

SPRING 2018

Biology of Sharks

Dion 110, Tuesday and Thursday, 12:30 – 1:45PM

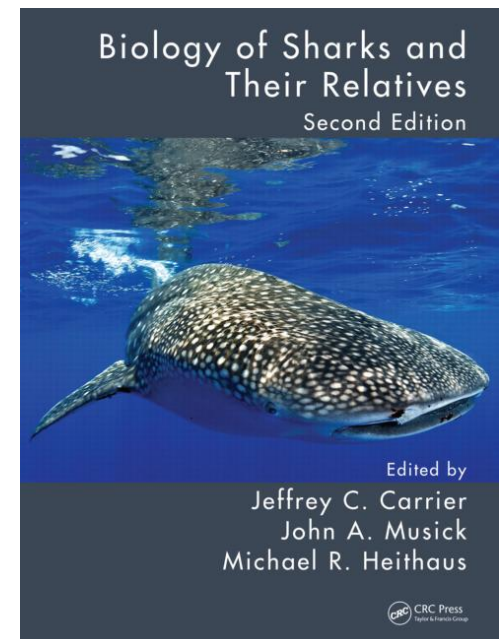
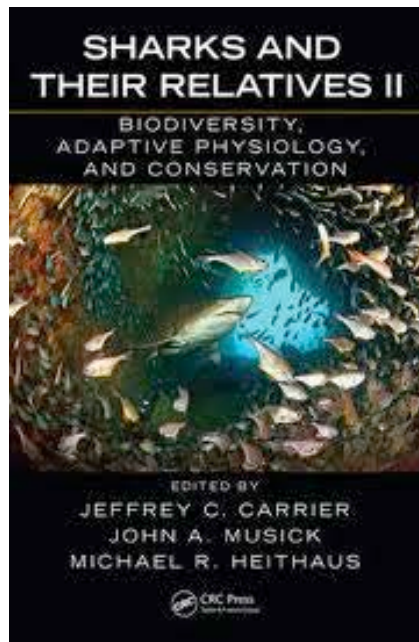
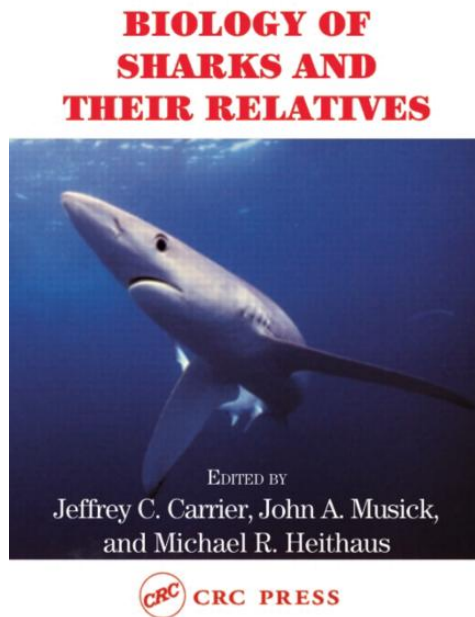
Instructor: Dr. Jeff Kneebone, [jkneebone@umassd.edu](mailto:jkneebone@umassd.edu), Violette Research: 115

Office Hours: Thursday 12:00 – 12:30 PM & 1:45 – 2:15 PM; otherwise by appointment only.

Course overview and objectives: The academic contents of this course are very intensive and require the student to strongly commit adequate time for the reading of all assign material and to attend lectures. This course introduces the student to the diversity of extinct and extant sharks and will provide an overview of chondrichthyan evolution, physiology, life history, and ecology with an emphasis on form and function. In addition, this course will increase the students overall academic skills by requiring additional readings in relevant scientific literature.

Recommended, but not mandated reading material:

<http://fishecophysiology.net>



Class etiquette: The lectures end at ~1:45PM, but if anyone in the lecture is discussing course-related material, you must wait until the verbal exchange is finished before leaving the classroom (do not pack your belongings and create a distraction, wait until we are done). Please turn off cell phones and other electronic devices prior to entering the classroom and if they absolutely must be on for emergency purposes, please make sure that they are silenced. Not texting is allowed and if you have to engage in a phone conversation, you must do so outside of the lecture hall, where your colleagues cannot hear you. No matter how tempting, please no sleeping or reading during the lecture.

Grading: There will be 3 lecture exams each worth 100 points.

100 to 93% = A	92 to 90% = A-	
89 to 87% = B+	86 to 83% = B	82 to 80% = B-
79 to 77% = C+	76 to 73% = C	72 to 70% = C-
69 to 67% = D+	66 to 63% = D	62 to 60% = D-
59% or lower = F		

In accordance with University policy, if you have a documented disability and require accommodations to obtain equal access in this course, please meet with the instructor at the beginning of the semester and provide the appropriate paperwork from the Disabled Students Services Office. The necessary paperwork is obtained when you bring proper documentation to the Disabled Students Services Office (DSS), which is located in Group I, Room 016; phone: 508-999-8711.

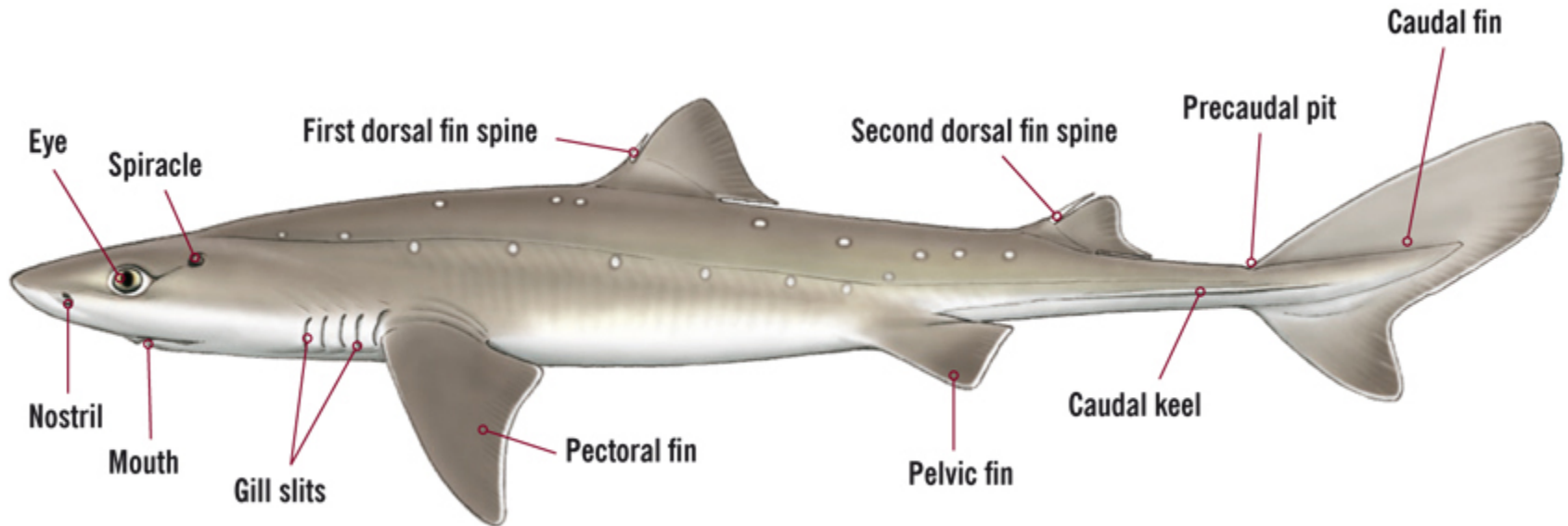
Date	Topic	Chapter <sup>A</sup>	Chapter <sup>B</sup>	Chapter <sup>C</sup>
January 23	Introduction and course overview			
January 25	The evolution of chondrichthyes (Ancient forms)	1		1
January 30	The evolution of chondrichthyes (Modern forms)	2		2
February 1	Morphology: Body form and function	5	2,3,4	5
February 6	Locomotion, swimming, and buoyancy	5		5
February 8	Locomotion, swimming, and buoyancy (cont)	5		5
February 13	Feeding and trophic ecology	6,8		6,8
February 15	Feeding and trophic ecology (cont)	6,8		6,8
February 20	NO CLASS			
February 22	<b>EXAM 1</b>			
February 27	Physiology: Metabolism and respiration	7		7
March 1	Physiology: Metabolism and respiration (cont)	7		7
March 6	Physiology: Endothermy	7		7
March 8	Physiology: Osmoregulation	9		9
March 13	SPRING BREAK: NO CLASS			
March 15	SPRING BREAK: NO CLASS			
March 20	Immune system	13		13
March 22	Sensory systems	12		12
March 27	Sensory systems (cont)	12		12
March 29	<b>EXAM 2</b>			
April 3	Life history: Age and Growth	14		14
April 5	Life history: Reproduction	10,11		10,11
April 10	Life history: Reproduction (cont)	10,11		10,11
April 12	Life history: Movements and ecology	19	7	19
April 17	Life history: Movements and ecology (cont)	19	7	19
April 19	Genetics	16		16
April 24	Fisheries, management, and conservation	15	11,17	15
April 26	Sharks of New England			
May 1	<b>EXAM 3</b>			

