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Fish Quantities Available in the Markets of Basrah Governorate's Center and Districts

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ABSTRACT

The current study assessed the quantities of fish offered in the center and districts of Basrah Governorate from 2016 to 2018. During these years, the total fish supply in the governorate amounted to 137,121 tons. The highest quantity of fish offered was obtained in the Center of Basrah and amounted to 42046 tons; the lowest was 5,053 tons in the Al-Dair district, representing 30.7 and 3.7%, respectively. The findings indicated that residents of Basrah's Center and the districts of the Shatt al-Arab, Al-Faw, and Abu Al-Khaseeb primarily prefer marine fish, while those in the northern districts of Basrah, including Al-Hartha, Al-Dair, Al-Qurna, Al-Midaina, and Al-Zubair, show a preference for freshwater fish, based on the quantities of fish offered.

INTRODUCTION

Fish is an important food source for many components of great importance to the human body, including iodine, selenium, vitamin D, omega-3 acids, taurine, and carnitine. It is a high-value protein source compared to other animal protein sources. It provides a high percentage of satiety and helps control appetite. Association between fish consumption and human health has been profoundly addressed **(FAO, 2010; Hosomi *et al*., 2012; Mendivil, 2021)**. On average, fish provided about 35 calories per person per day in 2017, with more than 100 calories per person per day in countries where fish is preferred. Fish is a significant source of high-quality animal proteins and polyunsaturated fatty acids in addition to micronutrients that are crucial for a varied and healthy diet. In 2017, fish accounted for about 17% of total animal proteins and 7% of all protein consumed worldwide. Fish supplied approximately 3.3 billion people with about 20% of their average per capita intake of animal proteins **(FAO, 2020)**. Consumer studies and market research have become important areas of interest for both the public and private sectors in developed countries. These studies are used to monitor and measure energy

consumption, track its developments, assess future expectations, and identify consumption patterns, characteristics, and determinants. In addition, they examine geographical and seasonal distribution, providing a foundation of accurate and sufficient information. These data help determine key parameters for production activities, ensuring that they are quantitatively and qualitatively aligned with consumer needs and characteristics, thereby achieving optimal resource allocation and investment **(El-Hag & El-Sagheer, 2012)**.

Numerous studies have been conducted on fish landings in Iraqi marine artisanal fisheries **(Morgan, 2006; Al-Dubakel, 2011; Mohamed & Qasim, 2014; Mohamed, 2018; Mohamed & Abood, 2020)**. Additionally, some research has focused on inland fisheries **(Al-Nasiri & Sharma, 1977; Khayat, 1978; Salman, 1978; Sharma, 1980; Mohamed *et al.*, 2008; Nasir & Khalid, 2017; Abood & Mohamed, 2020)**, particularly regarding fish marketing conditions in Basrah province. Furthemore, **Al-Maliki (2022)** examined the quantities of shrimp available in some markets in Basrah Governorate. While, the current study aimed to calculate the quantities of fish available in the Center and districts of Basrah Governorate from 2016 to 2018.

MATERIALS AND METHODS

Data were collected on the quantity of fish offered in the Center and districts of Basrah Governorate (Al-Zubair District, Al-Qurna, Shatt al-Arab, Al-Midaina, Al-Faw, Abu Al-Khasseb, Al-Dair, and Al-Hartha) (Fig. 1) from January 2016 to December 2018 in cooperation with the Ministry of Agriculture-Office of Animal Resources by making regular trips to the fish markets and visiting frozen fish stores.

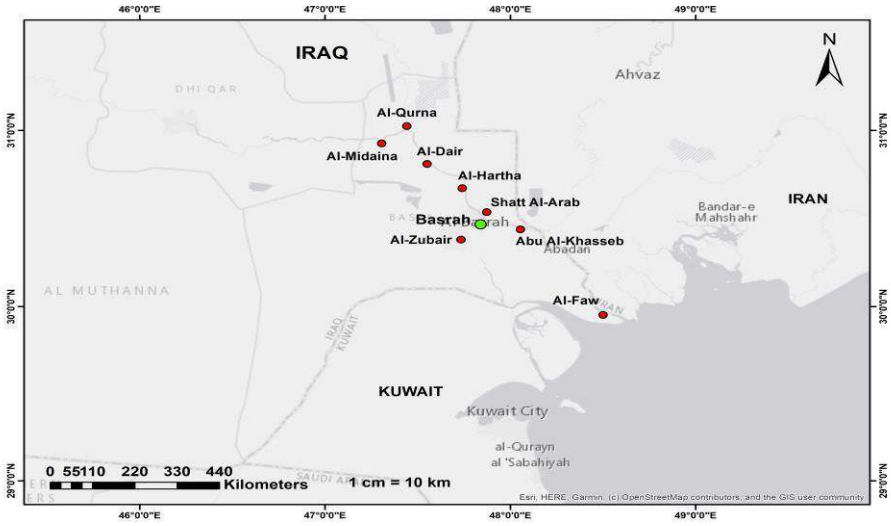

Fig. 1. A map showing the administrative divisions of Basrah Governorate

The data were recorded through records, which included the quantities and species of fish and the names of the traders.

RESULTS

The quantity of fish offered in Basrah Governorate for the years 2016, 2017, and 2018 amounted to 137,121 tons, which constituted freshwater fish (71,362 tons), equivalent to 52.0%, and its highest appearance was 27017 tons in 2018, where it accounted for 43.9%. On the other hand, the amount of marine fish represented 61541 tons, equivalent to 44.9%, and it reached the highest amount in 2018, recording 27133 tons at a rate of 44.1%. Moreover, the amount of frozen fish was 4218.9 tons at a rate of 3.1% of the quantity offered, and it appeared at a low rate during the study period.

1. Center of Basrah

The quantity of fish offered in the Center of Basrah amounted to 42046 tons, equivalent to 30.7% of the total fish. The quantity of marine fish offered amounted to 22,177 tons, equivalent to 52.7%, of which 6470 tons in 2016, 6476 in 2017, and 9231 tons in 2018, equivalent to 29.2, 29.2, and 41.6% of the total weight of marine fish offered, respectively. On the other hand, the quantity of freshwater fish offered 18,787 tons, equivalent to 44.7%, of which 4891 tons were in 2016, 6802 tons in 2017, and 7094 tons in 2018, equivalent to 26, 36.2 and 37.8% of the total weight of the freshwater fish offered, respectively. The quantity of frozen fish supplied was 1082.9 tons, equivalent to 2.6%, with 138 tons in 2016, 231.2 tons in 2017, and 713.7 tons in 2018 (Figs. 2, 3, 4).

