



Remarks on Fish Production in Kuwait During the Last Two Decades, and its Geographical Significance

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Abstract:

This paper deals mainly with the distinctive trends in the production of fish in Kuwait. Special attention is paid to studying the development of the annual, seasonal and monthly productions of different types of sea fish in the territorial water of Kuwait, (from 1990 to 2008) and the geographical factors affecting their development. Processes of producing farmed fish in order to raise the annual quantity of fish to be sold in Kuwait's markets are also studied. It is noted that, since 1990, Kuwait has been importing almost 60% to 70% of its total annual fish consumption. Fish consumption is expected to increase as the annual growth of population increases. (particularly within the non-Kuwaitis).

Although the territorial water of Kuwait, noted by several authors to be fertile, the mean annual production of the local sea-fish is very modest, and its quantity is insufficient to sustain the annual demand in Kuwait. To provide the fish markets with sufficient quantities of fish, the authors came to the conclusion that the use of aquaculture technology in fishing industry, low cost production of premium quality of fresh fish, and especial attention to the processes of fish farming are urgently needed to be carried out in Kuwait.

1.1 Introduction

Fishing provides a vital source of food, employment, recreation, trade and economic well being for people throughout the world, for both present and future generations. It is also a part of the traditional of Kuwaiti heritage, and the artisanal fleet lands about 90% of the

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finfish landings. Kuwait's fishing fleet targeting finfish species is composed of two types of fishing vessels, namely, wooden dhows, and speedboats. Currently, finfish production in Kuwait meets only about 25% of national demand and is declining rapidly as demand increases while production from the wild stock decreases⁽¹⁾. However, production of local sea-fish in Kuwait during the last two decades is not impressive and it is certainly affected by different geographical factors. In addition to that, oceanographic characteristics of the territorial water of Kuwait have perhaps the greatest impact on sea-fish production. On the other hand, some authors have indicated that the territorial of Kuwait is very fertile and rich in nutrients (Blegvad, H. 1944, Salock, D.K, and Turr, J. A. 1969, Al-Mannai and Selim, H, 1962, Mahdi N., 1971), and in the Kuwait Fisheries Statistics (2002 up to 2007).

Moreover, the policy aims to provide adequate supplies of reasonably priced food for its citizens. However, demand for fish in Kuwait continues to exceed the sustainable potential of the fish resources of Kuwait, particularly of finfish. Local demand for shrimp is also increasing, while catches have been low (*in contrast to the pre-invasion period*), resulting in less surplus for export.

The Government's response to these needs and to the declining levels of catches has been to increase the amount of direct subsidies to the industry in an effort to retain affordable domestic prices and to sustain the profitability of the operators. Consequently, the importance of this study emerges from the need to investigate the new levels and trends of fishing to know the extent of improvement in local fish production.

1.2 Methodology and Data Sources:

Published statistical data relating to the production of fish in Kuwait during the last two decades have been analyzed.

With regards to the mean per capita supply of fish (kg/year)

(1) For further information the reader can see the following link:
http://www.fao.org/fishery/countrysector/FI-CP_KW/en

during the period (1990 - 2008), the GCC countries can be divided into three different categories as follow:-

- a - High per capita supply (30-55 kg/year): Oman and UAE.
- b - Medium per capita supply (10-29 kg/year): Saudi Arabia, Bahrain and Qatar.
- c - Low per capita supply (less than 10 kg/year): Kuwait.

1.3 Objectives of the Study:

This paper deals mainly with the distinctive trends in the production of fish in Kuwait. Particular attention is paid to studying the development of the annual, seasonal, and monthly production of different types of sea fish in the territorial water of Kuwait (1990 - 2008) and the geographical factors affecting their development. The specific objectives of the study can be summarized in the following:

- Analyze the most recent data that measure (qualitatively and quantitatively) the levels of fish production in Kuwait.
- Study differences in fish production levels according to the different seasons of the year.
- Investigate trends in local fish production and consumption over the last two decades.
- Compare the level of fish production in Kuwait with the rest of the GCC countries.

2.1 Production and Consumption of Fish in Kuwait and other GCC Countries:

The annual production of local fish in Kuwait estimated of 3000 tons in 1985, has increased to 6000 tons in 2000, and then was reduced again to less than 3200 tons in 2007. The total number of population in Kuwait was about 1.4 millions in 1985 and increased to more than 2.9 millions in 2008. In 2002, Kuwait produced the lowest quantity of sea-fish compared with that of the other Gulf-States (6000 tons), were Oman produced 128,000 tons, UAE 110,000 tons, and Saudi Arabia 57,000 tons (Table 1).

Kuwait's annual mean production of fish for the years 2007 and 2008 was about 4,700 tons, while it was 15,000 tons in Oman, Bahrain

and Qatar 87,000 in UAE, and a high 88000 tons in Saudi Arabia. Consequently, the production of sea-fish in Kuwait was the lowest of the annual production of fish among the GCC countries. This considerable disparity might be related to the limited distances of the coastal boundaries of Kuwait (84 miles/134 km), to the limited area of its territorial water (5500 km²) and also to the limited time permitted - bylaw- to practice fishing in Kuwait (see Figure 1).

During the last two decades the annual production's curve of local Kuwaiti fishing industry has had a distinctive peak between 1992 and 2002 with a mean annual production of local fish of about 6000 tons. Consequently, Kuwait has been accustomed yearly to import of more than 50% of its total annual consumption of fish to meet fish market's demand.

