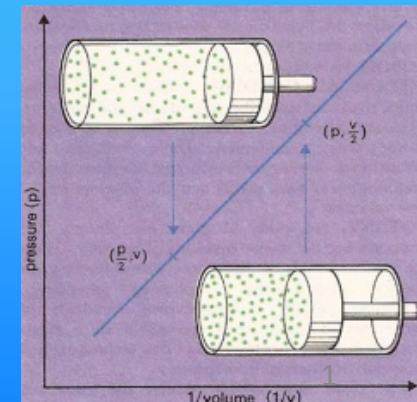


GMT Progress Report on Developing Mortality Rates for Rockfish Released Using Descending Devices

November 2012
Costa Mesa, CA



June 2012 Council Motion

- Declared that barotrauma associated with our hook and line catch and release recreational groundfish fishery was a priority consideration
- Need to account for the use of descending/recompression devices in our catch forecasting and catch accounting models
- Such accounting should include a differential release mortality rate associated with depth of capture and depth of release

June 2012 Council Motion

- GMT—develop draft proposed methodologies for decompression release survival rates for yelloweye and cowcod
 - progress report in time for Nov 2012 briefing book
- SSC—review the GMT depth based mortality estimates with regard to best available science and suitability for use in active fishery management decision making and produce a statement for consideration at Nov 2012 meeting
 - Identify additional research and data needs
- Council—consider the GMT proposal, SSC review, and GMT response to the SSC review at the March 2013 Council meeting
 - Objective of implementation in 2013 for cowcod and yelloweye
 - Broader range of species for 2015-2016 cycle

GMT Work to Date

- Sub-group worked between June and September council meetings
 - Summary of how current surface mortality came about
 - Summary of available research
 - Beginning ideas on proposed methodologies
- Entire GMT discussion at September Council meeting
 - Review available research
 - Refined ideas on proposed methodologies
- Entire GMT met in October
 - Review available research
 - Further refined proposed methodologies
 - Thoughts on implementation
 - Research and data needs
- Since October meeting—writing and reviewing progress report

Surface Release Discard Mortality Rate

In 2009, the Council approved estimates of discard mortality by depth developed by the GMT for important rockfish species. The discard mortality rates were based on three components of mortality:

1. surface release mortality;
2. short term bottom mortality; and
3. long term delayed mortality.

This is referred to as Equation 1 in the report.

Species	0-10	11-20	21-30	>30
Black	11%	20%	29%	63%
Black and Yellow	13%	24%	37%	100%
Blue	18%	30%	43%	100%
Bocaccio	19%	32%	46%	100%
Brown	12%	22%	33%	100%
Calico	24%	43%	60%	100%
Canary	21%	37%	53%	100%
China	13%	24%	37%	100%
Copper	19%	33%	48%	100%
Cowcod	21%	35%	52%	100%
Gopher	19%	34%	49%	100%
Grass	23%	45%	63%	100%
Kelp	11%	19%	29%	100%
Olive	34%	45%	57%	100%
Quillback	21%	35%	52%	100%
Tiger	20%	35%	51%	100%
Treefish	14%	25%	39%	100%
Vermillion	20%	34%	50%	100%
Widow	21%	36%	52%	100%
Yelloweye	22%	39%	56%	100%
Yellowtail	10%	17%	25%	50%

Data Informing Mortality Rates with Descending Devices

- Jarvis and Lowe, 2008 looked at the effects of barotrauma on both the initial capture survival and the short term (2-day) survival of line caught rockfish off southern California following recompression in cages
- Hannah et al. 2012 used a cage system designed to minimize the adverse effects of caging fish in the field to evaluate the discard mortality of seven species of rockfish with barotrauma
- Hochhalter and Reed, 2011 developed a study to quantitatively evaluate the effectiveness of deepwater release at improving the survival of discarded yelloweye rockfish in the wild
- Wegner, Pribyl and Hyde (in preparation) http://www.pcouncil.org/wp-content/uploads/D2c_SUP_SWFSC_PPT_VETTER_JUN202BB.pdf , studied the post release survival and behavior of deep-dwelling rockfish suffering from barotrauma
- Smiley and Drawbridge, 2007 used a portable hyperbaric chamber to evaluate the feasibility of decompressing fish to be held in captivity, at the surface

