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A Project to establish a shrimp farm in Basrah - Southern Iraq

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ABSTRACT

Preparation of the shrimp breeding project began in 2018-2019. And the creation of suitable conditions for farming larvae of the white-legged shrimp, *Penaeus vennami*. The shrimp project is funded by the Iraqi Ministry of Higher Education and Scientific Research. The shrimp project was designed by specialists at the Marine Science Centre (MSC). It aims to introduce *P. vennami* from neighboring Iranian shrimp farms and transfer experiences after reviewing all its details and sharing with them in similar environmental conditions. A contract was signed between MSC and an Iranian company in Abadan, which operates an integrated shrimp farm that includes a hatchery, ponds for breeding larvae, ponds for shrimp production, a plant for making pellets, and a factory for canning shrimp products, visits between both sides were conducted according to the signed contract, and a shrimp farm was designed in one of the mud ponds at the site of the University of Basra in Karmat Ali, with careful follow-up and under the supervision of specialists from both countries. So far, it is possible to start the project to be successful according to the considerations applied in shrimp farms from Iran. Two types of breeding systems were equipped, one of which is 3 fiberglass basins with dimensions of 2.5 m^3, and the other system is a mud pond with dimensions of 2500 m^2 with ideal specifications linked to a pond through four pipes covered on both sides with a 60-micron mesh. After passing through the mechanical filter made for the farm, a toilet was constructed with an area of 7 meters and a depth of 150 cm.

INTRODUCTION

Aquaculture is one of the most important sources of protein globally, and may slightly exceed the production of capture fisheries (**FAO, 2018; Edwards *et al.*, 2019**). Panaeid shrimp, the most expensive seafood, the shrimp is of high value (**FAO, 2018**). The shrimp, *Litopenaeus vannamei*, is the most cultured globally, accounting for 83% of the total population of Penaeid shrimp (**FAO, 2019**), and most of the production comes from Ecuador, Thailand, Vietnam, India, Indonesia and China.

Al-Maliky *et al.* (2009) studied a comparison of the growth rates of shrimp *Metapenaeus affinis* after rearing it in three different culture systems. **Al-Maliky (2010)** seek the effect of water current on behavior of movement of oriental river shrimp *Macrobrachium nipponense* (De Haan, 1849), the study showed that the proportion of

locomotor behavior of juveniles shrimp increased with the direction of the movement of the water current, while its percentage decreased with the increase in the weight and length of the shrimp, which suggests the hypothesis that this species entered Iraq from the shared waters with Iran, especially the Karun River, which flows into the Shatt al-Arab River. the ability of large groups to swim against the direction of the water current counter to the small aggregates that drift with the water current explained its spread from southern Iraq to the central regions, all the way to Northern Iraq and even the waters shared with Syria and Turkey. **Al-Maliky (2013)** wrote a book on shrimp in a simplified manner to define the most important types of shrimp common in the waters of southern Iraq.

Al-Maliky *et al.* (2015a) studied some biological and environmental aspects and methods of farming and reproduction of shrimp in fresh water. **Al-Maliky *et al.* (2015b) also** studied the feeding behavior of juveniles of *M. nipponense* under laboratory conditions, closer to pelagic swimming, most of which were found on the lattice walls of the basins, so a proportions of adolescent females was observed gathering in the parts of the experimental ponds, as it amounted to (80, 9 and 11)% in the three parts of ponds of smooth bottoms, within 2 hours. And in the same period it reached to (73, 12 and 14)% in the same parts of ponds with sandy-muddy bottoms. And the percentages of adolescent females were (72 and 12 and 16)% within 24 hours, in the parts of the ponds with smooth bottoms, and in the same period, the proportions of juveniles in the parts of the ponds with sandy and muddy bottoms were (67, 12 and 21)%. In the terms of expanding collection of information about shrimp, and for the first time in Iraq, a mini hatchery designed for breeding of river shrimp by **Al-Maliky *et al.* (2015 c)**, the results of caring of newly hatched larvae in different culture systems showed that most of their weights reached 3 mg during the period extended between (12-22) days, and the highest survival rates of larvae were 75.63% in clay pond, while it ranged between (50.27-50.47%) in other systems. The average final weights were (813 and 978 mg) for the hatchlings reared in floating cages and submersible, respectively. While the average weights were (805 and 950) mg for the reared wild juveniles. **Al-Maliky (2015)** recorded a descriptive study of the jellyfish shrimp *Latreutes anoplonyx* Kemp, 1914 in the waters of the northwestern Arabian Gulf. And as a continuing of colleting of information about shrimp, the study by **Al-Maliky (2016)** regarding sensory properties and the percentage of the netting of the oriental shrimp *M. nipponense* extracted from the outlet of the intake near the Hummar marsh is encouraging to develop the reality of shrimp farming, a study by **Al-Maliky (2017a)** about the rearing of the shrimp *M. affinis* in cages. Also, in another study, Al-Maliky (2017b), he highlighted on the mixed farming of shrimp and fish. furthermore, **Al-Maliky *et al.* (2019)** determined the effect of temperature on the food consumption of juvenile shrimp. A study on the behavior of *M. nipponense* by Al-Daraji *et al.* (2019) showed that the shrimp was predator on the small and diseased fish belongs to the species *Ctenopharyngodon idella* Val., 1844 and that depends on the size and health status of the fish and the shrimp's hunger.

