

WMS Marine Medicine Conference



Wilderness
Medical
Society



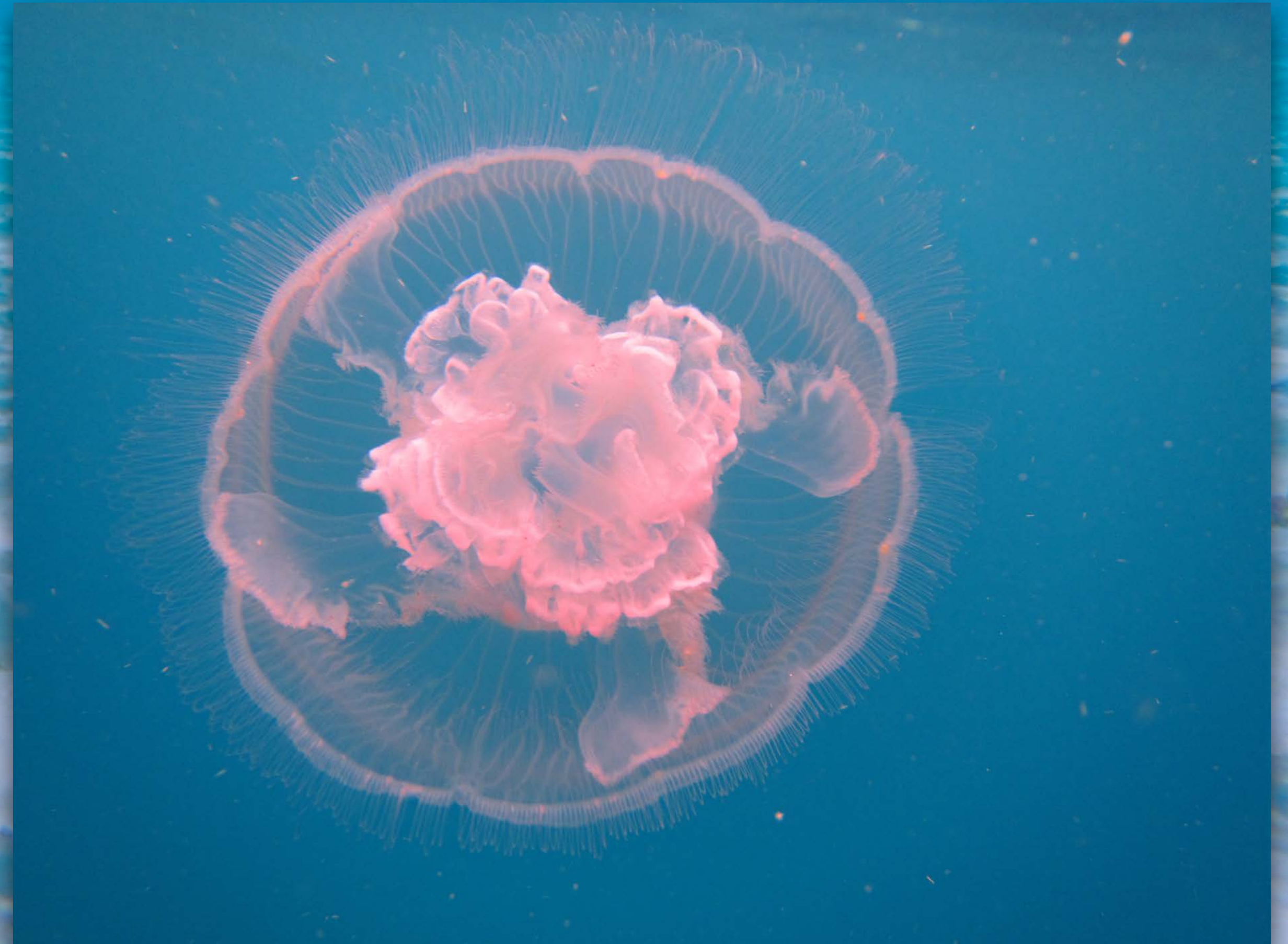
Invertebrate Marine Envenomations

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Outline

- General Approach to Invertebrate Marine Envenomations
- Review of Envenomation Types
 - Species that Annoy
 - Species that Kill
- Treatment
- Prevention



Outline

- Cnidaria: Hydroids, Corals, Jellyfish, Anemones
- Sponges
- Annelid worms: Bristle worm
- Echinoderms: Starfish, Sea urchin
- Mollusks: Octopus, Cone snail

Key Points



- Know the creatures in your practice area
- Be prepared to treat acute life threatening envenomations (box jellyfish, Irukandji syndrome, cone snails, blue-ringed octopus)
- Know when to use antivenom
- Be able to provide species specific decontamination, treatment, and pain control
- Secondary infection is common, so have a low threshold for initiating antibiotics and tetanus prophylaxis

