



Histopathology of Mekong Giant Catfish (*Pangasianodon gigas*) Infected with Columnaris Bacteria in Chiang Mai Province, Thailand

W. Maneepitaksanti ^{1*}, W. Tapingkae ¹, T. Moonmanee ¹ and K. Gatphayak ¹

¹ Animal and Aquatic Sciences Department, Agriculture Faculty, Chiang Mai University, Chiang Mai, 50200

*Corresponding author's e-mail address: worawitmm.4453@gmail.com (W. Maneepitaksanti)

ARTICLE INFO

Article history

Submitted: 19 April 2019

Revised: 6 August 2019

Accepted: 16 August 2019

Available online: 26 September 2019

Keywords:

Mekong giant catfish ; histopathology ;
aquaculture ; columnaris bacteria ; disease ;
Chiang Mai province

© 2018 The Microscopy Society of Thailand

ABSTRACT

Mekong giant catfish (*Pangasianodon gigas*) is the largest herbivorous freshwater. This fish habits in the Mekong river area. Problems on the growth development and aquatic environment make the population of this fish decrease. Recently, the aquaculture of this fish was successful, thus raised this fish to economic fish for fishery production. However, a constraint in aquaculture is due to the infectious diseases. From the experiment of Mekong giant catfish in Chiang Mai province the high mortality of fish was taken out in cultured system. The present study, therefore, aimed to diagnose and demonstrate the causes of mortality and histology changes on moribund Mekong giant catfish. The moribund fish were observed the clinical signs, external parasite and histopathological changes by wet smear technique. The pathogen and histopathology of sections were examined and recorded by the trinocular compound microscope attached to the digital camera. The results showed creamy white or brown patches on the skin and fins of moribund fish with the high mortality rate (80%). Under the microscopic examination of skin, the hay stack of columnaris bacteria was found. Histopathology changes indicated epidermal ulceration, necrosis and severe dermal infiltration of neutrophils, numerous of columnaris bacteria invasion, the gill hyperemia and oedema, degeneration of hepatocytes and hemorrhage in liver, necrotic degeneration and hemorrhage of spleen, hemorrhagic kidney degeneration. This study demonstrated that columnaris bacteria was the main pathogens for high mortality of Mekong giant catfish cultured in Chiang Mai province, Thailand.

INTRODUCTION

Mekong giant catfish is the largest economic freshwater catfish in the world. This fish can be found in China, Laos, Myanmar, and Thailand [1]. Recently, the aquaculture of this fish was successful, thus raised this fish to economic fish for fisheries production. However, a constraint in aquaculture is due to infectious diseases. Fish disease can cause the several level of fish mortalities and affects to the farmer income [2]. Columnaris bacteria is considered a serious pathogen for fish culture. This pathogen has been reported to be a major pathogen in carp, channel catfish, goldfish, eel, perch, salmonids and tilapia [3]. During the Mekong giant catfish' feed experiment in Chiang Mai province in August 2004, the fish was transferred from cages to circle tank for experiment. Unfortunately, the abnormal clinical signs and high mortality were present. Therefore, this study aimed to diagnose and demonstrate the causes of mortality and histology changes on moribund Mekong giant catfish cultured in Chiang Mai province.

METHODS

Ten moribund fish were observed the clinical signs presented. Gills and skin were examined for external parasite by wet smear technique [4]. Haematopoietic organs, gills, and skin were fixed by neutral buffer formalin, dehydrated by alcohol series, embedded in paraffin, cut in 5 micrometre thickness, stained with hematoxylin and eosin (H&E), cleared by xylene and mounted by permount for histopathology permanent slide [5]. All observations and records were done by the using of the trinocular compound microscope (M5T) attached to the digital camera (TOUPCAM, UCOS1000KPA). The water quality was also measured some parameter (water temperature, dissolved oxygen, pH, hardness, alkalinity, total ammonia, nitrate, and nitrite).

RESULTS

The results revealed the creamy white or brown patches on the skin and fins of moribund fish (Figure 1A). Under the microscopic examination of skin some ectoparasites were found such as *Trichodina heterodontata*, and *Epiplatys* sp.. The abundant bacteria with hay stack were also found on the skin (Figure 1B). Based on the shaped and the movement of living colony of this bacterium, it was identified as columnaris bacteria. The histopathology changes from epidermal ulceration indicated, necrosis and severe dermal infiltration of neutrophils, and numerous of columnaris bacteria invasion (Figure 1C). Hyperemia and oedema were found in the gills (Figure 1D). Degeneration and hemorrhage was found in liver (Figure 1E), spleen (Figure 1F), and

kidney degeneration (Figure 1G). The mortality rate was 80% within a week. The water quality including water temperature of 30°C, dissolved oxygen of 6 mg/L, pH 8.5, hardness of 50 mg/L, alkalinity of 170 mg/L, total ammonia 0 mg/L, nitrate, and nitrite of 0.5 mg/L was recorded.

