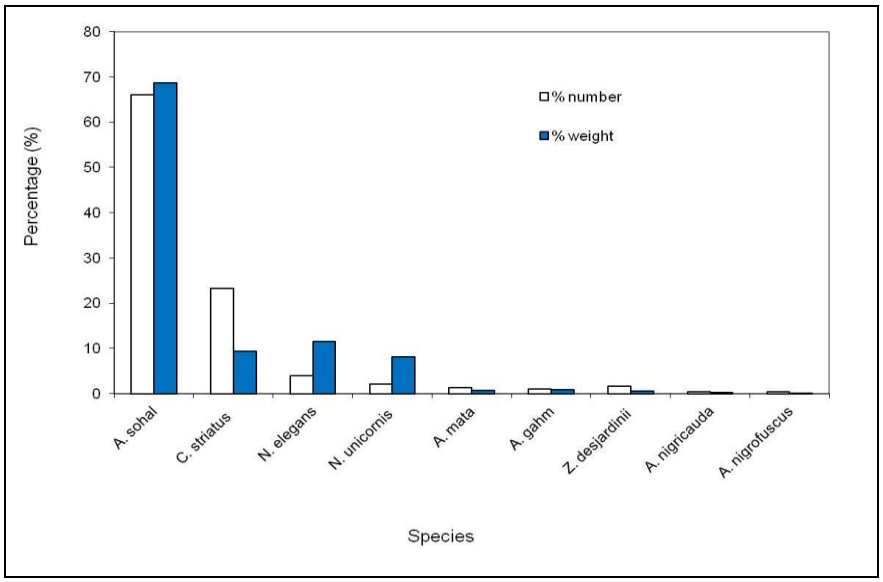

Fig 5: Species composition of family Acanthuridae caught in monofilament trammel nets in Jeddah coral reef fisheries

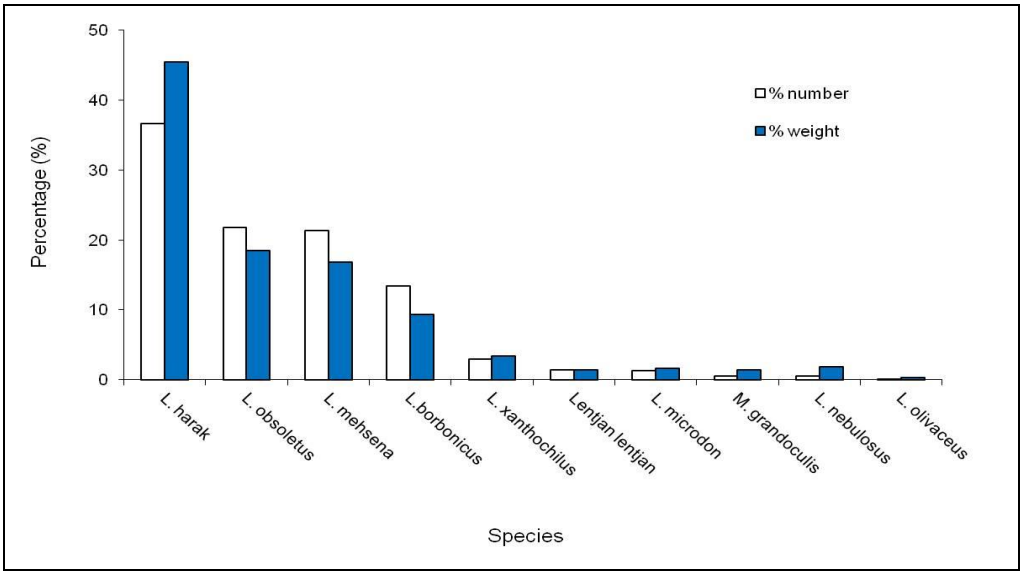

Fig 6: Species composition of family Lethrinidae caught in monofilament trammel nets in Jeddah coral reef fisheries