Expected Survivorship and 95% Confidence Intervals for Several Rockfish Species

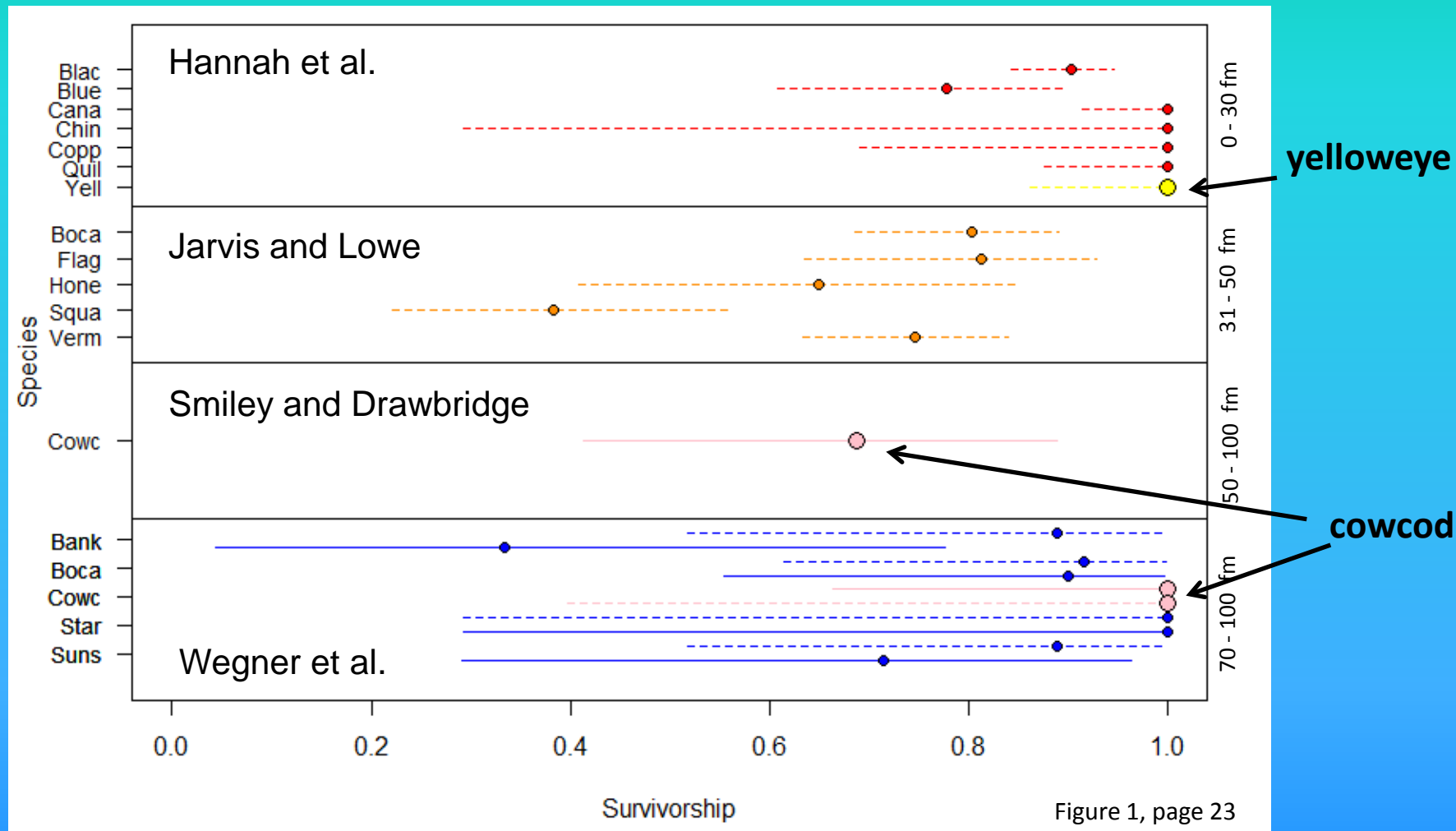


Figure 1, page 23

Depth bins are also given on the secondary y-axis. Yelloweye and cowcod are focus species for this analysis, and thus are designated with larger points. Line types also designated survivorship up to 2 days (broken lines) and 10 days (solid lines) after release.

Expected Survivorship and 95% Confidence Intervals with Species Combined

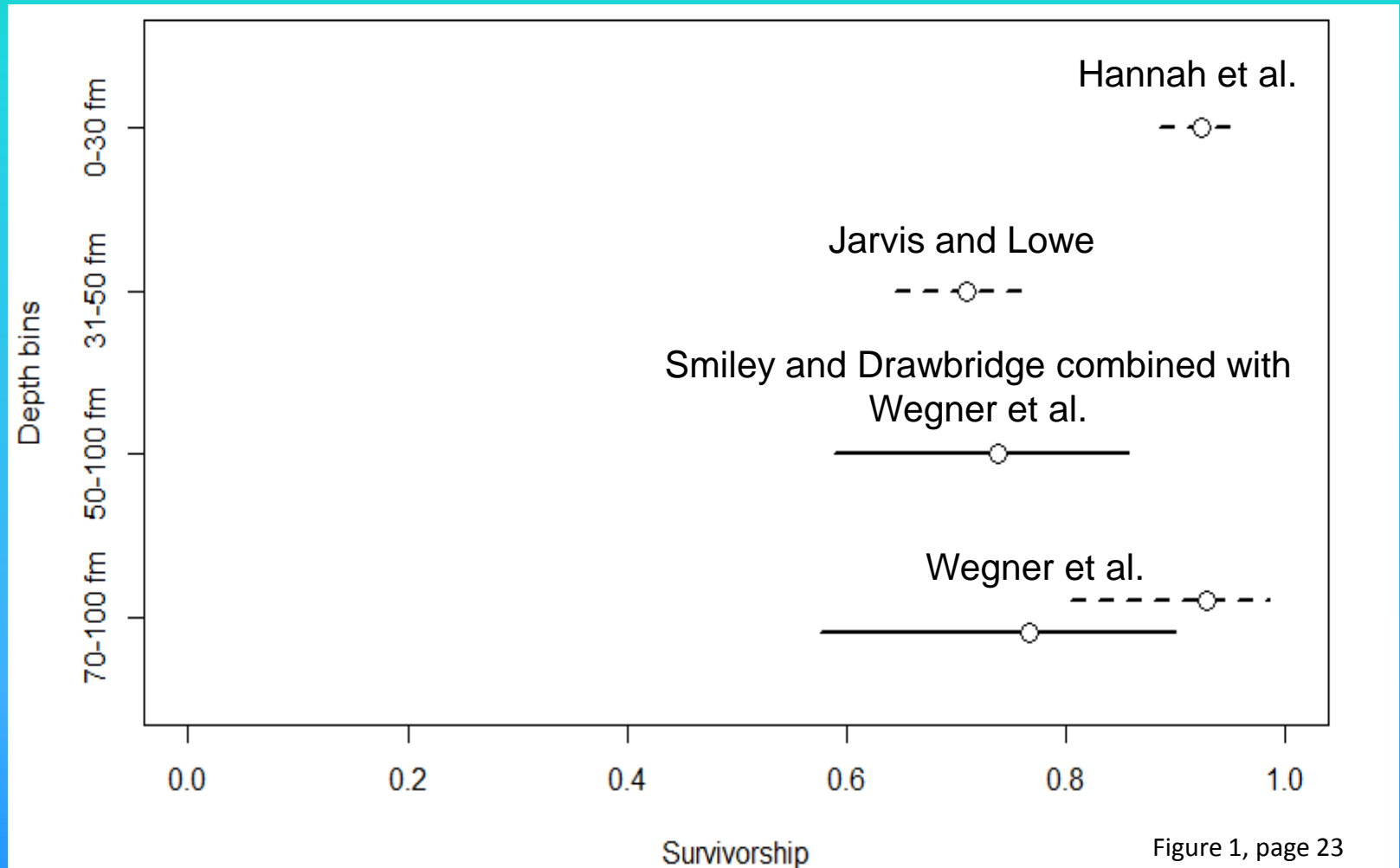


Figure 1, page 23

Line types also designated survivorship up to 2 days (broken lines) and 10 days (solid lines) after release.

