

# Microbiological And Physicochemical Analysis Of Water From Empurau Fish (Tor Tambroides) Farm In Kuching, Sarawak, Malaysian Borneo

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**Abstract:** The fish *Tor tambroides* locally known as empurau or kelah, is one of the most valuable and high commercial value fish species in the Cyprinidae (carps) family. The fish can grow up to the size of human in its natural habitats like cool, clean, fast moving waters and availability of riverine fruits from trees growing by the bank of upstream river. In aquaculture ponds where they are bred for the market, the fish have yet to get the right feed and appropriate water environment condition for their optimized growth, resulting in the slow production of the fish. The optimal parameter value related physicochemical and microbiological quality of water is important for the optimal growth of the fish. The Enterobacteriaceae group of bacteria has been commonly used as the main indicator for the microbiological water quality. This study aims to determine the water quality of empurau farm with regards to the physicochemical parameter value and microbiological indicator. The occurrence of Enterobacteriaceae as indicator organism and the physicochemical parameter value of the water used for the empurau farming were determined. Water samples from inlet and outlet were collected from seven empurau ponds at Indigenous Fish Research & Production Centre (IFRPC) in Tarat, Serian, Sarawak, Malaysian Borneo. Physicochemical parameters such as temperature, pH, biochemical oxygen demand (BOD), dissolved oxygen (DO) and total ammonia nitrogen (TAN) of water samples were determined. As for the microbiological analysis, water samples from the ponds were subjected to standard serial dilution followed by plating the samples on eosin methylene blue agar (EMBA) for isolation of Enterobacteriaceae. Gram staining was then performed on the isolates to determine their Gram's characteristics. Twenty five Gram-negative isolates were further analyzed with (GTG)<sub>5</sub>-PCR to screen for clonal isolates to be used for the identification by API 20E identification system. Dendrogram constructed from the (GTG)<sub>5</sub>-PCR analysis revealed that the 25 isolates were genetically diverged resulting in 4 major clusters (G1, G2, G3, G4) and 11 sub-clusters. Based on the dendrogram, 11 representative isolates of the Enterobacteriaceae were selected from different clusters and these isolates were identification by API 20E kit. The result of the API 20E identification revealed that the 11 presumptive Enterobacteriaceae isolates were belonged to ten different species within nine genera of Enterobacteriaceae. The Enterobacteriaceae species confirmed were *Brucella* spp., *Enterobacter cloacae*, *Citrobacter braakii*, *Erwinia* spp., *Vibrio fluvialis*, *Serratia odorifera*, *Citrobacter freundii*, *Butiaxella agrestis*, *Proteus vulgaris* group and *Cedecea davisae*. The Enterobacteriaceae isolated in this study were mostly human pathogens with few fish pathogens, suggesting human activities may be affecting the water quality. Physicochemical parameters may affect the microbial population in ecology, thus indirectly affecting the development of the fish.

**Index Terms:** Empurau farm water, Enterobacteriaceae, (GTG)<sub>5</sub>-PCR analysis, API 20E kit, Physicochemical factors, Water quality

## 1 INTRODUCTION

The fish *Tor tambroides* or locally known as empurau or kelah in Malaysia, is one of the most expensive and delicious fish species within the family Cyprinidae (carps) [1]. Because of its high price and demand, *Tor* has been recognized to have high potential in aquaculture [2]. The fish can grow up with normal growth rate in its natural habitats like the cool, clean, fast moving waters and availability of riverine fruits from trees growing by the river bank of upstream river.

However, in the ponds where they are bred for the market, the fish have yet to get the right feed and appropriate water environment for their optimized growth, resulting in the slow production of the fish. Good quality water is essential for sustaining the life of all living organisms in the aquaculture environment including fish [3], [4]. Enterobacteriaceae is non-sporing gram-negative bacteria that act as the main indicator for the bacteriological water quality. In fact, the bacteriological quality of the water reflects the bacterial flora of the fish [5]. Fish farmers should be able to understand the importance of managing the proper bacteriological quality of water, since bacteriological quality play an important role in the spreading of farmed fish diseases. Bacterial pathogens can cause infections and death of fish in aquatic environments [6]. Besides, the bacterial flora of the fish is the primary significant source of occupational disease on fish handlers [5]. In addition, bacteria, such as Enterobacteriaceae are closely related with many ecological factors in fish ponds. Some of the factors are the dissolved oxygen, suspended matter, organic detritus, transparency and nutrient salt. These factors show either positive or negative correlation in the pond management. Hence, the pond management has a very strong influence on bacterial number in the pond ecosystem [5]. The availability of information on microbiological aspect of empurau fish grown in ponds are still lacking. To date, there are still lacking of scientific studies regarding the suitable environment for *Tor* habitats, however, it is said that *Tor* lives in a very clean water environment. Thus, assessment of physicochemical and microbiological water quality needed to be done in order to determine the criteria for the suitable environment for rearing *Tor* species. Both the physicochemical parameters and microbiological parameters play a crucial role

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