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Research Article

DETERMINATION OF AVERAGE OF POPULATION DISTRIBUTION AND MERISTIC AND BIOMETRICS FEATURES OF GOLDEN RAINBOW TROUT IN MAMASANI REGION, FARS PROVINCE, IRAN

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ABSTRACT
Golden rainbow trout by the scientific name of *West Virginia Golden Trout* has special popularity today. Generally, at an altitude of 3,000 meters above sea level, this fish is able to live in condition of low temperature and high oxygen of rivers. With respect to marketability, this fish is of paramount importance in fish farming industries. Around 50-60 subspecies of golden rainbow trout in prepubertalage (pre-market period) were collected from 3 rainbow trout fish farms by the name of Mashayekh, Dehgerdo and Ghaedan in Mamasani Town, Fars Province, Iran. Reproduction and breeding of the fish, census and recording of water, food, heath and treatment management were performed in spring 2015. The samples were studied in terms of biometric, meristic, morphologic and anatomic properties. Except the color of the subspecies, according to the results no difference was found in terms of the above parameters compared to golden rainbow trout species. However, based on the reports of the owners of these farms, this subspecies has been shown some benefits in terms of breeding behaviors and disease resistance. In addition, its marketability in terms of taste as well as selling price has superiority to golden rainbow trout species. Golden rainbow trout has much less resistance compared to rainbow trout and can be a better farming suggestion than rainbow trout because of greater stress tolerance and it is hoped in the future to farm more resistance fish species with more greater economical gain through additional research.

Keywords: *Average, Population Distribution, Golden Rainbow Trout, Mamasani Town*

INTRODUCTION
Animal proteins play a very important role in human nutrition in terms of growth and health. One source of animal protein is fish. Increased fishing as well as aquatics population decline is one of the challenges ahead in this field to supply this type of protein. Intensive farming of fish in comparison with other animals has low ratio of feed conversion, fish breeding facilities associated with agriculture and horticulture, improvement of environment for the use of waste materials in fish feeding, rural development, presence of high percentage of amino acids including methionine and lysine, fatty acids like eicosapentaenoic acid, and minerals such as calcium, phosphorous, iron, sodium, potassium and A, B, C, D and B12 vitamins in fish. Feeding cost in aquaculture is normally included more than 60 percent of total costs of this field. So, aquaculture is of particular importance (Nafisi Bahabadi and Falahati Marvast, 2000).
Economical production of fish with the aim of shortening the time of fish delivery to markets is one of the objectives of research projects. Farmed fish must be fast growing and they must reach to the expected normal weight during their breeding. They must be market friendly and proportional to tests of consumers. In addition to consumption of natural foods, the farmed fish must feed from low cost and artificial food items and be compatible and resistant to physico-chemical conditions of water and resulted changes of them, be resistant to towing fishing net and manipulating and diseases. They also must be able to tolerate living in dense and super-dense conditions.
The opportunity of their mass propagation, the possibility of food and other needs of breeding preparation must be present in regions, as well (Nafisi Bahabadi and Falahati Marvast, 2000; Bruno and Popc, 1996).

Among the above species, rainbow trout is allocated the best performance and compatibility of production between various salmonids across the world (Nafisi Bahabadi and Falahati Marvast, 2000). Today, the rainbow trout has become as the best fish in the most of breeding farms and in cold water hatcheries in inland waters (TakamiGh and Shahidi, 2007). According to the Food and Agriculture Organization (FAO) of the United Nations in 2010, the production of this species had been 728447 tons that 441128 and 287319 tons of it had been produced in fresh waters and in salt water and brackish water, respectively (Iran Fisheries Organization, 2013).

One of subspecies of the rainbow trout is golden rainbow trout (Roustam Pour, 2014). The golden rainbow trout arose for the first time in 1954 in a fish farm on the basis of genetic mutations between common rainbow trout. In 1963, the golden rainbow trout which had special popularity became famous as "*West Virginia Centennial Golden Trout*". This kind of fish became famous in Persian as Hundred-Year-Old West Virginia Centennial Golden Trout (Abdoli, 2000).

The golden rainbow trout is phosphorus yellow to whitish yellow color (minimum amount) with red and pink fins. The weight and the size of this fish are up to 5 kg and 79 cm (Abdoli, 2000). The golden rainbow trout, which is found throughout Iran like the common rainbow trout is able to live in conditions of low temperature and high oxygen in rivers (Abdoli, 2000).

Given to the above as well as the proximity of this subspecies to other rainbow trout subspecies and given to the importance and sensitivity of correct choice of fish in income and economic of fish farming, the present study is aimed to evaluate the average distribution of golden rainbow trout in Mamasani Region, Fars Province, Iran, in order to identify better possible needs of this fish.

