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SURVEY OF FISH DISEASES IN RANYA (RAPARIN ADMINISTRATION)/ SULAIMANIYA GOVERNORATE; CASE STUDY

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ABSTRACT

This study tends to survey of common problems and diseases of fish aquaculture projects at Raparin administration area which have 76 projects, three species of Cyprinidae, common carp, grass carp, silver carp, in earthen and concrete ponds. By achieve the history of the disease outbreaks and understanding management strategies which applied by farmers, on this bases the collection of samples from different cases at different regions of Raparin area, clinical examinations done. The results of this study indicate the blow diseases and problems of fish aquaculture projects. Bacterial infections, hemorrhagic septicemia, Bacterial enteritis, Infectious dropsy, skin ulceration. Fungal infections, Saprolegniosis, epizootic ulcerative syndrome. Parasitic infections, *Gyrodyctylus* infection, *Ductylogyrus* infection, Argulosis. Bad management represented by poor nutrition, low applying oxygen, and bad water quality.

INTRODUCTION

Over the past three decades, aquaculture has grown more rapidly than any other food production sector and has continued to expand.Significant social and economic advantages were given,

recorded and felt. It is clear that the bulk of the fish expected in the coming decades to feed the world will come from aquaculture. It is also time to compare "nutrition protection" to "food safety." Aquaculture, a system of aquatic farming, provides tremendous possibilities tokeep people safe and to drive them out of poverty (1).

Marked productivity gains are possible, as are methods that can help to buffer seasonal swings i n dietary diversity and revenue. Community participation and education in nutrition, along with improv ed efficiency and revenue, open new doors to reducing nutrition (1). In our entire country, we have water supplies, including rivers such as the Tigris, the Great Zab, the Little Zab, the Khabur, the Sirwan, and the Awa Sipi, as well as rainfall and groundwater, including natural springs. Of our main rivers, nearly 60% of the flow originates in our country included Kurdistan Region. We do not have appropriate estimates of our groundwater supplies ,however. In fact, we do not have a complete analysis of our water resources, so we face a very high risk of our water supplies being mismanaged and our groundwater supplies being exhausted in particular (2).

Before 1991, the city of Sulaimani had four fish farms that produced common carp, after that, it has about 75 farms in which 7 of them are cages and the other forms are the earthen ponds, all ponds produce common carp except three of them (Sangasar, Penjwen, Bare and Halabja) that produce trout fish, which has recently being brought up in Kurdistan fish farming since 2006, reaches 386 projects till 2017 (3). The main types of fish available in the fish farms of Iraq are common carp (*Cyprinus carpio*) , silver carp (*Hypophthalmichthys molitrix*) and grass carp (*Ctenopharyngodon idella*), with a special fish farm which includes local fish species such as *Mesopotamichthys sharpeyi, Luciobarbus xanthopterus,* and *Arabibarbus grypus* (3).

Fish diseases are responsible for heavy mortalities in fish, and the signs of the diseases may include surface blood spots (i.e. hemorrhage, ulceration, abscesses, blisters/boils) and internally, there may be hemorrhage, digestive tract full of liquid (gastroenteritis) swollen kidney and liver (4).Infectious diseases are the main cause of economic losses in aquaculture industry which is negatively impacted by various pathogenic organisms (5).The aims of this study are studying the gross changes according to the cases obtained, the frequency rate of diseases in common carp fish (*C. carpio*) ponds in Raniya.

Aquaculture activity in the north region of Iraq started in 1960 with common carp on Dokan and Darbandikhan dam (6). In 1999 when the Food and Agriculture Organization established two projects for fish; one was in Erbil and the other in Sulaimaniya, and the development of a hatchery for

the artificial reproduction of common carp (*C. carpio*), silver carp *(H. molitrix)* and grass carp (*C. idellus*) (7). The capacity of each hatchery is approximately 20 million larvae per season, and two small feed mills with a capacity of 4-5 tons per hour are open. For demonstration and training, the project has a number of model fish ponds (6).

