

STUDIES ON CATCH RATES OF BOTTOM TRAWLERS IN QATAR WATERS, ARABIAN GULF

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ABSTRACT

Data pertaining to catch, effort, time, space, landing, commercial value, by-catch and some environmental parameters covering the period from 1983 to 1988 were used in this regard. The results conformed that; the CPUE exhibits an increasing trend from relatively shallower to deeper depths, and declines from sandy through muddy-sand to muddy type of bottom, and CPUE in waters less than 20 fathoms deep was lower in summer than in winter and the trend was vice versa in deeper water.

Higher CPUE values were obtained for the day and full-moon-nights operations than for night and/or moonless-nights ones respectively. The former is higher than the later by about 5.4% to 16.8% with a mean of 11.1%.

Effort exerted by QNFC fleet is still below the optimum effort of such fishing grounds and the yield is insignificant in comparison to the biomass. The fishery sector in Qatar can easily assure fish self-sufficiency by increasing fishing effort especially that of QNFC fleet by introducing an added trawler to the present fleet.

INTRODUCTION

The fundamental studies on the biology of the commercially valuable fish in Qatar waters are scarce. Such a condition has resulted from the fact that the opportunities for research in this field in the past were lacking. Nowadays, the attention has been directed to the study of the biological characteristics and the changes that take place within fish populations. Until such studies are complete, better understanding of any changes that might affect the fisheries will be lacking. On the other hand, in spite of such deficiency in the biological background, useful statistical information are valuable for proper administration and utilization of the fisheries and can be used to describe changes in production and fluctuations in the abundance of the commercially valuable varieties.

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Dependable data pertaining to trawling operations on the commercial scale by Qatar National Fishing Company (QNFC) along the eastern side of Qatar peninsula have been collected since 1981. The data are dependable due to specially designed data sheets that are compulsory to be filled by the trawler's skipper of QNFC in-situ. Moreover, such sheets are used as basis for production's incentives for the crew. The sheets are also revised by the administration department of the company as related to the actual sales. Detailed studies on the pattern of distribution and abundance of individual fish-families in Qatar waters had been reported by Sivasubramaniam and Ibrahim, 1982. Their study was based on bottom trawling operations carried out during 1980/81 and had been given a fair knowledge of the demersal fish resource potential of the mentioned waters. However, in view of the fisheries data being collected since 1981; the need was felt to study the demersal resource aspects not covered so far and to update the present knowledge about this fishery. The potential of Qatar waters was estimated by the former authors to be in the range of 22000 m. ton for only the grounds at depths greater than 20 fathoms which comprises about 22% of the whole area of Qatar waters. It is obvious that such estimate can be of little value to the fishing industry, except to indicate that the production could be stepped up by a more intensive exploitation of the partially exploited stocks as well as the unexploited resources in areas beyond the present fishing grounds.

The aim of the present study is to conduct a quick appraisal of the fisheries potential of Qatar waters based on the catch and effort data of 1983 - 1988 to evaluate the general status of the demersal stocks and to get an estimate of the standing stock and the potential yield of this water.

MATERIALS AND METHODS

The method of estimating the standing stock is based on the assumption that; catch per unit of effort (CPUE) is a function of stock density in the area surveyed, and changes in the CPUE are directly proportional to the variations in density (Gulland 1969, Ricker, 1978). Hence, data pertaining to catch, effort, time, space, landing, commercial value, by-catch and managerial operation files - covering the period from 1983 to 1988 - were secured from QNFC, trawlers Log Books and the skippers of the three trawlers owned and operated by QNFC. It should be pointed out that QNFC is the only licenced body to conduct bottom trawling in Qatar waters, beside some shrimpers conducting this method only during the shrimp open-season in the shallower depths.

The specifications of QNFC trawlers are as follows:

Two sister stern trawlers (converted shrimpers) "F/V FALCON" and "F/V ORYX". They are double rigged steel hull, single screw, made in Singapore in 1973. LOA 23.6 m; Beam 7.54 m; Depth moulded 3.77 m; CT 102.6 ton;

h.p. 480. Each is run by a crew of 7–8 men, and operates an Engle's Balloon Bottom Trawl No. 450. The other trawler is "F/V GAZELLE". She is a stern trawler, steel hull, single screw, Holland made 1975, LOA 30.3 m; Beam 6.7 m; Draft 3.4 m; CT 136 ton, h.p. 600. She is operating an Engle's Balloon bottom trawl No. 570 and is run by a crew of 8–12 men. The fishing operation area of the trawlers is on the eastern side of the peninsula between 25 00' to 26 00'N, 52 25' to 52 50'E. The bottom type is muddy-sand with a depth range of 20–25 fathom isobaths.

