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For centuries, the Diamond Shoals off North Carolina have been collecting shipwrecks. Hundreds of crumpled merchant vessels swamped by Mother Nature's fury and scores of battle scarred war machines torn apart by enemy shells loom above the otherwise featureless substrate. Subjected to racing currents and pounded by relentless surge, each wreck eventually erodes into an unidentifiable debris field. But in the interim, while the doomed ships still hold their structure, they are magically transformed into vibrant marine oases.

Initially, planktonic life forms looking for a permanent home attach themselves to every available inch of real estate. Larger invertebrates like snails and small crabs soon follow and begin grazing on the newly seeded decks. Within a season or two, blennies, angelfish and other small tropicals have arrived from who knows where, and the ghostly corridors are filled with swarms of silvery baitfish that morph from one shadowy corner to the next.

Bermuda chub peck away omnivorously at anything slow enough to constitute lunch, and amber jacks sweep

down from the heavens to scoop up the weak and injured.

Suspended in the water column, schools of shimmering Atlantic Spade fish practice their synchronized swimming techniques, while motionless barracudas hang in groups around the remaining

masts like living sign posts pointing to other distant oases.

Lording over the entire food web, enormous sandtiger sharks hover in the choicest locations, or patrol slowly back and forth with their unblinking eyes and implacable, snaggletooth grins.

### The Sandtiger shark

Sandtiger's belong to the mackerel shark order, but they share few characteristics with their fast moving mako and white shark cousins.

There are three species of sandtigers: the smalltooth sandtiger, which

is rarely encountered except at great depth around Malpelo Island; the big-eye sandtiger, which is extremely rare and inhabits even deeper water than its smalltooth cousin; and the common sandtiger that many divers around the world have come to know and love.

# Seize the Day

— a lesson from Mother Nature





# shark tales



CLOCKWISE FROM LEFT: Sandtiger shark with diver; Barracudas above the wreck of the *Spar*; Lionfish; School of Atlantic spade fish. PREVIOUS PAGE: Sandtiger shark inside wreck

Even beyond the diving community, sandtigers are well known celebrities. Their ability to gulp air in order to counteract their negative buoyancy means that they do not have to swim continuously to avoid sinking. This makes them popular sharks in public aquariums because they are less likely to swim into the walls and inflict damage on themselves.

However, long-term incarceration in small aquarium tanks does have an adverse effect on the sharks. After a few years in captivity, sandtigers often show signs of abnormal growth patterns including stunted fins and hunched backs.

Even in the wild, sandtigers have their problems. Many populations struggle with parasitic growths in their mouths, and I have seen sandtigers with spine deformations and even one albino that had somehow managed to survive till adulthood.

Sandtigers (called ragged-tooth sharks in Africa and grey nurse sharks in Australia) are unique in



more ways than one. They are livebearers that produce two offspring (one in each uterus) per season. The developing embryos indulge in inter-uterine cannibalism. Once they have devoured all of their smaller siblings, they begin consuming a constant supply of unfertilized eggs that are chan-



feed as often as faster swimming species. That is a great advantage for large predators that have to rely on a limited food supply like the sandtigers on the wrecks of North Carolina.

But, sandtigers are also ram ventilators, and their casual approach

neled into the oviducts—a feeding strategy known as oophagy.

The sandtiger's ability to mooch slowly along with a stomach full of air is a fascinating adaptation, but in some ways, it may be a double-edged sword. It allows the sharks to conserve energy, which means that they do not have to

to swimming may in some ways limit their oxygen uptake, making them more sluggish and possibly even slower witted than other mackerel sharks.

Sandtigers are not picky eaters. They are known to consume bony fishes, small

sharks, rays, squids, crabs and lobsters. Interestingly, the North Atlantic population has not yet developed a taste for red lionfish.

## Lionfish

A decade ago, lionfish from the tropical Pacific somehow managed to establish themselves on the wrecks of the Diamond Shoals. It's possible that the invaders were flushed from the bilges of passing ships, or they could have been released from home aquari-

ums. However they got there, they appear to be flourishing. As they have no natural enemies, it looks as though the ecosystems that they have invaded may be changed forever by their presence.

One of the best known wrecks off the North Carolina coastline is called the *Spar*. It is a thriving 300-foot long artificial reef that was sunk about a two-hour run from Morehead City. Because of its elevation and intact super-

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THIS PAGE: Sandtiger sharks' ability to gulp air to counteract their negative buoyancy means they don't have to swim continuously to avoid sinking

environments are in a constant state of change. Change can seem scary, especially when humanity is involved in manipulating the natural order of things, but the wrecks of the Diamond Shoals are a manipulation as well.