The highest amount of fish offered in 2016 occurred in May, totaling 1,051.5 tons, which represented 9.1% of the total fish offered. Of this, 611.2 tons were marine fish, 432.3 tons were freshwater fish, and 5.5 tons were frozen fish. The lowest amount was recorded in February, with 830.9 tons, accounting for 8.2% of the total. This included 440 tons of marine fish, 377.5 tons of freshwater fish, and 13.4 tons of frozen fish.

In 2017, the highest amount of fish offered was in July, reaching 1,335.2 tons, or 9.9% of the total. Of this, 772.3 tons were marine fish, 543.9 tons were freshwater fish, and 19 tons were frozen fish. The lowest amount was in October, with 839.8 tons, which included 439.5 tons of marine fish, 390 tons of freshwater fish, and 10.3 tons of frozen fish.

In 2018, the highest amount of fish offered occurred in June, totaling 1,729.3 tons, or 10.1% of the total. Of this, 978.3 tons were marine fish, 671 tons were freshwater fish, and 80 tons were frozen fish. The lowest amount was in February with 1,169 tons, which included 510.6 tons of marine fish, 593 tons of freshwater fish, and 65.4 tons of frozen fish (Table 1).

Table 1. Quantities of fish offered in the Center of Basrah (tons) from 2016-2018

Center of Basrah											
Month	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**
Jan.2016	533.5	390.8	5.64	Jan.2017	447.3	599	18.3	Jan.2018	390.9	520.8	14.9
Feb.	440	377.5	13.4	Feb.	309.5	612.3	9.4	Feb.	510.6	593	65.4
Mar.	561.5	314.5	8.7	Mar.	388.7	634.1	12.2	Mar.	683.3	514.2	10.8
Apr.	624.7	339.1	5.5	Apr.	484.6	642.8	20.4	Apr.	955.1	473.8	67
May.	611.2	432.3	8	May.	656.8	510.7	16.6	May.	910.1	537.1	63.5
Jun.	648.1	353.6	11.3	Jun.	723.7	449.9	12.4	Jun.	978.3	671	80
Jul.	633.6	335.5	9.6	Jul.	772.3	543.9	19	Jul.	994.8	631.6	74.7
Aug.	619.4	337.7	11.9	Aug.	635.5	636.7	24.4	Aug.	840.4	625.7	79.1
Sep.	656.2	348	14.1	Sep.	570.7	695.5	26.6	Sep.	774.6	614.2	71.4
Oct.	436.5	530	13.3	Oct.	439.5	390	10.3	Oct.	669.8	564.6	60.9
Nov.	375.7	559.5	22.8	Nov.	686	379.2	17.6	Nov.	728.2	698.7	60.2
Dec.2016	329.4	572	13.8	Dec.2017	361.4	707.4	44	Dec.2018	794.8	649.3	65.8

Mar: Marine fishes; Fw: Freshwater fishes; Fr: Frozen fishes

2. Shatt al-Arab district

The quantity of fish offered in the Shatt al-Arab district reached 10517 tons during the study period, equivalent to 7.7% of the total quantity offered. The quantity of marine fish offered amounted to 5,967 tons, equivalent to 56.7% of the total offered fish. It appeared in high quantities throughout the study period, reaching 1297 tons in 2016, 1,341 in 2017, and 3329 tons in 2018, equivalent to 56.55, 53.73, and 58.14% of the total weight of marine fish offered respectively. On the other hand, the freshwater fish occupied second (4244.6 tons), equivalent to 40.4%, of which 960.6 tons in 2016, 1114 in 2017, and 2170 tons in 2018, equivalent to 41.9, 44.6 and 37.9% of the total weight of the presented freshwater fish, respectively, while frozen fish (304.07 tons) constituted only 2.89% of the total weight of the offered fish (Figs. 2, 3, 4).

The highest appearance of offered fish in 2016 was in January, which amounted to 300 tons, equivalent to 13.1% of the total offered fish. It included 202 tons of marine fish, 97 tons of freshwater fish, and 0.97 tons of frozen fish, and the lowest was 164.7 tons in December, and 7.2% of them were 32.3 tons of marine fish. Moreover, 129.5 tons of freshwater fish and 2.9 tons of frozen fish, while the highest appearance in 2017 and 2018 was in July and amounted to 239.4 tons and 568.6, which is equivalent to 9.6% and 9.9%, respectively, of which 174.4 tons were marine fish, 61.6 tons of freshwater fish and 3.9 tons Frozen fish in 2017, 354.3 tons of marine fish, 196.2 tons of freshwater fish, 18.1 tons of frozen fish, and the lowest was 135.7 tons in October 2017, 5.4% of which were 73.1 tons of marine fish and 59.9 tons of river fish, 2.7 tons of frozen fish and 238.5 tons January 2018, with a rate of 4.2%, of which 53.3 tons of marine fish, 164 tons of

freshwater fish and 21.2 tons of frozen fish (Table. 2). The highest amount of fish offered in 2016 occurred in January, totaling 300 tons, which represents 13.1% of the total fish offered. This included 202 tons of marine fish, 97 tons of freshwater fish, and 0.97 tons of frozen fish. The lowest amount was recorded in December, with 164.7 tons, accounting for 7.2% of the total. This included 32.3 tons of marine fish, 129.5 tons of freshwater fish, and 2.9 tons of frozen fish.

In 2017 and 2018, the highest amounts of fish offered occurred in July, with 239.4 tons in 2017 and 568.6 tons in 2018. These represented 9.6% and 9.9% of the total, respectively. In 2017, the breakdown included 174.4 tons of marine fish, 61.6 tons of freshwater fish, and 3.9 tons of frozen fish. In 2018, the breakdown included 354.3 tons of marine fish, 196.2 tons of freshwater fish, and 18.1 tons of frozen fish.

The lowest amount of fish offered in 2017 was recorded in October, with 135.7 tons, accounting for 5.4% of the total. This included 73.1 tons of marine fish, 59.9 tons of freshwater fish, and 2.7 tons of frozen fish. In 2018, the lowest amount occurred in January, with 238.5 tons, representing 4.2% of the total. This included 53.3 tons of marine fish, 164 tons of freshwater fish, and 21.2 tons of frozen fish (Table 2).

