المستعملة. وأمكن وصف العلاقة بين الطول والوزن من خلال المعادلة $W = 0.0049 L^{3.26}$ لأسماك بياض قصر $W = 0.018 L^{2.93}$ لأسماك شعور الكرسييت. وأظهرت المشاهدات وجود تأثيرات سلبية على النظام البيئي للشعاب المرجانية نتيجة الصيد الزائد وتكسير الشعاب المرجانية نتيجة الصيد بالشباك الخيشومية.

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المحتوى النوعى والإنتاجية لوحدة جهد الصيد بالشباك الخيشومية وعلاقة الطول بالوزن لبعض الأسماك في مصايد الشعاب المرجانية بجدة وتول، السعودية محمد حسنى جبر ، احمد عثمان مال

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ص.ب. ٢٠٧٠٨ جدة ٢١٥٨٩

المستخلص: تم إجراء عمليات صيد تجريبي في مصايد الشعاب المرجانية بجدة وتول باستخدام شبك خيشومية ذات خيوط متعددة الفتائل وذلك خلال الفترة من مايو ٢٠١٣ الى مارس ٢٠١٤م. تم تحديد المحتوى النوعى والإنتاجية لوحدة جهد الصيد وعلاقة الطول بالوزن لبعض أسماك الشعاب المرجانية. وقد تم تعريف ٤٣ نوع ينتمون الى ١٦ عائلة سمكية تم صيدها في جدة، وفي تول تم تعريف ٥٣ نوع ينتمون الى ٢٣ عائلة سمكية في مصيد الشباك الخيشومية المستخدمة. وقد وجد أن الوفرة العددية لأربعة أنواع من الأسماك تمثل ٥٤,٨ % في مصايد جدة وهى الدقع *Acanthurus mata* والسحل *Acanthurus sohal* وبياض القز *Carangoides bajad* والقطرين *Plectorhynchus gaterinus*. وكان المصيد الكلى لوحدة جهد الصيد حوالي ٧٤ سمكة (١٨,٥٢٩ كجم) / ١٠٠٠ متر من طول شبكة الصيد. وتم وصف العلاقة بين الطول والوزن بالمعادلة $W = 0.012 L^{3.12}$ لأسماك الدقع والمعادلة $W = 0.013 L^{2.97}$ لأسماك بياض القز. بينما الوفرة العددية لأربعة أنواع أسماك وهى بياض قصر *Caranx melampygus* وبياض أبوعين *Caranx sexfasciatus* وشعور كرسيت *Lethrinus lentjan* وأبو قرن *Naso elegans* تمثل حوالي ٤٠ % من المصيد الكلى في تول. وكان المصيد الكلى لوحدة جهد الصيد ٦٦ سمكة (٣١,٣٥٢) / ١٠٠٠ متر من طول الشبكة

reefs since 1998 comes from the increased threat from overfishing and destructive fishing, particularly in the Pacific and Indian Ocean regions, largely due to the growth in coastal populations living near reefs.

It is clear from our qualitative observations on coral reef damage due to gillnet fishing in Jeddah and Thuwal fisheries that considerable negative impacts can be produced because of the destructive fishing gear and behavior.

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predominance of members of both families Carangidae and Lethrinidae, which are carnivores predators on the foraging reef fishes, where they have the highest species richness either in Jeddah or Thuwal fisheries.

Length-Weight Relationship 'LWR':

The length-weight relationship in fishes is important for the conversion of lengths to weights. Also, it is used to estimate the condition factor which reflects the wellbeing of fish stock in certain environment, and hence can allow inter- or intra-species comparisons of fishes from different locations and habitats (Petrakis and Stergiou, 1995; Goncalves *et al.*, 1997; Froese and Pauly, 2004; Sinovcic *et al.*, 2004).

