

Digestive Physiology of Sharks

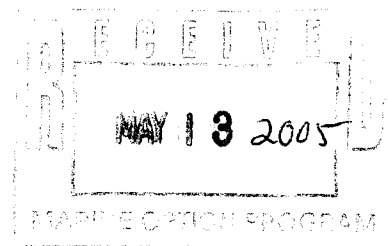
By Steve Russo

Mentored by: Dr. Carl Meyer and Yannis Papastamatiou

Project Dates: December 2004 Ongoing

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**Report Submission to: Marine Option Program, Leeward Community
College**



At the Hawaii Institute of Marine Biology on Coconut Island I have been involved in an internship with the pelagic fish lab. Under the supervision of Dr. Carl Meyer and Yannis Papastamatiou I performed several regular duties and participated in some scientific experiments. The experience was rewarding on a personal and educational level.

One of my primary duties was feeding the pelagic fish that the lab used for experimentation. The feeding of the pelagic fish is an entertaining and interesting job. There were several groups of sharks that are fed on different schedules. There is a group of juvenile *Carcharhinus plumbeus* (sandbar sharks), a small school of *Thunnus albacares* (yellow-fin tuna), a single juvenile *Sphyrna lewini* (scalloped hammerhead), several adult *Triaenodon obesus* (white-tip reef sharks) and several *Carcharhinus melanopterus* (black-tip reef sharks). The most important aspect of feeding these fish was to ensure that each animal ate and was behaving normally. This required patience and good observation skills as the fish usually got very excited around feeding time: it was quite hard to keep track of each individual. I also kept records of the feedings to establish eating patterns and provide evidence that the animals were being properly cared for. It was also important to estimate the amount of food each animal ate to reduce the amount of wasted food and maintain the water quality in the tanks. This was especially important to the *Carcharhinus plumbeus* and *Thunnus albacares* because they are kept in relatively small tanks. The ability to keep good records and make observations about the behaviors of the captive animals is important skill in any situation where captive animals need to be kept alive and in good condition.

Some of the fish, specifically the *Sphyrna lewini*, *Carcharhinus plumbeus*, and *Thunnus albacares* were kept in tanks to segregate them from the other fish that might consider them to be food. These tanks needed to have filtration systems to ensure the high

water quality that pelagic animals require. The filter systems need only very basic maintenance to operate correctly: the filters have to be regularly backwashed to remove all of the waste that would build up in the filter medium from the fish's excrement. Occasionally the lever mechanism, which allowed us to switch between the different filter functions needed to have an internal o-ring replaced. While this process was simple once demonstrated, I believe it to be a useful skill to already know should I work with aquariums in the future.

In addition to the daily care of the pelagic animals, I participated in some scientific experiments. The first experiment I participated in was to determine the electromagnetic sensitivity of *Sphyrna lewini*. The experiment was fairly simple and it started with a fishing trip. We caught an *Sphyrna lewini* about half a mile east of Coconut Island by fishing with hand lines. We transported it back to lab and placed it in a tank that was surrounded with copper wire. Inside the tank a one square foot area was measured out. When we fed the *Sphyrna lewini* we attached an electrode to the copper wire that surrounded the tank. Once we were ready to feed the shark we turned on the power and put the food inside the square. The hypothesis was that once the shark detected the change in the electromagnetic field that it would go into feeding mode whether or not food was added to the tank. Unfortunately this experiment had to be ended before conclusive data was collected due to a leak in the tank. The shark had to be removed and the tank drained and as of today the tank has not been repaired.

The other experiment in which I participated, involved the *Carcharhinus melanopterus* and its digestion. In this experiment a pH data logger was installed in to the sharks stomachs. The long-term goal of this experiment is to determine the regularity and method (physical or mechanical digestion) of *Carcharhinus melanopterus*. The experiment is

being conducted in a controlled environment currently to calibrate the readings from the data loggers. Once this process is done experiments can take place in the wild. Since this experiment is ongoing, I cannot share the results that have been obtained. My participation in this experiment was very exciting. Installing the pH logger involved sedating a shark and installing the logger via a tube inserted into the shark's mouth. After the installation the shark was kept in a quarantine area. This needed be done so the pH logger could be recovered as quickly as possible after the shark had regurgitated it. There is currently no date set to begin experiments in the wild.