To keep pace with development in shrimp farming, **Al-Maliky *et al.* (2021)** studied the effect of probiotics and molasses on the growth and survival of two species of wild shrimp without changing the water and without food additives. And nutritional requirements of shrimp larvae from algae was seek by **(Al-Maliky *et al.*,2022)**. **Al-Maliky (2022a,b)** determined the stock of shrimp in the intake water near the Hummar

marsh, and proportions of local shrimp quantities in some selected markets in Basrah. For the first time in Iraq, **Al-Maliky (2022c)** conducted an economic feasibility study of shrimp farming in Basra-Southern Iraq, the expected results were according to the situation in terms of prices and costs, by culturing a density of 80 larvae/m^2 with a survival rate of 50% productivity, was evaluated as not more than 1000 kg shrimp/0.25 hectares, and the amount of feed consumed one ton during the annual crop, the market value 32 million dinars in hectares of production, given that the price is 8 thousand dinars for one kg shrimp, and the weight of one shrimp reaches 10 grams during the period, after calculating the costs of establishing the farm, in the first year it needed 20 million, while in the second year, it needed only 10 million. Sole reliance on shrimp fishing from *M. affinis* and *Penaeus semisulcatus*, and possibly freshwater shrimp *M. nipponense* can benefit from those found in river waters. The aim of the current study is to give adequate information about the establishment of the first shrimp farm in Iraq in general and in Basrah Southern Iraq, especially, based on the Iranian experience that proofed its success in establishing and managing shrimp farms.

MATERIALS AND METHODS

The location of the shrimp farm has been identified at Al Karma site - Basra University. Two earthen ponds were chosen, one with an area of approximately 2500 m^2 and another one was as a water storage with an area of more than 5000 m^2 to start developing the larvae of the shrimp *P. vennami* after its import. The leveling process was carried out in two stages using different mechanisms. An iron bridge was built inside the culture pond to facilitate monitoring of the shrimp in the pond. And set up a complete network of water pipes for treatment and drainage with filter accessories.

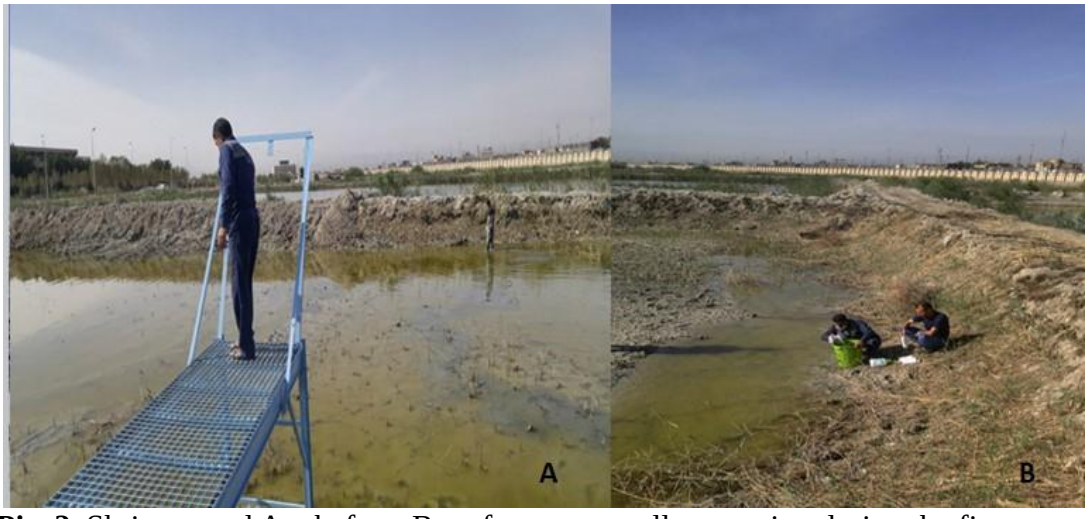
RESULTS AND DISCUSSION

Studies of shrimp farming began in the early nineties in Basra, southern Iraq. So far, experiments are still going on in shrimp farming. However, due to the lack of technical staff specialized in shrimp farming and due to the instability of Iraq and entry into wars and exposed to occupation and accompanied internal problems all these affected shrimp farming and thus the delay in the success of the shrimp farm.