In the present study, the length-weight relationships were estimated for two species in Jeddah and two species in Thuwal. The length-weight relationship for three species was determined for the first time in the southern Red sea: *Acanthurus mata*, *Carangoides bajad* in Jeddah and *Caranx melampygus* in Thuwal. However, the exponent b 'the slope' of the LWR varied between 2.93 for *Lethrinus lentjan* and 3.26 for *Caranx melampygus*. This range of b values coincide well with that reported by Froese (2006) who found that ninety percent of the b values of 1773 species ranged from 2.7 to 3.4, and confirmed Carlander (1969) suggestion that the exponent b should be between 2.5 and 3.5

Ghost fishing:

Due to the negative impacts of lost or abandoned fishing gear on species and environment by continuing catching fish resulting in unobserved fishing mortality for periods of weeks, months or even years based on their construction, depths and environmental

conditions (Matsuoka *et al.*, 2005; Brown & Macfadyen, 2007; Suuronen *et al.*, 2012), the FAO's code of conduct for responsible fisheries points out that countries should cooperate to develop and apply technologies, materials and operational methods that reduce fishing gear losses and the ghost fishing effects of lost or abandoned fishing gear (Queirolo and Gaete, 2014).

However, the rate at which net units may be lost depends on fishermen's experience in deciding the appropriate time and site of fishing with gillnets. Also, in severe weather conditions, under which fishermen cannot set the net in the right direction or position rather than the difficulty in hauling the net, fishermen are usually prevented from going fishing. Moreover, most fishermen avoid leaving their nets in the sea because of the high cost of making new net units instead of the lost ones. Thus, from our observations we expect that the ghost fishing problem by lost gillnets in Jeddah fisheries can be neglected because fishermen avoid the loss of gillnets and the fishing operations occur in shallow areas on the reef flats in which any lost gillnets will be visible and can be easily removed from there.

Coral reef damage:

Coral reefs are of the most productive and biologically rich ecosystems providing essential ecosystem services for millions of people depending upon (Burke *et al.*, 2011). They reported that the percent of reefs rated as threatened has increased by 30 % percent in the 10 years (from 1997 to 2007), with increases in all local threat categories and in all regions. They mentioned that 80 % of the increased pressure on

Thuwal, we observed sticking of gillnets to coral reefs. Sticking of gillnets to coral reefs occurs when gillnets are being set near or around the corals, and under the effect of water current the gillnet move and entangled the coral branches. When the fisherman tries to pull the net, some pieces of branches are broken leading to coral damage (Figure 12).

Figure 12: Fishermen removing the coral pieces from the multifilament gill nets

Discussion

Gillnet fishing in Jeddah fisheries occurs mainly in the shallow waters and lagoons in the coral reef flats. Gillnet fishing in Jeddah is of the multispecies fisheries as it occurs in the coral reef ecosystems which are characterized by high diversity of reef fishes, due to the heterogeneous nature of coral reef habitat accommodating large size-ranges of different reef fishes in relatively small areas (Bruckner *et al.*, 2011).

Species composition and catch per unit effort:

In the present study, fifty-three species belonging to 23 families and forty-three species belonging to 16 families were caught with the multifilament gillnets in the coral reef fisheries of Thuwal and Jeddah, respectively. These results,

however, reveal the multispecies nature of coral reef fisheries (Acosta, 1997; Harvey *et al.*, 2012) of Thuwal and Jeddah. However, Walker *et al.*, 2009, predicted that topographic complexity (rugosity) is directly correlated to species richness in the nearshore reef habitats. This might be the reason of having more species and families caught in the shallow coral reef fisheries of Thuwal; having wider area and high complexity of coral reef patches) than in those of Jeddah.

Although the catch number per unit effort in Jeddah (74.3 individual/1000 m net length) is higher than that in Thuwal (65.6 individual/1000 m net length), the catch biomass per unit effort in Thuwal (31352 gm/1000 m net length) is near to double the amount obtained in Jeddah (18529 gm/1000 m net length). A major part of this difference might be due to the presence of few individuals (18) of two large-sized (heavy) acanthurid species: *Naso elegans* and *Naso unicornis* in Thuwal, compared to many individuals (72) of two small-sized acanthurid species: *Acanthurus sohal* and *Acanthurus mata* in Jeddah.

It should be considered that the catch per unit effort reflects the relative abundance of the different species having large size enough to be caught and selected by the fishing gear, because there are small-sized species that their catches will not reflect their actual abundance in the fishing ground. Accordingly, while gillnets can provide reliable estimates of the commercial species composition of coral reef fishes, they do not provide an accurate estimate of stock abundance (Acosta, 1997).

