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An Investigation of Catch and Species Compositions Caught by Fishing Gears in The United Arab Emirates

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Abstract: The current research aimed to determine the catch composition of the fishing gears operated in the coastal area of the United Arab Emirates during the period from January to December 2022 with total of 3035 fishing trip. Catch composition, fishing gear and species composition of each fishing trip was investigated. The result showed the dominant species in term of biomass is Lethrinus lentjan and constitute 12.0% of the total catch, followed by Lethrinus nebulosus and Epinephelus coioides (11.56% and 8.52% respectively). A total of 58 fish species from 30 families were recorded in the catches of different gears with dominant species caught by nets, followed by the species caught by tarps. The fishing gear catch composition revealed that, trap caught 65.0% of the total catch, followed by nets 27.0%. While the least was recorded in hooks and lines 8.0%. The catch is dominated by fish species as much as 95.79%, while the other catch is Carcharhinidae (2.31%), Portunidae (0.86%), Batoides (0.57%) and Cephalopods (0.47%). The fish gear efficiency using the catch per unit effort CPUE revealed that, traps catch per unit effort ranged from 0.8kg/day to 14.60kg/day for both speed boat and dhow, while the CPUE in hooks&line fisheries was 12.54kg/day for dhow and 0.87kg/day for speed boat. Therefore, catch per unit effort for net was estimated as 3.03kg/day

Keywords: Fishing gear, trap, catch composition, net, species composition

INTRODUCTION

The United Arab Emirates (UAE) has coasts on both the southern Arabian Gulf and the northern Sea of Oman. The fisheries of the United Arab Emirates are small-scale in nature with two distinct fishing vessel types: fiberglass (speed boat), locally called (*tarrad)* and traditional wooden *dhows* (Lanch). *Tarrads* are typically 6-8m in length and equipped with 1-2 outboard engines, allowing a crew of 1-4 people to fish for 6-8 hours and sometimes extended to a day at a time (Grandcourt *et al.*, 2002; Al-Abdulrazzak, 2013 and Farrag, 2020 and 2021). The fishing gears used in the Emirates are clustered into three main groups: trap (*gargour*), net (*leikh*) and hand-line. The natural resources of coastal ecosystems are increasingly utilized by the growing human population, especially in less-developed tropical and sub-tropical countries (Clark 1994; De Boer & Longamane 1996; Cicin-Sain & Knecht, 1998; Krause *et al.*, 2001 and Diel *et al.*, 2005). The catch per unit fishing effort is a good measure of the relative abundance of the exploited stocks. It is well known that the catch per unit effort CPUE is a measure of stock density, physical and financial productivity, and an indicator of the efficiency of a fishing operation (Ghosh and Biswas, 2017). CPUE is expected to be proportionate to the fish population that is utilized as the relative abundance index (Karim *et al.*, 2019). In addition, information about effort and catch per unit effort is essential data for the estimation of maximum sustainable yield MSY and the corresponding level of fishing effort f_{MSY} by means of surplus production models (Mehanna *et al.*, 2021). Diversity index provides more information than simply the number of species present in a particular water body which acts as an important tool that gives vital information on the scarcity and commonness of species in a community (Sultana *et al.*, 2018 and Tikadar *et al.*, 2021). Hence, knowledge of total catch composition caught in fishing gears and species composition of target and non-target species could provide information for identifying potential impacts that the fishery has on different marine species and ecosystems (Gray *et al.*, 2005a; Senko *et al.*, 2022). Assessment of species abundance and biomass usually give an outline of the population structure that exists in the water bodies (Saha *et al.*, 2018). The purposes of the current study were to investigate catch composition, species composition and catch per unit effort of fishing gear in the coastal area of the Arabian Gulf off the United Arab Emirates.

MATERIALS AND METHODS

The current research was conducted in the coastal area of the United Arab Emirates includes Arabian Gulf and East Coast of Oman Sea (Figure 1) during the period from January to December 2022. A total of 3035 questionnaires interviews from operated fishing vessels and represented all traditional fishing gears (Nets, Trap Hooks and lines).

