Science, Service, Stewardship

Agenda Item F.1.a
Supplemental NWFSC PPT
April 2017

Groundfish Science Report

Michelle McClure
Northwest Fisheries Science Center

April 8, 2017

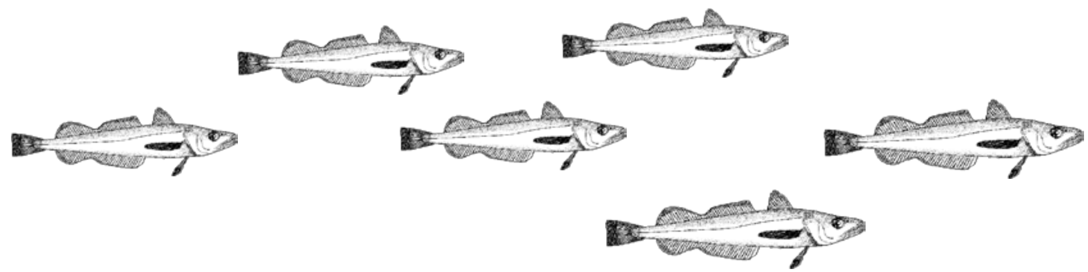
NOAA FISHERIES SERVICE

Overview

- Pacific Hake – summer survey
- Pacific Hake – winter cruise
- Salmon bycatch numbers
- Nearshore depth bins
- Science updates

NOAA FISHERIES SERVICE

Plans for the 2017 Joint U.S. – Canada Pacific Hake Acoustic Survey



NOAA Fisheries
Northwest Fisheries Science Center

Fisheries and Oceans Canada
Pacific region

Pêches et Océans Canada

Fisheries and Oceans Canada

Summer 2017 scenarios

~~PLAN A~~

Bell M. Shimada + ~~**W.E. Ricker**~~ = **113 DAS**

Bell M. Shimada
- 80 DAS
- June 15 – September 12
- Five legs ~15 DAS each

~~**W.E. Ricker**~~
- 33 DAS
- August 15 – September 18
- Two legs ~17 DAS each

Since the Ricker will not be certified to sail again, DFO…

- Is working on securing a charter vessel → **PLAN B**
  - Statement of work out for bidding
  - In process
- Has asked that Shimada conduct full survey if charter falls through. → **PLAN C**

PLAN B

Shimada + DFO charter

80 + 28 = **108 DAS**

PLAN C

Shimada only

= **80 DAS**

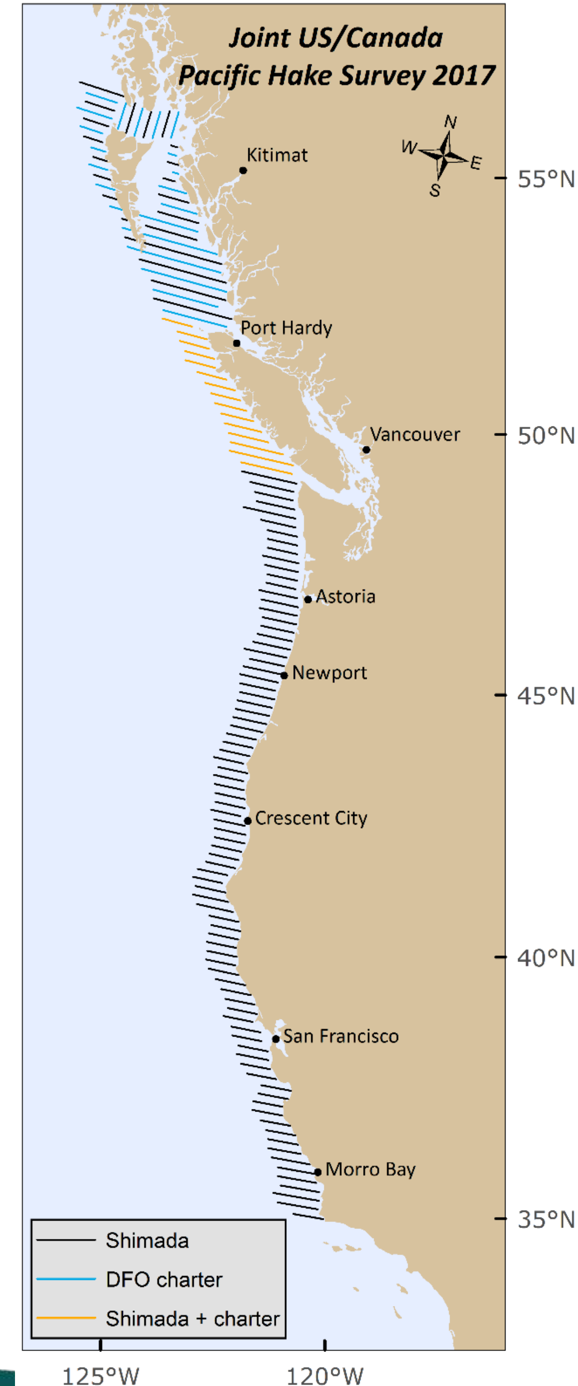
Plan B: Shimada + DFO charter vessel

Survey area & density

- Point Conception to Dixon Entrance, Alaska
- Transects 10-nmi apart
- From 50 m depth to 35 nmi offshore

108 DAS

- Shimada survey Point Conception to US/CAN border
- DFO charter survey WCVI and north
- Remaining DAS after survey transects
  - Interleaving of two vessels
  - Inter Vessel Calibration (IVC)



Plan C: Shimada only 15 nmi spacing

Survey area & density

Point Conception to Dixon Entrance, Alaska
Transects 15-nmi apart
From 50 m depth to 35 nmi offshore

80 DAS

Shimada survey entire area = 78 DAS

+2 DAS remaining →

- Make up lost time (if any)
- Additional transects or utilize time for additional fishing

Winter Hake Cruise

Hake Winter Cruise 2017

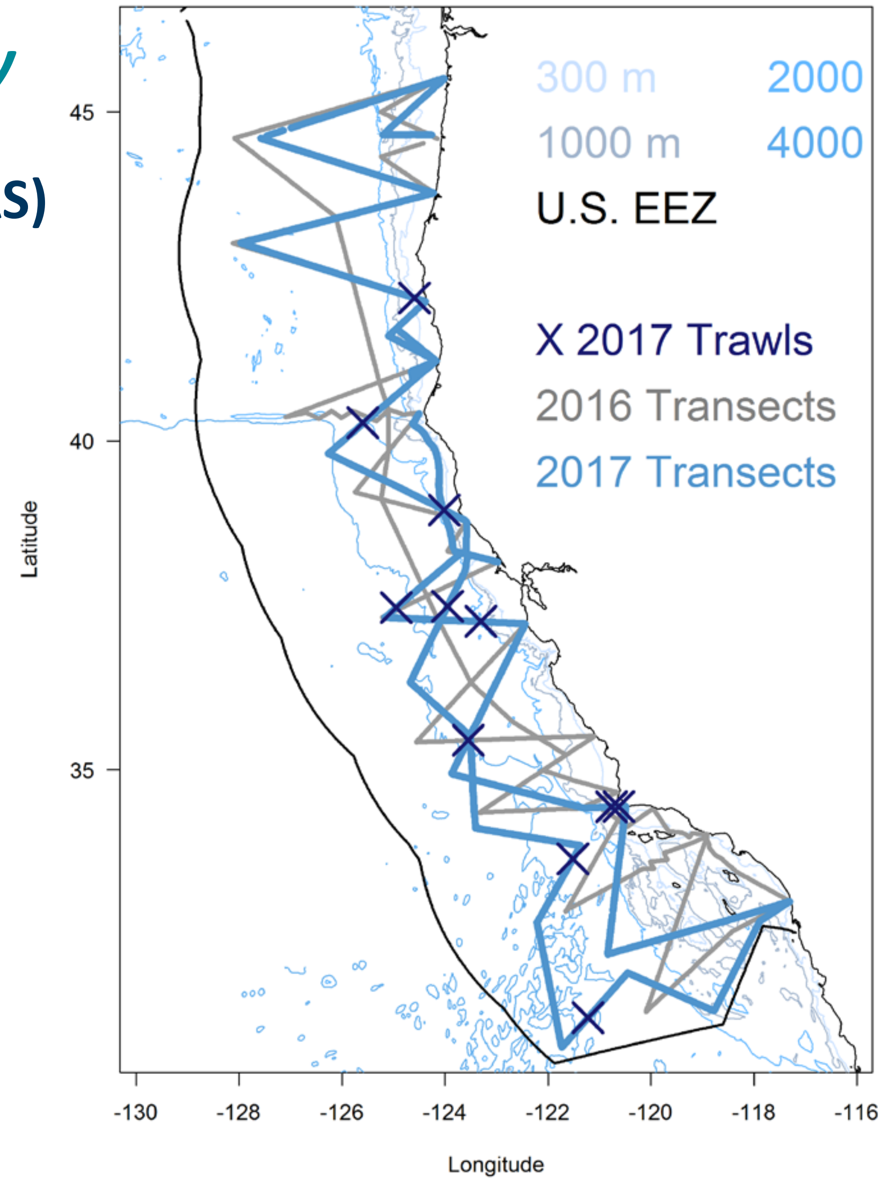
Survey feasibility & hake biology

Bell M. Shimada (Jan 9–Feb 12, 30 DAS)

