



Article/Artigo

Injuries and envenoming by aquatic animals in fishermen of Coxim and Corumbá municipalities, State of Mato Grosso do Sul, Brazil: identification of the causative agents, clinical aspects and first aid measures

Traumas e envenenamentos por animais aquáticos em pescadores de Coxim e Corumbá, Estado de Mato Grosso do Sul, Brasil: identificação de agentes causadores, aspectos clínicos e medidas de primeiros socorros

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ABSTRACT

Introduction: The fishes of continental Brazil have socioeconomic importance due to their potential for sport fishing and commercial and subsistence uses, as seen in the Upper Paraguay River Basin, particularly in the municipalities of the Pantanal region, where it is the second largest economic activity. Injuries caused in professional fishermen are common and poorly studied, as in other regions of the country. **Methods:** Data were obtained from questionnaires and interviews with 100 professional fishermen, 50 in each municipality, between December 2008 and October 2009. **Results:** All the fishermen reported some kind of injury caused by fish stings (78% of injuries) and fish, alligator and snake bites (22%) on the hands (46% of cases) and feet (35% of cases). Most of the patients had mild symptoms. The most severe cases were associated with secondary bacterial infections and required specific treatment and prolonged recovery associated with social and economic losses. **Conclusions:** The results of this study indicate that the stressful work conditions, inattention to basic preventive measures and carelessness were factors that contributed to accidents and that the toxicity and ability to inflict mechanical trauma of some aquatic species, plus the ineffective use of first aid and hospital treatment, contributed to the high morbidity and complications in many cases. Data from this study are relevant to the fishing communities of the Pantanal region, since they reveal high rates of accidents, lack of knowledge concerning first aid, initial treatment, injury prevention and lack of medical follow-up of the population.

Key-words: Fish. Venomous animals. Trauma. Fishermen. Public health. Pantanal.

RESUMO

Introdução: Os peixes continentais do Brasil têm grande importância socioeconômica, tanto pelo potencial para a pesca esportiva, quanto para a pesca comercial e de subsistência, como é notado na bacia do Alto Rio Paraguai, particularmente, nos municípios da região do Pantanal. Ferimentos e envenenamentos em pescadores profissionais são comuns e pouco estudados. **Métodos:** Foram entrevistados 100 pescadores profissionais, 50 em cada município, entre dezembro/2008 e outubro/2009. **Resultados:** Todos relataram ter sofrido algum tipo de acidente, sendo estes causados por ferões de peixes (78% dos acidentados) e mordidas de peixes, jacarés ou serpentes (22%), estes ocorridos em maioria nas mãos (46% dos casos) e pés (35% dos casos). A maioria dos pacientes apresentou sintomas leves. Os casos mais graves apresentavam infecções bacterianas e necessitaram de tratamento específico e tempo prolongado de recuperação, o que condicionou às vítimas prejuízos socioeconômicos. **Conclusões:** Os resultados deste estudo indicam que, no plano social, as condições estressantes do trabalho, a desatenção com medidas preventivas básicas e o descuido foram os fatores que mais contribuíram para os acidentes. Por outro lado, a capacidade de algumas espécies de envenenar ou de produzir traumas mecânicos e o emprego de primeiros socorros e tratamentos hospitalares ineficazes contribuíram para a grande morbidade e complicações em muitos casos. Os dados deste estudo são relevantes para as comunidades pesqueiras do Pantanal, uma vez que revelam altos índices de acidentes de trabalho, inexistência de noções de primeiros socorros ou prevenção dos acidentes e ausência de atendimento médico continuado junto a estas populações.

Palavras-chaves: Peixes. Animais peçonhentos. Traumas. Pescadores. Saúde pública. Pantanal.

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INTRODUCTION

The fishes of continental Brazil have socioeconomic importance for several Brazilian states, due to the potential of sport fishing and commercial and subsistence activities, as seen in the Upper Paraguay River Basin, particularly in the municipalities of the Pantanal region, where it is the second most important economic activity¹. In the Pantanal region, the towns Coxim and Corumbá, in the State of Mato Grosso do Sul, and the towns of Poconé and Cáceres, in the State of Mato Grosso, are the main representatives of the economic region for their importance in the production and marketing of cattle and activities like tourism, which is fueled by the sport of amateur and professional fishing².

