

The Chesapeake Bay is a critical nursery for sandbar sharks. And guess who else is swimming around down there?

shark spott



- *by Wendy Mitman Clarke*
- *photos by David Owen Hawxhurst*
- *illustrations by Kim Harrell*

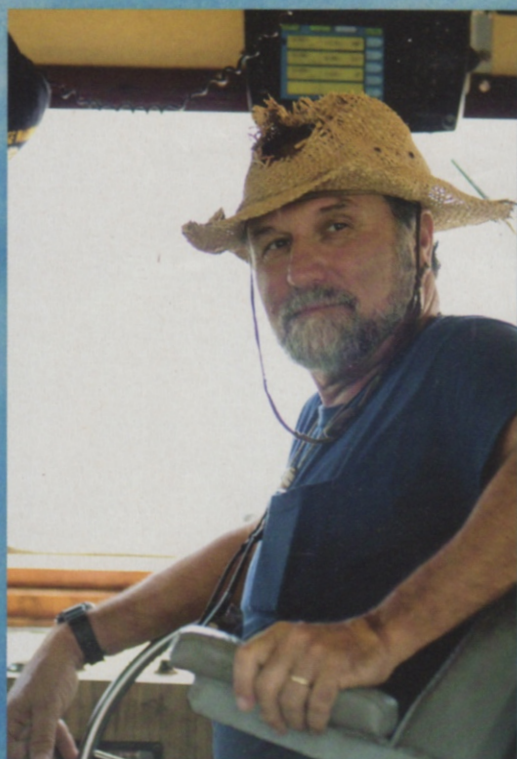
THE 65-FOOT *BAY EAGLE*, AN ALUMINUM “CREW boat” that once ran the mail to and from Tangier Island, is cruising toward Kiptopeke State Park on Virginia’s Eastern Shore. She’s been peeling back a blue-green wake all the way from Lynnhaven Inlet, now and then enticing dolphins to play. It’s an uncommonly beautiful, clear day for early August on the Chesapeake, with a gentle northwest breeze helping dissipate the reek of the dead menhaden that are piled, glassy-eyed and slick, in plastic bait tubs and strewn about an aluminum table on the *Bay Eagle*’s aft deck. ¶ Standing at that table, Dr. Tracey Sutton, an assistant professor of marine science at the Virginia Institute of Marine Science (VIMS) works with Megan Geidner, who’s finishing her master’s

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Right: Captain Durand Ward at the helm of Bay Eagle. Below: An illustration of a scalloped hammerhead.

Preceding pages: An illustration of a sandbar shark and (inset) a scientist checking the newly-inserted tag on a sandbar shark.