DISCUSSION

Mekong giant catfish is considered as an economic freshwater fish species. Many ways of research attempt to enhancement the production of this fish species such as genetically improvement, feed replacement, feed additive, including with cultured type [6]. However, the study of disease from this fish is scanty. The finding of ectoparasite (*T. heterodontata* and *Epiplatys* sp.) suggested that the water management

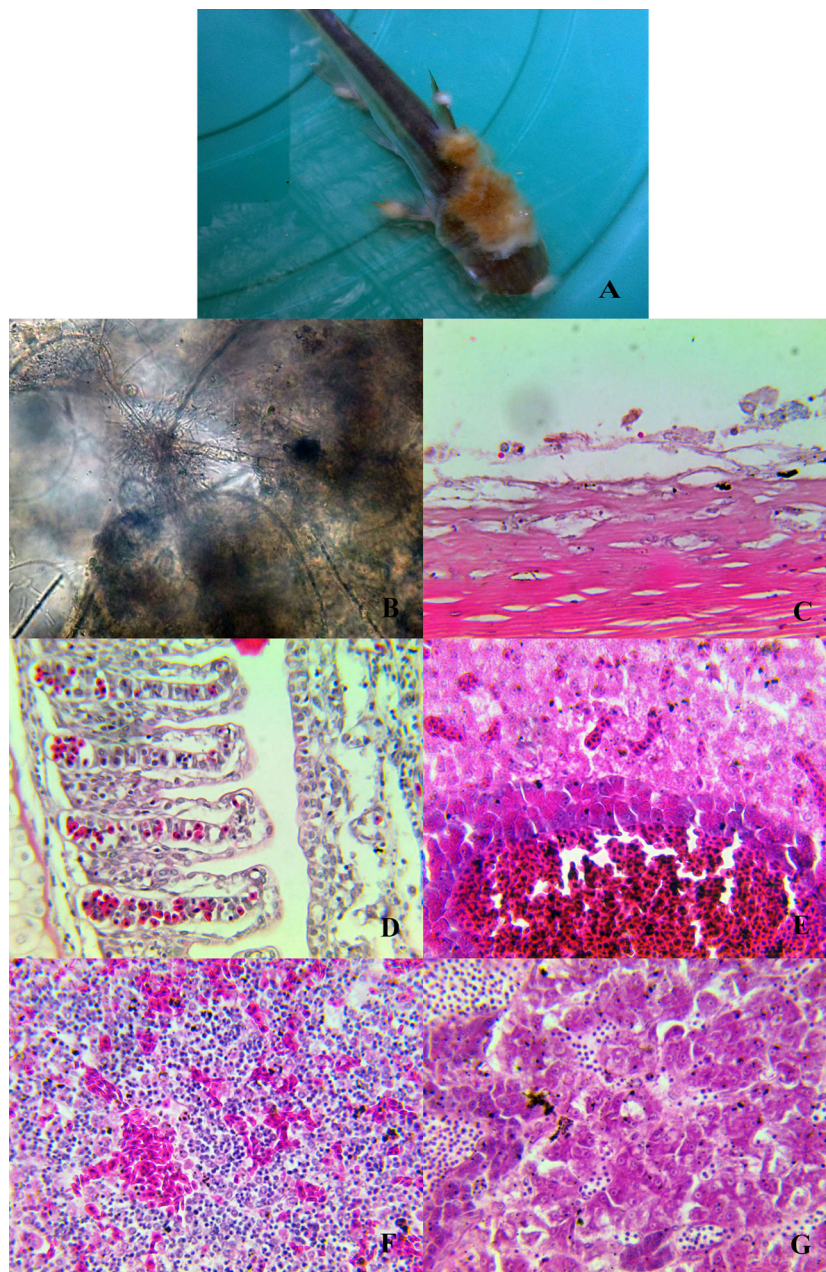


Figure 1. Clinical signs of moribund Mekong giant catfish (A), wet smear of dermal ulceration showed hay stack of columnaris bacteria (B) and histopathology of skin (C), gill (D), liver (E), spleen (F), kidney (G).

