



Gulf of Mexico Overview

Barotrauma – Predation – Circle Hooks





Ninth largest water body in the world
Bordered by the United States, Mexico,
Cuba and the Caribbean Sea

Area: 580,000 cubic miles of water
Average Depth: 5,299 ft

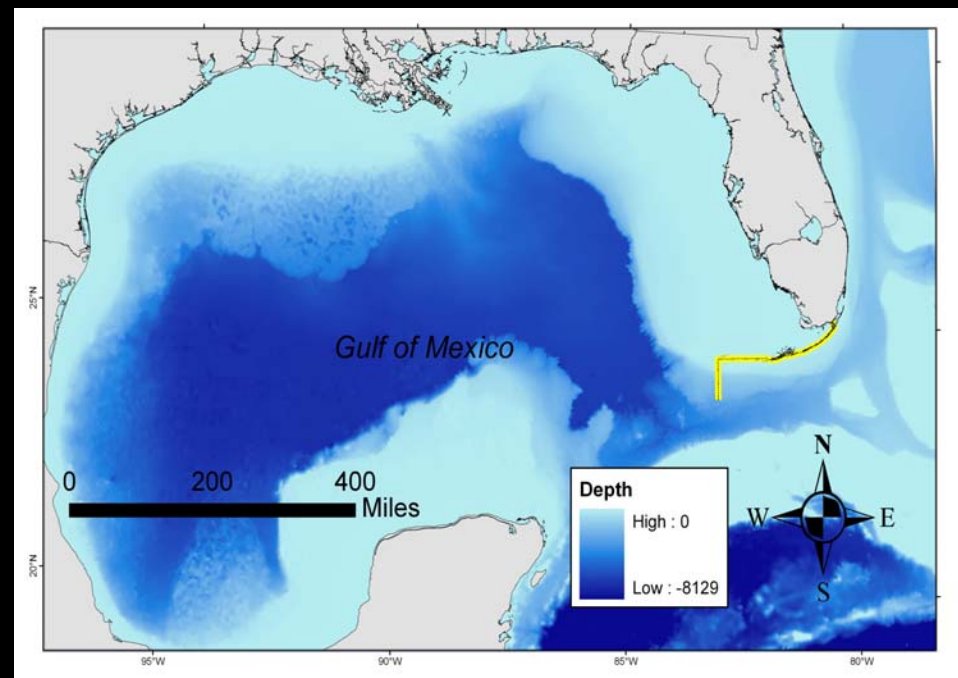


Image Credit: John Froeschke



East/West Differences

- Some fisheries prosecuted in shallow/deeper water
- Summer thermocline: absent/present
- Patch reefs/artificial reefs/oil platforms
- Ocean circulation patterns

Gulf of Mexico accounted for > 40%
of all U.S. marine recreational fishery
catches in 2006

56% of marine recreational fishing
catch in 2006 in the Gulf of Mexico
was released out of a total catch
of 193 million fish, not Including Texas

Source: NOAA



44 fish species - 31 are reef fishes

Most Belong to the
Grouper/Snapper Complex

Challenging Characteristics:

- Slow to Reproduce
- Some Are Hermaphroditic
- Some Form Spawning Aggregations
- Long Lived
- Territorial





Red Grouper Stock Abundance



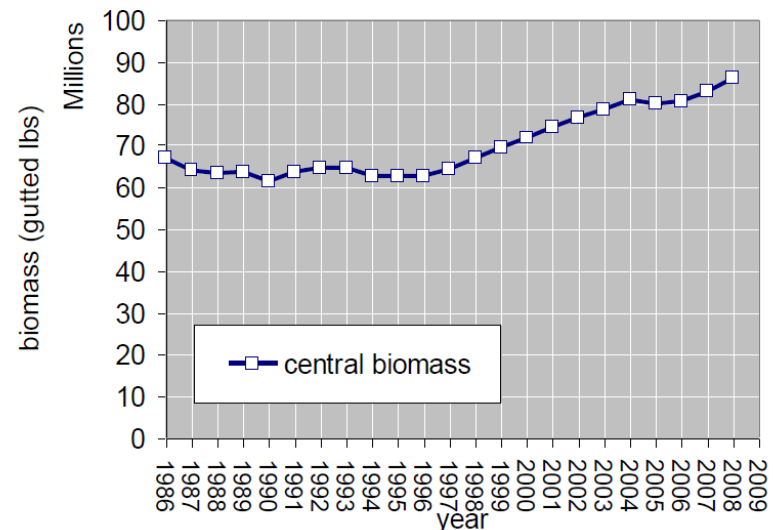
Image credit: NOAA Atlantis

Subject to barotrauma
low hook mortality

Classification:

- Not overfished
- Not experiencing overfishing

Figure 8.1.18. A. Total biomass for central model. B. Total numbers.





Red Snapper Stock Abundance



Subject to barotrauma
high hook mortality

Classification:

- Overfished
- Not experiencing overfishing according to the new definition in ACL/AM Amendment (landings below OFL)



Gag Stock Abundance



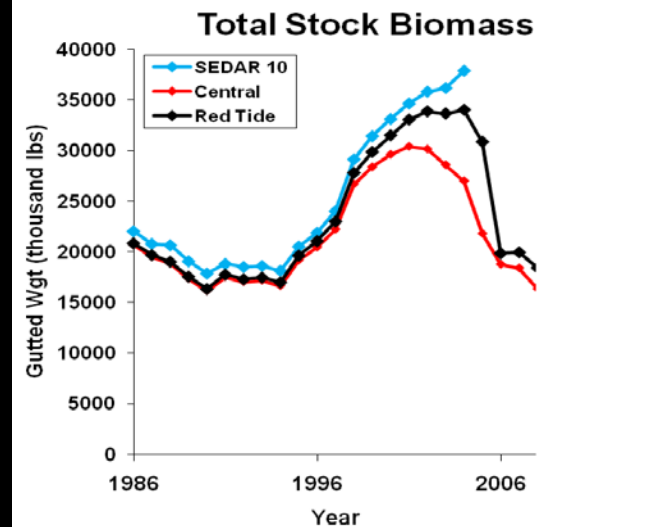
Image credit: NOAA

Subject to barotrauma
high hook mortality

Classification:

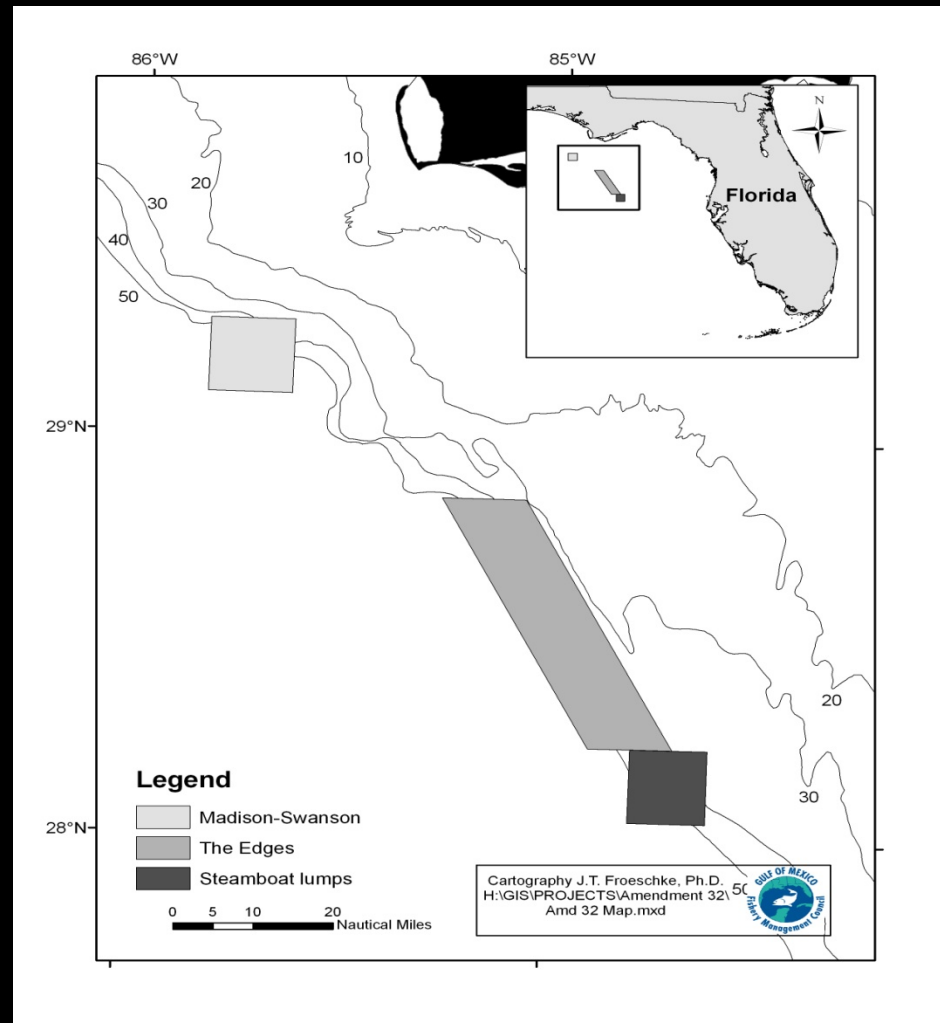
- Overfished
- Experiencing Overfishing

Figure 8.7. Total stock biomass estimates at start of year, before recruitment or mortality occur. Biomass units are thousand pounds, gutted weight.





Marine Protected Areas to Protect Gag Spawning Aggregations





Gulf Council Outreach

YouTube **Gulf Council TV**

Venting Deep-Water Fish.mpg

gulfcouncil 16 videos ▾

FISH SURVIVAL GUIDELINES

Following these guidelines will help ensure that the fish you are handling are kept in the best possible condition for release. The following guidelines are intended to provide a general overview of the best practices for handling fish. Specific guidelines for each species can be found in the Species Management Plan for that species.

- Handle fish with care. Do not handle fish unnecessarily.
- Handle fish with wet hands. Wet gloves are recommended.
- Avoid using gaffs and landing nets if possible.
- Minimize the time fish are out of the water.
- Do not handle fish with sharp or pointed objects.
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VENTING TOOLS

A venting tool can be any hollow, sharpened instrument that allows gases to escape. Ice picks and knives are not suitable because they puncture the fish's underbelly and can result in a mortal injury. The modified hypodermic needle pictured is an excellent choice for a fish venting tool. A hollow, sharpened stainless steel cannula mounted on a hollow wooden dowel also works.

Cannulas (16-gauge recommended) can be obtained from laser supply and feed stores.

The tool should be cleaned between uses and kept in a safe and accessible place. Chlorine bleach is a good disinfectant. Be sure to cap or place a cork on the tip of the tool after use to prevent personal injury.

THE PROBLEM



Many marine reef fish have a gas-filled organ called a swimbladder, which controls buoyancy and allows the fish to maintain a certain depth in the water column.

The gas in the swimbladder can over-expand when fish are brought quickly to the surface by hook and line. This can result in serious injury to the fish, and if released in this buoyant condition, the fish may float away and die from exposure to the elements or become an easy target for predators. This defeats the purpose of fishery management laws such as minimum size restrictions and daily bag limits.

SWIMBLADDER BIOLOGY

Many reef fish have a closed swimbladder, an internal organ filled with gases, mostly oxygen, carbon dioxide, and nitrogen. This organ is located in the peritoneal cavity attached to the fish's backbone beneath the dorsal fin.

Swimbladders can expand only so far before they burst. When the swimbladder bursts, the swimbladder gases escape into the fish's body cavity, where they can continue to expand. The pressure exerted by these gases is sufficient to push the stomach out the mouth and the intestines out of the anus.

VENTING PROCEDURE



It is best to vent the fish as quickly as possible with a minimum of handling. If the fish's stomach is everted out of the fish's mouth, do not attempt to push it back into the fish's body. Expelling the swimbladder gases will allow the stomach to return to its normal position within a few hours.

