Mesopot. J. Mar. Sci., 2017, 32(1): 35 - 44

The Present Status of Fish Farm in Floating Cages at Thi-Qar Governorate

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(Received: 6 April 2017 - Accepted: 23 May 2017)

Abstract - A field survey has been conducted for number of floating cages fish farms in 2016 at Thi-Qar Governorate. During a field visits for fish farms, we have distributed a survey forms, results of the survey showed that the number of fish breeding farms in cages in Thi-Qar Governorate reached 22 licensed farms included 458 cages were distributed on 7 districts. Highest number of cages was at Refayi District (164 cages) (41.20 %) of total number, and lowest number was at Shatra District (10 cages) (2.51 %) of total number. Farmed area of cages amounted 5926 m^2, and total size 12637 m^3, the highest of them were at Qalaat Cikar District (surface area = 2288 m^2, 38 %; size = 5056 m^3 40 %), while the lowest were at Shatra District (surface area = 120 m^2, 2.05 %; size = 240 m^3 1.89 %). Hilla's Farms were the most sources of providing small fishes of common carp (*Cyprinus carpio*) for fish farms and floating cages in Thi-Qar Governorate, where farms of Suqal shuyukh District, Refayi District, Bathaa District and Al-Nasur District were 100 % depend on Hilla's farms. Mechanical method was the common method for feeding the farmed fish in most of Districts in the Governorate. Farmed fish rates in floating cages ranged between 200-150 g in most of the districts of the Governorate while fish marketing rates have ranged between 1.000 g - 1800 g. Duration of breeding period was ranged between 7-9 months in most of districts. Fish farming rates were convergent in all districts and ranged between 39-52 fish/m^3, while the overall rate in the Governorate was 40 fish /m^3.

Key Words: Floating Cages, Fish Culture, Fish Farms and Thi-Qar.

Introduction

Fisheries in the Arab world are important resource in the Arab aquaculture resource base, where some Arab countries depend on fish production to meet the nutritional needs of animal protein (Arab Organization for Agricultural Development, 2013).

The fish culture in cages is the best achievements of modern technologies in aquaculture during the past two decades, it leads to positive productivity to get healthy and fast-growing fish by using an appropriate eco-system for aquaculture water, as well as it is a good and suitable way for the production of fish in areas that are difficult to use the traditional fish farming methods, such as seas, lakes, rivers and streams (Saleh, 2010).

Because of the benefits of fish farming system in the cages, for this why it is spreading in all of Europe, Asia, Africa and America and became a favorite system on the other farming systems, as well as product the fish as a cheap source of protein (Gopakumar, 2009).

Despite the using of these technologies for a long time, but it is not used in the Arab states, the modifications and modulations that made on the designs and materials of cages, how to create and run the cages, in addition to the progress in the development of suitable artificial food, especially the development of floating food, all these led to the use of these technologies in the world and Iraq (Bahadli, 2011).

In spite of the great potential of Southern Iraq for aquaculture as it constitute water marshes and rivers about 70 % of the total area, but these spaces untapped economic proper form for the production of fisheries, fish farming in Iraq began in 1955 with establishing the first fish farm in Baghdad, by breeding the common carp *Cyprinus carpio* and some native species from the family of Cyprinidae, and although it was introduced to the local environment for breeding purposes, but it didn't get that enough interest of farmers only a narrow range until the early seventies, as the governmental and private sectors devoted a wider attention for fish farming, particularly in central Iraq and the northern part of Southern Iraq (Al-Hamed, 1984). Most of fish farming was concentrated in the central region and surrounding areas in Baghdad where cultivated area reached 7,500 hectares, and it's going expanding up, but that is not the case in the south (Al-Mukhtar, 2005). In the Southern Governorates, there is a significant potential to expand aquaculture, however, this event is almost limited, as the fish culture in the south of Iraq was not at the expected levels for several reasons such as lack of experience, the weakness of potential, and laws that restrict and hinder the establishment of such projects, in recent years southern Iraq have seen much attention by the farmers who have been set up dozens of farms, mostly small sizes.

Numerous studies on fish farming have been conducted in Basra, Thi-Qar, and Maysan; including (Salman, 1994; Al-Mukhtar *et al.,* 2005; Jabir *et al.,* 2008; and Jabir *et al*., 2010). The cages culture has been entered to Iraq in the eighties of the last century, where fish breeding project in cages established in the south bank of Al Habbaniyah reservoir, followed by another attempt to build the cages during 1989 in Fish Research Centre in the Zaafaraniya district. Data of the Arab Organization for Agricultural Development (2015) indicated that the size of cages cultured in Iraq 2014 reached to about 98,415 cubic meters.

