

Management of Marine Envenomation. Part 2: Marine Animals

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ABSTRACT

Envenomation from jellyfish and other marine animals causes human deaths and severe morbidity in both tropical Australia and many countries in the world having tropical, or sub-tropical waters. World distribution of venomous marine animals and the human mortality and morbidity they cause, are discussed; simple first aid and effective medical treatment is suggested. With travel becoming commonplace amongst their patients, General Practitioners and Travel Medicine consultants must routinely advise them about the hazards of marine envenomation, both in Australia and overseas, when they are first consulted.

INTRODUCTION

Worldwide marine envenomation may be divided into two main groups: -
Jellyfish (covered in Part 1)
Other marine animals

Large numbers of fatalities occur worldwide from marine animals (Table 1). Awareness of the problem and the distribution of these animals is important for the traveler.

Table 1

Human fatalities from marine animal envenomation

Geographical locations – Human fatalities from marine envenomation
Blue-ringed octopus Australia, Singapore
Cone Shell Australia, Fiji, India (Banda), New Caledonia, Okinawa (Japan), Vanuatu
Sea snakes Burma, Malaysia, India (Madras), Java (Indonesia), Okinawa (Japan), Oman, Vietnam
Stingray California, Colombia, Fiji, New Zealand, Surinam, Texas
Stonefish ? Australia (Thursday Is.), East Africa, Japan, Seychelles

Blue-Ringed Octopus

- **Appearance** - May grow to 15-20cm. in diameter with tentacles extended. Usually yellowish-brown but when irritated, many small electric-blue rings appear, making it look very attractive.
- **Envenomation** - Minor bite from beak underneath body (often painless). The venom is injected from the salivary glands. Numbness of the lips and tongue may occur within minutes. In serious envenomation weakness and breathing difficulty develops rapidly, which, if untreated will develop into respiratory failure.
- **Fatalities** - There have been two fatalities in Australia, and one in Singapore.
- **First aid** -
 - Compression bandaging
 - Expired air resuscitation is commenced, if necessary.
- **Medical treatment** - Assisted ventilation for 4-6 hours, after which spontaneous breathing usually recurs.
- **Note:** the person remains conscious during this time, despite needing expired air resuscitation, or mechanical ventilation.

Sea snakes

- **Appearance** - Similar to land snakes except they have flattened, oar-like tail. Unlike eels, they have no gills.
- **Envenomation** - Most bites are "dry" – less than 10% of sea snakes actually inject any venom. Relatively painless bite followed by symptoms including drowsiness, nausea and vomiting, weakness, visual disturbances, breathing problems and muscle pains or stiffness.
- **Fatalities** - Fatalities from sea snake envenomation have occurred in the Countries listed in Table 1. Estimates of the fatality rates worldwide are around 3 per cent - at least 150 deaths annually.
- **First aid** -
 - Compression / immobilisation bandaging
 - May need cardiopulmonary resuscitation
- **Medical treatment** - Intravenous antivenom, as needed. However, the role of antivenom in reducing the extent of myolysis is at present uncertain. Other measures in the management of myolysis include good hydration and the maintenance of a good urinary output. Renal failure should be treated along standard lines.
- **Note:** Tiger snake antivenom can be used if sea snake antivenom is unobtainable. Care of the airway and breathing in the usual way (intubation and ventilation). Any patient suspected of being envenomed by a sea snake should be observed for 24 hours following the cessation of the appropriate first aid measures.

Stingray

- **Appearance** - Large flat-shaped fish with whip-like tail.
- **Envenomation** - Stingrays often burrow under the sand in shallow water. The usual method of injury is a reflex forward whip of the tail when the 'wings' are trodden on. The tail contains one or more sharp barbs which may embed in the skin of the victim and break off, or glance across the skin causing a laceration, which may be quite deep and extensive. The wound is usually (though not always) acutely painful. Most occur on the lower limbs but there have now been two deaths in Australia after the barb penetrated the heart. Other serious injuries have also occurred after the barb penetrated the chest or abdomen.
- **Fatalities** - At least 17 fatalities from stingrays have occurred worldwide, including New Zealand, Surinam, West Atlantic, Texas, Fiji, California, Colombia. Trunk wounds cause most of the fatalities, but acute exsanguination has caused at least two, and one death occurred from tetanus complicating a lower leg wound.