Venting releases these gases from the body cavity, thus eliminating the pressure on the internal organs. If damage is not excessive, the organs will return in place on their own, once the gases are expelled. Venting also will allow the fish to overcome buoyancy problems and swim down to habitat depth, enhancing its immediate survival.

DETERMINING WHICH FISH TO VENT

Scientific studies have shown that species with large swimbladders such as red grouper, black sea bass, and gag derive immediate benefit from venting.

Your ability to judge which should be vented will improve with practice and experience. After reeling in a fish, closely observe its condition. If the fish is bloated and float (is unable to control its buoyancy) or if the fish's stomach is distended out of the mouth, the fish should be vented. If the fish appears normal, not bloated, and is able to swim down to habitat depth on its own, venting is not necessary.

RETURNING FISH TO WATER



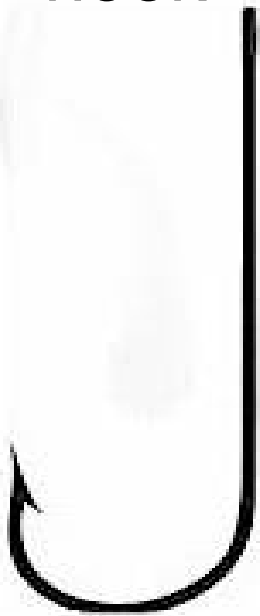
Hold the fish gently but firmly on its side and insert the venting tool at a 45-degree angle approximately one to two inches back from the base of the pectoral fin. Only insert the tool deep enough to release the gases — do not skewer the fish. The sound of the escaping gas is audible and deflation is noticeable. If a fish is extremely bloated, use your free hand to exert gentle pressure on the fish's abdomen to aid deflation. The fish's everted stomach should not be punctured.

Return the fish to the water as soon as possible. If necessary, revive it by holding the fish with the head pointed downward and moving the fish back and forth to pass water over the gills until the fish is able to swim unassisted.



Hook Types

J
hook



Zero offset circle



Kahle





Dolphin Predation & Depredation

Panama City: 2 trips: 6.9% & 2.9 %
confirmed 21.7 & 20% chased
downward: probable takes





Estimated Red Snapper Headboat Landings and Discards in the GOM

(NWFL –TX 2004-2010)

Total Estimated Kept: 1,029,425

Total Estimated Released Alive: 495,458

Total Estimated Released Dead: 58,854

Released red snapper taken by dolphins not accounted for in red snapper stock assessments

Data Courtesy of NMFS Beaufort



Factors Affecting Barotrauma



- Species
- Eco-morphology
- Swim bladder size
- Swim bladder structure
- Fish size
- Water depth
- Gear
- Healing
- Benthic versus Pelagic



