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Research Article

Mortality and Treatment of Electric Blue Jack Dempsey (*Rocio octofasciata*) and Blood Red Parrot Cichlid Fish in Planarian Infestation

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Abstract: Aquarium fisheries is an important sector in aquaculture, which is carried out for economic and hobby purposes. Diseases, particularly parasitic infestations, represent a significant economic challenge in this sector. Parasitic infestations have an important place in aquarium fish. Planarians are flatworms that can live in both freshwater and marine waters, appearing in many shapes and forms. In this study, mortality and treatment due to Planaria infestation in electric blue Jack Dempsey (*Rocio octofasciata*) and blood red parrot cichlid fish were investigated. In a freshwater aquarium with a 400 liter capacity, housing of 13 fish with an average length of 12 ± 0.1 cm and a weight of 50 ± 1 g, the infestation of Planaria occured due to overfeeding and equipment contamination, resulting in a mortality rate of 60%. For the treatment of morphologically identified Planaria species, it was observed that the mortality was reduced and the development of the parasite stopped with the use of 3 mL/100 L FMC (Formalin-Methylene-Malachite) suspension. As a result of the study, it was seen that the water temperature was increased to 31ºC after removing the infested fish from the aquarium in Planaria infestation and disinfection of contaminated tools and equipment after FMC (3.7 g / 3.7 g / L) application could get rid of the infestation.

Keywords: Fish parasites, Ornamental fish, Prophylaxis, American cichlids, Death ratio, Fish diseases

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1. INTRODUCTION

Ornamental aquarium fish keeping is a popular hobby around the world. Due to their various charming colour patterns and behaviours, ornamental fish have become among the most sought after animals in the world (Aqmal-Naser & Ahmad, 2020). Although aquarium is generally regarded as a hobby, it is obvious that it is an important sector in terms of aquaculture. Aquarium fish farming has an important commercial place in aquaculture in developing and developed countries. In addition, in many tropical region countries that are not economically strong, aquarium fish make a significant contribution to the country's economy. Electric blue Jack Dempsey (*Rocio octofasciata*), which has an important place among aquarium fish, originates from Central America and is a moderately aggressive fish species. This species is a variation of Jack Dempsey that is rarely found in nature. Their numbers were increased by selective breeding of Jack Dempseys carrying the appropriate gene in the aquarium environment. Even abroad, it is a rare species in aquarists. Its care is similar to other Central American cichlids. They can be aggressive towards their own species, but they do not show aggression outside of breeding periods. The optimum growth temperature of this species is 24-30ºC and it is reported that it is in an omnivorous feeding structure (Mills & Vevers, 1989; Conkel, 1993; Hekimoğlu, 2006).

Blood red parrot cichlids are among the preferred species among aquarium fishes, they are moderately aggressive, congenital spine, swim bladder and mouth/jaw problems, have faulty genes, are completely commercially produced fish. Due to their anatomical disabilities, they have difficulty in swimming as they gets older. Since female cannot reproduce with their own male, they are bred with a Midas male. For this reason, it causes a decrease in pure Midas in the market. He cannot close his mouth and has to chew the bait in his throat. This species has an optimum growth temperature between 22-27ºC of water temperature (Zhijing et al., 2014; Wu et al., 2021).

Planaria are considered to have a primitive brain because of their primitive synaptic nervous system with cranial ganglia, organized to suggest that they have the capacity for learning. Planaria represent the first organisms to have a true synaptic nervous system, definite cephalization, and bilateral symmetry, which are traits that can be traced to higher species. These qualities make Planaria a good candidate for study of basic memory and learning processes (Schiavoni & Genter, 2021). Planarians are parasites of the flatworm phylum, which can live mostly in marine or fresh waters. When these parasites disintegrate, each part has the ability into a new Planaria. This formation is attributed to whole body regeneration. Due to these properties, it has importance as a biological material used in regeneration studies that have been studied for hundreds of years. Planarian infestation increases the mortality rate when the host is stressed and in sensitive periods (Bedir & Kocabaş, 2015).