The whole catch of each kind of net was physically examined to determine the species composition, however additionally, the samples were separated by species, and the weight of each species was

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noted. For each kind of net, the proportion of species composition in the capture (measured in weight) was computed. Furthermore, the CPUE by gear type was evaluated by dividing the total catch per fishing gear on the number of fishing vessels. Fish species identification was done using field identification guide to the living marine resources of the Arabian Gulf countries (FAO, 1997 and Fish-Base, 2019).

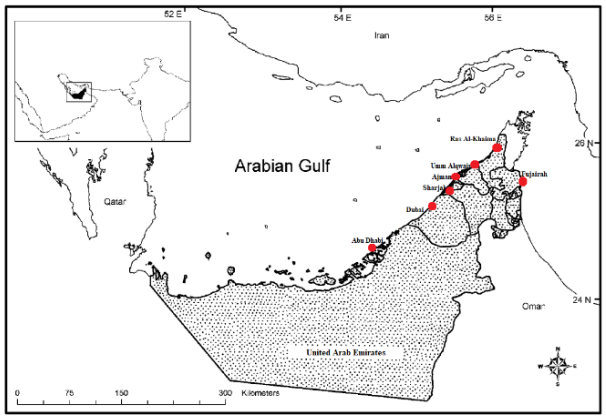

Figure 1: Map of the United Arab Emirates showing the sampling sites.

RESULTS

3035 fishing boats were investigated (194 decked dhows (6.0%) and 2841 speed boat (94.0%) from different landing sites along the coastal area of the United Arab Emirates. A tota1 of 58 fish species from 30 families were recorded in the catches of different gears used by the fishermen. The catch composition of nets, traps and hooks & lines are showed in Table 1. Among the catch composition of fishing gears operated, the highest number of species was recorded in the catches of nets (56), followed by the catches of traps (49). The lowest number of species were recorded in the catches of hooks and lines (39). The most commonly caught species were the family of *Carangidae*. This is the most commercial fish family and represented by Eight identified species, followed by family *Scombridae* with Five species. while the other distinguished fish families were *Serranidae*, *Lethrinidae*, *Haemulidae* and *Sparidae* represented by Four species each. Family *Lutjanidae* had Three species and *Nemiptridae* represented only by Two species. While the remaining fish families in the study had one species each (Table 1). Figure 2 shows the dominant species in term of biomass and declared *Lethrinus lentjan* was the highest abundant in the catch and constitute 12.0% of the total biomass, followed by *Lethrinus nebulosus* and *Epinephelus coioides* (11.56% and 8.52% respectively). In the present study, the least species were *Caranx sp* (0.05%), *Scarus Persicus* and *Trichiurus lepturus* (0.11 and 0.125 respectively). The fish species <0.01 of the total biomass did not mention in the table. The fishing gear catch composition revealed that, trap caught 65.0% of the total catch, followed by nets 27.0%. While the least was recorded in hooks and lines 8.0%. The catch is dominated by fish species as much as 95.79%, while the other catch is *Carcharhinidae* (2.31%), *Portunidae* (0.86%), *Batoides* (0.57%) and *Cephalopods* (0.47%).

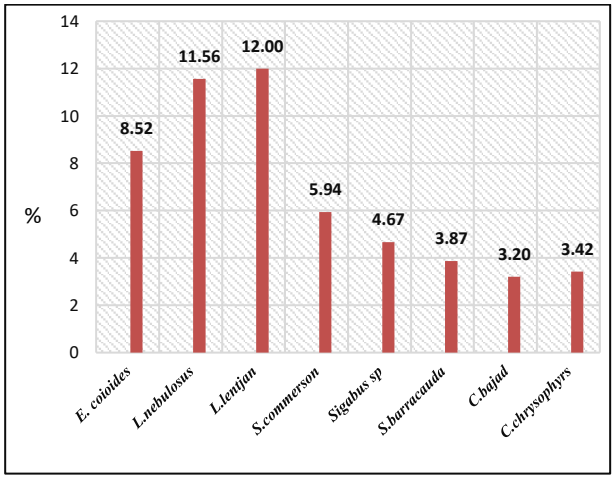

Figure 2: Dominant species (%) caught by different fishing gear

Table 1: The Catch Composition of Different Fishing Gear (%) Operated in The Coastal Area of The United Arab Emirates off Arabian Golf.