1-Mowing and cleaning: one of the clay ponds with an area of about one dunam (2500 m^2) was selected for culturing the shrimp larvae, and the process of weeding plants eliminate was carried out as shown in the **pic. 1**, start to eliminate of the plants in the shrimp tank prepared for the experiment, which is almost the same as the specifications of the shrimp farms ponds in Iran, the neighboring country (**Apud *et al.*, 1983**).

Pic. 1. Shrimp pond A = before, B = after remove all vegetation during the first stage.

2-Construction of a bridge in the middle of the pond: an iron bridge was constructed in the middle of the pond with dimensions (0.5 x 3 x 2 m) (**Pic. 2**), to monitor the growth and feeding of the larvae, and sterilization: the aquarium was sterilized using tea seed powder at 12.5 kg\2500 m^2 in depth 30 cm, to eliminate of unwanted organisms that are believed to compete with the larvae when cultured. The sterilization step of the aquarium is one of the important steps before prepare the aquarium for receiving shrimp larvae because it increase the survival of the larvae by protecting them from predators and providing the necessary food at the beginning of their life (**Baliao and Tookwinas, 2002; Wirth *et al.*, 2004**).



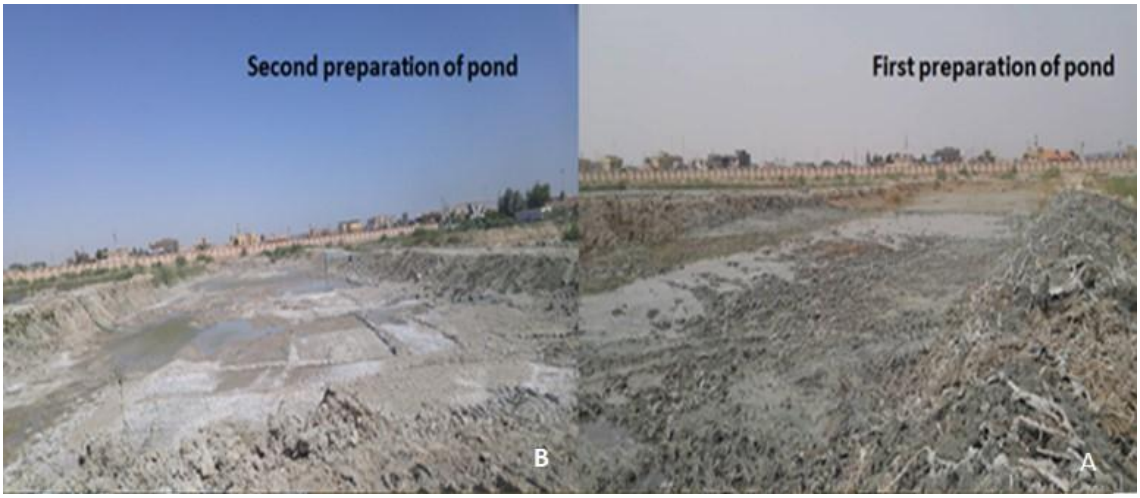
Pic. 2. Shrimp pond A = before, B = after remove all vegetation during the first stage.

The bridge in shrimp ponds is one of the necessary techniques in monitoring the acceptance of the shrimp and the benefit of food provided, as well as monitoring the health status of shrimp. An expert made some important observations that must be taken

into account before transporting shrimp larvae, this including increase the depth of the shrimp pond.

3-Excavation and leveling: the unwanted layer of mud that negatively affects the life and growth of the larvae has been removed. At the same time, increasing the depth of the pond (one and a half meters), use of bouclen to drill and leveling the shrimp pond (twice time), (**Pics. 3 and 4**) the shape of the shrimp pond after the first and second drilling and leveling operations (**Treece and Fox, 1993**).

Pic. 3. Excavations, Phase I = A and Phase II = B, in the shrimp pond.



Pic. 4. The end of the excavations, the first phase = A and the second phase = B, in the shrimp pond.

The shrimp pond prepared by cleaning and removing plants and shoveling the unwanted black muddy layer containing unwanted organisms down to the desired muddy layer of nutty color.

4-Toilet work in a shrimp growing pond (**Pic. 5**). Increasing the depth of the pond and making a toilet in the pond and the pits by re-drilled and cleaning, all the way to the red

dirt, as well as a circle with a diameter of 7 m and a slope in the middle the pond in order to collect and dispose of waste, this agrees with (**Khan, 2018**). Increasing the depth of the pond with the establishment of a toilet, which is a circle near one of the sides of pond, its center is 150 cm deep and covered with a net to filter these residues.

