Science, Service, Stewardship

Agenda Item F.1.b
Supplemental NWFSC PPT
November 2016

Groundfish Science Report

Michelle McClure and Mark Strom
Northwest Fisheries Science Center

November 17, 2016

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NWFSC NORTHWEST FISHERIES SCIENCE CENTER

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Overview

- Discard (observer) data delivery and improvements
- Survey updates
  - Hook and Line
  - Bottom trawl
- 2016 Winter Hake
- EFH Conservation Values
- Science Updates

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WCGOP Discard Data Delivery

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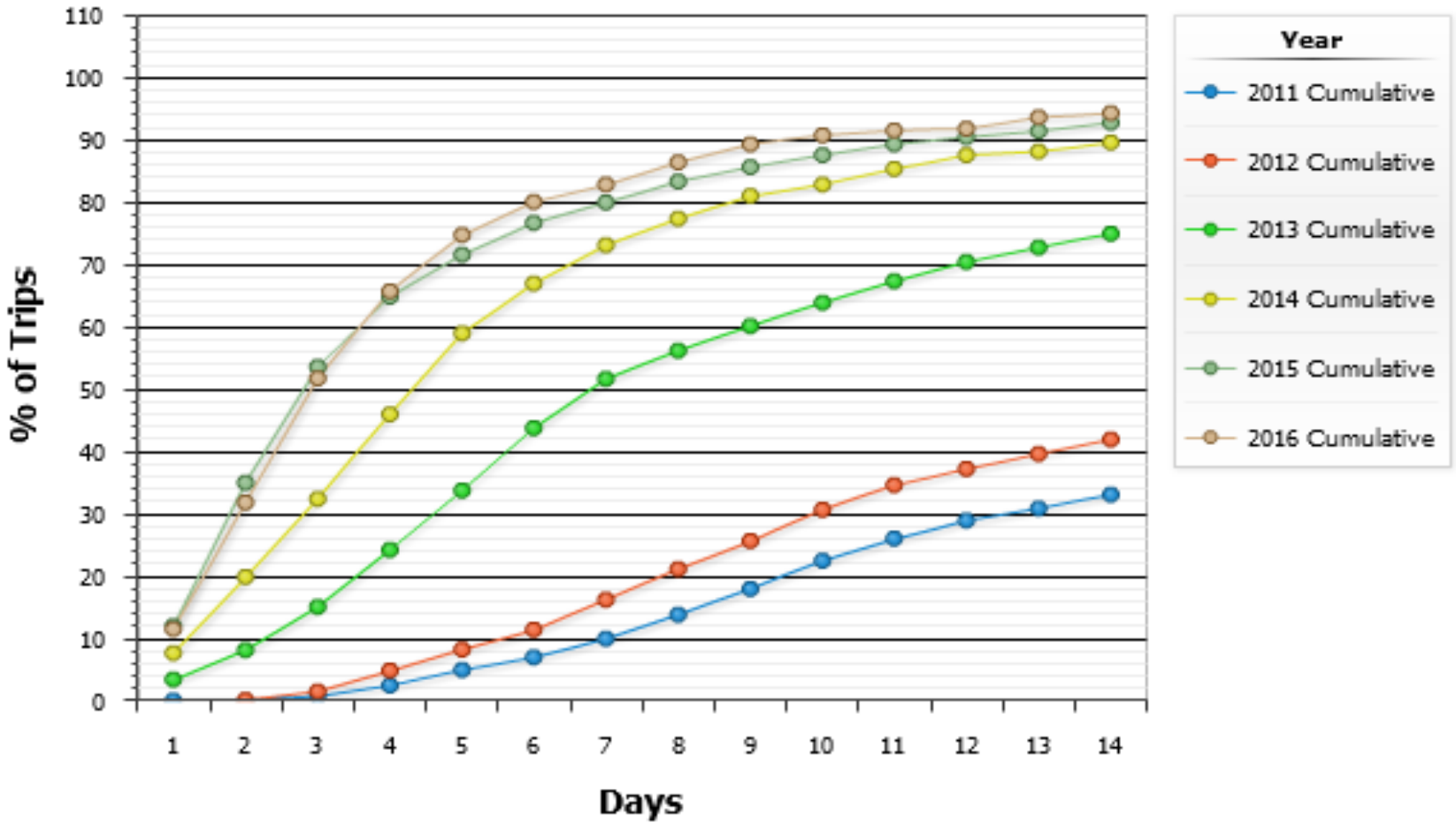
Observer Discard Data Finalization in the Catch Share Fishery



