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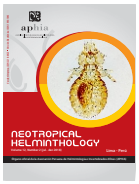


ORIGINAL ARTICLE / ARTÍCULO ORIGINAL

# MORTALITY OF *COLOSSOMA MACROPOMUM* (ACTYNOPTERYGII, SERRASALMIDAE) CAUSED BY INFESTATION OF *ICHTHYOPHTHIRIUS MULTIFILIIS* (CILIATEA, ICHTHYOPHTHIRIIDAE) IN A FISH FARM, LORETO, PERU

# MORTANDAD DE *COLOSSOMA MACROPOMUM* (ACTYNOPTERYGII, SERRASALMIDAE) CAUSADA POR INFESTACIÓN DE *ICHTHYOPHTHIRIUS MULTIFILIIS* (CILIATEA, ICHTHYOPHTHIRIIDAE) EN UNA PISCIGRANJA, LORETO, PERÚ

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## ABSTRACT

Mortality of *Colossoma macropomum* (Cuvier, 1818) caused by *Ichthyophthirius multifiliis* Fouquet, 1876 is reported from a fish-farm located in the Peruvian Amazon. The infestation of *I. multifiliis* was influenced by inadequate water conditions caused by low temperatures and high values of ammonium. Prophylactic measures such as daily evaluation of physical and chemical parameters in the water and proper management of the fish such as the location of the pond and the water supply must be taken into consideration to prevent the manifestation of diseases.

**Keywords:** *Colossoma macropomum* – ectoparasite – fish-farm – Peru – ichthyophthiriasis – Gamitana – white spot disease

## RESUMEN

Mortandad de *Colossoma macropomum* (Cuvier, 1818) causado por *Ichthyophthirius multifiliis* Fouquet, 1876 es registrado en una piscigranja localizada en la Amazonía peruana. La infestación por *I. multifiliis* fue influenciada por inadecuadas condiciones del agua del estanque de cultivo causadas por bajas temperatura y elevados niveles de amonio. Medidas profilácticas como: evaluación diaria de los parámetros físico-químicos del agua y adecuado manejo de los peces como la localización del estanque y el suministro de agua deben ser implementados para prevenir la manifestación de enfermedades.

**Palabras clave**: *Colossoma macropomum* – ectoparásito - enfermedad del punto blanco – ichthyophthiriasis - Gamitana - piscigranja.

## INTRODUCTION

The development of the aquaculture activity promotes the increase of inappropriate practices that disregard the care with the environment and the health of the animals. Intensive systems are often associated with increased stock density and volume and the massive use of artificial feed, often of poor quality. All these characteristics, together, act directly on the pathogen / environment / host relationship (García *et al.,* 2013). This relationship occurs in a balanced way in the natural environment, unlike the intensive systems that invariably act favoring the development of pathogens, while negatively affecting the environmental characteristics and the defense mechanisms of the host (García *et al.,* 2013).

*Colossoma macropomum* (Cuvier, 1818) (Characiformes: Characidae), known as tambaqui or gamitana, is an endemic species of the Amazon Basin and is considered the second largest fish in South America (Araujo-Lima & Goulding, 1997). The *C. macropomum* can reach up to 90 cm in length and 30 kg of total weight and is a highly appreciated species with great acceptance on the Amazonian market being regarded as an eatable fish of the highest quality (Gomes *et al.,* 2006).

Ectoparasites infections on fishes are commonly encountered in the wild and in aquaculture (Hoffman, 1999). Among ectoparasites, *Ichthyophthirius multifiliis* Fouquet, 1876 is a cosmopolitan ciliate protozoan, which causes parasitism called ichthyophthiriasis, or popularly known as "white spot disease". This parasite presents direct life cycle and short generation times, which may result in high infestation intensities (Noga, 2010). It is considered one of the most pathogenic parasites in fish affecting several species without showing host specificity (Yao *et al.,* 2011).

In the present study, a case of infestation of *I. multifiliis* and mortality of *C. macropomum* is reported from a fish-farm located in the Peruvian Amazon.

## MATERIAL AND METHODS

Two-thousand *C. macropomum* with 60 days old, 3.6 ± 0.34 cm standard length and 1.83 ± 0.45 g of weight were placed in a floating cage with 9.2 $m^2$ of dimension located in the middle of a fish pond with 8902 $m^2$ of dimension (Fig. 1A).

Two weeks after having been placed in the cage, the owner of the farm noticed some individuals of *C. macropomum* floating on the water. The first day 17 death fish were collected, the second 973 and the third day all the remaining fish died (Fig. 1C, 1D).