Table 2. Quantities of fish offered in the Shatt al-Arab (tons) from 2016-2018

Shatt Al-Arab											
Month	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**
Jan.2016	202	97	0.97	Jan.2017	98.4	120.8	5.2	Jan.2018	53.3	164	21.2
Feb.	85.6	77.8	4.7	Feb.	85.7	116.8	0.6	Feb.	196.7	174.9	24.9
Mar.	120.4	54.9	2.1	Mar.	69.4	143.5	2.6	Mar.	294.6	175.6	20.8
Apr.	139.8	41.4	1.4	Apr.	82.4	135.5	4.8	Apr.	279	197.7	26.8
May.	128	59.7	1.9	May.	130.8	93.6	3.7	May.	345.9	189.3	20.2
Jun.	129.3	64.9	2.7	Jun.	149	70.6	1.6	Jun.	331.5	179.6	16
Jul.	122.6	68.1	2.2	Jul.	174.4	61.1	3.9	Jul.	354.3	196.2	18.1
Aug.	116	70.1	2.9	Aug.	156.9	76.4	3.4	Aug.	285	184.1	16.4
Sep.	110.3	55.2	3.2	Sep.	150	67.9	4	Sep.	292.7	184.5	18.3
Oct.	63.6	117.6	3.6	Oct.	73.1	59.9	2.7	Oct.	295.7	178.4	13.3
Nov.	47.2	124.4	7.5	Nov.	87.6	53.9	3.6	Nov.	304.3	196.5	14.6
Dec.2016	32.3	129.5	2.9	Dec.2017	83.7	114.2	4.7	Dec.2018	296.2	149.3	16.6

Mar: Marine fishes; Fw: Freshwater fishes; Fr: Frozen fishes

3. Al-Hartha district

During the study period, the amount of fish offered in the Al-Hartha district reached 8,001 tons, which accounted for 5.8% of the total fish offered. Freshwater fish were the dominant type in Al-Hartha, totaling 5,171 tons or 64.6% of the total. The highest amount of freshwater fish appeared in 2017, with 1,897 tons, while the lowest amount was

recorded in 2016 with 1,499 tons, representing 36.7% and 29.0% of the total for those years, respectively. Marine fish followed totaling 2,534.3 tons or 31.7%. The highest appearance of marine fish occurred in 2018, reaching 1,156 tons or 45.6% of the total for that year (Figs. 2, 3, 4). Freshwater fish consistently showed the highest abundance throughout the study period, except for April 2017 and March 2018.

In 2016, the highest amount of fish offered occurred in January, with 232.2 tons, representing 10.5% of the total offered. This included 74 tons of marine fish, 157.3 tons of freshwater fish, and 1.2 tons of frozen fish. The lowest amount was recorded in February with 169.2 tons or 7.6% of the total. This consisted of 56.7 tons of marine fish, 111 tons of freshwater fish, and 1.5 tons of frozen fish.

In 2017, the highest appearance of fish occurred in July with 273.4 tons, equivalent to 10.5% of the total. This included 42.9 tons of marine fish, 203.5 tons of freshwater fish, and 27 tons of frozen fish. The lowest amount was in October, with 174.6 tons, accounting for 6.5% of the total. This consisted of 40.8 tons of marine fish, 123.8 tons of freshwater fish, and 10 tons of frozen fish.

In 2018, the highest percentage of fish offered occurred in May with 308 tons or 10% of the total. This included 112.1 tons of marine fish, 184.5 tons of freshwater fish, and 12.2 tons of frozen fish. The lowest amount was recorded in February, with 203.8 tons, which included 89 tons of marine fish, 103.4 tons of freshwater fish, and 11.4 tons of frozen fish (Table 3).

Table 3. Quantities of fish offered in the Al-Hartha (tons) from 2016-2018

Al-Hartha											
Month	**Mar**	**Fw**	**Fr**	**Month**	**Mar**	**Fw**	**Fr**	**Month**	**Mar**	**Fw**	**Fr**
Jan.2016	74	157.3	1.2	Jan.2017	69.6	152.7	0.6	Jan. 2018	63	97.5	10.5
Feb.	56.7	111	1.5	Feb.	57.5	153.8	4.3	Feb.	59.7	97.8	9.4
Mar.	42.2	126.8	1	Mar.	88.7	167.2	5.2	Mar.	86.1	76	8.5
Apr.	55.7	122.1	1.1	Apr.	99.5	96.9	7	Apr.	69.5	107.3	7.9
May.	52.7	122.1	1.2	May.	83	165.9	7.3	May	69.8	108.5	8.5
Jun.	56.8	131.2	1.4	Jun.	43.1	219.4	7	Jun.	57.6	113.6	7.2
Jul.	71.1	134.5	1.9	Jul.	42.9	203.5	27	Jul.	61.3	97.8	8.3
Aug.	72	116.8	1.5	Aug.	32.8	193.1	19.5	Aug.	55	85.5	8.3
Sep.	67.1	116.2	1.96	Sep.	38.4	131.7	23.4	Sep.	58.2	94.5	7.8
Oct.	56.1	121.8	1.9	Oct.	40.8	123.8	10	Oct.	55.6	90.9	8.4
Nov.	57.1	115.1	2.04	Nov.	44.3	135.6	9.6	Nov.	59.7	83.8	6.5
Dec.2016	42.9	124.2	2.2	Dec.2017	33.3	153.5	10.3	Dec.2018	56	80.9	7.1

Mar: Marine fishes; Fw: Freshwater fishes; Fr: Frozen fishes

4. Al-Dair district

During the study period, the total amount of fish offered in the Al-Dair district was 5,053 tons, which accounted for 3.7% of the total fish offered. Freshwater fish dominated the offerings throughout the study period, except for April 2017 and March 2018. In Al-Dair, the highest amount of fish offered in 2016 occurred in July with 158.5 tons, representing 11.03% of the total. This included 54.3 tons of marine fish, 102.7 tons of freshwater fish, and 1.5 tons of frozen fish. The lowest amount was recorded in February with 103.2 tons or 7.2% of the total. This consisted of 32.2 tons of marine fish, 69.9 tons of freshwater fish, and 1.1 tons of frozen fish.