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Continued improvements

- In-season salmon reporting system implemented in 2016 for all Catch Share sectors.
- OPTECS: Development continues on a paperless electronic data collection system to further reduce transcription and data errors.
- Electronic Monitoring and EFPs: WCGOP continues to work closely with the WCR and PSMFC on EM testing and implementation efforts, and additional data collections to inform EFPs.
- WCGOP implemented protocols to characterize the use of Bycatch Reduction Devices in the trawl fishery and streamer use on longline vessels.

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Survey Updates

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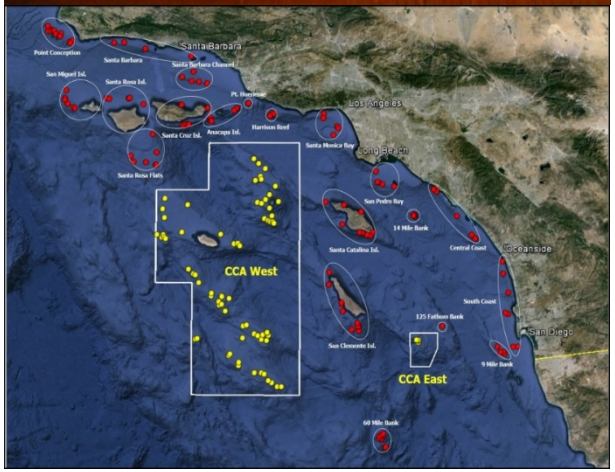
2016 Southern CA Shelf Rockfish Hook and Line Survey

13th year in survey time series

Sept. 19 – Oct. 6, 2016

- Vessels: F/V Aggressor, F/V Mirage, and F/V Toronado
- ~80 sites in Cowcod Conservation Area (CCA) (yellow dots) and 121 original sites (red dots)
- Expanded camera sled operations for habitat classification)
- New this year! eDNA!



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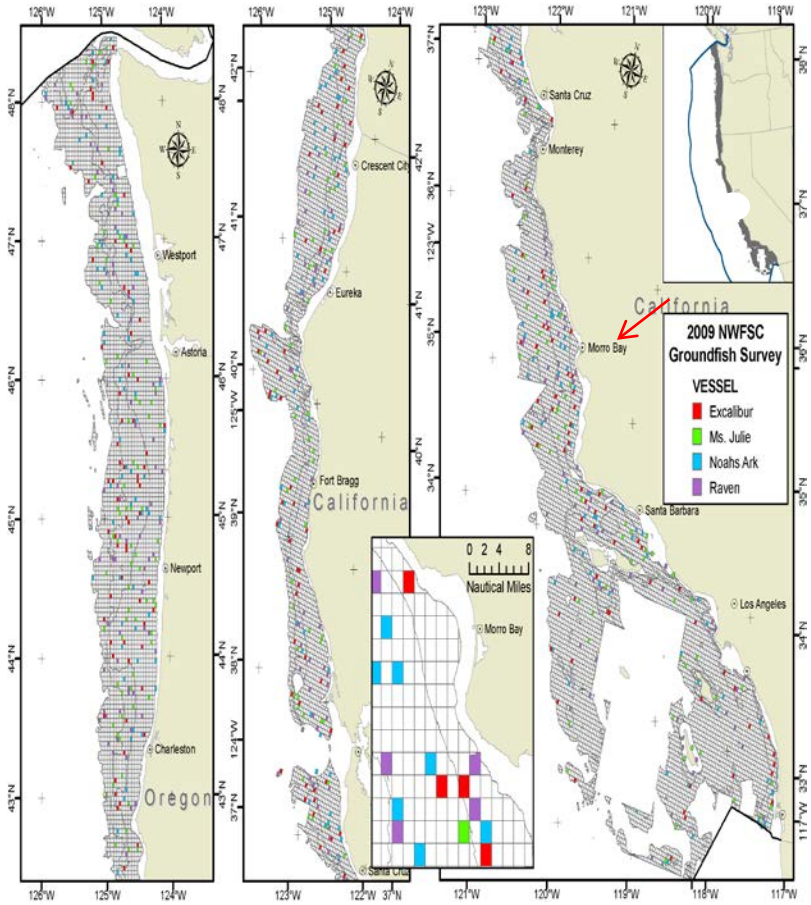
2016 Groundfish Bottom Trawl Survey