Injuries to humans caused by aquatic animals, whether marine or freshwater, are common and can be observed in many situations, causing painful processes, necrosis, mutilation, high morbidity and even mortality. These accidents are caused by teeth capable of tearing, as in piranha bites, or by perforating teeth, such as venomous snakes, when they act as instruments of inoculation, and stings, bony structures common in the fish of the order Siluriformes (catfish and sorubins, among others). Most injuries occur in fishermen, who may require long recovery periods, remaining days without being able to work, causing them social and economic difficulties³.

Regarding the Pantanal region, despite the high potential for tourism and capturing noble fish, like the pacu (*Piaractus mesopotamicus*), sorubins (*Pseudoplatystoma spp*), dourado (*Salminus brasiliensis*), jau (*Zungaro jahu*), piavuçu (*Leporinus macrocephalus*), piraputanga (*Brycon hilarii*), barbado (*Pinirampus pinirampu*), jurupoca (*Hemisorubim platyrhinchos*), jurupencem (*Sorubim lima*) and others, there are no reports studying traumatic injuries caused by animals among the fishermen of the region⁴. Many of these noble species and other

species, such as the piranhas (Serrasalminae subfamily), traíras (*Hoplias malabaricus*), freshwater stingrays (*Potamotrygon* sp), small catfish (*Pimelodus* sp, *Pimelodella* sp and *Rhamdia* sp), thorny catfish (*Doradidae* family), armored catfish (*Loricadae* family) and others, are capable of cause serious accidents due to stings or bites.

METHODS

A retrospective study was conducted in two stages: first in the town of Coxim during the months of October 2008 and February 2009 and the second in Corumbá, in October and November 2009. One hundred fishermen were interviewed (50 in each town). They were chosen randomly, following an active search made by the authors, from among the 1,750 fishermen who regularly work in the rivers that form the flood plains in Corumbá region (Paraguay River) and Coxim (Taquari River) (**Figure 1**) in the Z1 colony (Corumbá) and Z2 colony, in Coxim. Traveling fieldworks were held sporadically in local concentrations of fishermen in order to obtain prior contact and consent for the interviewers. The interviewers tried to get a at least six respondents in each of the different districts and villages of the fishermen, ending the visits after 50 individuals had been interviewed in each municipality.

In Coxim, contacts and interviews were facilitated because the fishermen conducted fishing trips to the Pantanal and at the time of the study, many were closed for business due to the prohibition on fishing during the fish breeding season. Fishermen of the colony affiliated with the local Z1-Corumbá were interviewed in Corumbá General Harbor and Ladário Harbor.

The interview characterized the most recent injury suffered by the fishermen, without worrying about the time elapsed from the time of injury until the time of the interview. The interviews were combined with the application of a questionnaire regarding aspects of the injuries, which contained questions about the individual's age, the date and time of the accident, number of accidents, the circumstances of the accident, the body site affected, the animal that caused it, the type of skin lesions, duration and intensity of pain, accompanying symptoms and treatments. Additional information was also collected, such as the layoff period from work due to injury, seeking medical services, until medical treatment was received, specific treatments and sequelae.

Ethical considerations

The fishermen were asked to read and sign a consent form for their participation in every interview, in accordance with the Ethical Committee of UNIDERP. From the questionnaires and responses provided, data were obtained regarding the occurrence of accidents, the identification of aquatic animals involved in trauma, clinical aspects of injuries and first aid measures.

RESULTS

The main data are shown in **Tables 1 and 3**, for ease of interpretation. All the fishermen interviewed reported having had some kind of injury caused by any aquatic animal (**Table 1**). The conditions that favored traumas and envenoming were ordinary actions related to the exercise of their activities.