The mean annual local fish production has increased from about 1300 tons in 1991 to 2500 tons in 2007 in Kuwait, while it decreased from 102,000 to 87,000 tons during 1995-2008 in UAE. The rest of the other GCC countries showed a noticeable increase in the production of fish year after year (Table~). Annual production increased from 9,000 tons to 15,000 tons in Bahrain, 140,000 to 151,000 tons in Oman, 4,000 tons to 15,000 tons in Qatar, and from 46,000 tons to 81,000 tons in Saudi Arabia (FAO, Statistical Yearbook, 2009, Table B, p.14) and (Fisheries Statistics, Kuwait, 1994).

Therefore, the mean annual domestic per capita consumption of fish in Kuwait (1990 - 2008) is estimated to be very low, (i.e., 3 kg) in comparison to that of the other GCC countries, and it is considered to be very modest compared with that of Oman (53 kg/year), UAE (42 kg/year) and Bahrain (16 kg/year) (Table 1). The mean annual per capita supply (1990 - 2007) in some other countries such as Japan, China, Norway and Philippines varies from 30 to 45 kg/year.*

* The highest per capita consumption of fish occurs among the Islanders who depend entirely on fish as a main diet. It is 203 kg/year In the Maldives Islands, 90 kg/year, in Greenland, 84 kg/year in British Guiana, and 50 to 65 kg/year per capita in Hong Kong, the Solomon, Samoa, Iceland and the Faeroes Islands. The world mean per capita consumption of fish is about 16 kg annually.

Table (1)
Population and Annual Fish production in the GCC countries (1995 - 2008)

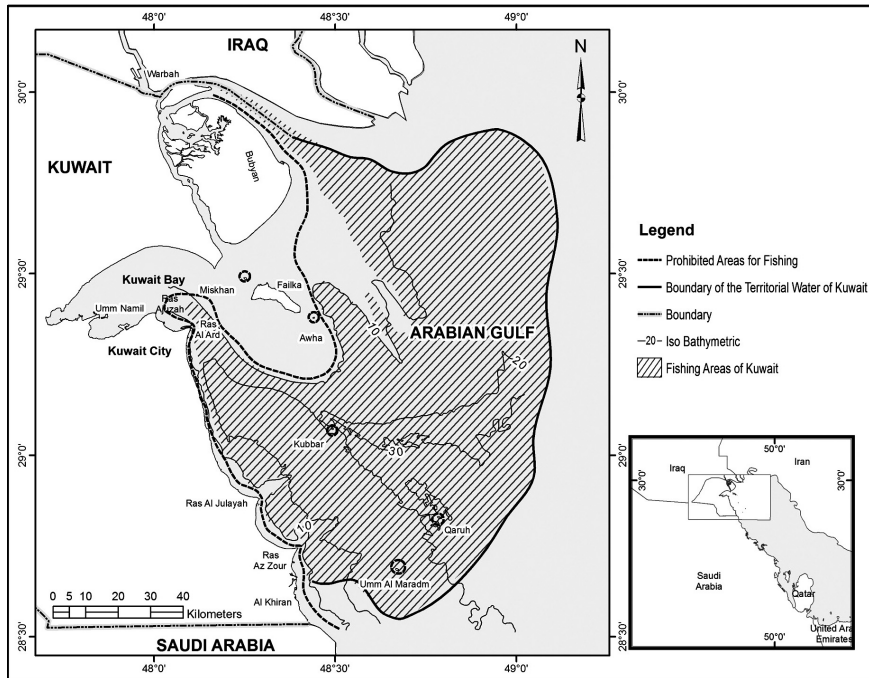
Country	Distance of the Arabian Gulf coastal boundaries		GCC countries - Population (in millions)					Fish production (in thousands tons)					Mean per capita supply (1996-2004) Kg/year	Mean per capita supply (2002-2008) Kg/year
	Mile	km	Mean 1990/5	1999	2002	2006	Mean 2007/8	1995	1999	2002	Mean 2004/6	Mean 2007/8		
Oman	501	801	2.1	2.5	2.4	2.6	2.7	140	109	128	186	15	57	53
UAE	487	780	2.3	2.9	2.6	4.6	4.8	102	118	110	90	87	28.5	42
Bahrain	68	108	0.5	0.6	0.7	0.73	0.76	9	11	11	14	15	17	16
Qatar	304	487	0.5	0.67	0.5	0.84	0.86	4.2	4.4	8.6	11	15	12	15
Saudi Arabia	296	473	18.6	20.2	20	25.2	26.4	46	47	57	55.4	88	4.2	3
Kuwait	84	134	1.9	2.4	2.2	2.7	2.9	8.6	6.2	6	4.8	4.7	2.5	3
Total	-	-	25.9	29.2	28.4	36.67	38.42	309.8	295.6	320.6	361.2	224.7	121.2 (-16.8)	132

Sources: U.N. FAO, Year Book Fishery Statistics, (2000) pp: 183-186 and Vol. 99 (2004) p.44 and Vol. 101 (2006) pp: 214- 215,(2007), Vol. 104 (2008) pp: 24-26, (2009)Table (B), p.14.

- U.N. Demographic Year Book (2000) pp: 112-121, (2004). and (2007).

- U.N. Statistical Abstract of the ESCWA Regions, 2003) p.176, Vol. 26 (2007) p.5.