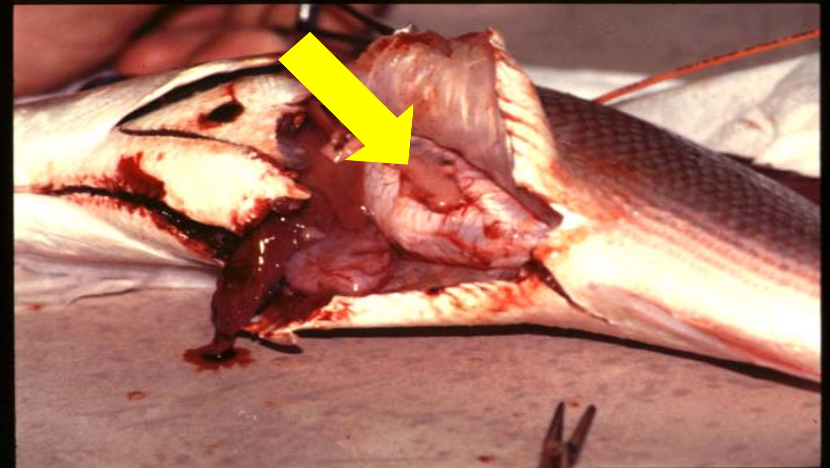
Swim Bladder Morphology

Red Grouper

Red Snapper



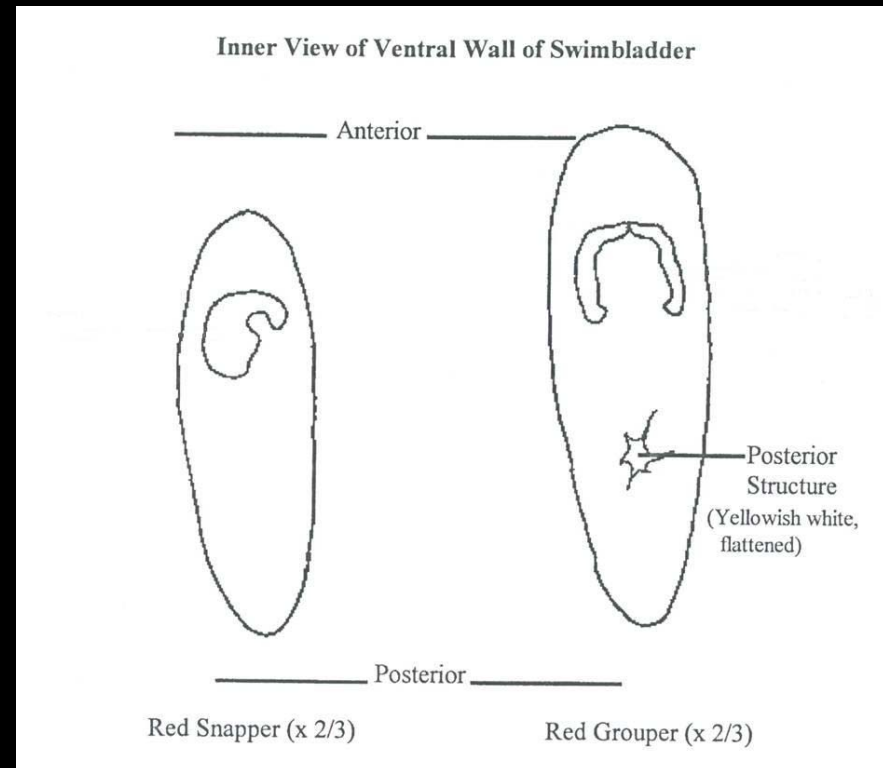
Larger, Thinner Wall



Smaller, Thicker Wall

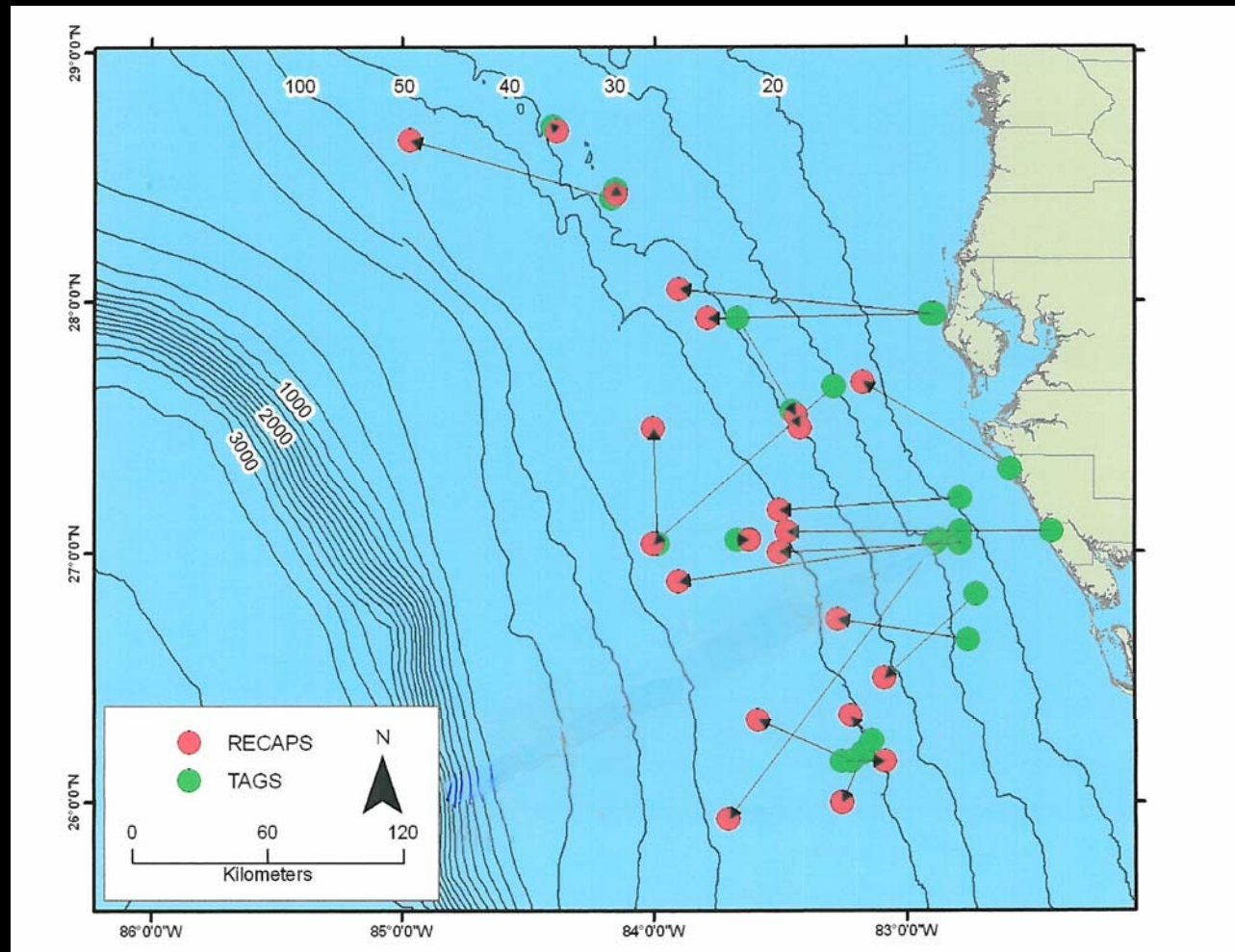


Differences in Swim Bladder Structure Between Species





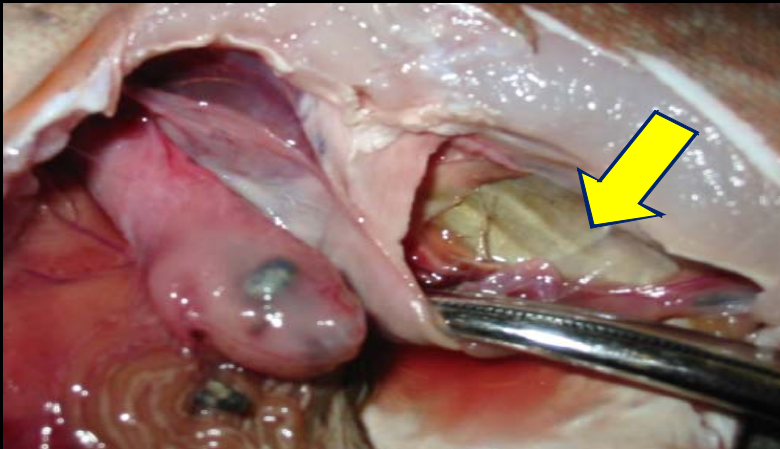
Red Grouper Offshore Ontogenetic Movement



