



Barotrauma in West Coast Fisheries

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~7000 Miles of Varied Coastline Alaska, Washington, Oregon, California

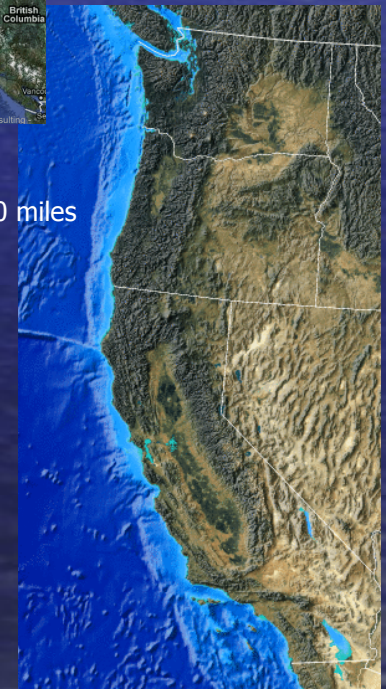
- Four major ecosystems
 - Cold Water Systems
 - Bering Sea/Aleutian Islands
 - Gulf of Alaska
 - California Current (WA, OR, NorCAI)
 - Warm Water System
 - SoCal bight



Not to scale!

- Our Coastal features are diverse
 - Both broad and narrow shelf
 - Deep canyons
 - Steep slopes
 - Kelp
 - Rocky reefs
 - Sandy beaches, muddy bottoms
 - Some sea-mounts
 - Some deep water corals

1300 miles

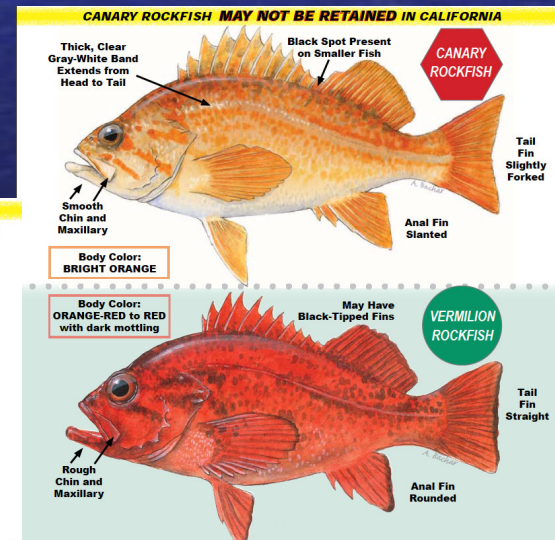
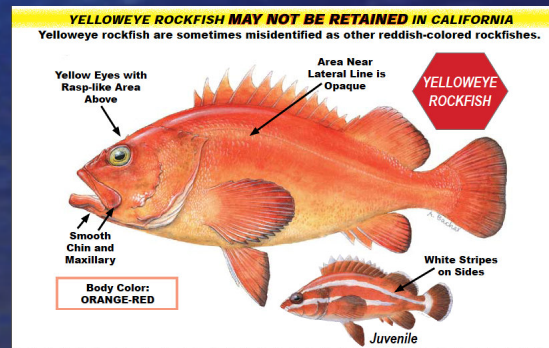


Barotrauma - Alaska

- Rockfish most susceptible to barotrauma
 - Over 30 species of rockfish in AK
- Targeted and caught incidentally in numerous commercial fisheries
 - Several species are “bycatch” only status
- In recreational fisheries often targeted and are incidentally caught in sport halibut fishery
 - No area closures but restrictive bag limits in most areas
 - Yelloweye greatest concern in recreational fisheries
 - Recent reductions in halibut sport bag limits may impact rockfish catches