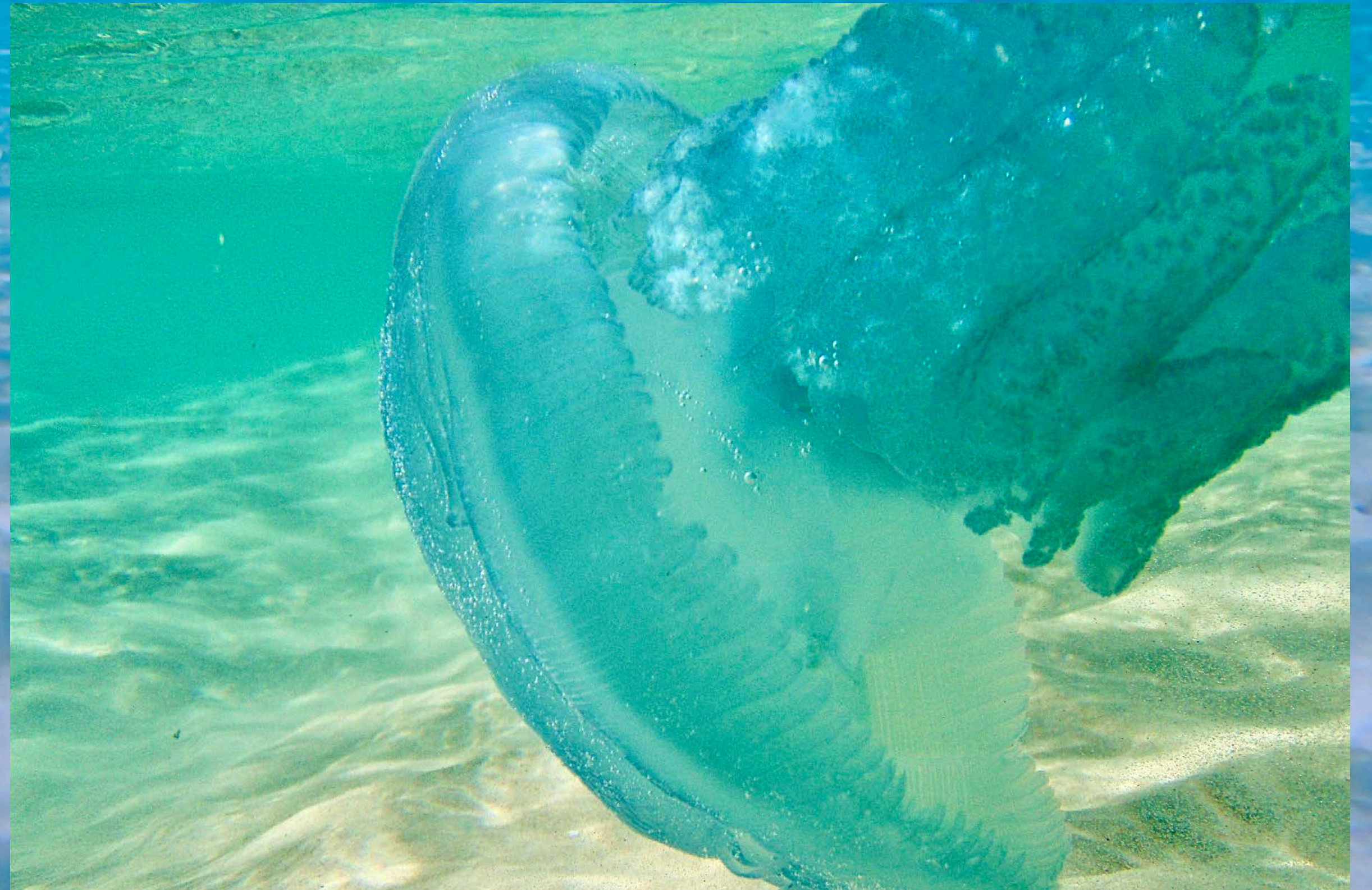
General Approach to Marine Envenomations

- ABC's
- Attempt to Identify causative species
- Deactivate, Decontaminate, Denature
- Be prepared for toxicological effects and decompensation
- Stabilize and treat
- Consider tetanus, prophylactic antibiotics, extended wound care follow up



Cnidaria Envenomations

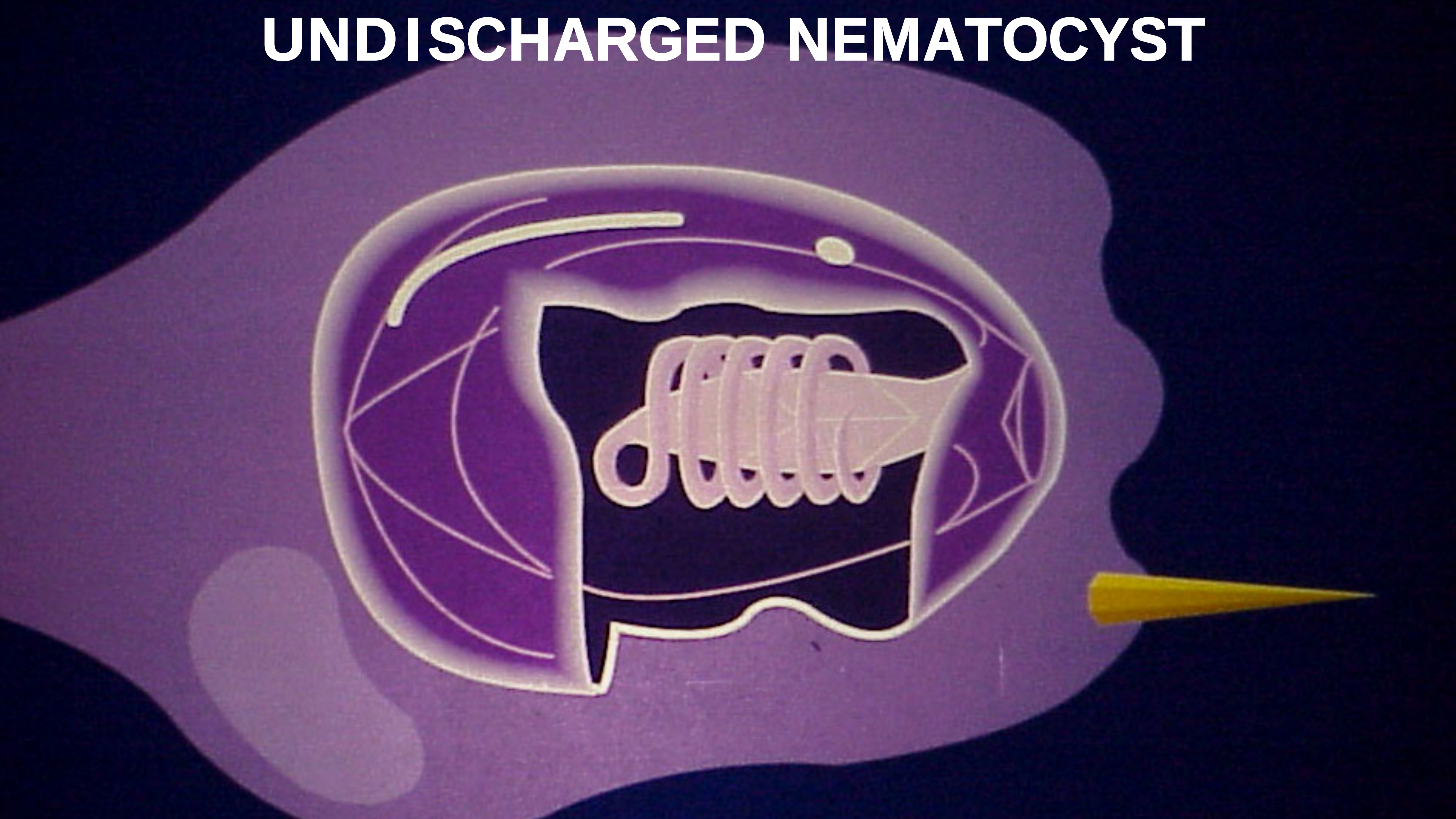
- Cnidaria - Possess stinging cells
 - Hydrozoa (hydroids, fire coral, Portuguese man-of-war/ blue bottle)
 - Scyphozoa (true jellyfish)
 - Anthozoa (anemones, soft corals)
 - Cubozoa (box jellyfish and Irukandji)
- Signs of envenomation include:
 - Painful, reddish lesions
 - Headache
 - Lightheadedness
 - Muscle cramps
 - Loss of Consciousness