Family	Species	Hooks & hand-line	Traps	Nets	% Total
Serranidae	*Epinephelus coioides*	0.25	8.25	0.02	8.52
	Cephalopholis hemistiktos		0.13		0.13
	Epinephelus areolatus		0.48		0.49
	Epinephelus bleekeri		1.32	0.01	1.34
Carangidae	*Scomberoides commersonnianus*	0.23	0.37	1.35	1.96
	Atule mate	0.01	0.62	0.52	1.16
	Seriolina sp.		0.04	0.09	0.14
	Caranx sp.		0.02	0.03	0.05
	Carangoides bajad	0.49	2.18	0.54	3.20
	Carangoides chrysophyres	0.20	2.86	0.35	3.42
	Decapterus russelli			1.06	1.06
	Gnathonodon speciosus	0.05	1.03	0.06	1.13

***Corresponding Author:** Elsayed Farrag

Lethrinidae	*Lethrinus nebulosus*	1.15	10.03	0.38	11.56
	Lethrinus lentjan	0.76	10.98	0.26	12.00
	Lethrinus microdon	0.06	1.52	0.01	1.59
	Lethrinus barbonicus	0.05	1.73	0.02	1.80
Heamulidae	*Diagrama pictum*		1.54		1.54
	Pomadasys hasta		0.13		0.13
Scombridae	*Plectorhinchus sordidus*	0.05	0.44	0.09	0.57
	Thunnus tonggol	0.62	0.20	1.19	2.01
	Rastrelliger kanagurta		0.08	0.92	1.01
	Scomberomorus commerson	1.44	0.05	4.45	5.94
	Auxis thazard	0.25		0.70	0.95
	Euthynnus affinis	0.01		0.36	0.37
Sparidae	*Acanthopagrus bifasciatus*		1.08	0.03	1.12
	Rhabdosargus sarba	0.09	1.24	0.10	1.43
	Argyrops spinifer	0.06	1.64	0.08	1.77
	Acanthopagrus latus	0.01	0.23	0.02	0.26
Lutjanidae	*Lutjanus malabaricus*		0.70		0.71
	Lutjanus ehrenbergii	0.03	1.96	0.64	2.62
	Lutjanus argentimaculatus	0.01	0.20		0.21
Nemiptridae	*Scolopsis ghanam*		0.98		0.99
	Nemipterus sp	0.01	0.94	0.02	0.97
Chanidae	*Chanos chanos*	0.01	0.03	0.71	0.75
Cheatodontidae	*Pomacanthus maculosus*		0.30		0.30
Coryphaenidae	*Coryphaena hippurus*	0.05			0.06
Engraulidae	*Stolephorus indicus*			2.42	2.42
Gerridae	*Gerres longirostirs*		0.39	0.38	0.77
Mugilidae	*Valamugil seheli*	0.01	0.17	0.76	0.95
Ephippidae	*Platax orbicularis*		0.14		0.14
Scaridae	*Scarus persicus*		0.11		0.11
Sphyranidae	*Sphyraena barracuda*	1.02	0.14	2.71	3.87
Belonidae	*Tylosurus c.crocodilus*			0.27	0.27
Mullidae	*Parupeneus cyclostomus*		0.10	0.05	0.15
Ariidae	*Arius thalassinus*	0.10	1.21	0.13	1.44
Clupeidae	*Sardinella longiceps*			2.68	2.68
Siganidae	*Sigabus sp*	0.03	3.91	0.73	4.67
Trichiuridae	*Trichiurus lepturus*	0.03		0.09	0.12
Hemiramphidae	*Hemiramphus marginatus*			0.06	0.06
Rachycentridae	*Rachycentron canadum*	0.12	1.76	0.04	1.92
Portunidae	*Portunus pelagicus*		0.56	0.30	0.86
Carcharhinidae	*Carcharhinus sp*	0.07	1.93	0.31	2.31
Leiognathidae	*Leiognathus sp*			1.22	1.22
Cephalopods	*Sepiasp, Loligosp,Octopus*	0.01	0.39	0.07	0.47
Batoid	*Gymnuridae/Dasytidae*		0.05	0.52	0.57
Others		0.06	1.11	0.60	1.77