Descending Devices Discard Mortality Rates

Builds on approach used for current estimates of surface discard mortality using estimates of mortality for fish released to depth from current research:

Equation 2.

Replaces surface mortality with discard mortality from two to four day cage studies such as Jarvis and Lowe, 2008 or Hannah et. al 2012 or acoustic tagging. The estimates for short term bottom mortality and long term delayed mortality are not changed.

Equation 3.

Replaces surface mortality with discard mortality from cage studies such as Jarvis and Lowe, 2008 or Hannah et. al 2012 or acoustic tagging. Replaces the current short term bottom and long term delayed mortality with estimates of mortality from three to ten day cage studies such as Wegner et al. (in prep.)

In some instances ten day mortality estimates from acoustic tagging provide stand alone mortality rates (no additional mortality past ten days in four month study)

Mortality Rates by Depth Bin Estimated for Each Method of Estimating Mortality Rates for Yelloweye Rockfish using Equation 2

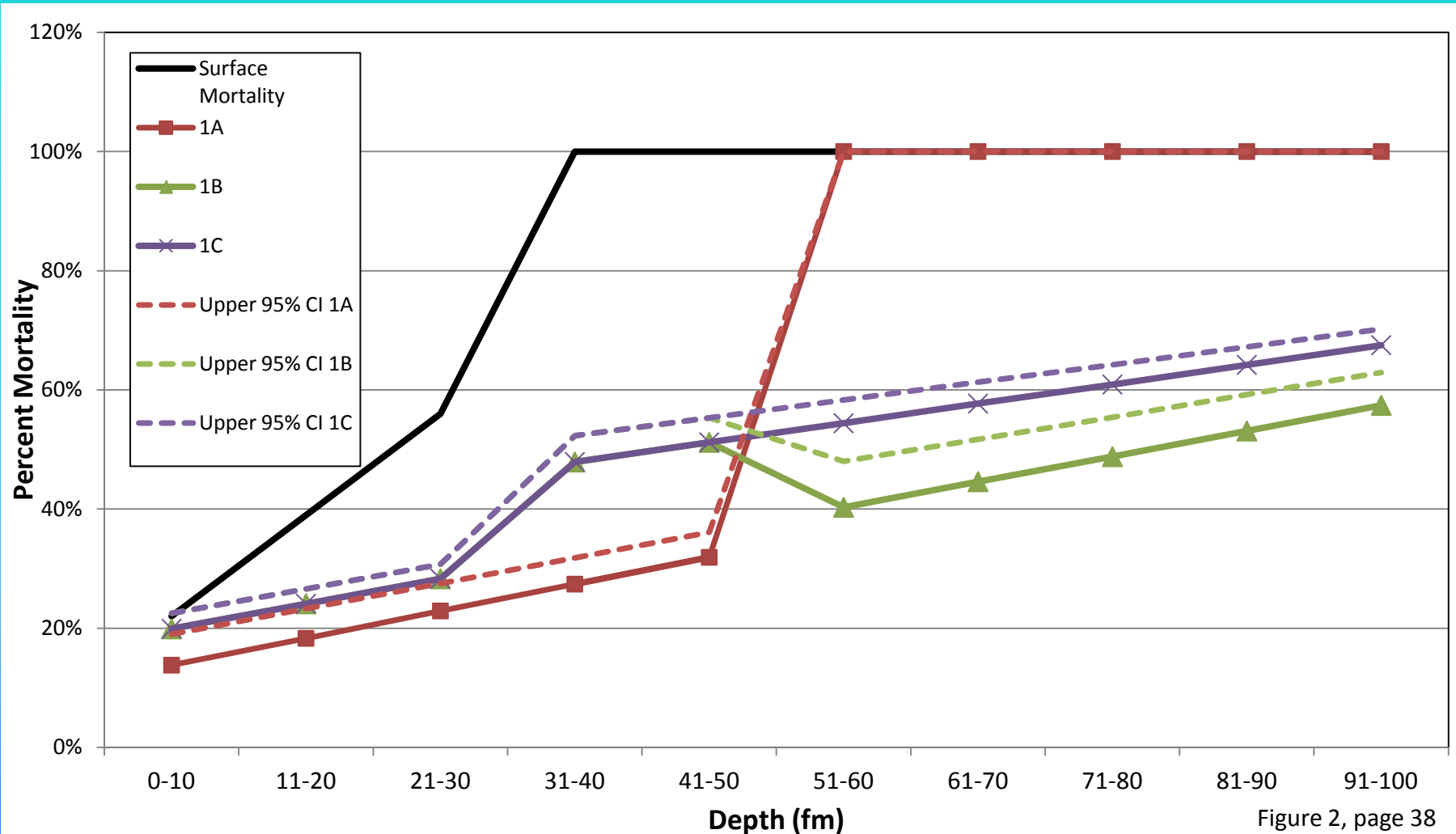


Figure 2, page 38

Mortality Rates by Depth Bin Estimated for Each Method of Estimating Mortality Rates for Yelloweye Rockfish using Equation 3