The CPUE for each of the above trawlers was obtained by dividing the catch (Kg) by the exerted effort (Hr) for each fishing operation. These fishing operations were classified into four categories as follows:

1. Day-only operations (4:00 a.m. to 7:00 p.m.).
2. Night-only operations (7:00 p.m. to 4:00 a.m.).
3. Moon-nights operation (occurring during the period of 4 days before and after the full moon).
4. Dark-nights operations (occurring during nights other than mentioned under 3 above).

Hence, four CPUE values were calculated for each trawler corresponding to each month. The values obtained for the two sister trawlers were pooled to get an average of their diurnal CPUE as well as the monthly overall CPUE average. On the other hand, the CPUE values of "GAZELLE" were kept separate. As for the standardization of the effort of the three mentioned trawlers to be used in Yield estimations; a ratio was worked out between the monthly overall CPUE average of the two sister trawlers and that of "Gazelle" to get an estimate for the standard effort exerted by the later. Since the CPUE average of "GAZELLE" was always higher than the corresponding CPUE average of the two sister trawlers; a factor was obtained by dividing the CPUE of "Gazelle" by the average CPUE of the two sister trawlers. Then this factor was multiplied by the original effort exerted by "Gazelle" to get her standardized effort. On the other hand, the annual total catch was obtained by direct addition of the catch from the three trawlers, then the average CPUE was calculated as mentioned. This is, by no means, an entirely correct or satisfactory method, but was used as the only practical means, in the context of the mixed coverage made by the three trawlers.

RESULTS AND DISCUSSION

The area of Qatar waters as a whole is approximately 35000 square kilometers, and nearly 75% of it is on the eastern side of the peninsula. This area is within the boundaries demarcated by the State of Qatar for the exclusive exploitation of oil and gas resources. The existing Qatar fisheries is almost entirely on the eastern side with a little on the north. Except for the game fishery; there is

hardly any fishery on the west of Qatar. Traditionally, the fishery in Qatar has been primarily a demersal fishery, where demersal fish varieties represent about 70% of the production. Out of the 110 species truly demersal in Qatar waters; only 66 are presently of commercial value.

The fish landing in Qatar has been at an almost steady level - since the appearance of the official fish statistics of Qatar - due to insignificant changes in the fishing effort. As presented in Table (1) and shown in Figure (1), and as based on the yearly fish statistics of Qatar; bottom trawl fishery on the commercial scale solely conducted by QNFCC contributes about 25% to the total annual production from Qatar waters. It should be mentioned that, due to the dependability of the data recorded by QNFCC - as pointed out before - the present study will be restricted to the data mentioned.

Table 1

Annual total fish landing from Qatar waters by Artisanal and Commercial fisheries (m. ton; during 1981-1988. (Based on Anonymous 1981-1988).

Year	Type of fisheries		
	Artisanal	Commercial	Total
1981	1558	613	2171
1982	1266	594	1860
1983	1279	781	2069
1984	2276	792	3068
1985	1746	648	2394
1986	1119	746	1883
1987	1652	870	2522
1988	2270	816	3086

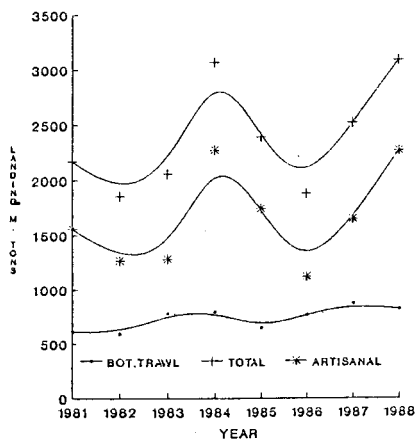


Fig. 1: Annual; total, bottom trawl, and artisanal fish landing (m. tons) for Qatar waters during 1981-1987.

The analysis of the CPUE of the three trawlers showed a correlation between the two sister trawlers with no significant difference between the mean CPUE of both of them, while it was higher for "GAZELLE" than any of the sister trawlers. This difference is due to the fact that "GAZELLE" is a bigger sized ship operating bigger net in comparison to the other two. On the other hand, normal variation in the CPUE could be attributed to behavioral pattern of the gear in relation to that of the fish, differences in depth, bottom condition, dynamic factors in the waters, as well as seasonal changes in distribution that is brought about by localized migration. Moreover, it is known that environmental factors have significant influence on the occurrence, abundance and seasonal movements of the fish. The available data are insufficient to attempt a conclusive correlation among these factors and the CPUE variation. However, depth, and time of fishing operation as related to natural light intensity could be used to consider possible influence on the catch rates.