MATERIALS AND METHODS

Methods

A number of 50-60 golden rainbow trout in prepubertal age (pre-market) was prepared from three farms. The golden rainbow trout farms were located in Mamasani Town and the features of the studied stations were recorded that include:

Station 1: long cement floor canals rainbow trout aquaculture farm (Mashayekh Pool)
Station 2: long cement floor canals rainbow trout aquaculture farm (Dehgerdo Pool)
Station 3: round pound rainbow trout aquaculture farm (Ghaedan Pool) (Tables 1 and 2).

Table 1: Pools Characteristics

Pool Number	Pool Name	Pool Location	Pool Type	Water Supply	Pool Area
1	Mashayekh	Around Mashayekh Doshman Zyari Village, South West of Nourabad Town, Fars Province, Iran	Long Cement Floor	Mashayekh Water Fountains	1 Hectare
2	Dehgerdo	Around Dehgerdo Doshman Zyari Village, South West of Nourabad, Fars Province, Iran	Long Cement Floor	Dehgerdo Water Fountains	450 m^2
3	Ghaedan	Around Dehgerdo Doshman Zyari Village, 40 km South West of Nourabad, Fars Province, Iran	Round Pounds	Balehkouh Water Fountains	350 m^2

Table 2: Salinity and Temperature of Water

Pool Number	Water Salinity	Water Temperature
1	Do Not Have	13-14
2	Do Not Have	17-16
3	Do Not Have	13-14

It should be noted that the sampling method in this research was performed in both field and laboratory studies, so that field operations were included identifying and counting of samples and recording of related information to the studied stations. Laboratory operations were included recognition, measurement, imaging and recording of characteristics of the samples (meristic and biometrics features of the fish).

Biometric measurement in this study was performed using a ruler, so that the standard length, total body length, body depth, diameter of eye and diameter of pupil were measured using a ruler. To measure meristic features, the number of hard and soft rays of pelvic fin and anal fin and the number of scales on the lateral lines were evaluated and counted.

Data were collected then, and for statistical analysis Charts and Tables were plotted using Excel Software showing frequency and average.

RESULTS AND DISCUSSION

Results

All information of the evaluated pools including, the number of fish and the number, weight, age and losses of golden rainbow trout and location of preparation of baby fish were collected separately and for each of the three stations in Table (3).

Table 3: Pools Information

Pool Number	Number of Fish	Number of Golden Rainbow Trout	Weight of Golden Rainbow Trout	Age of Golden Rainbow Trout	losses of Golden Rainbow Trout	Location of Preparation of Fish Babies	Company Name of Consuming Foods
1	2000-3000	20-30	1-4 kg	2-4 years	Do Not Have	Khodash	Kimiagaran
2	4000-10,000	100	450-550 g	10 Months	Do Not Have	Mashayekh	Kimiagaran and Faradaneh
3	2000-20,000	2000-20,000	700-800 g	8-12 Months	Do Not Have	Mashayekh and Ardakan	Faradaneh

The comparison of the number of the rainbow trout with the golden rainbow trout has been collected separately and for each of the three stations in Chart (1).

