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Mob feeding: Driven to frenzy by blood and commotion, a group of spinner sharks churns the ocean to froth.

ICTHYOLOGY

Cutting through the sharklore

Insight begins to replace assumption as the habits of the terrible fish fall under scientific scrutiny

by Christopher Weathersbee

Sharks possess all the characteristics necessary to touch the deepest fears. They attack out of the dim and unknown, in a medium in which man flounders and drowns, and they devour their victims alive. Big sharks, on occasion, bite people in half.

Despite their bone-chilling threat to man in the water—or perhaps because of it, out of an ignorance-is-bliss psychology—until recent years little was known about what makes sharks tick and what makes them attack.

Out of such ignorance came an incredible folklore on how to handle the menace, promulgated by authoritative sources. Pre-World War II survival manuals, for instance, told men swimming in shark-filled waters that the fish are slow moving, coward'y and easily frightened off by splashing.

Those approached by a shark were told to dodge, grab a fin, ride the shark and stab him in the belly or simply bang him on the nose.

Bad experiences with sharks during the war convinced people that this is nonsense. After the war, with more and more people going into the sea for knowledge, money or fun, it was recognized that next to nothing was known about sharks or defenses against them.

As a result the Navy and the American Institute of Biological Sciences formed the Shark Research Panel, determined to learn as much as possible about all aspects of sharks. Now insight is beginning to replace ignorance.

A recent meeting of the research panel at the Smithsonian Institution in Washington drew some 100 scientists, from disciplines as diverse as psychiatry and biochemistry. Topics under discussion ranged from the biting forces of sharks to the function of sharks' cerebrospinal fluid and the psychology of shark-human encounters.

It was apparent that, in the 10 years that the panel has been sponsoring research into the elasmobranchs, the shark art has advanced far beyond the bang-him-on-the-nose era. Instead of being the unpredictable enigma, the shark is emerging as just a big, stupid, predictable fish with strong jaws and a lot of teeth.

An unexpected bonus of the research is a new unders anding of the natural history and physiology of what may turn out to be a very important marine resource. Americans are following the rest of the world in accepting shark on the table, and the fish are the source of the hydrocarbon squalene used in cosmetics.

Research on the elasmobranchs, which includes sharks, skates and rays, has been sparked by shark attacks on men. Thus a great deal of the work on shark behavior and physiology has centered on the elasmobranch central nervous system, in an effort to discover the triggers of the fish's various actions.

The elasmobranch brain is primitive. In most sharks and rays the olfactory and lateral line (hearing-and-touch) sensory systems are very well developed, but other systems are lacking in comparison with bony fishes, and the elasmobranchs seem poorly equipped to integrate their various sensory inputs.

This lack of neural integration results in fairly inflexible responses to stimuli. As a result the sharks have remained essentially open-water fish, confined to the relatively uniform environment there, whereas bony fish have been able to ultilize almost all available living slots in the marine ecology.

The inflexible response is evident in the mob feeding behavior of many sharks. Once a group of sharks has been stimulated to feed, they are more than likely to engulf anything they see, including paper cartons, tin cans, men, and oars. They do not appear to differentiate between edible and inedible, will continue to feed when mortally

wounded and are excited by the smell of even their own blood.

Few sharks exhibit any regular cycle of reduced and increased activity, leaving them more at the mercy of the environment than are bony fishes. Many sharks in fact must swim continuously in order to keep water moving across their gills, while their bony cousins often do something very like sleeping.

Some sharks, it should be noted, have been observed by divers and fishermen in what they describe as a state of rest. Mostly smaller sharks, they have been reported to lie with their heads hidden in crevices. Larger sharks have been reported exhibiting the same behavior in the sea around Takarajima, Japan.

The sharks, all males, arrive around the beginning of March each year, raising the possibility that the phenomenon is not resting but sex-linked behavior. Divers have been able to approach 6- and 7-foot sharks and lasso them as they lay in a trance. Sharks unable to stake out a crevice appear to roll over on their backs.

Another apparently neural peculiarity of elasmobranchs, possibly of comfort, though small, to those trying to outswim them, is that they cannot accelerate rapidly. Bony fishes are able to dart around, but sharks can only bank and roll like heavy bombers.

This may account for their circling approach, which allows them to maintain speed while they inspect a potential victim, and for their final approach, which usually is in the form of a charge. If a shark is deflected from his line of charge, momentum may carry him some way off before he can turn, by which time he may have forgotten he was going to attack.

There appear to be two populations of sharks: Generally they are deep-water fish, but another population, a kind of spillover from the mainstream population, lives inshore.

It is these inshore residents—called bank loafers by some fishermen, from their habit of hanging around sand bars and other shallow water—that are responsible for the bulk of attacks on divers and swimmers.