Table 2
Diurnal CPUE of three bottom trawlers operating in Qatar waters during 1983-1988. The average represents only the two sister trawlers "ORYX" and "FALCON".

Year	Vessel	Day (Ave)	Night (Ave)	F. Moon Nights	Moonless Nights	Total Catch(Kg)	Total Effort(Hr)	CPUE Kb/Hr
1983	Oryx	107.1	73.7	87.8	70.8	119	1284	92.6
	Falcon	124.4	97.2	114.9	97.1	237	2177	109.0
	Average	115.8	85.5	101.4	84.0	178	1731	100.8
	Gazelle	163.5	126.8	166.4	119.9	380	2514	151.1
1984	Oryx	96.8	94.6	92.1	92.2	234	2401	97.5
	Falcon	119.6	106.4	96.3	102.6	252	2231	112.8
	Average	108.2	100.5	94.2	97.4	243	2316	105.2
	Gazelle	163.9	129.3	126.4	148.4	336	2452	137.2
1985	Oryx	71.0	72.1	77.1	65.4	175	2508	69.7
	Falcon	88.3	84.8	108.9	79.9	209	2463	84.7
	Average	79.7	78.5	93.0	72.2	192	2486	77.2
	Gazelle	122.5	119.5	132.3	114.1	306	2520	121.2
1986	Oryx	77.4	75.7	105.4	70.6	210	2721	77.1
	Falcon	90.4	92.2	110.5	90.3	239	2779	86.1
	Average	83.9	84.0	108.0	80.5	225	2750	81.6
	Gazelle	118.0	101.2	112.2	98.8	326	2837	115.0
1987	Oryx	100.8	93.8	107.5	92.0	239	2458	97.2
	Falcon	109.5	113.7	101.4	114.6	275	2460	111.9
	Average	105.2	103.8	104.5	103.3	257	2459	104.6
	Gazelle	129.3	109.6	108.6	125.5	372	2947	125.5
1988	Oryx	97.5	88.1	95.8	88.7	275	2880	95.3
	Falcon	113.6	110.5	107.8	107.6	297	2645	112.1
	Average	105.6	99.3	101.8	98.2	286	2763	103.7
	Gazelle	134.7	106.1	118.7	112.4	320	2627	121.8

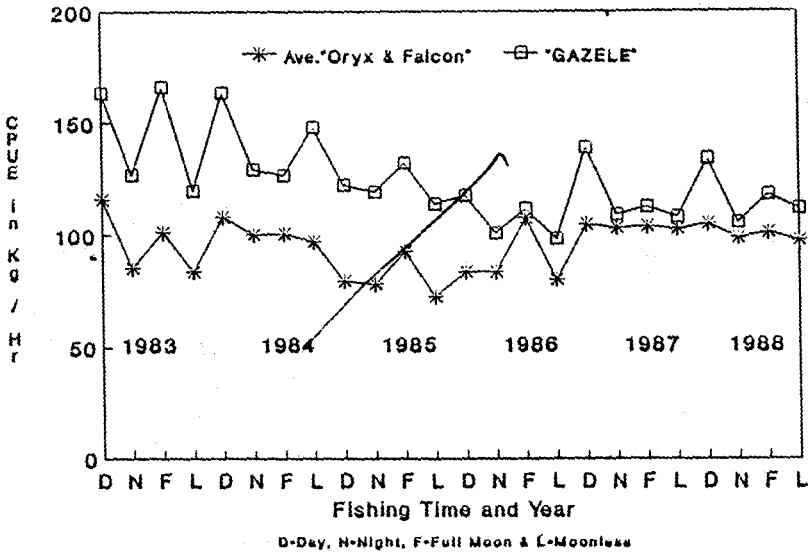


Fig. 2: Annual CPUE of the three bottom trawlers operating in Qatar waters during 1983-1988.

To test for the influence of different natural light intensity on the CPUE; the data of the three trawlers were grouped as yearly average after standardizing efforts exerted by "Gazelle" as mentioned before. The results are shown in Figures 2 and 3. As presented in Table 2 and shown in Figure (2); there is a closely related pattern in the distribution of the CPUE of both "GAZELLE" and the two sister trawlers. Though it differs in magnitude; it generally shows higher CPUE values for the day and full-moon-nights operations than night and moonless-nights operations respectively.