However, in the present study, gillnets were set in the slightly deeper places (lagoons) in the reef flat. This may be the reason behind the

Figure 8: Length-weight relationship of *A. mata* in Jeddah coral reef fisheries **Figure 9: Length-weight relationship of *C. bajad* in Jeddah coral reef fisheries.** **Figure 11: Length-weight relationship of *L. lentjan* in Thuwal coral reef fisheries.** **Figure 10: Length-weight relationship of *C. melampygus* in Thuwal coral reef fisheries.****Ghost fishing evaluation:**

Gillnet fishing usually occurs in the shallow waters on the reef flat (1-3 m depth). Under normal weather conditions, the rate of net losing may reach zero, as in the case of our experiments, where there were no loss of net units occurred. Thus, it is expected that the ghost fishing problem by lost gillnets in Jeddah and Thuwal fisheries can be neglected in our study

Damage of coral reefs by gillnet fishing:

During the fishing operations with gillnets in the shallow coral reef flat of Jeddah and

Family	Species	N	%	Wt (gm)	%	CPUE		Length range		Mean Length (cm)
						N/f	Wt/f	Min.	Max.	
Acanthuridae	<i>Naso elegans</i>	15	6.4	26739	23.7	4.2	7427.5	37	59	52.3
	<i>Naso unicornis</i>	3	1.3	4473	4.0	0.8	1242.5	40.4	52.5	45.8
Albulidae	<i>Alpula vulpes</i>	5	2.1	3346	3.0	1.4	929.4	37.2	48	43.3
Balistidae	<i>Pseudobalistes flavimarginatus</i>	1	0.4	932	0.8	0.3	258.9	-	-	33
Bothidae	<i>Bothus pantherinus</i>	2	0.8	2874	0.1	0.6	26.1	14.1	17.5	15.8
Carangidae	<i>Caranx melampygus</i>	27	11.4	6847	6.1	7.5	1901.9	25.2	36.4	27.8
	<i>Caranx sexifasciatus</i>	15	6.4	6252	5.5	4.2	1736.7	27	43	31.6
	<i>Scomberoides tol</i>	7	3.0	2184	1.9	1.9	606.7	30.5	85.5	42.8
	<i>Caranx ignobilis</i>	5	2.1	3595	3.2	1.4	998.6	28.2	53	37.1
	<i>Alectis indicus</i>	3	1.3	3123	2.8	0.8	867.5	44	49	46.3
	<i>Carangoides bajad</i>	1	0.4	235	0.2	0.3	65.3	-	-	25.7
	<i>Carangoides caeruleopinnatus</i>	1	0.4	366	0.3	0.3	101.7	-	-	30.9
	<i>Scomberoides commersonianus</i>	1	0.4	1823	1.6	0.3	506.4	-	-	62
Chaetodontidae	<i>Heniochus intermedius</i>	2	0.8	70	0.1	0.6	19.4	10.8	10.9	10.9
Chirocentridae	<i>Chirocentrus nudus</i>	3	1.3	2534	2.2	0.8	703.9	57	72.5	63.6
Ephippidae	<i>Platax orbicularis</i>	3	1.3	225	0.2	0.8	62.5	12.9	13.6	13.3
Gerreidae	<i>Gerres longirostris</i>	5	2.1	788	0.7	1.4	218.9	21.2	26.4	23.3
	<i>Gerres filament</i>	2	0.8	468	0.4	0.6	130.0	20.5	26.4	23.3
