THE NORTHERN HOSPITAL

# STONE FISH ENVENOMATION

*"After the Bath", oil on canvas,1875, William Adolphe Bouguereau*

*"In this remote part of the earth, nature having made horses, oxen, ducks, geese, oaks, elms, and all regular productions for the rest of the world, seems determined to have a bit of a play, and to amuse herself as she pleases".*

*Rev. Sydney Smith, Sydney, 1819.*

*So wrote the aptly named Reverend Sydney Smith from the fledgling colony of New South Wales, in 1819. Ever since the reports of Sir Joseph Banks, a generation before, the European world had been spellbound by the hitherto unknown flora and fauna of the Great Southern Land, Australia. Astonishing specimens were being sent back to London for the most eminent Naturalists of the day to examine and to ponder. In a pre-Darwinian and profoundly religious age, these mysterious creatures, unclassifiable to the then known taxonomic groups of the day, were a profound enigma. The early Nineteenth century was an age confident in its knowledge of humanity's place in the Universe, and its empire over the natural world. Many held a quite literal belief in the biblical stories, including one of the most famous of all - Noah and the Great Deluge.*

*But Scientists and Naturalists struggled mightily to reconcile their research and enquiry to the framework of the received religious dogma of the day. Joseph Banks' reports on the new continent severely challenged comfortably held views of the completeness of human knowledge of life on Earth. All life - it was said - was invariable and descended - without modification - from the animals that had disembarked from the Ark atop Mount Ararat. No new species had arisen since that distant time and the concept of the extinction of an entire species although debated was generally dismissed, principally on the basis that total extinction would be against God's plan.*

*And yet great multitudes of previously unknown species were daily being discovered. If they had been present since the time of antiquity, indeed from Biblical times - why were there no historical records at all of any of these remarkable creatures? Could they have somehow been living all along in the Southern continent and have somehow avoided the supposedly worldwide deluge? But this was to question religion. If they did disembark from the Ark, then Noah and his descendents would have been well familiar with these strange animals. And yet the historical record remained completely silent on them until the time of Joseph Banks. It would be questions such as these that would haunt a future trainee for the clergy by the name of Charles Darwin. After his trip on the Beagle, that training would never be completed.*

*In the latter Eighteenth century most of the antipodean creatures were known as beautiful and harmless animals. But as the Nineteenth century dawned, and colonists began to fill the Great Southern Continent, alarming reports began to filter in on the previously unsuspected deadly nature of some of them. Visions of Eve extracting a vicious spine of a monstrous stonefish from her foot, if sadly confusing to the taxonomists of the day, were at least happily and helpfully enlightening to the Church - the Garden of Eden was probably not located in far North Queensland!*

# STONE FISH ENVENOMATION

*Synanceia verrucosa; a maestro of reef camouflage*

*Left: Synanceia verrucosa, shown camouflaged and barely distinguishable within its reef habitat.*

*Synanceia trachynis.*

## Introduction

**Stonefish are some of the best camouflaged reef marine creatures.**

There are 2 main venomous stonefish that are found in northern Australian reefs:

- **Synanceia trachynis**
- **Synanceia verrucosa**

The dorsal spines contain venom that causes **extreme pain**, but no deaths have been (reliably) reported from envenomation in Australian waters.

Treatment consists of warm **water immersion** of the affected part**, opioid analgesia** and in selected cases **antivenom**.

## History

The type species of the genus **Synanceia** is Synanceia verrucosa.

The genus includes the species Synanceia horrida that Linnaeus described as Scorpaena, in 1766.

Synanceia verrucosa was first described by two Germans, the Doctor and Naturalist **Marcus Elieser Bloch** (1723 - 1799) and the classicist and naturalist **Johann Gottlob Schneider** (1750 -1822) in "Systema Ichthyologiae iconibus CX illustratum (Illustrated Catalogue of Fishes), in 1801.

Stonefish antivenom was developed in Australia in 1959.

## Biology

*Stone Fish Spine (Mark McGrouther - Australian Museum)*

Stonefish usually lie motionless, often partially buried in the sand and **perfectly** camouflaged among surrounding coral, rocky reef, and aquatic plants.

They have 13 sharp strong dorsal fin spines that are contained within a sheath of thick skin.

At the base of each spine there are two venom glands that discharge their contents along ducts in the spine.

When disturbed, the fish erects its spines, but maintains its position on the sea floor.