# What are sharks?

## Sharks are Fish!!!

“a poikilothermic, aquatic chordate with appendages (when present) developed as fins, whose chief respiratory organs are gills and whose body is usually covered by scales”

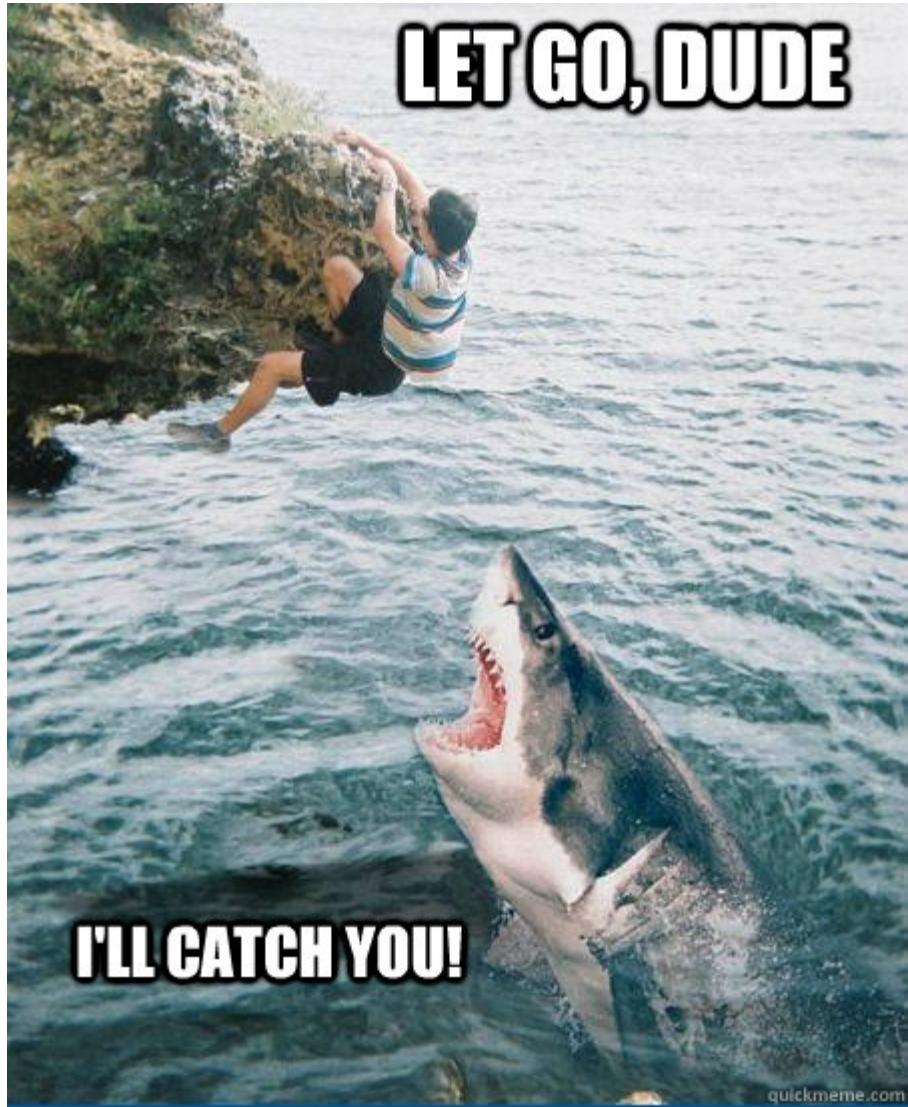
“an aquatic vertebrate with gills and with limbs in the shape of fins”



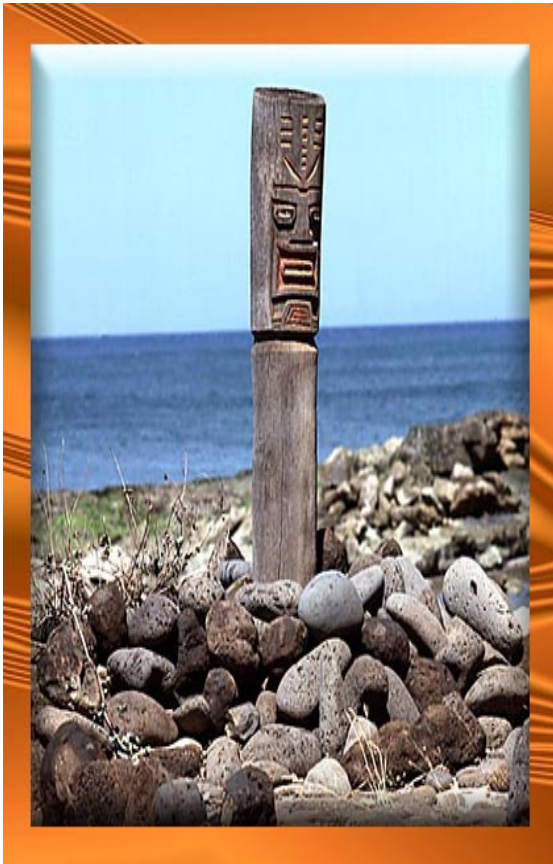
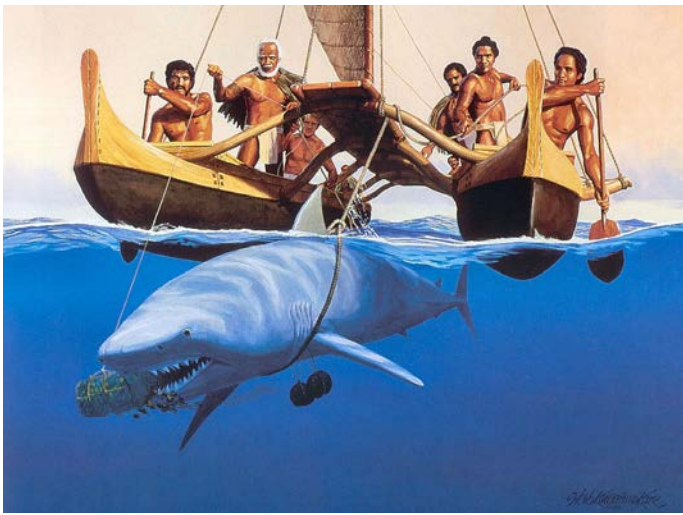
# Historical Depictions of Sharks







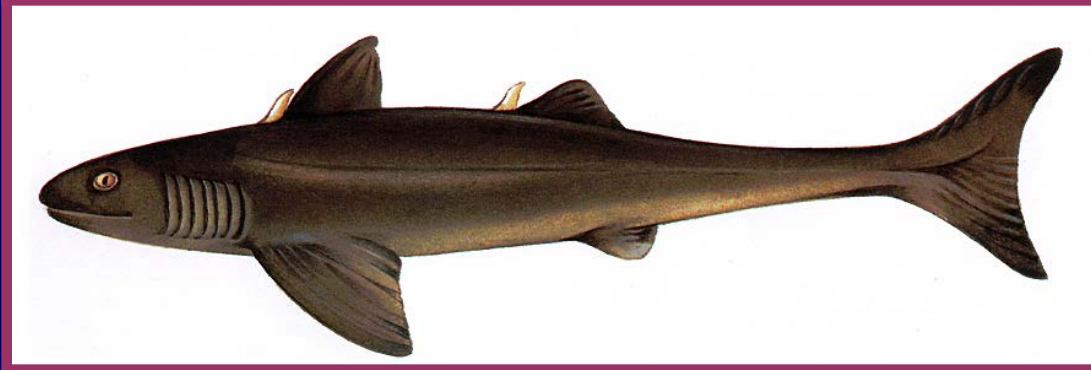
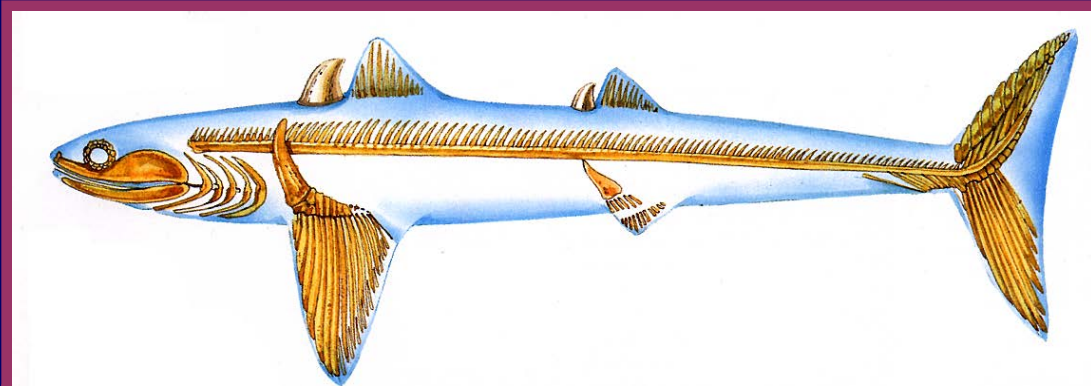