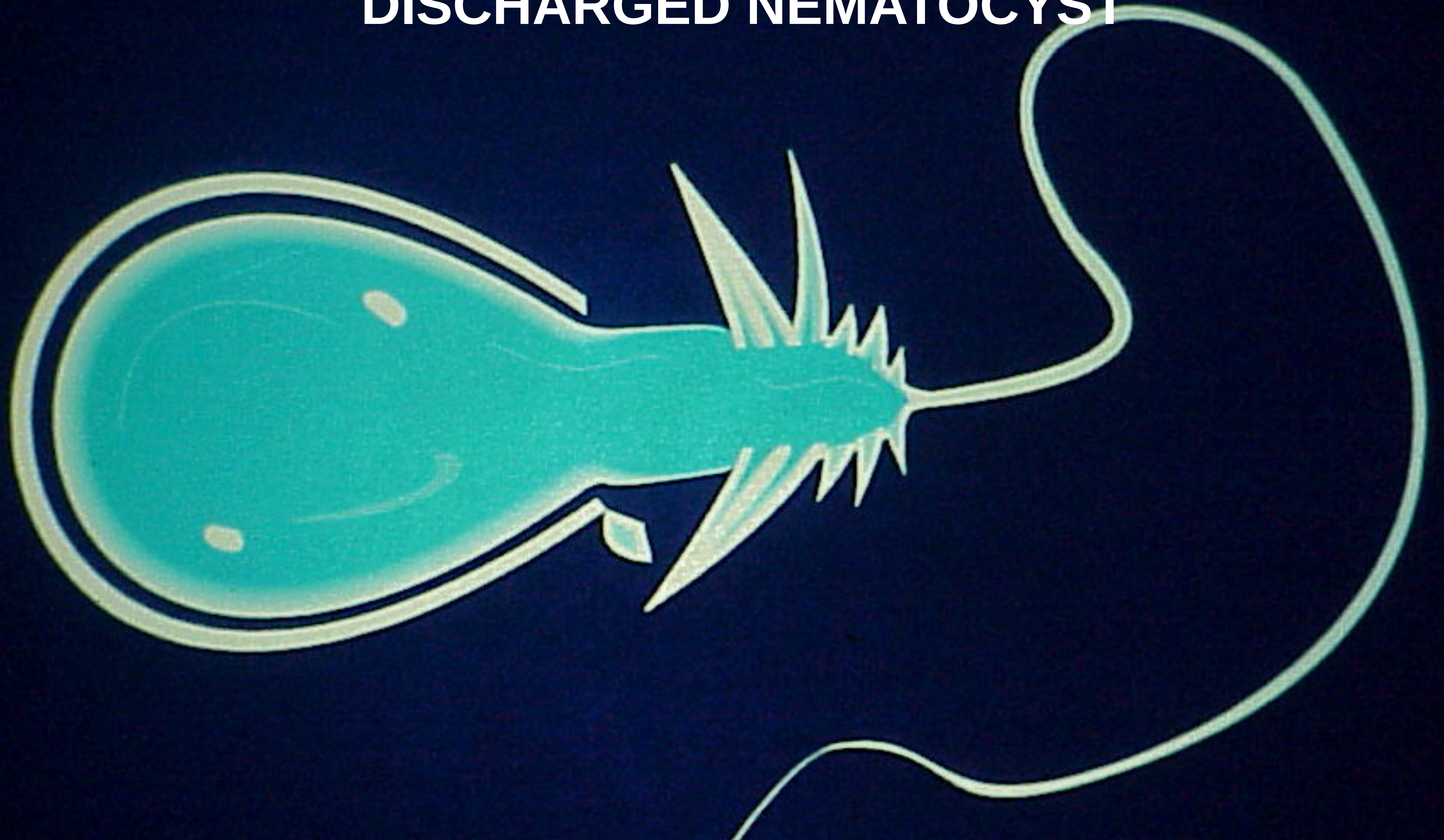
Cnidaria

- Cnidocyte is the stinging cell; thousands of cnidocytes on tentacles
- Each cnidocyte contains stinging organelles: nematocysts
- Each nematocyst contains a coiled barbed tube that injects venom
- Thread tube may attain length of 200-850 microns when deployed
- Exocytosis of thread tube triggered by pressure or chemoreceptor
- Velocity of thread tube ejection estimated at 2 m/sec
- Skin is struck and injected with a force of 2 to 5 lb/sq in
- Upper dermis penetrated and venom diffuses into skin

UNDISCHARGED NEMATOCYST



DISCHARGED NEMATOCYST



Cnidaria Envenomation: Primary Treatment

- **Deactivate:** Rinse with acetic acid 5% (full strength vinegar) immediately to deactivate nematocyst, preventing further discharge
- **Decontaminate:** Wearing protective gloves, gently remove tentacle fragments with forceps minimizing manipulation
- Do not rinse with freshwater or rub the wound
- **Denature:** Follow with non-scalding hot water soak (45C/ 113F), hot shower or heat pack for 45 minutes to denature heat labile components of venom injected into the skin