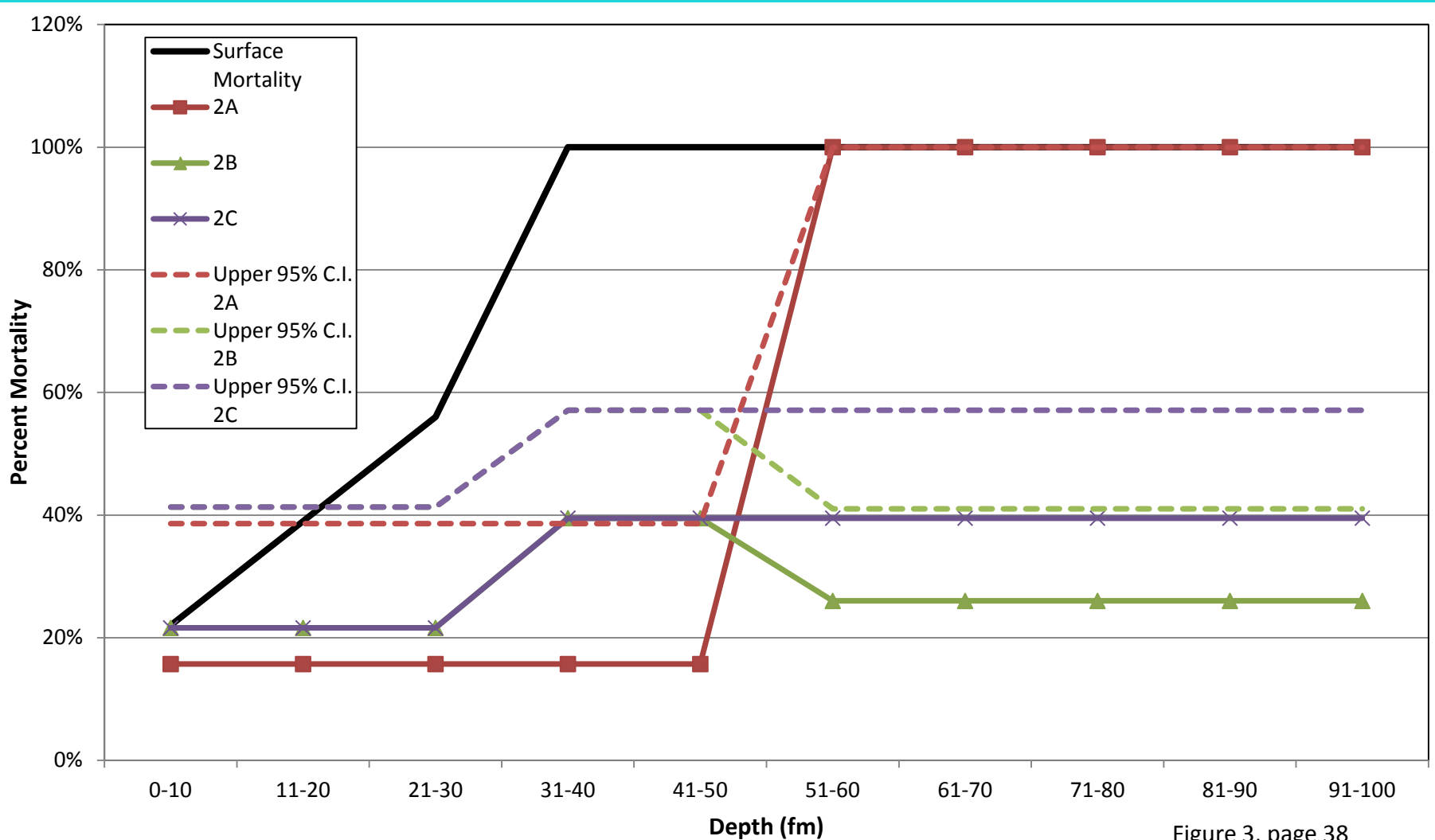


Figure 3, page 38

Mortality Rates by Depth Bin Estimated for Each Method of Estimating Mortality Rates for Cowcod using Equation 2