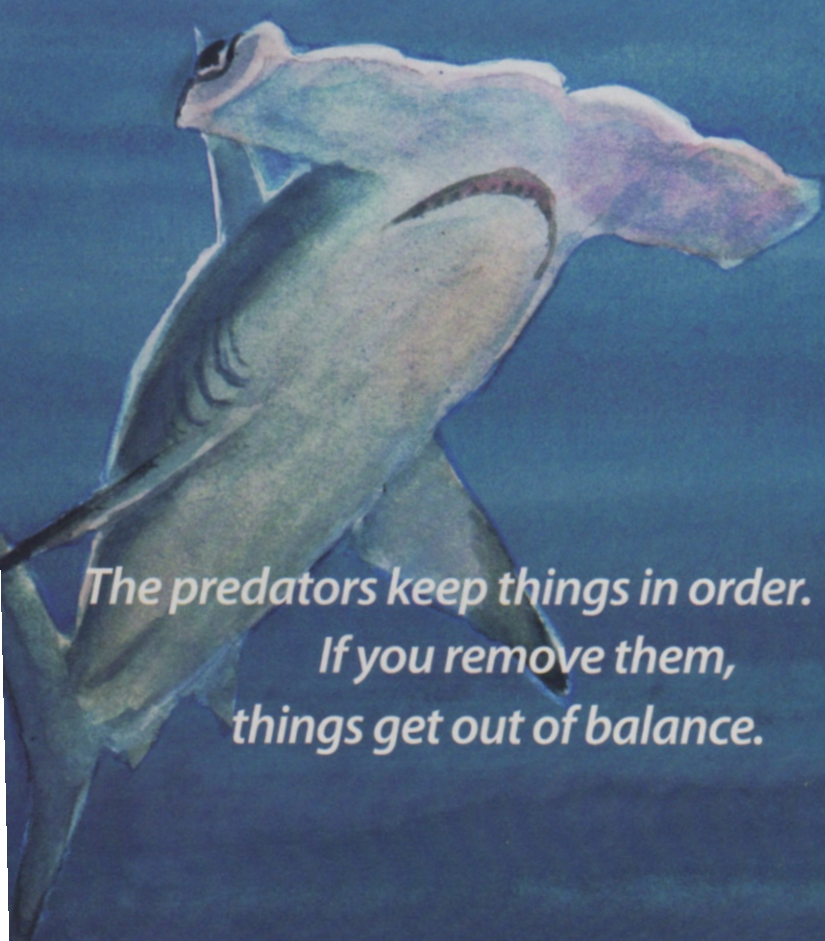


degree at Florida Atlantic University, specializing in a type of deep-sea eel. Wrist-deep in gore, they're baiting hooks with chunks of the menhaden. Hundreds of chunks, attached to gangions that are then carefully laid in yet another plastic tub, so they can be clipped systematically to a longline that will be deployed off the stern of the *Bay Eagle* in a few minutes, just as soon as Captain Durand Ward arrives precisely on station.

And precision is everything on this boat, on this day of fishing for sharks in the southern Chesapeake Bay. The scientists aboard the *Bay Eagle* are conducting surveys for the VIMS Shark Research Program, arguably the longest running shark study in the world. Begun in 1973 by Dr. John A. "Jack" Musick, now professor emeritus at VIMS, the shark survey has enabled scientists to document the dramatic decline in sharks in the Bay and worldwide, which in turn has helped regulators make more informed decisions about how to manage the shark fishery.

"This program is really well known among ichthyologists," says Sutton, who recently took over the program after Musick's retirement. Formerly a principal investigator at Harbor Branch Oceanographic Institute at Florida Atlantic University, Sutton studies what happens to ocean communities when apex predators like sharks begin to disappear. "We're finding that ecosystems are healthier when they have sharks," he says. "It's called top-down control. The predators keep things in order, and if you remove the predators, things get out of balance."

The data developed by the VIMS program, used by scientists worldwide, depends upon as few variables as possible entering the 35-year-old experiment. And so, precision. When Ward finally pulls back the *Bay Eagle's* throttles, he's brought her to exactly the same spot off Kiptopeke that Musick started fishing years ago—near the breakwater made of scuttled experimental concrete-hull ships that were built during World War II. It's one of nine stations, fished every month from June through September, between here and a spot called Triangle Wreck, about 40 miles offshore. The boat will make two sets today, one here and one a few miles southwest on the Middle Ground. Tomorrow, it will head to Sandbridge, Va., for two more sets there, then north to a station at Chesapeake Light Tower, and then two stations off the Atlantic side of the Eastern Shore. Then it's offshore for a check



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at Smith Island Shoal, and then the Triangle Wreck. Weather depending, the whole trip may take three to five days. Asked which he likes better, the Bay or the Atlantic, Ward, a native of Poquoson, Va., who's been running the shark program boat pretty much since it began, grins knowingly. "Depends on the day," he says.