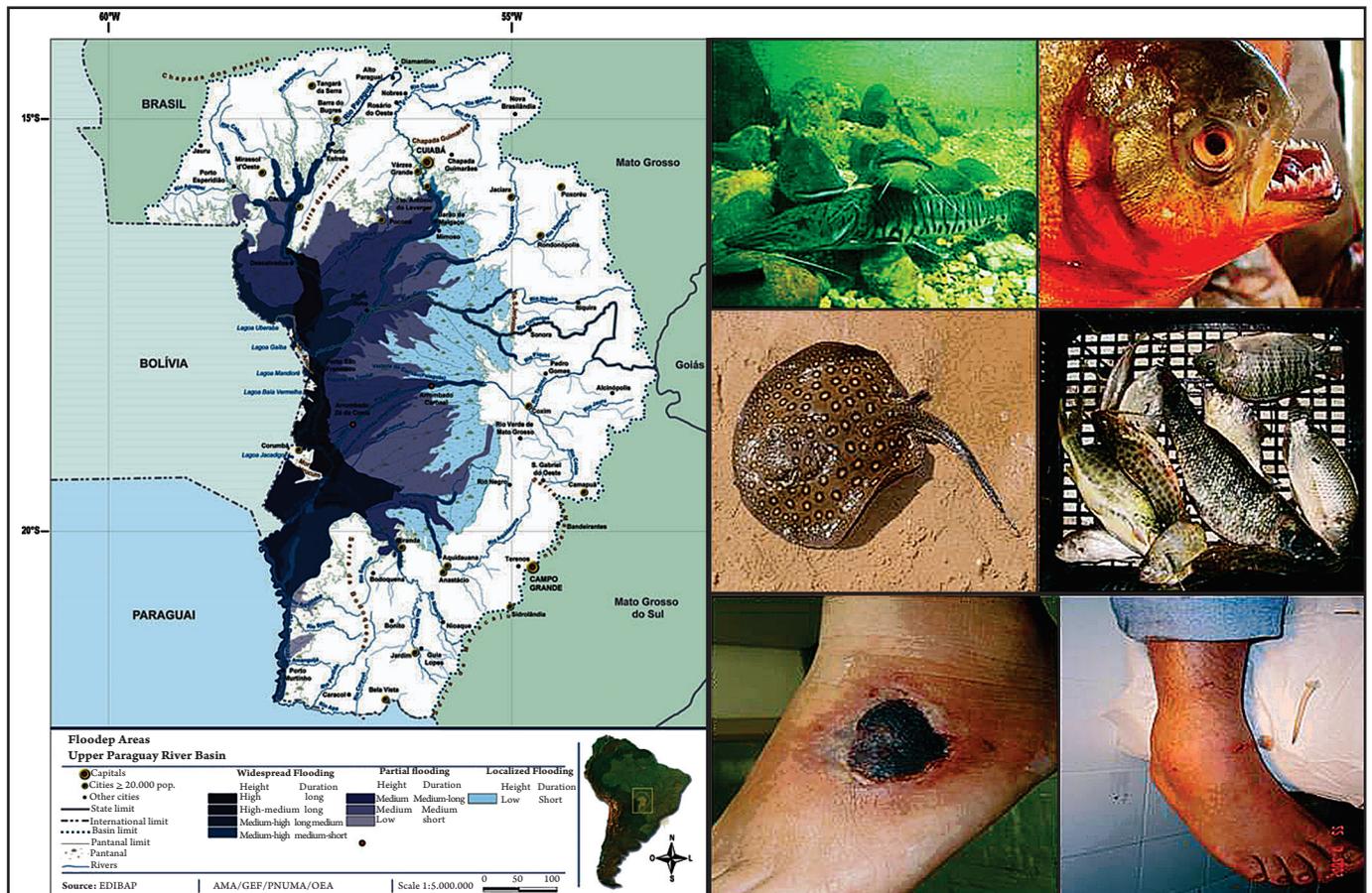


FIGURE 1 - Left: Flooded areas of the Upper Paraguay River Basin in the States of Mato Grosso and Mato Grosso do Sul, indicating the municipalities of Coxim and Corumbá (Source: ANA, GEF, UNEP, OAS, 2004). Right (up): sorubim (left), piranha, freshwater stingray and mandi. Below: skin necrosis caused by envenoming by a freshwater stingray (with necrosis) and an earlier injury caused by the sting of a sorubim (see the sting near the wound).