(8) emerged that a bacterial infection was the main causative agent of skin ulceration, and the main bacterial species were 9 species isolated from skin, liver and kidney lesions, and the following bacteria (*Pseudomonas spp*, *Citrobacter freundii, C. amalonaticus, Enterobacter aerogenes, Yarsina krestensia, Serratia odorifera, Escherichia coli, Proteus vulgaris* and *Edwardsiella tarda*). All 9 bacterial species were isolated from skin lesions, and all 9 bacterial species were isolated from the liver, with the exception of *C. amalonaticus*, although only 6 bacterial species were isolated from the kidneys that were *(Pseudomonas* spp*., C. freundii, C. amalonaticus, Y. krestensia, E. aerogenes* and *E. tarda*)

As for the availability of just a few papers scattered here and there on fungi and fungal-like species infecting fish in the province of Basrah. Fish mycology in Basrah province can be said to be overlooked as compared to fish parasitology in the same province, where a total of 333 parasites are found, species are so far known from previous checklists of different fish parasite groups achieved on the same province (9; 10). According to (11) the parasites species affected *C. carpio* Ciliophora, Myxozoa, Monogenea, Cestoda, Nematoda, and some Arthropoda.

MATERIALS AND METHODS

Description of studied area Ranya (Raparin Administration):

The lakelet of Ranya is a part of Little Zap River which is located east of Ranya district (8.49km) and western north of Sulaimaniya governorate (83.97km) on 36°11’58.2°N 44°56’50.7°E. Ranya is surrounded by three mountain, the Kewarash at the northern, the Asos at eastern the Hajila at western and Dukan Lake at southern. Ranya with Pshdar Zone (Include Qaladze district with Sangasar, Zharawa, Esewa, Hero,Halsho Sub-Districts), at its east Bitwen zone (Include Chwarqurna, Hajiawa Sub-Districts) at south western Betwata zone (Include Saruchawa Sub-District with Khoshnawaty valley) at northern west are called Raparin administration, it area cover about 2214 km² and it perimeter 308 Km, it has international boundary with Iran at east of Qaladze district its 55Km far from Ranya central. However Raparin zone has best agriculture land and touristic places it has also many Orchard at mountain and valley, Rivers, lake, dyke, Brooks, watersheds (12).

The depth of water can be measured by the height of a hill in the region built on the high area between 1956-1958 and its height of 36 m. Recently this hill was sunken and it's called Basmusian. Yearly or seasonally the depth of water fluctuates, most times it covers the hill completely, so it can be said that the depth of water at least is 36m, the water of region such as Qaladza, Zharawa, Sultanade stream, Shahidan, Garfen, and others pour into water Ranya lakelet, as a result the average of water flow is in a year 222.2 m^3/second and yearly income is about 7 milliard m^3, so it's composed about 17% of Tigris River. In addition domestic sewage and waste water of different region such as Qaladza, Zharawa, Sangasar and others pour into the Ranya lakelet. There is no reference which it's refer to the width of area due to inconstant and water flow in each season (13, 14).

Fish sampling

Clinical (Gross) Examination: The fish were clinically evaluated according to the methods described by (Noga, 2010) at the fish pond immediately. Attention to fish behavior in feeding, swimming and growing, changes in color, respiratory manifestations and external lesions must be taken in consideration.

Farmer's perception: To understand the past of disease outbreaks and management techniques implemented by farmers, semi-structured interviews were conducted. The content of the interview included the ability of farmers to diagnose or analyze disease conditions at aquaculture farms. In order to determine the incidence of outbreaks, the number of deaths and the total number of diseased fish, farm records were reviewed.

Collection of samples and preparation: Different cases of carp fish have been reported in different ponds with signs of disease from different regions of the province of Ranya / Sulaimani.

RESULTS AND DISCUSSION

Based on the information obtained from the directory of Agriculture and veterinary in Ranya the following illustrated the situation of fish culture and diseases in general as explained in table (1).