For examination and analyses, 200 samples were placed into plastic bags and transported to the laboratory of "Parasitología y Sanidad Acuícola" of the "Instituto de Investigaciones de la Amazonía Peruana" (IIAP), located in Iquitos, Peru.

The physicochemical parameters of the water (temperature, dissolved oxygen, carbon dioxide, pH, ammonium) were measured during the three days at 8 AM, noon and 4 PM using a YSI multiparameter (Model MPS 556) and using a complete package of freshwater (LaMotte AQ-2).

## RESULTS

In the laboratory an external observation of the individuals was made, noticing the presence of white spots on the skin, operculum and fins (Fig. 2A-D). Samples of skin scraping were taken and observed under microscope. After the observation of the samples, the protozoan *I. multifiliis* (Fig. 2E, 2F) was detected parasitizing the tegument, fins and gills of the fish, being responsible for high mortalities on the farm.

Values of physicochemical parameters of the water were: temperature (23 $^{O}$C), pH (6.8), dissolved oxygen (2 mg·$L^{-1}$), carbon dioxide (6.5 mg·$L^{-1}$) and ammonium (1.5 mg·$L^{-1}$).


**Figure 1.** A. Floating cage with *Colossoma macropomum* (Cuvier, 1818). B. Farm with pigs, placed at 150 m of the pond. C. Collection of dead fish, D. Dead specimens of *C. macropomum.*

## DISCUSSION

According to Faria *et al.* (2013) tropical fish tolerate temperature between 25 and 32 $^{O}$C, dissolved oxygen 1 – 5 mg·L$^{-1}$ , pH 6.5 – 9 and ammonium with values below 0.05 mg·L$^{-1}$). It is known that unsuitable environmental conditions and abrupt variations of the temperature, pH and oxygen concentration in aquaculture can render fishes more susceptible to parasites (Garcia *et al.,* 2007). In the present study, low values in the temperature together with high values of ammonium may have influenced the parasitism of *I. multifilis* in *C. macropomum* due to stress and weakening of the fish immune system.

In the Amazon, August is a month that corresponds to low water season, characterized by days with hot temperatures. However, in some days, strong rains with considerable reduction of the temperature may occur. As it was noticed in this study, strong oscillations of the temperature were registered before the presence of the pathology. High values in ammonium may be as a product of excessive organic and inorganic matter present in the water. At just 150 m of the pond, there is a farm of pigs (Fig 1B.). Residues of their food and also excrement of these animals are dragged by rains until the ponds, increasing the concentration of ammonium in the water.

Fish of importance for world aquaculture are affected by *I. multifiliis* every year, from carp