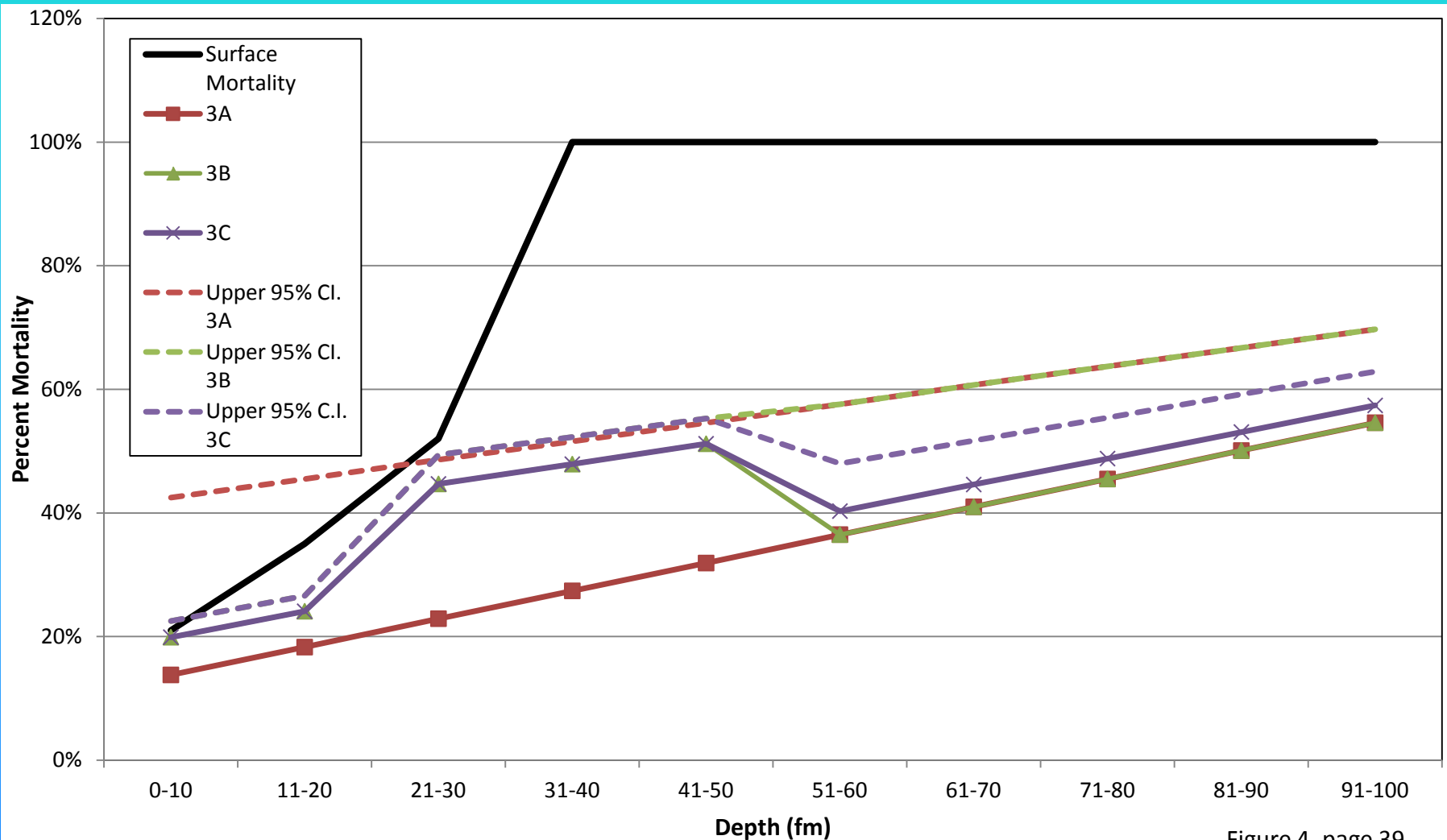


Figure 4, page 39

Mortality Rates by Depth Bin Estimated for Each Method of Estimating Mortality Rates for Cowcod using Equation 3

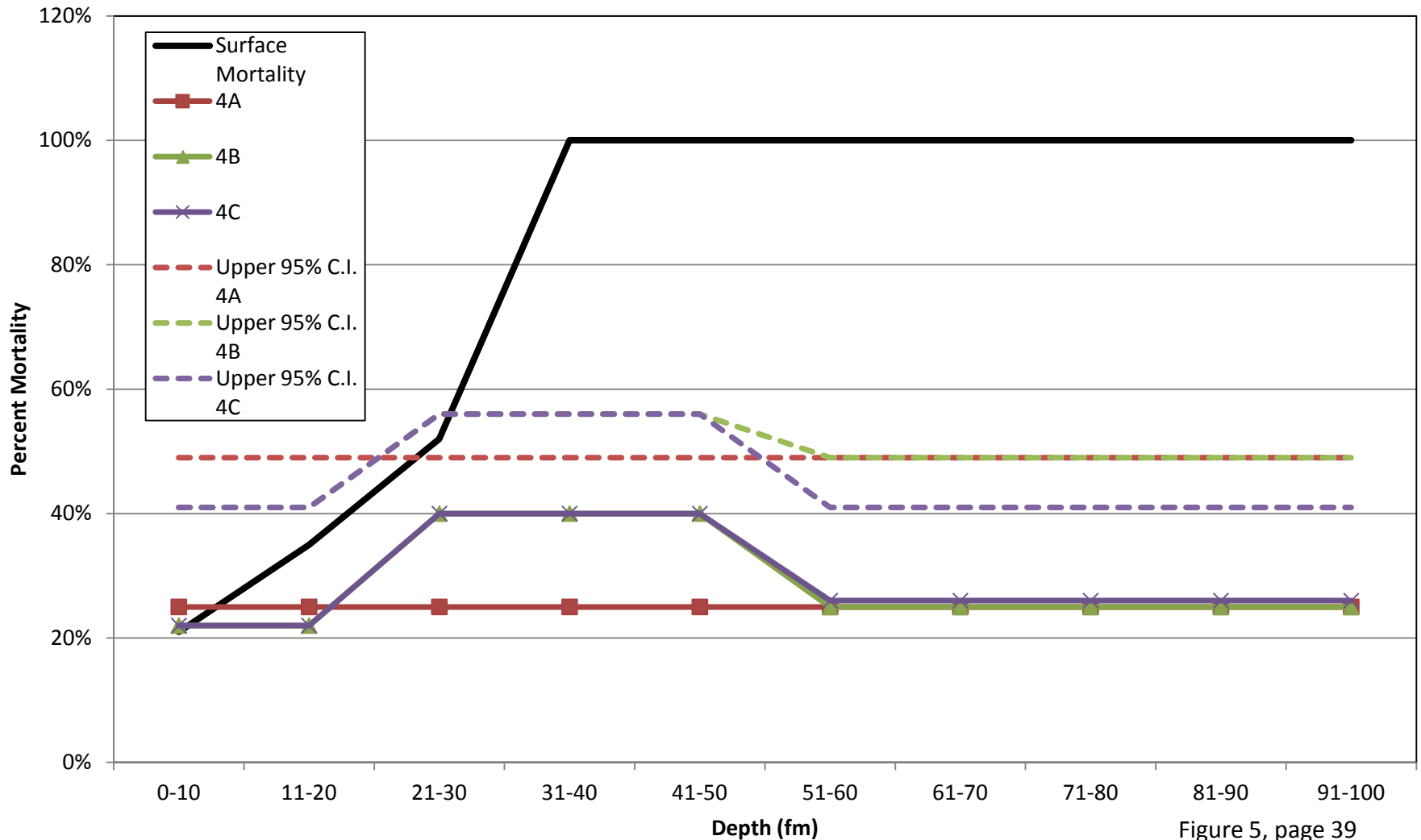


Figure 5, page 39

Yelloweye Rockfish (Retained and Released) by Depth Bin from All Washington Recreational Trip Types Combined from 2006-2012

