Hidrobiológica 2020, 30 (2): 173-176

UNIVERSIDAD AUTÓNOMA METROPOLITANA
Casa abierta al tiempo
Unidad Iztapalapa

HIDROBIOLÓGICA
http:/hidrobiologica.izt.uam.mx
ISSN: 2448-7333

OPEN ACCESS
Research Article
August, 2020

# NOTA CIENTÍFICA

## Injuries caused by the invasive armoured suckermouth catfish *Pterygoplichthys* sp. in three captive Antillean manatees *Trichechus manatus manatus*

## Lesiones ocasionadas por el bagre armado del Amazonas *Pterygoplichthys* sp. en tres manatíes antillanos en cautiverio *Trichechus manatus manatus*

Jonathan Pérez-Flores[1*] and Omar Pigenutt-Galindo[2]

***Recibido:*** 15 de junio de 2018. ***Aceptado:*** 29 de junio de 2020. ***Publicado:*** agosto de 2020.

[1] Departamento de Sistemática y Ecología Acuática, El Colegio de la Frontera Sur, Unidad Chetumal. Avenida Centenario km 5.5, Chetumal, Quintana Roo, 77014. México.

[2] Conservación, Manejo y Aprovechamiento Sustentable de Flora y Fauna AC. Calle 4 Sur-Poniente 174, Colonia Centro, Tuxtla Gutiérrez, Chiapas, 29000. México.

***Corresponding author:**
Jonathan Pérez-Flores: e-mail: johnspf77@yahoo.com.mx

**To quote as:**
Pérez-Flores, J. & O. Pigenutt-Galindo. 2020. Injuries caused by the invasive armoured suckermouth catfish *Pterygoplichthys* sp. in three captive Antillean manatees *Trichechus manatus manatus*. *Hidrobiológica* 30 (2): 173-176.

DOI:10.24275/uam/izt/dcbs/hidro/2020v30n2/Perez

## ABSTRACT

**Background**: The interaction between *Pterygoplichthys* and Florida manatee (*Trichechus manatus latirostris*) was recorded approximately 13 years ago in Florida, United States. In Mexico, this interaction has not been documented neither in the wild nor in captivity. Until now it was supposed that *Pterygoplichthys* attach to manatees to forage the epibiota of the skin without causing any damage. However, some behaviour displayed suggests pain, stress, and discomfort when these fish attach to the manatee's skin. **Goals**: To determine if the skin wounds found in three captive manatees are associated with the presence of *Pterygoplichthys* in the facilities where they are housed. **Methods**: By trawling a large artificial lagoon (AL) for three consecutive days, every six months for two and a half years we decimated the local population of *Pterygoplichthys;* in the management pool (MP), fish were removed manually. Additionally, we reduced the time individuals spent in the management facilities by releasing them into the AL. **Results**: Total disappearance of the skin wounds was achieved in three years, due to their decreased interaction with the catfish (both through the reduction of the population of *Pterygoplichthys* and of the time spent by the manatees in the MP). **Conclusions**: Injuries were caused by the fact that manatees lived in a small space, without food available for the catfish, which caused an increase in the frequency and aggressiveness of the encounters. Therefore, we recommend creating and implementing strategies to reduce *Pterygoplichthys* populations in places where manatees inhabit, because in the future the wounds they cause could be a potential threat for the long-term population viability of the endangered Antillean manatee.

**Keywords**: Antillean manatee, Chiapas, Interactions, Invasive species, *Pterigoplichthys.*

## RESUMEN

**Antecedentes**: La interacción entre *Pterygoplichthys* y el manatí de Florida (*Trichechus manatus latirostris*) se registró desde hace aproximadamente 13 años en Florida, Estados Unidos. En México, esta interacción no ha sido documentada en vida libre ni en cautiverio. Hasta este momento, se creía que el pez diablo se adhería al manatí solamente para consumir la epibiota que vive en su piel sin ocasionarle ningún daño. Sin embargo, algunos comportamientos documentados sugieren dolor, estrés e incomodidad cuando este pez se adhiere a la piel del manatí. **Objetivos**: Determinar si existe una relación entre las heridas cutáneas presentes en tres manatíes en cautiverio y la presencia de *Pterygoplichthys* en las instalaciones donde se encuentran albergados. **Métodos**: Se diezmó la población de *Pterygoplichthys* mediante la técnica de arrastre en una laguna artificial grande (LA) durante tres días consecutivos, cada seis meses durante dos años y medio; en el estanque de manejo (EM), la remoción fue manual. Además, redujimos el tiempo que los individuos pasaban en el EM al liberarlos en la LA. **Resultados**: La desaparición total de las heridas cutáneas se logró en dos años y medio, gracias a la reducción de la interacción de los manatíes con los peces diablo (tanto a través de la reducción