Figures 4, 5 and 6. shows the abundant fishes caught by different fishing gears. The dominant species in mass caught by net were *S.commerson* (16.27%), *S.barracauda* (9.90%) and *S.longiceps* (9.90%). For trap fisheries, *Lethrinus lentjan* was the highest catch and constitute (16.81%) followed by *L.nebulosus* (15.36%) and *E.coioides* (12.63%). On the other hand, the major species composition of fish species caught by hooks and lines were *S.commerson* (19.67%). *L.nebulosus* (15.66%) and *S.barracauda* (13.87).

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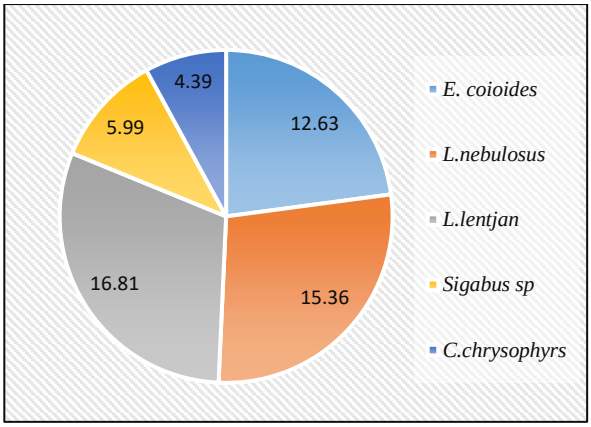

Figure 4: Commercial species in biomass (%) caught by traps

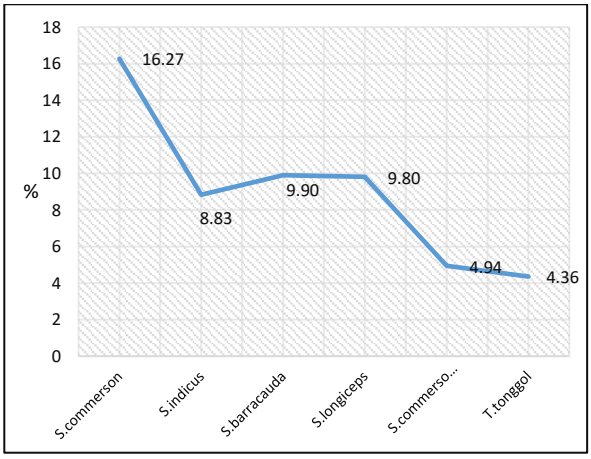

Figure 5: Species composition (%) of fish caught by nets

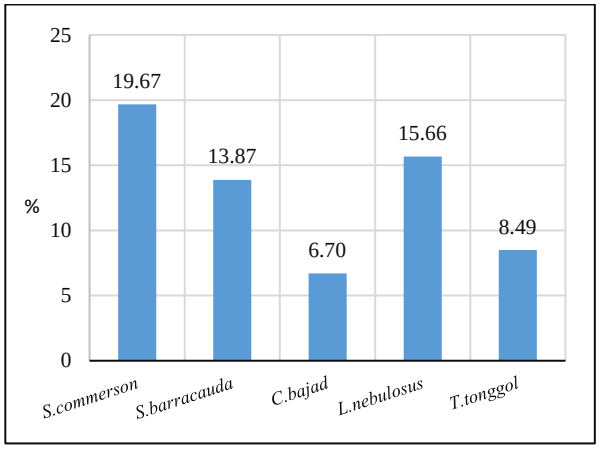

Figure 6: Species composition of fish caught by hooks and lines.

Catch per unit effort (CPUE)

The term "catch per unit effort" (CPUE) refers to the quantity of fish obtained for a certain amount of fishing effort. The fish gear efficiency using the catch per unit effort (CPUE) revealed that, traps catch per unit effort ranged from 0.8kg/day to 14.60kg/day for both speed boat and dhow, while the CPUE in hooks&line fisheries was 12.54kg/day for dhow and 0.87kg/day for speed boat. Therefore, catch per unit effort for net was estimated as 3.03kg/day for United Arab Emirate fisheries. In general, trap fisheries were recorded the highest catch per unit effort followed by hooks and line fisheries. The least CPUE value was recorded by net fisheries.

