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Stock Assessment of Demersal Resources in the West Northern of Persian Gulf Water

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Abstract: In order to estimate the biomass of demersal in a part of Khuzestan and Boushehr water (North- West Persian Gulf), a research Survey was carried out by using R/V Ferdows 1covering the depths 10-20, 20-30 and >30m. Study area was stratified into 2 strata (A, B) and 32 stations selected randomly and were sampled by Swept Area method. 44, 43, 54 and 36 species were identified in substrata A_1, B_1, B_2 and B_3, respectively. Catch per unit of area and biomass in substrata A_1, B_1, B_2 and B_3 were 2396, 3102, 4942, 7904 kg/nm^2 and 1198, 1292, 2471, 3952 kg, respectively. The maximum and minimum biomass belong to *Upeneus sulphureus* (1269kg), *Nemipterus Japonicus* (857kg) and *Apogon sp.* (2.23kg), *Scorpion sp.*(4.18kg) species, respectively. Total biomass in the area was estimated 9015 kg of which 6491 kg was non- commercial. A decrease of fishing effort should seriously be taken into consideration.

Key words: Demersal Fishes · Biomass · Catch per unit of area

INTRODUCTION

Although available statistics are poor, the annual commercial catch from the fisheries of world is approaching 100 million t, a figure which has often been regarded as close to the sustainable limit [1]. The proper assessment and management of a fishery requires an understanding of the biology, life cycle and distribution of the species on which it is based and the aim of stock status assessment is to understand the current status of resources exploitation relative to the long-term sustainable levels [1].

Persian Gulf is one the most important gulf in the world from fishing industries point of view. Iran, Iraq, Saudi A., Kuwait, Oman, Qatar, Emirates are located in the coast of this gulf [2]. The Persian Gulf is a semi enclosed sea that laying almost between the latitudes of 25°-32° N and longitudes of 48°-56° E. This water basin is shallow continental shelf and average of depth was 35 m, which is increasing from Arvend estuary and reach to maximum in strait of Hormuz Strata. Next to oil, fisheries represent the second most important natural resource and the most important renewable natural resource [2].

The first studies about Persian Gulf benthic assessment carried out with name UNDP/FAO in 1976-1979[3]. Also were studied benthic assessment survey [4] and benthic stock assessment of in Persian Gulf [5, 6]. The objectives of this study are (i) to identify the catch composition (ii) to determine the CPUA, Biomass, species combined and (iii) the percentage of this species in the total economic.

MATERIALS AND METHODS

This research was carried out in North West of Persian Gulf and coastal water of Khuzestan province and part from coastal of between longitudes 49°00′ and 50°30′and latitude 28°45′- 30°N and area was 2037.3 m^2 of sea.

The area of case study was divided into 2 strata (A, B) and was classified into 3 depths (Substrata: 10-20, 20-30 and upper 30 m). A strata was located in water limitation of Khuzestan between longitudes 49° 00′- 49° 45′ whereas low depth of this areas. Strata B, the part of Khuzestan province waters and west Busher province was enclosed (between longitudes 49° 45′ and 50° 30′), that divided to three substratum (B_1, B_2, B_3). The total area and area of each substratum was calculated with a plannimeter (Table 1).

Sampling Method: The stock amount was estimated with random design 32 stations were determined randomly and geographical location was implemented on the map.

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Table 1: The number of trawl stations in proportion to substratum in the West northern of Persian Gulf water

Stratum	A_1	B_1	B_2	B_3
Area (nm^2)	621.7	340.6	481.9	593.1
Station	7	3	15	7
Deep	10-20	10-20	20-30	30<

Ferdows-1 vessel is a stern trawler (673 gross registered tonnages, 45.4m length) with bottom-trawl net (mesh size of cod end 80mm and headline 72m). Each trawl lasted 1h, following which the net was hauled and the catch sampled as follows: (a) all large fish (such as sharks, rays, large catfish, etc.) were separated from the catch, counted and weighed; (b) the remaining catch was distributed into equal-sized baskets and one in every baskets was selected randomly; (c) for each selected basket, all fish were identified to species or group [7, 8, 9] and weighed; (d) total number and weight for each category were calculated.