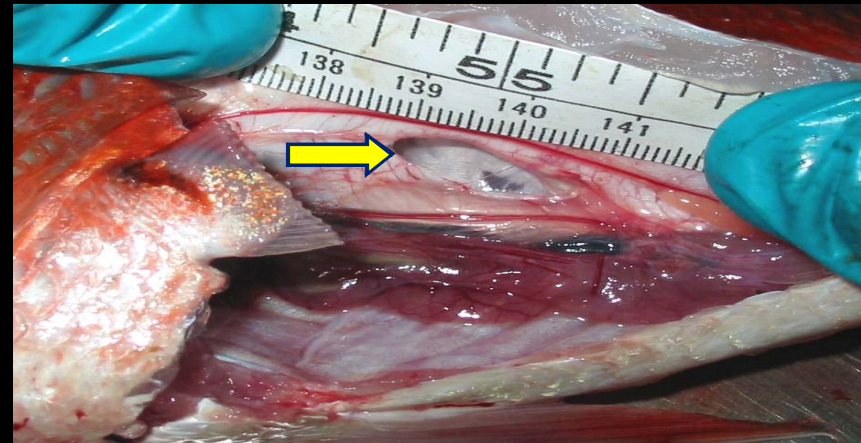


Swim Bladder Rupture

Red Grouper Swim Bladder Rupture



Red Snapper Bladder Rupture

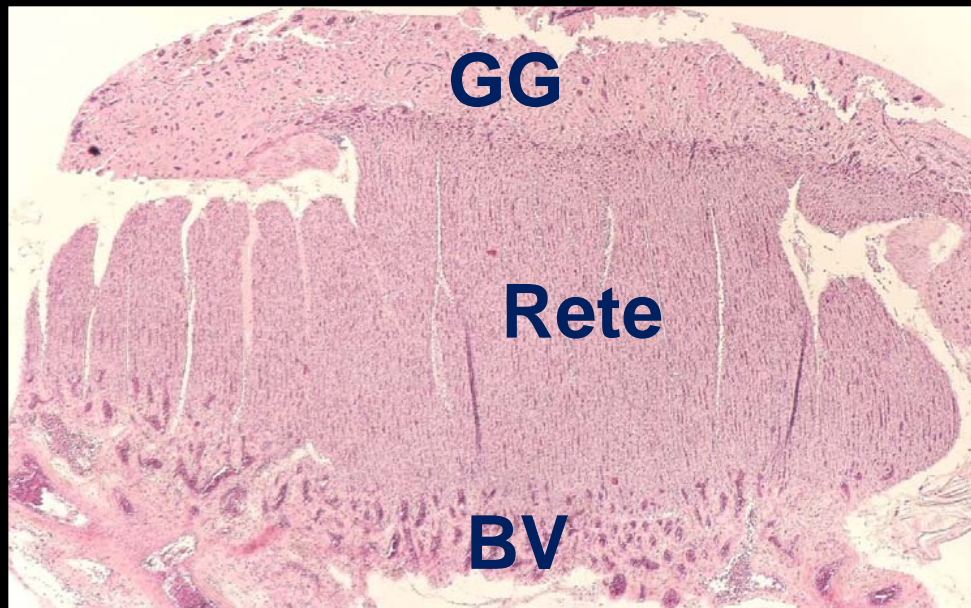




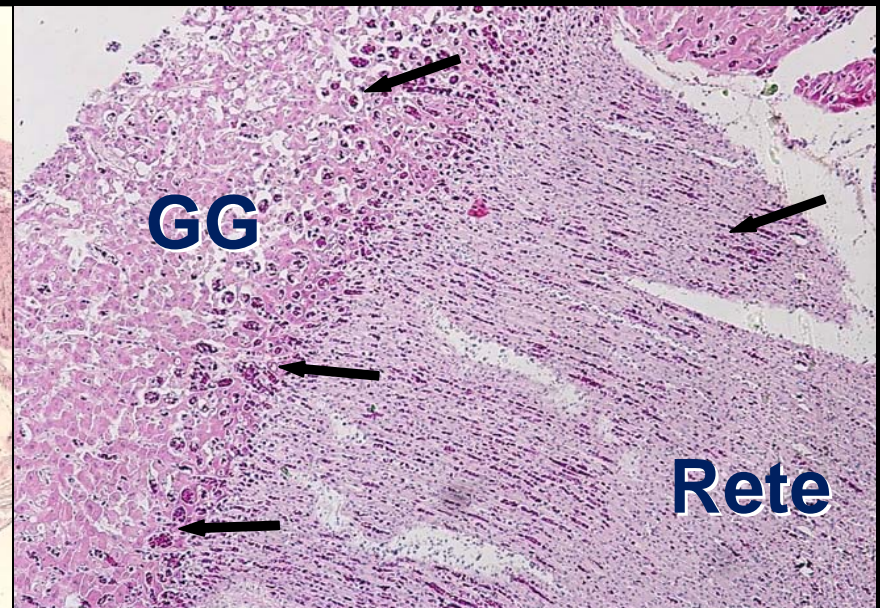
Swim Bladder Histology

- Angler caught fishes from headboats
- Measured hemorrhaging as a function of fish size