	<i>Gerres oyena</i>	1	0.4	248	0.2	0.3	68.9	-	-	26.5
Haemulidae	<i>Diagramma pictum</i>	7	3.0	2772	2.5	1.9	770.0	24.5	40.2	31
	<i>Plectorhinchus gaterinus</i>	5	2.1	1666	1.5	1.4	462.8	25.2	33.6	27.8
	<i>Plectorhinchus schotaff</i>	1	0.4	306	0.3	0.3	85.0	-	-	36.3
	<i>Pomadasys kaakan</i>	1	0.4	817	0.7	0.3	226.9	-	-	39.6
Holocentridae	<i>Neonippon samara</i>	5	2.1	273	0.2	1.4	75.8	12.8	20	16.1
	<i>Sargocentron spiniferum</i>	3	1.3	745	0.7	0.8	206.9	21.8	29.5	24.6
	<i>Myripristis murdjan</i>	1	0.4	85	0.1	0.3	23.6	-	-	17.2
Lethrinidae	<i>Lethrinus lentjan</i>	37	15.7	11378	10.1	10.3	3160.6	21.6	37	26.4
	<i>Lethrinus microdon</i>	12	5.1	4179	3.7	3.3	1160.8	23.5	40	30.3
	<i>Monotaxis grandoculis</i>	5	2.1	2145	1.9	1.4	595.8	24.5	32	28.9
	<i>Lethrinus harak</i>	4	1.7	845	0.7	1.1	234.7	21.5	26.4	24.3
	<i>Lethrinus obsoletus</i>	4	1.7	1070	0.9	1.1	297.2	22.2	29.6	26.3
	<i>Lethrinus xanthochilus</i>	3	1.3	1870	1.7	0.8	519.4	30.8	39.3	35.2
	<i>Lethrinus nebulosus</i>	1	0.4	204	0.2	0.3	56.7	-	-	24.9
	<i>Gymnocranius microdon</i>	1	0.4	244	0.2	0.3	67.8	-	-	25.5
Lutjanidae	<i>Lutjanus monostigma</i>	3	1.3	544	0.5	0.8	151.1	24.5	25.5	24.9
	<i>Lutjanus fulviflamma</i>	2	0.8	165	0.1	0.6	45.8	15.2	21.1	17.7
	<i>Lutjanus bohar</i>	2	0.8	3780	3.3	0.6	1050.0	43.3	57	50.3
	<i>Lutjanus gibbus</i>	1	0.4	278	0.2	0.3	77.2	-	-	26.1
Monodactylidae	<i>Monodactylus argentens</i>	1	0.4	82	0.1	0.3	22.8	-	-	16
Mullidae	<i>Mulloidichthys flavolineatus</i>	1	0.4	68	0.1	0.3	18.9	-	-	19.6
Platycephalidae	<i>Sorsogona prionata</i>	1	0.4	712	0.6	0.3	197.8	-	-	48
	<i>Papilloculiceps longiceps</i>	1	0.4	1623	1.4	0.3	450.8	-	-	59
Scaridae	<i>Hipposcarus harid</i>	2	0.8	1619	1.4	0.6	449.7	40	42.3	41.2
	<i>Scarus ferrugineus</i>	2	0.8	798	0.7	0.6	221.7	24.5	29.5	27
	<i>Scarus ghobban</i>	2	0.8	1315	1.2	0.6	365.3	32.5	34.5	33.5
	<i>Scarus nigar</i>	2	0.8	673	0.6	0.6	186.9	25	28.7	26.9
Scombridae	<i>Rastrelliger kanagurta</i>	12	5.1	3070	2.7	3.3	852.8	23.3	31	28.3
Serranidae	<i>Epinephelus summana</i>	1	0.4	403	0.4	0.1	111.9	-	-	31
Siganidae	<i>Siganus rivulatus</i>	1	0.4	112	0.1	0.3	31.1	-	-	20
Sparidae	<i>Acanthopagrus bifasciatus</i>	4	1.7	1467	1.3	1.1	407.5	19.5	34.8	24.3
Sphyraenidae	<i>Sphyraena genie</i>	3	1.3	1865	1.7	0.8	518.1	50	54	52.5
	<i>Sphyraena baracuda</i>	2	0.8	1325	1.2	0.6	368.1	55	56.5	55.8
Synodontidae	<i>Synodus variegatus</i>	1	0.4	28	0.0	0.3	7.8	-	-	15.1