Cnidaria Envenomation: Adjuvant Treatment

- Local anesthetics can be used sparingly
- Apply topical corticosteroid for mild skin reaction
- For moderate to severe inflammation, administer systemic glucocorticoid
- Antihistamines (topical and systemic) can be used as an adjunct
- Administer tetanus prophylaxis
- Arrange close follow up to detect poor healing and/or infection

Cnidaria Envenomation: Systemic Therapy for Severe Stings

- Anticipate and manage anaphylaxis - but realize most reactions are venom driven
- Manage hypotension with crystalloid infusion, then vasopressors
- Manage hypertension (Irukandji)
- Consider alpha-adrenergic blocking drug
- Obtain an EKG, treat arrhythmias
- Manage hemolysis and renal failure with urine alkalization
- If *Chironex fleckeri*, consider antivenom
- Control pain and muscle spasm with a narcotic, benzodiazepine or NSAID

HYDROID







FIRE CORAL



Feather Hydroid & Fire Coral

- **Stinging pain, urticaria, petechiae, ulceration, residual hyperpigmentation**
- Deactivate nematocysts with Acetic acid 5% (Vinegar)
- Decontaminate by gently plucking off fragments with forceps or gloved fingers
- Denature venom with hot water immersion to tolerance (upper limit 45° C)
- If the inflammatory reaction is severe, consider a local or systemic antihistamine or corticosteroid
- May require prolonged wound care



ANEMONE



Sea Anemone

- **Erythema, pruritus, petechiae, blisters, ulceration, necrosis in 24 hours**
- Deactivate nematocysts with Acetic acid 5%
- Denature venom with hot water immersion to tolerance (upper limit 45° C)
- If the inflammatory reaction is severe, consider systemic or local antihistamine or corticosteroid
- May require prolonged wound care



SEABATHER'S ERUPTION

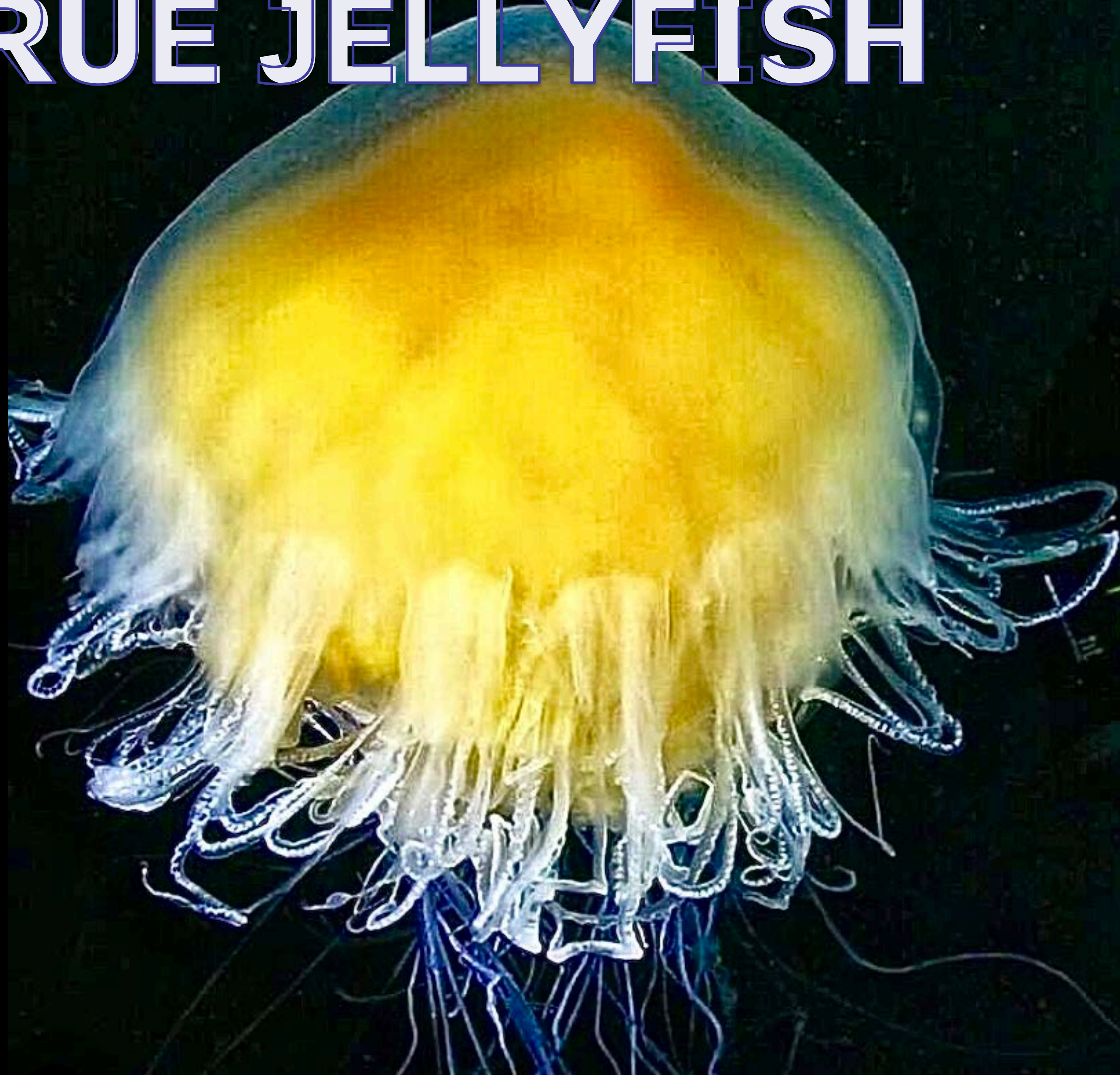


Sea Bather's Eruption

- **Pruritic papules resembling insect bites in distribution of swim suit**
- Deactivate nematocysts with Acetic acid 5%
- Denature venom with hot water immersion to tolerance (upper limit 45° C)
- If the inflammatory reaction is severe, consider an oral antihistamine or corticosteroid
- Wash swim suit with hot water and detergent, dry fully, repeat