de la población de *Pterygoplichthys* como a que se disminuyó el tiempo que pasaban los manatíes en el EM). **Conclusiones**: Las lesiones ocasionadas por *Pterygoplichthys* se debían a que los manatíes habitaban en un espacio reducido y sin alimento disponible para los peces; esto causó un aumento en la frecuencia y agresividad de los encuentros. Por lo que recomendamos crear e implementar medidas para reducir las poblaciones de peces diablo en los lugares donde habitan los manatíes, ya que en el futuro esto podría convertirse en una amenaza para la viabilidad a largo plazo de las poblaciones de una especie amenazada como lo es el manatí antillano.

**Palabras clave**: Chiapas, Especie invasiva, Interacciones, Manatí antillano, Pez diablo.

The Grijalva and Usumacinta rivers, the most important rivers in southern Mexico, begin their course in Guatemala and flow through the states of Chiapas and Tabasco (Pease *et al*., 2012). In the Mexican side of this basin, Miller (2005) documented the presence of 115 fish species, 41 out of which are endemic. There are also two species of aquatic mammals, the Neotropical river otter (*Lontra longicaudis*, Olfers 1818) and the Antillean manatee (*Trichechus manatus manatus*, Linnaeus 1758), considered near-threatened and endangered, respectively, by the IUCN (Self-Sullivan & Mignucci-Giannoni, 2008; Rheingantz & Trinca, 2015).

Over the last 15 years, Mexican freshwater ecosystems have been affected by the presence of the invasive armoured suckermouth catfish (*Pterygoplichthys pardalis*, Castelnau 1855 and another species of the genus) (Mendoza *et al*., 2007). This species is tolerant to extreme changes of temperature, flow, salinity and quality of water (Capps *et al*., 2011; Bijukumar *et al*., 2015). Additionally, its early reproduction, nest construction, parental care, high fertility rate (800 to 1500 eggs per female) and larval survival have facilitated its invasion in water bodies from all over the world (Tello *et al*., 1992; Hoover *et al*., 2004).

Armoured catfish interactions with other species include its predators (Power, 1984; Willard, 1985; Bistoni *et al*., 1995; Aguilar & Di-Bernardo, 2004; Kasper *et al*., 2008; Bonino *et al*., 2009; Borteiro *et al*., 2009; Cabral *et al*., 2010; Ríos-Muñoz, 2015) and the Florida manatee (*T. m. latirostris*) (Nico *et al*., 2009). This last interaction is controversial, because it is not clear whether it is beneficial or harmful to manatee's health. Nico *et al*. (2009) mentioned that catfish attached to manatees to feed on the epibiota that live on their skin and searching for protection from its predators. In Florida, no injured manatees had been observed due to catfish attachment and in surveys analysing catfish gut contents, no epibiont (e.g., copepods, nematodes, ostracods) was found only algae (Gibbs *et al*., 2010). However, when manatees have a catfish attached, they have been observed agitated, irritated, discomforted and attempting to dislodge catfish; these reactions have been also observed when larger jacks and *Archosargus probatocephalus*, Walbaum 1792, peck the manatees (Nico *et al*., 2009; Gibbs *et al*., 2010). This suggests that some structures of fish oral apparatus (teeth) are harming manatees.

Manatees in southern Mexico are considered abundant (Colmenero & Hoz, 1986; Álvarez *et al*.,1988), but in the last two decades, orphaned and injured animals have been rescued and transferred to different institutions (e.g., zoos, aquariums, universities, wildlife rescue centres) (Ortega-Argueta & Castelblanco-Martínez, 2018) of the states of Chiapas and Tabasco to provide them with veterinary clinical assistance. In most of the facilities where these animals are housed, the water used to fill the pools comes from the hydrological network of the lower basin of the Grijalva-Usumacinta, which increases the frequency and intensity of the contact among catfish and manatees.