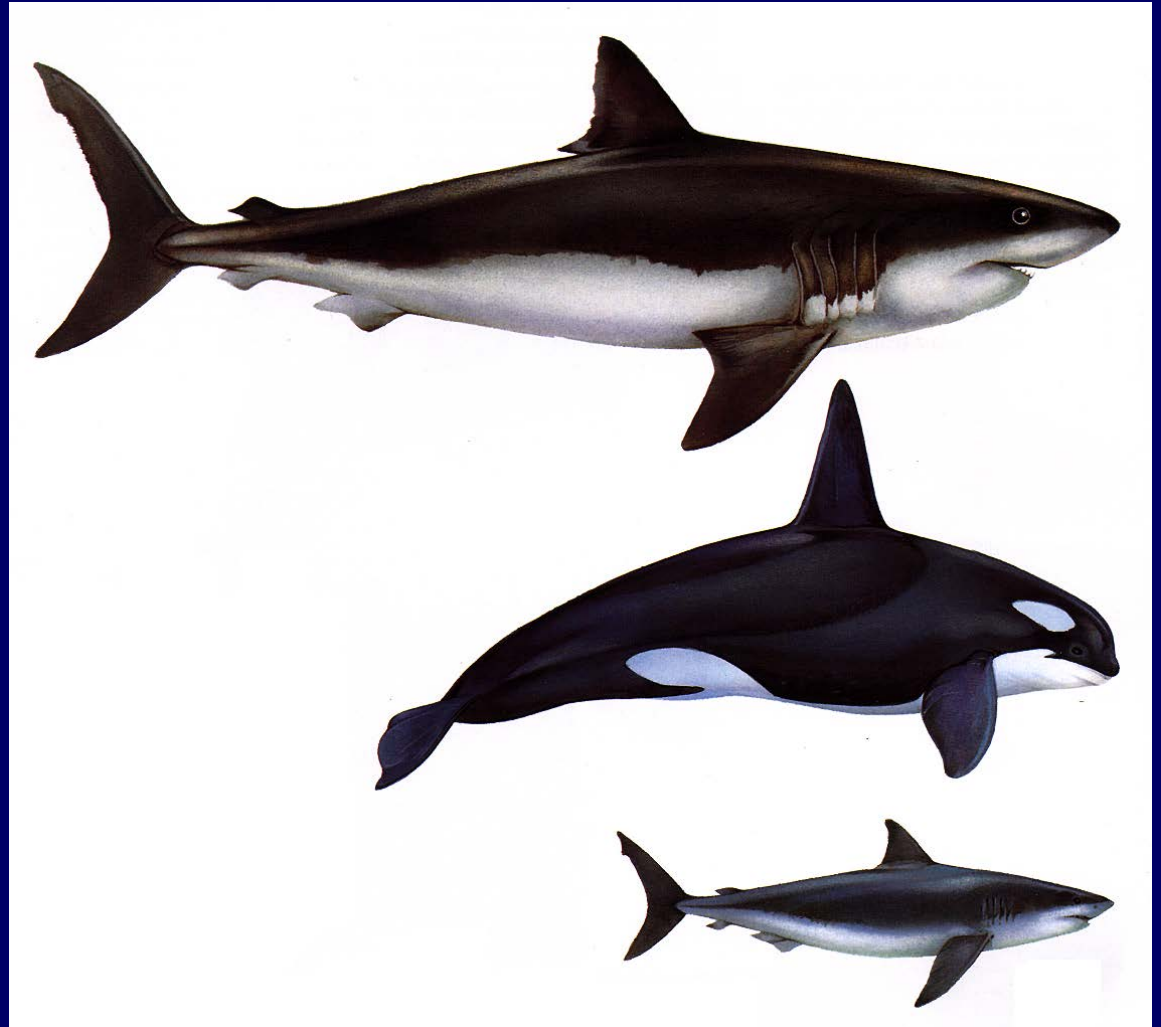


Why are you interested  
in sharks?

# Fossil Sharks



# Giants of the Past





# Modern Chondrichthyes

~1050 species

sharks

~450 species



~550 species

rays



chimaeras ~40 species

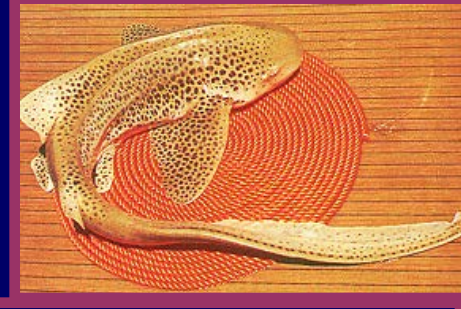


skates



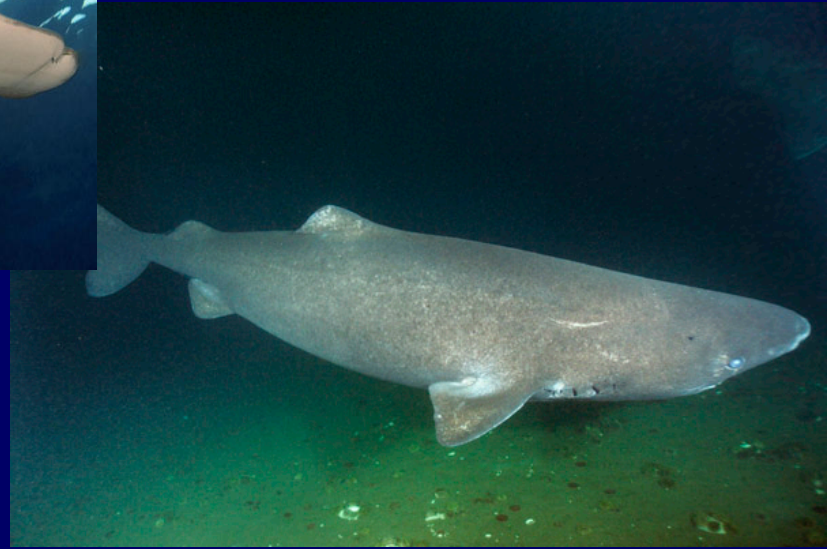
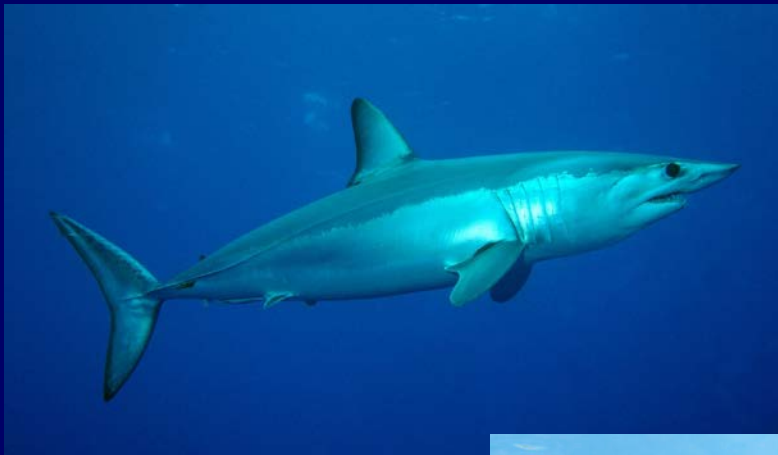