In 2017, the highest amount of fish offered occurred in June, totaling 173.5 tons, or 10.6% of the total. This included 27.8 tons of marine fish, 141.2 tons of freshwater fish, and 4.5 tons of frozen fish. The lowest amount was in September with 81.6 tons, accounting for 5% of the total. This consisted of 16.2 tons of marine fish, 55.5 tons of freshwater fish, and 9.9 tons of frozen fish.

In 2018, the highest percentage of fish offered occurred in May with 186.8 tons or 9.4% of the total. This included 69.8 tons of marine fish, 108.5 tons of freshwater fish, and 8.5 tons of frozen fish. The lowest amount was recorded in December with 144 tons, which included 56 tons of marine fish, 80.9 tons of freshwater fish, and 7.1 tons of frozen fish (Table 4).

Table 4. Quantities of fish offered in the Al-Dair (tons) from 2016-2018

Al-Dair											
Month	**Mar**	**Fw**	**Fr**	**Month**	**Mar**	**Fw**	**Fr**	**Month**	**Mar**	**Fw**	**Fr**
Jan.2016	45.5	90.5	2.5	Jan.2017	48.7	106.8	0.4	Jan.2018	63	97.5	10.5
Feb.	40.7	79.7	1.1	Feb.	39.7	106.2	2.9	Feb.	59.7	97.8	9.4
Mar.	29.2	87.9	0.7	Mar.	57.3	108.3	3.3	Mar.	86.1	76	8.5
Apr.	38.1	83.5	0.8	Apr.	65.2	63.5	4.6	Apr.	69.5	107.3	7.9
May.	37.3	86.5	0.9	May.	53.4	106.8	4.7	May.	69.8	108.5	8.5
Jun.	37.8	87.3	0.94	Jun.	27.8	141.2	4.5	Jun.	57.6	113.6	7.2
Jul.	54.3	102.7	1.5	Jul.	26.6	126.4	16.8	Jul.	61.3	97.8	8.3
Aug.	40.9	66.4	0.9	Aug.	19.6	115.5	11.7	Aug.	55	85.5	8.3
Sep.	38.5	66.6	1.2	Sep.	16.2	55.5	9.9	Sep.	58.2	94.5	7.8
Oct.	32.2	69.9	1.1	Oct.	20.3	61.7	5	Oct.	55.6	90.9	8.4
Nov.	34.4	69.3	1.2	Nov.	23.5	71.9	5.1	Nov.	59.7	83.8	6.5
Dec.2016	26.3	76.1	1.3	Dec.2017	17.2	79.5	5.3	Dec.2018	56	80.9	7.1

Mar: Marine fishes; Fw: Freshwater fishes; Fr: Frozen fishes.

5. Al-Zubair district

The total quantity of fish offered in the Al-Zubair district during the study period was 23,076 tons, which accounted for 16.8% of the total fish offered. Marine fish accounted for 10,557 tons or 45.7% of the total, with 3,001 tons in 2016, 3,342 tons in 2017, and 4,214 tons in 2018, representing 46.9%, 44.3%, and 46.1% of the total marine fish offered, respectively. Freshwater fish amounted to 11,751 tons or 50.9% of the total, with 3,350 tons in 2016, 4,066 tons in 2017, and 4,335 tons in 2018, representing 52.4%, 53.9%, and 47.4% of the total freshwater fish offered, respectively. Frozen fish totaled 769.6 tons, or 3.3% of the total, with 42.6 tons in 2016, 135.5 tons in 2017, and 591.5 tons in 2018 (Figs. 2, 3, 4).

The highest amount of fish offered in 2016 occurred in September, totaling 583 tons, or 9.1% of the total fish offered. This included 271 tons of marine fish, 309 tons of freshwater fish, and 3 tons of frozen fish. The lowest amount was recorded in February, with 452.7 tons, or 7.1% of the total. This included 190.5 tons of marine fish, 259.8 tons of freshwater fish, and 2.4 tons of frozen fish. In 2017, the highest amount of fish offered occurred in July, totaling 683.4 tons, or 9.1% of the total. This included 398 tons of marine fish, 269.4 tons of freshwater fish, and 16 tons of frozen fish. The lowest amount was in October, with 358 tons, which included 203 tons of marine fish, 150.5 tons of freshwater fish, and 4.5 tons of frozen fish. In 2018, the highest amount of fish offered occurred in May, totaling 839 tons, or 9.2% of the total. This included 569 tons of marine fish, 216 tons of freshwater fish, and 54 tons of frozen fish. The lowest amount was in January, with 647 tons, including 215 tons of marine fish, 423 tons of freshwater fish, and 9 tons of frozen fish (Table 5).

Table 5. Quantities of fish offered in the Al-Zubair (tons) from 2016-2018

Al-Zubair											
Month	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**
Jan.2016	266	277	1	Jan.2017	239	317	1	Jan.2018	215	423	9
Feb.	190.5	259.8	2.4	Feb.	139	355.5	4.5	Feb.	288.6	335.2	37.1
Mar.	206.1	272.3	3.8	Mar.	236	320.6	5.9	Mar.	425	312.2	24.9
Apr.	240.1	250.9	4.4	Apr.	244	361.5	9.6	Apr.	574	192	65
May.	221.2	295.2	3.3	May.	409	257.5	4	May.	569	216	54
Jun.	266.1	298.2	2.8	Jun.	417	259.2	6	Jun.	388	334	76
Jul.	246.4	293.8	3.3	Jul.	398	269.4	16	Jul.	325	398	62
Aug.	245	297.3	2.7	Aug.	317.5	317.1	15	Aug.	302	410	66
Sep.	271	309	3	Sep.	297	851.7	26.5	Sep.	256	453	44
Oct.	243.9	302.6	4.5	Oct.	203	150.5	4.5	Oct.	286.2	382.3	38.5
Nov.	309.2	241.2	5.8	Nov.	235	263.5	15.5	Nov.	298	449	61
Dec.2016	295.7	252.2	5.6	Dec.2016	207	342	27	Dec.2016	287	430	54

Mar: Marine fishes; Fw: Freshwater fishes; Fr: Frozen fishes.