Dr. Stewart Springer of the Smithsonian's Natural History Museum and a member of the Shark Research Panel, says the simplest approach to control of these inshore sharks—fishing them out—appears to be the best. He says 18-inch-mesh gill nets are just about right, and are being used to great effect in Australia and South Africa.

Quite simply, Dr. Springer says, the inshore sharks can be fished out and kept fished out, either with the nets or by hook and line if the nets might damage other fish populations. Because of the constant replenishment of the inshore population from the main stream, he says, there will always be a few individuals left in the area being fished. But the chance of shark-human encounters and thus of attack will be reduced almost to nothing.

Dr. Springer believes that the genesis of many or most attacks on inshore bathers is a chance meeting. The shark is not hunting people, but if he bumps into something soft and bite-sized he may try it. Many shark attacks occur in murky water, not because it enables the shark to approach an unwary victim, but because he cannot see to avoid one.

The first bite may be little more than a nip under these conditions, or blood may be drawn by the fish's abrasive skin rubbing against a leg. And here the folklore is right. The presence of blood stimulates the shark to feed.

Once a shark is stimulated, Dr. Springer believes, little short of death will discourage him from trying to feed. There have been reports that rescuers have been able to drive off an attacking shark, but it is unlikely that the fish fled for good. Others report dragging the victim almost ashore with the shark still clamped on.

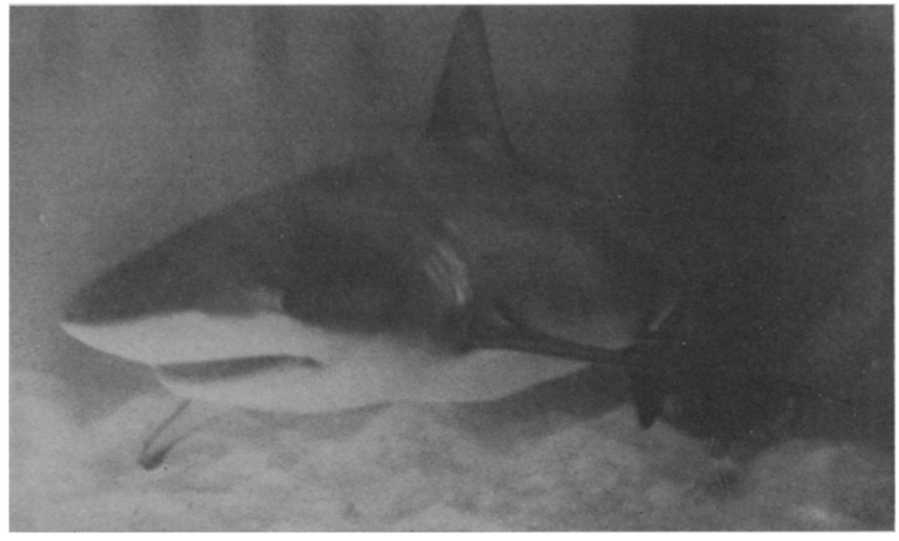
The unfortunate truth is that ordinary bathers have little chance of forestalling this stimulation because they realize too late what is going on.

Two things seem to attract sharks well. One is fish blood or juices. The other is irregular noise or vibrations in the water reminiscent of struggling prey; the sounds of struggle, or the sight of it, appear to be almost a universal stimulant for predators.

Arthur A. Myrberg Jr. of Miami has filmed sharks being attracted to an underwater sound emitter. It is found that regular, pure sounds do not attract the animals well. Harsh, irregular noise is capable of bringing them from great distances, however. Apparently the splashing once so confidently advised as a shark repellent is in fact an attractant instead. So might be the underwater screaming, bubbles and so on recommended to divers.

Dr. Springer says attempts to find a chemical shark repellent have about ended. Anything that would injure a shark would do more harm to the human using them.

Recently the Naval Undersea Warfare Center developed a shark protection device that may be the best answer yet. It consists of a bag suspended beneath an inflatable collar. The downed airman or survivor inflates the collar, jumps into the bag and fills it with water. The bag is dark colored and innocuous looking, and so far sharks appear a lot less likely to attack it than they would a dangling pair of legs.



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Sharks may circle to maintain speed while they size up a potential victim.

The bag may even be useable by a diver, Dr. Springer says. A diver could inflate the collar while submerged, hop in the bag, and hide inside as the contraption floats to the surface. Thus he would avoid the riskiest part of getting away from an interested shark, the trip from bottom to boat when he must swim and possibly stimulate an attack.

In the final analysis, Dr. Springer says, what may save a lot of people is that sharks just don't like people very much. They far prefer fish.