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Frequency and gravity of human envenomations caused by marine catfish (suborder siluroidei): a clinical and epidemiological study

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Abstract

Introduction and objectives: Catfish occur in marine and freshwater environments worldwide. They have three serrated venomous bony stings in the dorsal and pectoral fins that are used for defence against predators and are refilled by glandular tissues under the epithelium. However, some catfishes do not have poisonous glands next to the sting and cause traumatic wounds without poisoning. The objective of this study was to provide data for, and comment on, the epidemiological and clinical problems caused by marine catfish.

Patients and methods: The authors have observed, followed and documented 127 injuries caused by marine catfish stings during different phases of the envenoming over a time period of 8 years at three points along the Western Atlantic Ocean coast.

Results: The patients presented intense pain during the acute phase of envenoming and complications, such as bacterial and fungi infections and retention of bony fragments, in the later phase. Immersion of the affected extremity in hot water was used in about 20% of cases with excellent results.

Discussion: Injuries caused by marine catfish are common (about 20% of injuries caused by marine animals in a series of more than 700 injuries recorded by the author) and cause intense pain and later complications. Immersion of the affected extremity in hot water results in improvement in the acute phase, but does not prevent the appearance of secondary infection or foreign body reactions.

Keywords: Venomous fish; Venoms; Ariidae; Catfish; Venomous aquatic animals

1. Introduction

Catfish (suborder Siluroidei) are found in marine and freshwater environments worldwide. They come in many shapes and sizes, their mouths have barbels and they have no true scales on the skin. There are nine families and about 1000 species of catfish, of which only a few are present in the marine environment, the majority living in freshwater streams. The most important catfish families are the Ariidae

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(worldwide marine distribution); the Doradidae and Pimelodidae, many of which are found in the rivers of South America and include giant and poisonous catfish; the Ictaluridae family, found in the rivers and lakes of North America; the Plotosidae family from the Indo-Pacific region, which are very venomous and can cause fatal envenomations; and the Siluridae family, which contains catfish from Europe, Asia and Africa (Halstead, 1988). Two families of the Siluroidei suborder, Ariidae and Plotosidae, are mainly marine, but have members that are frequently found in brackish and coastal waters and sometimes in exclusively freshwater environments (Nelson, 1994).

The Ariidae family (sea catfish) consists of 20 genera and 153 species. The most representative genera in the South Atlantic are *Arius*, *Cathorops*, *Hexanematichthyes*, *Bagre* and *Genidens* (Froese and Pauly, 2005). They are found in tropical and subtropical waters in much of the world, but particularly in estuarine waters (Moyle and Cech, 1996). The species associated with injuries in humans are:

Bagre bagre: Central and South America, which can be up to 55 cm in diameter (*Bagre bandeira* or Flag catfish, because of its long dorsal fin—Fig. 1).
Bagre marinus: Western Atlantic (Caribbean and the northern margins of South America), sometimes found in rivers and estuaries. Up to 70 cm in diameter.
Cathorops spixii: South America (Atlantic and Caribbean rivers and estuaries from Colombia to Rio de Janeiro, Brazil). Up to 30 cm in diameter. (*Bagre amarelo* or Yellow catfish).
Cathorops agassizii: South America (Rio de Janeiro to Southern Brazil). About 30 cm in diameter (*B. amarelo* or Yellow catfish of the Southern region)—Fig. 1.
Genidens genidens: Southwest Atlantic (southern South America rivers draining to the Atlantic). Up to 35 cm in diameter (*Bagre Branco* or White catfish)—Fig. 1.

Some species of catfish have important economic value as food in poor regions of the world.

Many catfish have three serrated bony stings on the dorsal and pectoral fins (Fig. 2), which are used for defence against predators and are refilled by glandular tissues under the epithelium (Halstead, et al., 1953; Haddad Jr., 2000). However, some do not have poisonous glands next to the sting and cause traumatic wounds without poisoning. Catfish have two toxicity mechanisms: the first is linked to sting penetration and rupture of the venomous glandular tissue surrounding the sting, while the second, called crinotoxicity, is associated with the production of toxins in the entire fish skin and not with inoculation (Cameron and Endean, 1973; Shiomi, et al., 1988; Shepherd et al., 1994). The crinotoxins may have been the evolutionary precursors of the toxins present in the stings of catfish (Cameron and Endean, 1973; Shiomi, et al., 1988; Shepherd et al., 1994). Studies of the venoms have demonstrated that they contain vasoconstrictor components and that prostaglandins can also

Fig. 1. Three species of marine catfish common off the Western Atlantic Ocean coast. Top: the white catfish (*Bagre bagre*) and the yellow catfish (*Cathorops agassizii*). Bottom: the white or snake catfish (*Genidens genidens*). Note the stings anterior to the dorsal and pectoral fins.

be liberated (Birkhead, 1967; Calton and Burnett, 1975; Burnett, et al., 1985; Al-Hassam et al., 1986, 1987). Proteins in the venom can cause allergic manifestations in patients (Kotz et al., 1978). There have been some recent studies on Atlantic catfish venoms. Electrophoretic analysis of sting venoms from the species *C. spixii* (*C. agassizii*) and

Fig. 2. Details of the bony serrated stings of a marine catfish.