Studies on fish farming in cages were characterized with its limitations, including the study of (Salman and Saleh, 1988) about the possibility of exploiting the drainage water for breeding common carp fish. A study by Al Bahadli (2011) was turning to the cultivation of different densities of common carp fish in floating cages in the marshes of Maysan Governorate.

Tahir (2014) and Nasir (2013) conducted an extensive study in this aspect which dealt with the effect of fish density and the ratio of nutrition on growth of common carp fish in floating cages in Basra / Iraq's southern Governorate. Number of studies showed the importance of the economic efficiency of fish farming in cages projects, (Jabr, 2012; Ali and Farhan, 2015 and Jedran *et al*., 2015). The total area of fish farms in Iraq is 26292 dunums, with an annual production of 11309 tons of fish farming in 2012, while the projects of fish breeding in cages in 2012 (324) project (Statistics of General Authority for Fish Resources Development, 2012).

The present study was aimed to describe the reality of fish farming in floating cages in Thi-Qar Governorate and the constraints involved and propose many scientific ideas aimed to reach the best ways to advance the wealth of fish and development in the region in the future.

Methodology

A field survey was carried out in Thi-Qar Governorate in 2016 by field visits to fish farms (7 field visits). All farms were culturing Common carp (*Cyprinus carpio*). A questionnaire was distributed through a personal interview with fish breeders in floating cages after field observation of 22 authorized farms with 398 cages distributed to 7 districts. The survey data were recorded at Thi-Qar by using the questionnaire forms which shown below:
Note: Dunum = 2500 m^2.

Questionnaire Form about Fish Breeding in
Thi-Qar Governorate

1. Cages Site:
2. Number of Cages:
3. Total Area of Cages:
4. Dimensions of Cage: Length: Width: High:
5. Rate of the Cage's Area (m^2):
6. Rate of Cage's Size (m^3):
7. The Cost Per Cage:
8. Number of workers in Site:
9. Fish density rate in The Cage: Number of fish Per m^3:
10. Date of commencement of Culture: Date of finishing of Culture:
11. Size of Farmed Fish at the Beginning of the Season:
12. Fish source:
13. Fish Price Rate:
14. Species of Reared Fish:
15. Problems: Theft, Cages Damaged, Diseases, predators
16. Which of Above Problems is the Most Harmful?
17. Size of Marketed Fish:
18. Fish Diet Price Rate:
19. Fish Diet Type:
20. Feeding method: Manual, Mechanical Feedlots,
21. Other Notes:

Results

Cages Numbers and farmed area:

Our survey showed that the number of fish farms at cages in Thi-Qar Governorate reached 22 licensed farms with 458 cages in 7 officials unites. The highest number was in Refayi District (164 cages) (41.20 % of total number). The lowest number was in Shatra District (10 cages) (2.51 % of total number).

Area of cages reached 5926 m^2 and total size 12637 m^3, Qalaat Cikar District is covering the highest surface area and water size of cages, which is 2288 m^2 with a percentage 38.60 % and 5056 m^3 (40 %) respectively, while Shatra District was covering the smallest farmed area and size of fish cages 120 m^2 (2.05 %) and 240 m^3 (1.89 %). Total number of farms' workers was 75 persons; highest number of them was in Qalaat Ciker District (21 persons), and lowest was in Shatra District (2 persons) (Table 1).

Table 1. Districts and Percentages of Cages Numbers, Cages areas and Cages size.

Districts	Sites No.	Cages No.	%	Workers No.	Cages Area (m^2)	%	Cages Size (m^3)	%
Nasiriya Dist.	8	43	10.80	19	656	11.07	1935	15.31
Suqalshuyukh Dist	4	42	10.55	5	492	8.3	1002	7.94
Shatra Dist.	1	10	2.51	2	120	2.05	240	1.89
Refayi Dist.	4	164	41.20	19	1554	26.23	2964	23.45
Bathaa Dist.	3	49	12.30	4	624	10.52	1056	8.37
Qalaat Cikar Dist.	3	138	34.68	21	2288	38.60	5056	40
Alasur Dist.	1	12	3.01	5	192	3.23	384	3.04
Total	24	458	115	75	5926	100	12637	100

The Table (2) shows the source of farmed fish in Thi-Qar Governorate's cages, Hilla's fish Farms were the major source which supplies most of fish farms and fish cages with the small fish juveniles, and young fish. Suqalshuyukh Dist., Rifayi Dist., Bathaa District, and Al-Nasur District were 100 % depend on Hilla's Fish Farms, while Shatra District was 100 % depending on its own hatcheries in supplying the fish cages of fish, while Qalaat Cikar District was depending 70 % on Hilla's farms and 30 % on fish breeding in fish cultured in same district.