6. Al-Qurna district

During the study period, the total amount of fish offered in the Al-Qurna district was 16,073 tons, accounting for 11.7% of the total fish offered. Freshwater fish dominated the offerings in Al-Qurna, totaling 10,350 tons, or 64.4%. The highest amount of freshwater fish appeared in 2018 with 3,898 tons, while the lowest amount was recorded in 2016 with 3,142 tons, representing 37.7% and 30.4% of the total for those years, respectively. Marine fish amounted to 5,155 tons or 32.1%, with the highest amount in 2018 reaching 2,503 tons or 48.6%. The lowest amount of marine fish was recorded in 2016 with 1,469 tons, representing 28.5% of the total for that year (Figs. 2, 3, 4). Freshwater fish consistently showed the highest abundance throughout the study period, except for April 2017. In 2016, the highest amount of fish offered occurred in June with 431.8 tons or 9.3% of the total fish offered. This included 129.5 tons of marine fish, 299.1 tons of freshwater fish, and 3.2 tons of frozen fish. The lowest amount was recorded in January, with 158.5 tons, or 3.4% of the total. This included 50.5 tons of marine fish, 107.2 tons of freshwater fish, and 0.8 tons of frozen fish. In 2017, the highest amount of fish offered occurred in January, totaling 599.7 tons, or 12.8% of the total. This included 187.2 tons of marine fish, 410.9 tons of freshwater fish, and 1.6 tons of frozen fish. The lowest amount was in September, with 215.2 tons, or 4.6% of the total. This consisted of 42.7 tons of marine fish, 146.4 tons of freshwater fish, and 26.1 tons of frozen fish. In 2018, the highest amount of fish offered occurred in May, totaling 617.8 tons, or 9.2% of the total. This included 220.4 tons of marine fish, 372.7 tons of freshwater fish, and 24.7 tons of frozen fish. The lowest amount was recorded in February with 488.4 tons, which included 184 tons of marine fish, 280.7 tons of freshwater fish, and 23.7 tons of frozen fish (Table 6).

Table 6. Quantities of fish offered in the Al-Qurna (tons) from 2016-2018.

Al- Qurna											
Month	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**
Jan.2016	50.5	107.2	0.8	Jan.2017	187.2	410.9	1.6	Jan.2018	182.8	336.1	5.1
Feb.	141.9	277.8	3.7	Feb.	120.2	321.8	8.9	Feb.	184	280.7	23.7
Mar.	105.1	316.2	2.5	Mar.	153.3	288.9	8.9	Mar.	283.2	298.1	24.9
Apr.	133.5	292.8	2.7	Apr.	176.6	172	12.4	Apr.	203.4	332.9	20.3
May.	127	294.4	3	May.	140.2	380.2	12.4	May.	220.4	372.7	24.7
Jun.	129.5	299.1	3.2	Jun.	68.2	346.9	11.1	Jun.	189.9	383.1	29.5
Jul.	135.6	256.5	3.7	Jul.	66.8	316.9	42	Jul.	215.9	327.6	34.8
Aug.	155.2	251.9	3.3	Aug.	46.1	271.4	27.4	Aug.	202.8	318.8	35.5
Sep.	149.4	258.5	4.4	Sep.	42.7	146.4	26.1	Sep.	170.6	355.1	32.9
Oct.	123.3	267.6	4.2	Oct.	46.4	140.7	11.4	Oct.	258.7	310.7	41.7
Nov.	127.5	257.1	4.6	Nov.	70.2	214.7	15.2	Nov.	201.4	290.3	27.6
Dec.2016	90.7	262.5	4.6	Dec.2017	64.8	298.9	20	Dec.2018	189.7	292	29.3

Mar: Marine fishes; Fw: Freshwater fishes; Fr: Frozen fishes.

7. Al-Midaina district

During the study period, the total quantity of fish offered in the Midaina district was 16,668 tons, accounting for 12.2% of the total fish offered. Freshwater fish dominated the offerings, totaling 10,674 tons, or 64.03% of the total fish. Freshwater fish appeared in high quantities throughout the study period, with 3,494 tons in 2016, 3,497 tons in 2017, and 3,683 tons in 2018, representing 67.5%, 70.6%, and 56.4% of the total weight of freshwater fish offered, respectively. Marine fish, totaling 5,402 tons, or 32.4%, followed as the second-most offered type of fish. Of this, 1,640 tons were offered in 2016, 1,221 tons in 2017, and 2,541 tons in 2018, which accounted for 31.7%, 24.7%, and 38.9% of the total weight of marine fish offered, respectively. Frozen fish, at 509.9 tons, constituted only 3.1% of the total weight of the offered fish (Figs. 2, 3, 4). In 2016, the highest amount of fish offered occurred in January, totaling 477.5 tons, or 9.2% of the total. This included 152 tons of marine fish, 323 tons of freshwater fish, and 2.5 tons of frozen fish. The lowest amount was recorded in December, with 387.4 tons, or 7.5% of the total, consisting of 98.2 tons of marine fish, 284.2 tons of freshwater fish, and 5.0 tons of frozen fish. In 2017, the highest amount of fish offered occurred in August, totaling 507.8 tons, or 10.2% of the total. This included 67.9 tons of marine fish, 399.5 tons of freshwater fish, and 40.4 tons of frozen fish. The lowest amount was in October, with 281 tons, or 5.4% of the total, which included 65.6 tons of marine fish, 199.2 tons of freshwater fish, and 16.2 tons of frozen fish. In 2018, the highest percentage of fish offered occurred in April, with 625.5 tons, or 9.6% of the total. This included 266.7 tons of marine fish, 338.2 tons of freshwater fish, and 20.5 tons of frozen fish. The lowest amount was recorded in February, with 459.8 tons, consisting of 200.8 tons of marine fish, 233.2 tons of freshwater fish, and 25.8 tons of frozen fish (Table 7).

Table 7. Quantities of fish offered in the Al-Midaina (tons) from 2016-2018.

Al-Midain											
Month	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**
Jan.2016	152	323	2.5	Jan.2017	150.6	330.6	1.3	Jan.2018	179.7	330.3	5
Feb.	133.6	261.6	3.5	Feb.	113.6	304.1	8.4	Feb.	200.8	233.2	25.8
Mar.	101	303.6	2.4	Mar.	147.7	278.5	8.6	Mar.	283.3	208.1	16.6
Apr.	133.2	292.2	2.7	Apr.	164.7	160.4	12	Apr.	266.7	338.2	20.6
May.	138.9	322.2	3.3	May.	131.4	262.8	11.6	May.	206.8	340.4	22.6
Jun.	139.9	323.2	3.5	Jun.	70	356.1	11.4	Jun.	186.6	366.7	28.2
Jul.	148	280	4.1	Jul.	74.2	352.5	46.7	Jul.	206.5	327	34.7
Aug.	179	290.3	3.8	Aug.	67.9	399.5	40.4	Aug.	200.3	314.8	34.3
Sep.	156.4	270.1	4.6	Sep.	58.5	200.7	35.7	Sep.	158.8	351.2	32.5
Oct.	128.9	279.6	4.4	Oct.	65.6	199.2	16.2	Oct.	257.7	277.7	31.7
Nov.	131	264.1	4.7	Nov.	106	324.3	23	Nov.	201	298.7	27.5
Dec.2016	98.2	284.2	5	Dec.2017	71.2	328.5	21.9	Dec.2018	192.7	296.6	29.7

Mar: Marine fishes; Fw: Freshwater fishes; Fr: Frozen fishes.