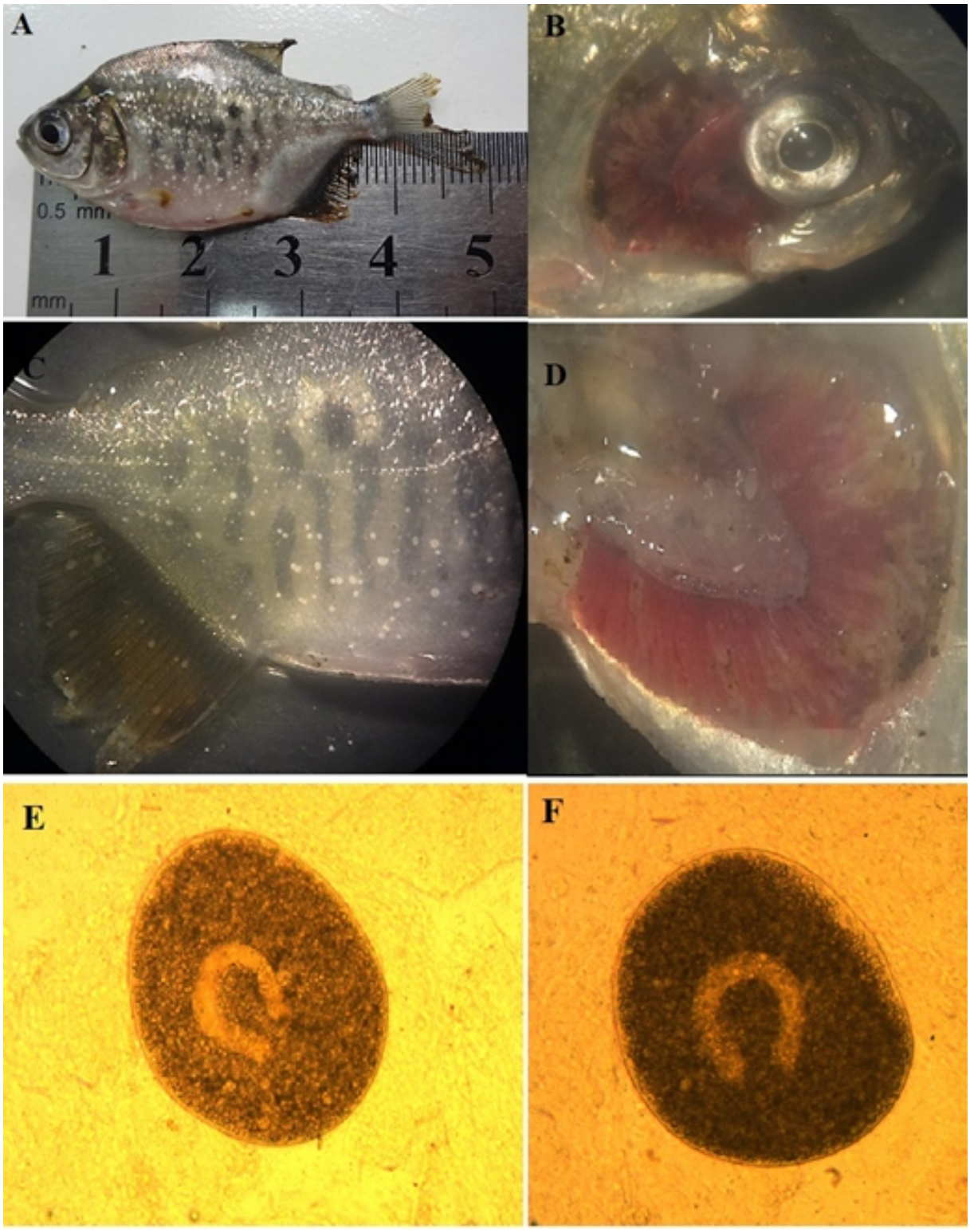


**Figure 2**. Specimen of *Colossoma macropomum* (Cuvier, 1818) with signs of "white spot disease". B. Observation of the gills of a specimen of *C. macropomum*. C. Body of a specimen of *C. macropomum* with white spots. D. Observation of damages on the gills of a specimen of *C. macropomum*. E and F. Microscopical observation of *Ichthyophthirius multifiliis* Fouquet, 1876.

*Cyprinus carpio* Linnaeus, 1758 (Witeska *et al*., 2010), trout *Oncorhynchus mykiss* (Walbaum, 1792) (Picón-Camacho *et al*., 2012), catfish *Ictalurus punctatus* (Rafinesque, 1818) (Xu *et al.,* 2012), *Oreochromis niloticus* (Linnaeus, 1758) (Pantoja *et al*., 2012) and of native fish species such as the catfish *Pseudoplatystoma reticulatum* Eigenmann & Eigenmann, 1889 (Jeronimo *et al.,* 2013), catfish *Rhamdia quelen* (Quoy & Gaimard, 1824) (Garcia *et al.,* 2011) paco *Piaractus mesopotamicus* (Holmberg, 1887) (Franceschini *et al.,* 2013), and gamitana *C. macropomum* (Matthews, 2005) decreasing the chances of success of the production of these fish.

The rate of ichthyophthiriasis morbidity can reach up to 100%, causing great economic losses (Osman *et al.,* 2009). In severe cases of infestation, deaths occur primarily due to respiratory impairment (Wei *et al.,* 2013). Microscopic lesions such as ulcers and necrosis of the integument and gill associated with the severe inflammatory response are commonly described in this disease (Matthews, 2005). In the present study, a new case of infestation of *I. multifiliis* is reported in the Peruvian Amazon. Our results showed also a case with 100% of mortality, observing ulcers in the gills that cause the death of the fish.

To prevent the manifestation of diseases and the death of fish, prophylactic measures and proper management such as adequate location of the pond together with the water supply must be implemented for fish-farmers. Daily evaluations of physico-chemical parameters are recommended, especially in regions with tropical weather, where strong oscillations of the temperature may be present from one day to another.

## BIBLIOGRAPHIC REFERENCES

Araujo-Lima, CRM & Goulding, M. 1997. *So fruitful fish: ecology, conservation, and aquaculture of the Amazon's tambaqui.* Columbia University Press, New York. 157 pp.

Faria, RHS, Morais, M, Soranna, MRGS & Sallum, BW. 2013. *Manual de criação de peixes em viveiro*. Brasília: Codevasf. 136pp.