Red Grouper



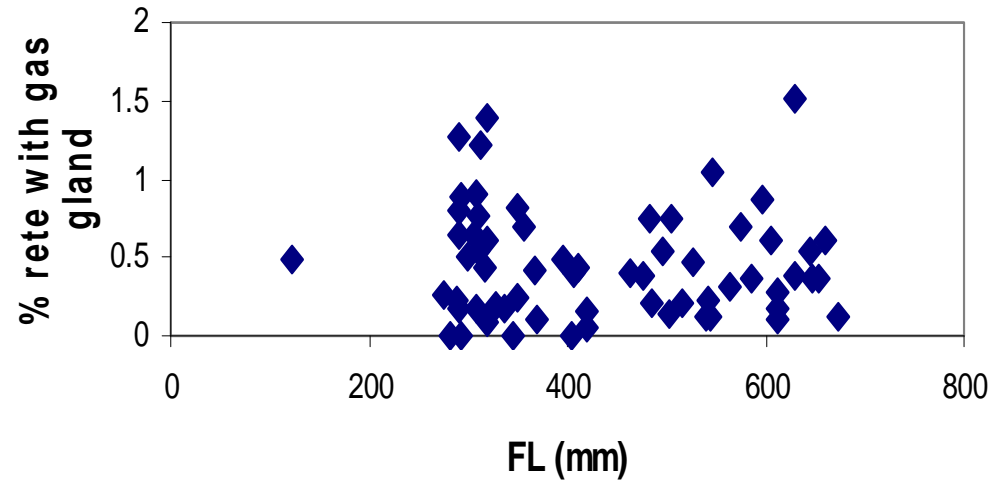
Red Snapper



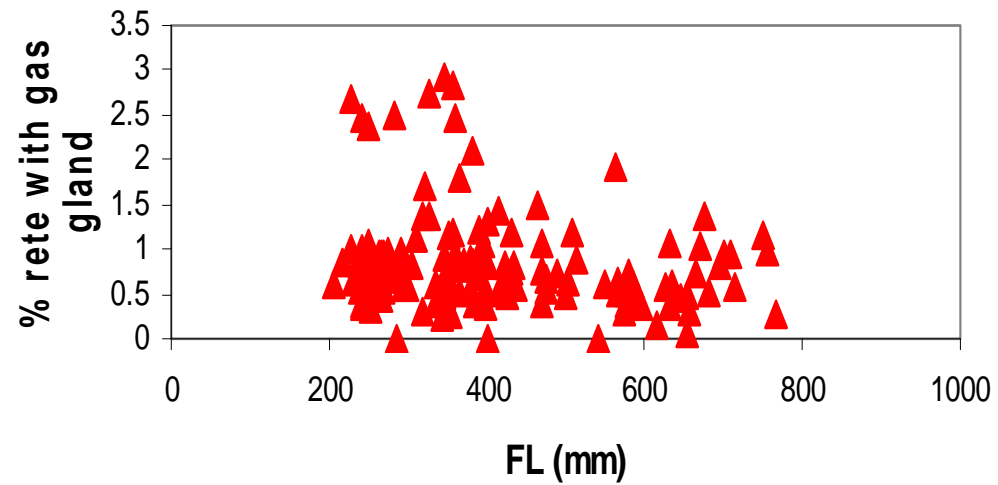
GG = Gas Gland, BV = Blood Vessel



Red Snapper

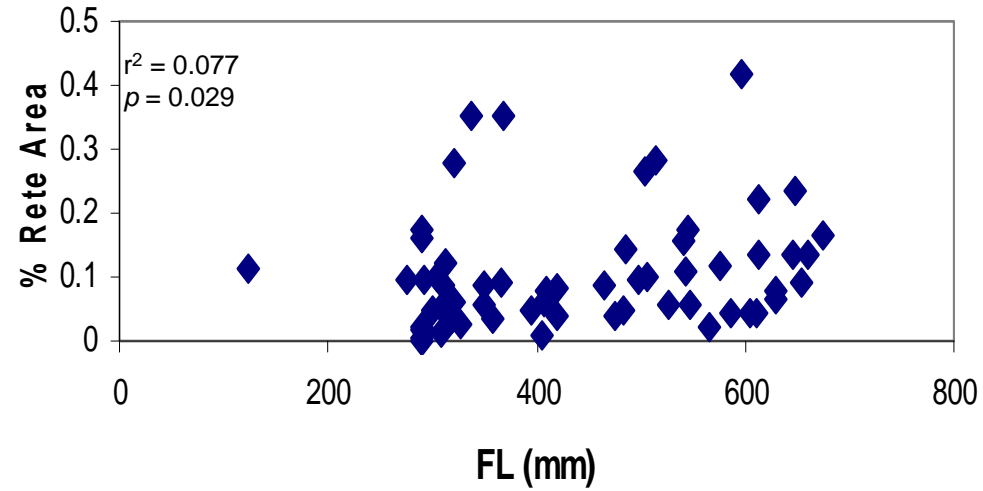


Red Grouper

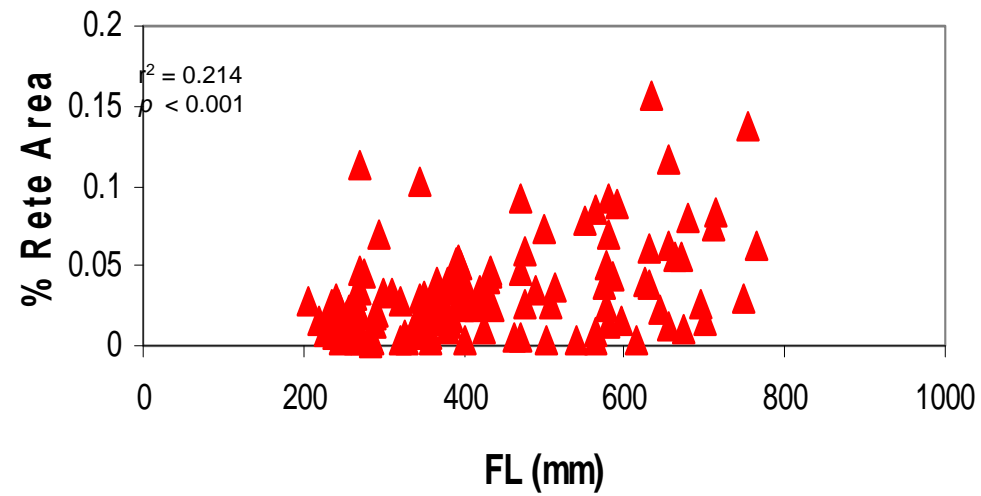




Red Snapper

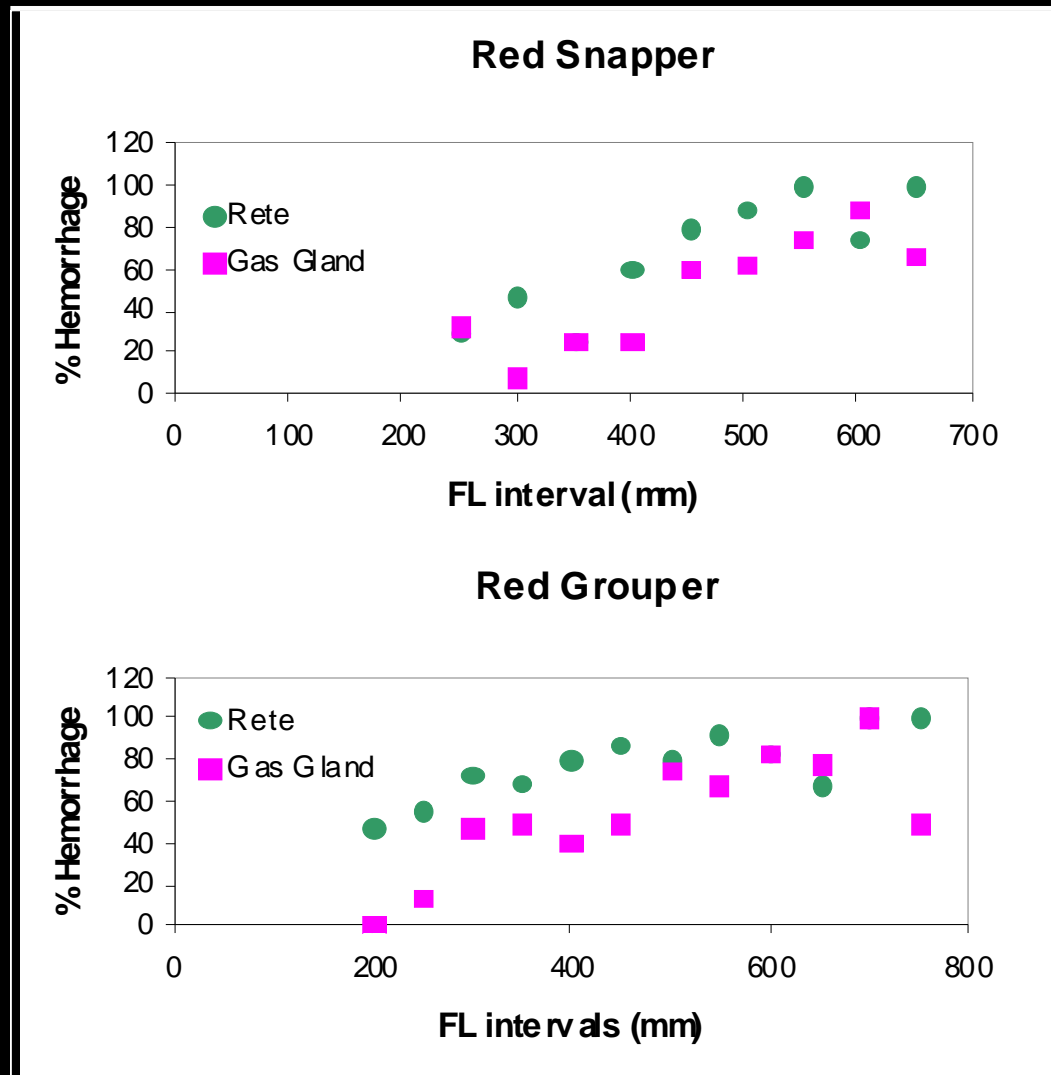


Red Grouper





Differences in % Hemorrhaging by Species by Size





Red Grouper

Sector	Size (cm)	No. Tagged	No. Recaps	% Recaps	G crit & p value
Private Rec	≤ 40.6	1029	127	12.3	G = 3.84 p = 0.922
	> 40.6	261	33	12.6	
Rec for-Hire	≤ 40.6	6419	283	4.4	G = 3.84 p = 4.02 × 10 ⁻¹³
	> 40.6	1083	116	10.7	



Red Snapper

Sector	Size (cm)	No. Tagged	No. Recaps	% Recaps	G crit & <i>p</i> value