- **First aid** -
 - Penetration of barb - Immerse the wounded area in hot water (remember to first test the water yourself!).
 - Bleeding - Compression dressing and bandaging. Rarely, a tourniquet may be required, but if used, it should be released every 30 minutes to prevent loss of limb viability.
- **Medical treatment** - The barb sheath ruptured on penetration of the affected area, leaving tissue and venom, which will cause necrosis and infection. The whole tract is excised, if possible, and the crater packed with a alginate-based wick to allow healing by secondary intention. These dressings are useful in toxin absorption and are left in place for as long as possible. They frequently fall out at about 8-10 days, or are then easily removed without pain or damage to the healing wound. Wounds to the chest or abdomen MUST be explored under anaesthetic by skilled surgeons.

Cone Shell

- **Appearance** - Their cone-like shape with a slit-like aperture running the full length of the shell up to 15cm in length.
- **Envenomation** - Pain at the site of envenomation, occasionally mild, occasionally severe and excruciating. The envenomated area may blanch, or develop a bluish tinge, and is followed by numbness and local swelling. In serious envenomations incoordination and muscular weakness may develop rapidly, and swallowing, speech, vision and hearing may be affected. Nausea, generalised pruritus and respiratory paralysis may develop.
- **Fatalities** - Up to 15 deaths have been claimed in Countries listed in Table 1, but the exact number is uncertain. *Conus geographus* is responsible for the majority of confirmed deaths, with *Conus textile* responsible for one death and suspected in one other. Recently two deaths in Japan (from *Conus geographus*) have occurred.
- **First aid** - Compression, immobilisation bandaging
- **Medical treatment** - There is no specific treatment, and symptoms and signs should be treated under the usual guidelines.

Stonefish

- **Appearance** - A true fish 20-30 cms long. It has tough, warty skin, which may be covered with slime. It is usually the colour of its surrounds (frequently dark brown). Along the back of the fish are 13 spines, which when stepped on, penetrate the skin of the victim injecting venom.
- **Envenomation** - Immediate, severe pain which may cause the patient to become frantic, or delirious. Local limb paralysis, nausea and vomiting, faintness may occur.
- **Fatalities** - Deaths from stonefish envenomation are rare. They are also difficult to actually confirm with just five deaths reported, three fairly well-documented: one at Mahé, Seychelles, and the other at Pinda, Mozambique and a third reported recently, when a SCUBA diver stepped on a stonefish underwater, panicked, and then ascended too rapidly, death occurring from arterial embolism. A death was reported from Japan prior to 1989 of a male trying to put a stonefish in a bag. He had four puncture marks and 'fell down and was drowned'. Another death was reported to have occurred on Thursday Island in 1915, several days' following envenomation, although doubt as to the causative animal exists.
- **First aid** - Place the stung limb in hot water (remember to test first).
- **Medical treatment** - Parenteral opioids are usually necessary; local anesthetic (without adrenaline) or, preferably, local nerve block. Antivenom is available for intractable pain, or systemic symptoms.

Marine wound infections

Marine wounds are often contaminated by different organisms to those found in normal wound infections. These include *Vibrios*, *Altermonas*, *Mycobacteria* and marine varieties of *Pseudomonas*, which do not respond to antibiotics such as flucloxacillin. The antibiotics of choice if culture and sensitivity are not immediately available are doxycycline (100mg daily) or 3rd generation cephalosporins.

When taking a culture from a marine wound it is essential to state this on the pathology form, as marine organisms do not grow on the usual culture plates. When receiving a request from a marine wound, laboratories will culture organisms on saline-based culture plates, as otherwise organisms that may be contaminating the wounds, will not grow.

Further reading

Fenner PJ. The Marine Stinger Guide. Surf Life saving Queensland

Williamson JA, Fenner PJ, Burnett JW, Rifkin JR (eds). Venomous and Poisonous Marine Animals: a Medical and Biological Textbook. NSW University Press, Sydney.