- Ministry of Planning. Central Statistical Office. Annual Statistical Abstract (2002 and 2007) Kuwait, see Table1 and p.44. (Compiled and arranged by the authors.)



Figure(1) - The Territorial Water of Kuwait and Prohibited Fishing Areas.

2.2 Fisheries and Fishing in Kuwait

Before the discovery of oil in the 20th century in Kuwait, fishing was one of the oldest crafts or professions, and represented the main source of income to the Kuwaitis. The production of fish in Kuwait sustained sufficient marine food for its people. Since the mid- 20th century, fishing in Kuwait expanded rapidly as a result of using motorized vessels, inexpensive oil, refrigeration and increasing numbers of population. Therefore the territorial water of Kuwait has been subjected to extensive over-fishing which caused mainly by bottom trawling of increasing numbers of fishing boats. In addition, litter, boat exhaust, sewage drainage pipes and oil spills have a significantly negative impact upon the pollution level of Kuwait's marine ecosystem. With the continuation of over-fishing by using present fishing methods, the majority of fished marine species will vanish rapidly.

It was indicated that roughly half of the Kuwait's fishery stocks are extensively exploited; meaning that they are harvested at rates near their maximum sustainable limits (Abou el enin, et al, 2005 and E.Duffy, 2009). Due to the very small size of the annual production of fish in Kuwait and the existence of limited types of marine species in its territorial water, it was concluded that the Kuwaiti marine ecosystems with its fewer species, whether naturally or because of human impacts, have lower average productivity and stability.

2.3 Total Annual Consumption of Fish in Kuwait by Type

Due to the annual increase of population in Kuwait from less than 2 million before the year 1995 to more than 3 million presently, the annual consumption of fish in Kuwait is, in turn, increased considerably. From 1990 to 2006, the mean annual consumption of fish in Kuwait was about 13,000 tons. In the year 2007 the total consumption of fish was noted to be more than 9,000 tons. This quantity of fish does not only comprise the annual local fish volume of Kuwait (28%), but it is also composed of several types namely; farmed fish 6%, fish companies 13% and imported fish 63% of the mean annual consumption of fish in Kuwait, from 2005-2007.

The production of local sea-fish in Kuwait decreased significantly from 5,912 tons in 1995 to 3,600 tons in 2007 representing about 26% of annual consumption of fish in Kuwait in 2007, valued at approximately 4.5 million KD. The mean annual production of farmed fish in Kuwait (2005 - 2007) is very modest, (i.e. less than 400 tons, has a value of about 630,000 K.D.). The mean annual production of fish-companies in Kuwait during the last decade was about 50% of the local sea-fish and about 13% of the mean annual consumption of fish in Kuwait (2005 - 2007). Therefore, Kuwait imports about three to four times the quantity of its own annual local sea-fish annually. The imported fish was more than 5983 tons, (local sea-fish was 2,300 tons) in 2007, it represents more than 53% of the annual consumption of fish in Kuwait, but it costs the country more than 7.5 millions K.D. annually.

The mean annual percentage of the imported fish in Kuwait

(fresh, frozen, salted, smoked and canned fish) in relation to the total annual consumption was about 65% (2000 - 2007), and it has increased with population growth (Kuwaitis and non-Kuwaitis). Consequently, retail and wholesale of fish in Kuwait continues to develop as additional modern large supermarkets are projected to open. These food distributions outlets, besides the widespread of the traditional small groceries, have changed the purchasing habits of a wide base of urban consumers (particularly among non- Kuwaitis) in Kuwait. The concentration of high-income population in Kuwait is behind the wide marketing of foreign expensive types of fresh, frozen sea-fish such as Salmon, Haddock, Cod, Halibut, Conger eels, and Shrimps as well as different types of smoked and canned fish.

Bold During the last decades Kuwait has encouraged the production of farmed fish to increase its annual fish production. Fish farming in Kuwait is being considered at present time, the prime principal form of aquaculture and it involves raising fish commercially in tanks or enclosures usually for food. Some fish farming centers in Kuwait release juvenile fish into the catching areas of the territorial water of Kuwait for recreational fishing and to supplement a species natural number (i.e., shrimps). The production of farmed fish in Kuwait started with less than 2000 kg before the year 2000, and then increased to 328, tons in 2005, and to about 350 tons in 2007 (see Table 2). The most common species raised by fish farms in Kuwait are Tilapia (84%) and Silvery lolack sea-bream (12%) of the total fish farming production in 2007. The mean annual production of farmed fish in Kuwait was about 330 tons (2005 - 2007), with a peak of about 611 tons in the year 2006 (Ministry of Planning, Central Statistical Office, 2008).

According to the data in Table (2), the total quantities of fish sold in the markets of Kuwait were 15.4 million tons in 2005 and 14 million tons in 2007. The annual mean quantity of the imported fish represented 66% of the grand total (2005 - 2007), while local fish (including shrimps) 26%, fish companies 6% and fish farming about 2.5% (Ministry of Planning, Central Statistical Office, 2008). During a period of five years from 2003 to 2007, the curve of annual production of local fish in Kuwait was nearly flat (annual mean 3500 tons).

However, annual total amount of fish sold in Kuwait' markets (including all types of fish, local and imported) varied from 13319 tons (in 2003) to 14038 tons (in 2007). The percentage of annual production of local shrimps to the grand total varied from 25% in 2003 to about 20% in 2007 while the percentage of all other types of fish to the annual grand total was of about 65% (Table 3).