In this study, fish mortality due to Planaria infestation was investigated in aquariums of electric blue Jack Dempsey and blood red parrot cichlid fish. Treatment suggestions were made that could be a solution for fish exposed to the same parasite infestation.

2. MATERIAL AND METHOD

2.1. Stock Ratios and Water Quality Values

The trial aquarium with a 350 L main tank and 75 L sump system and a total water volume of 425 L was prepared by stocking 6 electric blue Jack Dempsey and 7 blood red parrot cichlid breeders, representing the American cichlid aquarium concept. The total length was determined as minimum 9 cm and maximum length 14 cm in electric blue Jack Dempsey individuals, and the total length was determined as minimum 11 cm and maximum length 19 cm in parrot cichlid individuals. The average body weight of all individuals was 187 g and the total biomass was 975 g. Jack Dempsey breeders consist of 2 female and 4 male individuals. These fish species are distributed in hard waters (9-20 dH) between 24-30°C and 7.0-8.0 pH (FishBase, 2021).

2.2. Water Change and Feeding Procedure

Water change in the aquarium was carried out with mains water in weekly periods by making a bottom siphon at the rate of 20% of the entire water volume. Fish were fed twice a day with a mixture of commercially available granulated food (70% Tetra discus granule) and flake food (30% Tetra pro energy flake). The nutritional content values of the feeds used in the experiment are given in Table 1.

Table 1. Proportional contents of feed

Feed Type	Raw Protein (%)	Raw oil (%)	Raw Cellulose (%)	Ash (%)	Moisture (%)	Additives
Flake	46.0	12.0	2.0	11.0	9.0	Vit. A, D_3, E
Granular	47.5	6.5	2.0	10.0	6.0	Zn, Fe, Mn, Vit. A, D_3

For tropical origin fish and kept at a water temperature of 24-26ºC, feeding between 4-5% of body weight is generally considered sufficient (Hekimoğlu & Alpbaz, 2003). Based on this feeding rate, 50 g of daily feeding was made according to the total body weight (approximately 1000 g) of all individuals.

2.3. Parasite Isolation and Identification

Random sampling (10 pieces per day) of parasites observed due to the increase in the feeding rate applied in the experimental aquarium was performed with a Nikon SMZ 745T brand stereo microscope, and some morphometric measurements were carried out using ImageJ 1.46 software on the images obtained. However, the identification of the species was provided by

evaluating the images taken from different morphological parts of the parasite (Van-Wyk & Mayhew, 2013).

2.4. Determination of Parasite Virulence

In order to determine the parasite virulence accurately for the entire water volume and to ensure the homogeneous distribution of the parasites in the water column, 2 air stones were added to the system in different positions in addition to the existing air stones to provide water circulation from the bottom as well as the closed circuit water cycle in the aquarium system. For the counting of parasites, glass beakers with a water volume of 0.5 L were taken randomly from different parts of the aquarium, and the number of individuals in these volumes was determined, and the number of parasites in the water column was evaluated by dividing the total aquarium volume by taking the average of the numbers obtained (Frank, 1996).

3. RESULTS

3.1. Stock Ratios

During the experiment, the temperature, electrical conductivity (EI), dissolved oxygen (DO) and pH values were measured daily in the aquarium using the HACH HQ 40d multimeter, and considering the optimum water quality values of the related species, the water temperature was 25±0.5°C, EI 850±55. µS/cm, DO 8.4±0.1 mg/L and pH 7.4±0.6.

3.2. Isolation and Morphology of Parasites

Microscopic images of the parasites were taken using different magnifications in order to identify the free-swimming parasite form observed in the community aquarium. When the images taken were evaluated in detail, the head and tail region of the parasite and the cilia structure of Planaria sp. were observed quite clearly (Figure 1). When the movements of the parasites in the aquarium are examined, it is observed that Planaria sp. Similarly, it has been determined that the corrugated shaped curling movement is characteristic. At the end of 48 hours, an average of 600±25 parasites/L density was determined in the sampling and counting carried out to determine virulence. Morphological measurements made on parasite samples taken were determined as a minimum length of 4.68 mm and a maximum length of 8.2 cm. The average length of the parasites was 410±20 µm in the widest part (head) and 220±5 µm in the narrowest part (tail).