TABLE 1 - Distribution of the number and probability of occurrence of accidents suffered by the 100 fishermen interviewed (body segment, period of the day and activities at the moment of injury) in the towns of Coxim and Corumbá, State of Mato Grosso do Sul.

| Town | Coxim | Corumbá | Occurrence |
|---|-------|---------|------------|
| Variable | n | n | % |
| Period of the day | | | |
| morning | 16 | 27 | 43.0 |
| afternoon | 20 | 15 | 35.0 |
| night | 14 | 13 | 27.0 |
| Body place | | | |
| hand | 23 | 23 | 46.0 |
| foot | 20 | 15 | 35.0 |
| arm | 1 | 2 | 3.0 |
| leg | 6 | 8 | 14.0 |
| thorax | - | 2 | 2.0 |
| Activity | | | |
| removing the fish from the hooks or net | 22 | 19 | 41.0 |
| walking in the water | 7 | 9 | 16.0 |
| walking in the boat or on the margin (step on, touch) | 5 | 12 | 17.0 |
| handling the fish | 16 | 10 | 26.0 |

TABLE 2 - Number and percentage of occurrence according to fish species and traumatic structures in the injuries observed in 100 fishermen interviewed in the towns of Coxim and Corumbá, State of Mato Grosso do Sul.

| Town | Coxim | Corumbá | Occurrence |
|---|-------|---------|------------|
| Variable | n | n | % |
| Causer animal | | | |
| catfish (<i>Pimelodus</i> sp, <i>Pimelodella</i> sp and <i>Rhamdia</i> sp) | 10 | 13 | 23.0 |
| stingrays (<i>Potamotrygon motoro</i> , <i>P. falkneri</i> , <i>P. brachyura</i>) | 7 | 9 | 16.0 |
| dourado (<i>Salminus brasiliensis</i>) | 1 | 0 | 1.0 |
| piranhas (<i>Pygocentrus nattereri</i> , <i>Serrasalmus marginatus</i>) | 4 | 12 | 16.0 |
| sorubins (<i>Pseudoplatystoma</i> sp) | 14 | 10 | 24.0 |
| jurupencem (<i>Sorubim lima</i>) | 9 | 3 | 12.0 |
| jurupoca (<i>Hemisorubim platyrhynchos</i>) | 3 | 0 | 3.0 |
| traíra (<i>Hoplias malabaricus</i>) | 1 | 0 | 1.0 |
| caiman (<i>Caiman yacare</i>) | 1 | 1 | 2.0 |
| snake (<i>Bothrops</i> sp) | 0 | 2 | 2.0 |
| Cause | | | |
| bites | 7 | 15 | 22.0 |
| stings | 43 | 35 | 78.0 |

Analysis of the data also clarified that inattention to the proper use of primary safety equipment, such as working barefoot, recklessness when it came to handling live fish when removing them from the hook or net fishing and displacement inside the boat, all facilitated the causes of accidents, which mainly affected the hands (46%) and legs (35% of cases) of fishermen.

Bites were responsible for 22% of cases (Table 2) and were mainly caused by piranhas (*Pygocentrus nattereri* and *Serrasalmus marginatus*), dourados (*Salminus brasiliensis*) and caiman (*Caiman yacare*).

Injuries caused by stings were responsible for 78% of the 100 accidents among the fishermen interviewed (Table 2). The fish that caused these types of injuries were: sorubins (*Pseudoplatystoma* sp), 24 cases; catfish (*Pimelodus*, *Pimelodella* and *Rhamdia*), 23 cases;

jurupencens (*Sorubim lima*), 12 cases; jurupoca (*Hemisorubim platyrhynchos*), 3 cases; and stingrays (*Potamotrygon* sp), 16 cases; as presented in Table 2.

Siluriformes, including sorubins (*Pseudoplatystoma* sp), jurupencens (*Sorubim lima*), jurupoca (*Hemisorubim platyrhynchos*) and catfish (*Pimelodus*, *Rhamdia* and *Pimelodella*) together totaled 62% of cases (Figure 1 and Table 2), causing a wide variety of symptoms and clinical complications (Table 3).