Figure (3) represents the diurnal variations in the average CPUE of the two sister trawlers. Applying the standard statistical methods as described by Snedecor and Cochran, 1977; to test for differences between the means of the yearly CPUE during day-times and night-times fishing operations; statistics showed that there is no significant difference between them at $P=0.95$. On the other hand, a significant difference was detected at $P=0.95$ between the noon-nights and moonless-nights operations. The former is higher than the latter about 5.4% to 16.8% with a mean of 11.1% higher, due to a calculated t of 4.34% compared to a tabulated (t) of 2.23 at $P=0.95$ and 10 degrees of freedom. This could be attributed to the fact that; night is the period of activity of many marine invertebrates that are considered as the main food resource of demersal fishes; and it is known that some of these invertebrates show

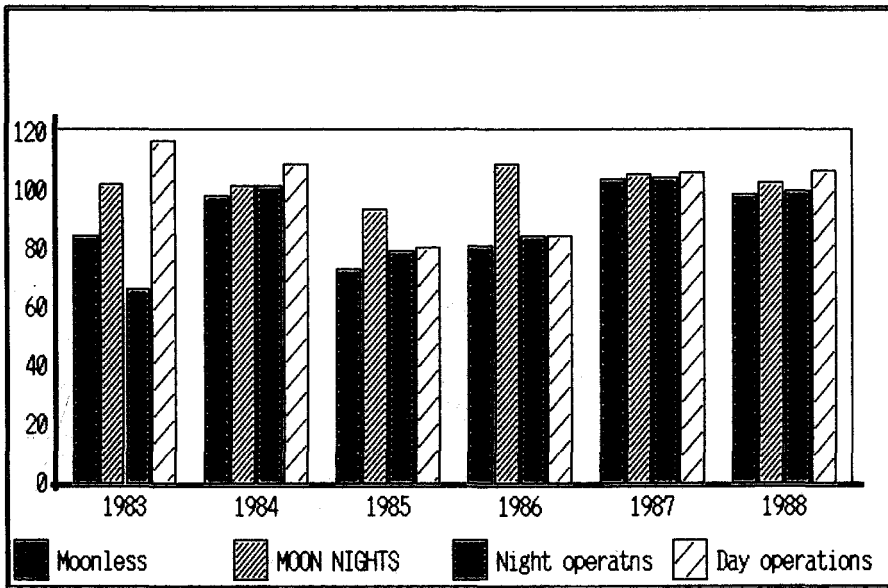


Fig. 3: Diurnal variations in the average CPUE of the two sisters trawlers.

specific activity cycles related to the full moon. This could mean that demersal fishes forage for food close to bottom during the moon-lighted nights. Hence; is is advisable for QNFC trawlers to arrange for carrying out bottom trawling operations during these nights more than others.

When plotting the CPUE against the cumulative catch from the three trawlers corresponding to the years 1983-88 to estimate the fish population size; an almost horizontal line was obtained. Yet, statistics proved that the slope of the line is not significant at $P=0.95$. This could indicate that either the stocks are not heavily exploited in the trawling grounds of QNFC, and/or both the fishery and the stocks are in equilibrium.

According to Ricker, 1978, when data are no available to make a detailed analysi of growth, mortality and recruitment, it is some times possible to relate yield directly to stock abundance or fishing effort. In case of Qatar waters; production has been at about steady level during - at least - the past 8 years. Hence, the "surplus yield" model of Schaefer, 1954 was attempted to estimate the maximum sustainable yield (MSY) from the trawling grounds. When plotting the combined CPUE on Effort for the three trawlers during the years 1983-1988, as presented in Fig. 4; the correlation coefficient obtained (r) was (-0.696). Yet, test of significance of the slope was not significant at ($P=0.95$) due to a calculated (t) of 0.866 against a tabulated one of 2.78. In view of no significant decreasing trend in the slope; it indicates that effort exerted by

QNFC fleet is still below the optimum effort of such fishing grounds. The mean CPUE obtained is about 96 Kg/Hr with a standard deviation of 13Kg/Hr. Keeping in mind that about 40-50% of the catch is discarded as by-catch; it seems that the CPUE value obtained is below the estimate by the UNDP project (RAB/71/278) that the catch rate from area 2BC - which encircles the fishing grounds of QNFC-varies between 300-500 Kg/Hr of all fishing species excluding the pelagics. In the mean time; when plotting the total catch on effort from Table 3; no satisfactory curve was obtained. This could also prove either the above mentioned finding and/or the present data as not sufficient to use such