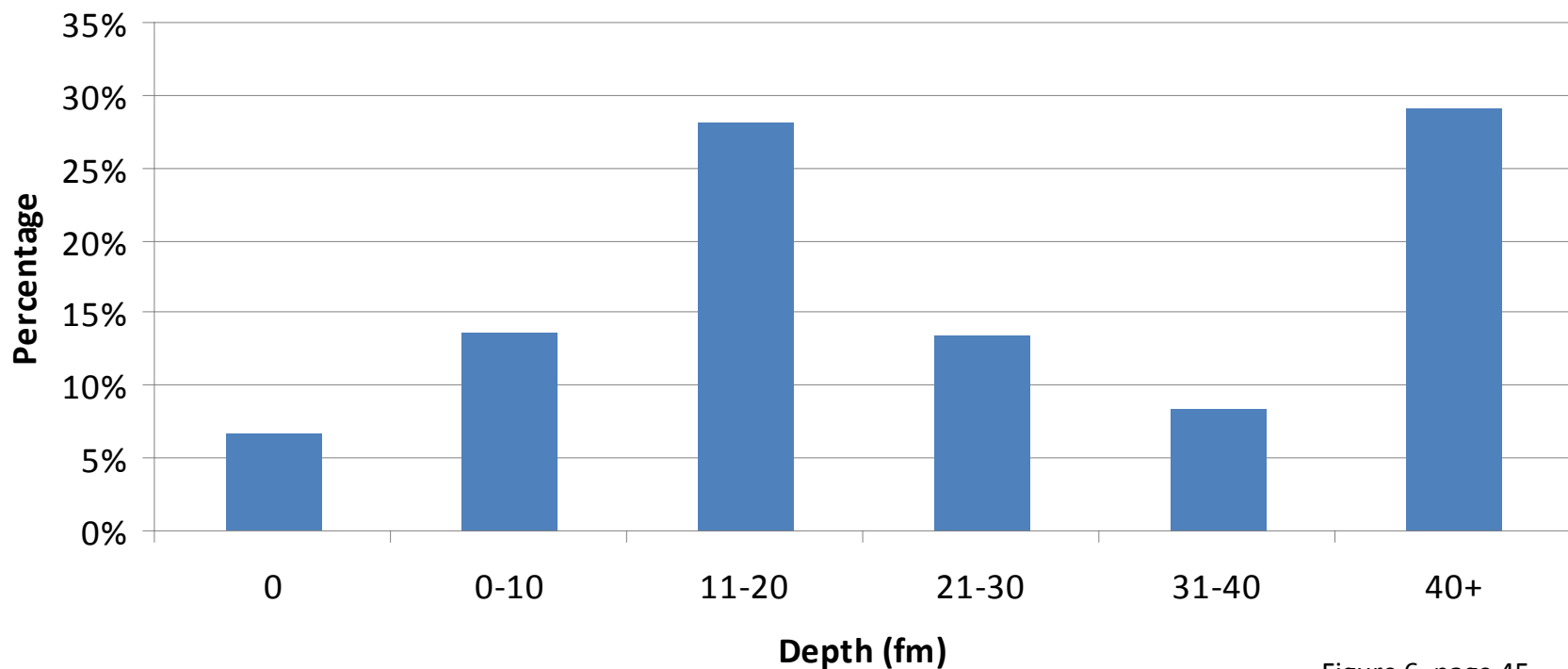


Figure 6, page 45

Percentage of Yelloweye Rockfish Released by Depth Bin from the Oregon Recreational Bottomfish and Halibut Fisheries Combined, 2010-Sept 2012.