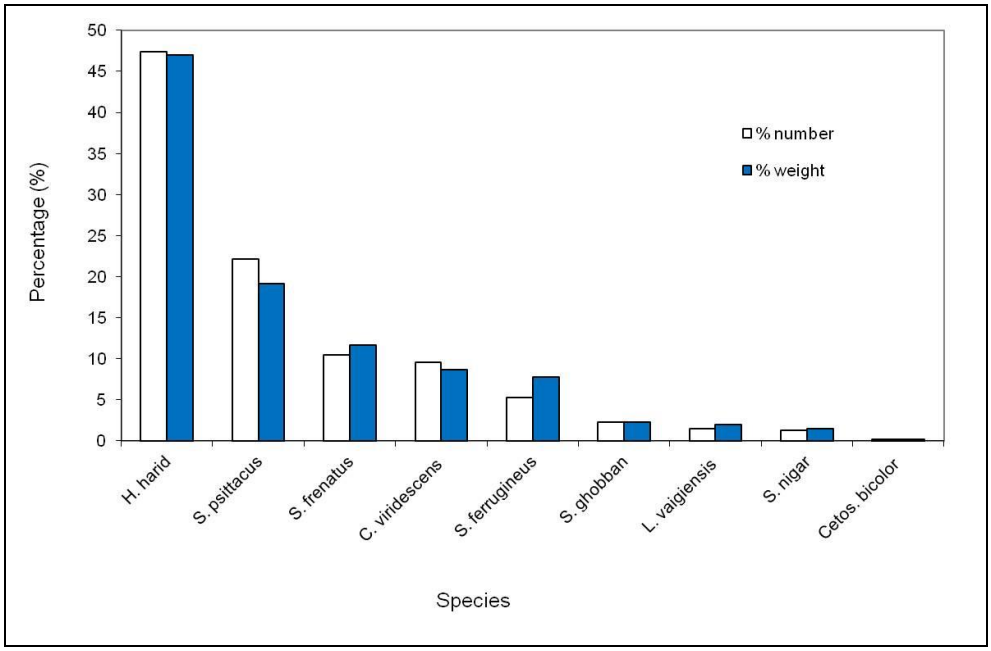

Fig 7: Species composition of family Scaridae caught in monofilament trammel nets in Jeddah coral reef fisheries

Species of the three major families: Siganidae, Scaridae and Acanthuridae are herbivorous species which dominate the catch of trammel nets representing 53.1% (in numbers) and 54.48% (in weight) of the total catch. This means that they are more abundant than carnivorous species, a case which may indicate the presence of overexploitation of the large carnivorous species (top predators) in Jeddah coral reef fisheries. Similar to this situation, Khalil *et al.* [23] indicated that the bulk of the biomass in Thuwal reefs is attributed to herbivores, whereas top predators are almost absent. They referred to a possible overfishing problem in Thuwal coral reef ecosystem.

The overall catch per unit effort of trammel net fishing was found to be 244 individuals (34.624 kg) /1000 m net length. This value is much higher than that obtained by Gabr and Mal [22] for gillnets in Jeddah (74.3 individuals (18.529 kg) /1000 m net length) and in Thuwal (65.6 individuals (31.352 km) /1000 m net length). It is important to notice that it is not only the difference in structure which is the main reason for the high efficiency of trammel nets, but also the mode of action and fishing depth might have played the major role of this difference; trammel nets were set very close to the reef patches which are associated with very high diversity of fish species compared to gillnets used by Gabr and Mal [22] which were set in the slightly deeper places (lagoons) in the reef flat. In conclusion, this high efficiency of trammel nets to catch more species and individuals agrees well with what is reported in earlier comparative studies on gillnets and trammel nets [6- 11, 24].

Index of Relative Importance (IRI)

Kolding [25], applied an index of relative importance IRI to estimate the relative importance of each species in the catch of gillnets. This index was first developed by Pinkas *et al.* [26] for investigating the stomach contents of piscivorous predators to rank the importance of different preys. This index is formulated by combining information of percentage number, percentage weight and percentage frequency of each species in total net settings.

In the present study, the index of relative importance of the different species is shown in Fig. 8. The values of the most important ten species are given in Table 3. The most important species having the highest index of relative importance was found to be *S. rivulatus* (29.2%) followed by *A. sohal* (15.4%), *H. harid* (12.7%) and *L. harak* (12.4%).