for fish cultured in Chiang Mai strictly need to be take care of. These parasites were previously reported from the redbell catfish, Nile tilapia, climbing perch as the common primary pathogen found from cultured fishes in Chiang Mai province [7,8]. The finding of columnaris bacteria on the fish skin and gills the showed the severe damage on the epithelial cell. This damage can be an entrance of the others pathogen such as virus, opportunistic bacteria, and water mold. Columnaris disease is the common disease, it can be found worldwide both of marine and freshwater fish. Many fish species have been reported to affect from this disease in Thailand such as walking catfish (*Clarias batrachus*), snakehead (*Channa striata*), sand goby (*Oxyeleotris marmorata*), Nile tilapia (*O. niloticus*), gold fish (*Carassius auratus*), fancy carp (*Cyprinus carpio*), iridescent shark (*Pangasianodon hypophthalmus*) [9,10]. The histopathology changes on the skin of infected Mekong giant catfish was similar to the skin of infected *Labeo rohita*. The epidermal ulceration and necrosis with a severe dermal infiltrate of neutrophils was found [11,12]. This disease outbreak always occurred in fluctuated water temperature and traumatic action from transportation. Mekong giant catfish is a high susceptibility fish. Therefore, the use of chemical for stressful decreasing after transportation must be necessary for disease prevention and control. This study demonstrated that columnaris bacteria was the main pathogens for high mortality of Mekong giant catfish cultured in Chiang Mai province, Thailand.

ACKNOWLEDGEMENTS

This work was supported by the Higher Education Research Promotion and National Research University Project of Thailand, Office of the Higher Education Commission, 2014. We are also thankful to Comparisons of Egg Production and Quality Among Four Popular Commercial Layer breeds in Thailand Project for our work suppurations.

REFERENCES

- [1] C. Vidthayanon, A. Termvidchakorn, R. Jala, P. Leepayakhun, Species identification manual for fishes in Thai wildlife protection act and CITES, Department of Fisheries of Thailand, Bangkok, **2000**.
- [2] E. J. Noga, Fish disease: Diagnostic and treatment, first ed., Wiley-Blackwell publisher, Iowa, **2010**.
- [3] A. M. Declercq, F. Haesebrouck, W. Van den Broeck, P. Bossier, A. Decostere, Columnaris disease in fish: a review with emphasis on bacterium-host interactions, *Vet. Res.*, 2013, 44: 1-17.
- [4] K. Thonguthai, S. Chinabut, T. Somsiri, P. Chanratchakool, S. Kanchanakhan, *Diagnostic Procedures for Finfish Diseases*. Department of Fisheries of Thailand, Bangkok, **1999**.
- [5] G. L. Humason, *Animal Tissue Techniques*. fourth ed., W. H. Freeman and Company, San Francisco, **1979**.
- [6] K. Meng-umphan, J. Saengkrachang, Production of generation-2 Mekong giant catfish (*Pangasianodon gigas*) cultured with *Spirulina* sp., Maejo Inter. J. Sci. Tech. 1., 2008, 2(3): 559-567.
- [7] C. Kunsete, Y. Kaewkhaw, W. Sangarkhom, W. Maneepitaksanti, Fungi and parasite found from *Anabas testudineus* in Sansai district, Chiang Mai Province, *Khon Kaen Agr. J.*, 2016, 44(2): 820-825.
- [8] P. Katta, P. Sakda, C. Wongsawad, W. Maneepitaksanti. Survey of parasitic fauna from reservoir fish at Mae-Hia Subdistrict, Chiang Mai Province, *Khon Kaen Agr. J.*, 2016, 44(2): 803-810.
- [9] S. Tandavanitj, T. Somsiri, W. Maneepitaksanti, V. Panyawachira, J. Polchana, S. Kanchanakhan, T. Laoprasert. 2008. Prevention and treatment of fish disease. Inland Aquatic Animal Health Research Institute, Department of Fisheries, Bangkok, **2008**.
- [10] S. Tandavanitj, T. Somsiri, W. Maneepitaksanti, V. Panyawachira, J. Polchana, S. Kanchanakhan, T. Laoprasert, P. Baoprasertkul, B. Somridhivej, J. Bamrunkit.. Disease of Tilapia. Inland Aquatic Animal Health Research Institute, Department of Fisheries, Bangkok, **2008**.
- [11] S.E. Snieszko, G. L. Bullock. Columnaris disease of fishes. U.S. *Fish Wildl. Serv.*, Fish Dis. Leaflet No. 45, Washington, DC., 1976, 10 p
- [12] C. B. Tiwari, V. S. Pandey, Studies of hematology and histology in *Labeo rohita* infected with cutaneous columnaris disease. *Rec. zool. Surv. India*, **2014**, 114, 151-157.