for even the major species. However, the length frequency was determined and represented in Figure 6 for the major four species in Jeddah, and in Figure 7 for the major four species in Thuwal. Length and weight measurements were used to estimate the length-weight relationship for four species: *A. mata* and *C. bajad* in Jeddah, and *C. melampyrgus* and *L. lentjan* in Thuwal. The LWR

could be described by the following power equations and represented in Figures 8-11:

In Jeddah: *A. mata* $W = 0.012 L^{3.12}$ ($R^2 = 0.95$)

C. bajad $W = 0.013 L^{2.97}$ ($R^2 = 0.98$)

In Thuwal: *C. melampyrgus* $W = 0.0049 L^{3.26}$ ($R^2 = 0.95$)

L. lentjan $W = 0.018 L^{2.93}$ ($R^2 = 0.98$)

Figure 6: Length frequency of the major four species caught with gillnet in Jeddah coral reef fisheries.

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

Table 1: Species composition, catch per unit effort, and length range of the different species caught with gillnets in Jeddah fisheries

Family	Species	N	%	Wt (gm)	%	CPUE		Length range		Mean length (cm)
						N/f	Wt/f	Min.	Max.	
Acanthuridae	<i>Acanthurus sohal</i>	40	17.1	7262	12.4	12.70	2305	16.3	36	22.3
	<i>Acanthurus mata</i>	32	13.7	2738	4.7	10.16	869	15.1	19.7	16.8
	<i>Acanthurus gahm</i>	3	1.3	431	0.7	0.95	137	16	24.9	19
Balistidae	<i>Rhinecanthus assassi</i>	1	0.4	122	0.2	0.32	39	-	-	16.5
	<i>Pseudobalistes flavimarginatus</i>	1	0.4	59	0.1	0.32	19	-	-	12.4
	<i>Sufflamenal bicaudatum</i>	1	0.4	111	0.2	0.32	35	-	-	16.9
	<i>Balistoides viridescens</i>	1	0.4	1700	2.9	0.32	540	-	-	43.8
Carangidae	<i>Carangoides bajad</i>	35	15.0	8108	13.9	11.11	2574	23	31.5	26.6
	<i>Caranx melampygus</i>	8	3.4	5292	9.1	2.54	1680	28.3	52	35.8
	<i>Scomberoides tol</i>	5	2.1	1601	2.7	1.59	508	33.2	40.5	36.4
	<i>Caranx sexifasciatus</i>	4	1.7	1548	2.7	1.27	491	27.7	41.7	31.5
	<i>Carangoides ferdu</i>	2	0.9	674.6	1.2	0.63	214	22.8	32.5	27.7
	<i>Scombooides lysan</i>	1	0.4	215	0.4	0.32	68	-	-	32.2
	<i>Alectis indicus</i>	1	0.4	2421	4.1	0.32	769	-	-	66
Chaetodontidae	<i>Chaetodon auriga</i>	1	0.4	29	0.0	0.32	9	-	-	10.5
	<i>Chaetodon austriacus</i>	1	0.4	27	0.0	0.32	9	-	-	9.7
Cynoglossidae	<i>Cynoglossus arel</i>	1	0.4	427	0.7	0.32	136	-	-	41
Echeneidae	<i>Remora remora</i>	1	0.4	160	0.3	0.32	51	-	-	37
Haemulidae	<i>Plectorhinchus gaterinus</i>	21	9.0	6105	10.5	6.67	1938	19.5	34.5	24.7
	<i>Plectorhinchus schotaff</i>	4	1.7	1194	2.0	1.27	379	22.2	28.2	26.7
Holocentridae	<i>Sargocentron spiniferum</i>	17	7.3	4631	7.9	5.40	1470	15.5	33.2	25.3
	<i>Myripristis murdjan</i>	9	3.8	956	1.6	2.86	303	15.5	20	18.3
	<i>Sargocentron caudimaculatum</i>	2	0.9	186	0.3	0.63	59	16.8	18.4	17.6
	<i>Neoniphon samara</i>	1	0.4	44	0.1	0.32	14	-	-	15
Labridae	<i>Cheilinus lunulatus</i>	2	0.9	430	0.7	0.63	137	21.2	23.3	22.3
Lethrinidae	<i>Lethrinus harak</i>	5	2.1	1026	1.8	1.59	326	21.7	25.8	24.3
	<i>Lethrinus obsoletus</i>	3	1.3	582	1.0	0.95	185	21.5	25	23.3
	<i>Lethrinus Mehsena</i>	2	0.9	279	0.5	0.63	89	18.5	20.5	19.5
	<i>Lethrinus lentjan</i>	1	0.4	200	0.3	0.32	63	-	-	23.7
	<i>Monotaxis grandoculis</i>	1	0.4	538	0.9	0.32	171	-	-	31.5
	<i>Lethrinus nebulosus</i>	1	0.4	132.5	0.2	0.32	42	-	-	21.2
Lutjanidae	<i>Lutjanus monostigma</i>	1	0.4	116	0.2	0.32	37	-	-	19.7
Monodactylidae	<i>Monodactylus falciformis</i>	3	1.3	246	0.4	0.95	78	14.9	17.3	15.7
Pomacanthidae	<i>Pomacanthus asfur</i>	1	0.4	92	0.2	0.32	29	-	-	13.7
Scaridae	<i>Scarus ferrugineus</i>	6	2.6	2916	5.0	1.90	926	26	34.1	28.3
	<i>Scarus frenatus</i>	3	1.3	1634	2.8	0.95	519	29.3	33	31
	<i>Hipposcarus harid</i>	2	0.9	438	0.8	0.63	139	22.5	24.6	23.6
	<i>Scarus ghobban</i>	1	0.4	401	0.7	0.32	127	-	-	27.7
	<i>Scarus nigar</i>	1	0.4	777	1.3	0.32	247	-	-	33
	<i>Chlorurus gibbus</i>	1	0.4	391	0.7	0.32	124	-	-	27.4
Serranidae	<i>Epinephelus tauvina</i>	1	0.4	268	0.5	0.32	85	-	-	25.8
	<i>Epinephelus summana</i>	2	0.9	1115	1.9	0.63	354	31.6	32	31.8
Siganidae	<i>Siganus rivulatus</i>	4	1.7	742	1.3	1.27	236	22.3	24.1	23.3