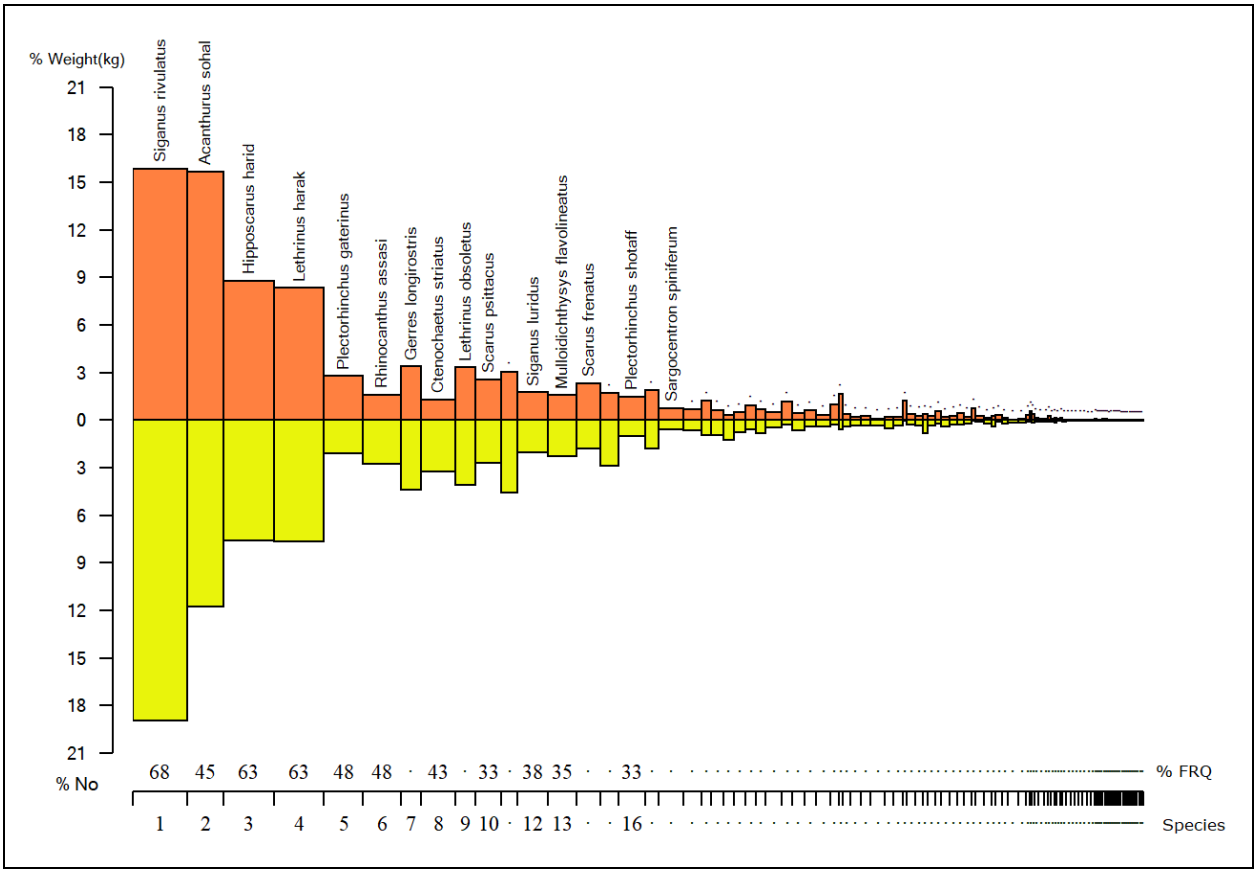

Fig 8: Index of relative importance of the different species caught in monofilament trammel nets in Jeddah coral reef fisheries (output of Pasgear II software)

Length-weight relationship (LWR)

Describing the length-weight relationship is a simple and easy to estimate routine in fishery science. In addition to its importance for the inter-conversion between lengths and weights, the wellbeing of fish populations can be predicted from the nature of the length-weight relationship which can be affected by many factors related to sex, season, water temperature, food availability, maturity stage, and length range of samples used [27, 28].

In the present study, the length-weight relationship was estimated for the most abundant and important 10 coral reef fish species caught with trammel nets in Jeddah fisheries. The number of specimens, length range, parameters of the length-weight relationship for the 10 species were recorded in Table 2. New information is provided in the present study on the length-weight relationship of two fish species: *Rhinocanthus assassi* and *Plectorhinchus gaterinus* which have no previous data on length-weight relationships in the electronic database

website, FishBase [18]. Moreover, the length-weight relationship for three species was determined for the first time in the southern Red sea: *Ctenochaetus striatus*, *Lethrinus Lethrinus obsoletus, and Scarus psittacus.* The values of the slope b of the LWR for the different species varied between 2.71 for *Scarus psittacus* indicating a negative allometric growth and 3.05 for *Lethrinus obsoletus* reflecting a positive allometric growth. However, this range of b values falls within the range (2.5 - 3.5) suggested by Carlander [29], and goes well with the range of b values (2.7 -3.4) estimated by Froese [30] for Ninety percent of 1773 species.