Table1: The information in fish projects at Ranya Raparin administration

Parameters	**Value**
Numberof fish projects	76
Number of fish ponds	240
Total area of each basin pond (m^2)	2500 - 5000
Depth of the ponds (m)	between (1- 2)
Number of fish stock in ponds	Between (1500 -2000) fish
Species of Cyprinidae	% 96 common carp % 2.5 grass carp % 1.5 silver carp
Water resources of fish farms in this area	% 95 water of lakes and rivers % 5 water of well
Source of fish fingerlings	% 7 - % 10 from Qaladze % 20 - % 30 from Taq taq % 6 - % 70 from Hilla
Type of fish farms	% 99 earthen ponds % 1 concrete

According to the data in table (2) based on farmers interview the most repeatable problems was the bad management then the diseases pathogens such as Fungal and Parasitic infection followed by the feeding problem overfeeding or bad diets and finally the Bacterial infection.

Table 2: The most repeatable problems at Raparin administration fish farms

Problems	**Percent**
Bad management	% 60
Fungal infection	% 20
Parasitic infection	% 10
Stress or over feeding	% 5
Bacterial infection	% 5

In order to show the problems they faced during the fish growing period in the pond, all farmers were asked to make a ranking, as seen in table 3.Bad water quality (35.35 percent) was the biggest

concern, followed by illnesses (31.1 percent), poor quality seeds / fingerlings were ranked third and too little water was ranked fourth. Feed, theft and predation availability figured in the fifth, sixth and seventh rankings. Half of the farmers said that they were able to choose fingerlings (49%), while the other half (47%) must take what is available. In the question about the physical condition of the fingerlings, the same trend was noted: 50 percent of farmers said the fingerlings were stable, while the rest (46 percent) did not know.

Table 3. Problems faced by farmers.

Conditions	%
Poor Water Quality	35.35
Diseases	31.1
Low Quality seed/ fingerlings	18.14
Too little Water	5.22
Feed availability	6.2
Predation	2.88
Theft	1.11

n = total number of farmers surveyed. (n = 240)

Of the 240 farmers interviewed, 29.16% indicated that in the last five years they had encountered disease problems, 12.5% had problems in the last six months, and 5.2% had problems in the last three months.The majority of owners said they had issues with sickness, but they were unable to recall when. Most of the farmers said that 'some' of the fish died as a result of disease problems.Just three farmers reported that "all" of the fish died, one of the owners of the fish farm said that his farm was totally destroyed by illness and two farmers reported that their farms were partially damaged.

The outbreak of the disease has lowered the rate of fish consumption in a few areas under investigation. Consequently, the trade in fish was badly affected as well.The traders did not allow such fish for sale because of market resistance. Few farmers said they cooked the infected fish for their family's nutrition because of the low price in the fish market, but the majority of farmers buried the disease-affected fish. The effect of the disease on the households of fishermen is shown in Table 4.

Table 4: Impact of fish diseases problems.

Reply	**Positive %**	**Negative %**	**No comment %**

Disease affected fish price is low at market	54.67	25.76	19.57
Your household income is reduced	45.76	47.34	6.9
Your debt is increased	47.21	41.83	10.96
Eat the affected fish	25.73	42.76	31.51

Farmers were asked to observe the disease in every single season or entirely during the growing cycle. Most of the illnesses occurred immediately after stocking, according to the farmers, and accompanied by cold seasons during the post rainy seasons. Some farmers said they had seen some signs of disease before harvesting; few farmers said they saw after flood and draught.

Farmers have been questioned about their capacity to detect illnesses. Twenty-three percent of farmers said that certain diseases could be detected, while 15.62 percent said that no diseases could be recognized one said that all or most illnesses could be recognized by him or her. The ability to detect illness was dependent on a variety of variables; death, irregular swimming and feeding activity, abnormal appearance, and some localized lesions and decreased growth were the most commonly cited. Table 5 lists the most common issues mentioned. It did not appear that the disease caused enormous losses; most farmers (51.98 percent) recorded that only a few fish died, but 22.41 percent reported that most of the fish died. Since mortality losses have been calculated, it is not possible to estimate output losses due to reduced growth.