8. Al-Faw district

During the study period, the total amount of fish offered in the Al-Faw district was 4,577 tons, which accounted for 3.3% of the total fish offered. The highest amount of fish offered in 2016 occurred in April, with 107.2 tons or 9.03% of the total. This included 59.8 tons of marine fish, 47 tons of freshwater fish, and 0.44 tons of frozen fish. The lowest amount was recorded in February, with 84.3 tons, or 7.1% of the total, consisting of 46 tons of marine fish, 37.7 tons of freshwater fish, and 0.6 tons of frozen fish. In 2017, the highest amount of fish offered was in August, totaling 159.7 tons, or 11.9% of the total. This included 101.9 tons of marine fish, 54.1 tons of freshwater fish, and 3.7 tons of frozen fish. The lowest amount was in November, with 75.2 tons, or 5.6% of the total, consisting of 38.4 tons of marine fish, 36.2 tons of freshwater fish, and 0.6 tons of frozen fish. In 2018, the highest amount of fish offered occurred in May, totaling 220 tons, or 10.7% of the total. This included 140.5 tons of marine fish, 70.8 tons of freshwater fish, and 8.7 tons of frozen fish. The lowest amount was recorded in January, with 102.2 tons, consisting of 47.4 tons of marine fish, 52.5 tons of freshwater fish, and 2.3 tons of frozen fish (Table 8).

Table 8. Quantities of fish offered in the Al-Faw (tons) from 2016-2018

Al-Faw											
Month	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**	**Month**	**Mar**	**FW**	**Fr**
Jan.2016	53.5	33	0.64	Jan.2017	60	41.5	1.3	Jan.2018	47.4	52.5	2.3
Feb.	46	37.7	0.6	Feb.	73	25.1	1.7	Feb.	59.3	58.4	7.6
Mar.	57.8	36.7	0.8	Mar.	54.7	41.1	1.1	Mar.	95.2	69.4	5.6
Apr.	59.8	47	0.44	Apr.	56.5	52.3	1.6	Apr.	139.1	44.3	8.1
May.	60.3	55	0.7	May.	56.2	47.9	1.2	May.	140.5	70.8	8.7
Jun.	65.4	38	0.98	Jun.	69.1	57.8	1.8	Jun.	95.9	84.7	9.7
Jul.	65.9	33.6	0.8	Jul.	53.9	44.6	1.2	Jul.	87.7	88.8	9.1
Aug.	65.2	32.8	1	Aug.	101.9	54.1	3.7	Aug.	85.2	77.9	8.6
Sep.	65.3	36.3	1	Sep.	99.1	34.5	3.1	Sep.	70.7	110	10.7
Oct.	53.5	47.4	0.9	Oct.	38.4	36.2	0.6	Oct.	73.8	70.3	10.2
Nov.	47.5	47.9	1	Nov.	70.2	36.4	1.2	Nov.	90.7	81	6.1
Dec.2016	44.4	47	1.2	Dec.2017	81.3	32.5	5.9	Dec.2018	81.8	78.8	6.4

Mar: Marine fishes; Fw: Freshwater fishes; Fr: Frozen fishes.

9. Abu Al-Khasseb district

The total amount of fish offered in the Abu Al-Khaseeb district was 11,111 tons, accounting for 8.1% of the total fish offered. The quantity of marine fish offered was 5,560 tons, or 50.0%, with 1,755 tons in 2016, 1,464 tons in 2017, and 2,341 tons in 2018, representing 51.05%, 42.01%, and 57.7% of the total weight of marine fish offered, respectively. The quantity of freshwater fish offered was 5,259 tons or 47.3%, with 1,259

tons in 2016, 1,959 tons in 2017, and 2,041 tons in 2018, representing 44.51%, 56.19%, and 41.4% of the total weight of freshwater fish offered, respectively. The quantity of frozen fish offered was 292.1 tons, or 2.62%, with 25.8 tons in 2016, 63 tons in 2017, and 203.3 tons in 2018 (Figs. 2, 3, 4). The highest amount of offered fish in 2016 was in May, totaling 293.7 tons or 9.7% of the total offered fish. This included 152.7 tons of marine fish, 139.2 tons of freshwater fish, and 1.8 tons of frozen fish. The lowest amount was recorded in December, with 231.1 tons or 7.6% of the total, consisting of 110.8 tons of marine fish, 117.3 tons of freshwater fish, and 3 tons of frozen fish. In 2017, the highest amount of offered fish was in August, totaling 351.3 tons, or 10.1% of the total. This included 119.0 tons of marine fish, 224.3 tons of freshwater fish, and 8.0 tons of frozen fish. The lowest amount was in October, with 192.5 tons, or 5.5% of the total, consisting of 92.7 tons of marine fish, 98.4 tons of freshwater fish, and 1.4 tons of frozen fish. In 2018, the highest amount of offered fish occurred in May, totaling 449.8 tons or 9.8% of the total. This included 284.5 tons of marine fish, 143.6 tons of freshwater fish, and 21.7 tons of frozen fish. The lowest amount was recorded in January, with 238.2 tons, consisting of 101.8 tons of marine fish, 131.8 tons of freshwater fish, and 4.6 tons of frozen fish (Table 9).