Length-girth relationship (LGR)

In the present study, the length-maximum girth relationships were estimated for the most abundant and important 10 coral reef fish species caught with trammel nets in Jeddah fisheries and the results are given in Table 2. A strong linear correlation was found between the total length and the maximum girth for all species with a determination coefficient (R^2) ranging from 0.90 to 0.98.

Because mesh size-selectivity of the fishing gears depends mainly on the girth of fish which has to be at least equal to mesh perimeter [31, 32, 33], thus, the obtained results of the length-girth relationship for the different species will allow the estimation of the maximum girth for a given fish length which is easier to measure [12, 34]. This maximum girth has been predicted and accepted to represent the fish girth at capture by the fishing net [33].

Table 3: Parameters of the Length-weight relationship (LWR), Length-girth relationship (LGR), and the index of relative importance (% IRI) of the most important 10 species caught with trammel nets in Jeddah fisheries.

Species	N	Length range	LWR			LGR			% IRI
			a	b	R^2	c	d	R^2	
**Siganus rivulatus*	656	14.7 – 26.5	0.0150	2.990	0.97	0.692	0.666	0.90	29.2
**Acanthurus sohal*	318	12.6 – 36.0	0.0240	2.810	0.98	1.320	0.712	0.96	15.4
Hipposcarus harid	253	14.0 – 26.7	0.0190	2.940	0.99	0.480	0.700	0.95	12.7
Lethrinus harak	264	15.5 – 29.5	0.0140	3.030	0.98	-0.650	0.730	0.96	12.4
Plectorhinchus gaterinus	72	14.6 – 39.0	0.0230	2.900	0.99	-0.417	0.772	0.98	2.9
Rhinecanthus assassi	93	11.8 – 19.9	0.0400	2.850	0.95	-0.920	0.990	0.92	2.6
Gerres longirostris	127	11.5 – 33.1	0.0130	2.980	0.96	-1.466	0.792	0.94	2.4
Ctenochaetus striatus	112	12.2 – 18.7	0.0290	2.840	0.92	-0.231	0.866	0.90	2.4
Lethrinus obsoletus	157	15.1 – 25.0	0.0130	3.050	0.98	-1.712	0.793	0.97	2.3
Scarus psittacus	118	15.3 – 23.4	0.048	2.710	0.98	-0.764	0.797	0.91	2.1

* Parameters of *Acanthurus sohal* and *Siganus rivulatus* are published in Gabr and Mal [15]

Conclusions

In the present study, the catch of trammel nets was composed of 99 species belonging to 36 families and this indicates that trammel net fishing in Jeddah is of the multispecies nature. The overall catch per unit effort was estimated to be 244 individuals (34.6 kg) / 1000 m net length. Members of four families: Siganidae, Lethrinidae, Scaridae and Acanthuridae represented collectively 75.05% of the total number of fish caught, and 74.6% of the total biomass of fish caught. In these major fish families, four species: *Siganus rivulatus*, *Acanthurus sohal, Hipposcarus harid, and Lethrinus harak* were the most abundant species in their respective families, and represented collectively 45.2% of the total catch, and also ranked the first important four species having the largest index of relative importance (%IRI): 29.2, 15.4, 12.7, and 12.4, respectively. Trammel nets have higher efficiency to catch more species and CPUE (more individuals) than do gillnets. The length-weight and length-girth relationships were described for the most abundant 10 coral reef species, two species of them: *Rhinocanthus assassi* and *Plectorhinchus gaterinus* have no previous data on length-weight relationships in the electronic database website, FishBase. The values of the slope b of the LWR for the different species varied between 2.71 for *Scarus psittacus* and 3.05 for *Lethrinus obsoletus*. A strong linear correlation was found between the total length and the maximum girth for all species with a determination coefficient (R^2) ranging from 0.90 to 0.98.

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