Table (2)
Total Production of Types of Fish (in kg) in Kuwait (1995 - 2007)

Year	Fish type	Local fish	Fish companies	Farmed fish	Imported fish	Grand total (kg)
Mean 1995/98	Shrimp	963,680	661,051	-	1,021,360	3,909,106
	Other types of fish	4,948,843	996,009	-	1,905,992	7,850,844
	Total	5,912,593	1,657,060	-	2,927,352	10,495,935
	Percentage	56%	16%	-	28%	100%
2000	Shrimp	41,740	722,747	-	741,740	1,876,227
	Other types of fish	2,915,940	302,183	1,960	3,195,268	6,415,351
	Total	3,357,680	1,024,930	1,960	3,937,008	8,291,578
	Percentage	39%	12%	2%	47%	100%
2005	Shrimp	1,090,000	700,255	--	1,370,080	3,260,335
	Other types of fish	2,686,568	318,991	328,54	8,935,580	12,170,678
	Total	3,876,569	1,019, 246	328,54	10,206,660	15,431,013
	Percentage	25.50%	6%	2%	66.50%	100%
2007	Shrimp	1,033,620	506,237	--	1,265,750	2,805,607
	Other types of fish	2,652,448	180,849	399,093	8,040,880	11,233,270
	Total	3,686,068	687,086	349,093	9,316,630	14,038,877
	Percentage	26.50%	4.50%	2.50%	66.60%	100%

Source: Ministry of Planning, Central Statistical Office, Annual Statistics Abstracts, edition 45(2008), pp. 43-44.

- Ministry of Planning, Central Statistical Office, Fisheries Statistics, 1995, 1998, p. 1; 2000, 2005, pp. 1-2; 2007, pp. 1-2, 28, Table 16, p.38, and Table 7 p.39.

(Compiled and arranged by the authors).

Table 3 shows the development of the grand total annual fish production, including the quantities of imported fish sold in the markets of Kuwait during (2003 - 2007). The main findings of the table can be summarized in the following:

- 1 - The annual amount of all types of fish in Kuwait varied from 13319 tons in 2003 to 15102 tons and then decreased to reach about 14,038 tons in 2007.
- 2 - The imported fish represented 66.5%, including the annual amount of all types of fish sold in the market.
- 3 - The percentage of the annual production of shrimps averaged 22.5% of the annual total amount of fish.
- 4 - The most important types of fish according to their amount of production, and values through the period (2003 - 2007) were, Silvery pomfret (Zobaity), Brown spotted grouper (Hamour), Silvery croaker (Newaiby), Silvery grunt (Nakroor), Anda'ac, Red-Finned pigface bream (Shaary), and River shad (Suboar), respectively.

Table (3)
The Development of Annual Production of Total Fish in Kuwait
(2003 - 2007) in kg

Fish Types	2003	2004	2005	2006	2007
Shrimp	3,351,334	381,756	3,260,335	3,278,092	2,805,607
Silvery pomfret	1,754,787	1,946,411	2,132,903	1,943,522	1,982,794
River shad	205,147	134,798	154,412	136,492	77,699
Silvery grunt	673,636	963,554	1,000,869	986,647	880,896
Brown spotted grouper	1,394,612	1,478,402	1,431,879	1,395,056	1,457,451
Blue spotted mullet	105,127	294,625	220,494	301,355	258,555
Silvery croaker	925,585	1,134,678	1,031,168	1,165,732	870,082
Barred Spanish Mackerel	205,107	279,943	247,798	231,791	148,096
Crimson snapper	134,864	128,004	122,339	106,297	93,400
Large-scaled mullet	103,094	94,215	95,684	107,383	89,520

Cont. Table (3)
The Development of Annual Production of Total Fish in Kuwait
(2003 - 2007) in kg

Fish Types	2003	2004	2005	2006	2007
Herring travelly	442,542	513,657	513,637	445,070	635,354
Thread line	73,149	116,509	112,880	109,015	97,759
Jack pomfret	143,551	230,298	165,865	184,654	87,152
Yellow-finned black borgy	612,040	822,541	888,806	789,307	744,932
Berttam	200,980	196,680	192,777	167,590	114,970
Three-banded grunt	98,171	103,593	79,212	85,016	52,683
Red-finned pigface bream	295,232	416,393	416,991	355,223	340,277
Cobia	65,301	93,410	78,575	101,092	77,726
Gray finned croaker	74,421	110,086	106,783	132,973	110,299
Spotted Spanish Mackerel	89,020	154,524	129,809	114,291	81,290
Notched thread-fin bream	120,560	208,368	299,344	334,207	283,144
Spotted lizard fish	27,152	32,590	75,661	97,305	106,953
Andaac	340,830	351,992	286,456	274,420	183,189
Others	1,873,021	2,024,366	2,057,797	2,672,297	2,459,050
Total	13,319,263	15,647,211	15,102,476	15,514,827	14,038,877
% imported	65%	67%	66.50%	67%	66.50%

Source: Ministry of Planning, Central Statistical Office, Annual Statistics Abstracts, edition 45(2008), pp. 144-151.

- Ministry of Planning, Central Statistical Office, Central Statistical Office, Fisheries Statistics (2003-2007).

(Compiled and arranged by the authors).

