



**NOAA Teacher at Sea  
Brenton Burnett  
Onboard NOAA Ship DAVID STARR JORDAN  
June 26 – July 6, 2006**

**NOAA Teacher at Sea: Brenton Burnett**  
NOAA Ship DAVID STARR JORDAN  
Mission: Shark Abundance Survey  
Day 6: Saturday, July 1, 2006

**Weather Data from Bridge**

Visibility: 10 nautical miles (nm)  
Wind direction: 315 degrees  
Wind speed: 12 kts  
Sea wave height: 1'  
Swell wave height: 2-4'  
Seawater temperature: 19.6 degrees C  
Sea level pressure: 1012.5 mb  
Cloud cover: Clear

**Science and Technology Log**

Today's first run was sharkless but instead we did catch *eight* pelagic stingrays. In the afternoon we caught two smaller makos and another ray.

As I mentioned yesterday, chimera, skates and rays, and sharks make up Class Chondrichthyes. The chimera are the most ancient grouping of these cartilaginous fish. Later came the skates, rays, and sharks in the Subclass

Elasmobranch which make up 96% of the cartilaginous fish species.



Which of the toy models is a ray and which is a skate? Skates have dorsal fins located near the ends of their tails.



A hooked pelagic ray swims aside the DAVID STARR JORDAN.

In general, the rays and skates are characterized by a flattened body with their pectoral fins fully attached to the head. This design is an adaptation to living on the seafloor. Creatures that live here are described as benthic. This lifestyle is in contrast to sea life that lives in the open ocean, which is described as pelagic.

The pelagic stingray is the only stingray that is not benthic. This behavior may be a relatively recent occurrence on evolutionary time scales, however, as it retains a number of characteristics best designed for benthic lifestyles.

Like all skates and rays, their mouths are located under their flattened body. In this position, they can swim along the bottom and suck in prey off the seafloor. I recently witnessed such feeding as I fed a bat ray at SeaWorld last week.

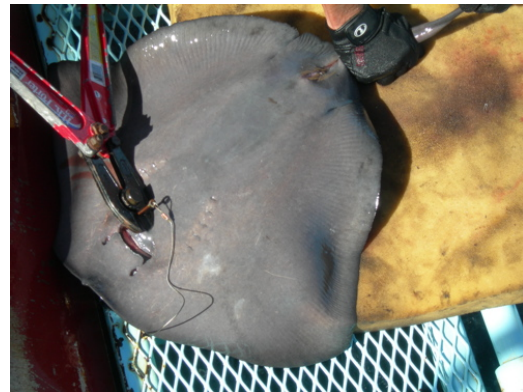


The spiracles of a stingray are located just behind the eyes. The spine, sometimes two or three of them, is found near the base of the tail.

The gills of skates and rays (collectively known as the batoids) are located underneath, or ventral, to the body. When resting on the bottom, water flow through the gills is limited and so obtaining oxygen would be a problem if it weren't for another feature common in cartilaginous fish, the spiracle. Most sharks also have spiracles, which are small holes on either side of their head. They have a

respiratory function. In rays and skates these spiracles are located just behind the eyes up on the top of the head. When the pelagic rays are out of the water, the opening and closing of the spiracles as they breathed was obvious.

There are two features most useful in distinguishing a skate from a ray. Most skates have one or two dorsal fins located far back on their tails, and they never have spines that are typical of rays.



A pelagic ray is on the shark platform belly up. Its spine is safely lodged into the foam.

The spine of a ray is often toxic and used as a defense by the ray. When the pelagic rays



The spine of a stingray has serrated edges that make it virtually impossible to remove a spine by simply pulling it out the way it went in.

were brought on board, the first priority was the safety of the humans. The spine was snipped or if possible, the ray is placed upside down on foam that ultimately will take a spine "hit" and from then on cover the spine. The toxin of a ray's spine is not delivered in the way a snake's fangs might inject its poison. A ray's spine is serrated and acts like a harpoon or barbed hook, preventing removal in the opposite direction from which it was inserted. The venom is not contained within the spine, but is in the form of a mucous that fills two grooves on the underside of the spine. The danger to humans would be a slash or a

puncture made by the spine that may then be infected by the toxic mucus.



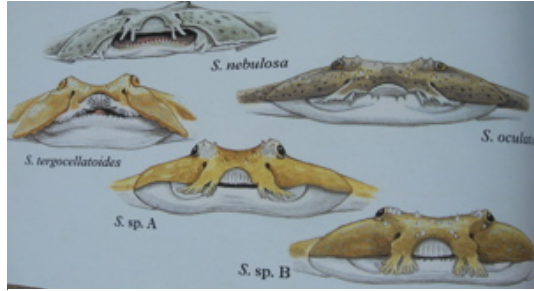
Angel sharks are flattened like a ray but their pectoral fins are distinctly unattached from the head.

Telling shark from batoid is not always easy. The order of sharks known as

angel sharks bear resemblance to batoids

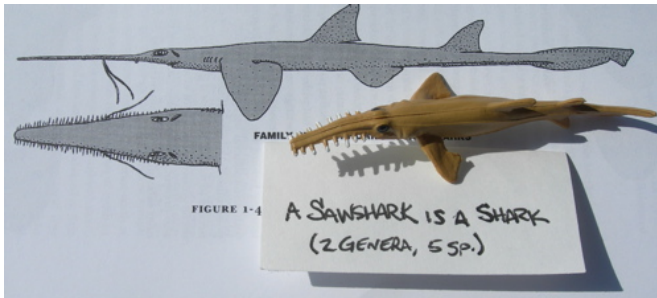
but their pectoral fins are clearly *not* fully attached to the

head, and their mouths are at the front of the head and not underneath as it is in all rays and skates.