# Shark Diversity





# Form and Function





# Propeller



# Feeding



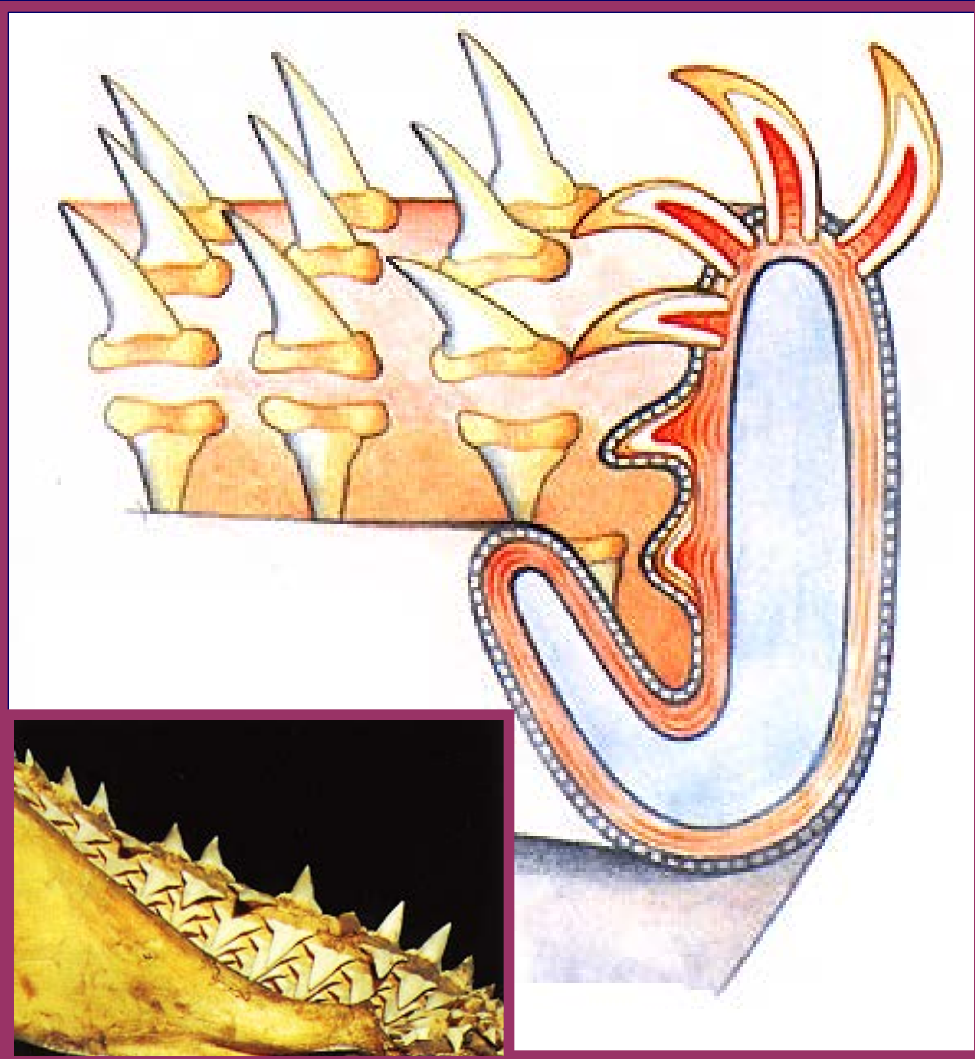
# Feeding



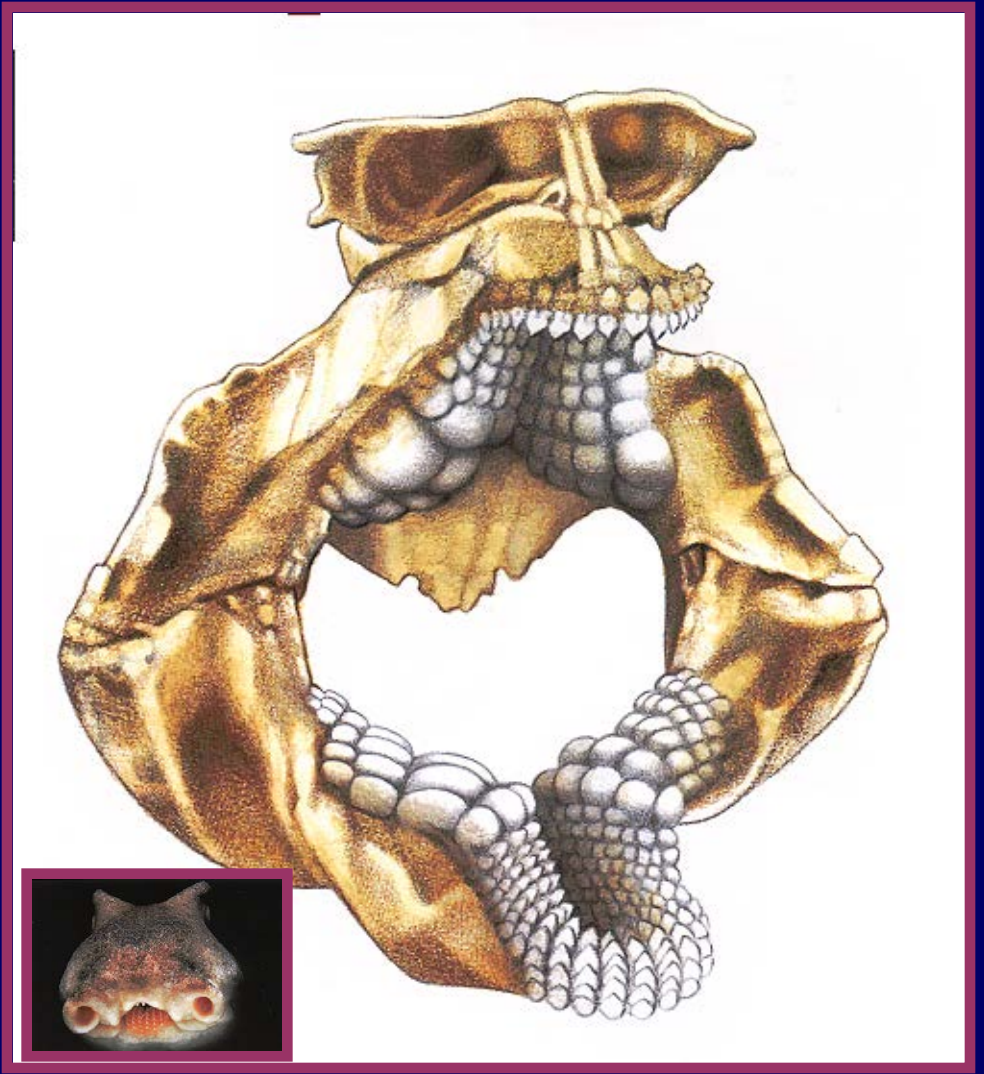
© Julia Sumerling



# Teeth

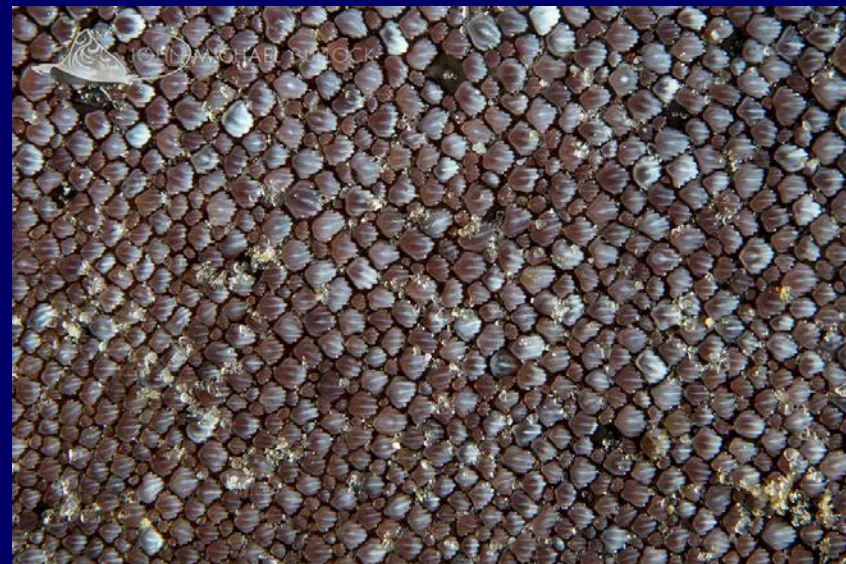
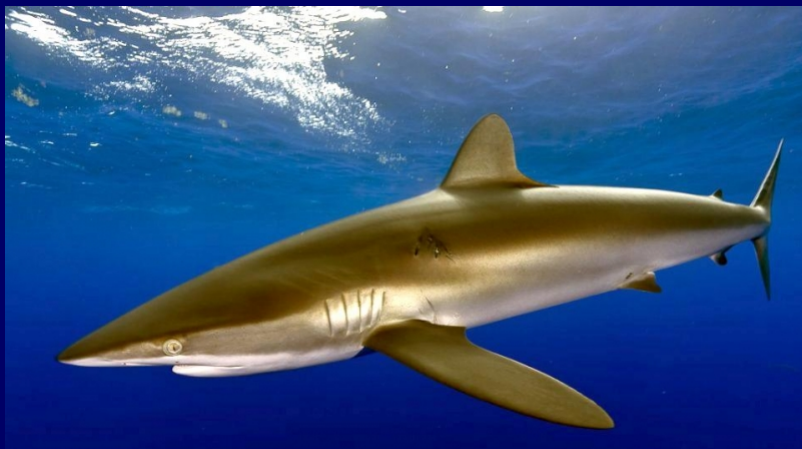
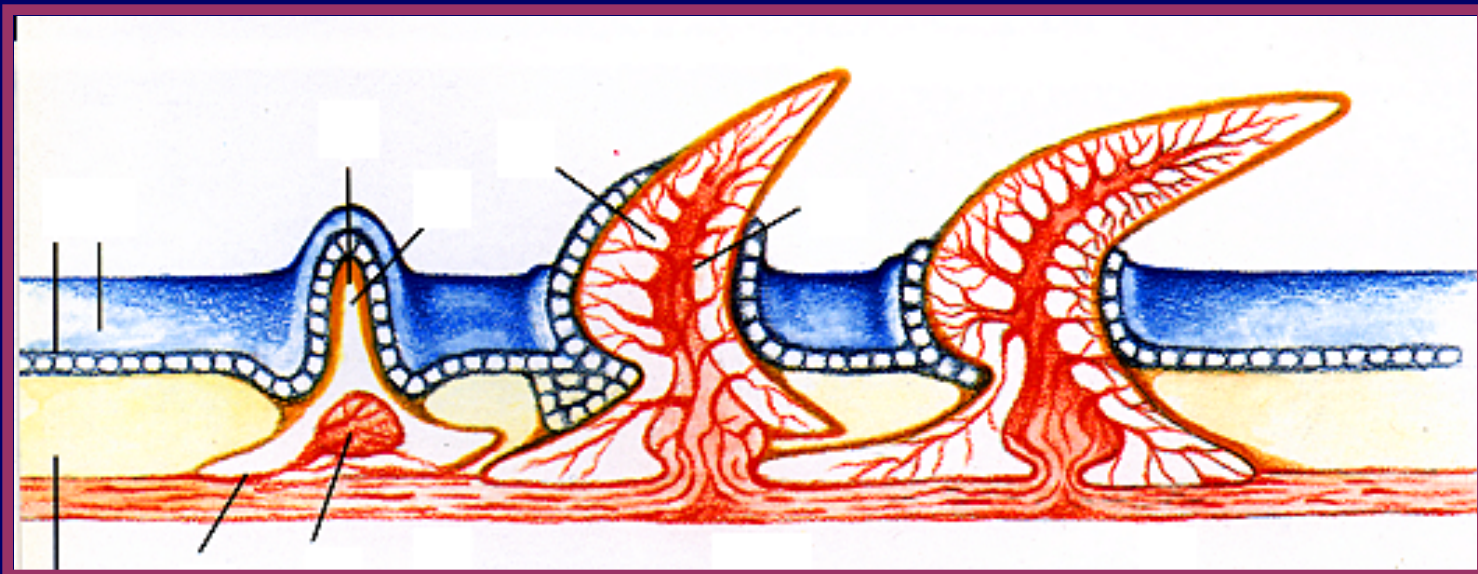