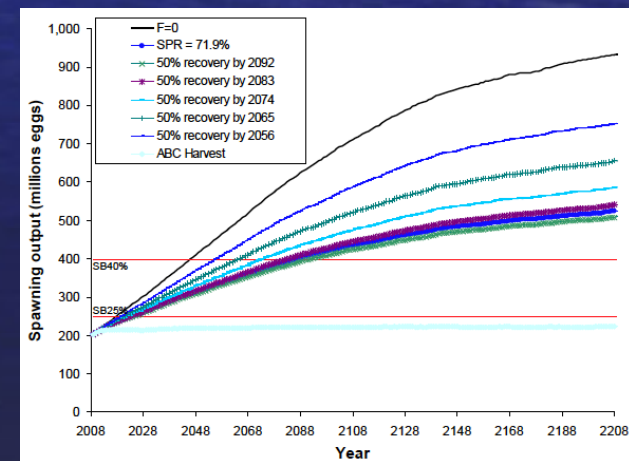
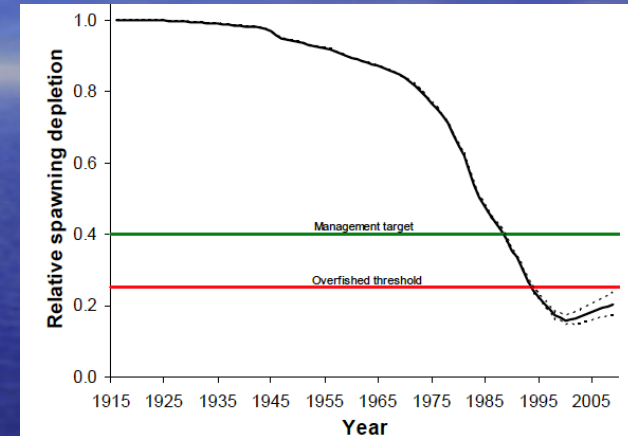
OR, WA, CA Recreational Groundfish Fishery

- Mixed stock groundfish fishery includes 90 + species
 - In the Pacific Council (WA, OR, CA) there are 64 + species of **rockfish** alone, NO overfishing, 7 overfished and rebuilding
 - Canary, Yelloweye, Bocaccio, Darkblotched, Widow, Cowcod, Pacific Ocean Perch
 - Difficult to differentiate abundant and constraining species
- Private boats, kayaks, CPFV's (charter and 6-pack)
 - Surf line to the shelf (limited by RCA restrictions)



Stock Abundance

- During mid to late 20th century groundfish stocks saw deep declines
 - Effective management measures put in place in the 90's
 - Overfishing was stopped
 - Stocks are rebuilding – but rebuilding rate is controversial and slow
 - Biology of the fish, and Magnuson community welfare considerations



WA, OR, CA Yelloweye

OR, WA, CA Constraining Rockfish (Sebastes)

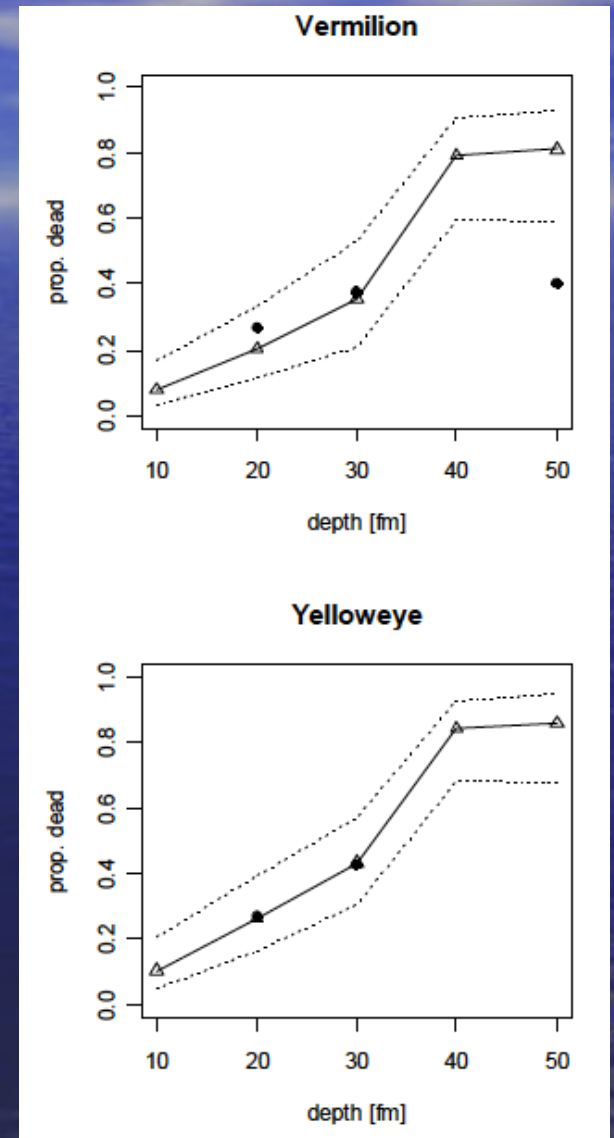
- Typically long lived, slow to reproduce, somewhat to largely territorial,....
 - Zero, or very limited retention
- Constraining species *tend* to prefer deeper habitat
 - Current management strategy is to avoid contact by closing preferred depths – Rockfish Conservation Areas (RCAs), Cowcod Conservation Areas (CCAs).
 - Thousands of square miles are closed to recreational hook and line fishing
 - Forces fishermen into more constrained areas and reefs
 - ❖ Some safety concerns as well as localized depletions
- Season structures are designed to close the entire recreational groundfish fishery based on these constraining species
 - Largely dependent on contact and presumed mortality rates
 - Have ability to close individual management zones
- Development of gear types to selectively avoid species of concern