Distribution of length

Table 2. shows the length distribution of commercial species caught by different fishing gear operated along the Arabian Gulf and Sea of Oman and shows the longest size of fish caught is 141.0cm (FL) for *S.commerson* and caught by lines, while the shortest is 15.0cm (FL) for *S.canaliculatus*.

Table 2: Size Composition of Commercial Species Caught by Different Fishing Gear

Species	Arabian Gulf L. range (cm)	Arabian Gulf Av. Length	Sea of Oman L. range (cm)	Sea of Oman Av. Length
Epinephelus coioides	25-98	50.0	38-64	49.0
Carangoides bajad	16-57	31.0	22-47	34.0
Lethrinus nebulosus	32-61	39.0	23-52	38.0
Lethrinus lentjan	18-48	35.0	23-46	35.0
Diagrama pictum	21-67	34.0	23-40	30.0
Scomberomorus commerson	31-141	75.0	45-97	68.0
Rhabdosargus sarba	16-39	26.0	17-39	29.0
Argyrops spinifer	16-60	32.0	22-48	34.0
Siganus canaliculatus	15-39	26.0	19-35	27.0
Gnathonodon speciosus	20-67	37.0	24-41	32.0

Table 3: Catch Per Unit Effort for Fishing Gears During 2022

Gear	No. of trips	Days	Catch (kg)	CPUE
Dhow/Trap	4672	18688	272891	14.60
Dhow/hook&lines	145	435	5456	12.54
Speed boat/Trap	120230	360690	287895	0.80
Speed boat/Lines	55105	55105	48137	0.87
Speed boat/net	75144	75144	228053	3.03

Figure 7 shows the CPUE of abundant species caught by different fishing gears in the coastal area of the UAE and revealed that, the highest CPUE was estimated foe *Lethrinus lentjan* (9.32kg/day) followd by *Lethrinus nebulosus* (6.87kg/day). On the other hand, CPUE for *Epinephelus coioides* and *Rachycentron canadum* were 2.93kg/day and 1.24kg/day respectively. The least CPUE was observed in *S.canaliculatus* 0.44kg/day.

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Catch trend

The annual total fish production from the Coastal area of the United Arab Emirates during the period from 2013 to 2022 (Fig. 8) fluctuated between a minimum of 65510ton during 2022 and a maximum of 75615ton during 2018, with an average of 72143ton.