- 24-hour operations (DFO on board)
- Acoustics (~3,250 nmi transects)
- Midwater trawls (11 completed)
- Full biological work-up + samples
- Zooplankton (25 stations)
- CTD & underway CTD stations
- Underway observations

Considerations

- Weather was poor (-4 DAS)
- Vessel issues (-3.4 DAS)
- Design adapted in field
- Hake harder to find…



Hake Winter Cruise 2017

Draft results

2017 general acoustic observations

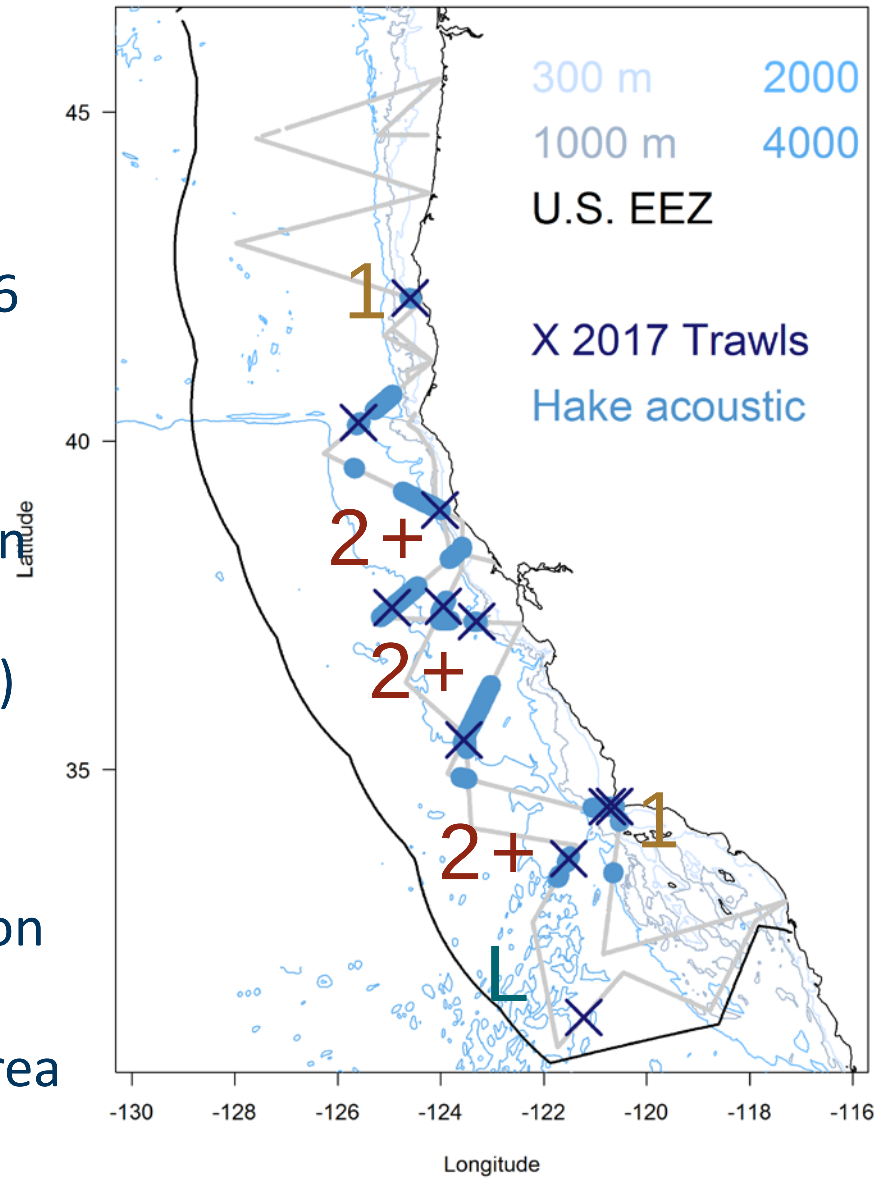
- Much less backscatter than 2016
- Much weaker backscatter than 2016
- Layers were thinner (top-bottom)

2017 trawling & locations

- Unfished, weak possible 2+ echosign north of Cape Mendocino
- Age-2+ offshore (mean 35 or 45 cm)
- Juveniles nearshore (mean 20 cm)

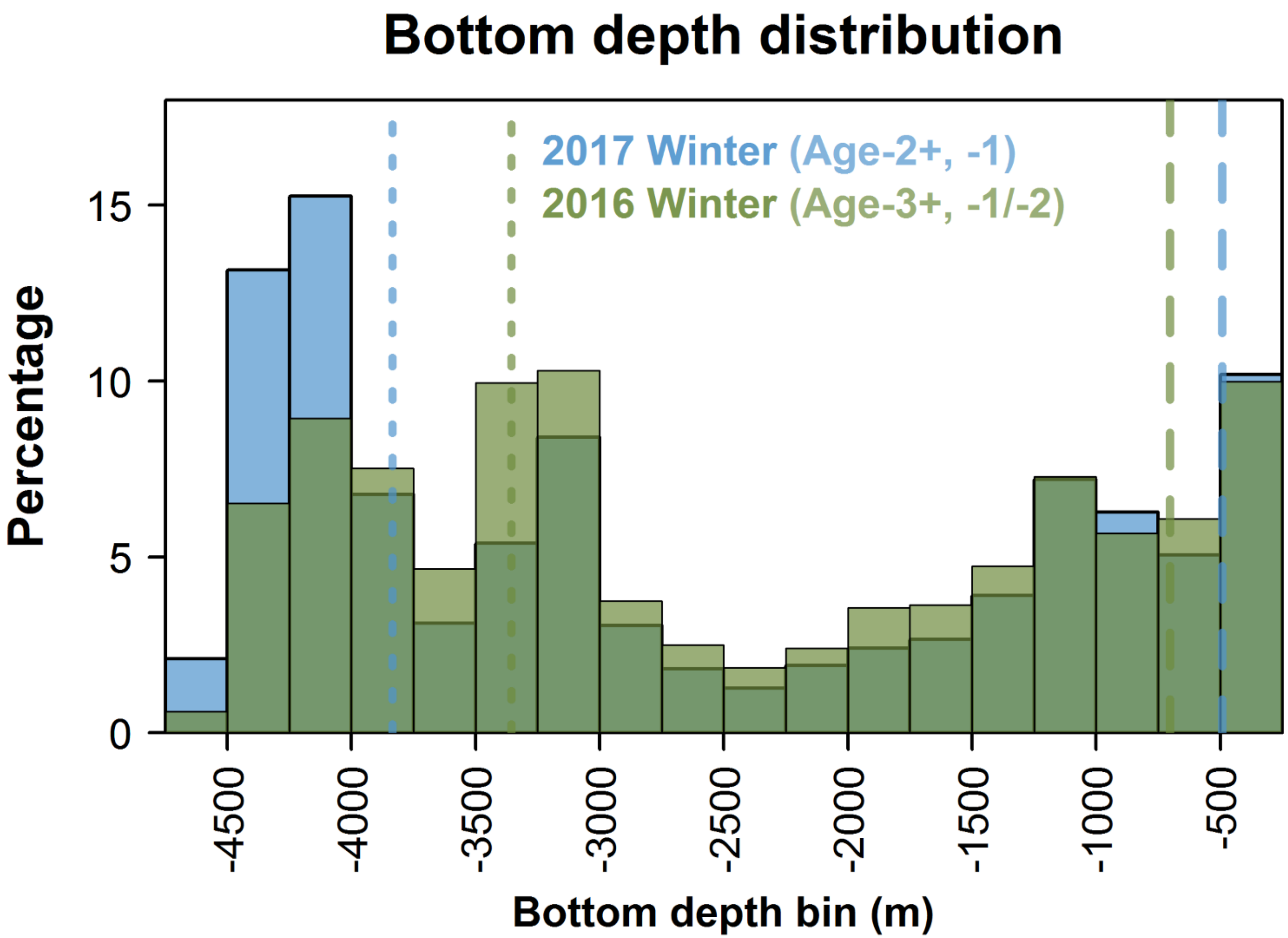
2017 biology

- Some females ripe SF to PConception
- Verified larvae (L) w 1 bongo tow
- SWFSC also found larvae in same area



Hake Winter Cruise 2017

Distribution over bottom depths



2017 Age-2+
Median: 3586 m

2016 Age-3+
Median: 3105 m

2017 Age-1
Median: 243 m

2016 Age-1/-2
Median: 452 m

n=6,470
n=7,956

Hake Winter Cruise 2017

Next steps

Synthesize Winter 2016 & 2017 findings

Historical context

Additional data (CalCOFI?) to consider

Compare Winter with Summer 2015 (2017?)