Private Rec	≤ 40.6	270	34	12.6	G =3.84
	> 40.6	27	3	11.1	<i>p</i> =0.845
Rec for-Hire	≤ 40.6	1230	102	8.3	G= 3.84
	> 40.6	296	50	16.9	<i>p</i> =0.00021



Red Grouper Caught on the Same Long-line Set Exhibiting Various Degrees of Exophthalmia.





Trap Studies GOM Fish Captured at 55 m (180 ft.)



Most, but not all reef fishes caught in fish traps, did not exhibit outward signs of barotrauma and were able to return to capture depth unaided



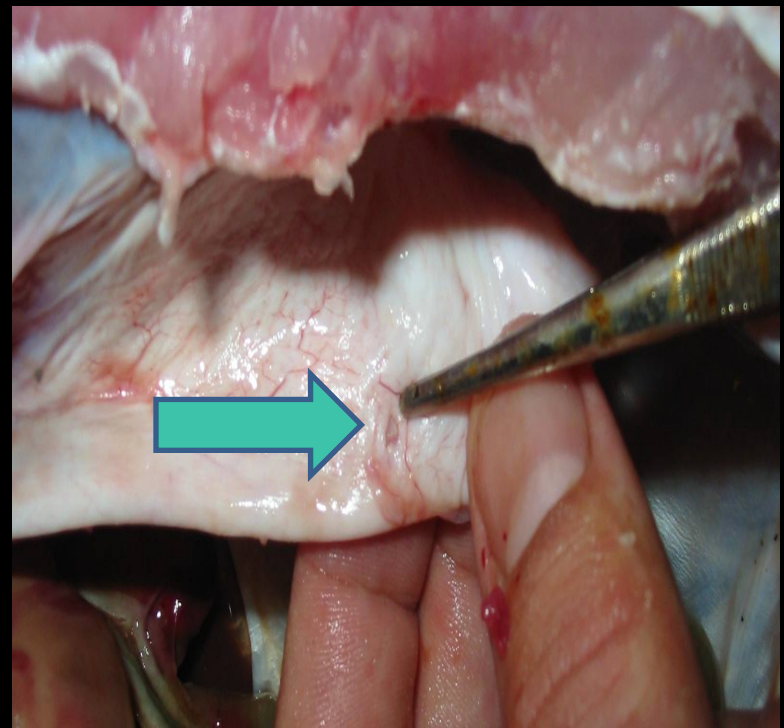
Red grouper caught in
commercial fish traps at 54.9,
61 & 62 m



Excised inflated swim bladder from 700 mm FL trap caught red grouper captured at 61 m