Three adult female manatees are kept in an artificial lagoon (AL) (6824 $m^2$ total area) in Palenque, Chiapas, Mexico (17º 29'10'' N, 92º 01'10'' W). This lagoon is connected to a management pool (MP) (8.40 m wide, 7.20 m long and 2.10 m deep), where veterinarians inspect animals and keepers conduct training sessions. The water filling these artificial water bodies is turbid and comes from a nearby lagoon (1 km away). Two of the manatees arrived in August 2011 from an aquarium from Veracruz, Mexico. One of them has a total length (TL) of 2.75 m (13 years old), weighing 650 kg and the other has a TL of 2.87 m, and weighs 700 kg (14 years old). The third one (TL=3.28 m, unknown age and weighs 850 kg) was rescued from the wild in May 2013 from nearby Catazajá wetlands (Figure 1 A). Upon its arrival, none of the manatees presented wounds, just the wild one presented a buoyancy problem derived from ingestion of plastic garbage. Since their arrival, the females that came from the aquarium lived in the MP, due to the difficulty to handle them in the AL. On the other hand, the wild female spent a few weeks in the MP while recovering from the buoyancy problem; after the veterinarians discharged her, she was released to the AL.

In December 2013, as part of a routinely veterinary examination, the water of the MP was removed and while examining the manatees' skin we observed rounded and irregular lesions through the dorsal region (head, thorax, pectoral flippers, abdomen, fluke) (Figure 1 B, D-E); no other clinical sign was observed. Cutaneous lesions of the three manatees were similar in appearance (width from 0.4 to 2.1 cm; length from 0.5 to 2.3 cm), irregular, sometimes well defined, with an abnormal thickening of the skin showing a rough surface and a light grey to off-white coloration. Occasionally the lesions showed very prominent borders and a whitish depressed centre (crater-like). These lesions were interpreted as ulcers in healing process. No systemic or topical medication was administered to the individuals. During each examination, we observed that wounds were healing slowly from the periphery to the centre. This type of healing process has been observed previously by one of the authors in other injured manatees from the Mexican Caribbean (Pérez-Flores *et al*., 2010). Finally, in January 2017, we performed the last clinical evaluation and observed a total recovery of cutaneous wounds (Figure 1C).

After inspecting the MP carefully, we didn't find any object that could cause these kinds of injuries, except for the presence of 120 suckermouth catfish. Therefore, in May 2014 we decided to establish a protocol to reduce the population of catfish in AL and MP, and to monitor the manatees' skin healing process. First, we removed the water from the MP every 20 days to take out catfish and track the healing process of the wounds. Second, periodic extraction of catfish from the AL was performed by trawling three consecutive days every six months for two and a half years. Since we performed the first trawling, we decided to release the two manatees held in the MP into the AL to avoid contact between the manatees and the catfish.

The eradication of catfish from the MP was achieved in five months by removing catfish every time we emptied the MP (every 20 days) and closing the gates that connect with the AL. Meanwhile, hundreds of catfish were removed from the AL since the first trawling; however, complete eradication was not possible due to the characteristics of the lagoon.


**Figure 1.** Same female manatee on three different dates: A) May 2013 the day she arrived to the facilities without wounds, B) December 2013 she presented wounds through all the dorsal region, C) January 2017 the wounds totally disappeared, D-E) Rounded and irregular cutaneous lesions presented through all the dorsal area. Photo A courtesy of María Silva.

It was previously assumed that the interaction between *P. pardalis* and manatees was not harmful for the latter (Nico *et al*., 2009; Gibbs *et al*., 2010). However, Williams (2005) and Nico *et al*. (2009) mentioned that catfish sometimes bite the skin of manatees, causing them to squirm and roll, flip the fluke, increase vocalizations, and rub their body against some superficies (e.g., branches, logs, stream bottom). Despite the fact that manatee skin is thick, we believe that this kind of behaviour is displayed as a consequence of pain or discomfort caused by the scrapping-feeding movements of *P. pardalis* (Adriaens *et al*., 2009). Catfish present a row of rake-like teeth, which they use to scrape up to one and a half meters deep in different kind of substrates they have invaded (Mendoza *et al*., 2007; Adriaens *et al*., 2009).

The parts of the body where we observed the wounds (head, snout, dorsal and ventral regions, and caudal fluke) are the same parts where catfish are usually found attached (Nico *et al*., 2009). Furthermore, the length of *Pterygoplichthys* sp. found in the MP (28.0 to 44.6 cm) coincides with the length (30-40 cm) of catfish attached to manatees in Florida (Nico *et al*., 2009). Williams (2005) and Nico *et al*. (2009) observed up to 40 catfish attached to a single manatee for a period of four minutes; however, it only takes one armoured catfish attached to a manatee to provoke a change in latter's behaviour (Gibbs *et al*., 2010). Due to low visibility, we only observed catfish attached (a maximum of 2 minutes) to the manatees during the training sessions, but when manatees swam on the surface most of the fish detached.