Plectorhynchus gaterinus represented collectively more than half of all fish caught (about 55 %). The catch per unit effort, which reflects the relative abundance, of the four species (expressed in number of fish caught per 1000 m of net length) was found to be the largest among all species caught (Table 1).

In Thuwal, the species richness by family is shown in Figure 5 (B). Also, the largest number

of species was recorded in family Carangidae (8) and family Lethrinidae (8). Concerning the abundance, members of three families: Lethrinidae, Carangidae and Acanthuridae represented collectively 61.5 % and 68.7 % of the total number and biomass, respectively, of fish caught. Four species: *Caranx melapygus*, *C. sexifasciatus*, *Lethrinus lentjan*, and *N. elagans* represented collectively 39.9% of all fish caught.

Figure 5: Species richness by family in multifilament gillnet fisheries in Jeddah (A) and Thuwal (B).

Figure 3: The percentage composition of each family, in terms of numbers and biomass, in the catch of gillnet fishing in Jeddah coral reef fisheries

Figure 4: The percentage composition of each family, in terms of numbers and biomass, in the catch of gillnet fishing in Thuwal coral reef fisheries.

In Jeddah, the species richness (the number of species recorded) by family is shown in Figure 5 (A). The largest number of species was recorded in family Carangidae (7) followed by family Lethrinidae (6) and family Scaridae (6). Regardless of the species richness, members of

four families: Acanthuridae, Carangidae, Holocentridae and Haemulidae represented collectively 79.1 % of the total number of fish caught, and 74.4 % of the total biomass of fish caught. Four species: *Acanthurus mata*, *Acanthurus sohal*, *Carangoides bajad*, and

The species composition was determined as percentage of the total catch expressed in numbers and weights. The fishing effort (f) and catch per unit effort (CPUE) for the various species could be calculated using the following formula, modified from De Metrio and Megalofonou (1988):

$$f = (a'/1000) \times g$$

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,

$$CPUE = N / f \quad (N \text{ is the number of fish caught}).$$

$$CPUE = B / f \quad (B \text{ is the biomass of fish caught}).$$

The length-weight relationship was described using the power equation:

$$W = a L^b$$

Where, a is the intercept and b is the slope of the linearized logarithmic form of the power equation:

$$\ln W = \ln a + b \ln L$$

Results

Gear specifications:-

The design and specifications of each unit of multifilament gillnets is shown in Figure 2. Nine units of multifilament gillnets were used, each three units have one of the three mesh sizes used. The units were tied to each other end-to-end in an alternative order of mesh sizes. At the beginning of each fishing operation, two fishermen, on a wooden fishing boat of 6-7 m length provided with outboard engine of 25 - 40 hp, throw the net into the water at afternoon (between 13:00 to 15:00 pm). At night (between 22:00 to 24:00 pm),

fishermen start hauling gillnets into the fishing boat to collect caught fishes.

Species composition and Catch per unit effort:

Results in Tables 1&2 show the names, numbers and weights, catch per unit effort 'CPUE', length range and mean length of the different species caught with multifilament gillnets in Jeddah and in Thuwal, respectively. Forty-three species belonging to 16 families were identified in the catch of multifilament gillnets in Jeddah. In Thuwal, fifty-three species belonging to 23 families were identified. The percentage composition of each family, in terms of numbers and biomass, was shown in Figures 3 & 4.