Table 2. Sources of farmed fish in Thi-Qar Governorate's Districts.

Districts	Sources of Farmed Fish %		
	Hilla's Fish Farms (%)	From the Farm Itself	Thi-Qar Governorate 's Fish Farms
Nasiriya District	89	-	11
Suqalshuyukh District	100	-	-
Shatra District	-	-	100
Refayi District	100	-	-
BathaaDistrict	100	-	-
QalaatCikarDistrict	70	30	-
Al-NasurDistrict	100	-	-

The Table (3) shows the types of used pellet, and the feeding regimes. Floating and sinking pellets were used and constituted 70 % of Floating cages in Qalaat Cikar District, while the lowest percentage was in Shatra, and Refayi Districts, while sinking pellets constituted 100 % in Shatra and Refayi Districts, and the lower was in Qalaat Cikar.

Mechanical method was the most common regimes with a percentage 100 % in most of Districts, except in Al-Nasur District, both mechanical and manual feeding methods were used with a percentage 50 % for each one.

The Table (4) shows the average of farmed fish weights in cages, average of marketed fish weight, and period of culturing in Thi-Qar Governorate. Averages of farmed fish weight were ranged between 125-200 g in most of districts, while marketing averages of farmed fish were ranging between 1000-1800 g. Period of culturing was ranged between 7-9 months in most of districts at Thi-Qar Governorate.

Table 3. Pellet types and feeding regimes in Districts of Thi-Qar Governorate.

District	Pellet type%		Feeding method%	
	Floating Pellets	Sinking Pellets	Manual	Mechanical
Nasiriya Dist.	11	89	-	100
Suqalshuyukh Dist.	30	70	-	100
Shatra Dist.	0	100	-	100
Refayi Dist.	0	100	-	100
Bathaa District	30	70	-	100
QalaatCikar District	70	30	-	100
Al-Nasur District	50	50	50	50

Table 4. Average of farmed fish weights, average of marketing and period of breeding in Thi-Qar Governorate.

Districts	Average of farmed fish weights (g)	Average of Marketed fish weights (g)	Average of culturing period (month)
Nasiriya Dist.	200.43 ± 29.98	1274 ± 316.22	7 ± 0.64
Suqalshuyukh Dist.	183 ± 27.38	1716 ± 377.96	7
Shatra Dist.	200 ± 40.82	1000 ± 306.18	8 ± 0.81
Refayi Dist.	125 ± 38.49	1575 ± 400.44	8 ± 0.95
Bathaa District	183 ± 64.54	1800 ± 670.82	9 ± 1.73
Qalaat Cikar District	160 ± 47.87	1833 ± 273.86	8 ± 0.57
Al-Nasur District	150 ± 41.83	1500 ± 311.86	8 ± 0.81

The most problems in fish farmed at floating cages were 80 % diseases (fungal and bacterial diseases), 10 % damages of cages, and 10 % predators. Additional 10 % of these problems were Stealing Fish which is only in Nasiriya district.

The Table (5) showes average of fish farming, pellet price, and the cost of building up each cage in Thi-Qar Governorate. Results had showed that averages of fish farming were Convergent in all districts, ranged between 39-51 individual in 1 m^3. Average price of farmed fish was ranged between 650-1900 dinar/Kg in all districts, except at Shatra District it was 300 dinar. Pellet price was ranged between 1,086000-6,50,000 Iraqi dinar, while average of fodder price was 876000 dinar per ton. The cost of building up a floating cage was 2,500,000-1,500,000 dinar at most of districts, where the cost average in Thi-Qar Governorate was 1900000 dinar.

Table 5. Average of fish farming, pellet price, and the cost of building up each cage.

