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Short Communication

Injuries caused by fish in a community of Pantanal fishermen: detection, treatment, and prevention of envenomations and trauma

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Abstract

Introduction: Injuries caused by fish are common in the Pantanal, a flooded area in Midwestern Brazil. **Methods**: A survey was conducted to identify venomous and trauma-inducing fish and the incidence of such injuries in a local fishing community. **Results**: The injuries were caused by catfish, freshwater stingrays, and piranhas. All fishermen had suffered injuries, and nearly 30% had recent injuries. **Conclusions**: A leaflet and discussions decreased the injuries (only two were recorded in the next year). The campaign educated fishermen about prevention of and first aid for injuries. Similar campaigns will be performed in other communities of the Pantanal.

Keywords: Pantanal. Occupational accidents. Fishermen. Traumatogenic fish. Venomous fish. Catfish.

The Pantanal region experiences seasonal flooding caused by the Paraguay River and its tributaries, which form a connection between the Brazilian Cerrado and the flooded areas (**Figure 1**). The ichthyofauna have a high species richness, which allows for commercial and amateur fishing, important economic and subsistence factors for the local people. The latest data indicate that the number of professional fishermen increased by 95.7% in one year, jumping from 1,921 in 2014 to 3,759 in 2015. Thus, the number of guides completed in SCPesca (Mato Grosso do Sul State Fishery Control System) increased from 4,140 to 5,259 in the same period[1,2]. The most-caught fish in the Pantanal, according to the SCPesca/MS, are listed below[1,2].

Catfish caught in the Pantanal:

Curimbatá (Streaked prochilod) - *Prochilodus lineatus* Valenciennes, 1837
Dourado (Dorado) - *Salminus brasiliensis* Cuvier, 1816
Pacu – (Pacu) *Piaractus mesopotamicus* Holmberg, 1887
Piavuçu - *Leporinus macrocephalus* Garavelo & Britski, 1988
Piranhas – *Pigocentrus nattereri* (Red piranha) Kner, 1858; *Serrasalmus maculatus* Kner, 1858; *Serrasalmus marginatus* Valenciennes, 1837
Piraputanga - *Brycon hilarii* Valenciennes, 1850
Tucunaré (Peacock seabass) - *Cichla* sp. Kullander & Ferreira, 2006
Arraias fluviais (Freshwater stingrays) - *Potamotrygon motoro* (South American freshwater stingray) Müller & Henle, 1841; *P. falkneri* (Largespot river stingray) Castex & Maciel, 1963; *P. brachyura* (Shot-tailed river stingray) Günther, 1880.

Most important scale fish caught in the Pantanal:

Pinirampus pirinampu Spix & Agassiz, 1829 and *Luciopimelodus pati* Valenciennes, 1840 – Barbado e Pati (Flatwhiskered catfish)
Pseudoplatystoma reticulatum Eigenmann & Eigenmann, 1889 - Surubim Cachara (Striped catfish)
Pseudoplatystoma corruscans Spix & Agassiz, 1829 - Surubim Pintado (Spotted catfish)
Zungaro jahu Ihering, 1898 - Jaú (Gilded catfish)
Sorubim lima Bloch & Schneider, 1801 - Jurupensém (Duckbill catfish)
Hemisorubim platyrhynchos Valenciennes, 1840 - Jurupoca (Porthole shovelnose catfish)

The diversity of fish species and large number of fishermen in the Pantanal lead to injuries being common in the region, as previously published studies show[3,4]. In addition, less economically valuable species such as the freshwater stingrays can be caught; these stingrays have one to four stingers covered by venomous mucus on the tail. Other small catfish, such as the mandis and bagres, can also be caught; these fish have three venomous body stingers and cause painful injuries in the fishermen[5,6].

Injuries may be associated with mechanical trauma from stingers, teeth, or other traumatogenic structures, and generally occur when fishermen handle the fish when withdrawing them from hooks or nets. These traumas can also include envenomations, since some of these fish are venomous and have the ability to inoculate toxins into the victim through stingers; such fish include freshwater stingrays, spotted catfish, striped catfish, and some other catfish[3,4]. In a survey carried out in fishermen's colonies in Coxim and Corumbá counties