TRUE JELLYFISH



True Jellyfish

- **Mild pain, pruritus, irritant dermatitis**
- Deactivate nematocysts with acetic acid 5%
- Decontaminate by gently plucking off tentacles with forceps or gloved fingers
- Denature venom with hot water immersion to tolerance (upper limit 45° C)
- If the inflammatory reaction is severe, consider local or systemic antihistamine or corticosteroid





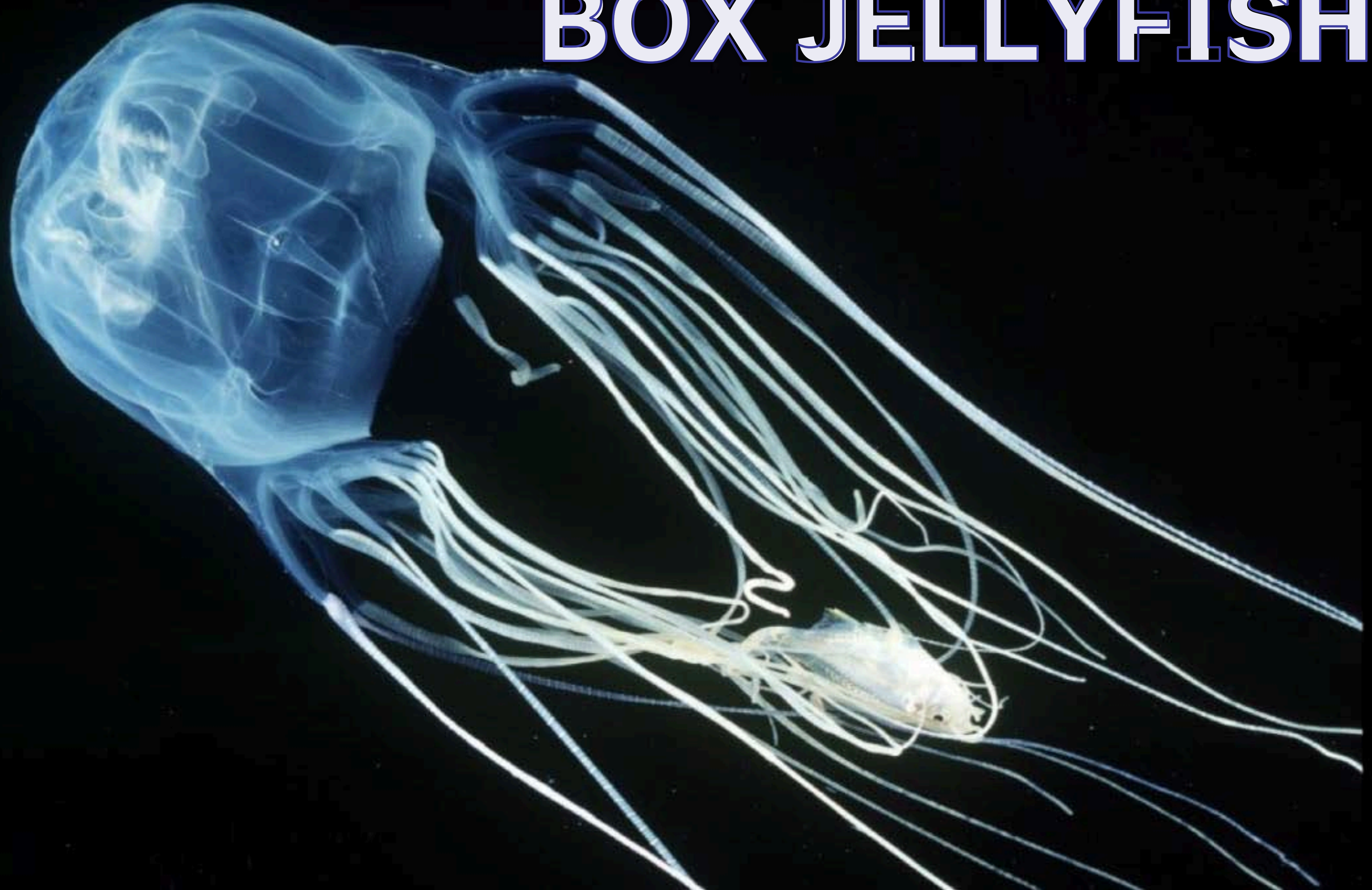
**PORTUGUESE
MAN-OF-WAR/ BLUE BOTTLE**

Portuguese Man-of-war / Blue Bottle

- **Local pain, skin blisters, nausea, vomiting, abdominal pain, muscle cramps, dyspnea, hypotension and LOC**
- Deactivate nematocysts with acetic acid 5%
- Decontaminate by gently plucking off tentacles with forceps or gloved fingers
- Denature venom with hot water immersion to tolerance (upper limit 45° C)
- If the inflammatory reaction is severe, consider an oral antihistamine or corticosteroid
- Can cause a severe systemic reaction, be prepared for decompensation