CA Marine Life Protection Act

- The state of CA is implementing a network of Marine Protective areas within state waters
 - Habitat / ecosystem protection often results in closures and groundfish restrictions from the shoreline to three miles
- Will redistribute and concentrate the fishermen into fewer open areas, resulting in more localized depletions
- Both OR and WA are considering similar protections, will face similar concerns and issues

Depth Based Survivability

- The Pacific Council uses depth related mortality factors to account for survivability of released rockfish
 - Depth related Barotrauma factors
 - Constant Hooking and handling factors
 - Constant Long term survivability factors



CDFG Outreach Program

- Implemented in 2008
 - Encourages descending devices
 - Discourages venting devices
- Concern for infection and improper use
 - Voluntary program

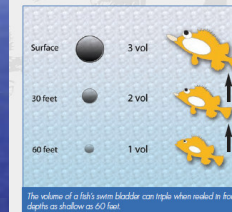
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WHY ARE ROCKFISH PRONE TO PRESSURE-RELATED INJURIES?

Every rockfish has a gas-filled organ called a swim bladder that allows the fish to gently control its buoyancy. By deflating its bladder, a fish can descend more easily. By inflating it, its ascent is assisted. When a fish is caught and reeled in, this mechanism for moving vertically in the water column is thrown out of whack.

Depending on the depth at which the fish was caught, a fish's air bladder may swell so much its stomach is forced out its mouth. The eyes may bulge and other organs can be injured as well. Fish suffering from pressure-related injuries are said to be experiencing barotrauma (pressure shock). Without intervention, a fish with barotrauma may die from the progression of its wounds or succumb to temperature shock or predators.

"Floaters" – overly inflated fish that cannot re-descend on their own – are especially easy targets for sea gulls and sea lions.



Alternate communication formats of this document are available upon request. If accessible accommodations is needed, call DFG at (916) 322-8911. The California Relay Service for the deaf or hearing-impaired can be utilized from TDD phones at (800) 735-2929.

ROCKFISH-BAROTRAUMA MYTHS

- Myth:** Reeling a fish in slowly prevents barotrauma.
- Fact:** Rockfish cannot acclimate to the pressure drop even when reeled in slowly.
- Myth:** The organ protruding from a 'popped' fish's mouth is the swim bladder.
- Fact:** It is the stomach! Never vent the stomach or try to force it back inside the mouth.
- Myth:** You can tell by looking whether a fish will survive or die.
- Fact:** When properly recompressed, even fish with severe barotrauma can survive.

ROCKFISH-BAROTRAUMA SCIENCE

According to published results of a Sea Grant study led by researchers at Cal State Long Beach: The degree of barotrauma in a fish is not a reliable predictor of its survival. The most significant predictor of post-release survivorship is the time a fish spends at the surface. In experiments with several species of common Southern California rockfish, 83 percent of fish caught at depths between 217 feet and 350 feet, survived when returned to depth within 2 minutes. The odds of a fish dying following recompression nearly doubled with every 10-minute increase in time at the surface. Tagging and recapture studies showed some released fish were still alive 1.5 years later.

For current recreational groundfish fishing regulations, call (831) 649-2801 for recorded information or visit the California Department of Fish and Game website at www.dfg.ca.gov/marine/regulations.asp.



This brochure was a collaborative effort of California Sea Grant, Oregon Sea Grant and University of Southern California Sea Grant. Printing was funded by the California Department of Fish and Game.