Explain distributions and biology

Maturity, hatch dates, genetics, age-0s

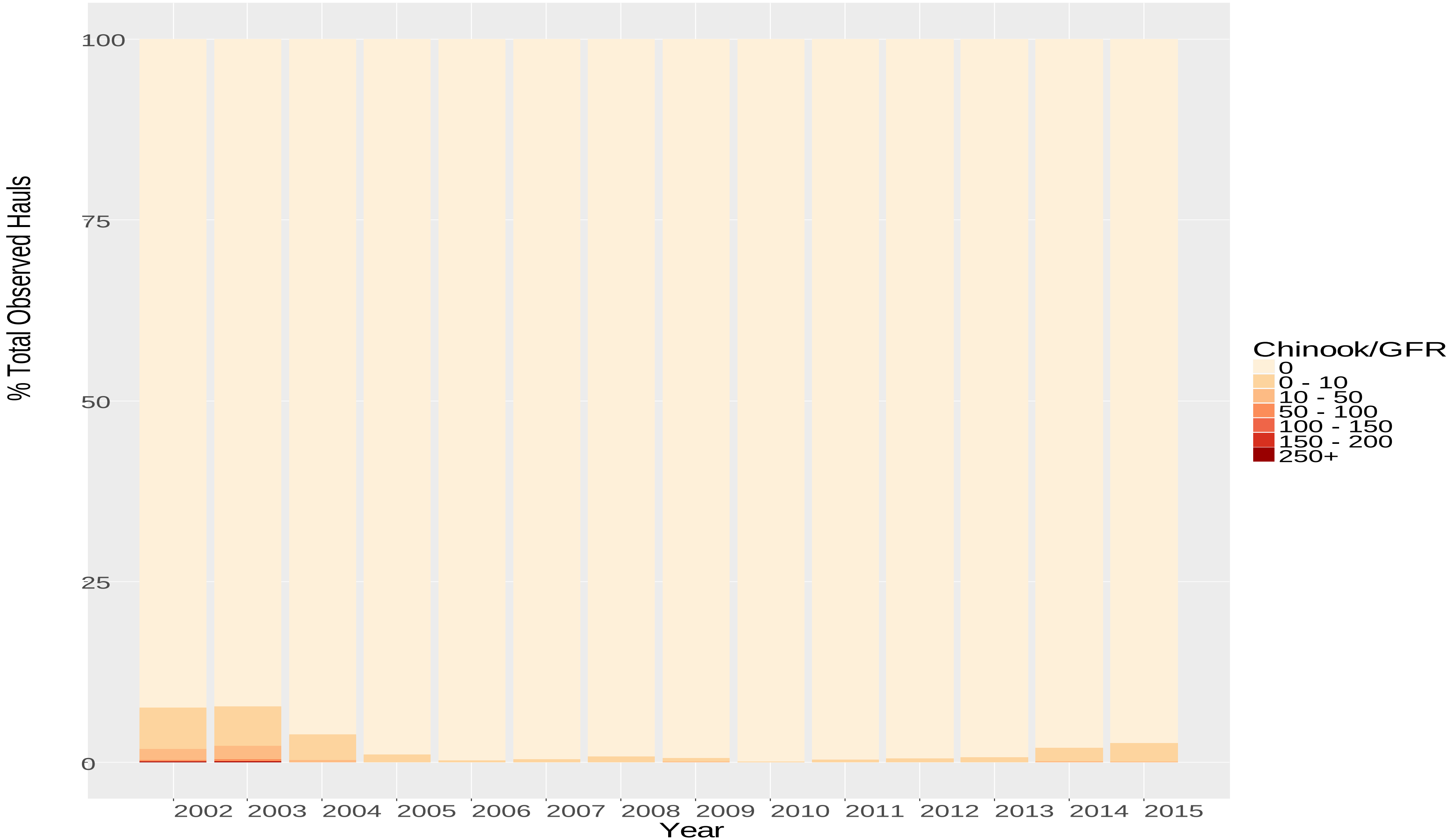
Model & management implications if:

1. Always along coast during winter?
2. Diel vertical migration?
3. Feeding, especially fish?
4. Maturities complicated?
5. Spawning complicated?