2.5 Seasonal and monthly production of fish in Kuwait:

Statistical fishery data published by (the Ministry of Planning, Central Statistical Office), in Kuwait over several periods (1991 - 2002) and (2003 -2007), are tabulated in Table 2 and Table 3

respectively. In addition, more detailed monthly data are presented in Table 4.

The total annual production of the main types of local fish (local shrimps and sea-fish, fish companies and fish farming) in Kuwait during (1991 - 2007) is shown in Table 2. While monthly productions of the top ten important and popular types of fish in Kuwait are presented in Table 4. Local fish production was very low in 1991 (less than 1000 tons), because of the environmental damages of land, sea water and air caused by the invasion of the Iraq Army to the State of Kuwait in 1990. From 1992 to 1995 the mean annual production of local fish in Kuwait was about 5200 tons, and it has decreased to less than 4000 tons from 2000 to 2002. The mean annual production of local shrimps (Robian) from 1991 to 2002 was about 1311 tons representing (26.3%) of the mean annual total production of the local fish.

The mean annual production of commercial sea-fish in Kuwait through the same period (1991/2002) was 2374 tons (59% of the total). Non- commercial local sea fish as Red-finned bream, large- scaled Mullet, Anda'c, Cobia, Shim, Bassi, Hamrah, Kassor and others represented about 15% of the mean annual total production of local-fish. The most important types of commercial fish which enjoyed remarkable production yields through that period are Silvery Crooker (Newaiby) 13%, Blue spotted mullet (Maid) 6.1 %, River Shad (Suboar) 10.3 %, and Brown-spotted grouper (Hamoor) 5.5 % of the mean annual local fish production.

Table (4)
Top Ten Imported Types of Fish in of Kuwait in 2007 (in tons)

Types	Months	Jan.	Feb.	Mar- ch	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	To- tal	%
Shrimps		59	-	-	-	-	-	-	214	275	203	153	116	1020	14.3
Silvery pomfret		118	80	108	244	199	121	41	91	93	75	57	53	1280	15
Brown spotted grouper		87	109	148	133	134	99	59	76	53	66	55	48	1067	13
Silvery croaker		73	114	85	43	37	12	9	19	20	20	28	37	497	6
Yellow finned black porgy		65	88	94	71	35	22	10	23	20	25	35	46	534	6.2
Silvery grunt		50	44	75	180	121	44	19	29	24	43	27	26	682	8.1
Herring travelly		46	52	70	60	65	56	18	13	14	19	17	14	444	5.4
Notched thread-fin bream		16	17	17	18	18	10	7	6	9	16	9	9	152	1.7
Red-finned pigface bream		15	25	53	44	32	14	12	13	17	14	12	11	262	3
Large-scaled mullet		9	12	18	8	2	1	2	3	2	2	3	3	65	0.7
Others		136	194	129	226	321	241	158	168	135	162	200	126	2196	26.6
Total		674	735	397	1027	964	620	335	655	662	645	596	489	8199	100

Source: Ministry of Planning, Central Statistical Office, Fisheries Statistics.(2007), Tables 4 and 7.

-Numbers in bold, represent the length of the main fishing seasons

3.1 Trends in the Monthly Production of Different Types of Fish in Kuwait:

Analysis of the structure of the seasonal and monthly productions of fish in Kuwait according to fish types and species in the years 2002, (Table 4) indicates clearly that shrimp represents about 25% of the total annual catch of the local fish. In order to maintain the fertility of the sea water and the development of fish in the territorial water of Kuwait; shrimp is not allowed to be caught-by law- during the period extending from the 1st February to the end of July, annually. Excluding all other types of fish, shrimp is the only type of fish that its catching season takes place in summer. The highest production of shrimp is during the period extending from 1st August to end of October. The production of local shrimp in these 3 months was about 692 tons (68%) of the annual catch of shrimp in 2007.

The rapidly increasing shrimp production in summer season is clearly shown by the remarkable apex of the curve in Figure (2). In September, 2007 the monthly production of shrimp peaked at 275 tons (26% of the total annual production of shrimp). On the other hand, the catching seasons of most of the other types and species of fish in Kuwait are limited and confined in winter and spring seasons.

The catching season of Silvery pomfret (Zobaidy), Brown spotted grouper (Hamoor), extended from the first of February to the end of May, while that of Silvery grunt (Nakroor), Silvery croaker (Newaiby), Large-Scaled mullet (Biah), and Herring travelled (Hamam) starts from the 1st of February to the end of April every year (Figure 2).

In 2007, the production of fish companies in Kuwait decreased to about 687 tons (15% of the annual catch), with a value of about 775,000 KD. The most prolific types of commercial fish produced by fish companies were Shrimp 506 tons, Silvery croaker (Newaiby) 40 tons, Yellow-Finned black porgy (Shiam), 20 tons, and Herring travelled (Hamam) 11 tons. Therefore shrimps (26.3%), Silvery croaker, (13%), River shad (10.3%), Silvery pomfret (10.3%), and Blue spotted grouper, (5.5%), were the highest produced types of commercial fish in the year 2002. They represented about 65.4 % of the total catch in Kuwait (3382 tons). In the year 2007, the five highest

produced types of commercial fish in Kuwait, were shrimps (35%), Silvery croaker (13.5%), Yellow-Finned black bory (7%), Blue spotted mullet, (5%), and Brown spotted grouper (3%). These later types represented about, 65% of the annual total catch (Ministry of Planning, Central Statistical Office, 2008).