Table 9. Quantities of fish offered in the Abu Al Khaseeb (tons) from 2016-2018

Abu Al Khaseeb											
Month	**Mar**	**Fw**	**Fr**	**Month**	**Mar**	**Fw**	**Fr**	**Month**	**Mar**	**Fw**	**Fr**
Jan.2016	145	89	1.7	Jan.2017	111.2	159.7	3.4	Jan.2018	101.8	131.8	4.6
Feb.	129.8	106.4	1.6	Feb.	62.7	182.6	4.2	Feb.	142.7	165.7	18.3
Mar.	154.4	98	2.2	Mar.	122.5	162.9	3.3	Mar.	199.5	146.5	11.7
Apr.	146.2	114.7	1.1	Apr.	142	153.4	4.3	Apr.	250.1	86	15.7
May.	152.7	139.2	1.8	May.	162.6	138.6	5.5	May.	284.5	143.6	21.7
Jun.	170.2	98.8	2.6	Jun.	161.7	135.1	4.3	Jun.	199.4	206.7	23.3
Jul.	164.9	84.2	2.1	Jul.	155.4	187.6	4.3	Jul.	211.2	184.4	21
Aug.	163.1	81.9	2.5	Aug.	119	224.3	8	Aug.	198.4	181.4	20
Sep.	166.2	92.2	2.5	Sep.	81.5	233.6	7.3	Sep.	203.7	210.6	23.6
Oct.	131.9	116.6	2.2	Oct.	92.7	98.4	1.4	Oct.	189	154.7	15.1
Nov.	119.9	121	2.5	Nov.	176.7	91.6	3.1	Nov.	185.4	212.1	14.1
Dec.2016	110.8	117.3	3	Dec.2017	76.4	191	13.9	Dec.2018	175.2	217.6	14.2

Mar: Marine fishes; Fw: Freshwater fishes; Fr: Frozen fishes.

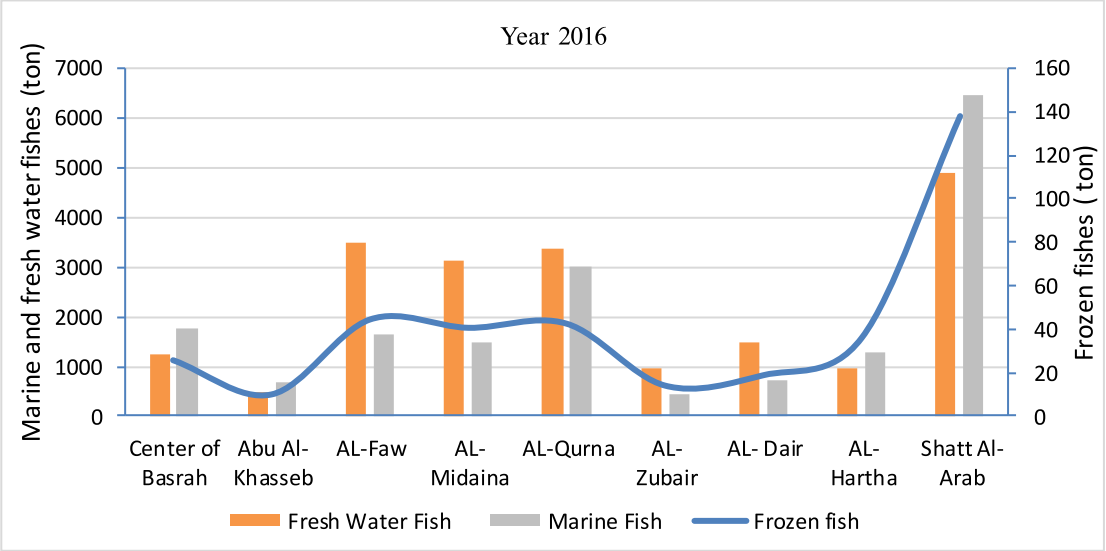

Fig. 2. The quantities of fish offered (tons) in the Center and districts of Basrah during 2016

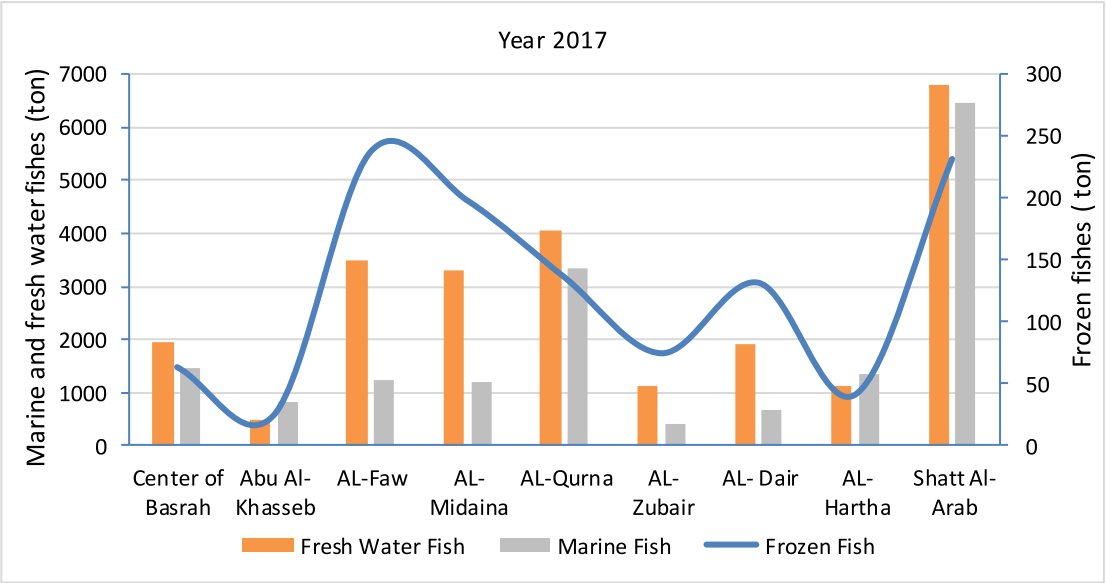

Fig. 3. The quantities of marine, fresh water and frozen fish offered (tons) in the Center and districts of Basrah during 2017