Districts	Average of fish farming in 1 m^3	Average of pellet price for 1 ton (Iraqi Dinar)	Average of the cost of cage's building (Iraqi Dinar)	Averageof stocked fish price (Iraqi Dinar)
Nasiriya Dist.	48 ±47.30	872.200 ±111603.6	2.300.000 ±496515.6	1000 ±396.8627
Suqalshuyukh Dist.	52 ±52.03	733.300 ±99303.1	2.160.000 ±288675.1	1250 ±210.8185
Shatra Dist.	42 ±28.02	650.000 ±120514.8	2.500.000 ±433012.7	300 ±151.1858
Refayi Dist.	42 ±41.6	925.000 ±159947.9	1.787.500 ±332603.4	950 ±119.0238
Bathaa District	47 ±46.66	1.086.600 ±236930.6	1.500.000 ±251661.1	1900 ±152.7525
Qalaat Cikar District	51 ±43.57	966.666 ±138694.3	1.883.333 ±202072.6	775 ±381.8813
Al-Nasur District	39 ±28.04	900.000 ±120514.8	1.500.000 ±433012.7	650 ±171.7556
Total Average	40 ±21.93	876.252 ±148278.5	1.900.000 ±435431.5	975 ±301.8639

Discussion

In the Arab World, activities of fish farming are multiplied depend on the available sources, and most fish production is coming from the fresh water (95 %). Therefore, the most productive countries are those which have water sources such as Egypt, Syria, and Iraq (Al-Jamal, 2006). Iraq is one of the rich countries with bodies of water, as these bodies is estimated about 1074 hectares represented by rivers, lakes, reservoirs, marshes, swamps, streams, ponds and other natural and artificial water bodies, which are sources of fisheries through breeding and cultivating different ways (Muheisen and Al-Kanani, 1983).

Jiddran *et al.* (2015) had mentioned that there is a huge deficit in supplying an enough fish production which caused by weakness of investments and lack of scientific vision in achieving suitable projects, in addition to the overfishing and lack of water which caused reduce its area and induce its salinity levels, all these problems had harmed the fisheries which reduced the production levels and induces the prices, for this why a need of finding a new resources can support the lack by using a different manners for fish breeding such as floating cages farms which give a significant increase in production size.

In 2016, a survey results of the reality of fish farming in floating cages in Thi-Qar Governorate pointed the turnout of fish breeders due to the encouraging of Relevant institutions to buildup floating cages projects, the benefits of this kind of breeding system compare with the breeding in ponds make it a favorite system (Masser, 1988).

On the other hand, this Orientation had appeared for the reason of dwindling water level of Tigris and Euphrates which cause by water Policies of neighbor countries which in turn caused reducing in the work with ponds farms. Al-Mahmoud (2015) mentioned to the decrease in water in Tigris and Euphrates in the last few years.

In the current study, number of floating cages farms was 22 farms with 398 cages. Jabr (2012) and Ali and Farhan (2015) refers that the year 2010 assisted building 31 cages were divided among Baghdad, Diyala, Wasit, and Babylon, then the extension in using floating cages farms got inducing till 2012 it reached in Baghdad to 54 farms. In fact, in Thi-Qar Governorate, the first use of floating cages was in 2012, and number of cages reached to 176 cages (Jedran *et al.*, 2015). The diversity of fish sources showing the limitation in fish farms of Thi-Qar Governorate and its inability to supply the needs of quantity and sizes of fish for breeding at those farms. Jabir *et al.* (2010) mentioned to the Deterioration in the reality of fish farms in Thi-Qar Governorate. However, in Thi-Qar Governorate, fish farms had primarily relied on farming common carp fish which cover 70 % of fish farming in the Governorate, this back to several reasons, such as it need easy methods for breeding, its high resistance to the environmental conditions, its wide food spectrum, and it is very accepted by Iraqi customer (Jabir *et al.*, 2010).

Masser (1988) explained that common carp had exceeded other fish species in floating cages fish farming in Europe, Asia, and middle easy. Al-Shamma (1993) mentioned that the reason of preferring common carp is its high resistance to the extremist environmental conditions, it is easy breeding methods, availability of its multiple food sources, and it had reached high growth ranged in breeding ponds. Jabr (2012) referred to the superiority of flouting cages fish farms on ponds fish farms where final weigh had reached 1.2 kg per fish, while it reached 0.802 kg per fish in ponds fish farms during the three months breeding period. Taher (2014) indicates that best growth and final weight average had achieved by fish with 50-75 individual/m^3 of fish density compared with fish which had farmed in 100 individual/m^3.

The current study showed the lack of workers in floating cages farms, and this is consistent with Jabr (2012), who mentioned to reducing the number of workers in floating cages farms to less than half of that in ponds fish farms. Jiddran *et al.* (2015) concluded that fish breeding using floating cages doesn't need many workers, it can be managed by the owner himself or one of his family. The disparity in weights of fish during the marketing due to some reasons such as the breeding period, size of farmed fish, fodder type, protein's percentage in the fodder, and sometimes reasons could turn to difference in farmed fish's density, other reason that there is no monthly or weekly separation for different sizes of farmed fish (no grading).