# Teeth



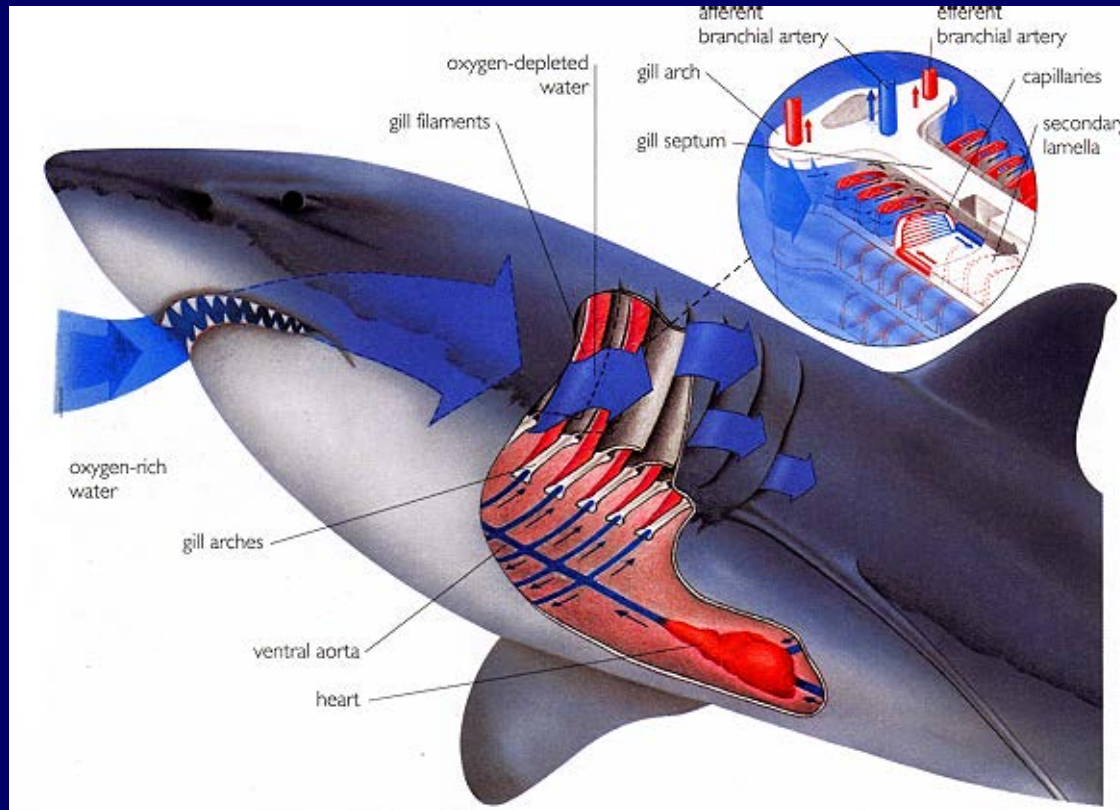


# Skin

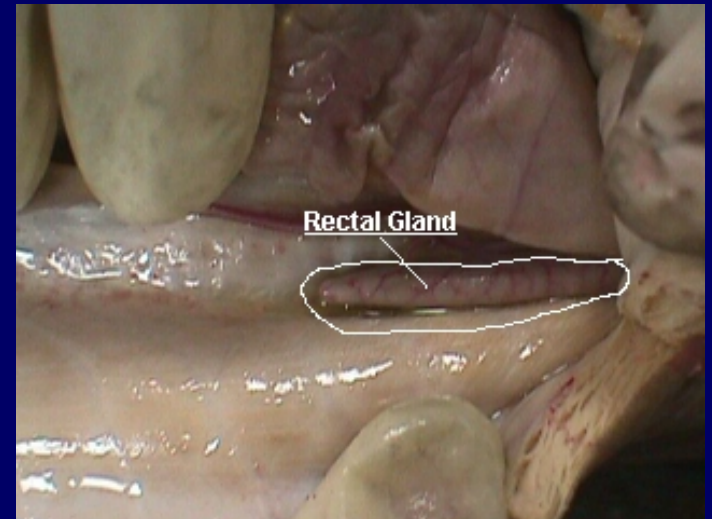
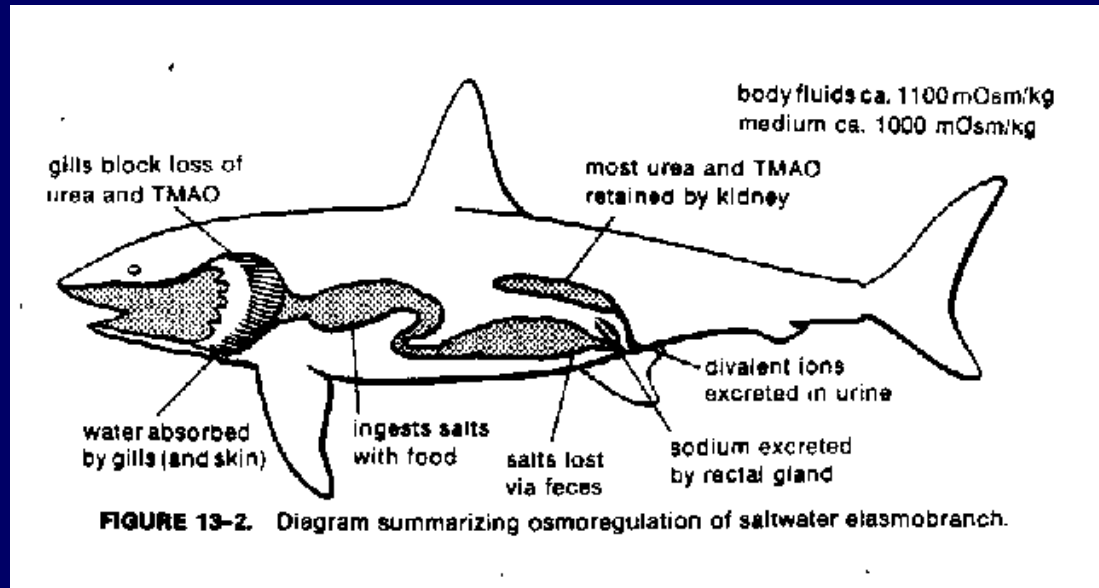