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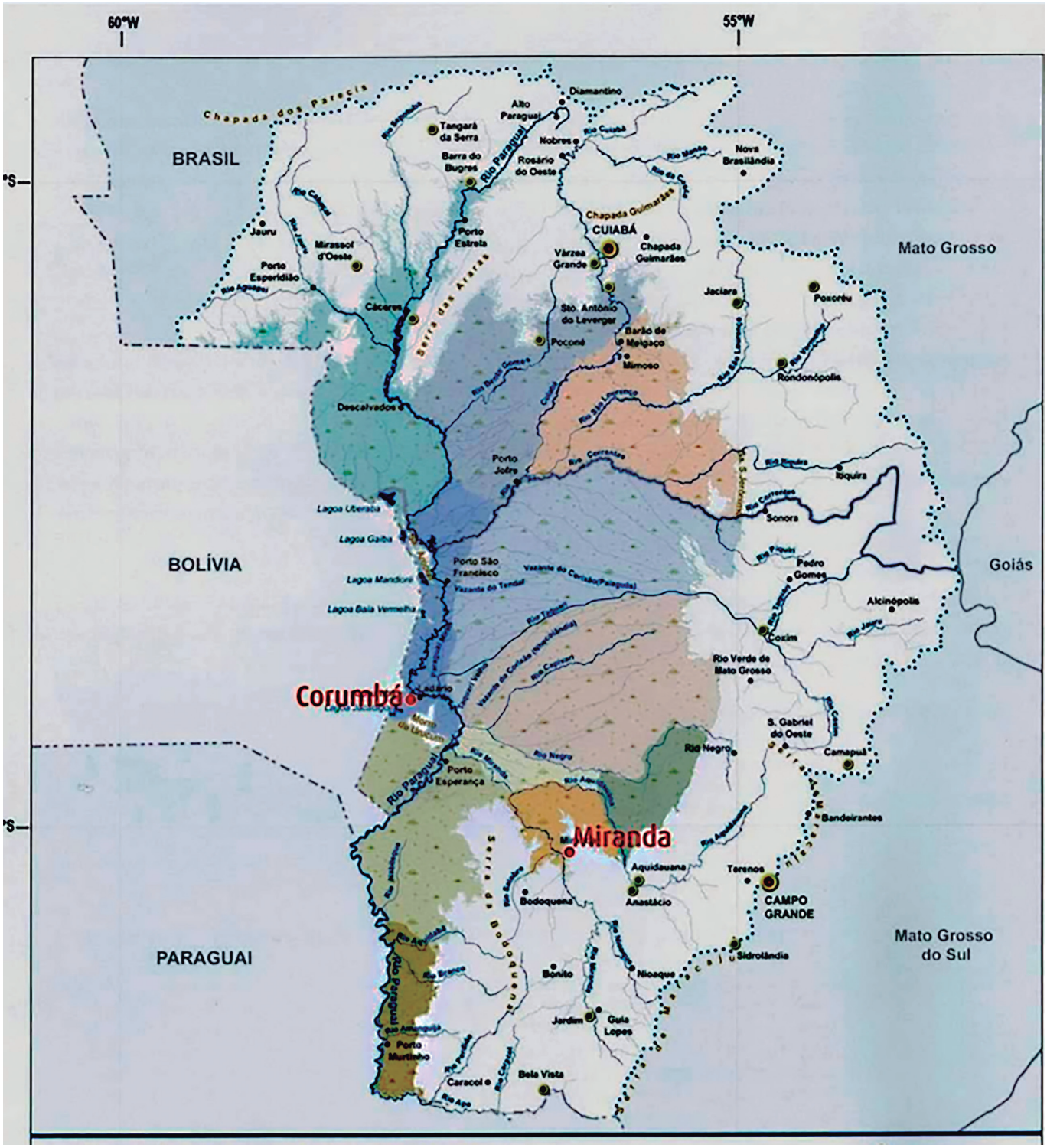

FIGURE 1: Map of the Pantanal with indication of the region of the project. Adapted from *Agência Nacional das Águas* (ANA) and *Organização dos Estados Americanos* (OEA) (2004).; **PNUMA:** *Programa das Nações Unidas para o Meio Ambiente*; **GEF:** *Fundo Global para o Meio Ambiente*.

(Mato Grosso do Sul State), all fishermen reported some kind of animal-caused injury during their work, with fish causing 78% of the injuries[3]. Another survey, in Miranda county, showed that of 126 fishermen, 38 (approximately 30%) had previously been injured by spotted or striped catfish, and in Corumbá county, 111 of 355 fishermen (56.61%) reported injuries caused by these fish[4].

Envenomations by venomous fish such as spotted catfish, striped catfish, mandis, and freshwater stingrays are very painful and cause extreme malaise in the victim in the first few hours, and carry a possibility of secondary fungal and bacterial infections. Another complication is the introduction of foreign bodies when stingers are broken in the wounds. Even more serious are the injuries caused by freshwater stingrays, which

in addition to causing severe pain and incapacitation for days or weeks, can cause extensive skin necrosis and chronic ulcers that may have difficulty healing, with the possibility of development of disabling sequelae[5,6].