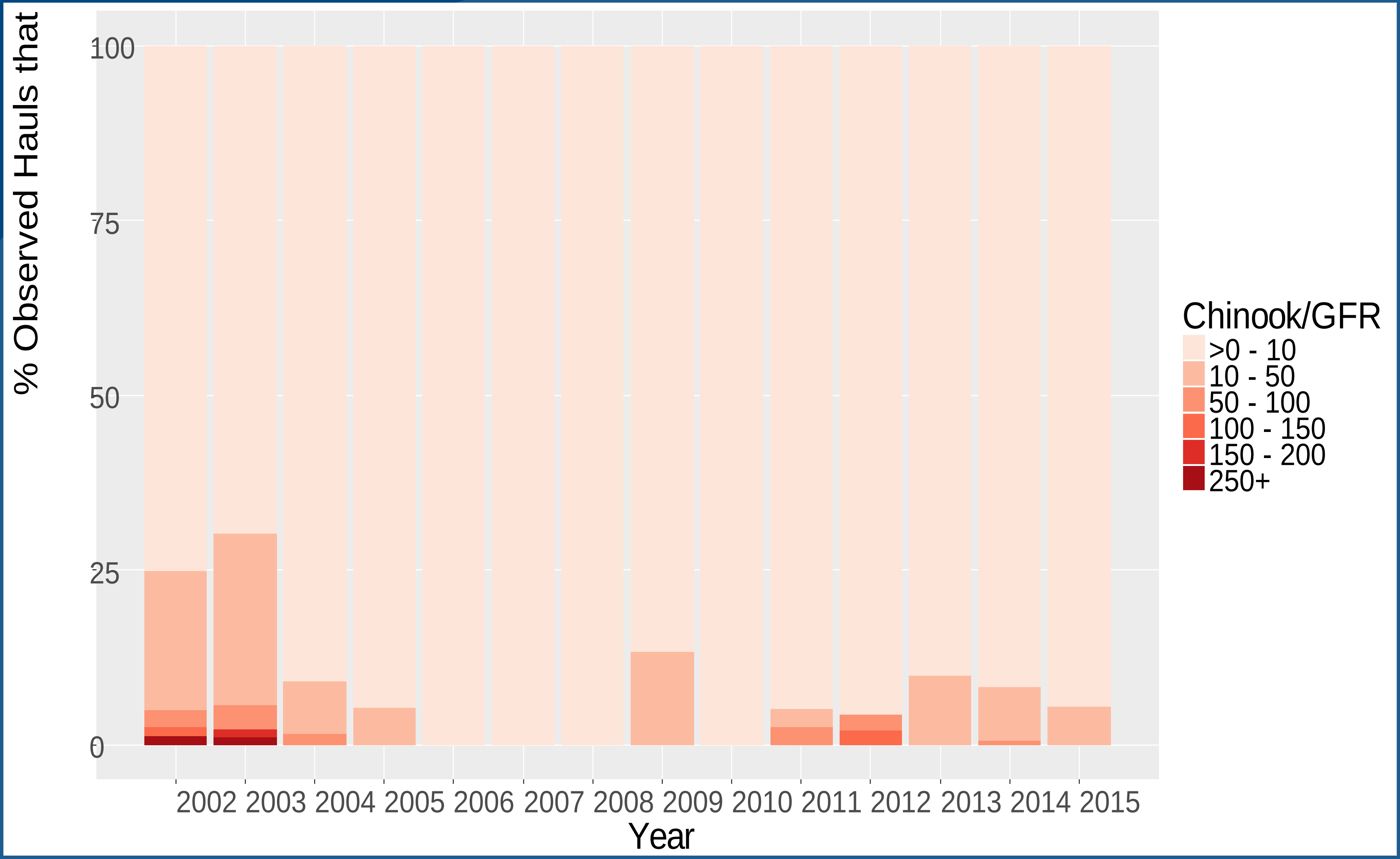
NOAA FISHERIES SERVICE

Historical Salmon Bycatch

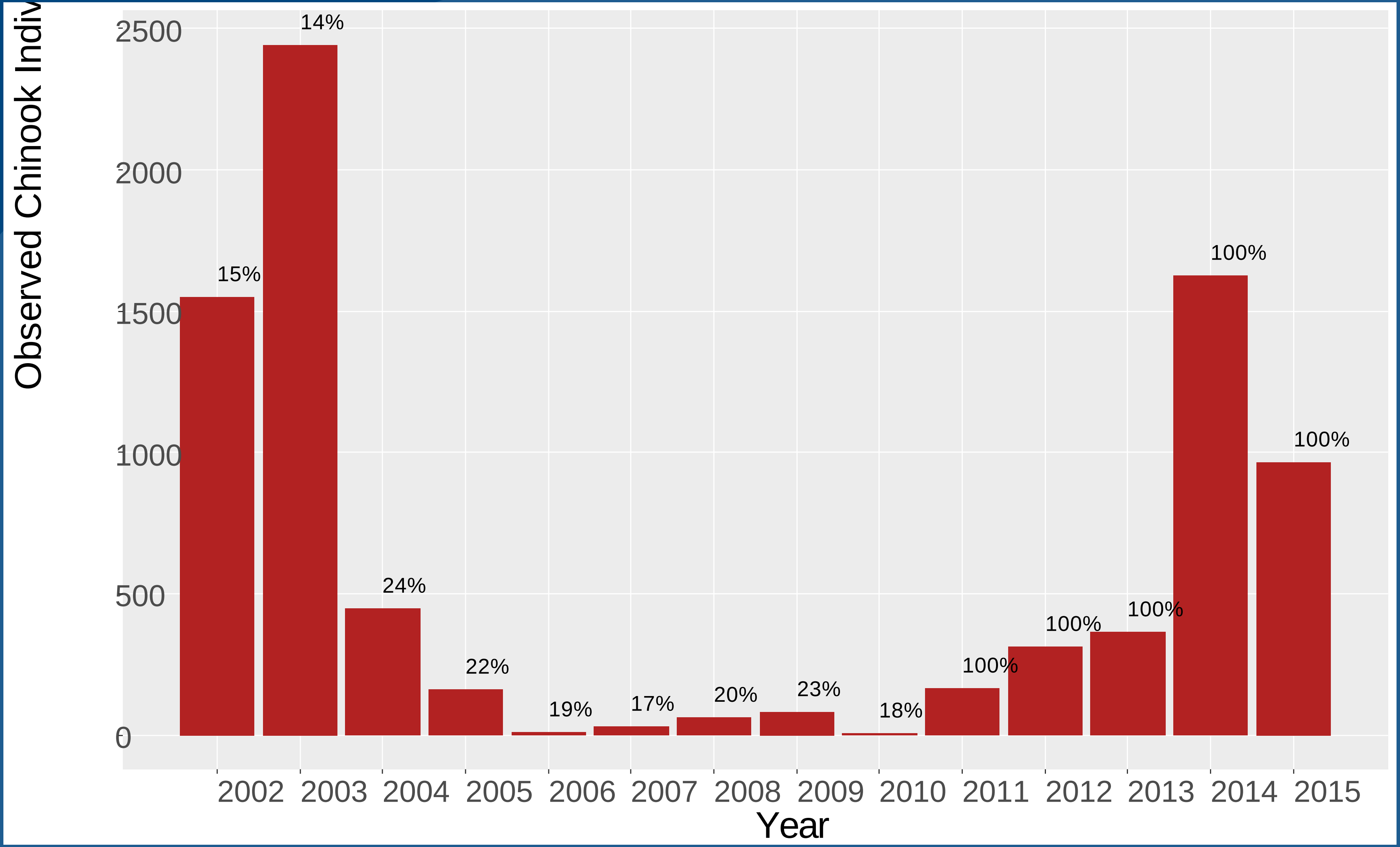
Percentage of hauls in the bottom trawl fishery with observed Chinook salmon bycatch



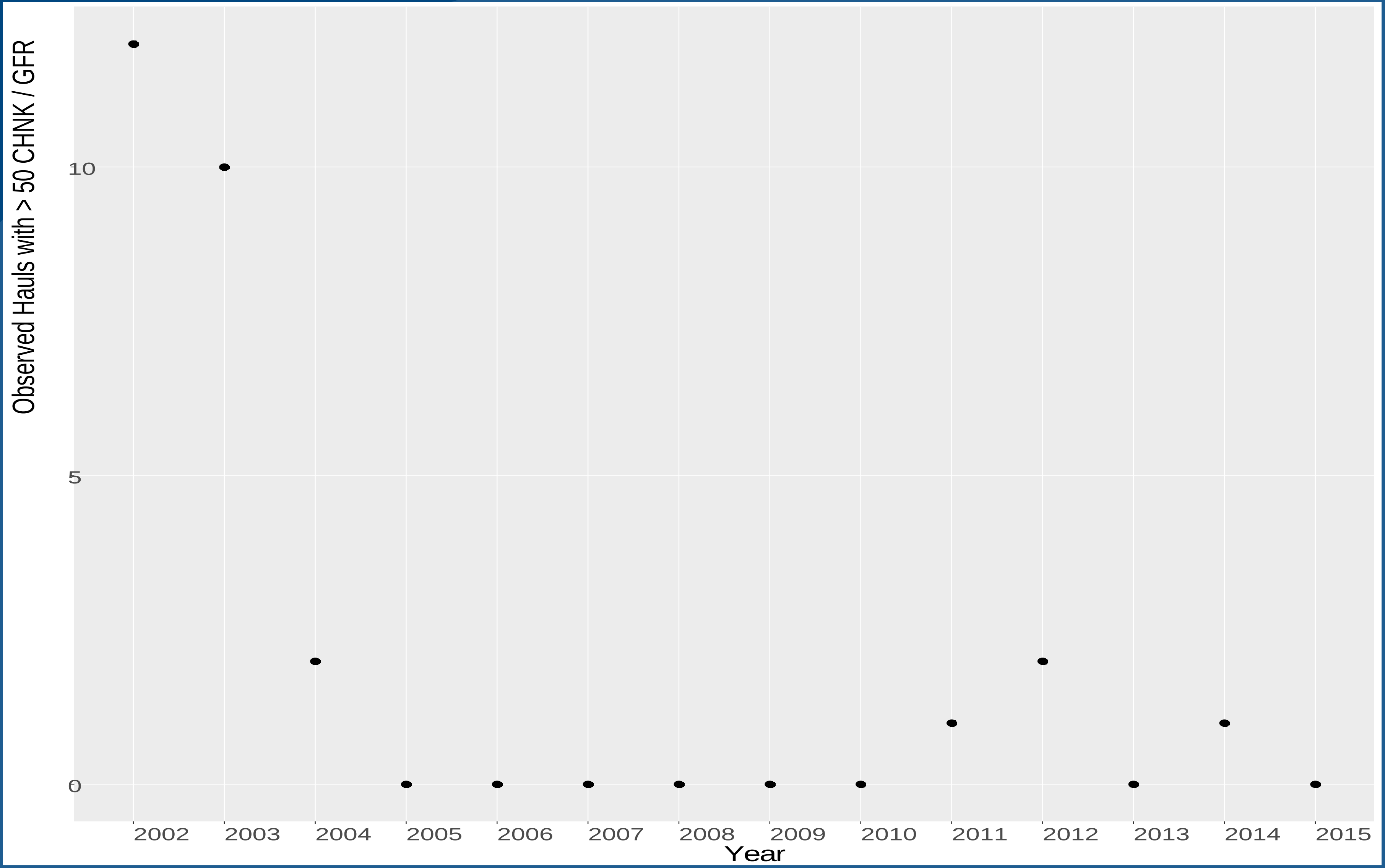
Bycatch rates for hauls that encountered Chinook



Chinook salmon observed and coverage rates



Frequency of >50 Chinook/mt groundfish



Impacts of High Bycatch Hauls on Total Estimates of Chinook Bycatch

	Fleetwide Estimate using All Hauls	Fleetwide Estimate excluding hauls with > 50 chinook per metric ton of groundfish
2002	14,534	7,033
2003	16,340	8,445
2011	175	
2012	304	
2013	323	
2014	*1082*	
2015	*1067*	

2014 & 2015 estimates are preliminary and do not include estimations of the <1% unsampled hauls in the non-EM fleet

Nearshore Depth Bins

Nearshore Fishery Additional Depth Bin and Mortality Rates

- WCGOP will incorporate the additional 20-30 fathom depth bin and associated mortality rates as requested by council in the 2016 Groundfish Mortality Report.

- Due to confidentiality the entire calculations of the deeper depth bins may not be able to be published. In those cases, the mortality rates will be applied by depth bin as requested and summed up to the level that meets confidentiality requirements.