CPUA Estimation: Catch per unit swept area (CPUA) is most often based on either commercial or survey data. Survey data are preferred because they are usually collected using a standardized procedure that is kept constant to the extent possible [1]. CPUA was calculated as being the catch weight (Cw) divided by the swept area (a) for each species and for each hauls [1]: CPUA = Cw/a. The swept area (nm^2) or the 'effective path swept' for each hauling was estimated thus: a = D× h× X.

Where h is the length of the head-rope and D is t he covers of distance. X is the fraction of the head rope length which is equal to the width of the path swept by the trawl. The value of X varies from 0.4 to 0.66. It is suggested that X = 0.5 is the best compromise value for Mediterranean Sea [10]. The value of X was taken to be 0.6 in this study. The distance covered (Di) was estimated for each haul in units of nautical miles [10]. An estimates of the total stock biomass (B), which uses the following formula: B= Cw/υ ×(A/a), Where υ is the vulnerability of the fish and value of υ=0.5 [10]. Analysis of length and weight aquatic and tables design and curves was used by Excel software program.

RESULTS

The mean catches per unit effort (CPUA) values for the various species and for every stratum was estimated. In total, 55 group of animal was identified that included: 1 order, 14 family and 45 species (Table 2). The most biomass fish were *Nemipterus japanicus*, *Upeneus sulphureus* and the lowest biomass fish were Apogonidae and Scorponidae. In area A_1, B_1, B_2 and B_3 have 44, 43, 54 and 36 numbers species respectively, mean catch per unit area estimated 1198.2 kg, 2471.4 kg and 3952.3kg respectively. Mean biomass amount of strata A_1, B_1, B_2 and B_3 were calculated 2396.05 kg, 3102.25 kg, 4942.87 kg and 7904.67 kg (Fig. 1). The maximum and minimum biomasses were found in substratum A_1: *Illisha megaloptera*, *Grammopolites suppositus*, B_1: Anguilla and *Alectic Sp.*, B_2: *Upeneus sulphureus* and *Platycephalus indicus*, B_3: *Nemipterus japanicus* and shark, respectively (Table 2).

Catch per unit area and biomass in strata A, 1198.2 and 1498.0 (kg/nm^2) and strata B 2572.1, 7520.1 kg were calculated. Maximum and minimum CPUA were found in depth 30-50 m, 10-20 m, respectively. Also, biomass was highest in the depths of depth zone and lowest in the depths of 10-20 m (Fig. 2). The total biomass of demersal

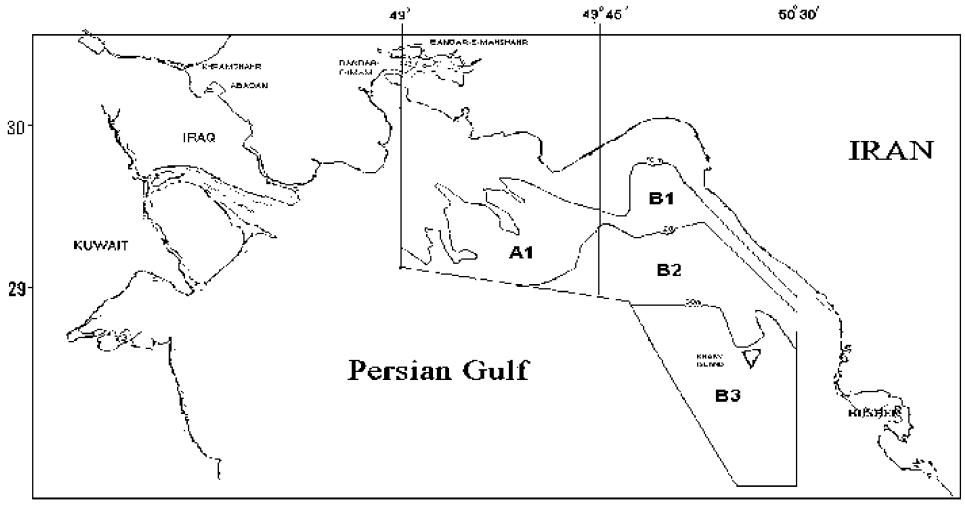

Fig. 1: Study area for stock assessment of demersal resources in the West northern of Persian Gulf water