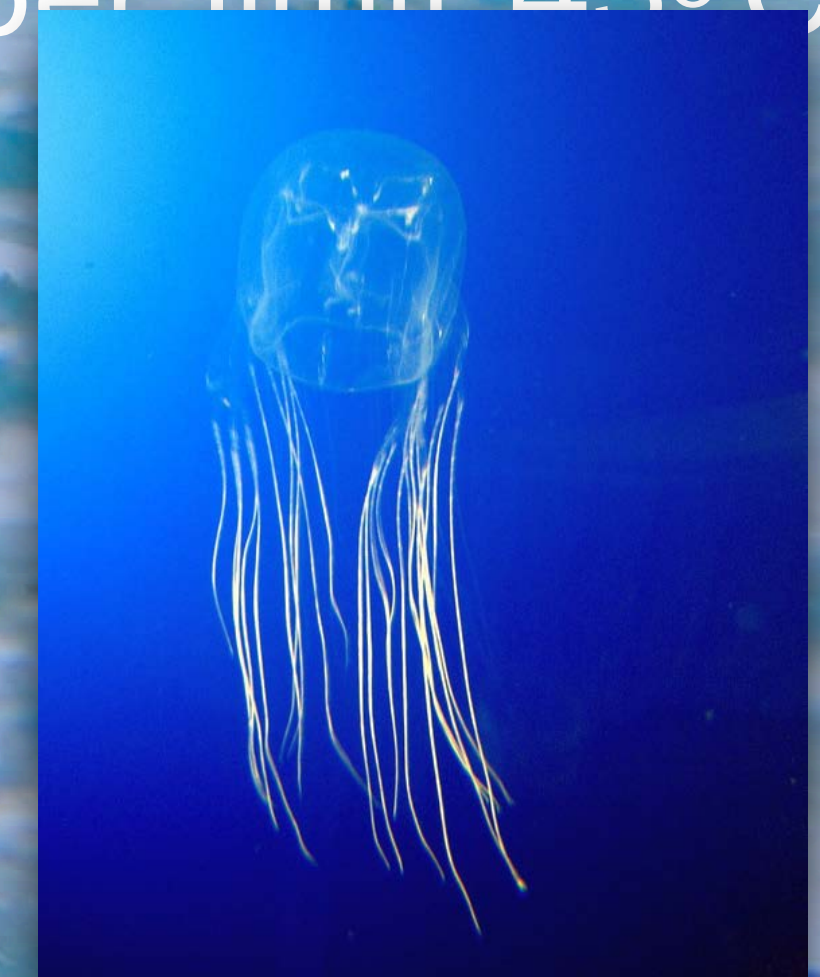


BOX JELLYFISH



Box Jellyfish

- **“Tentacle prints” with cross-hatching, excruciating pain, hypotension, paralysis, respiratory failure, cardiac arrest, skin blisters and necrosis**
- ABC's
- Deactivate nematocysts with acetic acid 5%
- Decontaminate by gently plucking off tentacles with forceps or gloved fingers
- Denature venom with hot water immersion to tolerance (upper limit 45°C)
- Antivenom
- Close wound follow up with specialist







IRUKANDJI



Irukandji Syndrome

- **Massive catecholamine release causing hypertensive emergency. May include, muscle pain, abdominal pain, vomiting, troponin leak, heart failure, pulmonary edema, intracranial bleeding**
- Deactivate nematocysts with acetic acid 5%
- Decontaminate by gently plucking off tentacles with forceps or gloved fingers
- Denature venom with hot water immersion to tolerance (upper limit 45° C)
- ABC's
- Cardiac monitoring
- Blood pressure control
 - Give short acting IV antihypertensives for severe hypertension
 - Avoid beta-adrenergic blockers - could cause unopposed alpha
 - Magnesium sulfate has been used
- Narcotics and benzodiazepines as needed for pain and muscle spasm



SEA SPONGE



Sea Sponge

- **Pruritic irritant dermatitis, blisters, delayed desquamation**
- Remove spicules with tape or other adhesive
- Deactivate any cnidocytes from cindea on the sponge with Acetic acid 5%
- If the inflammatory reaction is severe, consider systemic or local antihistamine or corticosteroid





BRISTLEWORM



Bristle Worm

- **Painful urticarial rash**
- Remove large bristles with forceps
- Remove small bristles with tape or other adhesive
- Deactivate any associated cnidocytes with Acetic acid 5%
- Hot water immersion to tolerance (maximum 45°C) for 30 to 90 minutes
- If the inflammatory reaction is severe, consider local or systemic antihistamine or corticosteroid