The cost of making floating cages has varied from district to other, and this depends on the quality of used materials, cage size. Farmed fish destiny has also varied from area to other which affects the fish growth rate and size of marketed fish for each farm.

Diseases problem was the most harmful problem in managing floating cages which reached 90 % of the problems faced fish breeding using floating cages. Masser (1988, 2008) explained that diseases infections were one of common problems in ponds farms and it can cause a large mortality in ponds farmed fish since fish cached from natural water sources can carry some diseases in its body to

the fish farms, he also referred that high density of fish in each cage can increase the stress on fish and allow to diseases and infections to spread inside the cage. Mortality that caused by diseases caused reduce in fish survival's percentage. Materials which use in making cages have to be high quality to avoid the harms which cause fish escaping. Problems due to environmental effects, has played a role in reducing the productivity of cages farms in the Governorate. The decline in the water levels of the Euphrates and its variants results deterioration in many cages farms and stop breed as well as water qualities and water suitability for fish breeding. Several studies such Masser (2008) have referred that stealing is another problem which farmers had faced during breeding season, for this why designing a cover for floating cages is necessary to avoid this problem. Cages' lift during Cleaning of rivers is another problem has faced fish breeding in floating cages, in addition to electric fishing by people who lives nearby.

The current study indicated that most of farms were depending on buying pellet from local markets, while low proportion of those farms were made its needs of pellet by itself for daily use only. Fish pellet factory is required to support fish farming and reducing the project cost. Where Salim and Al-Rawi (2014) demonstrated that the most cost of fish farms is the fodder cost. The limitation of using floating pellet due to its high cost. Farms in Thi-Qar Governorate were depending on sinking pellets and floating pellets in equal percentages.

Al-Shimmary and Saleh (2014) showed that floating pellet have been given better results by giving higher fish weight, higher average of daily fish weight, higher metabolism average, and higher average of weight benefit (kg/m^3) comparing with Sinking pellets.

The advantage of using floating pellet due to the higher protein percentage and less losing of fodders during feeding the cages fish. Mechanical methods for fish feeding was used in all farms of Thi-Qar Governorate.

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دراسة حقلية لواقع المزارع السمكية في الأقفاص العائمة في محافظة ذي قار

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المستخلص - أجري مسح ميداني لعدد من المزارع السمكية للأقفاص العائمة في محافظة ذي قار خلال عام 2016 من خلال الزيارات الميدانية للمزارع السمكية. وزعت أستمارة خاصة بالمسحإذ أظهرت نتائج المسح أن عدد مزارع تربية الأسماك في الأقفاص العائمة والتي بلغت 22 مزرعة مجازة ضمت 458 قفصاً توزعت على 7 وحدات إدارية. بلغ أعلى عدد لها في قضاء الرفاعي (164 قفصاً) بنسبة 41.20 % من العدد الكلي للأقفاص، وأدناها في قضاء الشطرة (10 أقفاص) لكل منهما وبنسبة 2.51 % من العدد الكلي. كما بلغت المساحة المائية المستزرعة للأقفاص 5926م^2 والحجم الكلي 12637 م^3، تصدرت فيها ناحية قلعة سكرالمساحة السطحية والحجم الأكبر للأقفاص، إذ بلغتا 2288 م^2 (بنسبة 38 %) و 5056 م^3 (بنسبة 40 %) على التوالي، أما أصغر مساحة وحجم إستزراع فكان في قضاء الشطرة حيث بلغتا 120 م^2 (بنسبة 2.05 %) و 240 م^3 (بنسبة 1.89 %). أغلب مصادر تجهيز المزارع السمكية والأقفاص العائمة بصغار أسماك الكارب الشائع (*Cyprinus carpio*) هو مزارع الحلة حيث أعتمدتها أغلب مزارع المحافظة وجاء بالمرتبة الأولى قضاء سوق الشيوخ والرفاعي والبطحاء وناحية النصر 100 %، بينما كانت الطريقة الشائعة في طرق تغذية الاسماك هي الطريقة الميكانيكية وشكلت ما نسبته 100 % في أغلب اقضية المحافظة. تراوحت معدلات الأسماك المستزرعة في الأقفاص العائمة بين 200-150 غم في أغلب أقضية المحافظة، أما معدلات تسويق الأسماك فقد تراوحت بين 1000-1800 غم حيث تباينت فترة التربية بين 7-9 أشهر في أغلب الأقضية. إن معدلات إستزراع الأسماك كانت متقاربة في جميع الأقضية وتراوحت بين بين 42-50 سمكة/م^3، في حين كان المعدل العام في المحافظة 40 سمكة/م^3.