Notable Catch

- Return of abundant pelagic red crab
- Relatively abundant small sablefish
- Abundant age-0 hake during pass 2

Improvements

- New backdeck software
  - Real-time catch validations to accelerate data QA/QC process
  - Error reduction



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Hake Winter Survey

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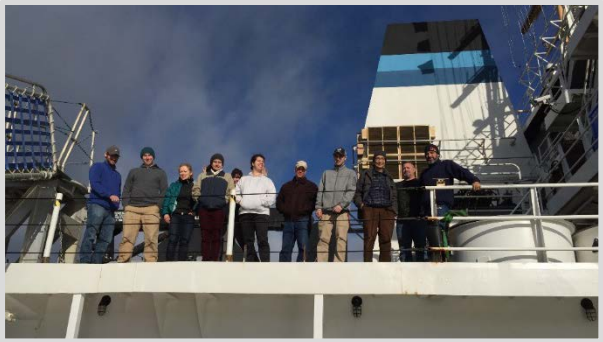
Hake Winter Survey 2016

The science (and science parties!)

The objectives of the 2016 survey were to characterize:

- Distribution of adult hake
- Hake aggregations
- Hake within aggregations

to evaluate feasibility/design of potential future winter biomass survey and update understanding of CCE during winter



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Hake Winter Survey 2016

The science

Bell M. Shimada (Jan-Feb, 30 DAS)

Acoustics

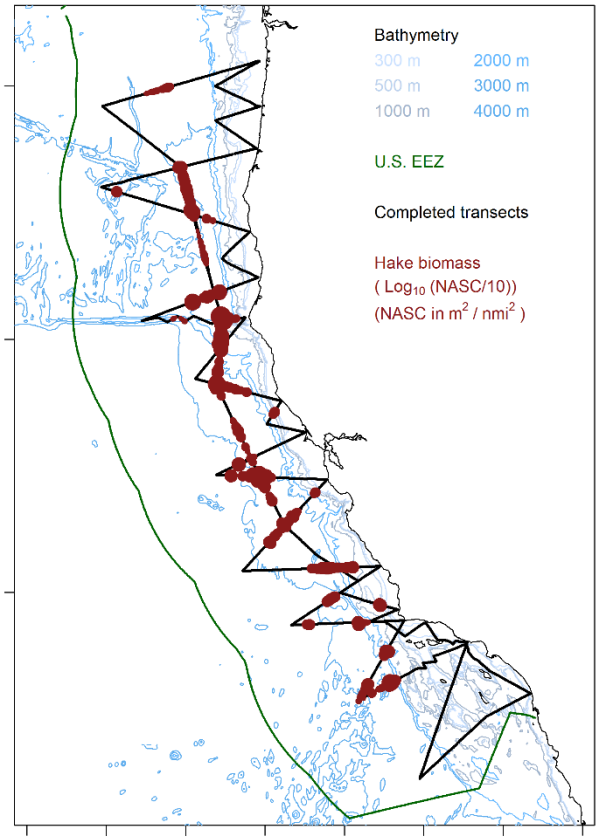
Midwater trawls

Biological samples (genetics, ovaries)