Despite representing only 16% of the 100 cases, the results observed in Tables 2 and 3 show that the majority of injuries from stingray barbs occurred in the feet of the victims and were associated with severe pain, paresthesia, lymphadenopathy, erythema, edema and skin necrosis, resulting in deep ulcers complicated by secondary bacterial infections (Figure 1) and extensive scarring.

TABLE 3 - Relation of the fish associated with the lesions, the popular treatment used, symptoms, the duration of pain and layoff from work due to injuries and accidents.

| | | Case animal | | | | | | | | | | occurrence | | | |
|-------------------|----------------------|-------------|------------|----------|---------|---------|----------|--------|-----------|--------|--------|------------|--|--|----|
| | | sorubins | jurupencem | jurupoca | catfish | dourado | piranhas | traíra | stingrays | caiman | snakes | | | | |
| Treatments | urine | 1 | 1 | | 1 | | | | | | | | | | 3 |
| | alcohol | 4 | 1 | | 4 | 1 | 1 | | 1 | | | | | | 12 |
| | ice | | | 1 | | | 1 | | | | | | | | 2 |
| | liquor | 3 | | | 1 | | | 1 | | 1 | | | | | 6 |
| | gasoline | 2 | | | 1 | | | | | 1 | | | | | 4 |
| | kerosene | | | 1 | | | | | | | | | | | 1 |
| | herbs* | 4 | 2 | | 1 | | 3 | | | 4 | 1 | | | | 15 |
| | heat** | 3 | | 1 | 3 | | | | | 3 | 2 | | | | 12 |
| | parts/fish*** | 3 | 2 | 1 | 1 | | | | | 1 | | | | | 8 |
| | blessings and prayer | | | | 1 | | | | | 1 | | 1 | | | 3 |
| | tied/squeezed | | 3 | | 1 | | 6 | | | | | 2 | | | 12 |
| | salt/brine | 2 | 1 | | 1 | | | | 1 | | | | | | 5 |
| | propolis | | | | | | 1 | | | | | | | | 1 |
| | smoke | 2 | 1 | | | | | | | | | | | | 3 |
| | other**** | 2 | 2 | | 6 | | 3 | | | 1 | | 1 | | | 15 |
| Symptoms | blisters | | | | | | | | 1 | | | | | | 1 |
| | wounds | 7 | 2 | | 2 | 1 | 16 | 1 | 10 | 2 | 2 | | | | 43 |
| | edema | 18 | 4 | 1 | 8 | | 2 | | 13 | | 2 | | | | 48 |
| | erythema | 6 | 4 | | 3 | | 5 | | 4 | 2 | 2 | | | | 26 |
| | nausea/vomit | | | | | | | | | | 1 | | | | 1 |
| | tachycardia | | | | 1 | | | | | | | 1 | | | 2 |
| | fever | 3 | 2 | | | | | | 3 | | 2 | | | | 10 |
| | numbness | 5 | 4 | 1 | 1 | | | | 3 | | | | | | 14 |
| | adenopathy | 2 | 3 | | | | | | | 2 | | | | | 7 |
| Time/pain | less than 2 hours | 4 | 8 | | 11 | | 9 | | 1 | | | | | | 33 |
| | 2 to 8 hours | 6 | 2 | | 1 | 1 | 2 | | | 1 | | | | | 13 |
| | 8 to 24 hours | 1 | | 1 | | | | | | | 2 | | | | 4 |
| | up to 24 hours | 11 | 3 | 1 | 7 | | 6 | | 14 | 1 | | | | | 43 |
| Layoff | less than 7 days | 12 | 1 | | 1 | | 1 | | 9 | | 1 | | | | 25 |
| | 7 to 15 days | | | | 2 | | 1 | | 1 | | | | | | 4 |
| | 15 to 29 days | 1 | 1 | | 1 | | 1 | | 3 | | | | | | 7 |
| | up to 30 days | 6 | | | | | 3 | | 5 | 1 | 1 | | | | 16 |

*caninha do brejo, erva-mate, erva Santa Maria, leite de peão, cipó de arraia; other measures. **water, cloths or warm compresses (heat). ***eyes or viscera (parts of the fish). ****clay, sand, leaf litter, termite pupa or coffee powder.

DISCUSSION

The capture of fish in natural conditions exposes the fisherman to a number of risks, since the preparation of fishing gear and coping with adverse natural conditions during the handling of fish, during or after fishing⁵.