Franceschini, L, Zago, AC, Schalch, SHC, Garcia, F, Romera, DM & Silva, RJD. 2013. *Parasitic infections of* Piaractus mesopotamicus *and hybrid (*P. mesopotamicus *x* Piaractus brachypomus*) cultured in Brazil.* Revista Brasileira de Parasitologia Veterinária, vol. 22, pp. 407-414.

Garcia F, Pilarskia F, Onakac EM, Moraes FR & Martins ML. 2007. *Hematology of* Piaractus mesopotamicus *fed diets supplemented with vitamins C and E, challenged by* Aeromonas hydrophila. Aquaculture, vol. 271, pp. 39–46.

Garcia, F, Romera, DM, Gozi, KS, Onaka, EM, Fonseca, FS, Schalch SH, Candeira, PG, Guerra, LOM, Carmo, FJ, Carneiro, DJ, Martins, MIEG & Portella, MC. 2013. *Stocking density of Nile tilapia in cages placed in a hydroelectric reservoir.* Aquaculture, vol. 410, pp. 51-56.

Garcia, LDO, Becker, AG, Cunha, MA, Baldisserotto, B, Copatti, CE & Kochhann, D. 2011. *Effects of water pH and hardness on infection of silver catfish,* Rhamdia quelen*, fingerlings by* Ichthyophthirius multifiliis. Journal of the World Aquaculture Society, vol. 42, pp. 399-405.

Gomes, LC, Chagas, EC, Martins, H, Roubach, R, Ono, EA & Lourenço, JNP. 2006. *Cage cultured of tambaqui (*Colossoma macropomum*) in a central Amazon floodplain lake*. Aquaculture, vol. 253, pp. 374–384.

Hoffman, GL. 1999. *Parasites of North American freshwater fishes*. Comstock Publishing Associates, Ithaca, New York, USA. 539pp.

Jerônimo, GT, Ventura, AS, Pádua, SB, Satake, F, Ishikawa, MM & Martins, ML. 2013. *Parasitofauna de cachara cultivado em tanque-rede no rio Paraguai.* Pesquisa Agropecuária Brasileira, vol. 48, pp. 1163-1166.

Matthews, RA. 2005. Ichthyophthirius multifiliis *Fouquet and Ichthyophthiriosis in Freshwater Teleosts*. Advances in Parasitology, vol. 59, pp. 159-241.

Noga, EJ. 2010. *Fish disease diagnosis and treatment*, 2nd edition. Wiley-Blackwell, San Francisco, California, USA. 304pp.

Osman, HAM, El-Bana, LF, Noor, El Deen, AE &

Abd El-Hady, OK. 2009. *Investigations on white spots disease (Ichthyophthriasis) in catfish (*Clarias gariepinus*) with special reference to the immune response*. Global Veterinaria, vol. 3, pp. 113–119.

Pantoja, MF, Neves, R, Dias, RD, Marinho, GB, Montagner, D & Tavares-Dias, M. 2012. *Protozoan and metazoan parasites of Nile tilapia* Oreochromis niloticus *cultured in Brazil*. Revista MVZ Córdoba, vol. 17, pp. 2812-2819.

Picón-Camacho, SM, Taylor, NG, Bron, JE, Guo, FC & Shinn, AP. 2012. *Effects of long duration, low dose bronopol exposure on the control of Ichthyophthirius multifiliis (Ciliophora), parasitising rainbow trout (Oncorhynchus mykiss Walbaum)*. Veterinary Parasitology, vol. 186, pp. 237-244.

Wei, JZ, Li, H & Yu, H. 2013. *Ichthyophthiriasis: emphases on the epizootiology.* Letters in Applied Microbiology, vol. 57, pp. 91-101.

Witeska, M, Kondera, E & Ługowska, K. 2010. *The effects of ichthyophthiriasis on some haematological parameters in common carp*. Turkish Journal of Veterinary and Animal Sciences, vol. 34, pp. 267–271.

Xu, DH, Shoemaker, CA & Klesius, PH. 2012. Ichthyophthirius multifiliis *as a potential vector of* Edwardsiella ictaluri *in channel catfish*. FEMS Microbiology Letters, vol. 329, pp. 160–167.

Yao, J, Zhou, Z, Li, X, Yin, W, Ru, H, Pan, X, Hao, G, Xu, Y & Shen, J. 2011. *Antiparasitic efficacy of dihydrosanguinarine and dihydrochelerythrine from* Macleaya microcarpa *against* Ichthyophthirius multifiliis *in richadsin (*Squaliobarbus curriculus*)*. Veterinary Parasitology, vol. 183, pp. 8–13.

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