

THE COOKIECUTTER SHARK



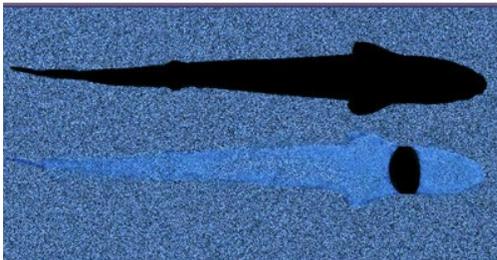
The cookiecutter shark, (*Isistius brasiliensis*) has a small cigar-shaped body with a short conical snout. The cookiecutter is a dwarf schooling shark. Its average adult length is 12 to 17 inches. It is found from the surface to depths of 11,000 feet. Until recently, the cookiecutter shark was known as the "cigar shark," in reference to its brown color, smallish size, overall shape and the dark band around the gill slits. But its current vernacular name refers to its habit of removing plugs of flesh from northern elephant seals and other large pelagic creatures.



The oral anatomy of this little shark is at once bizarre and gruesomely efficient. The cookiecutter has lips that help create a good seal against the body surface of its prey. Suction is created primarily by the large, highly mobile tongue, which elevates in the shark's throat. Thus firmly secured, the cookiecutter bites. Its broad, greatly enlarged lower teeth make the initial incision as its spike-like upper teeth function like a mini-pronged fork to securely grasp the prey. Through a combination of oscillatory jaw movements and violent bodily twisting, the cookiecutter removes a conical plug of flesh from its victim. Each lower tooth has a base that interlocks with adjacent teeth. Collectively, the lower teeth of the cookiecutter form a "band saw" like arrangement with a continuous cutting edge. Like other sharks, the cookiecutter replaces its teeth continually. But what makes the cookiecutter unusual is that it replaces each lower tooth band as a single unit. This insures that it always has a sharp set of lower dentition available. The lower tooth bands that are shed are often swallowed—possibly as a way of recycling calcium and phosphates.



The cookiecutter has an elongated body cavity filled with an enormous liver comprising as much as 35% of its total weight. This liver is perfused with low-density oils which render the shark almost neutrally buoyant over a wide range of depths and thereby saves energy by freeing it from the need to swim constantly to avoid sinking. It has very large eyes with which to see potential prey in low light levels at great depths, and a short broad caudal (tail) fin that is ideal for rapid bursts of acceleration to ambush prey from close range.



From beneath, the cookiecutter's true silhouette (top) blends in with light filtering from the sky because of the shark's luminescent underside. A dark patch in the glow resembles a smaller fish.

To lure prey within range, the cookiecutter shark relies on its luminescence. Complex light producing organs called "photophores" are scattered over the cookiecutter's entire body and are especially richly distributed on its belly and lower surfaces. A main function of this pattern of bioluminescent organs is to eliminate an animal's shadow as seen from below, a common mesopelagic anti-predatory strategy known as "counter-illumination." But there is a very curious fact about the distribution of photophores on the cookiecutter's under surfaces: they are completely

absent from the region under the throat between the gill slits. It has been proposed that this dark patch bordered by luminescent organs may mimic the search image of upward looking pelagic predators. Thus, when a would be predator approaches what appears to be a small shadow of a potential prey animal, it is brought within the striking range of the cookiecutter shark and the predator becomes the prey. Cookiecutters are capable of ingesting a whole squid and can swallow octopus that appear larger than themselves.

Northern elephant seals—particularly females that forage in the deep water column—often display evidence of cookiecutter shark bites. The fact that cookiecutters also prey on squid may be the reason they come into contact with female elephant seals. Or, since elephant seals also ingest small fish, they may be attracted to a school of cookie cutters mimicking a school of fish. As the dive response of the elephant seal greatly reduces blood supply to the skin, the seal loses hair, skin and blubber, but does not "bleed out" even after multiple bites inflicted by a school of cookiecutter sharks.



Biological Bulletin <http://www.biolbull.org/cgi/reprint/207/1/1>

Florida Museum of Natural History <http://www.flmnh.ufl.edu/fish/Gallery/Descript/CookiecutterShark/CookiecutterShark.html>

ReefQuest Centre for Shark Research <http://elasma-research.org/education/ecology/deepsea-cookiecutter.htm>