

BULL SHARKS: A REAL BALANCING ACT

By: Randolph Fillmore

Michelle Heupel has spent hundreds of hours catching, tagging, releasing and tracking young bull sharks in Southwest Florida's Caloosahatchee River. Bull sharks, named for their muscular, buffed-up appearance, have the unique talent of being able to live in both salt and fresh water, and much of Heupel's research is aimed at unraveling how they do it. She also wants to know how the youngest bull sharks react when salinity levels change.



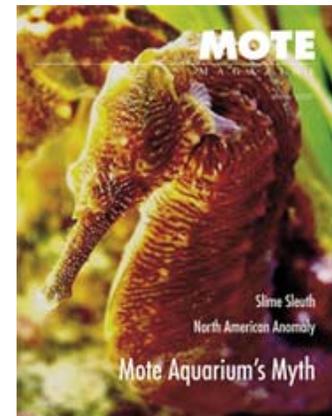
"I want to know more about how bull sharks — the only shark species known to frequent freshwater environments — survive in fresh water," said Heupel, Ph.D, a staff scientist in Mote's Center for Shark Research. "We also want to find out if water management practices that change the natural salinity levels of the river affect how bull sharks use their habitat."

According to Heupel, bull sharks have been known to travel 1,000 miles up the Mississippi River. How do they survive and thrive in fresh water?

"Bull sharks have a salt pump," said Heupel. It's not an organ or a real pump, but a cellular ability to retain salt when breathing high concentrations of fresh water. Heupel hopes to study the physiological processes going on in bull shark cells, the process that allows them to cellularly "osmoregulate" their body fluids to cope with their environment and stay for long periods in a freshwater environment. Although young bull sharks have this ability, they generally choose to stay in a moderately salty environment, somewhere in between fresh and salt water. One focus of Heupel's research is how well young bull sharks, those less than 2 years old, tolerate fresh water.

"The big question is whether living in fresh water is more stressful for these smaller animals than for adults," Heupel said. "It appears that the animals change their behavior to spur their growth at young ages. As salinity declines upstream, sharks head back toward the bay where salinity is higher. We assume that this is because retaining salt uses energy that could be dedicated to growth."

Heupel catches bull sharks by longline fishing, then weighs and measures the animals. Finally, a transmitter is attached to the shark's dorsal fin, and the animal is sent on its way. Strategically placed hydrophones that record the time, date and identity of the bull sharks that pass by track them 24 hours a day, seven days a week.



Editor, Nadine Slimak

MOTE MAGAZINE A Unique Mission

Mote Magazine is published by Mote Marine Laboratory, a nonprofit organization dedicated to advancing the science of the sea. By offering internships to science journalism students through the Media Lab@Mote, the magazine helps foster a better understanding of sea science in those reporting it. Contributing interns have come from the University of South Florida, Kent State University, the Ringling School of Art and Design, Wesleyan University, the University of Wisconsin-Madison, the University of Kansas and Brown University.

Information is periodically downloaded from the monitors, and water salinity levels where the sharks roam are tested.

Early data show young bull sharks ventured farther upriver in 2004 than in 2003, a very wet year, with a lot of freshwater runoff. The young animals appeared to prefer saltwater.

"We are seeing that the young animals stay in their estuarine nurseries for a long time," Heupel said. "The ratio of fresh to salt water seems to have a more noticeable effect on bull sharks less than 1 year old. It appears they become more tolerant of high or low salinity as they age."

Saltwater fluctuations can be blamed on the increasing or decreasing flow of fresh water downstream and the changes in tidal pushes of salt water upstream, said Heupel. Her work is partially funded by the agency that controls fresh water released from Lake Okeechobee through the Caloosahatchee River. Agency officials want to know whether large volumes of fresh water periodically released downstream pose a danger to the young bull sharks using that habitat. "Forty-five percent of the water released from Lake Okeechobee, usually in later summer, flows down the Caloosahatchee River toward bull shark nurseries," Heupel said.

Why should research seek answers to help understand and protect bull sharks? "They're natural predators and without them, estuaries — and rivers feeding estuaries with fresh water — could be overrun with some species," said Heupel.

It's all about keeping the balance.

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