Table 5: Problems reported by the farmers during production season

Diseases signs	**Frequency observed by farmers**
Fish gasping	5
Swollen belly	4
White discoloration	6
Red spot	8
Tail and fin rot	12
Gill rot	16
Loss of mucus	8
Parasitic infection	3

The most common response to illness, according to the farmers' study, was the use of chemicals (18.3%) or lime (0.65%); antibiotics were used by 20.76% of farmers.21.76% of farmers, however,

changed water, 6.36% eliminated fish, and 2.54% stopped feeding. Treatments earned by farmers have been shown in Table 6. Cocktail recipe, i.e. lime and potassium permanganate together, lime and salt, lime salt and potash together were applied by the majority of farmers. The second most common procedure has been the application of liming.

Table 6: Antibiotic/ chemicals added by farmers

Strategies	**% of farmers adopted**
Change the water	21.76
Add lime in to the ponds	0.65
Add antibiotics into the ponds	20.76
Add chemicals into the ponds	18.3
Copper sulphate	16.3
Put formalin in to the ponds	13.33
Remove the fish from the ponds	6.36
Stop feeding	2.54

There are very diverse problems relating to the quality of water in aquaculture systems. To maintain the optimal conditions of cultivation needed for fish health, a careful balance of nutrients and other factors is important. These variables include, among many others, temperature, salinity, pH, hardness and the equilibrium between nitrogen, oxygen and phosphorus.Some farmers said that they were not given safe seeds by the seed traders, so the mortality rate is high and the production rate is very low and they lose money every year.

Water quality criteria are rarely tested by farmers and they never justify their pond being acceptable for fish cultivation. While the production failed, all of them reported that the quality of the seed / fingerlings was poor, but they did not worry about the quality of their culture pond water, which was crucial for aquaculture.This study finds a number of freshwater aquaculture diseases in Raniya. Gill rot, accompanied by tail and fin rot, parasitic (*Lernae* and *Argulosis*), black discoloration, red blot, and swollen belly, were the most prevalent disease.

The fish farmers of the region under investigation recorded that, after heavy rainfall and at low temperatures in the winter season, the signs of fungal infection and lice were generally seen and caused fish mortality. The most familiar disease problem identified by farmers was tail and fin rot.The typical

signs of the disease are the rotting of the infected fish's tail and, very often, of the fins. However, several factors such as poorly controlled, excessive stress, sudden rise in temperature and hardness and low water pH may develop the disease, most diseases typically occurred during the seasons that have variable temperatures such as spring and autumn, as shown in table (7).

Table 7: Diseases occurrence according to season and project's position

Type of diseases	**Season**	**Project's position**
Fungal infections	Winter + Spring + Autumn	All projects
Bacterial infections	Autumn	All projects
Bacterial and Fungal infections	Spring + Autumn	Saruchawa + Zharawa + Qaladze + HajeAwa + Xdran
Dropsy	Spring	Zharawa
Lernaea	Spring + Autumn	Zharawa + Qaladze
Lice	Winter + Autumn	Zharawa
Protozoa infections	Spring	All projects
Blood parasites	Spring + Autumn	Zharawa + Saruchawa
Blood poisoning	Autumn	Zharawa + Saruchawa + Sangasar
Feed poisoning	Spring	All projects
Vitamins deficiency	Autumn	All projects

The parasitic disease was also documented by farmers and the current study found that carp fish were widely infected by *Lernaea* and *Argulus*. The parasite normally functions either as a pathogen or as a disease vector.Farmers have confirmed in the current investigation that they have found a red spot on their trout. The appearance of a red patch at the base of the dorsal fins and over the skin is a sign of this disease.

Most fish farmers do not have sufficient knowledge of fish health management methods, and losses continue to occur. The capacity of fish farmers, extension officers and policy makers to manage disease and parasite outbreaks needs to be developed to realize this level of production. The majority of fish farmers have been unable to detect and control fish diseases and parasites occurring in or near their farms.