Pic. 5. Toilet shrimp pond.

And make a toilet in the form of a circle with a diameter of 7 meters in the bottom middle of the pond, in addition to another pond as storage for filtered water. The waste is drained through Toilet outside the basin either through a pipe at the bottom of the toilet or through an electric pump (**Jalal and Alireza, 2017; Makmur *et al.*, 2021**).

5-Connecting a source of water: the water was delivered to the pond by a plastic tube at the corner of the pond from the posterior end close to the water source, Karma Ali River is the source of water.

6-Preparing the ponds of the culture station: 3 ponds belonging to the culture station were prepared to be ready to receive shrimp larvae imported from Iran for acclimatization and then rearing in the muddy pond (**Pic. 6**).

Pic. 6. Fiberglass ponds for receiving shrimp larvae and juveniles, calculating, monitoring and feeding.

It is possible to use the fiber-class rearing system in the ponds for caring, housing and account of the shrimp larvae from the moment of receiving from the equipped source until distribution in the breeding ponds. The absorptive capacity of each pond depends on the type of the chosen breeding system (**Apud *et al.*, 1983**).

7- Feed store for shrimp farm (**Pic. 7**).

Pic. 7. Shrimp feed store in the farm, a= ration size, b= a form of packaging.

It is possible to expanding such system if the experience of breeding in the mud pond succeed, and if the farmers and investors turn away from pessimism of shrimp farming. Development of this economic field is important for the citizen and the state (**Davis and Boyd, 2021**).

Different diets have been found for shrimp feeding, one of which is the cheap one that gives a slower growth than these of expensive, like these come from Thailand, that give a better and faster growth. The sector that provides a special ration for shrimp feeding is one of the important sectors to success the shrimp project because the ration constitutes a high percentage of the project cost, which may reach more than 40% (**Davis and Boyd, 2021**).

8-Preparing the storage pond: A pond with an area of 5000 m^2 was selected as storage, that is because it near from the shrimp pond and on the other hand it also near from water source and filter location. (**Pic. 8**).

Pic. 8. A water pond next to the shrimp breeding pond.

The storage pond was drained, cleaned, and connected to the shrimp breeding tank using four tubes with a diameter 15 cm, covered with 60-micron meshes, the water of culture pond that containing impurities replaced with clean water weekly by 10% more or a little less.

9-Sand filter: after examining the design of the Iranian shrimp farm, a sand filter was designed according to the Iranian farm. It works by eliminates the impurities and harmful organisms from the water before entering the storage pond which conducted by passing through several levels of sand, gravel, and fine meshes (**Pic. 9**).

Pic. 9. The sand filter is connected to the storage pond in the shrimp farm.

Method of transporting shrimp larvae: Cork boxes (30) were used to transport shrimp larvae in an accurate scientific way. 26 thousand larvae placed in a bag containing water and supplied by oxygen. Each cork box had 3 bags, meaning that each cork box

was contained 7,800 larvae, 234.000 larvae in total, (**Treece and Fox, 1993; Hossain *et al.*, 2013**).

Our visit to one of the shrimp canning factories: to gain experience and see the larvae, the owner of the contracting shrimp company, a partner in Bahta Ond Company, facilitated our visit.

CONCLUSION

There are many challenges that face our work to establish a typical shrimp farm economically feasible. The following are the challenges which are summarized in problems and solutions.

Problems:

Bad infrastructure to establish a shrimp farm, it is failed to establish private ponds in a suitable and well-studied location. There is no a harmonic cooperation by customs employees of Iraqi border with such pioneering projects. It is difficult to provide a water that its quality suitable for the growth and survival of shrimp during the culture period. Rareness of technicians specialists in the field of shrimp breeding. There is no a special diet for shrimp. The absence of a shrimp hatchery and depending only on larvae from the wild environment of the local shrimp.

Solutions:

Provide an infrastructure through establish of special ponds for shrimp of all age stages according to a well-studied and planned vision in scientifically selected locations. coordinate of work between higher authorities and customs employees of Iraqi border to facilitates the procedures of shrimp breeding project. provide a fixed source of electricity to supply shrimp ponds by oxygen and all the requirements needed to improve the water quality during the farming period. Training many of workers and those interested in the field of shrimp breeding to provide technical personnel in . Working to provide special diets for shrimp suitable for each age stage, as well as provide the required live food. Establishing a special hatchery for shrimp.

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Conflict of Interest

The authors declare that they have no conflicts of interest.

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