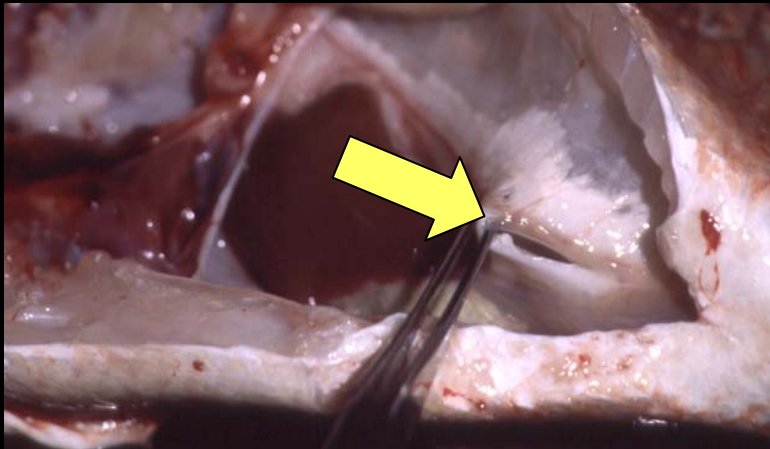


Trap caught (62 m) red grouper exhibiting pinhole wound in deflated swim bladder

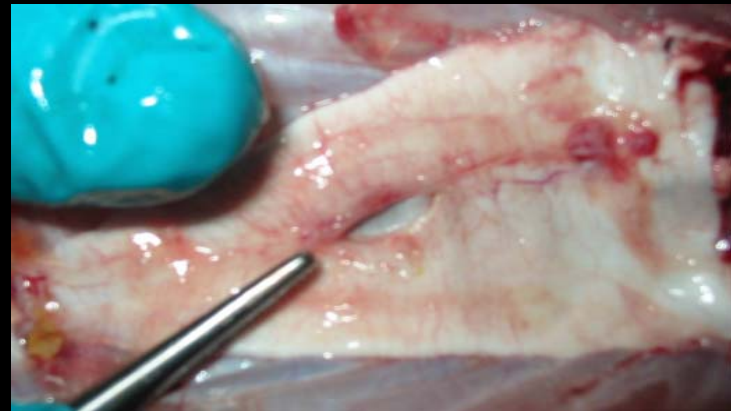


Swim Bladder Healing

24 Hours After Rupture

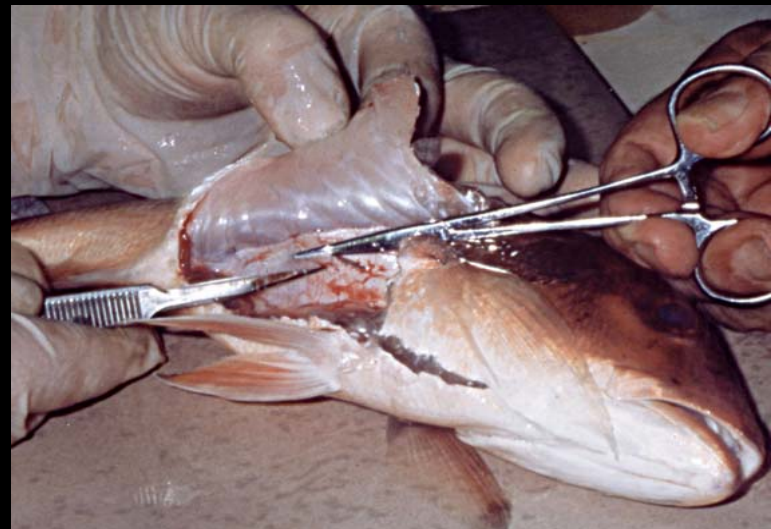


4 Days After Rupture



New & healed ruptures

7 Days After Rupture





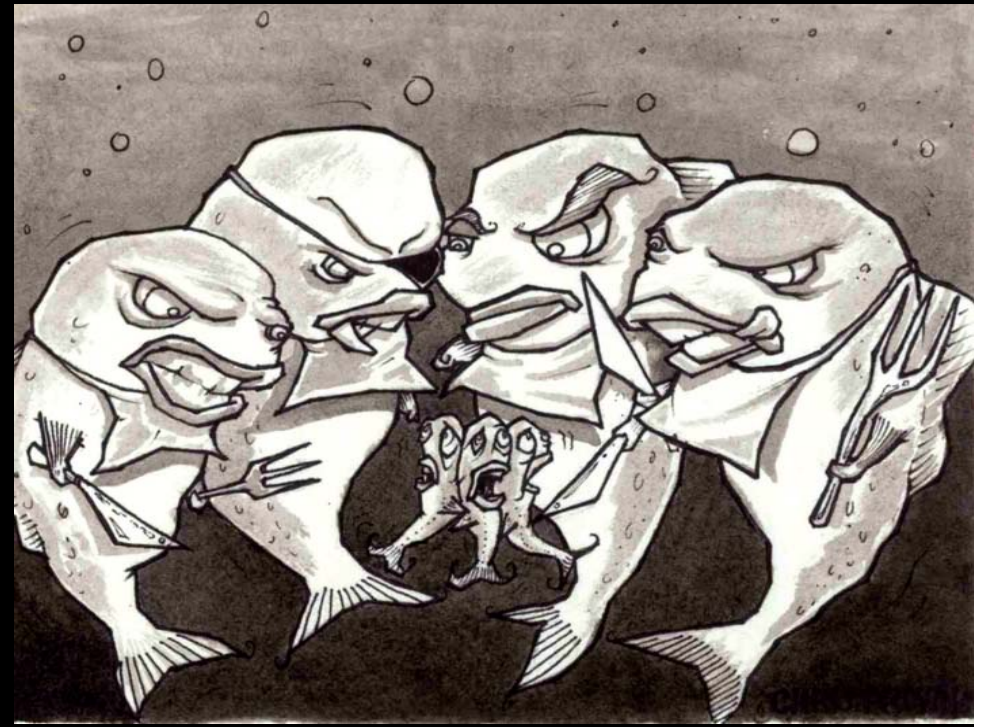
Post-experimental fish feeding

Species	Depth (m)	Time (hrs)
Red	21.3	2
Grouper	27.4	
	42.7	12-24
Red Snapper	21.3 27.4	1
	42.7	4





Benthic versus Pelagic Species





Vermilion Snapper at 62 m (200 ft)



Photo taken from an ROV camera



Conclusion

- Hook type & size makes a difference
- No standardization of hook size by manufacturers
- Dolphin predation & depredation = serious issue
- Barotrauma is dependent on multiple factors
- Survival from barotrauma also depends on a suite of factors