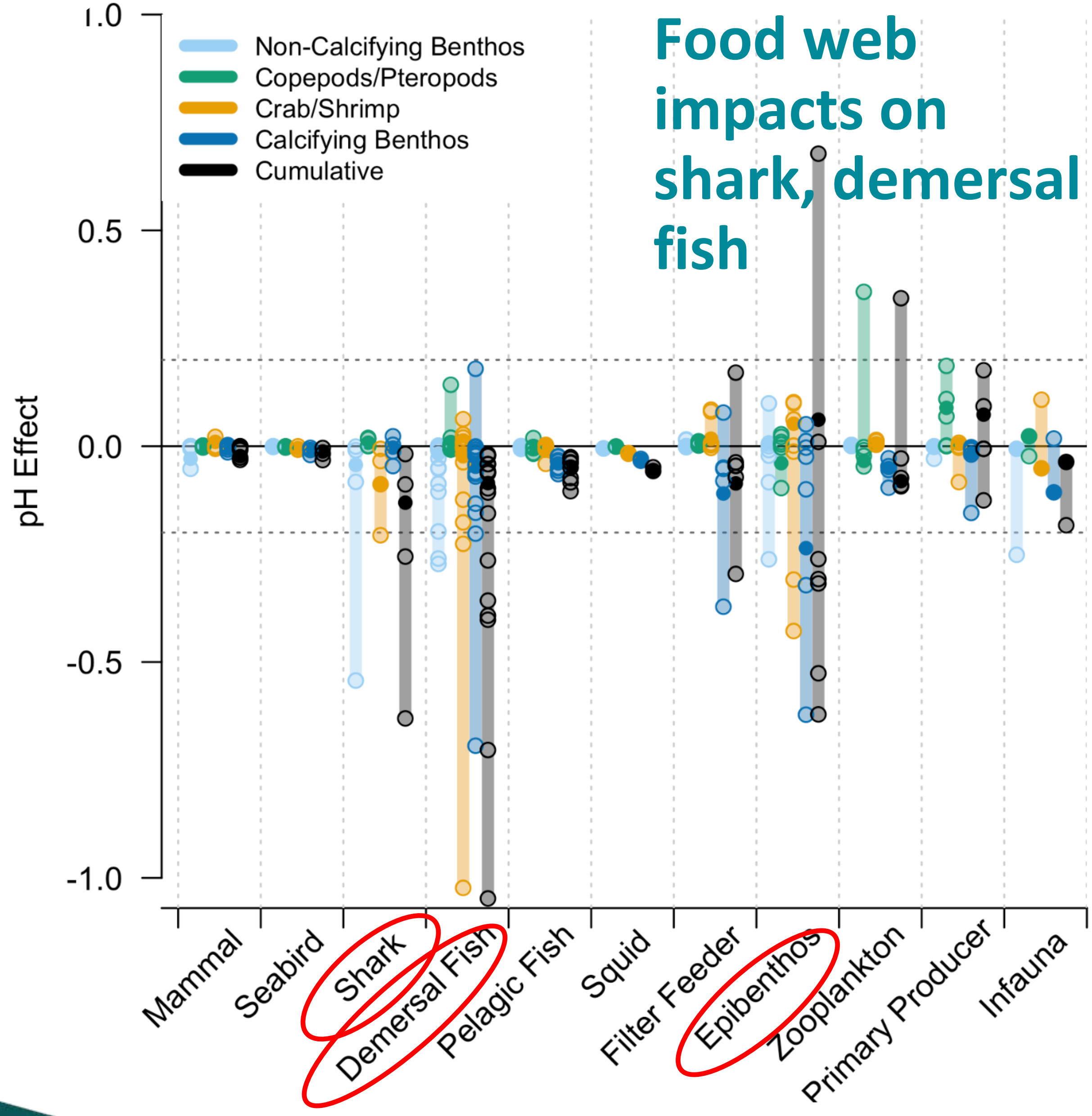
Science Updates: Recent Publications

Tradeoffs between business-as-usual global change versus groundfish and crab fisheries

Marshall, Kristin N., Isaac C. Kaplan, Emma E. Hodgson, Albert Hermann, D. Shallin Busch, Paul McElhany, Timothy E. Essington, Chris J. Harvey, and Elizabeth A. Fulton. "Risks of ocean acidification in the California Current food web and fisheries: ecosystem model projections." *Global Change Biology* (2017).

Biomass responses of guilds to prey group sensitivity to pH

2060s relative to 2010s



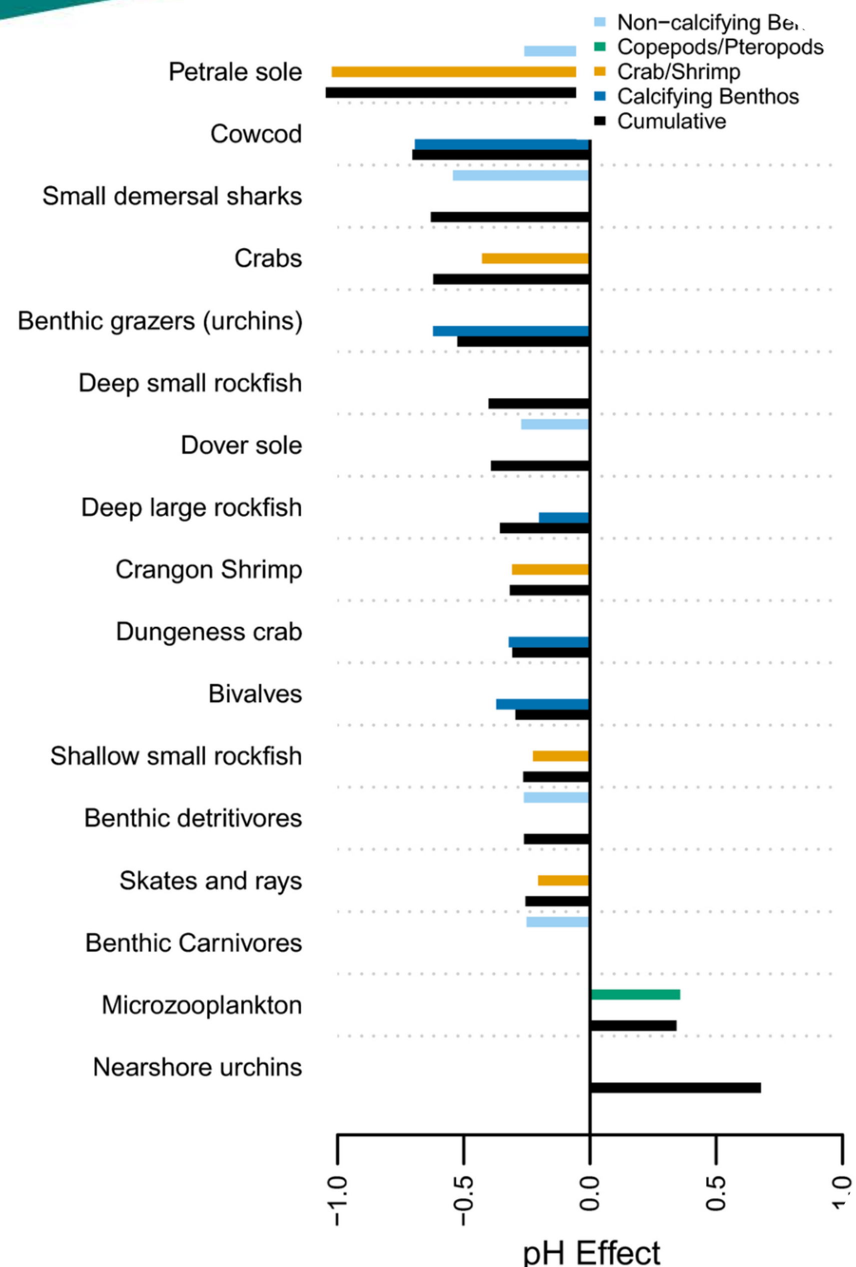
Food web impacts on shark, demersal fish