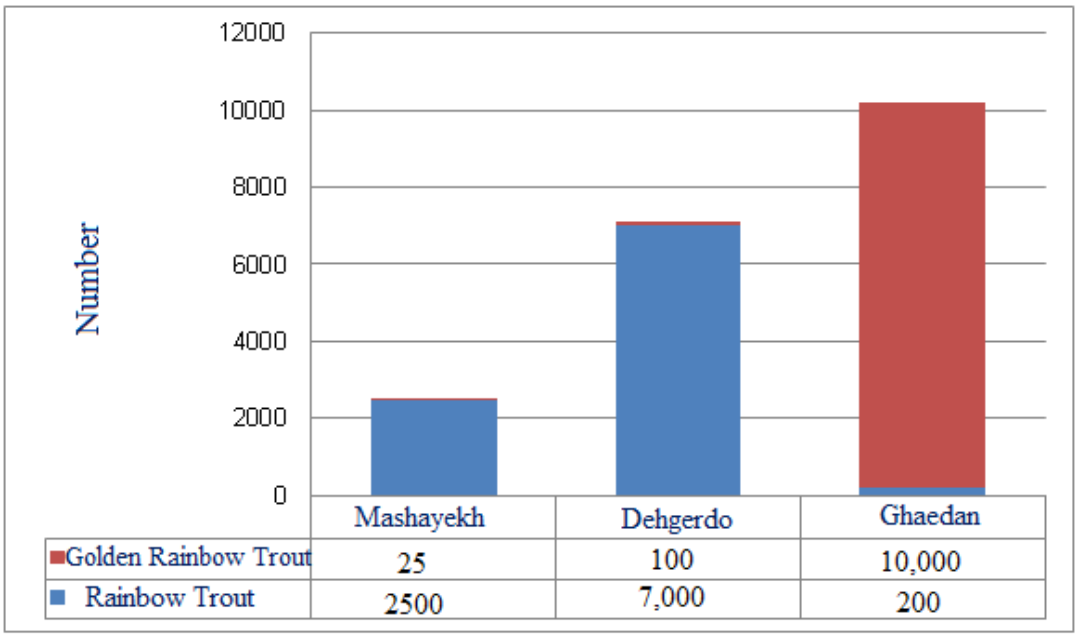

Chart 1: The Comparison of the Number of the Rainbow Trout with the Golden Rainbow Trout in the Three Stations

The comparison of the losses of the rainbow trout with the golden rainbow trout has been collected separately and for each of the three stations in Chart (2).

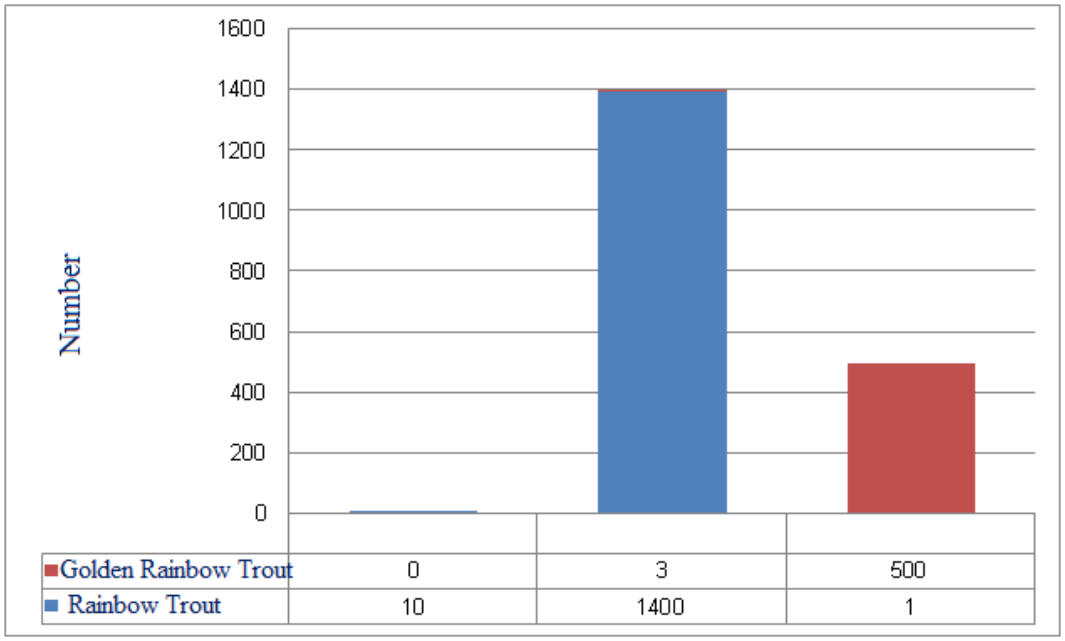

Chart 2: The Comparison of the Losses of the Rainbow Trout with the Golden Rainbow Trout in the Three Stations

The information of the evaluated pools including, the number of scales on the lateral lines, pelvic fin (the number of hard and soft rays) and anal fin (the number of hard and soft rays) of the fish of the three stations were collected separately and for each pools in Table 4.

Table 4: Meristic Measuring Results of Caught Fish from the Breeding Farms

Pool Number	The Number of Scales on the Lateral Lines	Pelvic Fin		Anal Fin	
		The Number of Hard Rays	The Number of Soft Rays	The Number of Hard Rays	The Number of Soft Rays
1	126	6	10	5	9
2	126	6	10	5	9
3	126	6	10	5	9

The biometric measurement of the evaluated pools including, the standard length, total body length, body depth, diameter of eye and diameter of pupil of the fish in the three stations were collected separately and for each pools in Table 5.

Table 5: The Results of the Biometric Measurement of Caught Fish from the Breeding Farms

Pool Number	Body Depth	Standard Length	Total Body Length	Diameter of Eye	Diameter of Pupil
1	10.3	52	52.4	10.1	0.3
2	7.3	26.4	28.2	0.6	0.2
3	7.9	27	29.5	0.7	0.2

Discussion

Aquatic importance in human and society health and its role in healthy nutrition of human have become more evident with increasing human knowledge (Maygoli Nejad, 2012). Using of river, agriculture and fountain water, Aquaculture has a very short history compared to sea fishing.