Traumatic lesions such as piranha bites can cause deep ulcers and severe immediate bleeding, as well as serious subsequent bacterial infections[3-6]. In addition, recommended first aid measures, such as immersion of the affected site in hot water for 30-90 minutes, were not carried out by the fishermen in this survey. The local temperature increase with this treatment causes vasodilation, a counterbalance to the vasoconstriction caused by the venom of spotted catfish, striped catfish, stingrays, and mandis. This adds to the partial inactivation of the toxins by the heat and greatly improves the pain level of the patients[3-6].

Due to this high rate of injuries and the problematic consequences for the fishing communities of the Pantanal region, a survey-based study was carried out to confirm the species causing traumatic accidents and envenomations and to verify the incidence of these injuries in the local fishing community of Passo do Lontra, located between Corumbá and Miranda counties. This study was carried out over 4 years, starting in 2014, and was aided each year by a different team of academics from the last year of the Faculdade de Medicina de Botucatu, - Universidade Estadual Paulista. Based on the data obtained in the initial surveys, an explanatory leaflet, aimed at preventing injuries and using first aid measures when injuries occur, was prepared and widely discussed with the community. The study, supported by the CAPES Toxinology Project, was completed in March 2017 with an evaluation of the decline in injuries in the community after the interactive awareness project.

Of the 68 fishermen in the community, 47 (69.12%) responded to a questionnaire about the most common injury-causing fish in the region and the details of the injuries.

The fish most often captured and marketed in the region are the spotted catfish and the striped catfish, and there are high frequencies of dorados and pacus. Other fish of economic value are the flatwhiskered catfish and piraputanga. One hundred percent of the fishermen in this study (47) had had injuries caused by fish and about 30% (14 fishermen) had lesions at the time of the interview, with ulcers being the most common finding at the time of the examination (9 fishermen, or 19.15%). The species that caused most of these injuries were the spotted catfish and striped catfish (7 fishermen, or 14.90%). More rarely, other catfish such as flatwhiskered catfish, duckbill catfish, and porthole shovelnose catfish, cause trauma and envenomations. Although not commercially important to the community, fish such as freshwater stingrays and piranhas can be caught and cause severe acute envenomation and trauma accompanied by cutaneous necrosis. Envenomations by freshwater stingrays are very serious, with intense inflammation and excruciating initial pain and progression to extensive necroses and ulcers that are slow to heal. Piranhas are the fish that most often cause traumatic injuries, due to bites with sharp teeth, but all fish can cause mechanical trauma due to sharp teeth and other sharp body structures (**Figure 2**).

Based on these data, an explanatory leaflet written in simple language (**Figure 3**) was prepared in early 2016 and distributed during lectures and interactive activities. The activities were designed to teach the community to avoid new injuries and to carry out scientifically based first aid treatments when injuries did occur. The effectiveness of this campaign was evaluated in March 2017, when all 47 fishermen were again interviewed; there was a marked decrease in the rate of accidents. There were only two injuries during the year prior to this survey, and none of the fishermen had lesions at the time of the interview. The injuries were caused by piranha bites, and no envenomations were recorded after the campaign.

FIGURE 2: Left, top: Spotted catfish and striped catfish, or Surubins pintado and cachara (*Pseudoplatystoma corruscans* and *Pentabrachion. reticulatum*). Right, top: freshwater stingray (*Potamotrygon motoro*). Left, below: Red piranha (*Pygocentrus nattereri*). Right, below: Mandijuba catfish (*Pimelodus maculatus*). These fish are the main causes of injuries in fishermen in the Pantanal region. **Injuries caused by fish in fishermen in the study:** Top: inflammatory process with intense pain after a spotted catfish sting. Right: chronic ulcer resulting from envenomation by a freshwater stingray. Below: Piranha bites. Right: ulcer caused by skin necrosis after a mandi´s sting.

Injuries caused by fish are the most common occupational accidents in the Pantanal region of Mato Grosso do Sul State. This is also true in other places that include marine environments[3-7]. .The fauna is very varied and exposes the workers to a wide range of trauma and envenomations, and the most important injuries are those caused by spotted catfish, striped catfish, the mandis (catfish), freshwater stingrays, and other fish capable of causing serious traumatic injuries, like the piranhas. All fishermen in this study had suffered injuries of this type and about 30% had recent injuries at the time of the survey.