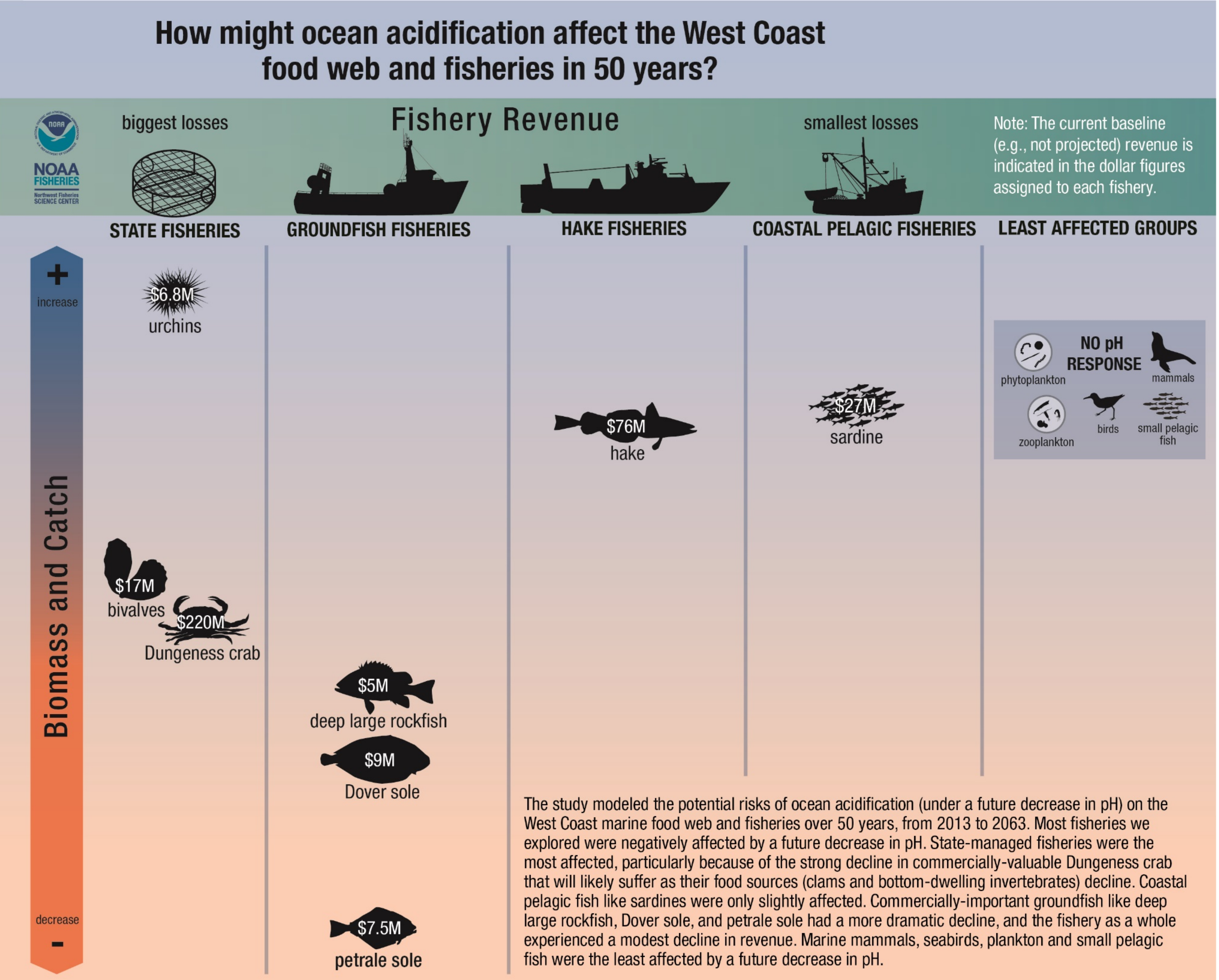
K.N. Marshall et al. (2017) Global Change Biology

NOAA FISHERIES SERVICE

Biomass responses to ocean acidification

2060s relative to 2010s





Graphic: Su Kim, Vicky Krikelkas

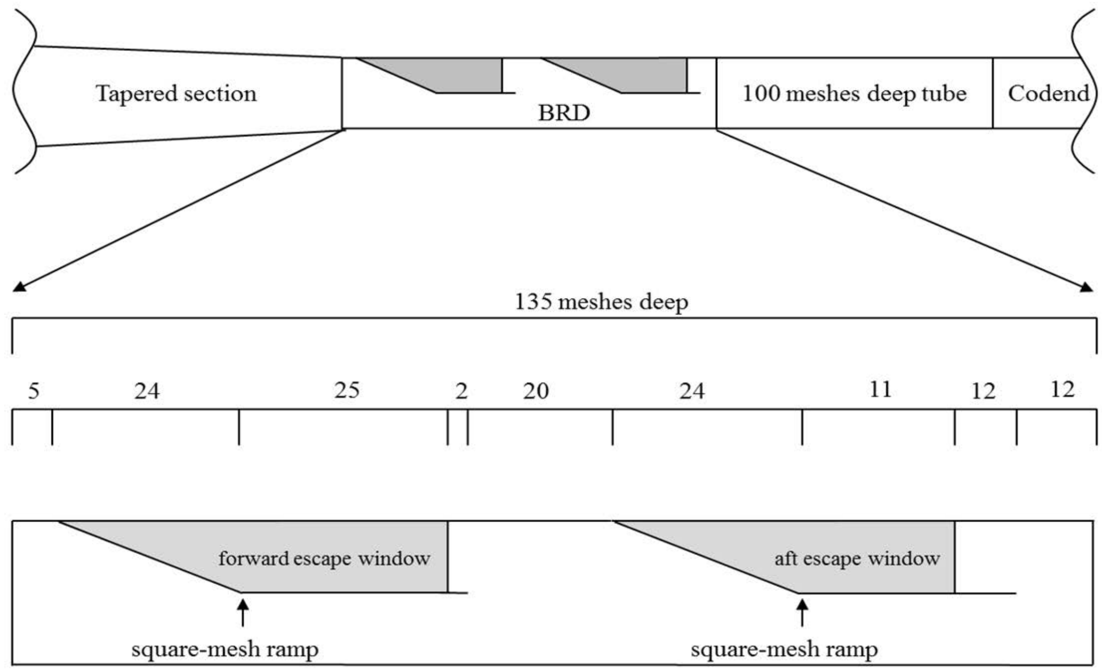
NOAA
FISHERIES
SERVICE

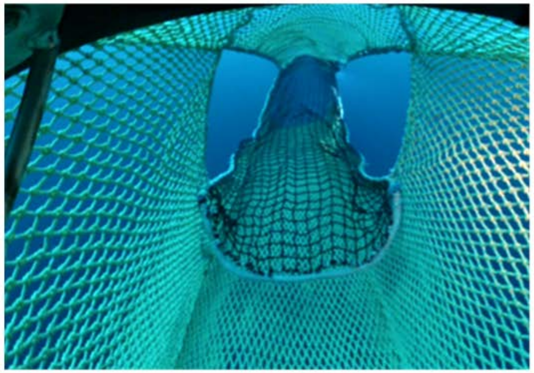
Use of Artificial Light to Reduce Chinook Salmon Catches in the Pacific Hake Fishery

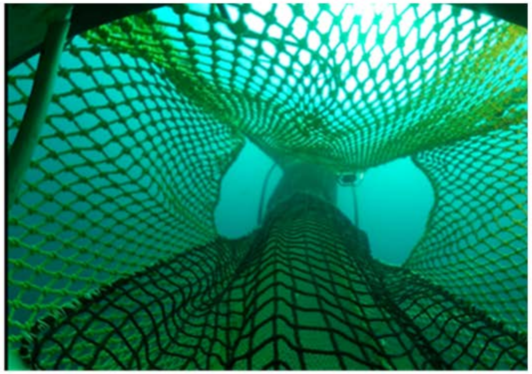
Lomeli, M.J.M., and W.W. Wakefield. 2016. Artificial light: Its influence on Chinook salmon escapement out a bycatch reduction device in a Pacific hake midwater trawl. Pacific States Marine Fisheries Commission Report, 16 pp.

http://www.psmfc.org/bycatch/publications.html

Open Escape Window BRD







NOAA FISHERIES SERVICE

2016 Findings

Overall:

- 437 Chinook salmon encountered with 298 individuals escaping out the BRD (mean escapement rate = 68.2 %)

At trawl depths (in the absence of ambient light):

- 266 escapes with 230 individuals (86.4%) exiting out an illuminated window
- P-value = <0.00001

At haulback (under ambient light):

- 32 escapes noted with 12 fish exiting out an illuminated window
- P-value = 0.2153; an anticipated result

Project report available:

- Lomeli, M.J.M., and W.W. Wakefield. 2016. Artificial light: Its influence on Chinook salmon escapement out a bycatch reduction device in a Pacific hake midwater trawl. Pacific States Marine Fisheries Commission Report, 16 pp.
- http://www.psmfc.org/bycatch/publications.html

NOAA FISHERIES SERVICE

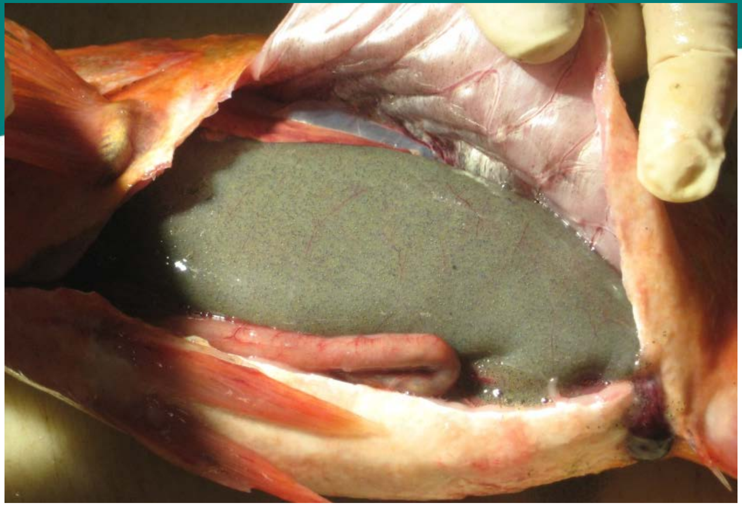
Upcoming Research – May 2017

PSMFC, NWFSC-MH&E group, and F/V *Miss Sue* seek to determine the effect that artificial light has on the *overall* escapement of Chinook salmon out a BRD