The authors came to the conclusion that some fish types and species are badly affected and recovering slowly by the wide variety of pollutions that occurred in the territorial water of Kuwait since the Iraqi invasion of Kuwait in 1990. Present fishing techniques such as the use of heavy trawls partially destroyed the floor of the Arabian Gulf ecosystems, on which all fish depend (Abou- El-Enin, 2001; Abou- El-Enin and Abdulla, 2005; Abou- El-Enin and Al-Hasam, 2006). Changes in physical, chemical and biological characteristics of the sea-water in the Gulf of Kuwait cause disastrous effect on the flourishing and development of several fish types and local species in the territorial water of Kuwait.

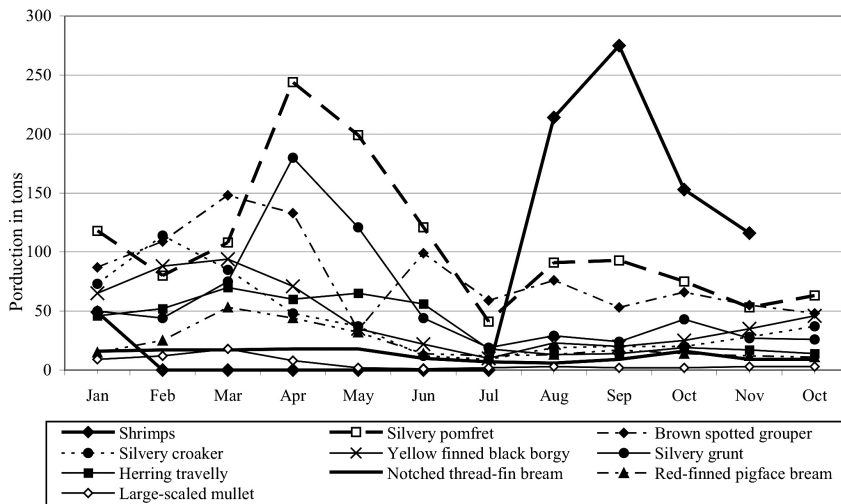


Figure (2) - Monthly production of the top ten economically important types of fish sold in Kuwait in (2007) in tons

The amount of fish production in Kuwait varies monthly, seasonally, and annually. Physical and chemical oceanographic factors affect greatly the abundance of the biomass, the general biological characteristics of the territorial water of Kuwait and its effect on seasonal and monthly catches of the different types of fishes. Human and financial factors are of little significance, (Abou- El-Enin, 2001; Abou- El-Enin and Abdulla, 2005; Abou- El-Enin and Al-Hasam, 2006; Al-Sarawi, M, et al., 1986 and Sheppard, C., 1993). Monthly and seasonal variations of production of fish, as well as the localization and distribution of fisheries are reflections of what locally named “marine desert seas” and “fertile sea water” in the territorial water of Kuwait. Marine desert seas refer to water areas where nutrients once used are not replaced, while fertile sea water represents area of active and continual upwelling action of water. The latter takes place in water layers of different temperatures, salinities, and densities, where dense water tends to descend below less denser one (Abou- El-Enin, 2001; Abou- El-Enin and Abdulla, 2005; Abou- El-Enin 2006 and Duxbury, A., et al., 2002). To manage and conserve the marine environment and to organize fisheries in Kuwait, Amiri Act No. 46 was issued in 1980. This act prohibits the catching of shrimps by any method and for any purpose from the territorial water of Kuwait during the period extending from the first of March to the end of July, annually. Consequently, shrimps are given a reasonable time to flourish safely and rapidly. During spring season phyto and zooplankton increase rapidly and shrimps lay their eggs without any disturbances or annoyances.

The season for catching shrimps starts on the first day of August every year. The most abundant catch of shrimps occurs during the summer. In the summer season of 2007 about 670 tons were produced, representing 64% of the annual total catch (1,033 tons) of shrimps were caught. During the period from Aug. to Nov. 2007, the total quantity of caught shrimps was about 845 tons, about 83% of the annual catch (Ministry of Planning, Central Statistical Office, 2008, p: 141-151). During the autumn season surface water's temperature varies between 22° and 26°C, and its salinity is (39.5%) which gives rise

to the notable flowering of photo and zoo-plankton. The autumn's catch of shrimps reached 320 tons (30.9% of total annual catch) while it was approximately 98 tons (9.5%) in the winter (Ministry of Planning, Central Statistical Office, 2008).

The production of shrimps in the territorial waters of Kuwait in 2007 increased in September and October to about 275 tons and 203 tons, respectively. The production of these two months together represented about 47% of the total annual catch of the shrimps (Table 4). The lowest monthly production of shrimps was in January (59 tons only).

Seasonal production of the main commercial fishes in Kuwait (about 19 types) during the year 2002 shows a decrease in production during the autumn season (26.7% of the annual total catch), while it represents about 29.7% in winter, 29.5% in spring and 13.9% in summer.

Figure (2) indicates the fluctuations in monthly production of the main local fishes sold in the markets of Kuwait in 2007. Many types of commercial fishes, River shade (Sabour), Yellow-finned black borgy (Sheim), Brown-spotted grouper (Hamoor) and Barred Spanish mackerel (Chanieh) are plentiful during April (Spring season) and October-November (Autumn season). During both of the these two seasons the surface temperature and salinity of Kuwait's territorial water are moderate and allowing freely the flowering of the biomass and flourishing of nutrients on which all fish types depend to develop and grow.