Zooplankton & CTD stations

HABs sampling

Underway observations



Key adult hake findings

Spread along coast

Maturing but not spawning

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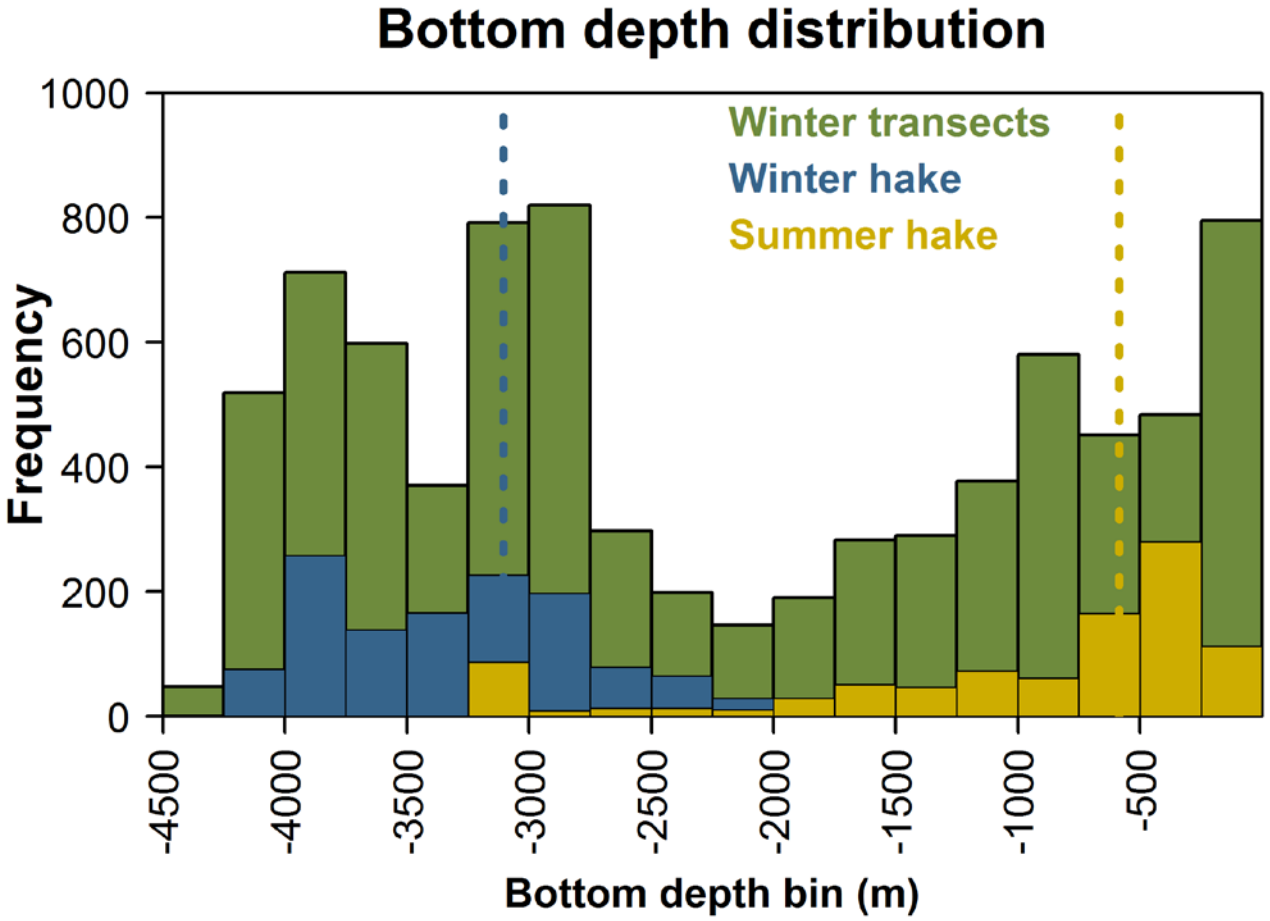
Hake Winter Survey 2016