Using a recapture net, we will compare Chinook salmon escapement rates between tows conducted with and without the use of artificial light

Findings are anticipated to show that artificial light can be used as a technique to enhance Chinook salmon escapement overall

NOAA
FISHERIES
SERVICE



A meta-analysis of fecundity in rockfishes (genus *Sebastes*)

E.J. Dick[1], Sabrina Beyer[2], Marc Mangel[3], Stephen Ralston[1]

[1] Fisheries Ecology Division, Southwest Fisheries Science Center;
[2] University of California, Santa Cruz, Cooperative Institute for Marine Ecosystems and Climate,
[3] University of California, Santa Cruz, Center for Stock Assessment Research

Fisheries Research (2017) 187: 73-85

NOAA
FISHERIES
SERVICE

- Used a Bayesian model and a compilation of previously published fecundity data to estimate fecundity-length relationships for 29 species of rockfish.
- Results confirm that weight-specific fecundity increases with size, provides parameter estimates for use in all rockfish assessments
- Terms of reference for groundfish stock assessments have been revised to recommend use of these results

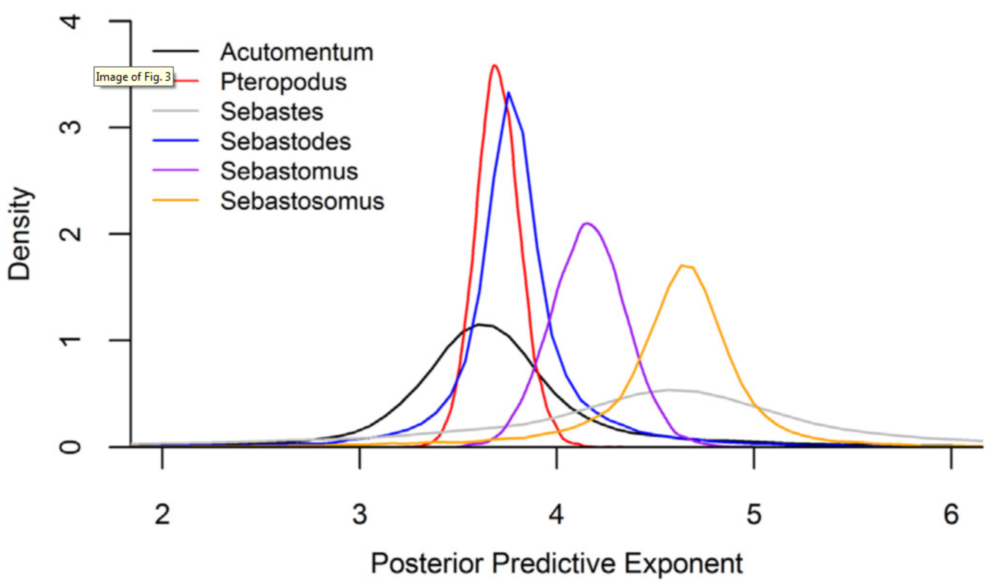


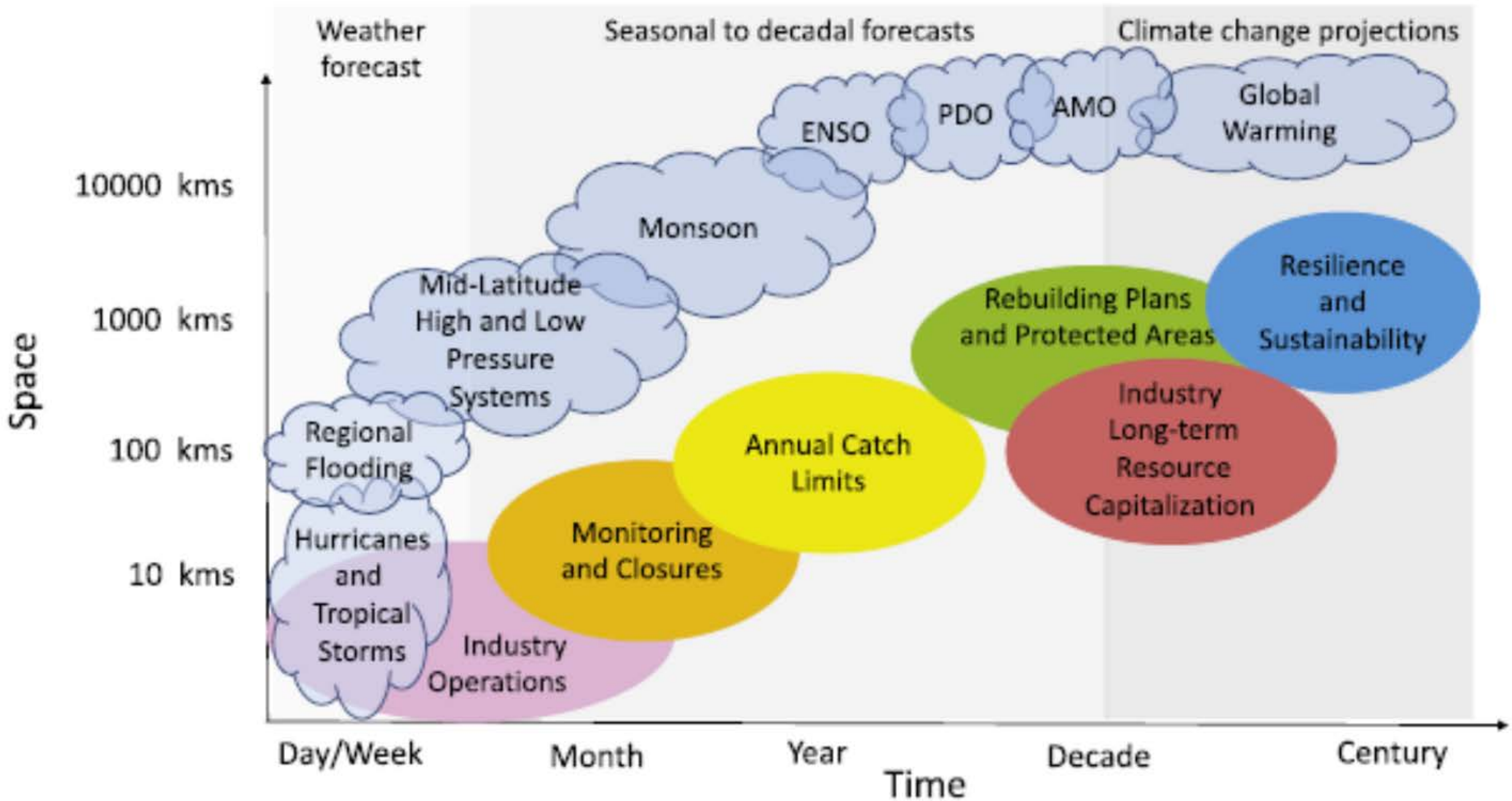
Fig. 3. Posterior predictive distributions of the subgenus-level exponent in the 3-level hierarchical model for fecundity at length (Model 3a).

Managing living marine resources in a dynamic environment: The role of seasonal to decadal climate forecasts