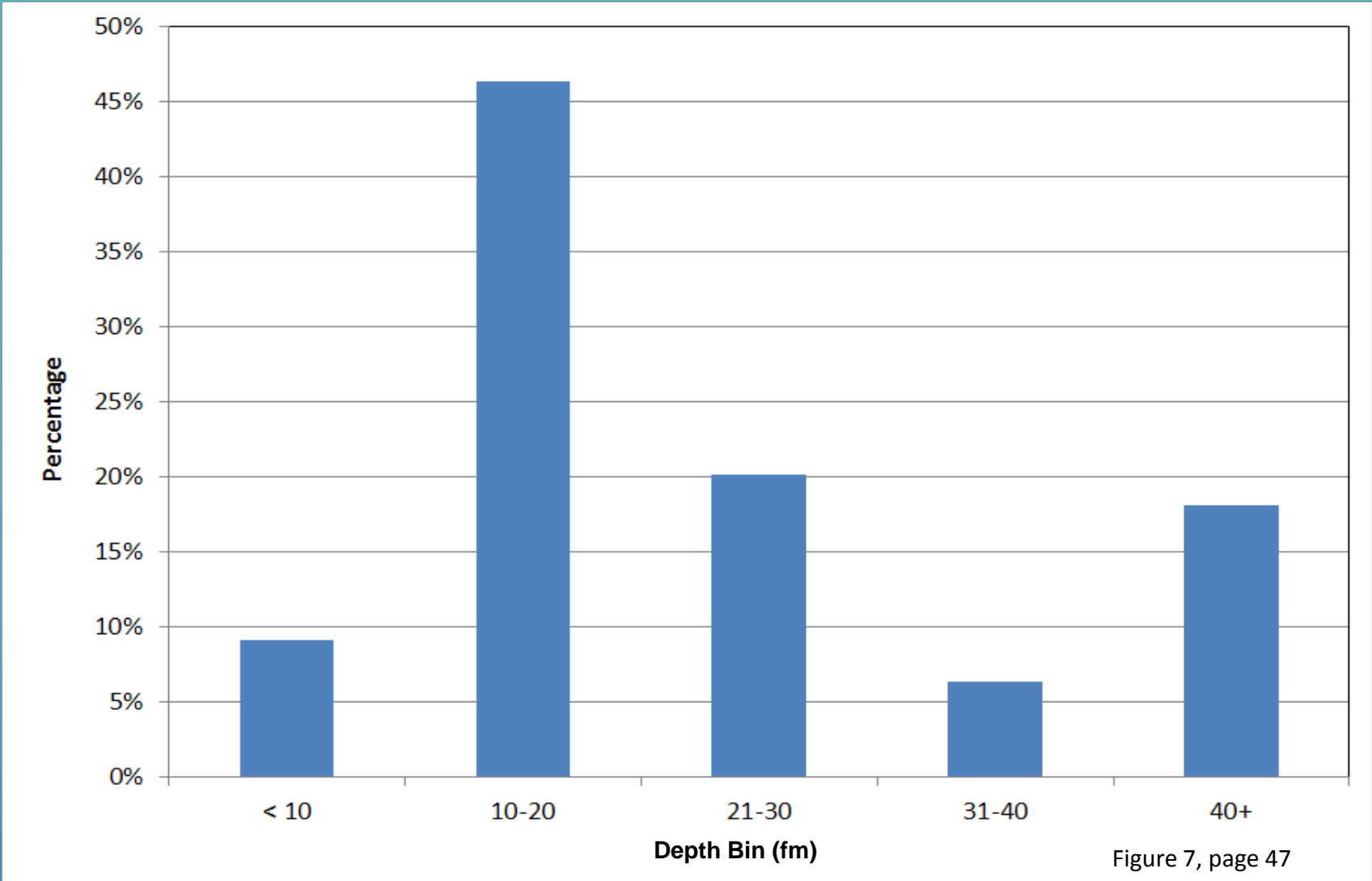
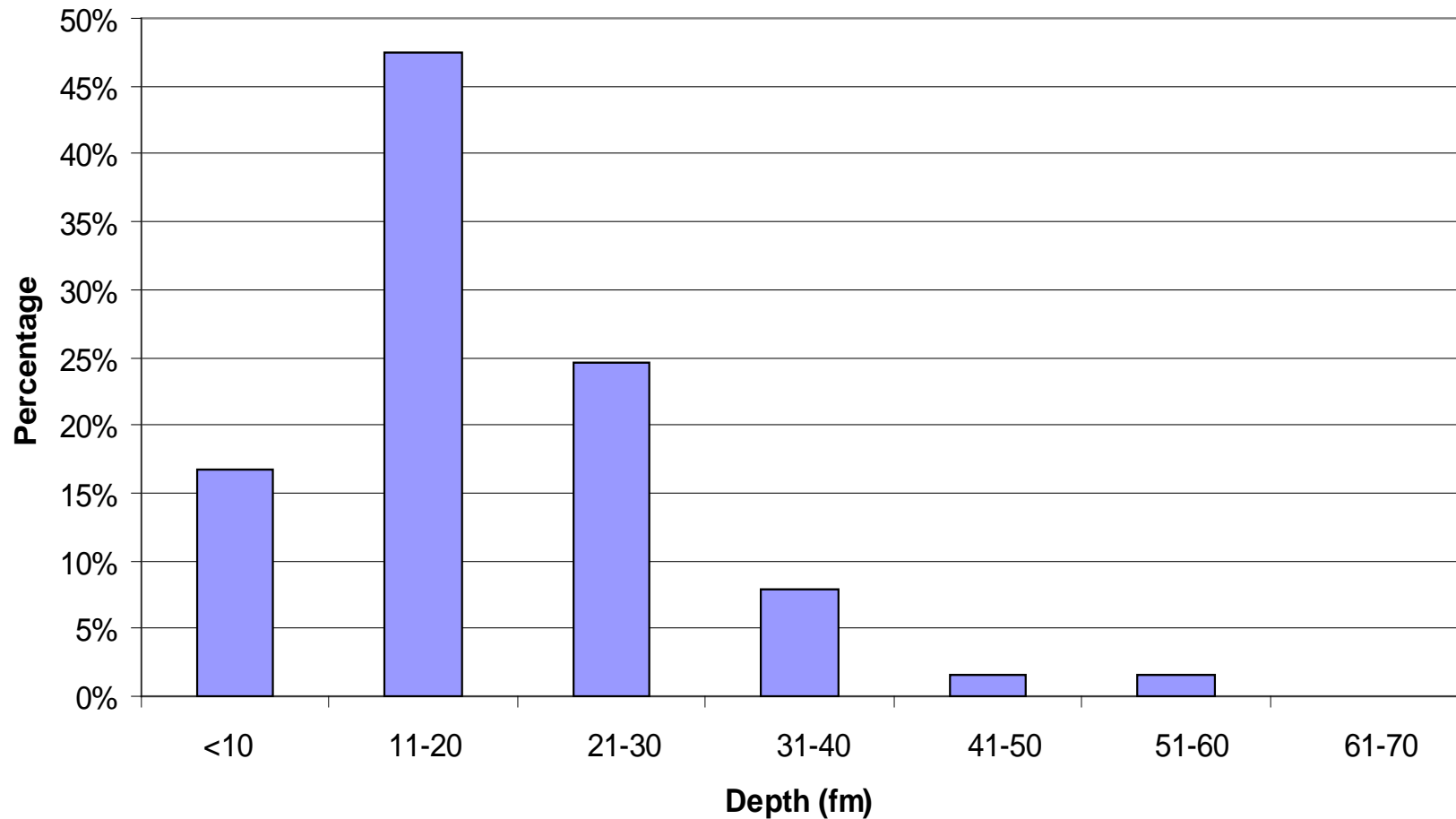
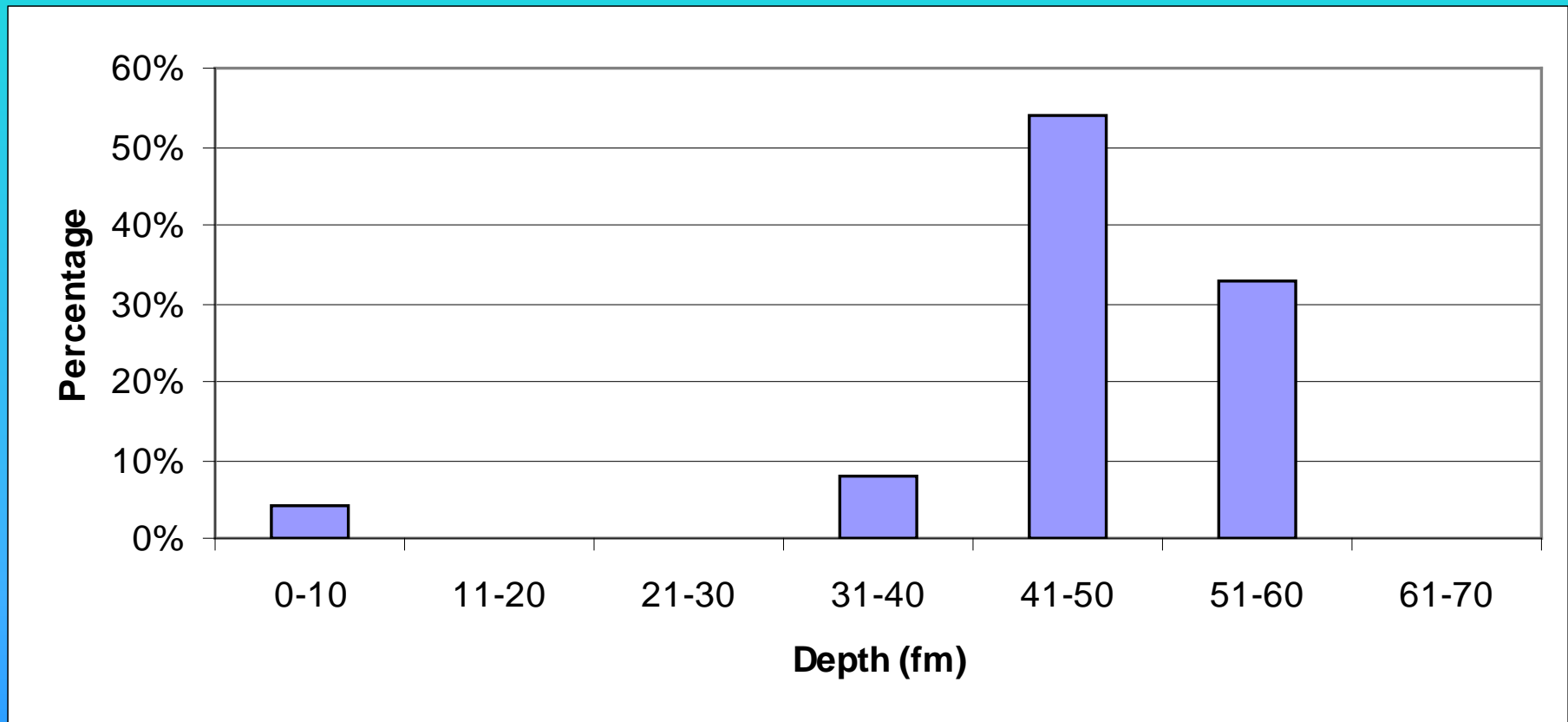