CROWN OF THORNS



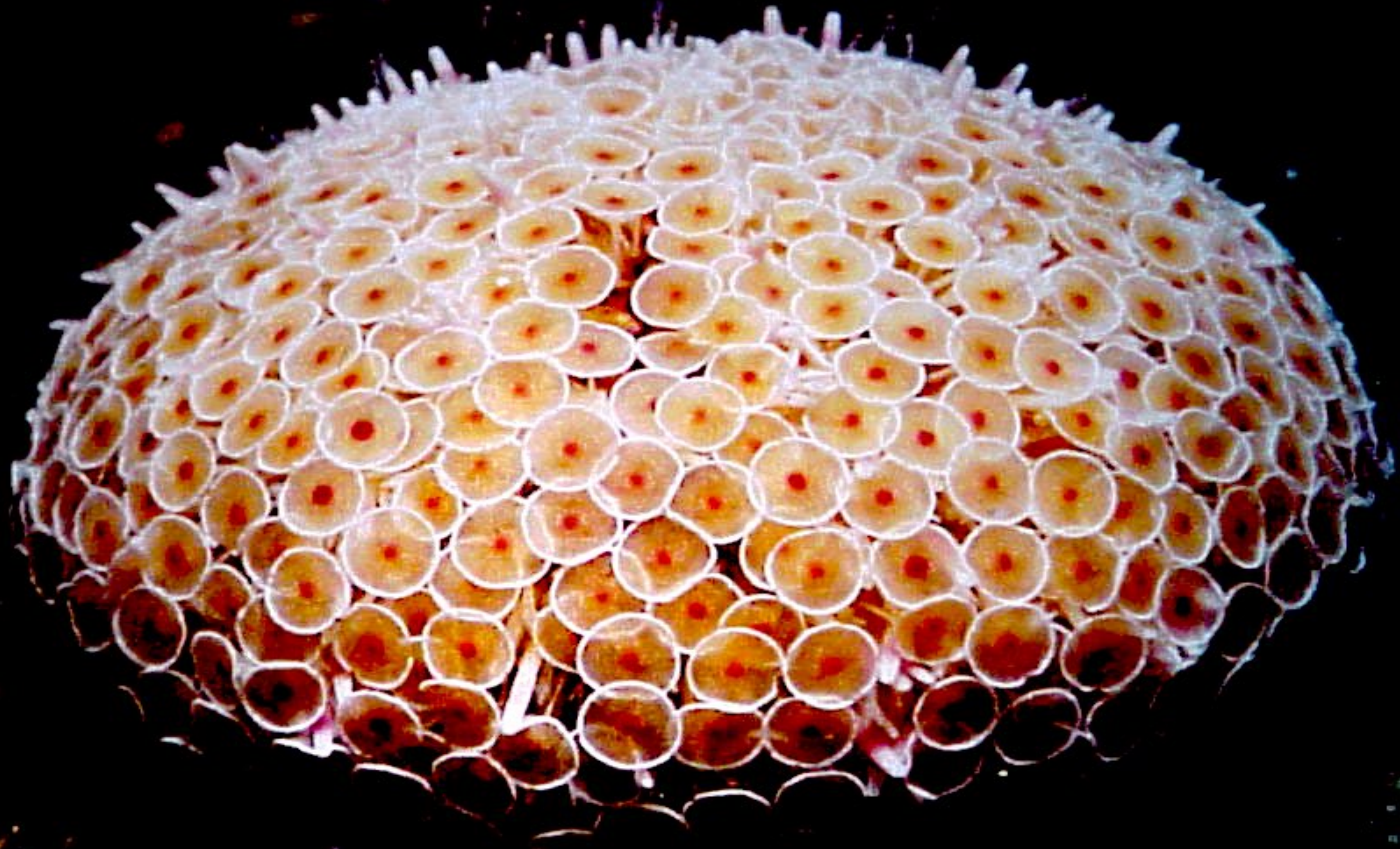
Crown of Thorns

- **Dusky puncture wound, pain, bleeding, edema Multiple punctures cause nausea, vomiting, paresthesias**
- Hot water immersion to tolerance (maximum 45°C)
- Obtain imaging (x-ray, MRI, CT, ultrasound) to visualize retained foreign body
- Local anesthetic & removal retained spines
- Surgical removal if spine(s) near nerve, tendon, or joint
- Consider prophylactic antibiotics if deep puncture wound
- Close wound follow up