Ward slows the *Bay Eagle*. Cape Charles is just ahead, and to the east, the long stretch of beach is a white necklace on the green throat of the shoreline. "All right!" says Josh Smith, one of Musick's grad students, specializing in stingrays, ready to get to work. Most of Smith's work takes place in knee-deep water on the back bays of Virginia's Atlantic coast. But even though his studies aren't specific to sharks, like the other graduate students on this trip he's here as part of his curriculum requirements. And the fact is, you never know what you're going to pull up.

Smith takes up position at the *Bay Eagle*'s transom. Chip Cotton, a grad student studying the ecology of deep-sea sharks, pulls a high-flyer—a tall pole with a buoy partway up and a small radar reflector and strobe at the top—from a plastic holder and hands it over to Smith, who attaches it to the longline and tosses it overboard. After that he chucks a rusty anchor to hold this end of the line, with a bright orange buoy attached. This marks the starting point of this set.

Methodically and with little talk, Sutton and Geidner continue to bait, while incoming PhD student Kristene Parsons (who hasn't decided on her specialty, just that it will have something to do with sharks), hands the baited gangions one by one to Smith. He clips them onto the line at 20-meter intervals as Cotton monitors the huge spool that's spinning, whapping noisily as it peels off line that runs through a series of pulleys before falling behind the boat.

The first series of hooks (40 of them) are small, 12/0 circle hooks aimed to catch baby sharks—called "yoyos," short for young of the year. After that come 80 more—9/0 J-hooks, for larger animals. As Parsons hands each gangion to Smith she calls out the number, and at every 20 Smith drops another orange ball. The hook size and number, type of bait, gangion length (two meters), dis-

tance between gangions, even the line running off the spool, has remained consistent through the duration of the VIMS study.

Each set stays in the water for exactly four hours, Sutton says. "The constraints are strictly kept. We want to control which variables we're looking at. These are highly migratory species, so we need to know how much of the change in abundance is due to migration, or a change in population." He calls up to the captain, "What's the depth?"

"Thirty-four," comes Ward's voice over the loudspeaker. "We started at seventy-five."

The current, pulled by a nearly full moon, is ebbing strongly. "Last twenty," Smith calls, clipping another buoy on the line. The buoys stretch astern of the *Bay Eagle* like huge Christmas balls dotting the flat green water. The one marking the beginning of the set is nearly out of sight. "Anchor over," calls Smith.

"Twenty-four," Ward calls the depth.

Smith throws over another high-flyer to mark the line's end, Ward powers up the diesels, and about half an hour later he slows down again, this time on the Middle Ground just north of the Bridge-Tunnel. "Twenty-five, Josh," Ward says on the loudspeaker, and the whole routine begins again, until another mile or so of line with 120 hooks is set. When the scientists are done, Ward cruises back across the Bay to

Below: Ship's mate John Olney, Jr. hauls in a scalloped hammerhead. Bottom: Graduate students Chip Cotton (left) and Josh Smith examine a sandbar shark and record data.





Top to bottom: A sandbar shark on the hook; Dr. Tracey Sutton with a young sandbar shark; and Florida Atlantic grad student Megan Geidner measuring an Atlantic sharpnose shark. Opposite page: Sutton and Geidner measuring a rougtail stingray; and an illustration of an Atlantic sharpnose shark.



the set off Kiptopeke, where he will anchor, the crew will rest, read, eat lunch, and wait the allotted four hours to haul back the first line.

So, what kinds of sharks are in the Chesapeake, swimming around down there under your boat's keel? You might be surprised. By far the most common is the sandbar shark, *Carcharhinus plumbeus*. Six to seven feet long when they're fully grown, they range worldwide in both temperate and tropical waters. Along the East Coast, they migrate from New England to the Florida Keys, and in June the females come to the lower Chesapeake to have their pups,

usually eight to nine every other year. As with other juvenile pelagic species, like sea turtles, the baby sandbar sharks find the Chesapeake's shallow waters an ideal nursery. "For the Atlantic coast population, the Chesapeake Bay is the nursing ground," Musick says. "So whatever happens to these sharks in the Chesapeake affects the whole East Coast population. They stay till the end of September and migrate south. . . . They over-winter off the Carolina coast and when it gets cold inshore, they move offshore to the edge of the Gulf Stream. The bigger and older they get, the farther they go."