Depending our results the higher occurrence of hemorrhagic septicemia and bacterial enteritis or other parasitic diseases of cultured carp fish may be due to the limited or unsuitable environment conditions and bad management, No optimum water quality parameters, including temperatures, pH, ammonia, nitrate levels, overcrowding, very high or very low temperature overfeeding and organic contamination, have been maintained.

Anchor worm (*Lernaea*) infect fresh water fish is thriving at summer months, anchor worms were high in common carp than other species may be due to the high percentage of common carp in the local fish farms, as well as the high total percentage of lernaeal infestation may be is due to parasite is highly contagious or fish farms are endemic, anchor worm easy to find, because it doesn't move around on the body of the fish once it's attached unlike fish lice were low because lice difficult to find and can be found anywhere on the body of the fish or due to speed movement of carp, this explain the differences in the infection ratio of lice compared with high rate of anchor worms.

Present study may revealed a problems facing carp fish cultivation due to diversity of parasitic and bacterial diseases, it’s difficult to made a solutions at recent situation because of a huge movement of fish without control and uncontrolled fish markets or farms that take place in fish industry, improving water quality and disinfection bottom of the pond after each harvesting, proper identification of problem, and correct therapy for treatable infections/ infestations dramatically may improve the health and productivity of fish farms.

Infected common carp fish in ponds were usually calm (quiet) during this study, and they also had lethargy, lack of appetite , weight loss, and irregular activity floating on the surface of the water, and often they did not respond to external stimuli. Also gross lesions of the infection of common carp fish in this study showed that, easily detached scales, presence of many reddish color spots which reveal presence of superficial skin hemorrhage as shown in (Fig 2 and 3) and later causes sloughing off the scales and a large detachment of the skin on the fish's body, erosion on the operculum, bilateral exophthalmia, also skin erosions and cutaneous grayish patches are primarily induced by the release of powerful bacterial proteolytic enzymes that lead to electrolyte and protein loss together with disturbed circulation (15) Similar results were reported by (5) and (16).

Figure 1: Lesions on common carp skin

Figure 2:Hemorrhages on fish skin

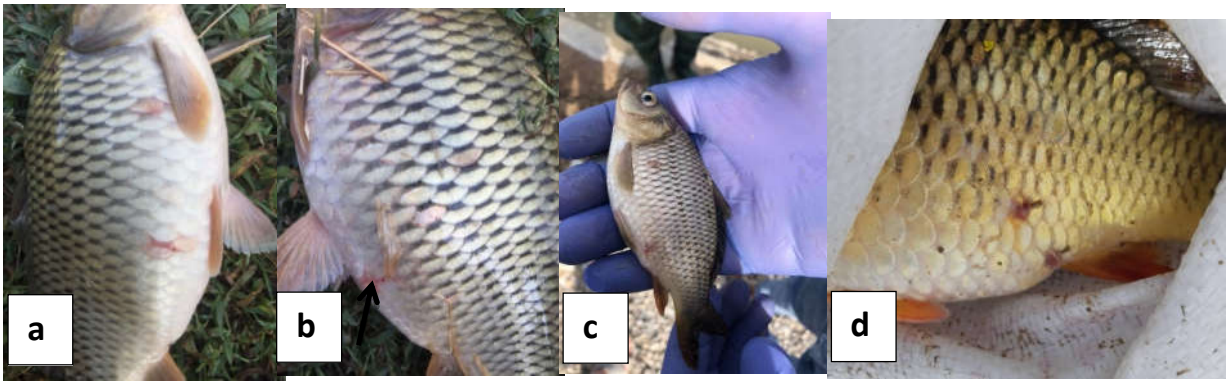

Figure 3 : *Lernaea* infections; (a, b, c) larvae of Lernaea, (d) adult of Lernaea