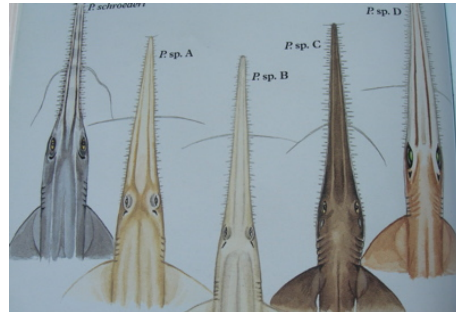


Angel sharks have mouths at the front of the head while all batoids have mouths located ventrally, or under the body.

Other kinds of sharks and rays that can be confused are the sawshark, which is a shark, and the sawfish, which is a ray. Both have a bizarre flattened snout from which teeth stick laterally, or sideways, outwards. They both have a thicker more sharklike body. Both have two dorsal fins, a set of pectoral fins and a set of pelvic fins. But they are no more closely related than any shark is to any ray.



There five known species of sawsharks. They, like most other sharks, have their gill slits on the sides of their head. Also, their pectoral fins are not fully attached to the head.

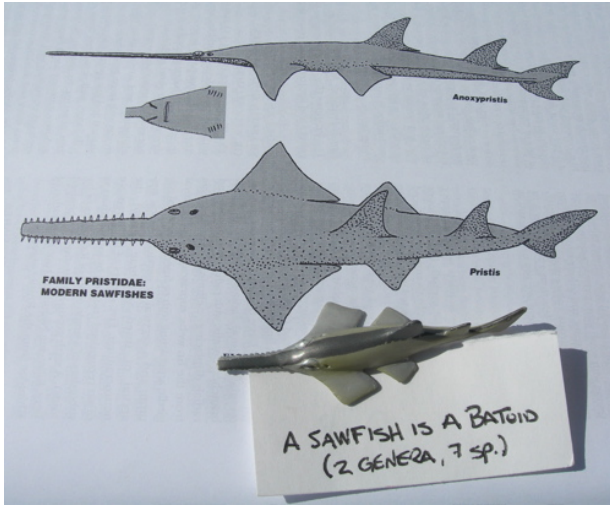


Sawsharks have a pair of barbels coming from the sides of their snouts, giving them a mustachioed appearance.

When two different types of animals (or plants, or other living thing) are faced with similar challenges, they can sometimes independently evolve in a way that arrives at a similar solution. Bats, birds and butterflies each independently evolved flight. Triceratops and rhinos evolved head horns. Mako sharks and dolphins evolved sleek torpedo shaped bodies for rapid swimming.

And sawsharks and sawfish have independently evolved a saw shaped snout. Each is believed to use their snout to capture and kill prey. But they also retain their sharkiness

and rayness, respectively. Sawsharks like other sharks have a sensitivity to the electrical

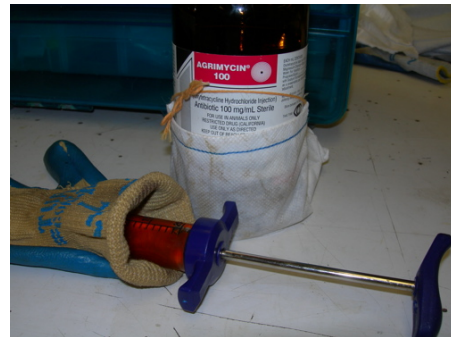


Sawfish have their gills located underneath their head like all other batoids.

disturbances created by moving fish and other prey. Their snout enhances this sensitivity. But the sawfish has no such electrical organ. The sawfish does have pectoral fins that attach fully to the head where the sawshark’s pectoral fins do not. Additionally, the pectoral and pelvic fins of the sawfish are flatter and more flush with the body. And the gills of the sawfish are underneath the head, but they are found on the side of the head on the sawshark. Lastly, another feature that distinguishes the two are the sawshark barbels that stick out from the middles of their snouts like moustaches—sawfish do not have these.

I need to address a couple of student questions that I don’t believe I’ve yet answered:

Oxytetracycline (OTC), the dye used to stain the vertebrae for aging studies, is not known to do harm to the shark if given in excess. However, a table of calculated dosages based on length is used because if too much OTC is used, growth layers other than just the present one will also become stained.



Oxytetracycline is light sensitive, meaning it reacts and breaks down when exposed to enough light. For this reason the bottle is brown and kept in a bag, and loaded syringes are kept inside a glove for ready use.

The J-hooks typically used are about four inches in length. The shark abundance survey has been going



The J-hook and somewhat smaller circle hook are used for mako and thresher shark lines.

on since 1994, and to maintain consistent and scientifically comparable data, they continue to use these hooks.

Sharks have few enemies in the oceans. They tend to be the top predators in their food webs, but as the vast majority of sharks are less than one meter (three feet) long, they can be come prey for other, larger sharks, or even whales like orca. By far the species that poses the largest

threat to them are humans. Mostly humans kill sharks when it is other types of fish that

meant to be caught. The shark would then be referred to as “by-catch”. At other times sharks are intentionally caught for their meat or as sport—this is often the case for mako sharks.

**Personal Log**

I continue to have a good time here, if not for the sights and sounds but for the people I am working with. Lots of interesting, friendly, and fun-loving folks. And, happily, they have been quite tolerant, and even obliging of me walking around with my video camera catching this and that...

Brenton