Figure 7, page 47

Percentage of Yelloweye Rockfish Released by Depth Bin from the California Recreational Fishery 2009-2012



Percentage of Cowcod Released by Depth Bin from the California Recreational Fishery 2009-2012



Mortality Rate Considerations

- Do these studies contain sufficient information to provide a basis for developing alternative mortality rates?
- Are the studies applicable to recreational fisheries (cages vs. descending devices)?
- Are proxy estimates based on other species acceptable?
- Of the assumptions and biases presented, which are acceptable?
- Do they account for all or the vast majority of expected mortality and effective mortality from fitness reduction?

Physiological Impairment from Barotrauma

Reducing Fitness

- Types of injury affecting fitness
 - Exophthalmia Stretching Optic Nerve:
 - Vision impairment affecting feeding?
 - Rogers 2011 et al. shows recovery in 4 days in Rosy rockfish
 - Ruptured Swim Bladder
 - Buoyancy regulation issues?
 - Pribyl et al. 2012 indicates potential for healing in black rockfish
 - Reproductive Capacity
 - Unable to find mates, produce gametes, produce larvae?
 - Hochhalter and Reed 2011 unaffected recaptured yelloweye rockfish

Precautionary Buffers for Uncertainty in Mortality Rate Estimates

- Addressing Biases
 - Using less robust proxy species for yelloweye and cowcod +
 - Some redundant mortality estimates in equations +
 - Greater handling, tagging and stress from confinement +
 - Predation at the bottom
- Addressing Uncertainty
 - Sample size, random sampling error and precision
- Appropriate magnitude
 - Does lower 95% CI address sample size concerns relative to random sampling error and precision of estimates?
 - Additional buffer ?
- Do we need it? Not done applied in salmon mortality rates or halibut mortality rate estimates just mortality computed with data from research

Implementation/Application of Mortality Rates

- Proportion of yelloweye and cowcod encountered by depth
- Proportion of those fish released using a descending device
- State by state basis
- Depends on information available from sampling program
- Sampling rate by mode
- Pooling by depth, month, area
- Sampling program trade-offs
 - Each additional question asked means X less interviews per hour/day
- Sampling program priorities
 - Most programs were developed for salmon, groundfish has just been added on

Considerations Related to Implementation

- Data available from each state may vary – ability to collect/sample size
- Coastwide consistency vs. optimal estimation with each states data
- Are 10 fm bins for proportion discarded with a device too fine scale? (maybe < 30 fm and > 30 fm) – assume same – catch by depth only
- Match sampling precision to estimation precision and management objectives
- Can use information on one mode, be applied to others?
 - Conversely, if only have it for one mode, does that preclude from using for just that one mode?
- Is proxy data sufficient i.e. proportion of boats in possession
- All states assume that fish are discarded at the same depth as the majority/average of catch – also applies to surface release mortality

Precautionary Buffers for Uncertainty in the Application of Mortality Rates

- Addressing Biases
 - Reported disposition biases vs. omission
 - Failed use when assumed successful
- Addressing Uncertainty
 - Random sampling error – where is the bar, can pooling address this sufficiently without a buffer
- Appropriate magnitude
 - Cost of being wrong – risk to rebuilding/overharvest
 - Basis – estimate of use variance, bias magnitude
- Next steps in quantifying bias and uncertainty

Research and Data Needs

- Appropriate species to use as a proxy for yelloweye and cowcod?
- Increase sample size and depth range for cage studies and acoustic tagging
- Data for more species – priorities: discard rate/mgmt concern
- Percent failure in use of descending devices
- Technology and tools improving effectiveness of use
- Evaluation of current sampling rates/use estimation methods
- Trade-offs in collecting information on descending devices
- Outreach and education – awareness, use and effectiveness

Next Steps

- Refined Process
 - GMT revision of mortality rates , including a preferred alternative(s)
 - States develop methods to apply mortality rates
 - RecFIN review of data methods to apply mortality rates
 - SSC review of preferred mortality rate(s) and methods to apply them
- Additional Species
 - Canary rockfish: Data available, discarded prohibited species, management concern, frequent encounters
 - All species: Constraints on sampling programs, rates ok, application if prohibited in the future
- Buffers for Uncertainty in Estimates and Application
 - GMT develop
 - SSC review

QUESTIONS?