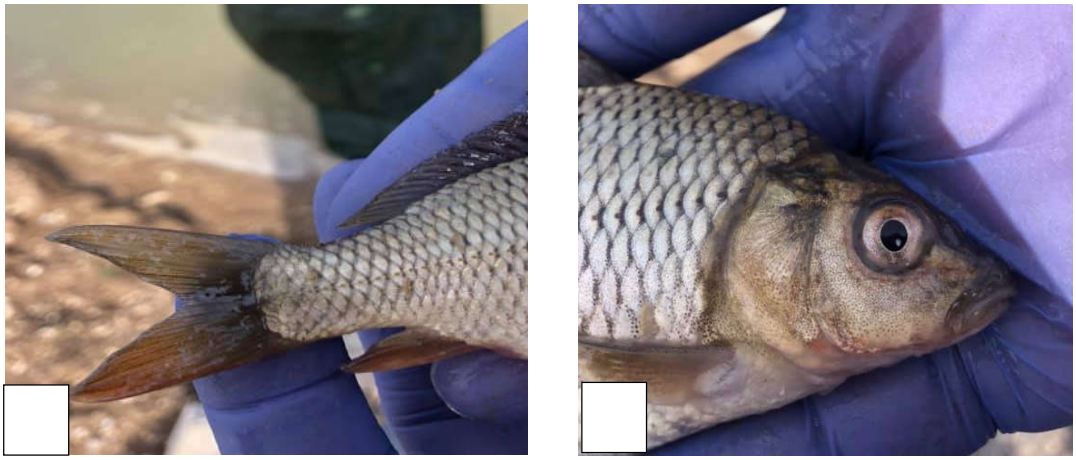

Figure 4: Protozoa infections (a): on fish caudal fin, (b) on fish head (mouth and eye).

Figure 5: Fish lice *Argulus*

Figure 6: Fish dropsy (a,b,c three different view of dropsy; d fluidly abdominal cavity)

The most infection occurred in common carp in Ranya was the gill infections as showed in fig(8), any changes in water quality and the being of any pathogens may reflected directly on fish gills such as low Dissolved oxygen, pH, ammonia increase, ; low quality of diet making fish searching for feed in ponds bottom making the gill muddy.

Figure 7: Gill infections (a: gill rot; b: ammonia increase; c: Alkalinity; d: low Dissolved oxygen; e: muddy gill; f: low pH; g: gill protozoa; h: gill necrosis

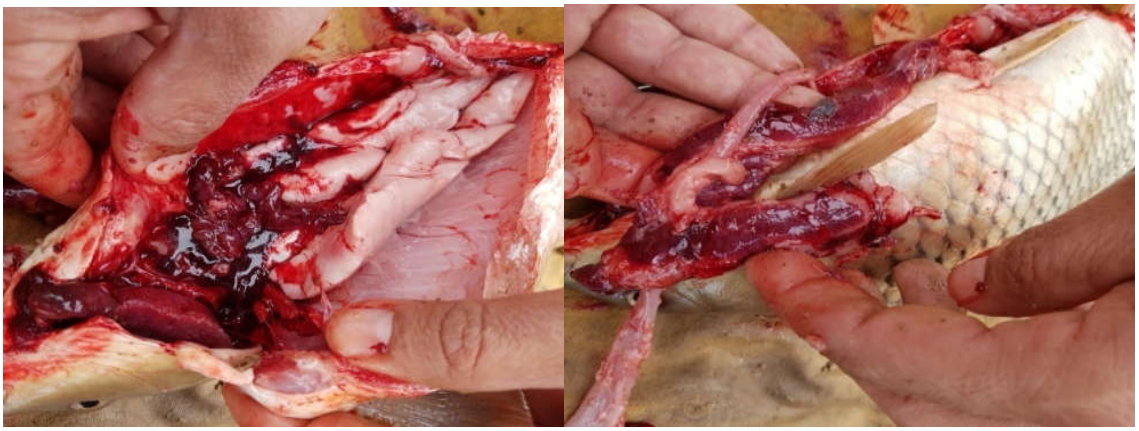

Figure 8: Chemical Poisoning

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