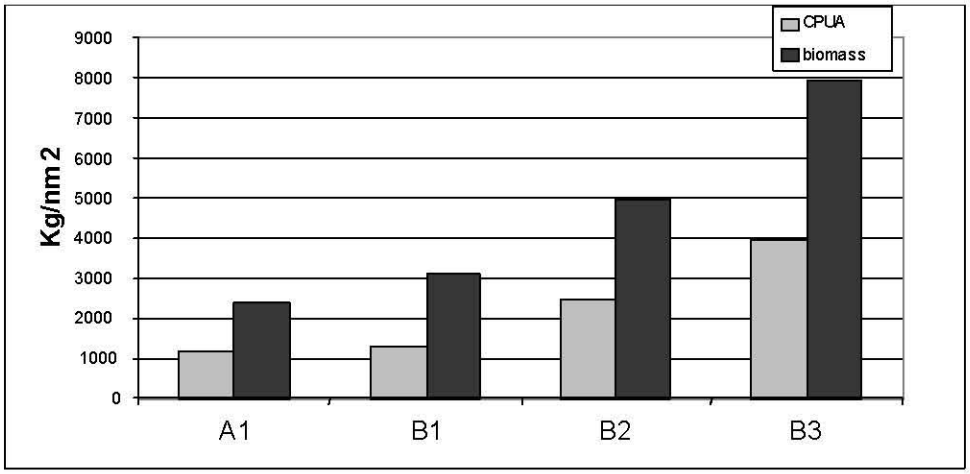

Fig. 2: Catch per unit Area (CPUA) on different local in the West northern of Persian Gulf water

Table 2: Checklist of species/species groups in bottom trawl catches in the Persian Gulf (2009-10) and their percentage from total catch

				Biomass (kg)					
	Species / Species group	Ecologic group	Economical value	A1	B1	B2	B3	Average	Percentage
1	*Urotenthis duvauceli*	Demersal	Non-commercial	3.61	17.26	28.95	100.39	47.70±112	0.68
2	*Apogonidae*	Demersal	Non-commercial	2.2	-	-	-	2.2	0.03
3	*Upeneus sulphureus*	Demersal	commercial	21.41	-	1349.84	1666.88	1269±542	18.41
4	*Lagocephalus inermis*	Demersal	Non-commercial	126.13	181.71	144.37	188.59	155.22±94	2.25
5	*Alectic Sp*	Demersal	Non-commercial	-	4.59	9.43	10.96	9.29±124	0.13
6	*Leiognathus fasciatus*	Demersal	Non-commercial	14.63	56.62	49.41	252.54	128.19±271	1.68
7	*Alutera monocerous*	Demersal	Non-commercial	-	-	47.48	-	47.48	0.7
8	*Trachinotus africanus*	Demersal	Commercial	-	-	32.37	-	32.37	0.46
9	*Triglidae*	Demersal	Non-commercial	-	15.44	-	13.01	13.82±12	0.19
10	*Gerreidae*	Demersal	Non-commercial	-	-	74.23	-	47.23	1.07
11	*Pumpus argenteus*	Demersal	commercial	41.57	80.24	-	-	45.42±45	0.65
12	*Parastromatcus niger*	Demersal	commercial	-	-	-	10.79	10.79	0.15
13	*Portuns pelagicus*	Demersal	commercial	10.79	11.48	24.12	-	11.13±285	0.16
14	*Derpanide*	Demersal	Non-commercial	-	5.56	-	-	5.56	0.07
15	*Eleutheronema tetradactylum*	Demersal	Commercial	-	-	53.41	-	53.41	0.77
16	*Grammoplites suppositus*	Demersal	Commercial	5.42	8.63	19.78	172.05	50.75±261	0.73
17	*Platycephalus indicus*	Demersal	Commercial	66.77	60.77	39.14	47.66	49.09±82	0.71
18	*Jellyfish*	Demersal	Non-commercial	10.79	-	52.37	204.60	155.66±457	2.25
19	*Clupeidae*	Pelagic	commercial	6.79	7.86	115.71	147.148	82.36±398	1.16
20	*Pomadasys kaakan*	Demersal	commercial	-	-	27.89	307.90	195.89±374	2.83
21	*Nemipterus japanicus*	Demersal	commercial	199.16	498.60	746.23	1915.24	857.83±276	12.43
22	*Nemipterus peronii*	Demersal	commercial	4.84	12.66	16.75	-	8.77±12	0.12
23	*Scomberoides commersonnianus*	Pelagic	commercial	-	13.19	25.29	-	28.44±22	0.41
24	*Lutjanus johni*	Demersal	Commercial	-	-	70.11	-	70.11	1.02
25	*Rachycentron canadum*	Pelagic	commercial	-	-	59.35	-	59.35	0.86
26	*Pomadasys multiculatum*	Demersal	commercial	4.19	-	-	-	4.19	0.06
27	*Rays*	Demersal	Non-commercial	30.03	94.57	80.75	114.02	83.20±215	1.20
28	*Otolithes ruber*	Demersal	Commercial	96.09	81.19	163.34	114.72	134.53±302	1.94
29	*Acanthopagrus latus*	Demersal	Commercial	185.53	95.05	60.30	45.43	107.34±174	1.55
30	*Lethrinus nebulosus*	Demersal	commercial	20.94	-	-	55.56	38.29±69	0.55
31	*Ilisha megaloptera*	Pelagic	Non-commercial	364.26	130.91	196.71	153.41	222.88±378	3.22
32	*Caragoides ferdau*	Demersal	Commercial	32.38	-	164	-	131.09±26	0.12
33	*Scomberomorus commerson*	Pelagic	commercial	-	89.03	146.63	-	83.11±239	1.20
34	*Thrssa ilisha*	Pelagic	Commercial	10.52	45.59	31.33	-	25.35±48	0.36
35	*Siganidae*	Demersal	commercial	-	-	11.12	-	11.12	0.16