Other species found in the Bay as juveniles are Atlantic sharpnose (*Rhizoprionodon terraenovae*) and scalloped hammerhead (*Sphyrna lewini*). Occasionally the VIMS scientists will also catch dusky sharks (*C. obscurus*), black-tips (*C. limbatus*), sand tigers (*C. taurus*), and smooth hammerheads (*S. zygaena*) in the Bay. On the ocean side they catch spinners (*C. brevipinna*), named for their penchant for making spinning leaps from the water, as well as the formidable tiger sharks (*Galeocerdo cuvier*) and bull sharks (*C. leucas*).

All told, Musick says, there are more than 20 subtropical shark species swimming in Maryland and Virginia coastal waters during the summer. All of them must migrate south in the fall when the area's waters grow too cold. Nearly all of these sharks must stay in salt water; most can't tolerate anything lower than 30 parts per thousand (ppt), Musick says. The sandbar shark is slightly more tolerant, down to 20 ppt or so. In the Bay, sharks stay mostly to the Eastern Shore side and south of Smith Island, well away from the freshwater influence of large rivers like the Potomac and Rappahannock. The one notable exception is the bull shark, which can tolerate fresh water and has been known to travel far up rivers including the Mississippi and Amazon—but it's nevertheless rare in the Bay. "We've been monitoring since 1973 and until last year we'd recorded something like seven thousand specimens, and of those only ten were bull sharks in all Virginia waters, including the Bay," Musick says.

It was, however, a bull shark that killed 10-year-old David Peltier of Richmond, Va., in September 2001 off Virginia Beach. He and his father were standing in four-foot-deep water on a sandbar some 50 yards offshore at about 6 p.m.

(dusk and dawn are prime shark feeding times) when he was attacked by what Musick says was a mature bull shark. Despite his father's attempts to save the boy, the shark's bite severed a major artery in his leg and he lost too much blood.

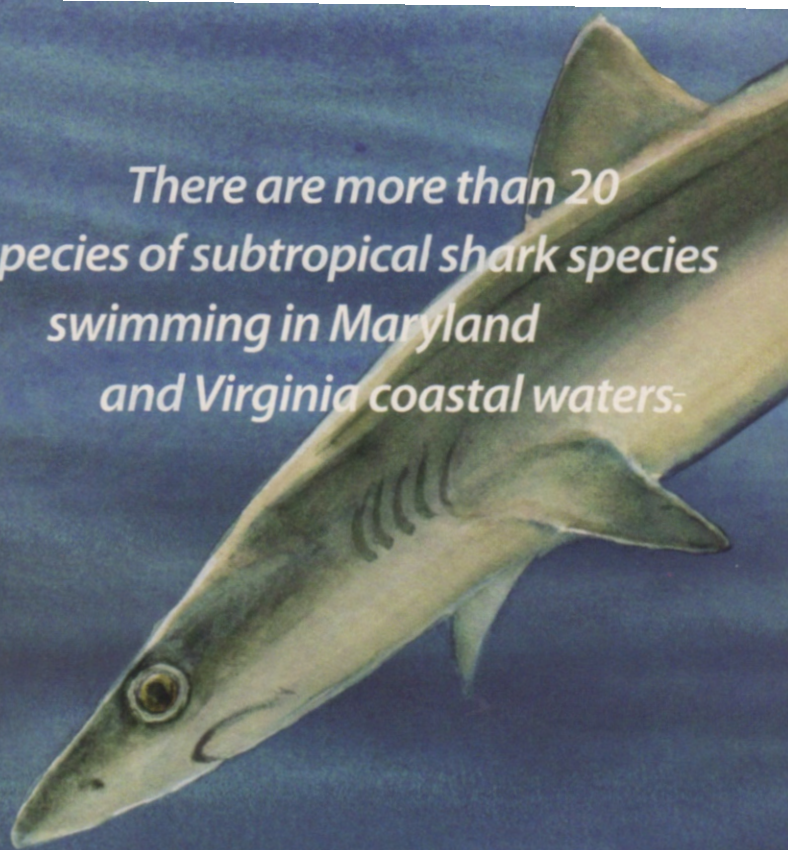
Which raises the \$6 million question: How likely is it you'll jump in for an evening dip and encounter a shark in the Bay? The answer is: extremely unlikely. In Maryland, from 1959 to 2007, 124 people died from being struck by lightning; none died from a shark attack, because there were no reported attacks in that period. In Virginia, where four attacks were reported for that period, only one was fatal (David Peltier), while lightning killed 64 people. Those numbers are according to the International Shark Attack File (ISAF), a database of shark information maintained by the American Elasmobranch Society (an international group of scientists studying sharks, skates and rays) and the Florida Museum of Natural History. Annually worldwide, ISAF says, 70 to 100 shark attacks result in 5 to 15 deaths. The numbers are ranges because not all attacks are reported, and information from Third World countries is limited. Most attacks happen in near-shore waters, typically between sandbars or inshore of a sandbar where sharks feed. Your chances of being bitten by a dog, the ISAF website points out, are much greater than being bitten by a shark. In 2007, 31 people were killed in dog attacks in the U.S, none by sharks.