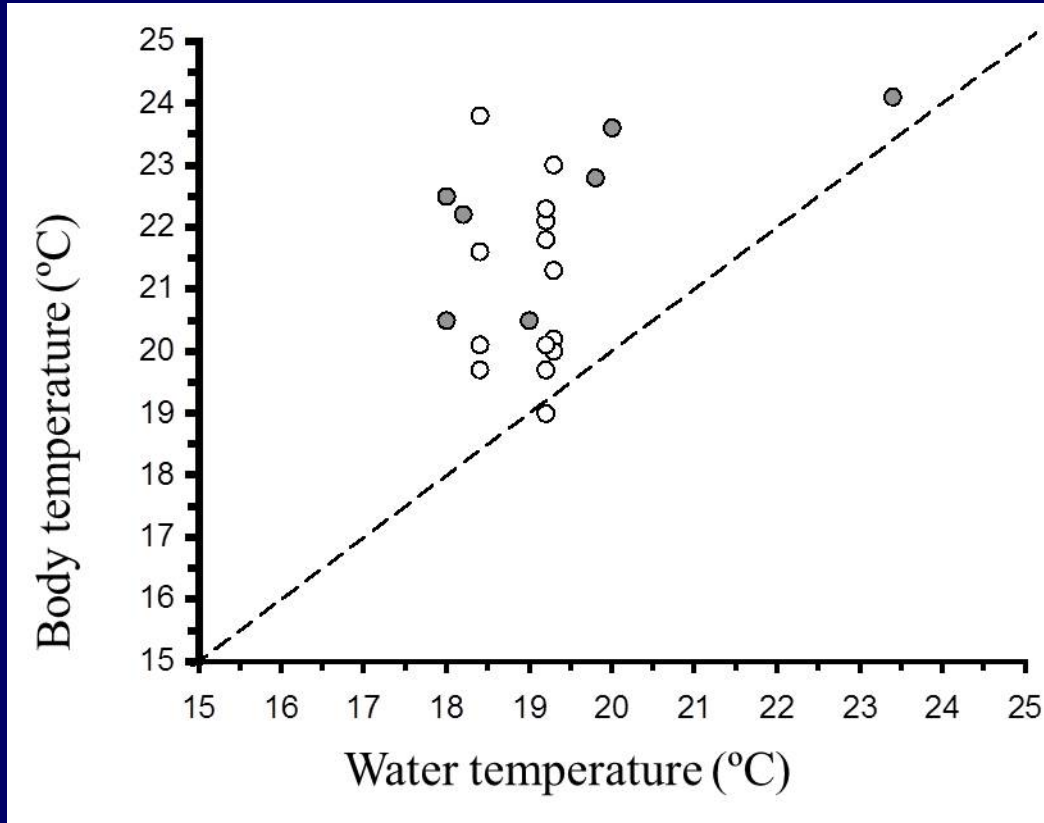
# Physiology



# Osmoregulation

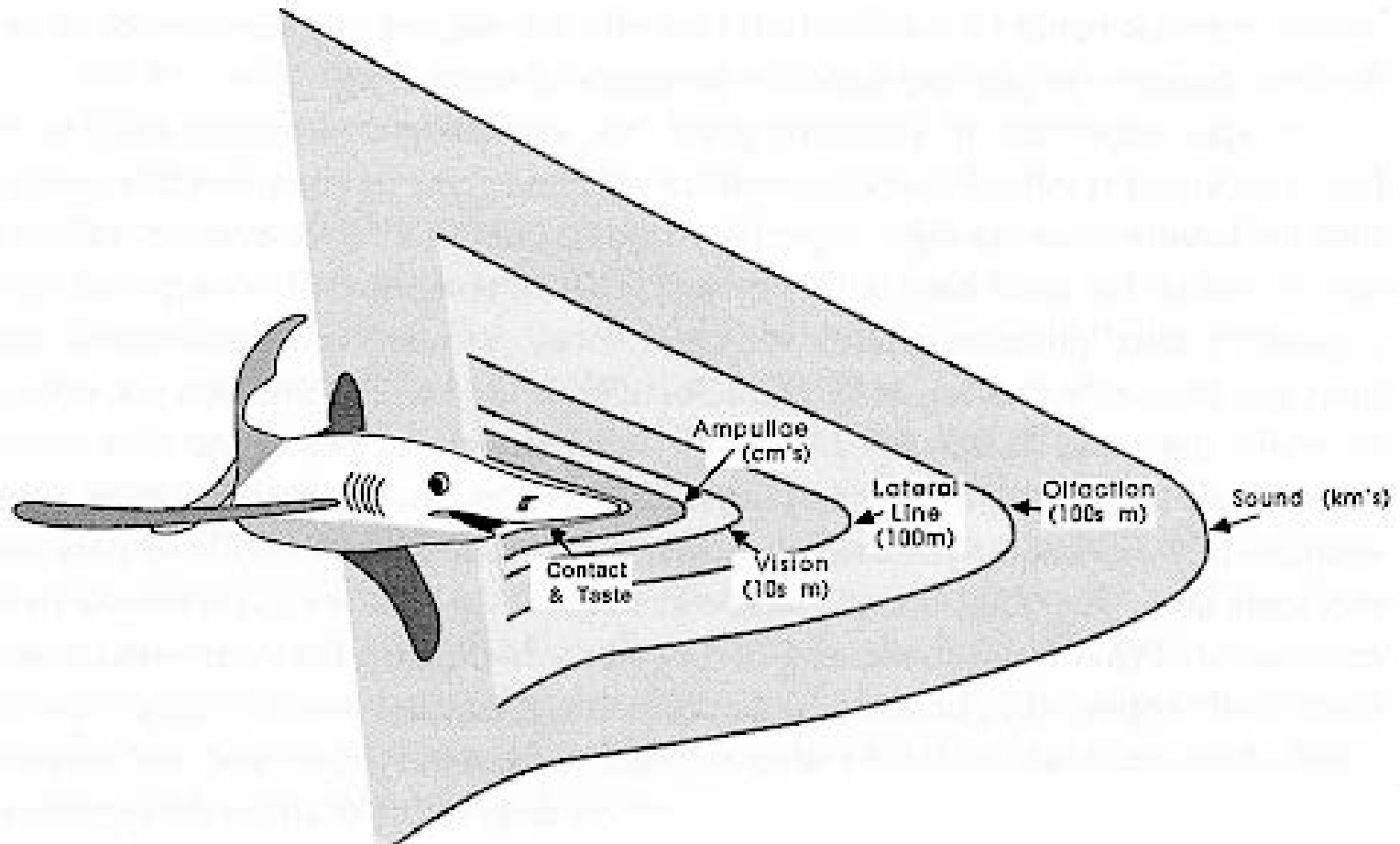


# Endothermy





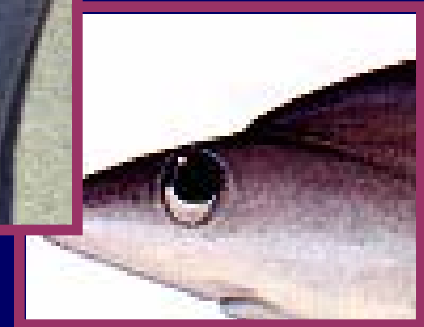
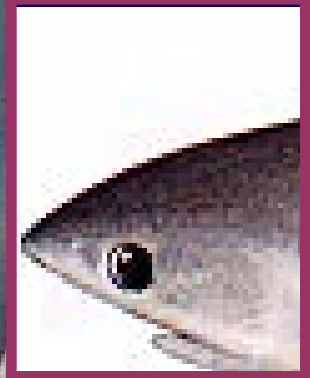
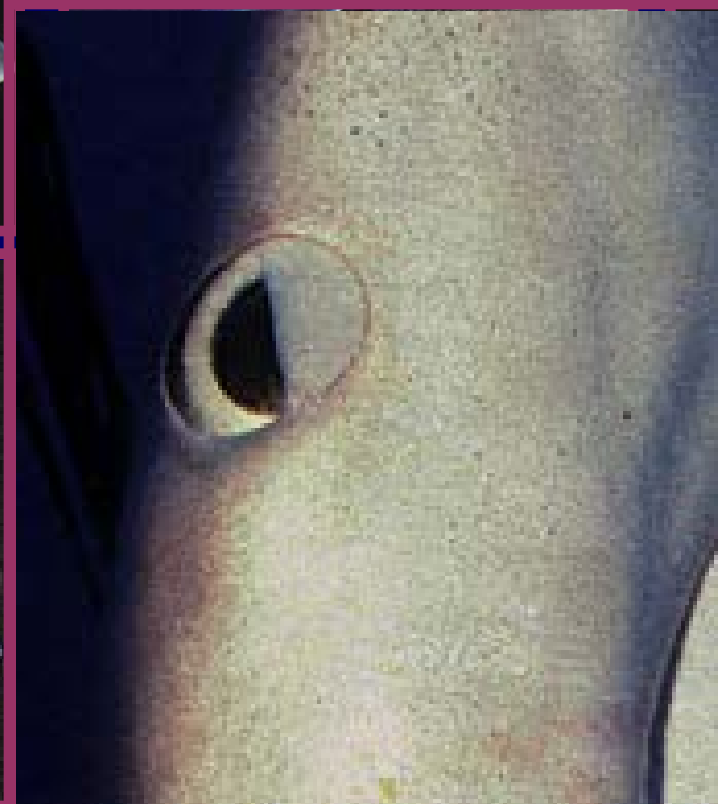
# Sensory systems