Table 2: Continued

36	*Sperdentex hasta*	Demersal	commercial	153.62	44.51	92.14	70.98	293.57±93	4.25
37	*Cheatodontidae*	Demersal	Non-commercial	4.31	-	-	-	4.31	0.06
38	*Scorponidae*	Demersal	Commercial	9.7	4.59	4.32	-	8.41±31	0.12
39	*Sphyraena jello*	Pelagic	Commercial	50.39	34.16	158.22	408.73	156.77±289	3.26
40	*Euryglussa orientalis*	Demersal	Commercial	13.66	24.68	80.21	52.28	44.62±148	0.64
41	*Psettodes erumei*	Demersal	Commercial	-	-	-	10.79	10.79	0.15
42	*Cynogloss arel*	Demersal	commercial	10.07	21.54	6.45	-	13.49±85	0.19
43	*Saurida tumbil*	Demersal	commercial	93.12	49.29	515.52	752.89	460.20±461	6.67
44	*Carcharhinus*	Demersal	commercial	44.51	-	133.54	67.39	79.55±379	1.15
45	*Argyrops spinifer*	Demersal	Commercial	5.30	-	39.02	82.59	58.40±262	0.84
46	*Atule mate*	Demersal	Commercial	93.12	49.29	515.52	752.89	460.20±461	6.67
47	*Carangoides plagioteania*	Demersal	Commercial	-	-	8.37	-	8.37	0.12
48	*Arius thalassinus*	Demersal	Commercial	107.18	85.76	66.84	172.07	92.40±392	1.33
49	*Anguilliformes*	Demersal	Commercial	237.49	643.32	122.98	-	238.16±92	3.45
50	*Sepia pharaonis.*	Demersal	commercial	167.12	74.15	234.83	260.53	209.49±170	3.03
51	*Shrimp*	Demersal	commercial	11.19	-	40.21	61.58	41.38±691	0.59
52	*Liza klunzingeri*	Demersal	Commercial	88.89	137.10	62.63	-	89.44±158	1.29
53	*Octopus sp*	Demersal	Commercial	-	43.16	25.9	-	43.53±25	0.62
54	*Epinephelus coioides*	Demersal	commercial	30.63	-	252.72	50.96	158.24±85	2.29
55	*Trichiuriurus lepturus*	Demersal	Non-commercial	37.19	123.23	176.52	156.22	135.38±531	1.96

fish in the west northern of Persian Gulf waters was estimated to be 9015.79 kg and non-commercial the non-commercial catch commercial catch in substratum A1, B1, B2 and B3 were found 0.66%, 0.56%, 0.77% and 0.78%, respectively.

