Killer catfish? Venomous species surprisingly common, study finds

December 10 2009

Northern Madtom (*Noturus stigmosus*), a venomous catfish species, collected from the Huron River near Ann Arbor, Michig Credit: Matthew Ross

(PhysOrg.com) -- Name all the venomous animals you can think of and you probably come up with snakes, spiders, bees, wasps and perhaps poisonous frogs. But catfish?

A new study by University of Michigan graduate student Jeremy Wright finds that at least 1,250 and possibly more than 1,600 species of catfish may be venomous---far more than previously believed. The research is described in a paper published online Dec. 4 in the open access journal BMC Evolutionary Biology.

Lest anyone have concerns about attacks of killer catfish, rest assured that, at least in North America, these finned fatales use their venom

mainly to defend themselves against predatory fish, though they can inflict a painful sting that many fishermen have suffered. In other parts of the world, some catfish do have extremely toxic venoms that can be deadly to humans.

Scientists have focused a great deal of attention of venom produced by snakes and spiders, but venomous fish had been largely neglected, said Wright, who used histological and toxicological techniques, as well as previous studies of evolutionary relationships among catfish species, to catalog the presence of venom glands and investigate their biological effects.

Catfish venom glands are found alongside sharp, bony spines on the edges of the dorsal and pectoral fins, and these spines can be locked into place when the catfish is threatened. When a spine jabs a potential predator, the membrane surrounding the venom gland cells is torn, releasing venom into the wound. In his paper, Wright describes how catfish venoms poison nerves and break down red blood cells, producing such effects as severe pain, reduced blood flow, muscle spasms and respiratory distress. However, because none of the species he examined produces more than three distinct toxins in its venom, each species probably displays only a subset of the whole repertoire of effects.

The main dangers to humans who tangle with North American catfish come not from the initial sting and inflammation, but from secondary bacterial and fungal infections that can be introduced through the puncture wound or when pieces of the spine and other tissue break off in the wound, Wright said. "In such cases, complications associated with these infections and foreign bodies can last several months."

On the evolutionary side, Wright's analyses point to at least two independent origins of catfish venom glands. In addition, the toxic proteins show strong similarities with, and might be derived from,

previously characterized toxins found in catfish skin secretions.

Those toxins in catfish skin secretions have been shown to accelerate wound healing in humans, so it's possible that the proteins from their venom glands could have similar properties. Probably not very likely, given the known effects of these venoms on humans, but perhaps worth investigating, Wright said.

"I'm currently working to isolate particular toxins and determine their chemical structures and the genes responsible for their production," he said. "It's a very poorly-studied area, with little in the way of scientific literature to draw on, and my studies are just getting off the ground. So at this point it remains to be seen whether they'll have any therapeutic value, though it's worth pointing out that toxins from the venoms of other organisms---snakes, cone snails and scorpions, for example---have all been put to pharmaceutical and therapeutic use."

Further examination of the chemical composition of the venoms also will provide valuable insight into the mechanisms and potential selective factors driving venom evolution in fishes, Wright said.

More information: *BMC Evolutionary Biology*: www.biomedcentral.com/bmcevolbiol/

Source: University of Michigan (news : web)