We hypothesize that two factors induced catfish to injure manatees. First, the long period of time spent by manatees in the MP. The MP is a small concrete reduced space where manatees cannot escape from catfish; this could increase the frequency and intensity of the attachment to the skin causing the observed wounds. Second, walls and floor of the MP were constantly cleaned, preventing the accumulation of organic particles; thus, the only source of food for *Pterygoplichthys* were the algae present in manatees' body, and once the algae were removed, they probably began to scrape manatees' skin.

We assumed that the main factor that contributes to heal the wounds of the manatees was the declining and eradication of catfish population from AL and MP respectively. This process must be carried out through the periodic extraction followed by killing, due to the rapid rate of colonisation of this species (Schmitter-Soto *et al*., 2015).

This interaction has probably been carried out since catfish invaded the fluvial-lagoon systems of Chiapas and Tabasco; however, the turbidity of the water makes it difficult to document it. The reduction of size of water bodies during the dry season could favour the contact between manatees and catfish; this might be harmful for manatees' health, since it is speculated that dermal scavenging is associated with the papilloma virus (Nico *et al*., 2009). For these reasons, it is necessary to create and implement strategies to control or eradicate armoured catfish populations, since there is evidence that this species is increasingly abundant and could be a potential threat to the long-term population viability of the endangered Antillean manatee in the South of Mexico.

## ACKNOWLEDGEMENTS

We thank the personnel of the Zoological Institution in Chiapas. Special thanks to Adriana de los Santos for helping in the manuscript. This manuscript benefited from comments by Juan Jacobo Schmitter Soto and two anonymous reviewers

## REFERENCES

Adriaens, D., T. Geerinckx, J. Vlassenbroeck, L. Van Hoorebeke & A. Herrel. 2009. Extensive jaw mobility in suckermouth armored catfishes (Loricariidae): a morphological and kinematic analysis of substrate scraping mode of feeding. *Physiological and Biochemical Zoology* 82(1): 51-62. DOI:10.1086/594378

Aguilar, L. F. S. & M. Di-Bernardo. 2004. Diet and Feeding Behavior of *Helicopsinfra taeniatus* (Serpentes: Colubridae: Xenodontinae) in Southern Brazil. *Studies on Neotropical Fauna and Environment* 39(1): 7-14. DOI:10.1080/01650520412331270927

Álvarez, C., A. Aguayo & L. Jhonson. 1988. Observaciones sobre el manatí *Trichechus manatus* en la región media del Usumacinta, Tabasco. *In*: Chávez-Lomelí, M. O. (ed.). *Ecología de los ríos Usumacinta y Grijalva*. Instituto Nacional de Investigación sobre Recursos Bióticos, División Regional Tabasco y Gobierno del Estado de Tabasco. Villahermosa, Tabasco, México. pp. 617-624.

Bijukumar, A., R. Smrithy, U. Sureshkumar & S. George. 2015. Invasion of South American suckermouth armoured catfishes *Pterygoplichthys* spp. (Loricariidae) in Kerala, India a case study. *Journal of Threatened Taxa* 7(3): 6987-6995. DOI:10.11609/JoTT.o4133.6987-95

Bistoni, M. A., J. G. Haro & M. Gutiérrez. 1995. Feeding of *Hoplias malabaricus* in the wetlands of Dulce River (Córdoba, Argentina). *Hydrobiologia* 316: 103-107.

Bonino, M., J. J. N. Lescano, J. G. Haro & G. C. Leynaud. 2009. Diet of *Hydromedusa tectifera* (Testudines-Chelidae) in a mountain stream of Córdoba province, Argentina. *Amphibia-Reptilia* 30(4): 545-554.

Borteiro, C., F. Gutiérrez, M. Tedros & F. Kolenc. 2009. Food habits of the broad-snouted Caiman (*Caiman latirostris*: Crocodylia, Alligatoridae) in northwestern Uruguay. *Studies on Neotropical Fauna and Environment* 44(1): 31-36.

Cabral, M. M. M., J. Zuanon, G. E. de Mattos & F. C. W. Rosas. 2010. Feeding habits of giant otters *Pteronura brasiliensis* (Carnivora: Mustelidae) in the Balbina hydroelectric reservoir, Central Brazilian Amazon. *Zoologia* 27(1): 47-53.

Capps, K. A., L. G. Nico, M. Mendoza-Carranza, W. Arévalo-Frías, A. J.Ropicki, S. A. Heilpern & R. Rodiles-Hernández. 2011. Salinity tolerance of non-native suckermouth armoured catfish (Loricariidae: *Pterygoplichthys*) in south-eastern Mexico: implications for invasion and dispersal. *Aquatic Conservation: Marine and Freshwater Ecosystems* 21: 528-540. DOI:10.1002/aqc.1210.