During the course of my time at HIMB, I have informally discussed working in the Biological sciences with Yannis Papastamatiou. I have not yet had an opportunity to sit down and talk with Dr. Carl Meyer, due to his and my schedule. I hope to find time to do this during the summer. Through my conversations with Yannis I learned a few things about working in scientific research. As I expected there are a large number of people who would like to enter this profession, especially working with more glamorous species such as sharks. This means that competition for positions is quite fierce and any personal aspects (such as related experience, useful qualifications and excellent grades) help job seekers stand out. I also learned that research isn't all 'looking through a microscope'. There are many projects that can be done on a more macroscopic level. In addition to learning these things a few classes were suggested to me to help make myself a more desirable job candidate. Taking courses Chemistry, Economics, and Environmental Law are good ways to expand the job possibilities for Environmental Science students. While I enjoyed the work that I was involved with at this internship, I don't believe that I am interested in doing research as a

career. The internship has helped me realize that I am most interested in environmental public policy, which should be based on good research.

I learned another important, yet rarely discussed fact from my involvement with this internship. When I began this project I made a budget. This budget only contained money for transportation (gas). While I used a realistic estimate for my fuel usage, I did not predict a large increase in the price of fuel over such a short time (Spring Semester 2005). I also did not budget in any additional trips that I might have made beyond my regularly scheduled Fridays. In this case the result of this underestimation was minor, only \$26.50. However in a larger project this underestimation could have been disastrous. What I have learned about budgeting is to add a cushion for unexpected expenses. After completing this project I realize that I should have estimated \$6.00/day for gas rather than \$5.00. In other words it would have been better to slightly overestimate and be under budget than underestimate and run out of money.

My experience worked at the pelagic fish lab has been both educational and entertaining. I have enjoyed learning more about the habits of the sharks I that worked with and about working in a lab. I feel that I have gained a better understanding about working in the biological research field after talking with Dr. Carl Meyer and Yannis Papastamatiou and have gained some valuable insight about the skills I need to cultivate to continue on my career path. I have enjoyed the experience so much that I will continue to work there throughout the summer, during which time I hope to be involved with the collection of wild specimens and more experiments on the shark's digestion. I would highly recommend this experience to any student who is interested in working with sharks or in the field of marine biology.

Steve Russo

MOP Skill Project Budget

Gas Budget	Date	Travel Time	Work Hours	Duties
	-12/6/2004	1	4	orientation to feeding/cleaning. Hamerhead fishing
\$ 5.00	12/17/2004	1	3	feed/clean
\$ 5.00	12/24/2004	1	3	feeding and cleaning
\$ 5.00	12/31/2004	1	3	feed and clean
\$ 5.00		0	4	proposal writing
\$ 5.00	1/7/2004	1	3	feeding and cleaning
\$ 5.00	1/14/2005	1	3	feeding and cleaning
\$ 5.00	1/21/2005	1	3	feeding and cleaning
\$ 5.00	1/27/2005	1	3	Insertion of data logger in blacktip
\$ 5.00	1/28/2005	1	4	feed/clean and insertion of data logger
\$ 5.00	2/4/2005	1	3	Begin feeding blacktips
\$ 5.00	2/11/2005	1	3	feed and clean
\$ 5.00	2/18/2005	1	4	Hammerhead tank breakdown + feeding
\$ 5.00	2/25/2004	1	4	feed and clean. Fixed filter control
\$ 5.50	3/4/2005	1	3	Feed and clean
\$ 5.50	3/11/2005	1	3	Feed and clean
\$ 5.50	3/18/2005	1	3	Feed and clean
\$ 5.50	3/25/2005	1	3	Feed and clean
\$ 5.50	4/1/2005	1	3	Feed and clean
\$ 5.50	4/8/2005	1	3	Feed and clean
\$ 5.50	4/15/2005	1	3	Feed and clean
\$ 5.50	4/22/2005	1	3	Feed and clean
\$ 5.50	4/29/2005	1	3	Feed and clean
\$ 5.50	5/6/2005	1	3	Feed and clean
\$ 5.50	5/13/2005	1	3	Feed and clean
\$ 5.50	5/20/2005	1	3	Feed and clean
\$ 5.50	5/29/2005	1	3	Feed and tank cleaning
\$ -	5/24/2005	0	4	Final Report
			26	
Totals	Estimate	Total		
Hours	105-110	90		
Travel	22	26		
	\$			
Budget	110.00	\$136.50		