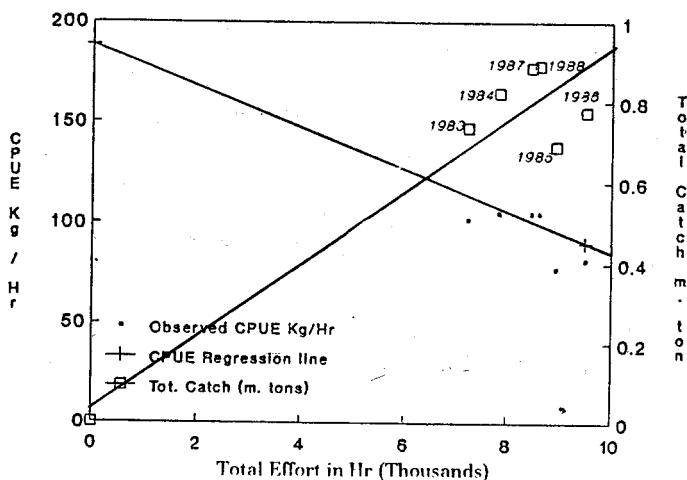


Fig. 4: Relation between total effort and CPUE of the three bottom trawlers operating in Qatar waters during 1983-1988.

Table 3

Total landing (Kg), standardized total effort (Hr) and catch per unit of effort (CPUE) of the three bottom trawlers operating in Qatar waters during 1983-1988

Year	Total Landing (tons)	Total Effort (Hr) (standardized)	CPUE (Kg/Hr)
1983	736	7230	101.8
1984	822	7830	105.0
1985	689	8927	77.2
1986	775	9498	81.6
1987	886	8454	104.8
1988	891	8611	103.5

model. It is worthy mentioning that; based on swept area method, Sivasubramaniam and Ibrahim, 1982; estimated that the maximum potential yield of the exploited stocks in Qatar waters is around 22000 m tons, and that the present annual landing of 3000 m tons is insignificant to the mentioned estimated yield of demersal fish from Qatar waters.

CONCLUSION

In view of the fact that fish landing in Qatar covered little over 90% of the country consumption during 1988; and in line with the overall government policy aiming at reaching food self-sufficiency and diversifying the economy; the fishery sector in Qatar can easily confirm fish self-sufficiency by increasing fishing effort - especially that of QNFC fleet - by introducing an added trawler to the present fleet. This is based on the finding that the effort exerted by QNFC fleet is still below the optimum effort of such fishing grounds and the present annual yield or 3000 tons is not significant in comparison to the demersal-fish biomass as estimated by Sivasubramaniam and Ibrahim, 1982.

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دراسات على معدلات الصيد بطريقة الجر على القاع في المياه القطرية

محمد أمين ابراهيم - محسن عبد الرحمن و كمال عبد الباري

تم في هذا البحث دراسة وتحليل البيانات المتجمعة منذ عام ١٩٨٣م عن حالة المصايد القاعية التجارية التي تقوم بها شركة قطر الوطنية لصيد الأسماك ، حيث اشتملت البيانات على كمية الصيد ، ومجهود الصيد ، ومواعيد وأماكن كل طرحة ، وغيرها من البيانات العلمية اللازمة . وتحليل البيانات إتضح أن معدل عملية الصيد يزيد في الليالي القمرية بمتوسط حوالي ١١٪ عن الليالي غير القمرية . وأن كمية الصيد أثناء النهار تتساوى من الناحية الإحصائية معها أثناء الليل . لذلك يقترح ان يستفاد من الليالي القمرية في إجراء أكبر عدد من عمليات الصيد وتأجيل عمليات الصيانة وغيرها لليالي غير القمرية كلما أمكن ذلك .

كما أوضحت الدراسة أن الاكتفاء الذاتي من الأسماك في قطر سهل المنال جداً نتيجة لأن كمية الانتاج السنوي الحالي من الاسماك لاتمثل إلا أقل من نصف الانتاج الدائم الذي يمكن الحصول عليه من تلك المياه دون أن يتأثر المخزون السمكي للسنوات القادمة . ويمكن لشركة قطر الوطنية لصيد الأسماك إضافة سفينة صيد بالجر إلى أسطولها الحالي فيزيد أنتاجها بمقدار ٤٠٪ ، كما يزيد الإنتاج القومي من الأسماك بمقدار لا يقل عن ١٠٪ ، علماً بأن الانتاج من الأسماك عام ١٩٨٨ قد غطى أكثر من ٩٠٪ من الاستهلاك حسب الإحصائيات السمكية التي تنشرها إدارة الاسماك في دولة قطر .