In the terms of the same production of livestock and poultry, the contribution of production of aquatics in Iran in 2010 was only 13 percent of total production of this group; and in terms of added value, it constituted only 2 percent of total agriculture productions indicating little attention to this subsection (Maygoli Nejad, 2012).

Sea fishing was growing slowly until 1979 and aquaculture did not also have any place in fisheries programs of Iran. Only a few fishing farms by production of 3000 tons from one meter from 1978 to 1991, the process of fishing from the north and the south seas of Iran had risen sharply. For the first time in 1994, reduced fishing in the south with the most contribution of aquatics production in Iran was occurred. That was a warning to officials and planners aquaculture industry in Iran. That was a happening that had been occurred in the World fishing in 1989 and Agriculture Organization of the United Nations had announced about that subject to the countries of the World in 1991.

With this occurrence, Iranian governments decided to reduce dedicated financial assistance to fishing part and 14 strategic reports of Economic Research Assistance Department were supported this activity to expand and enhance the aquatics production. So, some special restrictions for entrance to fishing activities were formed in Iran and vice versa the required bases for investment of private companies and cooperatives was provided in three sources of warm water and cold water fish and shrimp (Maygoli Nejad, 2012).

Based on random selection of Mamasani Town in this study, which is considered as one of dozen towns for farmed rainbow trout, it was observed that totally in all the studied farms except those that were entirely farmed the golden rainbow trout, about 0.05 percent of the total breeding fish was from the golden rainbow trout subspecies.

Among the histories that was prepared from the farms, all breeders were selectively and/or non-selectively accepted such a population among purchased fish babies. It is for several years that this subspecies, which originating and appearance of it is not clear, exists among breeding populations of the rainbow trout.

With all efforts that had performed in this study to extract similar resource and articles, no reports about the subject of this research was unfortunately or fortunately observed anywhere in Asia, Europe and America, except a thesis that the results of this study is in accordance with the obtained results from the thesis of Rostam Pour (2014).

With more accurate and more targeted identification of this subspecies in terms of bio systematic dimensions, the following cases can be considered, probable benefits of breeding, possible resistance to diseases, mutations or possible genetic crosses, proliferative potential advantages and many other scientific and economic efficiencies. It is worth mentioning that with respect to all biometric and meristic measurements and morphological and anatomical evaluations performed on many samples of the golden rainbow trout, no biometric and meristic, morphologic and anatomic differences was observed in this subspecies compared with the rainbow trout. However, as its name (golden rainbow trout) implies, the difference in the color of the body is very clear. Although thereare more needs to intensive studies in terms of reproduction and breeding characteristics, but given to practical approach to this issue and information collected from breeding fields of this subspecies by owners of breeding farms, no significant difference was reported in terms of reproductive properties, breeding features and defensive behaviors, as well as the resistance level against illnesses.

Of course, it should be noted that according to experiences and observations of most of farmers and owners of breeding farms, the mortality rate of this subspecies is very negligible compared to the rainbow trout species, although more studies are certainly needed to prove this hypothesis. But if future studies prove that this subspecies (golden rainbow trout) is stronger than the rainbow trout species, more resistant to stress species of rainbow trout can be replaced with the golden rainbow trout, certainly with enthusiasm in artificial proliferation of this species and preparation of hatcheries special for this subspecies.

It should be noted that from 1991 to 2011, such a good experience was carried out in the field of breeding shrimps. After influx of white spot disease and the breakdown of industrial replication, breeding and experts of shrimp and then very bad social, economic and even political consequences that yielded, the researchers went on to introduce specific pathogen free (SPF) western white leg shrimp species from America Continent and replaced it with dominant breeding species of that time, which were mainly Indian white shrimp species, green tiger shrimp and black tiger shrimp.

They were able to stop the progression of the disease due to identification of significant resistance of the species against the white spots. After nearly a decade of challenges and stress, this experience causes the shrimp industryreturn to quality and quantity of itself and more ever, now the dominant farmed species in all breeding farms in Iran and especially in the countries around the Persian Gulf is the western white leg shrimp species.

Since in detailed studies, the western white leg shrimp species not only in terms of resistance but also in terms of feed conversation rate, growth rate as well as marketability of its taste among consumers has superiorityto other breeding species.

Conclusion

As a result, we can say that this research has been performed for the first time in Mamasani Region and according to the statistics and the Tables, the golden rainbow trout is much less resistant to the rainbow trout and can be a better breeding suggestion compared to rainbow trout, because of greater stress tolerance and it is hoped in the future to farm more resistance fish species with more greater economical gain through additional research.

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