Most shark attacks, Musick says, are cases of mistaken identity. If a shark is hunting in the surf zone, for instance, where the water is turbid and visibility poor, it might see a flash of something and think it's a fish. "Then they realize it's a big animal they've gotten hold of and they [let go]," he says. "But by then you've got a nice gash." As more people spend more time on the coasts, mingling in the same environment as the shark, the chance of attacks increasing is to be expected.

What research by VIMS and other scientists has found is that by far the loser in interactions between humans and sharks is the shark. Around the world, shark populations are declining dramatically. Bycatch is a major problem—sharks being caught and killed by accident in nets or on lines that were meant for some other species.

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But the most recent and terrible culprit is the practice of finning—catching sharks solely for their fins, which are then shipped to Asia, where shark fin soup is a popular delicacy. Often, after their fins are cut off, the sharks are dumped back into the sea to die because their bodies take up valuable cargo space. The Ocean Conservancy estimates that finning kills more than 73 million sharks a year. Though finning was banned in all U.S. waters in 2000, it still is legal in most waters throughout the world, and the demand hasn't slowed.

"When finning started and the price of fins went off the wall, a lot of longliners who previously focused on swordfish started finning sharks and dumping carcasses," Musick says. "By 1992, we saw for a lot of big sharks, like the dusky, between a 70 and 90 percent decline. Unbelievable. A big animal like a dusky shark takes twenty years to mature, and has a three-year [birthing] cycle. An animal like that takes forever to come back."

VIMS' monitoring in the Bay and coastal Chesapeake waters found that by 2003, the population of sandbar sharks—once one of the most abundant species on the East Coast—had declined as much as 70 percent. Today it has recovered somewhat, but only to about 50 percent of its 1970s levels. Other sharks, like the dusky and sandtiger, remain severely low—at 25 and 40 percent, respectively, of their numbers in the 1970s.

Despite their fierce reputation, sharks are remarkably vulnerable animals when faced with this kind of predation. That's because it takes them a long time to mature, and a long time to gestate. Sandbars, for instance, don't reach sexual maturity for about 13 years, and when they do they only get pregnant every other year. It takes almost a full year for their embryos to develop, and when they do give birth, they have up to nine pups. "So you're

looking at a two-year cycle," Musick says. "What that means is the annual fecundity is five, and about half of them are female. Their chances of [population] increases are really low."