Due to the flow of the Gulf surface current from south to north (which is less denser than the territorial water of Kuwait), the process of upwelling takes place giving rise in turn to large school of fishes that gather together in the nursing fish ground of the shallow muddy floor of the territorial water of Kuwait. Silvery croaker (Newaiby) is noted to be abundant in February as well as in October according to its cycle of development. It is worthy to note that Shatt Al-Arab flows in the Arabian Gulf a large quantity of fresh water during winter and spring times. Mixing of both denser sea water (highly salted water) with the less denser fresh water increases the process of upwelling to take place and gives rise to the abundant flowering of nutrients and the agglomeration of different fish types within the territorial waters of

Kuwait (Abou- El-Enin, 2001; Abou- El-Enin and Abdulla, (2005); Abou- El-Enin and Al-Hasam, (2006).

4.1 Geographic and Oceanographic Factors Affecting the Production of Fish in Kuwait:

As noted previously due to the limited area of the territorial water of Kuwait, and its oceanographic characteristics, the mean annual fish production of Kuwait is very modest and it is of little significance compared with that of the other GCC countries.

Before the Iraqi invasion of the state of Kuwait in 1990, the annual fish production of Kuwait fluctuated from 3000 to 4000 tons. It dropped to less than 800 tons at the end of 1990. During the period of the Iraqi invasion of Kuwait, the soil, the sea, and the air were subjected to immense amount of pollution. The coastal water, estuaries and the whole areas of the territorial water of Kuwait were polluted by different waste disposal practices, resulting in million tons of oil particles, sewage sludge, dredged materials and various wastes being dumped in the fragile coastal water of Kuwait causing disastrous consequences of all Kuwaiti environmental terrestrial and marine ecosystems (Belitz, et al, 2004, Sale, 2002; Abou El-Enin, and Al-Otaibi, 2005).

Since 1991, the coastal water of Kuwait has been exposed, several times, to “red tide”. This later phenomena occurs due to the rapid increase in the production of harmful dinoflagelates which usually grow in water rich in nitrogen and phosphorus (French, 1977 and Key, 1998). The destructive red tide, some time known as “paralytic shellfish poisoning”, occurs due to the increase of nitrogen and the vast flowering of certain types of dinoflagelates in sea water. It spreads across the surface sea water like a red carpet absorbing oxygen preventing sunlight from reaching sea plants. When these organisms die and/or decay, they absorb more oxygen, literally suffocating fish and other marine life. (Don Groves, 1989 p. 52).

The phenomena of "Dead Fish" associated with desalination plants (thermal pollution and high concentration of chlorine) were reported in the territorial water of Kuwait in the years 1995, 1996, 1997

and 1998. On the 10th September 1999, red tides were observed in the Bay of Kuwait and in mid-September and on the first of October, 1999" Dead Fish " occurred as a result of the harmful action of the algaic blooms (> 1 million cells/liters), (Kuwait Institute of Scientific Research, 2000) concluded that harmful Gymno-dinium bloom (a type of dinoflagellates causing red tides) is a causative factor of the "Dead Fish" in Kuwait's water. Red tides in sea water have been studied and illustrated by GIS techniques, and the results were helpful in understanding and solving this dangerous marine environmental problem on a global scale (Vasills, 2002 and Dawn, 1999).

As previously stated the mean annual production of local fish in Kuwait was reduced to less than 1000 tons in the period from 1990 to 1991. However, at the end of 1991 and the beginning of 1992, Kuwaiti oil companies and the Kuwaiti government carried out several projects to assess the vast environmental damages of war activities on the coast lines and territorial water of Kuwait. Sea water pollution by crude oils, flowing oil to the sea water (as a result of firing of oil wells, and burning of oil lakes) were scanned using electronic, various microscopy, and x-ray energy spectrometry techniques to assess the cost of the restoration of both terrestrial and marine ecosystems and to describe effective remediation of oil contaminated soils and polluted sea water. Such efforts carried out by the government of Kuwait and the subsequent success in extinguishing the 727 burning oil wells during 240 days in 1991, revived to some extent the energy and reclamation of the Kuwaiti environments.

Due to the Allied Forces War on Iraq in March 2003; which ended the political system of Saddam Hussein, as well as the prohibitions of fishing in many areas, the annual production of local sea fish in Kuwait reduced to 3788 tons in 2001 and to 3382 tons in 2002, but then rose to about 4360 tons in 2007.

5.1 The Territorial Water of Kuwait, its Fertility and its Fish Productivity:

The annual production of local fish in Kuwait is caught mainly from its own limited territorial water (about 5,500 km²). According to

the first Geneva Conference in 1958, the continental shelf was extended to a depth of 200 meters (100 fathoms) to allow the exploitation of natural resources. In 1982, after to the Second Geneva Conference on the Law of the Sea the International Community redefined the continental shelf as an extension of the coast line to about 12 miles into the sea, measured from the base-line of a country. Since the floor of the Arabian Gulf to the north of the Strait of Hormz is less than 120 meters in depth, it is therefore considered a continental shelf. Definition and delimitation of marine boundaries between coastal countries facing the Arabian Gulf have been located and agreed upon according to the International Law of the Seas as well as the mutual political agreements between the Gulf State Countries.