BRING THAT ROCKFISH DOWN

FISH CAN SURVIVE BAROTRAUMA

Amazingly, rockfish that look dead at the surface can "pop" back to life if quickly returned to a native depth range. Because of this, rockfish that you must, or want to, toss back should be quickly recompressed.



TOP FIVE REASONS TO SEND 'EM DOWN

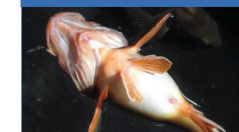
Why should you care about helping a released fish return to depth?

1. Floating fish are a waste of the resource.
2. Some populations of prohibited species, such as canary and yelloweye rockfish, may take decades to rebuild.
3. High-grading is illegal and selects for smaller fish in the gene pool.
4. Venting fish may cause more harm than good.
5. Re-descending fish can increase their chances of survival.

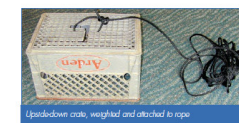
Catch-and-release practices work best when you can help with fish survival. Helping fish get back down is good for the resource and the sport.



PRACTICE THE FOLLOWING TECHNIQUES AND SAVE ROCKFISH LIKE THIS!



There are many ways of returning a fish to a depth at which it can recompress. Your choice may depend on the size of the fish you usually catch, your experience as an angler, sea conditions and cost.



Upside-down milk crate, weighted and attached to a rope: Crate is dropped over the fish and then, with the buoyant fish inside, lowered to a minimum depth of 60 feet and kept down until it can swim out on its own. Caveats: In rough seas, fish can escape prematurely and the crate may bang against a fish's extended eyes. Try lowering the fish down gently or paint crate's inside with a rubberized coating to smooth sharp edges.



Inverted barbless hook with weight: Hook fish through lower lip from inside to outside, to keep hook from puncturing an extruded stomach and to prevent line cuts to eyes. You can also hook a fish through the membrane on its upper lip from outside to inside, which some say makes for easier release. In both cases, the weight must lead the fish into the water and be heavy enough to sink to the desired depth. Fish is released with a sharp jerk on the line. Caveats: Hook can puncture an extruded stomach. Once a fish reaches a depth at which it regains muscle coordination, it may wridle free prematurely. Method works best with smaller fish.



Commercial fish descenders: There are a variety of practical, easy-to-use fish descenders on the market. The best one for you may depend on the sizes and species you catch. For more information, visit www.heliosproducts.com and <http://igt-t-down.com>.

VENTING: A sharp needle or steel cannula is used to puncture a fish's inflated swim bladder. The California Department of Fish and Game does not currently encourage venting as it can cause serious injury to fish and angler. You may accidentally puncture the wrong organ and/or introduce infection. Even when done properly, venting damages a fish's swim bladder.

New Alaska Barotrauma Research

Alaska Department of Fish and Game

- Yelloweye rockfish mark-recapture study
 - When released at surface 17-day survival probability was low (<0.25) but much higher when released at depth (>0.98)
 - Positively correlated with total length
- Predicting recompression success in yelloweye and quillback RF
 - Condition Index may be a promising predictor of post-release performance of rockfish

New Alaska Barotrauma Research

Alaska Fisheries Science Center

- Rougheye rockfish recompression

July, 2010 ~700ft



Immediately
recompressed ~50psi



Public display Feb, 2011



March 2011

On-going Oregon Research Efforts

ODFW Newport – Bob Hannah, Polly Rankin, Matt Blume

- Evaluation of 48 hr survival of rockfish with barotrauma that were recompressed using specially designed cages (see ppt slides)

Species	N	DOC* range	% survival
Black	144	9m – 64m	90.3%
Blue	36	9m – 54m	77.8%
Canary	41	19m - 64m	100%
Quillback	28	28m – 64 m	100%
Yelloweye	25	19m – 54m	100%
Copper	10	28m – 54m	100%
China	3	9m – 45m	100%

*Depth of capture



- **Take home:** Recompression response is species specific in rockfish (note differences between black, blue, and other species). Overall: Very high survival of rockfish when recompressed, especially benthic rockfish!

Need Access to Plentiful Stocks

- Area Closures avoid contact with constraining species
- Time closures limit seasons based on constraining species

- Can we offset by creative avoidance strategies and gear
- Can we offset by selective release of constraining species with acceptable mortality
- Can we implement regulations that are enforceable and acceptable to the fishermen

Need the Councils to adopt / update depth based mortality factors based on

Scientific determination of mortality factors for specific types of barotrauma treatments