*Synanceia verrucosa* grow to around 35 cm in length, although 50 cm monsters have been reported ! (australianmuseum.net.au)

*Taxonomy*

Kingdom: Animalia

Phylum: Chordata

Class: Actinopterygii

Order: Scorpaeniformes.

Family: Synanceiidae.

Genus: Synanceia

Species: *Synanceia trachynis.*

*Synanceia verrucosa.*

## Habitat

The stonefish habitat within Australian waters are northern tropical coastal reefs roughly from Geraldton to Brisbane.

## Pathophysiology

Stone fish antivenom consists of:

1. Pre and post synaptic neurotoxins.

2. Vascular permeability factors.

3. Tissue necrosis factors, (hyaluronidase).

4. Stonustoxin, (a vasodilator).

Some of these venom components may be denatured by heat.

## Clinical Features

The usually mechanism of injury is inadvertent handling or stepping on the creature.

Clinical features include:

1. Pain:
    - This is **immediate** and **severe** at the site of spine penetration.
2. Wound site may show:
    - Puncture wounds.
    - **Retained spines**.
    - Swelling/ bruising.
3. Systemic envenoming:

    This is uncommon and no deaths have been reported from it in Australia:

    Features are non-specific and may include:

    - Nausea and vomiting
    - Hypotension
    - Respiratory distress, pulmonary edema.

## Investigations

There are no specific investigations required for stonefish spine injury.

Any that are done will be directed toward ruling out alternative diagnoses or secondary complications.

### *Plain radiology:*

May be used to detect retained spines.

*Ultrasound:*

May be used to detect retained spines where these are suspected and plain radiology has not detected them.

## Management

1. Warm water immersion:

    - This provides useful first aid treatment.

      Some stonefish venom components may be denatured by heat.

      The CSL Antivenom Handbook, 2013 recommends the following method:

      ♥ Water temperature should be no hotter than the rescuer can tolerate, and no hotter than $45^0$ Celsius.

      ♥ Ideally the unaffected limb is also immersed into the hot water, to ensure that the water temperature is tolerable ad so prevent scalding, (CSL Antivenom Handbook, 2013)

      ♥ Hot water immersion should not be longer than **20 minutes**, then remove the affected part briefly. Immersion can be repeated if pain persists for 20 minute periods, for up to 2 hours.

2. Pressure bandage & immobilization:

    - This is **not** indicated (venom tends to remain localized to the region of the wound).

3. Analgesia:

    - Pain is usually severe, give IV opioid titrated to clinical effect.

4. Regional anaesthesia:

    - Where possible this is a useful additional option for intractable pain.

    - Use a long acting agent, such as ropivacaine.

    - Warm water immersion to the part must be discontinued if the part has been anesthetized, due to the risk of scalding to insensate skin.

5. Tetanus immunoprophylaxis as clinically indicated.

6. Stonefish antivenom:

This is an equine IgG Fab fragment antivenom.

Stonefish antivenom is indicated for:

Stonefish envenomation with:

- Pain that cannot be controlled by adequate analgesia.
- Systemic symptoms.

As well as stonefish envenomation, it *may* be useful for:

- Bullrout (Notesthes robusta) (also known as freshwater stonefish or kroki), stings.
- Lionfish (Pterois volitans)
- Cobbler (Gymnapistes marmoratus)

Dosing for Stonefish envenomation:

There is diversity of opinion among experts about the optimal dosing regimen of stonefish antivenom.

Current CSL and Product Information Insert recommendations are:

- **Give one ampoule IV (2000 units) diluted in 100 mls normal saline IV over 20 minutes, (or quicker if there is serious illness) for every 2 spine wounds, to a maximum of 3 ampoules (6 spine wounds).**

Current Therapeutic Guidelines recommendations are:

- **Give one ampoule IV (2000 units) diluted in 100 mls normal saline IV over 20 minutes.**

  With a further recommendation to titrate to the patients symptoms, rather than the observed number of spine wounds, for which there is no clear evidence for, (*personal communication Dr Geoff Isbister February 2015*).

Ampoules may also be given undiluted IM, although this route may not be as effective as the IV route. [2]

Repeat doses of 1 ampoule may be given if there is an incomplete or transient result.