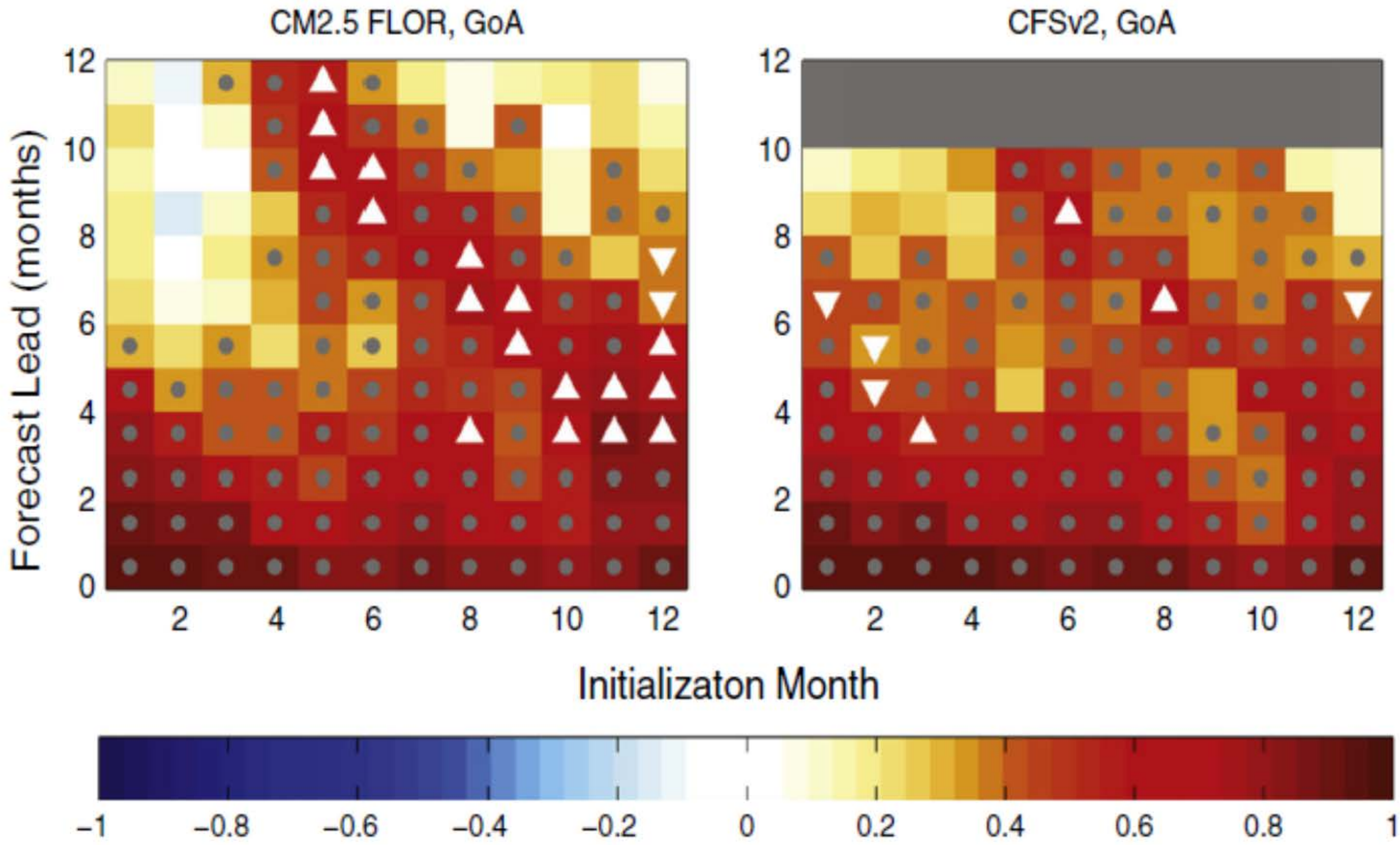
Desiree Tommasi a,⇑, Charles A. Stock b, Alistair J. Hobday c, Rick Methot d, Isaac C. Kaplan e, J. Paige Eveson c, Kirstin Holsman f, Timothy J. Miller g, Sarah Gaichas g, Marion Gehlen h, Andrew Pershing i, Gabriel A. Vecchi b, Rym Msadek j, Tom Delworth b, C. Mark Eakin k, Melissa A. Haltuch d, Roland Séférian l, Claire M. Spillmanm, Jason R. Hartog c, Samantha Siedlecki n, Jameal F. Samhouri e, Barbara Muhling a, Rebecca G. Asch a, Malin L. Pinsky o, Vincent S. Saba p, Sarah B. Kapnick b, Carlos F. Gaitan b,1, Ryan R. Rykaczewski q, Michael A. Alexander r, Yan Xue s, Kathleen V. Pegion t, Patrick Lynch u, Mark R. Payne v, Trond Kristiansen w, Patrick Lehodey x, Francisco E. Werner y

Progress in Oceanography 152 (2017): 15-49

Temporal and spatial scales of fisheries decisions and atmospheric weather phenomena



Anomaly correlation coefficients as a function of forecast initialization month and lead-time



Recommended Practices

1. Identify management need
2. Understand mechanistic relationships
3. Develop skillful physical climate variable forecasts
4. Determine value of using physical climate forecast in LMR model
5. Periodically re-evaluate environment-LMR relationships
6. Assess the uncertainty of both climate predictions and LMR models
7. Develop effective methods for delivering forecasts
8. Demonstrate value of integrating climate predictions into LMR decision making

The performance and trade-offs of alternative harvest control rules to meet management goals for U.S. west coast flatfish stocks

Chantel Wetzel[1], André E. Punt[2]

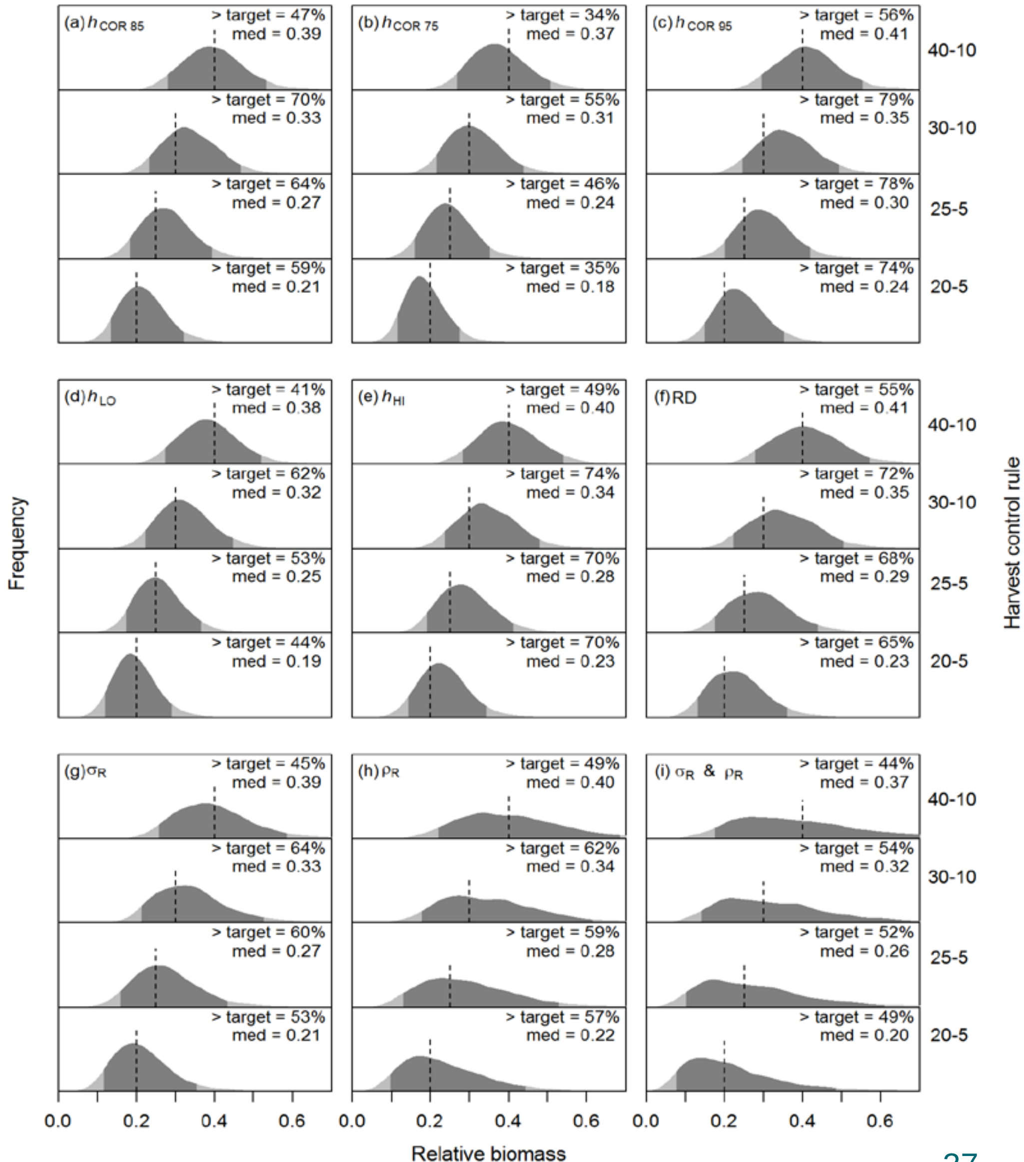
[1]Fishery Resource Analysis and Monitoring Division, Northwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 2725 Montlake Blvd. East, Seattle, WA 98112, USA

[2]School of Aquatic and Fishery Sciences, University of Washington, Box 355020, Seattle, WA 98195-5020, USA

Fisheries Research. 187: 139-149

There are trade-offs between catch and maintaining the stock near targets based on harvest strategy and biology

- Evaluated the current harvest control rule for West Coast flatfish stocks through MSE
- The current HCR (25-5) performs well at maintaining stocks at or near the target over a range of steepness values (0.75 – 0.95)
- Increased recruitment deviation and the presence of auto-correlation in recruitment can result in a lower probability of being with 10% of the target biomass.



Questions?