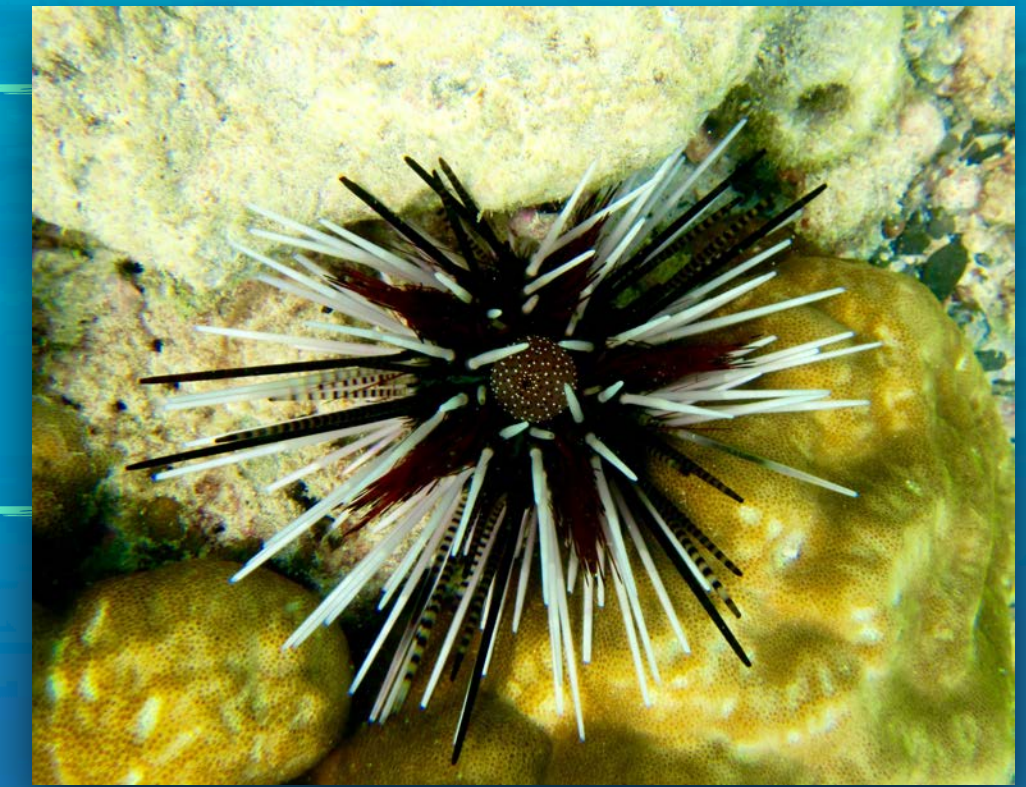


SEA URCHIN



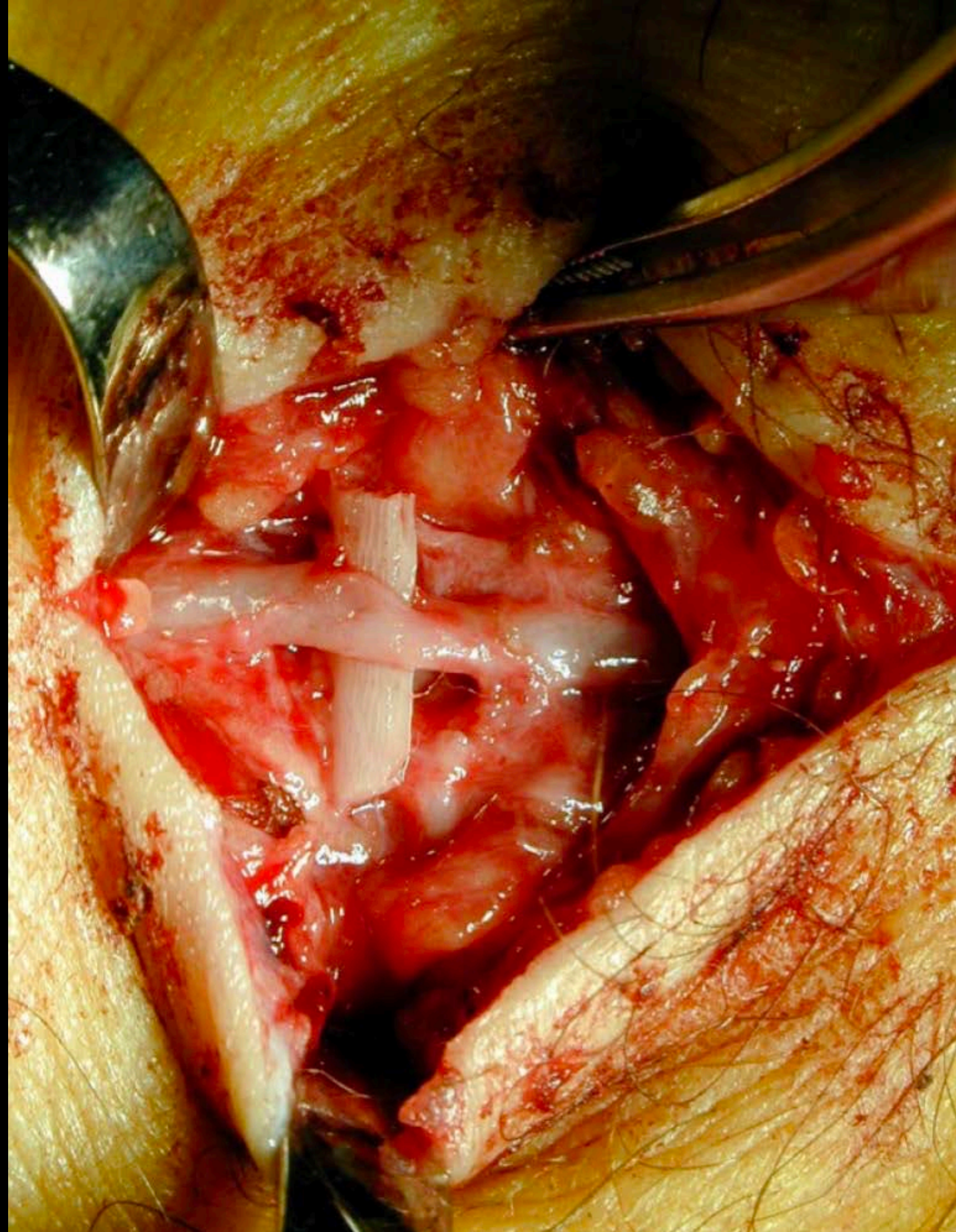


Sea Urchin



- **Red, purple or black puncture wounds, local muscle aching, edema. Multiple punctures cause nausea, vomiting, paresthesias**
- Hot water immersion to tolerance (maximum 45°C)
- Obtain x-ray, ultrasound, CT or MRI to visualize foreign body Local anesthetic & removal of retained spines
- Surgical removal if spine(s) near nerve, tendon, or joint
- Consider prophylactic antibiotics
- Close wound follow up





CONE SNAIL



Cone Snail

- **Puncture wound resembling bee sting, local cyanosis, limb paresthesias, paralysis, respiratory failure, cerebral edema, coma**
- ABC's
- Consider pressure immobilization
- Supportive care
- Local anesthetic & removal of retained radula
- Consider prophylactic antibiotics
- Close wound follow up



BLUE RINGED OCTOPUS



Blue Ringed Octopus

- **Painless small puncture wound(s), potent neurotoxin, facial numbness, rapidly progressive paralysis, respiratory failure**
- ABC's
- Consider pressure immobilization
- Supportive care



Prevention is Key



- Do not touch marine life
- Avoid touching the bottom or grasping ledges or overhangs
- Wear protective gear
- Shuffle feet when walking in shallow sandy areas
- Do not walk on reefs



THE UNDERSEA WORLD IS A
MIRACULOUS ENVIRONMENT.
TREAT IT WITH RESPECT AND AVOID INJURIES
BY ADOPTING AN ATTITUDE OF;



“LOOK BUT DON’T TOUCH”

References

- Auerbach et al: Envenomation by Aquatic Invertebrates, in *Wilderness Medicine*, 7th ed. Auerbach et al (eds). Philadelphia, Mosby Elsevier, 2017
- Auerbach et al: Envenomation by Aquatic Vertebrates, in *Wilderness Medicine*, 7th ed. Auerbach et al (eds). Philadelphia, Mosby Elsevier, 2017
- Birsa LM, Verity PG, Lee RF: Evaluation of the effects of various chemicals on discharge of and pain caused by jellyfish nematocysts, *Comp Biochem Physiol C Toxicol Pharmacol* 151:426, 2010.
- Boulware DR: A randomized controlled field trial for the prevention of jellyfish stings with a topical sting inhibitor, *J Travel Med* 13:166, 2006.
- Currie BJ. Marine Antivenoms: ANTIVENOMS. *Journal of Toxicology: Clinical Toxicology*. 2003;41(3):301-308.
- Fenner P. Marine envenomation: An update—A presentation on the current status of marine envenomation first aid and medical treatments. *Emergency Medicine*. 2000;12(4):295-302.
- Fenner PJ, Hadok JC: Fatal envenomation by jellyfish causing Irukandji syndrome, *Med J Aust* 177:362, 2002.
- Hornbeak, KB, Auerbach PS, Marine Envenomation, *Emergency Medicine Clinics* , Volume 35 , Issue 2 , 321 – 337
- Li L., McGee R.G., Isbister G., Webster A.C. Interventions for the symptoms and signs resulting from jellyfish stings. *Cochrane Database Syst. Rev.* 2013;12:CD009688.
- Minns et al: Seafood Toxidromes, in *Wilderness Medicine*, 7th ed. Auerbach et al (eds). Philadelphia, Mosby Elsevier, 2017
- Tibballs J: Australian venomous jellyfish, envenomation syndromes, toxins and therapy, *Toxicon* 48:830, 2006.
- Wilcox CL, Yanagihara AA. Heated Debates: Hot-Water Immersion or Ice Packs as First Aid for Cnidarian Envenomations? Daly M, ed. *Toxins*. 2016;8(4):97. doi:10.3390/toxins8040097.