Five hundred years ago the biggest topographic anomalies on the sea floor were probably a few small Viking ships. A thousand years ago there would have been nothing on the Diamond Shoals except an occasional whale carcass.

Now that large vessels are equipped with 21<sup>st</sup> century navigational aids and better marine safety protocols, North Carolina's crumbling underwater habitats are unlikely to be replenished. It'll take a while, but in a century or two there will be very few manmade structures left on the seafloor. That means, no more colonies of invertebrates, no more levitating sandtiger sharks and no more lionfish.

Mother Nature rolls with the punches. When conditions permit, she presents us with jewels like the marine oases we have right now.

The lesson to be learned from her is never to waste an opportunity. So, dust off your dive gear and enjoy the wondrous diversity of marine life on the shipwrecks of North Carolina while you can.

Find out how you can help to protect sharks by visiting [elasmodiver.com/protectingsharks.htm](http://elasmodiver.com/protectingsharks.htm) ■

structure, it is often packed with sandtigers.

In recent years, it has been plagued by red lionfish, but during a productive weekend shooting sandtigers on the Spar this summer, I was unable to locate a single invader. Could it be that the sharks have developed a taste for spicy Asian cuisine? It's a nice thought, but it is more likely that the lionfish have either migrated into cooler water for the summer, or they are hiding in the bowels of the wreck where sandtiger photographers seldom venture.

It may seem like a catastrophic problem, but before you lose too much sleep over the lionfish invasion, consider this: marine



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# Shark and ray watching could bring significant economic benefits to UK coastal communities



A joint study with La Universidad de la Laguna (Tenerife) shows that shark and ray watching by divers is bringing millions of pounds into the Canary Islands economy every year. Leading independent think-tank NEF (New Economics Foundation) said similar stories could be told in the United Kingdom if better conservation measures are put in place.

"This study reminds us that the marine environment is a key economic asset to countries such as the UK. Wildlife tourism in the UK already brings millions to our local economies but much of the marine environment remains an untapped resource that needs to be looked into in more detail," stated Aniol Esteban, head of environmental economics at NEF.

"Sharks and rays could be a very

exciting starting point to explore the benefits for UK marine wildlife tourism. Better conservation of the marine environment will undoubtedly bring opportunities for UK coastal communities helping them secure longer term income flows and employment," he added.

The study revealed diving companies on the Spanish mainland were missing out on the attraction of sharks for divers, but those inter-

viewed stated a higher frequency of shark and ray sightings would be very beneficial for their businesses.

Shark and ray watching by divers brings in €17.7 million (£14.5 million) to the Canary Islands each year. The United Kingdom has 21 types of sharks and 16 types of skates and rays in its waters, including the basking shark, which is the world's second largest fish. ■

## Algae blooms damage sharks' brains

**Toxins produced by red tide events can alter shark brains, resulting in "hyper-excitability" and even death, according to a new study.**

Brevetoxins, which are brain-changing compounds synthesized by some harmful algal blooms, have now been shown to affect a free-ranging marine species. In this case, researchers focused on lemon sharks, but they believe many other types of sharks could fall victim to the toxins.

"Sharks are exposed via consumption of brevetoxin-contam-

inated water and food, such as shellfish," co-author Niladri Basu explained to Discovery News, mentioning that the toxins can easily cross the shark's blood-brain barrier that otherwise protects the brain.

"Once inside the brain, brevetoxins bind very strongly to a protein that controls sodium flow," added Basu, an assistant professor of environmental health sciences at the University of Michigan School of Public Health. "By disrupting sodium flow in the brain, nerve cells will over-fire and cause hyperexcitability and ultimately result in death." ■

SOURCE: AQUATIC TOXICOLOGY.

## White sharks making a comeback off California

A longstanding statewide ban on fishing for white sharks, an increased survival rate among young white sharks because of fishing gear restrictions, and an expanding sea lion population as a prey source are chief reasons for the comeback.

Christopher Lowe, a professor at Cal State Long Beach, who has performed extensive tagging of juvenile white sharks off Southern California in the United States and has pored over data dating back generations, said personal observations and increased incidental catch rates of small white sharks by commercial fishermen help support his contention. ■

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