Many of the countries that situated on the Arabian Gulf have declared the extension of their territorial water and the limit of their continental shelves since 1949. These countries agreed to respect fishing rights as well as historical rights for pearl diving. They also took into account the delimitation of the equidistance Mid-line, measured from the base-line of a country (the lowest tidal level off its coast) in drawing and delimiting marine boundaries among them (Abou- El-Enin, 2001; Abou- El-Enin and Abdulla, 2005; Abou- El-Enin and Al-Hasam, 2006).

The length of maritime coasts facing the Arabian Gulf varies from one country to another. Iran has 635 miles of maritime frontage on the Gulf, while that of the United Arab Emirates (UAE) is about 487 miles, Qatar 304 miles, Saudi Arabia 296 miles, Kuwait 84 miles, the Kingdom of Bahrain 51 miles, the Sultanate of Oman 501 miles and the Republic of Iraq about 10 miles.

At the beginning of the 20th century, most Arabian Gulf countries delimited their maritime boundaries by 3 miles off their coasts; a distance which kept a country safe from cannon bombardment at that time. With the rapid development of rockets and missiles, along with the necessity to drill in the floor of the continental shelf to search for oil, many countries asked for an extension in the area of their territorial water. Such demands were taken into account in 1982, with the declaration of the Second Geneva Conference on the Law of the Seas,

which defined the territorial water of a country as being those within 12 nautical miles off its coastal base-line. According to an Amiri Decree issued in 1948, Kuwait defined its territorial water as those within 6 miles off its coast, and then in 1967 extended the distance to 12 nautical miles off its coastal base-line.

In accordance with the Second Geneva Conference on the Law of the Seas in 1982, most of the Arabian Gulf States delimited the distance of their territorial water to 12 nautical miles off their coastal base-line (Abou- El-Enin, 2001).

Oceanographic characteristics of the sea-water adjacent to the coasts of Kuwait were discussed and examined (Abou- El-Enin, 2005 and 2006). Changes in the composition of biomass and ichthoplankton in the territorial water of Kuwait in different seasons were analyzed. In cold winter seasons, off the coasts of Kuwait there is a distinctive peak in both, the nursing of photo and zooplanktons and the spawning of fish of the subtropical fauna as Silvery pomfret, Silvery grunt, Silvery croaker, Herring travelled and Yellow finned black borgy. In hot summer seasons, there is intensive spawning of fish of tropical fauna as *Sardinella aurita*, Notched red-feinned bream and Shrimps. The spawning biomass of principal local and commercial fish off the coasts of Kuwait is usually calculated by the quantity of eggs laid by female fish (Arkhiopv, AG, 2009). The Arabian Gulf sea-current descending from the coastal water of Shut Al-Arab in the north to the coasts of Kuwait, with its relatively cold and rich -in biomass- water has a great effect on the significant seasonal fertility of the territorial water of Kuwait and consequently on the phases of spawning and catching seasons of local fish in Kuwait.

6.1 Conclusion

The government of Kuwait is progressing remarkably in developing fish farming in order to increase the total annual production of fish in Kuwait and those units of all types of fishes that may be sold in the local market at reasonable prices. In 2007, the weights of fish 'plants' and fish broods were about 1,435 and 5,000 kg, respectively. The most important types of fish produced by fish farming methods

are Tilapia (119,110 kg) and Silvery-black sea bream (75,000 kg). The main centers for fish farming production in Kuwait are located at Al-Douha, Al-Salmiyah, Al-Wafra and Al-Abdaly. The total work force involved in fish farming was about 160 laborers in 2007. (including 82 agricultural farmers, 44 fish farmers and 8 farm technicians). Great efforts are still being made to increase the annual per capita consumption from 3.5 kg/year in 2008 to about 15 kg/year in the coming years.

It is noted that some fish types and species have declined dramatically as a result of pollution and over-fishing that carried out in a limited water surface area. Some fishermen are forced by economic necessity to increase the efficiency and intensity of their efforts which in turn, lead to more rapid depletion of the local fisheries. Fishing industry in Kuwait therefore requires improvement. Efforts and economic plans are underway to increase the annual production of fish that can be sold in the local market at reasonable prices. Studies recommended that number of fishing boats, (wooden, iron and yachts), should be adjusted along with the number of fishermen, to be directly involved in this important traditional industry. The government of Kuwait has to establish new ports for fishing and supply them with essential services such as water, gas, petrol and ice. Finally more attention to the development of fish farms must be given, so that they serve as an additional source of reasonably priced fish (Abou- El-Enin, et al, 2005, p. 148).

6.2 Recommendations

The following recommendation and potential solutions can lead to the sustainability of Kuwait's fisheries:

- a - Ecosystem-based fishery management seeks to incorporate with the complex interactions of fish stocks with one another, and with the broader ecosystems that support them.
- b - Marine spatial planning that focuses on overall human use of marine resources is well needed; and the laws concerning fishing in several water surfaces in Kuwait and fishing of Shrimps which prohibited for six months per year must be implemented.

- c - The rapidly growing aquaculture industry that use mechanical modern techniques of fishing and bottom trawler boats must be stopped. These techniques have noticeable disastrous effect on the environmental destruction of the historical fish nursing grounds of the territorial water of Kuwait.
- d - Fishing is very important to the economy in Kuwait, providing marine food to the people, as well as income and employment for thousands of fishermen, merchants, laborers and others. Planning is therefore needed to direct fishery management and to achieve an optimum balance between the biological and economic requirements of fisheries in Kuwait in the future.

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