Along with his work at VIMS, Musick is the chairman of the shark technical committee, which advises the Atlantic States Marine Fisheries Commission's (ASMFC) Spiny Dogfish and Coastal Sharks Management Board. The ASMFC regulates commercial and recreational fisheries out to three nautical miles. Beyond that, out to 200 nautical

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miles, fishing regulations are the bailiwick of the National Marine Fisheries Service (NMFS). Because they are trying to balance the survival needs of various species with the economic needs of commercial and recreational fishermen, the two groups must negotiate a minefield of opinion among anglers, environmental activists and scientists—who all look at management issues differently. But population assessments for coastal sharks have shown that many species can't sustain the current fishing pressure, and this year, the NMFS and the ASMFC made significant changes to give sharks a chance to rebound.

In spring 2008 the NMFS Office of Sustainable Fisheries implemented a rule amendment that reduced quotas and trip limits for fishermen, and made the sandbar shark a "research-only" species. That means only fishermen who have applied for and obtained a specific federal research permit can harvest sandbar sharks; the NMFS has indicated it will randomly select approximately 10 qualified applicants. The amendment also requires that fins remain attached to any sharks landed, which helps law enforcement officers identify the species.

In August, the ASMFC voted to do

the same, agreeing that the population of sandbars is so low that the species can't sustain any fishing pressure, and that making the species "research-only" will give the animals a better chance at recovery and focus all landings on research. Education and awareness is also important for the plan to succeed, so states can also issue permits for sharks to be taken for display in public aquariums and similar educational venues. The ASMFC also implemented a seasonal closure for silky, tiger, black-tip, bull, spinner, lemon, nurse, smooth

hammerhead, scalloped hammerhead and great hammerhead sharks from May 15 through July 15, from Virginia through New Jersey, to protect the pregnant females. And, the new regulations agree with NMFS's

position that all sharks must be landed with fins attached.

Musick and others hope the changes will give sandbar sharks a chance at recovery. "I would guess there are only a couple thousand females in the Bay population, and behind the barrier islands probably less than a hundred," Musick says. "Coastwise there are tens of thousands, but for a large species that probably once had a million animals or more, that's a helluva decline."

At a little after 4 p.m., with the Eagles playing "Hotel California" on the newly installed bridgedeck speakers, Captain Ward fires up the *Bay Eagle's* diesels, retrieves the anchor and heads for the top of the first set. The haul-back work is done at the bow rather than the stern as the boat motors along the line, and John Olney Jr., of Gloucester, Va., the ship's mate, picks up the buoy and high-flyer, handing them to Sutton. And then, as the first few gangions are pulled up and the longline slowly spools back onto the drum, things start happening pretty fast. One after another, Sutton, Geidner, and Smith walk aft carrying shark after shark, while Parsons and Olney monitor the retrieval of the longline.

On the boat's port side aft is a worktable where a V-shaped plywood cradle is attached. Staped to one side of the cradle is a metric tape measure; as soon as a shark is laid in here, the scientists start calling information to Cotton, who is waiting, clipboard and pen in hand. They measure the shark's length in three separate locations on the body, record the gender and species, the hook number, and then, with an instrument that resembles an ice pick, stab a pipe-cleaner-size tag into the base of the dorsal fin. The tag has VIMS' address and phone number; if someone catches the tagged shark, they can call VIMS and let them know where and when it was found, more fodder for migration studies. Then they release the animal. With everything happening at once, it's an intense choreography, with few wasted words or motions.

The first shark out of the water is a scalloped hammerhead, an immature male less than two feet long. It's dead. Then another one, this one alive. Sutton holds the shark in a large, open tub next to the worktable, where seawater is being pumped constantly so stressed-out fish can be "ventilated." By pushing water forcibly over the gills, the scientists can often revive a young shark that looked half dead when it came from the water. Sutton holds the fish here while Smith and Cotton record the dead hammerhead's information, then place it on another table for dissection later. They'll examine and record the stomach contents, and slice a piece of vertebrae out for a future study on shark aging (shark vertebrae are ringed, like a tree). "All the dead ones we'll keep and try to get more information on them," Cotton says. "We don't want to kill them but when they do die, we try to make the most of them."