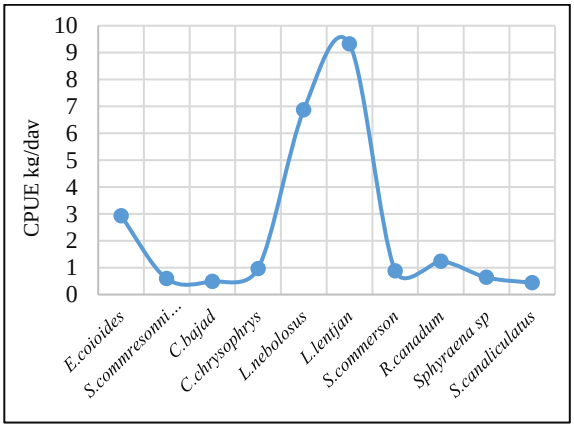

Figure 7: Catch per unit effort of common species in the UAE

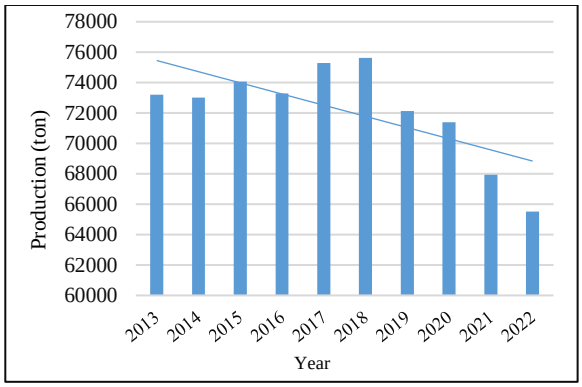

Figure 8: Total annual fish production from the United Arab Emirates

DISCUSSION

The fisheries of the United Arab Emirates are small-scale in nature and based on two distinct fishing vessels: fiberglass speed boat locally called *tarrad* and traditional wooden *dhows* locally called *lanch* (Farrag *et al.*, 2020). In the present study, the catch composition of fishes and catch per unit effort were estimated during the period from January to December 2022 through sampling on various fishing gears and different landing sites. Detailed data on trip duration, total catch, catch by species, average weight of individuals and gear utilized were collected from samples extracted from main landing sites. The whole catch of each kind of fishing gear was examined to separate the species composition and the weight of each species was recorded. Catch per unit effort by gear types and abundant species was calculated. Over 58 species from more than 35 families are caught by the gears operated in the different fisheries of the United Arab Emirates. The most commonly caught species were the family of *Carangidae* followed by family *Scombridae*. Regarding to species composition, *Lethrinus lentjan* was the highest abundant in the catch and constitute 12.0% of the total biomass, followed by *Lethrinus nebulosus* and *Epinephelus coioides* (11.56% and 8.52% respectively). The primary commercial species was recorded by Farrag *et al.*, 2020 and revealed that, the trap catch was dominated by *E. coioides* and represent 10.09%, followed by *L. nebulosus* and *S. canaliculatus* by 7.60% and 6.82% respectively. In the present study, the least species were *Caranx sp* (0.05%), *Scarus Persicus* and *Trichiurus lepturus* (0.11 and 0.125 respectively). Farrag *et al.*, 2021 reported 33 fish families caught by different fishing gear, the dominant families in mass were Scombridae (20.0%), Lethrinidae (19.0%), Carangidae (16.0%) and Serranidae (8.0%). The highest species composition was: *Lethrinus nebulosus* (7.9%), *Scomberomorus commerson* & *Lethrinus lentjan* (7.2% for each) and *Rastrelliger kanagurta* (6.5%). The fishing gear catch composition revealed that, trap caught 65.0% of the total catch, followed by nets 27.0%, while the least was recorded in hooks and lines 8.0%. The analysis of speed boat catch operated in the United Arab Emirates stated the traditional traps had a major catch in speed boat fishery and constitute 57.0% followed by nets 28.0% and hand-line with 15% (Farrag *et al.*, 2021). In the present study, the catch is dominated by fish species as much as 95.79%, while the other catches are *Carcharhinidae* (2.31%), *Portunidae* (0.86%), *Batoides* (0.57%) and *Cephalopods* (0.47%). The catches could be influenced by several factors such as fish behavior, seasonal fishing, location and soak time, Fisabilillah *et al.*, 2021. The study revealed that more fish were caught during the period from November to April. The catch per unit effort was studied and declared that, the traps catch per unit effort ranged from 0.8kg/day to 14.60kg/day for both speed boat and dhow, while the CPUE in hooks & line fisheries was 12.54kg/day for dhow and 0.87kg/day for speed boat. Therefore, catch per unit effort for net was estimated as 3.03kg/day for United Arab Emirate fisheries. In terms of species composition, the CPUE for *Lethrinus lentjan* was estimated at 9.32kg/day followd by *Lethrinus nebulosus* 6.87kg/day. On the other hand, CPUE for *Epinephelus coioides* and *Rachycentron canadum* were 2.93kg/day and 1.24kg/day respectively. The least CPUE was observed in *S.canaliculatus* 0.44kg/day.

CONCLUSION

The total catch composition of the fishing gears in the coastal area of the United Arab Emirates were 30 families consist of 58 species of fish. The most commonly caught species were the family of *Carangidae* followed by family *Scombridae*. Regarding to species composition, *Lethrinus lentjan* was the highest abundant in the catch and constitute 12.0% of the total biomass, followed by *Lethrinus nebulosus* and *Epinephelus coioides* (11.56% and 8.52% respectively). The catch per unit effort was studied and declared that, the traps catch per unit effort ranged from 0.8kg/day to 14.60kg/day for both speed boat and dhow, while the CPUE in hooks & line fisheries was 12.54kg/day for dhow and 0.87kg/day

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for speed boat. Therefore, catch per unit effort for net was estimated as 3.03kg/day species.

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