Hake are offshore over deep water



Adults

2016 Winter

> 2,000 m

2015 Summer

< 2,000 m

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Hake Winter Survey 2017

Survey feasibility & hake biology

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

24-hour operations

Acoustics

Midwater trawls

Full biological work-up + samples

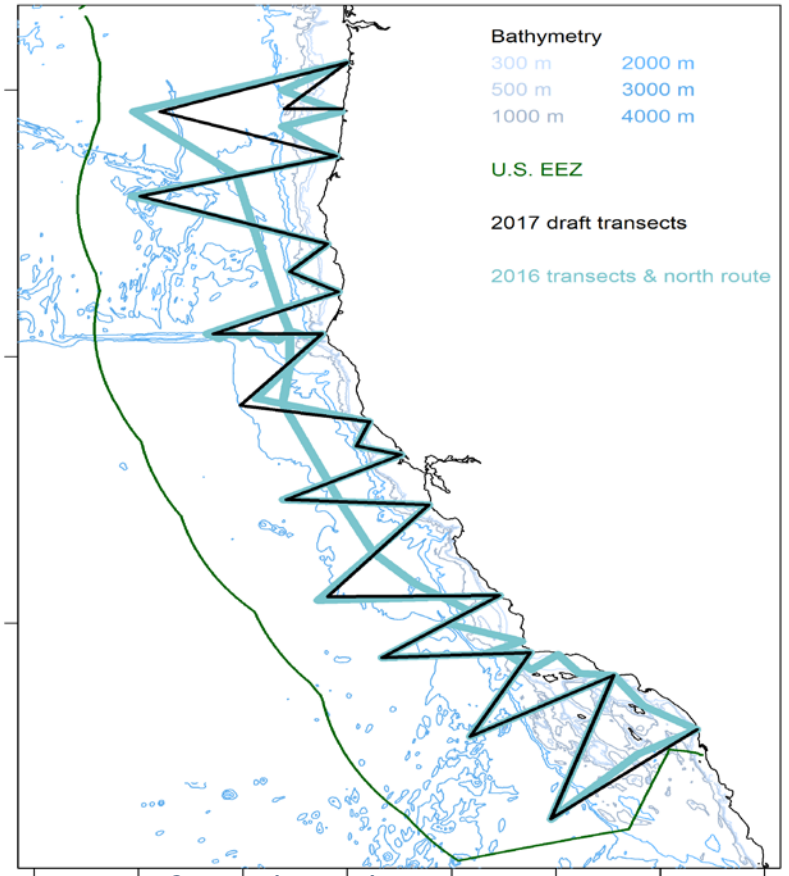
Zooplankton

CTD & underway CTD stations

Underway observations

Key considerations

2016 El Niño > 2017 Neutral or La Niña,
so compare 2016 to 2017



Questions? Sandy.Parker-Stetter@noaa.gov

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Essential Fish Habitat –

Conservation Value Analysis

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Conservation Value

Goal – summarize benefits of habitat conservation to groundfish and structure forming invertebrates

8 Datasets

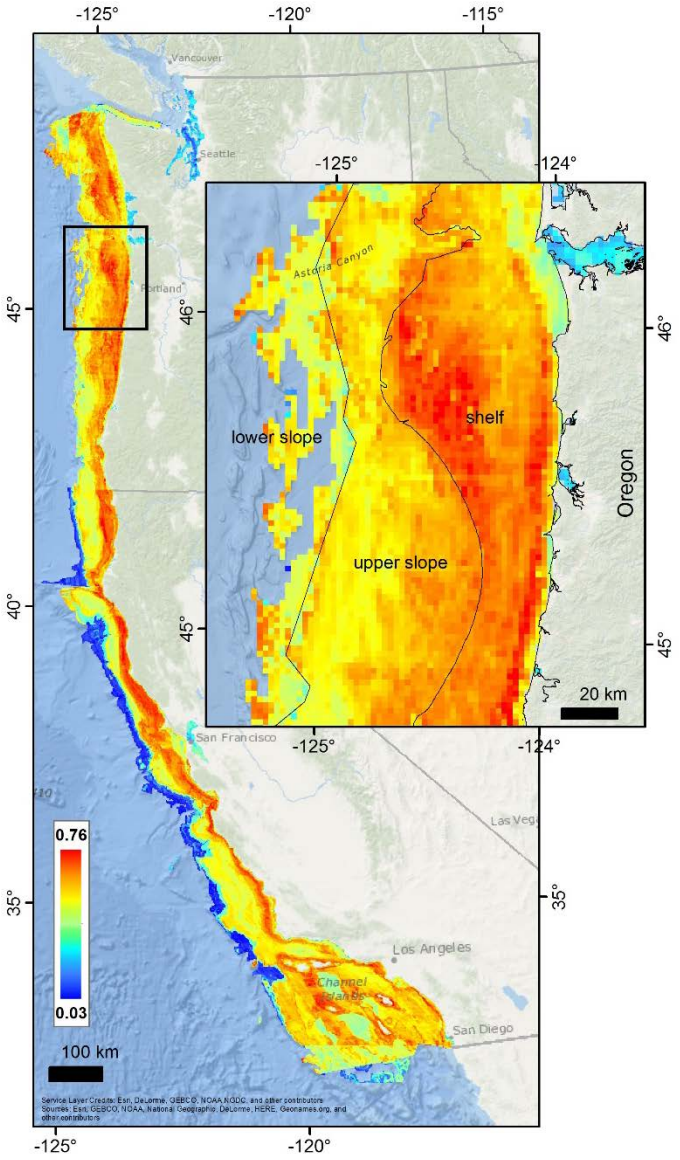
- 4 for fish diversity and biomass
- 2 for habitat-forming invertebrates
- Fishing activity
- Non-fishing activities