Figure 2: Design and specifications of the multifilament gillnets used in the present study

which depends on the mesh size and body shape (Cochrane and Garcia, 2009). Thus, it is recommended that gillnets having different mesh sizes can be used in stock surveys to catch as many species as possible having large size ranges (Hovgård and Lassen, 2000).

In Saudi Arabia, gillnet fishing is one of the most important fishing methods that are used in the traditional fisheries along the Red Sea coast. Unfortunately, there are no data available about the selectivity and efficiency of gillnets used in the Red Sea fisheries of Saudi Arabia. For successful management and sustainable development of fisheries, research programs should be carried out to investigate such aspects related to gillnet fishing as selectivity and catch per unit effort.

Hence, the present study aimed to determine the species composition and catch per unit effort, besides the length weight relationship of some coral reef fish species in Jeddah and Thuwal fisheries.

Material and Methods

The experimental fishing operations occurred in two coral reef fisheries: in southern Jeddah and Thuwal (north of Jeddah) as shown in Figure 1. Local fishermen usually use multifilament gillnets of 62, 75 and 88mm mesh size (stretched), according to the main target species. The experimental fishing operations in the present study used the multifilament gillnets with the three different mesh sizes.

Figure 1: Map showing the two fishing grounds covered in the present study

The effort exerted and mode of action of multifilament gillnets were described, and the retained catch was collected separately, and brought to the Laboratory for species identification and morphometric measurements.

The total fish length (L) was measured to the nearest 0.1 cm, and the total body weight (W) was recorded to the nearest 0.1 g, for each fish species.

Gillnet Species composition, Catch per unit effort and Length-weight relationship of some fishes in coral reef fisheries of Jeddah and Thuwal, Saudi Arabia

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Abstract: Experimental fishing operations were conducted in coral reef fisheries of Jeddah and Thuwal using multifilament gillnets during the period from May 2013 to March 2014. Species composition, catch per unit effort, and length-weight relationship of some coral reef fishes were determined. Results indicated that 43 species belonging to 16 families were identified in the catch of multifilament gillnets in Jeddah. In Thuwal, 53 species belonging to 23 families were identified. In Jeddah, four species: *Acanthurus mata*, *Acanthurus sohal*, *Carangoides bajad*, and *Plectorhynchus gaterinus* represented collectively more than half of all fish caught (about 55 %). The overall catch per unit effort was found to be 74 fish (18.529 kg)/1000 m gillnet length. The length-weight relationship could be described by the power form $W = 0.012 L^{3.12}$ for *Acanthurus mata* and $W = 0.013 L^{2.97}$ for *Carangoides bajad*. In Thuwal, four species: *Caranx melampygus*, *Caranx sexifasciatus*, *Lethrinus lentjan* and *Naso elegans* represented collectively 39.9 % of all fish caught. The overall catch per unit effort was found to be 66 fish (31.352 kg)/1000 m gillnet length. The length-weight relationship could be described by the power form $W = 0.0049 L^{3.26}$ for *Caranx melampygus* and $W = 0.018 L^{2.93}$ for *Lethrinus lentjan*. Negative impacts on the coral reef ecosystem in Jeddah and Thuwal can be produced due to overfishing and damage of coral reefs by gillnet fishing

Keywords: Gillnets, Species composition, Catch per unit effort, length-weight relationship, Jeddah, Thuwal, Red Sea.

INTRODUCTION

Gillnets are of the oldest fishing gears used to catch diverse marine species in the coral reef small-scale fisheries, especially in the developing countries, because they are cheap and easy to handle and maintain (Valdes-Pizzini *et al.*, 1992; Acosta and Appeldoorn, 1995; Sainsbury 1996; Gabriel *et al.*, 2005). They are rectangular panels

of netting twines hanged erect between the float line and the lead line and positioned in the swimming layer of the target species, which may be at the surface, at the bottom, or in the mid-water (Munprasit *et al.*, 1989). The main catching mechanism in gillnets is gilling, but wedging, snagging or entangling can also occur (Hovgård and Lassen, 2000). Whereas gillnets have poor species selectivity, they have good size-selectivity