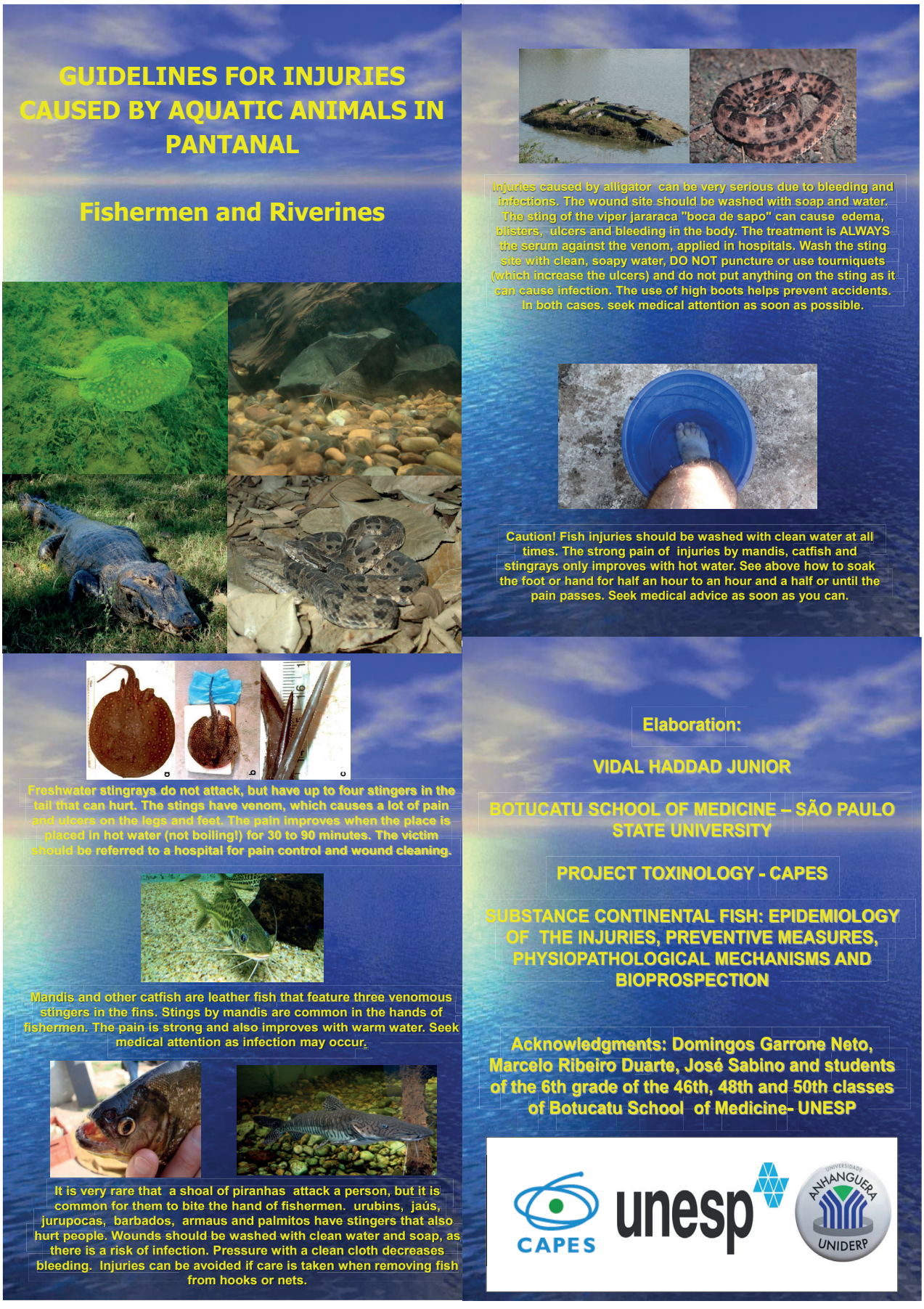

FIGURE 3: Leaflet used in interactive activities with the fishermen as part of the project.

With the proposed activities, which include discussion of an information leaflet prepared for this study, accident rates fell sharply. We believe that a campaign aimed at educating fishermen about potentially dangerous fish and their traumatic structures, first aid measures to be used when injuries do occur, and ways to prevent new injuries can change their relationship with the most common problem in their profession. Similar campaigns could be carried out in the Pantanal and other communities of marine and freshwater fishermen, possibly with the same results.

Ethical considerations

This project was approved by the Human Research Ethics Committee of the Faculdade de Medicina de Botucatu with the registration number CEPE 4300-2012 on August 8, 2012.

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Conflict of interest

The author declares that there is no conflict of interest.

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