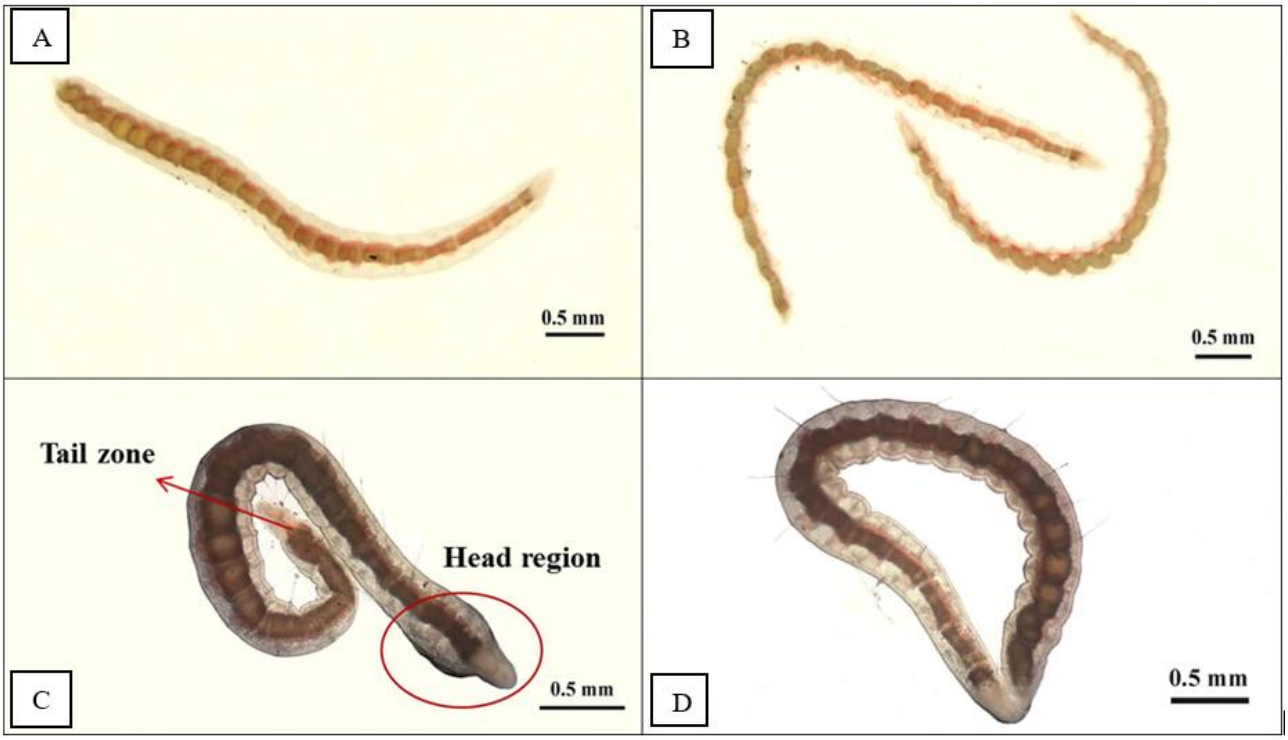

Figure 1. Microscope images of observed parasites (A: Side view B: Curve shape C: Typical head area D: Curvy shape)

With Planaria infestation, 7 of the rootstock-sized individuals (6 Jack Dempsey and 1 parrot cichlid) in the community tank died within 36-48 hours. With the determination of the Planaria density in the main tank, individuals were transferred to quarantine aquariums with 120 L volumes and a 3 mL/100 L FMC (Formalin-Methylene-Malachite) suspension was applied for treatment. With the initiation of treatment, only one of the quarantined individuals died and the others were rescued. Swelling of the abdomen and more darkening of the outer surface than usual were observed in deceased fish, especially in individuals of the Jack Dempsey species (Figure 2). However, an above-normal opening in the operculum caps of parrot cichlids and intense tears at the ends of the gill filaments were observed (Figure 3).