The need to catch greater quantities of fish, in contradiction with the decline in productivity and price of fish, primarily due to over-fishing, the technological development of fishing tourism⁶ and negative environmental impacts caused to the Taquari River⁷ has led fishermen to exceed their physical limits regarding extensive working hours, exposing themselves to immediate hazards. This fact may also have contributed to making simple activities during the handling of fish (how to remove the fish hook, to enter in the water or handle the fish in the boat) the main causes of errors that resulted in accidents (Table 1). There are reports of similar problems in an investigation

of injuries in rudimental fishermen of the Middle Araguaia River in State of Tocantins, Midwest region of Brasil⁸.

Some fishermen said that they remained on fishing trips in the Pantanal region for more than 60 days, often working day and night with short rest periods and facing adverse weather conditions. Only every two weeks, is the fish collected by support boats that go down the Taquari River with this objective and to carry supplies.

The reports made by two fishermen victims of necrotic ophidism, probably caused by *boca-de-sapo* snakes (*Bothrops matogrossensis*)⁹, which is the most common species in Pantanal¹⁰, were associated with severe pain and hemorrhagic blisters, manifestations consistent with envenoming caused by this group of snakes.

Injuries caused by fish stings (Siluriformes and Rajiformes) are more frequent on the hands, but the present data show that a significant proportion of accidents (35% of cases) affected regions of the lower limbs (Table 1). When the sting penetrates the tissues of the victim, the barbs release toxins that flow into the wound causing violent pain

and throbbing. The place becomes edematous and erythematous and the pain persists for more than six hours, with the possibility of infections that can last days (Table 3). This complication may indicate the presence of fragments of the stinger (Figure 1)¹¹. Bacterial infections are common factors complicating the accident and, in most cases are caused by *Staphylococcus* and *Streptococcus*, but may be associated with bacteria, such as *Vibrio vulnificus* (more common in marine environments) and *Aeromonas hydrophyla*, which cause severe infections with deep tissue necrosis (Figure 1)¹².

In a previous report of 84 envenoming in humans caused by freshwater stingrays, the authors demonstrated that this is the most severe local injury caused by fish in Brazil, requiring controlled and professional treatment, often with opioid analgesics and antibiotics¹¹.

Popular treatments reported by fishermen and used as palliative measures to ease the symptoms at the time of the accidents seem to be associated with moments of despair and lack of knowledge regarding the harmful effects of some substances used (Table 3). The use of gasoline and kerosene may aggravate the manifestations, increasing the pain and contributing to tissue necrosis.

Parts of the fish (eyes and viscera), organic and inorganic material in the soil (mud, leaves, sand), urine and pupae of termites were used in an attempt to alleviate the symptoms (Table 3), which in our view represents an increase risk due to the possibility of causing secondary infections.

All fishermen who used some thermal component on the affected sites for the treatment of injuries, by washing with hot water or placing a cloth or hot compresses or even urinating (12 cases) on the injury, said they experienced a significant reduction in pain, however momentary. Studies concerning the clinical and therapeutic aspects of accidents caused by mandijubas (the yellow catfish) report that main effect of the venom is intense vasoconstriction and the vasodilatation caused by hot water is responsible for the improvement in pain symptoms^{12,13}. Immersing the affected area in hot water (around 50°C) brings rapid relief to patients who must remain with injury immersed in hot water for 30-90 minutes.

More severe cases that required longer periods of removal may be related to lack of care and treatment or the lack of first aid measures by local health professionals, aggravated by the use of home treatment, carelessness in the treatment or the alleged delay in seeking medical attention.

In conclusion, accidents caused by aquatic animals in the regions where the fishermen were studied are very common; the animals mainly associated with the trauma are the most common fish and those of higher economic value; the severity of accidents is probably associated with inadequate and inefficient treatment; this study may be important for the fishing communities of the Pantanal region, since it provides information that assists in understanding the social, economic and environmental issues surrounding the proposed subject and there is a clear need to prepare printed material with guidance on the proposed subject that is adequately illustrated with the use of modern resources for graphic design and focused on language accessible to the fishermen.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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