Normalized score for each dataset (0-1)

Conservation Value = Avg of normalized scores

2 x 2 km grid cell resolution

Appendix C in Project Team Report (Agenda F.4.a)



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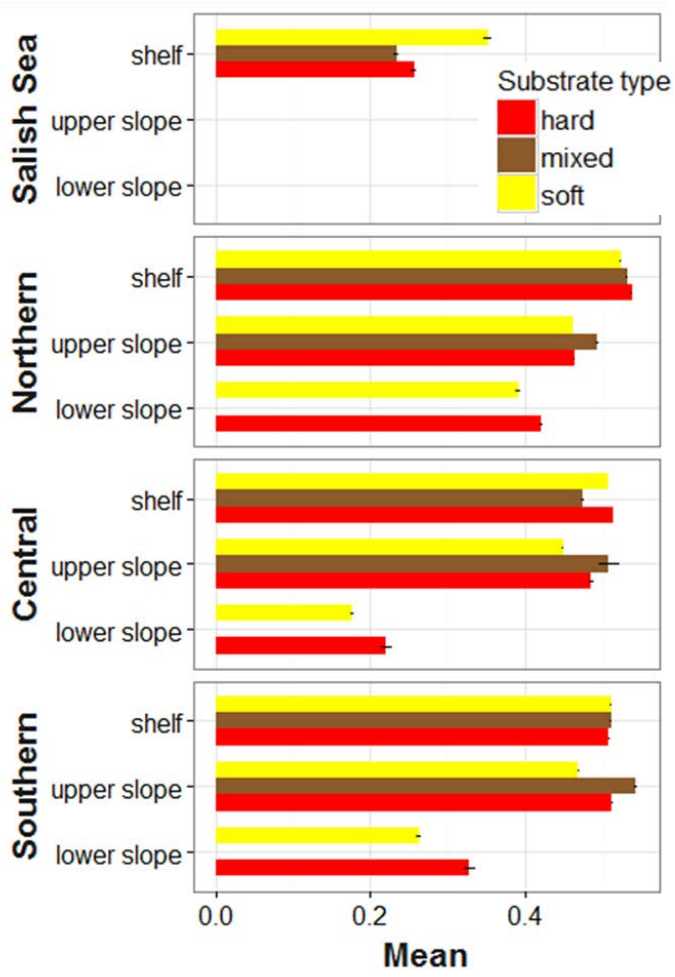
Conservation Value

- Strong spatial variation, mostly with respect to bathymetry
- Variation among proposed polygons in EFH alternatives
- Alternative- and polygon-specific conservation values in report appendices (and EFH visualization tool)



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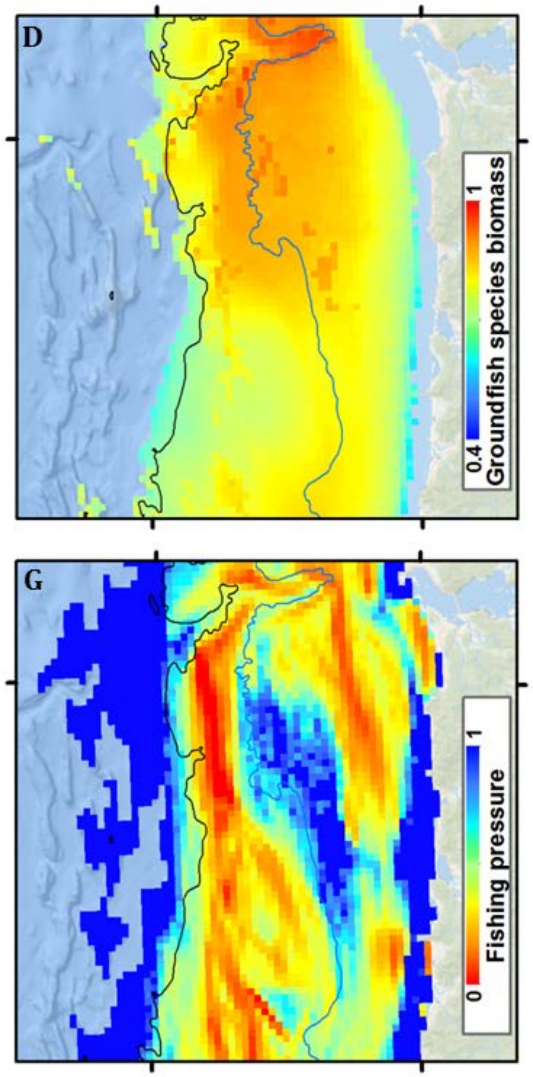
Conservation Value

