

## ***Cnidarians: Simple Animals with a Sting!***

<http://www.oceanicresearch.org/education/wonders/cnidarian.html>

1. List the characteristics of the phylum Cnidaria.

2. List and describe the three classes of cnidarians.

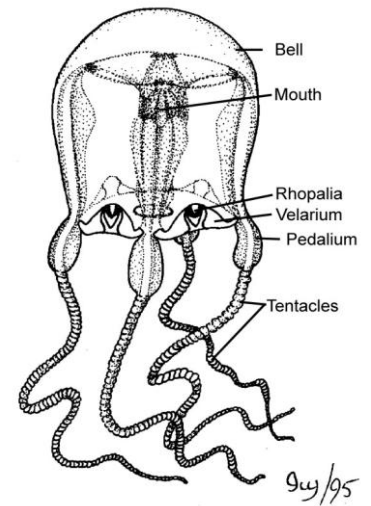
- a.
- b.
- c.

3. Explain why the anemone is sometimes called an upside-down jellyfish?

Name:

Per:

Date:



*A cubozoan*

## **The Box Jellyfish: Australia's Other Marine Killer**

*Journal of Young Investigators*

By Rebecca Straw, Volume 21, Issue 3. March 2011

<http://www.jyi.org/features/ft.php?id=189>

4. Describe the physical appearance of a box jellyfish.

5. What are nematocysts?

What is the function of a nematocyst?

6. What two capabilities differentiate box jellies from other jellyfish?

- a.
- b.

7. How large may a sea wasp grow?
  
8. Describe the classic symptoms of Irukandji Syndrome.
  
9. What body system is primarily affected by the venom released from the box jelly nematocysts?
  
10. How is the box jellyfish sting treated?

**Use the internet to answer the following questions.**

11. What is a jellyfish bloom?
  
12. Draw and label the life cycle of the jellyfish.
  
13. Draw a diagram of a cnidoblast with nematocysts. Label the nematocysts.

# Cnidarians: Simple Animals with a Sting!

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The phylum *Cnidaria* (pronounced nid-AIR-ee-ah) contains approximately 9000 living species worldwide. They are among the simplest of the so-called "higher" organisms, but are also among the most beautiful. The creatures in this phylum are radially symmetrical. This means that the parts of the body extend outward from the center like the spokes on a bicycle wheel. A common example of radial symmetry is the sea star (a member of the Echinoderm phylum) or the anemone, a Cnidarian.



*These flower-like animals resemble plants, but they have a mouth at the center of their tentacles, and a primitive digestive system.*

The Cnidarians include the hydroids, jellyfish, anemones, and corals. All Cnidarians have tentacles with stinging cells in their tips which are used to capture and subdue prey. In fact, the phylum name "Cnidarian" literally means "stinging creature." The stinging cells are called cnidocytes and contain a structure called a nematocyst. The nematocyst is a coiled thread-like stinger. When the nematocyst is called upon to fire, the thread is uncoiled, and springs straight. The harpoon-like thread punctures through the cnidocyte wall and into the prey. Most Cnidarians also have a toxin in their stinger which helps to disable the prey. The nematocyst is fired either by the tentacle touching something, or in some cases by a nerve impulse from the animal telling it to fire.

Most Cnidarian's nematocysts are not harmful to humans, as the stinger cannot penetrate sufficiently into human skin to inflict any harm. There are some jellyfish, however, which can deliver extremely painful, and in a few cases, even fatal, stings to humans.

The Cnidarian can have one of two basic body types, polypoid or medusoid. The polypoid (POL-ip-oyd) is the configuration of corals and anemones, with the tentacles and mouth generally facing up, and the other side affixed to a substrate or connected to a colony of other creatures of the same species. In the Medusoid, the organism is essentially upside-down, with the mouth and tentacles generally pointed down. These types of Cnidarians are usually free-swimmers, like jellyfish. This is why the anemone is sometimes called an upside-down jellyfish; that's just about what it is!

The Phylum is divided up into 3 Classes, called the Hydrozoans (meaning "water-animals"), the Anthozoans (meaning "Flower-animals") and Scyphozoans (meaning "bowl-animals").

## Hydrozoans

The Hydrozoans (hydroids) and Anthozoans (anemones, corals) are mostly all bottom dwelling animals, in a polypoid shape. This means that they live attached to the bottom with their tentacles and mouth pointing up. The northern Red Anemone is a good example of an Anthozoan. Some are solitary, meaning that they live alone, but some are colonial, meaning that they live in groups, connected together with living tissue, and share food resources.

## Scyphozoans

The Scyphozoans (SKY-foe-zo-ans) are the animals we call jellyfishes, although since they aren't real fishes, a better word is "jellies." The jellies drift along in the water generally with the mouth and tentacles pointing down. We call this a medusoid body form. Some jellies are extremely venomous to humans. Some can even kill people with enough contact of tentacle on bare skin, but most are not that dangerous, producing only a mild rash similar to that caused by poison ivy.