The biomass of commercial demersal fish, non-commercial demersal fish and pelagic for zones A, B were estimated 1597.82 kg, 307.29 kg, 482.9 kg - 3787.29 kg, 1785.54 kg and 355.52 kg, respectively.

DISCUSSION

Sustainability, in both ecological and socio-economic senses, is now recognized as the essential feature of the exploitation of living marine resources. A rational and long-term approach to management is necessary to achieve sustainable and successful exploitation [11]. For this to be achieved it is essential to monitor the status of the resource, including the collection of biological data. Biomass and CPUA estimates are commonly used as stock indices for management of demersal resource species [10].

Persian Gulf water is a semi-enclosed water body located in the tropical zone and has a vast area of shallow water, known to be a preferred habitat for demersal species. In tropical water, smaller numbers of a much larger range of species are caught more commonly as a critical source of protein, rather than as a source of income [1]. Fish density of aquatic species to Busheher and with upper depth sea shows an ascending trend, such as: *Sphyraena jello*, *Argyrops spinifer*, *Alectic sp.* Some other species to Khuzestan water and with lower depth sea shows to increasing, such as: Cheatodontidae. However, the most important commercial species (*Pampus argenteus* and *Otolithes ruber*) account for a very small proportion of the total catch. The most abundant non-commercial species were rays and catfish. The decrease of shark abundance over the last two decades [3], along with the decline in silver pomfret and croakers, due to over-exploitation and the great increasing abundance of groups such as rays and catfish, suggest that fishing is affecting community structure. Status of aquatic stocks of water resources depending on type and environment condition, are changed during different time periods [1].

In strata A, B of comparing commercial benthic to non-commercial benthic was obtained 5.2 times and 2.12 times, respectively. According to this result can be said that maximum degrading rate in strata A_1, B_3 was seen and minimum degradation was obtained in strata B_1, B_3. Total biomass amount from approximately 27000 tons in 1995 [2] has reached about 9000 tons in 2010, that showed to decrease 2/3 biomass and a gradual decline in different years was observed in these strata.

Persian Gulf benthic amount was estimated 72000 ton and fish density of benthic Persian Gulf was estimated 2 times of Oman Sea. Also, density amount of Khuzestan benthic was lower from other southern provinces and maximum aquatic density of Persian Gulf and Oman Sea were reported 30-50 m and 10-20 m respectively. The lowest of biomass amount and CPUA in Persian Gulf is related to area A [5, 6]. Khuzestan provinces biomass

amount was 10257 tones and 9.2% southern waters biomass was in 2005 [6]. In Persian Gulf there is an ascending trend for biomass with increasing depth. The estimated biomass of commercial species was 2.5 times higher that of the non-commercial species group [5]. And catch pressure with emphasis on strata A, it is suggested to gradual reduction of catch effort. In conformity with Iranian fisheries policy, bottom trawling for fish has been banned in this region since 1992 [12] to prevent over-exploitation. This has helped the recovery of demersal resources. Thus, despite existing restrictions on fishing effort (a ban on trawling for fish in the Persian Gulf), it appears that there remains a need for additional management measures. The spawning and nursery grounds of some commercial demersal species have been identified and are suggested to be considered as new protected areas in the near future. In order to achieve sustainable exploitation of this marine resource, these stocks should be regularly monitored and the migration pattern, the predator-prey relationships, growth and mortality parameters should be determined to gain sufficient knowledge to manage these stocks effectively [13]. Thus, it is necessary to study these factors for planning an effective management strategy that can be recommended to the government.

CONCLUSION

The catch composition of demersal resources shows a high changes compared to the last 2-3decades [6] and there is a high significant change in species diversity. Some species such as *Papmpus argenteus*, *Otolithes ruber* and *Platycephalus indicus* with high economic value are significantly decreased and on the other hand some other species mainly *Upeneus sulphureus, Nemipterus japonicus*, *Saurida tumbil and Atule mate* are significantly increased and in fact more than 40% of total biomass is consist of this group of fishes and ecologically have been adopted with all changes in ecosystem and it indicates an increase in abundance of predators in the study area.

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