Will be integrated with data on socioeconomic costs

—Comparison of two metrics within calculation suggest areas where benefits and costs are complementary and other areas where there will be tradeoffs



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Science Updates: Recent (and a few not-so-recent) Publications

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Action Plan for Fish Release Mortality Science

Benaka, L. R., L. Sharpe, K. Abrams, M. Campbell, J. Cope, F. Darby, E.J. Dick, J. Hyde, B. Linton, C. Lunsford, D. Rioux, and Y. Swimmer. 2016. Action Plan for Fish Release Mortality Science. U.S. Dept. of Commer., NOAA, 34 p.

http://www.st.nmfs.noaa.gov/ecosystems/bycatch/discard-and-release-mortality

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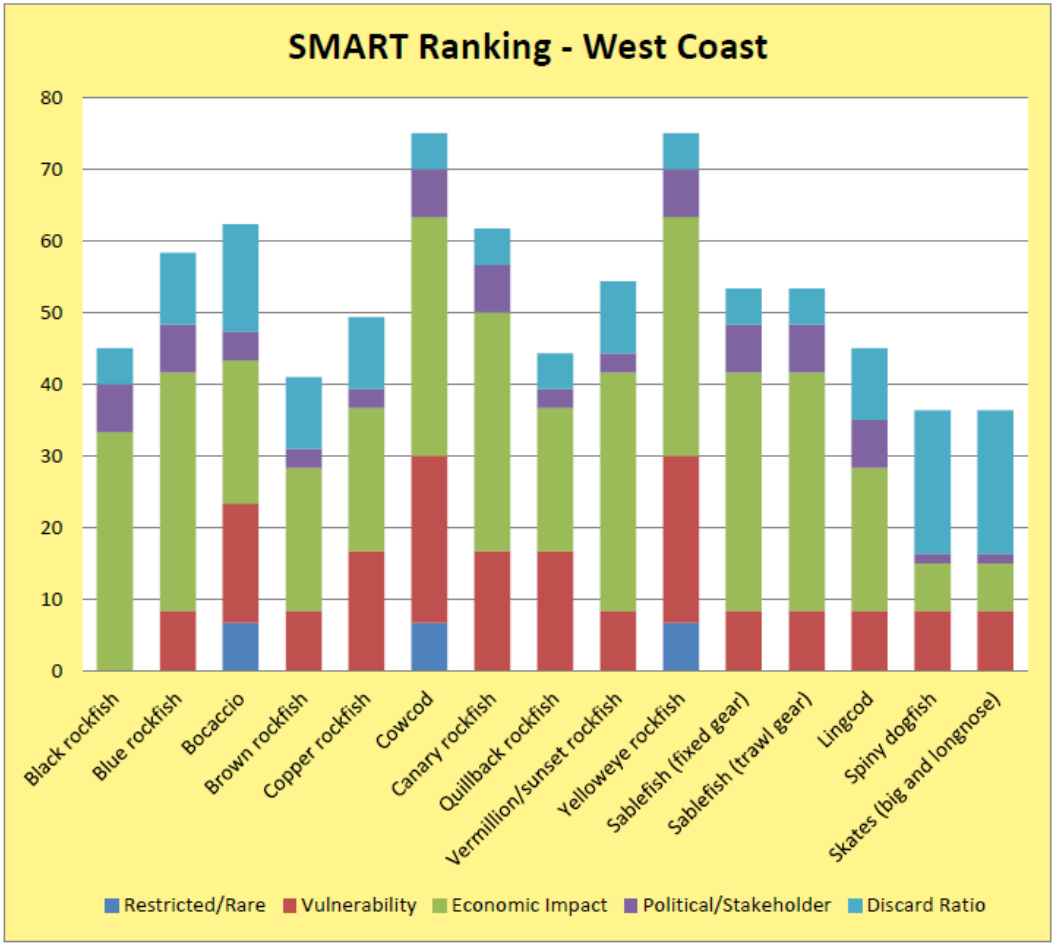
Develops the simple multi-attribute rating technique (SMART) planning tool