# The Box Jellyfish: Australia's Other Marine Killer

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The brilliant tropical sun seems to pause in its daily routine to warm the beaches of North Queensland, Australia. The turquoise water glistens, reflecting its light. A line of bodies lie in the soft sand, allowing the sun to bronze their skin. One sunbather turns over to face the warm rays. Some energetic young people play a rousing game of volleyball. An elderly couple read under a palm tree, glancing up occasionally to watch the volleyball players.

The beach seems ideal, but something is wrong. The still water seems so inviting on this hot day, but no one is swimming. Red warning flags flap in the wind, lining the beach like sentries. Where the grass meets the sand a giant yellow sign depicts a large jellyfish's tentacles encasing an unfortunate swimmer.

From October to May, the North Queensland beaches are haunted by a deadly animal, often forcing beach closures. The creatures that cause such havoc belong to a group of animals related to the jellyfish. Scientists named them Cubozoans for their box-like shape. Local residents call them box jellyfish or stingers.

## Profile of a Spineless Killer

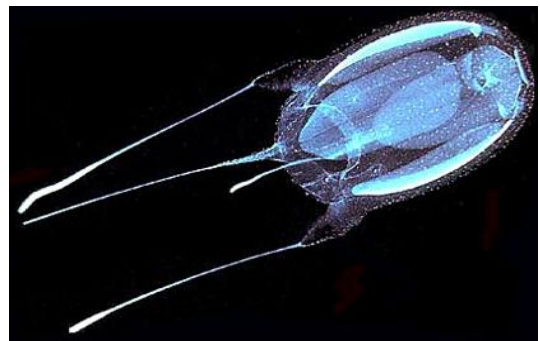
Box jellyfish have a square-shaped float with tentacles streaming from the corners of the bell. All box jellies can sting using nematocysts, tiny stinging cells that line the other surface of the animal. When an animal touches the box jellyfish, the nematocysts fire, puncture the victim and eject venom. The venom paralyzes and kills the box jelly's prey, which are usually invertebrates.

The venom of some box jellies can be deadly to humans as well. Of the 28 known species, only three can cause death in humans. These live in the Gulf of Mexico, Japan and Australia, according to Jamie Seymour. Seymour is the leading researcher of box jellyfish at James Cook University's Tropical Australia Stinger Research Unit (TASRU) and has been studying these animals for 10 years.

An encounter with one type of box jellyfish - Australia's sea wasp (*Chironex fleckeri*) - could be fatal. The sea wasp possesses the most potent venom of any marine creature. A brush of a mature sea wasp's tentacle causes heart failure and death within minutes.

On March 23, 2003, a seven year-old boy was swimming on an unprotected beach near Cairns, Australia. Suddenly he began screaming in pain. His grandfather rushed into the water and pulled the boy out of the water. After 10 minutes the child suffered full cardiac arrest. This boy was the 68th person to die from a sea wasp since 1883.

At a glance, the sea wasp may appear like a jellyfish, but nothing could be further from the truth. Unlike true jellyfish, all box jellyfish can swim. The sea wasp has been clocked at three knots or 3.35 miles per hour. Compared to true jellyfish that drift aimlessly on the wind and current, the sea wasp is a speed demon.



*This box jellyfish is similar to the species responsible for Irukandji Syndrome. (Image from [bioweb.uwlab.edu](http://bioweb.uwlab.edu))*

The body of a sea wasp may grow to be as large as a basketball. Long tentacles dangle from the four corners of the sea wasp's body. Adults may have up to 15 tentacles, three meters long, on each corner. The animal even has eyes, three on each corner. Two of the eyes in the set detect only light, giving the animal a sense of direction. The third eye is an image-forming eye complete with a lens, like our own eyes.

"The animals have eyes but no brain. No one knows how they process what they see," Seymour says.



*The venom of an adult sea wasp is so powerful that the victim may not even have time to swim to shore. (Image from Cairnsholiday.com.au)*

### **Irukandji Syndrome – The aftermath of a sting**

The sea wasp is not the only dangerous box jellyfish off the North Queensland beaches. This January, the Cairns beaches were closed for several days after three people developed Irukandji Syndrome, a set of symptoms caused by other species of box jellyfish. Initially, stings from these box jellyfish cause only a mild irritation with almost no marks. A half hour later, the victim may feel pain, cramps, nausea, headaches, severe back pain and even a sense of doom. These symptoms could then lead to heart failure and difficulty breathing, resulting in death.

Several different types of box jellyfish are responsible for Irukandji Syndrome. Throughout the world, 12 to 16 species of box jellyfish cause Irukandji Syndrome. Australia's waters have six to 12 of those species. Most are small, measuring 3 mm – 10 mm in length, according to the TARSU website. That's about the width of a pencil eraser. They are often clear or opaque with a single tentacle streaming from their four corners. The bodies and tentacles of the box jellyfish that cause Irukandji Syndrome are covered with the stinging nematocysts. Only the tentacles of the sea wasp have nematocysts.

### **The intended and accidental victims**

Seymour and his team are involved in a series of research projects to better understand these animals. Some of his research is devoted to learning how and why the venom is so potent to humans.

