

forces should exercise operational control of forces, exclusive of combatant operations, particularly with regard to training operations.

Therefore, a dual chain of command indicates a dual command structure,

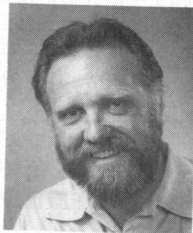
and not solely, two types of control, operational and administrative.

This discussion has only touched the tip of the organizational iceberg. The Navy is a complex body whose organizational characteristics must be

responsive to national objectives and compatible with the executive branch of government. Hopefully, NWP-2 will keep Navy personnel abreast of the ongoing modifications and realignments of the Navy organization.

Sea Creatures and the Problem of Equipment Damage

By C. Scott Johnson, staff scientist for biophysics in the Bioscience Department of the Naval Ocean Systems Center



Sharks, other fish, and squid do damage to deep sea lines as well as other equipment. Photo 1 shows the marks of a shark bite on a towed array. This bite caused an oil leak that might have resulted in damage to the array had it not been discovered in time. Because of the potential of shark bite damage, some towed arrays have been specially designed to prevent bites from causing failures.

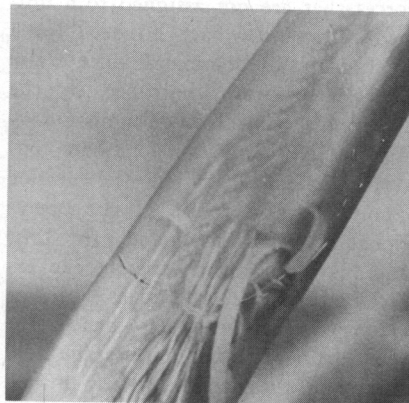
While some damage is easily determined to be of biological origin, in other cases this is not obvious. There have been instances of damaging cuts discovered on boots of AN/BQR-19 hydrophone arrays. Photo 2 shows the type of damage sustained by the BQR-19, which is located on a retractable mast in the sail of some U. S. submarines. Only Pacific-based submarines sustained this type of damage.

Raytheon, the prime contractor for the BQR-19, was in charge of investigating such damage. While none of the arrays ever actually failed due to the cuts, they were categorized as failures and replaced as a precautionary measure when cuts were discovered. At first, it was concluded that the cause of the damage could not be due to biologics because the patterns of the cuts could not be attributed to any animal. The search turned to mechanical stresses and other possible causes. In the end, Skip Gray, who was in charge of Raytheon's investigation, found the clue to the true cause of the problem while discussing it with scientists at the Naval Ocean Systems Center (NOSC). There is a small species

of shark known as *Isistius brasiliensis* that makes its living by biting chunks ("plugs") out of whales, large fish, and other marine animals. This shark (photos 3 & 4), commonly known as the "cigar shark" from its shape and color pattern, or "cookie-cutter" from the wounds it makes, lives in the deep tropical oceans. Once the cause of the damage was definitely established, a fiberglass protector was quickly designed and installed by Raytheon to prevent further damage. Although we are not sure why sharks bit the neoprene boots, no other part of the submarine is soft enough for them to damage.

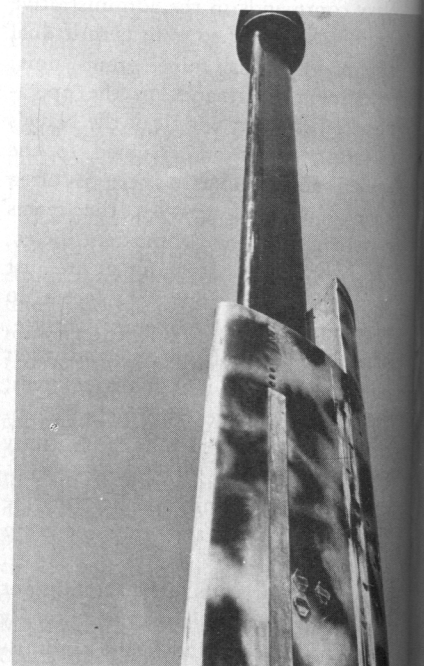
While no failures actually occurred as a result of these bites, on some occasions penetration came within as little as two mm. of doing so. Had actual failures occurred, the operational capability of Pacific-based submarines having AN/BQR-19 systems installed would have been seriously hampered.