# Ampullae of Lorenzini and Lateral Line

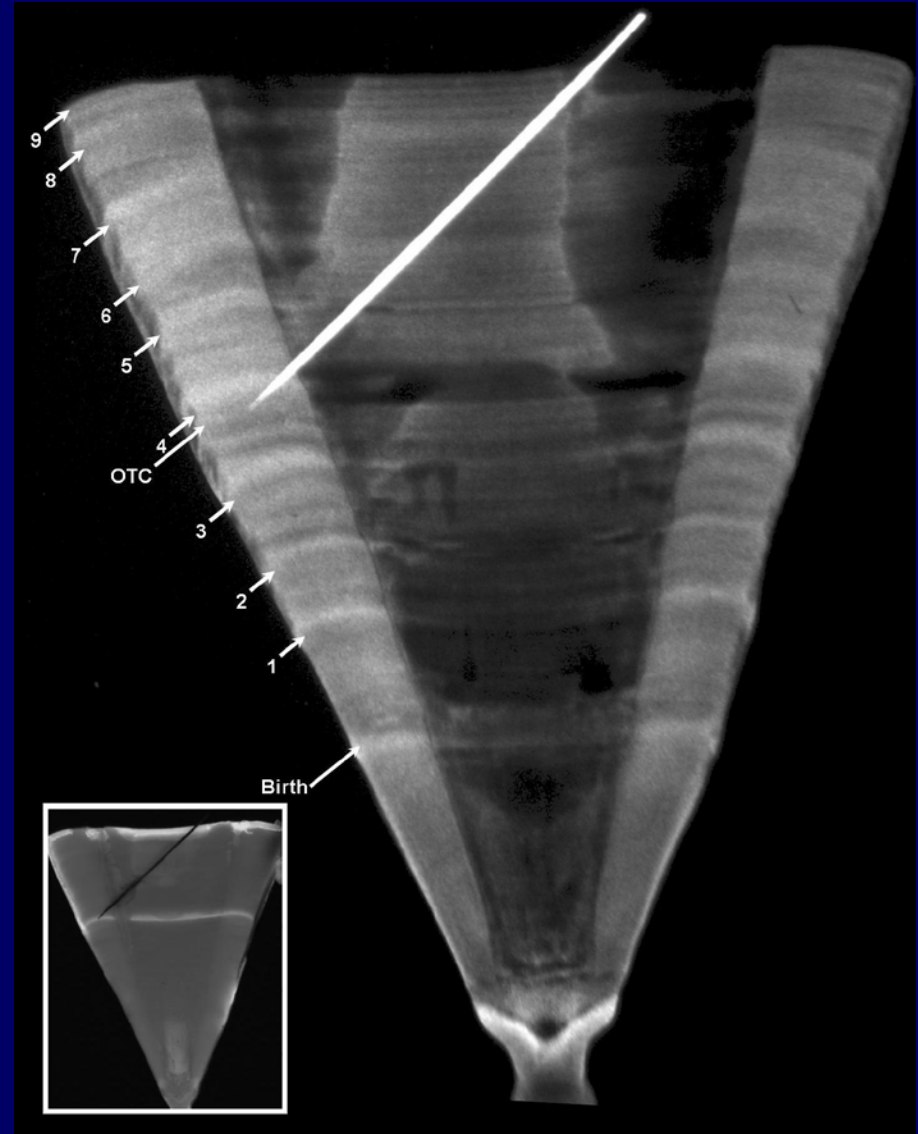
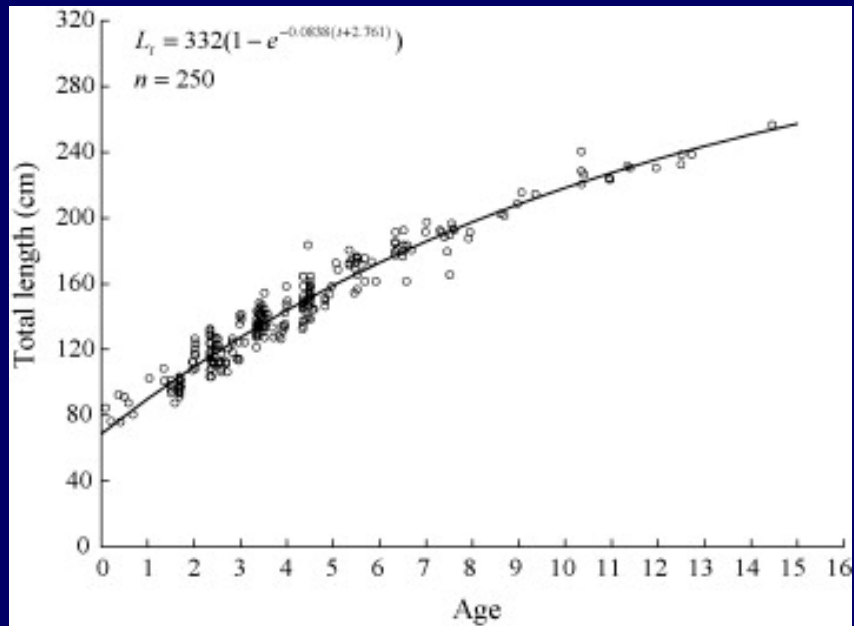
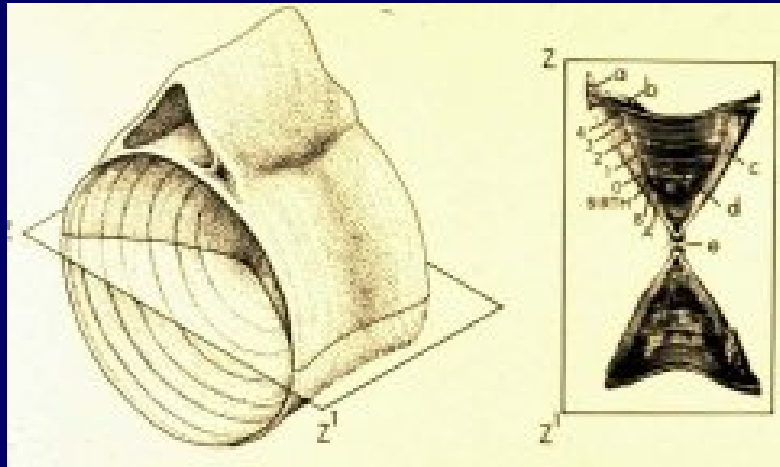


# Vision





# Life history



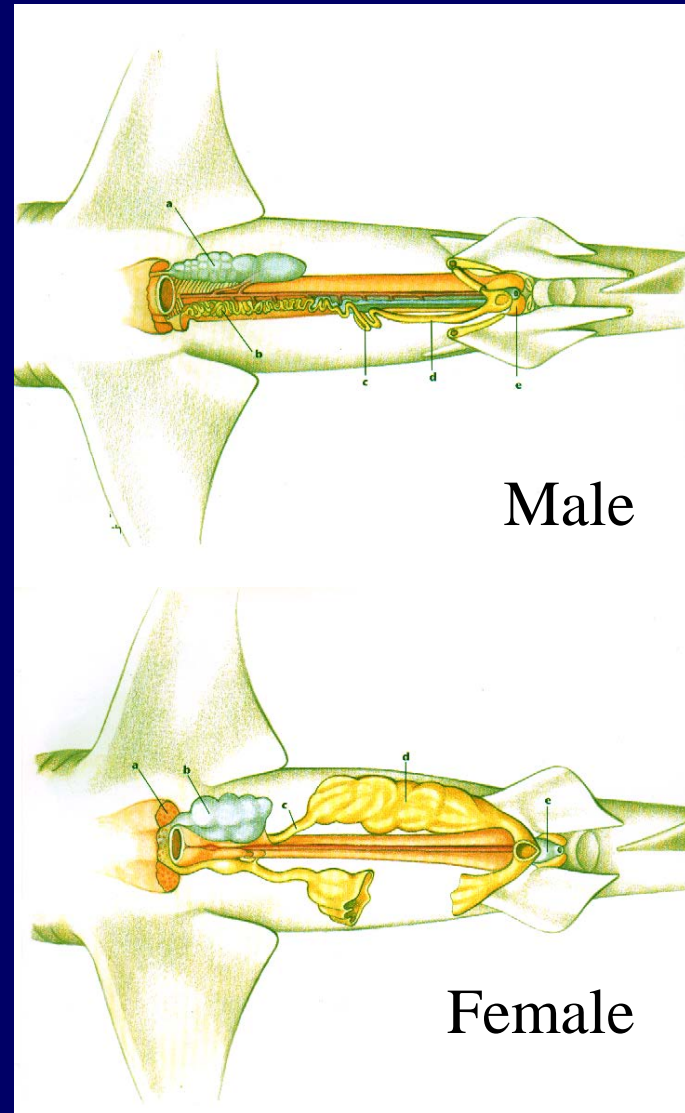
# Reproduction



# Sexual Dimorphism

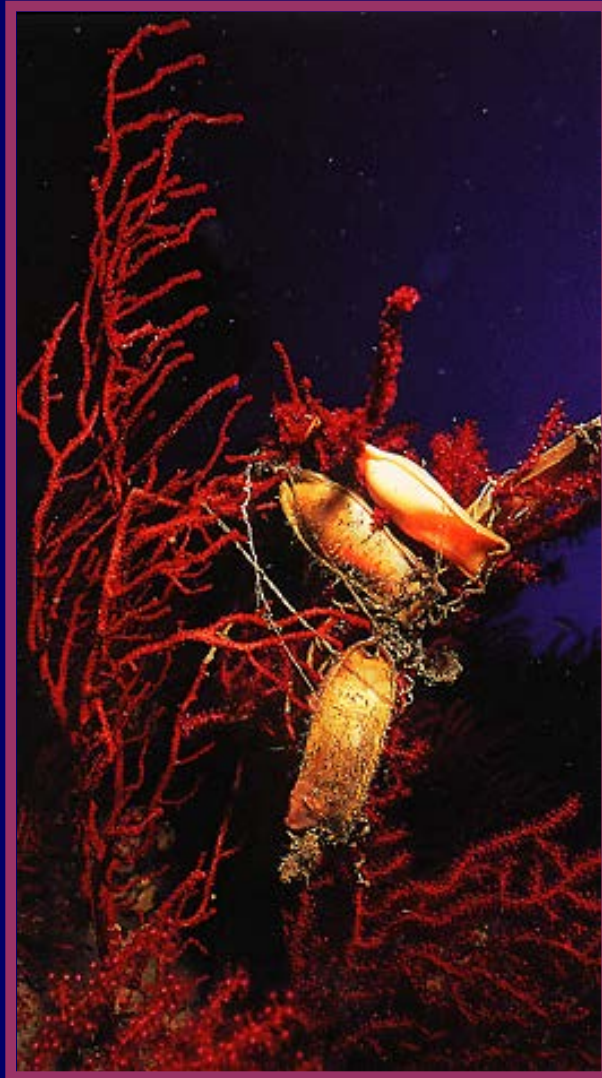
Females:

- No claspers
- Thicker skin
- Larger size



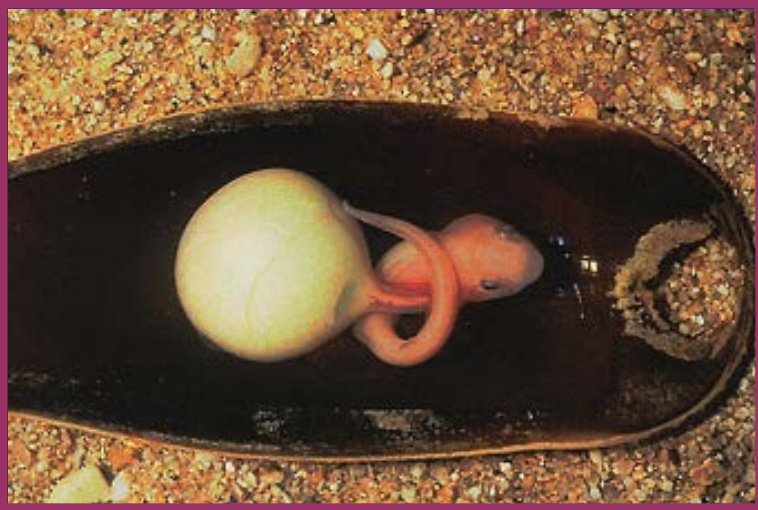


# External Development



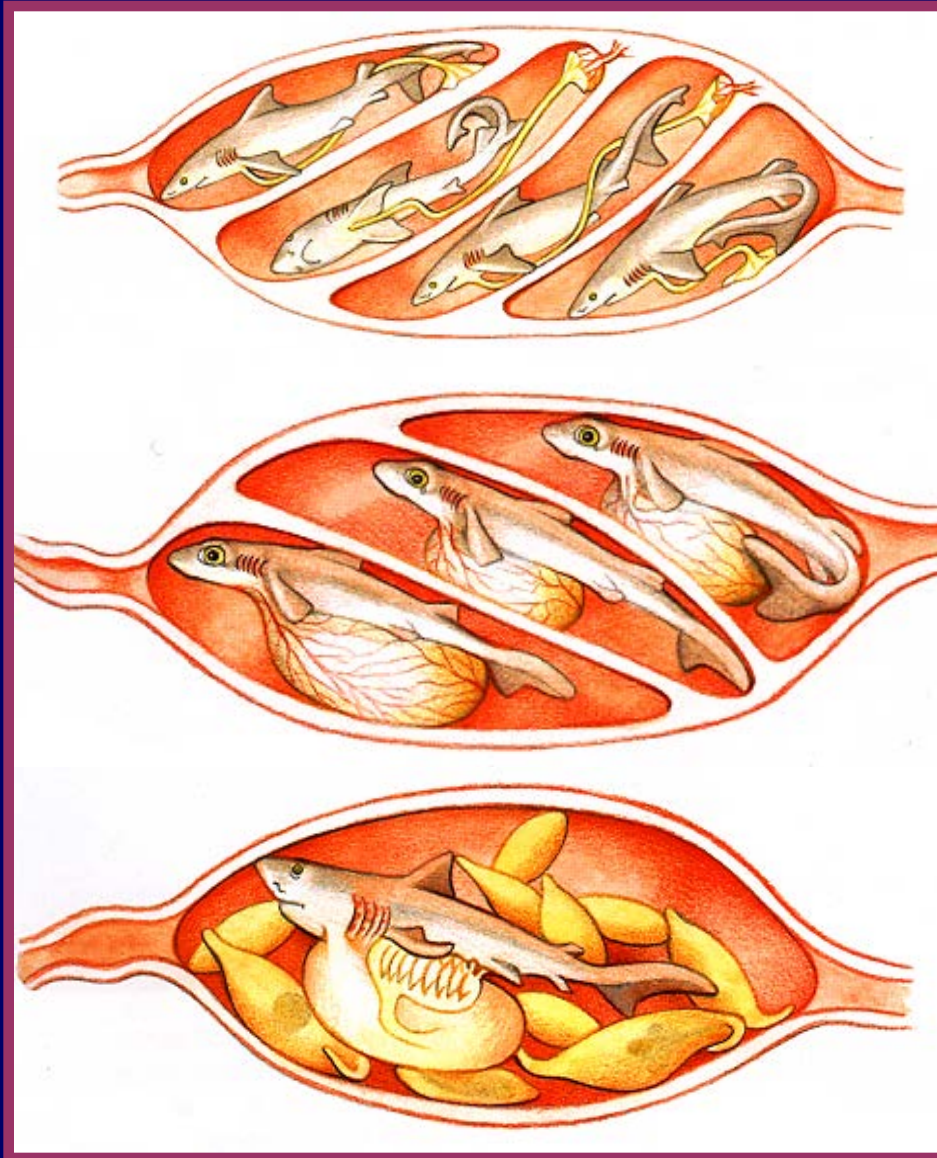


# External Development





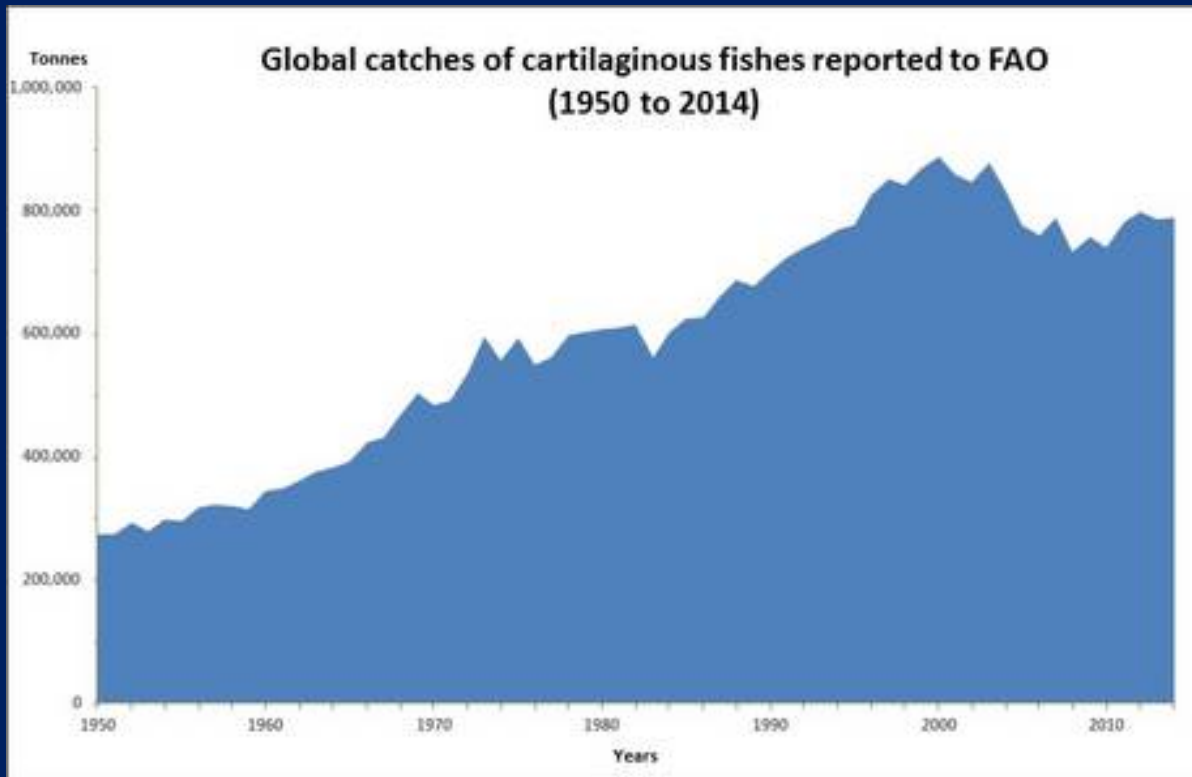
# Internal Development





# Who is a better predator?







# Research



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