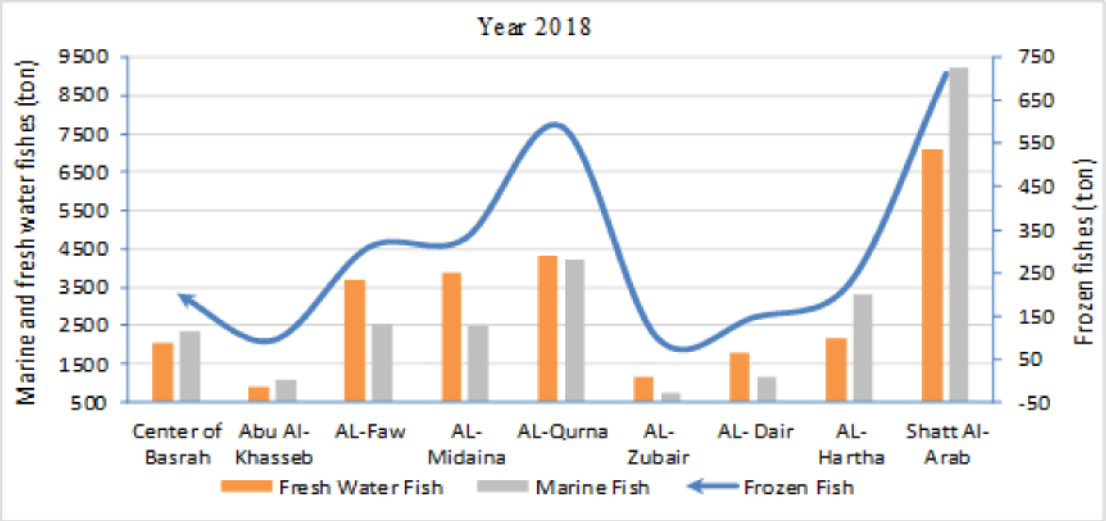

Fig. 4. The quantities of fish offered (tons) in the Center and districts of Basrah during 2018

DISCUSSION

The increasing demand for fish and other aquatic foods has rapidly changed the fisheries and aquaculture sector. Consumption is expected to increase by 15 percent to save an average of 21.4kg per capita by 2030, mainly due to rising incomes, urbanization, post-harvest and distribution practices, and dietary trends focusing on better health and nutrition Total aquatic animal production is expected to reach 202 million tons by 2030, primarily driven by continued growth in aquaculture, which is expected to reach 100 million tons for the first time by 2027 and 106 million tons by 2030 **(FAO, 2022)**. The importance of fish and the increase in its consumption rates can be attributed to its high protein and calorie content (ranging from 11% to 24%), along with 96% easy-to-digest unsaturated fats and essential fatty acids, such as omega-3. This increase in demand is largely driven by global population growth, rising standards of living, and a growing awareness among people about the health benefits of consuming fish **(Moogouei *et al.*, 2010)**. In 2018, global fish trade reached 67 million tons (live weight equivalent), which accounted for approximately 38% of all fish caught or farmed worldwide **(FAO, 2020)**.

In Iraqi society, fish is considered one of the main meals preferred by Iraqis, whether in the South, middle, or North of Iraq **(Al-Khayat, 2021)**. The results of the current study revealed a decrease in the quantity of frozen fish offered (4,218.9 tons) compared to marine and freshwater fish (61,541 tons and 71,362 tons, respectively). This finding aligns with the results of **Al-Ezi and Abdul-Majeed (2010)**, who conducted an economic analysis of the factors affecting fish meat demand in Iraq from 1980 to 2002. They estimated that the imported quantities of fish meat during this period were about 693 tons, with the highest import level recorded in 1981 at 2,652.46 tons. In contrast, the lowest level occurred in 1994, with 534 tons imported. These quantities were relatively low

compared to the total domestic production, which was estimated at 31,641.4 tons. Al-Ezi and Abdul-Majeed attributed the lower demand for frozen fish, compared to fresh and marine fish, to the significant influence of Iraqi consumers' taste preferences on their fish consumption habits.

The fisheries sector is among the most vulnerable to climate change, as it faces additional pressures from factors such as pollution **(Allison *et al.,* 2009; Coulthard, 2009)**. Climate change impacts marine environments by altering their physical and biochemical properties, which, in turn, affects marine organisms and the ecosystem services they provide **(Halpern *et al.,* 2012; Brown *et al.,* 2016)**. Growing concerns about the consequences of climate change on fisheries production have emerged, as climate change exacerbates existing challenges faced by fish stocks **(Hollowed *et al.,* 2013)**. Direct effects of climate change on fish stocks include altered physiology, behavior, growth, reproductive capacity, distribution, and mortality. Indirect effects influence the productivity and composition of marine ecosystems, which fish rely on for food **(Brander, 2010)**.

Yaseen *et al.* (2024a, b) confirmed that Iraqi territorial waters were affected by marine heatwaves in the summer due to climate change. These heatwaves caused a decrease in fish biodiversity, with a reduction in the composition of marine fish species. Consequently, marine fisheries have suffered under these conditions. Most commercial species are sensitive to high temperatures and salinity, while only a few species can tolerate these extreme conditions. As a result, fish have migrated horizontally to deeper, cooler waters. Changes in fishing seasons have also occurred, with species migrating from summer and autumn to winter and spring due to warmer winters. This shift has impacted the quantities of marine fish offered.

The current study also showed an increase in the percentage of freshwater fish offered in the northern districts of Basrah (Al-Hartha, Al-Dair, Al-Qurna, and Al-Midaina). The quantities of freshwater fish offered in these areas were 5,171 tons, 3,243.4 tons, 10,350 tons, and 10,674 tons, respectively, representing 64.6, 64.2, 64.4, and 64.03% of the total fish offered in these districts. This higher proportion of freshwater fish can be attributed to the proximity of these areas to rivers and southern marshes, which increases the availability and consumption of freshwater fish locally. Fishing is a primary livelihood in these areas, and the presence of ponds and cages for breeding carp further supports this trend. In contrast, the residents of Basrah city and the districts of Shatt Al-Arab, Al-Faw, and Abu Al-Khaseeb tend to prefer marine fish, with quantities offered reaching 22,177 tons, 5,967 tons, 2,565.9 tons, and 5,560 tons, respectively. These quantities represent 52.7, 56.7, 56.1, and 50% of the total fish offered in these districts.

CONCLUSION

The results of the current study indicated that the largest amount of fish offered was in the central districts of Basrah Governorate, primarily due to its increased population, extensive geographical area, and numerous markets. Additionally, the study revealed a preference among the population for consuming fresh fish—both marine and freshwater—over frozen fish. This preference highlights the significant influence of consumer taste on fish consumption in Iraq, with taste being a more important factor than price. Furthermore, districts to the north of Basrah (Al-Dair, Al-Qurna, Al-Midaina, and Al-Hartha), as well as the Al-Zubair district, showed a strong inclination toward freshwater fish.

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