F. G. Wood, also of NOSC, has discovered a case of apparent biological damage, but the animal responsible is still unidentified. Photo 5 shows part of the damaged NOFOUL* rubber coating taken from the SQS-26 sonar dome of the USS *Stein* (FF-1065). Approximately 8% of the dome area was damaged in this way resulting in increased sonar noise. Nearly all of the cuts contained remnants of what appear to be teeth or claws. From examining these "claws," scientists have presently concurred that the most likely culprit is a large species of squid. A number of kinds of squid have claws on the rims



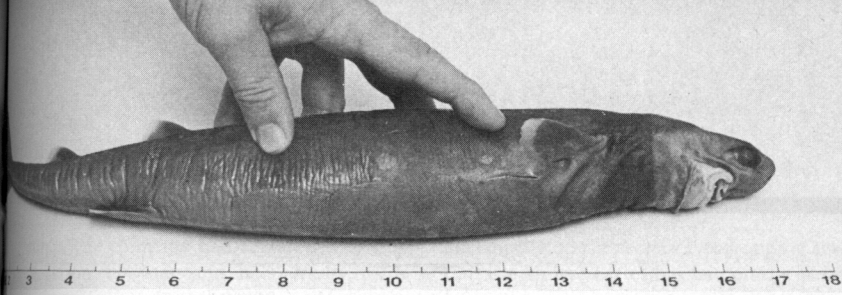
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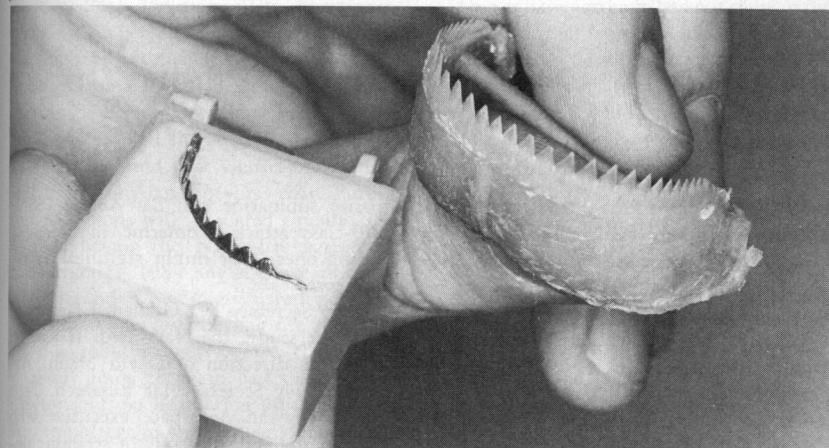


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of their suction cups, and in a few species, sharp, curved claws replace some of the suckers. But in none of these are the claws more than a fraction of the size of the fragments recovered from the NOFOUL. If a squid was indeed responsible for the damage (and there seems to be no other likely explanation), then it must have been extremely large and of a species still unknown to science.

The fact that there still exist large unknown species of animals in the deep oceans was very forcibly brought to the attention of some NOSC personnel on 15 November 1976. On that day a large shark became entangled in a cargo parachute being used as a sea anchor to stabilize oceanographic gear. Nicknamed "Megamouth" (photo 6), the fish was 4.4 meters (14.5 feet) long and weighed 750 kilograms (1,650 pounds). As far as is known, Megamouth represents not just a new species but a completely new family of shark. Like many of the great whales and the two largest species of shark, Megamouth is a filter feeder. It has specially developed gills that allow it to strain the small fish and crustaceans it lives on from the water. It also appears to have luminescent organs inside its mouth which may serve to attract the small prey it eats. (Incidentally, this large shark shows scars from wounds that could have been caused by the little cookie-cutter shark.)