One after another the young sharks come off the longline, back to the tank and then to the table for measuring—scalloped hammerheads, sandbars, Atlantic sharpnose. "Here's a yoyo," Smith calls, a newborn male sandbar pup. The baby sharks are perfect miniatures of their older brethren, with a silky

grey sheen to their backs and undersides as white as a full moon. Their tiny teeth are pure white, as small and sharp as a puppy's, set in an elegant curve in their jaw. Someone calls out another scalloped hammerhead and Cotton looks delighted. "This is great," he says. "I've never seen so many scalloped hammerheads over here."

As the boat works down the line and the larger hooks start coming up, the catch slows down but the sharks get bigger. The Eagles are singing "Take It to the Limit" when a three- to four-year-old male sandbar comes up, 93 centimeters long (just over three feet) head to tail. A few minutes later, Sutton needs pliers to remove the hook from a slightly larger male, which thrashes hard enough during the rough surgery to knock over a plastic toolbox beside the workbench. Though its back looks simply gray at first, as the light hits it, it shimmers an iridescent green, silver and blue. After being measured and tagged, the shark soars off into the water like lightning.

At the end of the first set Cotton has recorded 25 sharks, nine of them scalloped hammerheads. "I wouldn't go so far as to say that's unprecedented, but I've never seen it before here, at this station," he says. "But that species does tend to run in schools, and that's probably what we saw there."

The *Bay Eagle* starts hauling back the second set on the Middle Ground by 6 p.m. This time, the first shark up is a juvenile Atlantic sharpnose, followed by a clearnose skate, an exotic looking creature with a pearl-white underbelly, tiny spines up and down its tail, and a rainbow of color along the inner edge of its fins. All skates and rays get recorded too, and the scientists catch many more of them here. They also see more sharpnose sharks and young sandbars, but no adults, which is not surprising. The male sandbars rarely come into the Bay, Musick says, and mature females only come in long enough to pup before heading offshore again. This set is much quieter than the first—until nearly the end, when a southern stingray about the size of a twin bed looms up

alongside the boat, well hooked on the line. "Hey, gurney time, Chip!" Smith calls. Cotton and Parsons retrieve a rectangular aluminum frame strung with net that they use to cradle big animals and retrieve them from the water. They lower it with winches and finesse it beneath the ray, then winch it onto the deck, where the ray lays upside down, its boxy mouth open.

Cameras start popping out everywhere as Smith measures and examines the ray—it's a female, about four feet across, and she's swallowed the hook. Smith cuts the line as short as possible, then tags the ray and eases it over the side.

After a few more empty hooks, the set is finished. The haul: six sharpnose sharks, two cownose rays, two clearnose skates, one southern stingray, three sandbar sharks and one scalloped hammerhead. Sutton talks about the number of young hammerheads that died on the line and discusses the possibility of slightly lengthening the gangions, so the hammerheads, which are generally more active than the sandbars, have more room to swim after they're hooked. "Anything we can do to lower mortality," he says. "I don't want to kill any sharks. They look very robust, but they're actually very delicate animals."

To the west over Hampton Roads the sky is a deep orange, transforming the *Bay Eagle*'s wake into hammered copper. And beneath, where the water is dark already by now, the sharks are silently swimming, heading for a future of hope and doubt. ↓

Shark Bites

For more information about sharks in the Bay and elsewhere, here are some useful websites:

Shark fact sheet and list of common Virginia species: www.vims.edu/fastnews/sharknews.html

The International Shark Attack File: www.flmnh.ufl.edu/fish/sharks/ISAF/ISAF.htm

National Shark Research Consortium: www.flmnh.ufl.edu/fish/sharks/nsrc/vims.htm