The dose is the same for both children and adults

7. Secondary infection:

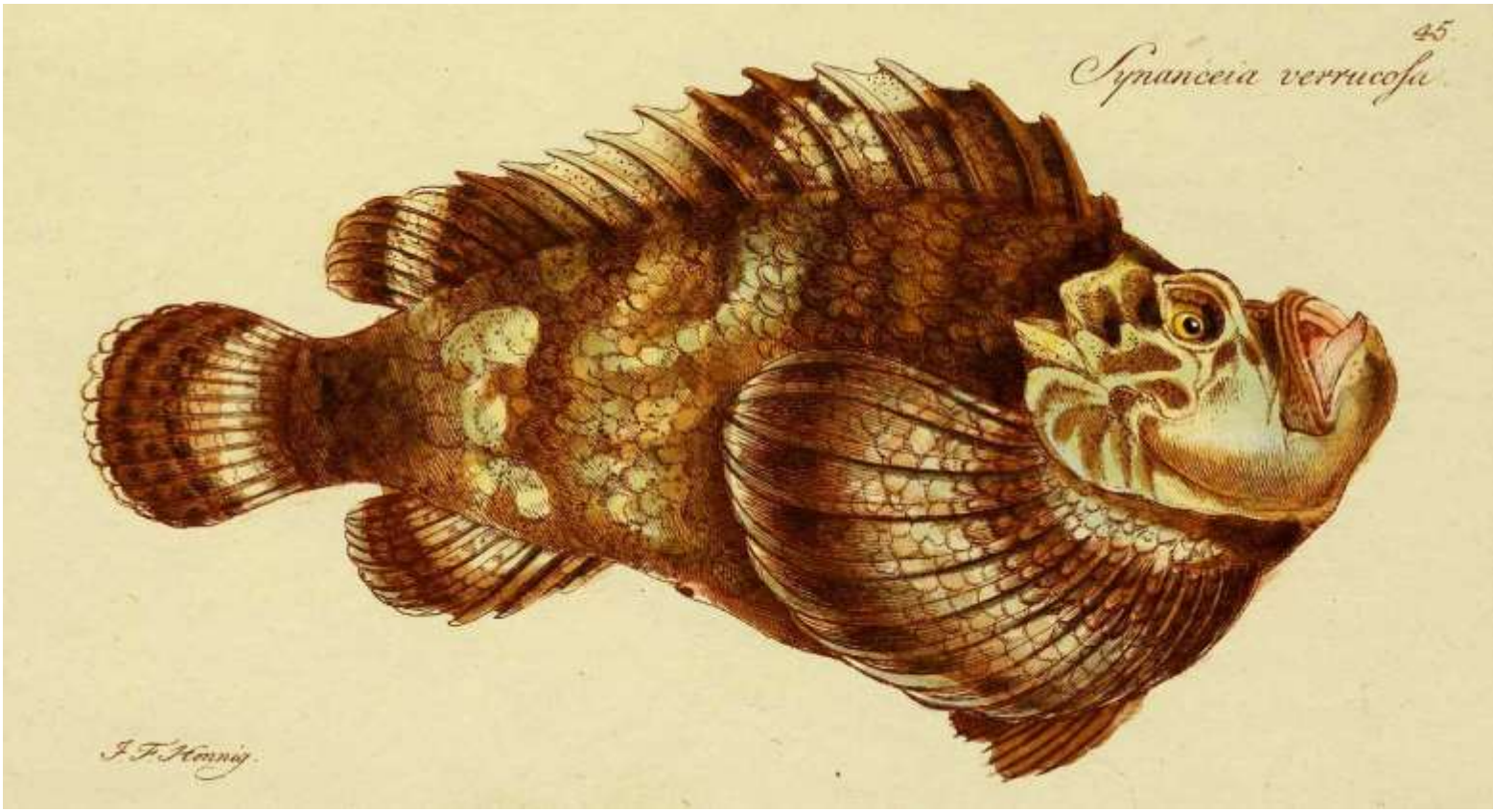
Note that delayed secondary infection may occur at the puncture wound sites, and patients should be alerted to this possibility.

- Infection may be due to **skin flora** or **marine bacteria.**
- Retained foreign body should also be suspected in these cases.

*Disposition:*

Patients who are symptom free at **2 hours** may be medically cleared.

Patients treated with opioid analgesia or antivenom may be discharged when they have been **asymptomatic** for **4 hours**.




*J. F. Hennig's drawing of the type specimen Synanceia verrucosa which appeared in the Systema ichthyologiae iconibus CX illustratum Vol. 2, 1801.*

*References*

1. Stone Fish in L Murray et al. Toxicology Handbook 3rd ed 2015.

2. eTG - March 2018.

3. Stone Fish Antivenom in L Murray et al. Toxicology Handbook 3rd ed 2015.

4. CSL Antivenom Handbook, 2013

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*Acknowledgements:*
Dr Geoff Isbister.
Reviewed May 2018