Colmenero, L. C. & M. E. Hoz. 1986. Distribución de los manatíes, situación y conservación en México. *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología* 56(3): 955-1020.

Gibbs, M., T. Futral, M. Mallinger, D. Martin & M. Ross. 2010. Disturbance of the Florida manatee by an invasive catfish. *Southeastern Naturalist* 9: 635-648.

Hoover, J. J., K. J. Killgore & A. F. Cofrancesco. 2004. Suckermouth catfishes: Threats to aquatic ecosystems of the United States? *Aquatic Nuisance Species Research Program Bulletin* 4(1): 1-9.

Kasper, C. B., V. A. G. Bastazini, J. Salvi & H. C. Z. Grillow. 2008. Trophic ecology and the use of shelters and latrines by the Neotropical otter (*Lontra longicaudis*) in the Taquari Valley, Southern Brazil. *Iheringia, Série Zoologia* 98: 469-474. DOI:10.1590/S0073-47212008000400009

Mendoza, R., S. Contreras, C. Ramírez, P. Koleff, P. Álvarez & V. Aguilar. 2007. Los peces diablo: Especies invasoras de alto impacto. *Biodiversitas* 70: 1-5.

Miller, R. R. 2005. *Freshwater Fishes of Mexico*. University of Chicago Press, Chicago. 652 p.

Nico, L. G., W. F. Lotus & J. P. Reid. 2009. Interactions between non-native armored suckermouth catfish (Loricariidae: *Pterygoplichthys*) and native Florida manatee (*Trichechus manatus latirostris*) in artesian springs. *Aquatic Invasions* 4(3): 511-519. DOI:10.3391/ai.2009.4.3.13

Ortega-Argueta, A.& D. N. Castelblanco-Martínez. 2018. Is captive breeding a priority for manatee conservation in Mexico? *Oryx* 54(1): 1-8. DOI:10.1017/S0030605317001697

Pease, A. A., A. A. González-Díaz, R. Rodiles-Hernández & K. O. Winemiller. 2012. Functional diversity and trait-environment relationships of stream fish assemblages in a large tropical catchment. *Freshwater Biology* 57(5): 1060-1075.

Pérez-Flores, J., A. G. Rosas-Rosas & J. G. Pérez-Juarez. 2010. Treatment and wound management of a semicaptive harpooned manatee (*Trichechus manatus*) in Laguna Guerrero, México. American Association of Zoo Veterinarians Annual Conference, South Padre Island, Texas from 23 to 29 of October.

Power, M. E. 1984. Habitat quality and the distribution of algae-grazing catfish in a Panamanian stream. *The Journal of Animal Ecology* 53: 357-374.

Rheingantz, M. L. & C. S. Trinca. 2015. *Lontra longicaudis*. *The IUCN Red List of Threatened Species* 2015: e.T12304A21937379. Available online at: DOI:10.2305/IUCN.UK.2015-2.RLTS.T12304A21937379.en.

Ríos-Muñoz, C. A. 2015. Depredación de pez diablo (Loricariidae: *Pterygoplichthys*) por el cormorán oliváceo (*Phalacrocorax brasilianus*) en Villahermosa, Tabasco, México. *Huitzil, Revista Mexicana de Ornitología* 16(2): 62-65.

Schmitter-Soto, J. J., R. Quintana, M. E. Valdez-Moreno, R. L. Herrera & P. C. Esselman. 2015. Armoured catfish (*Pterygoplichthys pardalis*) in the Hondo river, Mexico-Belize. *Mesoamericana* 19(3): 9-19.

Self-Sullivan, C. & A. A. Mignucci-Giannoni. 2008. *Trichechus manatus* ssp. *manatus*. *The IUCN Red List of Threatened Species* 2008: e.T22105A9359161. Available online at: DOI:10.2305/IUCN.UK.2008.RLTS.T22105A9359161.en (downloaded April 30, 2018).

Tello, J. S., V. H. Montreuil, J.T. Maco, R.A. Ismiño & H. Sanchez.1992. Bioecología de peces de importancia económica de la parte inferior de los ríos Ucayali y Maranon-Perú. *Folia Amazonica* 4(2): 87-107.

Willard, D. E. 1985. Comparative feeding ecology of twenty-two tropical piscivores. *Ornithological Monographs* 36: 788-797.

Williams, L. 2005. Individual distinctiveness, short-and long-term comparisons and context specific rate of Florida manatee vocalizations. Master in Science Thesis, University of North Carolina, Wilmington. NC. 93 p.