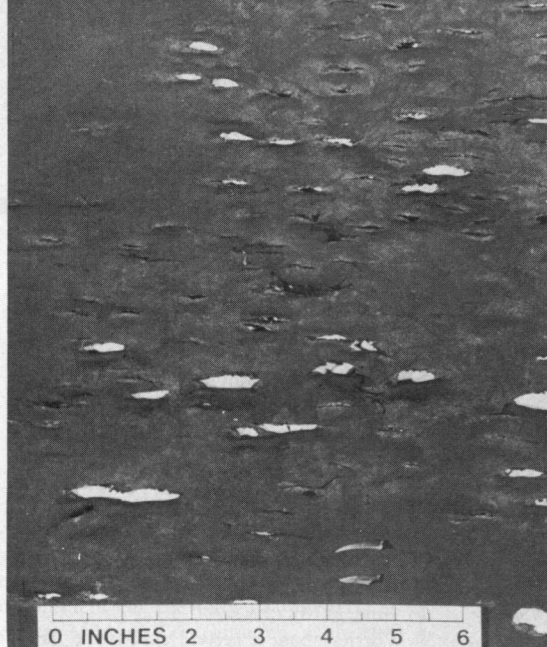
Since we have only one specimen,

we don't know whether the Megamouth we have is a large or small one, nor do we know how many Megamouths exist. We do know that it appears to be a mature male, and was not caught before, most probably, because it is a filter feeder and would not bite a baited hook. Why it became entangled in the parachute is unknown. Since it had part of the chute in its mouth, we can only assume that either it blundered into the chute while feeding with its mouth wide open or it was trying to eat it.

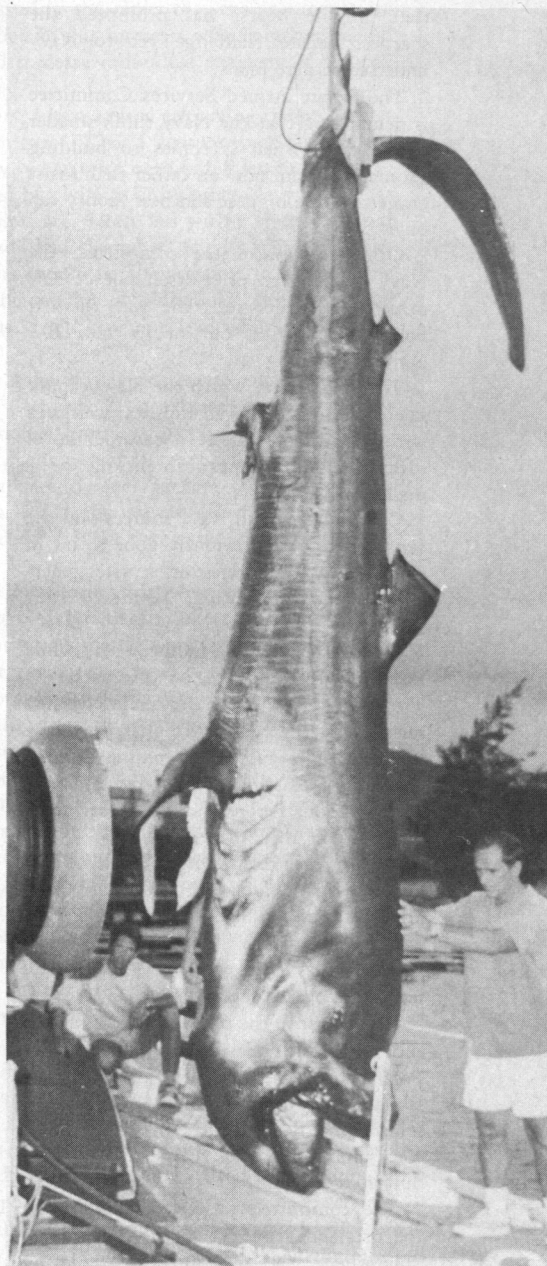
Sharks like Megamouth do not present a biting hazard, but they can cause problems because of their size and power. A fish this size is potentially capable of exerting large pulling forces. In landing Megamouth, the crew of the torpedo recovery boat had to use the full capacity of the anchor winch to make way against the fish. Fortunately, the shark suffocated in a few minutes because the parachute prevented water from circulating through its gills and the crew only had to lift its weight to the surface.

Damage caused by sea animals will, of course, continue. In the interest of identifying the sources of damage it is important that new cases be reported at once to NOSC so that preventive measures can be devised.

*NOFOUL is a rubber-like coating used to cover sonar domes to reduce the growth of fouling organisms.



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