"The venom is not targeted to humans," states Seymour. Instead, he explains that the sea wasp and those that cause Irukandji Syndrome are hunting fish. Most box jellyfish and true jellyfish eat only invertebrates. The venom of the sea wasp is targeted toward a vertebrate nervous system, like ours.

"When it is scaled up," Seymour explains, "the same amount of tentacle is needed to kill a fish as a human." A seven inch fish will die from contact with one half inch of tentacle, but humans need seven to eight feet of tentacle – proportionally the same amount.



*Warning signs, like this one, are common along the North Queensland beaches. (Image from zoltantakacs.com)*



Not only is the venom directed towards nervous systems like ours, but it is also particularly potent. “Jellyfish don’t have hands or feet,” Seymour remarks. “They have to kill and kill instantly.” The venom has a direct effect on the heart and causes immediate death to the tissue it contacts. “The venom begins to digest the tissue immediately,” Seymour continues. “It turns the tissue into soup.”

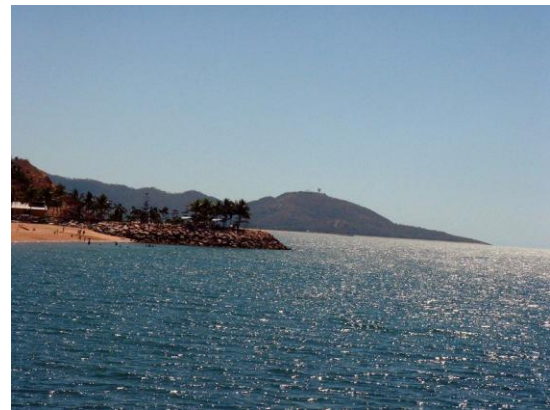
The venom of the box jellyfish that cause Irukandji Syndrome has a weaker effect on humans. “The Irukandji jellies feed on larval fish,” according to Seymour. The fish larva has a vertebrate system but the venom enters the lymphatic system before it reaches the heart. In humans, the venom takes 20 minutes to pass through the lymphatic system and into the heart, but for fish larva the venom directly enters the heart.

### Surviving the stingers – Treatment and prevention

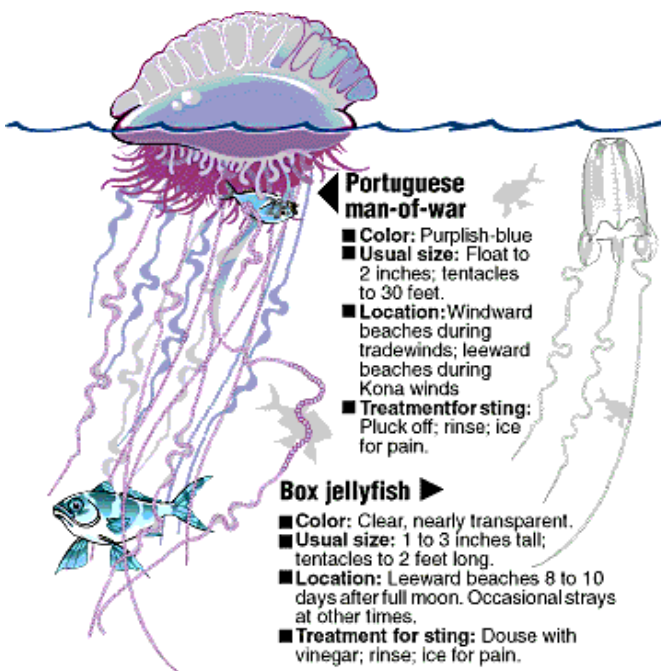
Stings from any box jellyfish are immediately treated with vinegar. “The vinegar does not stop the pain or remove the venom,” Seymour states. Only 20 percent of the nematocysts fire when a person is stung. Vinegar prevents the remainder of the stinging cells from injecting venom into the victim. Afterwards, the victim is taken to the hospital. He is given painkillers while doctors monitor his breathing and heart rate.

Currently, patients are receiving a new treatment for stings. The doctors are giving victims magnesium to control the pain – the same treatment given to women in labor. Doctors recognized that the labor pain is similar to the pain caused by Irukandji Syndrome. “No one knows why [magnesium] works,” remarks Seymour.

Avoiding stings is better than the best treatment. Seymour and his fellow researchers are becoming more accurate with predicting the beginning and the end of the box jellyfish season. During these months, swimmers, snorkelers and scuba divers are encouraged to wear “stinger suits,” full-body protective gear. Swimming is also allowed within nets that prevent box jellies from entering. In time, the number of casualties from box jellyfish may be reduced to zero.



*During the winter months (June – September) swimmers can enjoy the North Queensland beaches without fear. (Image by Rebecca Straw, Townsville, Australia)*



**Simple Fix**  
Turns out, something as thin and flimsy as women's nylon pantyhose worn over the skin will prevent the jellies from stinging. Aussies have known about this trick for years. You'll catch totally cool Aussie Lifeguards wearing women's pantyhose over their arms and on their legs. It may look funny, but it can prevent them from suffering agonizing pain and can even save their lives.