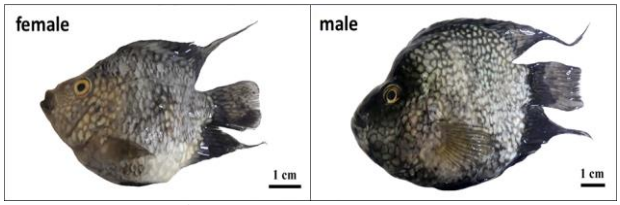

Figure 2. Male and female individuals (Jack Dempsey) who died as a result of Planaria infestation.

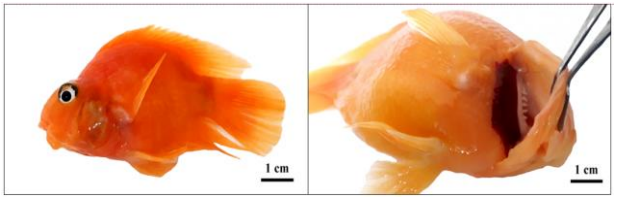

Figure 3. Deformation that occurs in the gill lamellae of blood red parrot cichlid.

The change in the color pattern observed in Jack Dempsey rootstocks occurred in the opposite way in parrot cichlids, and it was observed that the natural red color was lightened in contrast to darkening in the stem parts of the individuals. From the moment the Planaria was first observed in the main tank, it was determined that feed intake stopped and physical activity slowed down in all fishes.

4. DISCUSSION AND CONCLUSION

It has been reported that free-swimming flatworms such as Planarian are used in many researches because they are very cheap to use in laboratory culture, maintenance and toxicological tests (Boğa et al., 2006). Studies have reported that the biochemical and physiological organization of Planarians resembles higher animals such as mammals in many ways.

Planarian infestation can pass into aquariums by clinging to parasites, snails, crabs and shrimps that can be transported with aquatic plants, live feeds and aquarium materials, as in general parasitic structures. For this reason, care should be taken when purchasing live animals, other than plants and aquarium materials.

In this study, fish mortality and treatment due to Planaria infestation in Electric blue Jack Dempsey and parrot cichlid aquariums were investigated. In a freshwater aquarium with a 400 liter capacity consisting of 13 fish with an average length of 12 cm and a weight of 50 g, the infestation of Planaria occurred as a result of overfeeding and equipment contamination, with a mortality rate of approximately 60%. For the treatment of morphologically identified Planaria species, it was observed that the virulence was reduced and the development of the parasite stopped with the use of 3 mL/100 L FMC (Formalin-Methylene-Malachite) suspension.

As a result, the applications that can be carried out for prophylaxis and treatment in case of exposure to Planaria infestation can be listed as follows; the amount of feed to be given daily in aquariums should not be exceeded. Because, as in other parasites, it will be a triggering factor in the formation of Planaria. In case of purchase live for the aquarium, pre-quarantine (7 days) for general parasite inspection followed by transfer will prevent possible contamination. During the transfer of live to aquariums, the water in which the fish are in should not be transferred. Fish that die in aquariums must be immediately removed from the aquarium. This should be applied as a general rule not only in parasitic but also in bacterial and viral diseases. For treatment purposes, first of all, live fish in aquariums should be moved to quarantine aquariums. The feeding of fish in quarantine should be stopped. With a parasitic aquarium, the water must be brought to 31°C and kept for one day. Then, the bottom shooting and filter cleaning should be started. Aquarium sand should be taken after this stage and disinfected in a separate place. In the filter cleaning of aquariums, products such as sponges and bioballs should be cleaned with boiling water. The re-establishment of the aquarium and the application of 3 mL/100 L of FMC (3.7 g / 3.7 g/ L) in the quarantine aquarium should be repeated 3 times a day, once a day.

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Authors' Contributions
ŞÖ: Manuscript design, field sampling, Draft checking and writing, laboratory experiments, statistical analysis and approved the final manuscript.
AS: Manuscript design, field sampling, Draft checking and writing, approved the final manuscript.

Conflict of Interest
The authors declare that there is no conflict of interest.

Statement of Human Rights
Ethical approval for this type of study formal consent is not required.

Data Availability
The dataset generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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