5 criteria for rating a species for the need to revise release mortality estimates

1. Restricted or rare species
2. Vulnerability (PSA)
3. Economic impact
4. Political sensitivity and stakeholder engagement
5. Discard ratio



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Fisheries Research 183 (2016) 447–460

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journal homepage: www.elsevier.com/locate/fishres

Review

A review of stock assessment packages in the United States

Catherine M. Dichmont[a], Roy A. Deng[a], Andre E. Punt[b,c,*], Jon Brodziak[d], Yi-Jay Chang[e], Jason M. Cope[f], James N. Ianelli[g], Christopher M. Legault[h], Richard D. Methot Jr[f], Clay E. Porch[i], Michael H. Prager[j], Kyle W. Shertzer[k]

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Table 1
Overall summaries of the 16 packages considered in this paper.

Package Name	Primary Developer(s)	US regions of use (Fig. 1)	Data for use (in addition to catch)	Uncertainty Quantification	Simulation evaluation studies	Primary references
Age/Age-size Models						
Assessment Method for Alaska (AMAK)	Jim Ianelli	North Pacific	Age, Index	Asymptotic, Bayesian	SWG (2010); Kinzey (2010)	Anon (2015)
Age Structured Assessment Procedure (ASAP)	Chis Legault	New England, Mid-Atlantic, South Atlantic	Age, Index	Asymptotic, Bayesian	Brooks et al. (2008)	Legault and Restrepo (1998); Miller and Legault (2015)
Beaufort Assessment Model (BAM)	Erik Williams, Kyle Shertzer	Gulf, South Atlantic, Mid-Atlantic	Age, Size, Index, Discards	Monte Carlo, Bootstrap	Conn et al. (2010); Siegfried et al. (2016)	Williams and Shertzer (2015)
MULTIFAN-CL	David Fournier	HMS	Age, Length, Tagging, Index	Asymptotic	Labelle (2005)	Fournier et al. (1998)
Statistical Catch-At-Length (SCALE)	Paul Nitschke	New England, Mid-Atlantic	Age, Size, Index	Asymptotic and Bayesian	Brooks et al. (2008)	NOAA Fisheries Toolbox
Stock Synthesis (SS)	Richard Methot	All	Age, Length, Conditional age-at-length, Index, Discards, Tagging	Asymptotic, bootstrap, Bayesian	See below	Methot (1990); Methot and Wetzell (2013)
Simple Stock Synthesis (SSS)	Jason Cope	Pacific	None[a]	Monte Carlo	Cope (2013)	Cope (2013)
Extended Simple Stock Synthesis (XSSS)	Jason Cope, Chantel Wetzel	Pacific	Index	Adaptive Importance Sampling		Cope et al. (2015a,b); Wetzel and Punt (2016)
Virtual Population Analysis (VPA)	Many	New England	Age, Index	Bootstrap	Brooks et al. (2008)	Gavaris (1988); Conser and Powers (1990)
VPA-2BOX	Clay Porch	HMS, South Atlantic	Age, Index, Tagging	Asymptotic, bootstrap	Porch et al. (1998); Porch (1995); unpublished research	Porch et al (1995); Porch and Turner (1999); Restrepo and Porch (2000); Porch et al. (2001); Walter and Porch (2012)
Surplus production models						
A Stock Production Model Incorporating Covariates (ASPIC)	Michael Prager	HMS	Index	Bootstrap	Prager et al. (1996); Prager (2002); Williams and Prager (2002)	Prager (1992, 1994, 2002)
Bayesian Surplus Production Model-1 (BSP1)	Jon Brodziak, Yi-Jay Chang	HMS, New England, Western Pacific	Index	Bayesian	Chang et al. (2014)	Brodziak and Ishimura (2011); Brodziak et al. (2014)
Bayesian Surplus Production Model-2 (BSP2)	Mudoch McAllister, Beth Babcock	HMS, South Atlantic	Index	Bayesian SIR algorithm	Unpublished research	McAllister (2014)
Depletion-Based Stock Reduction Analysis (DB-SRA)	EJ Dick, Alec MacCall	Pacific	None[a]	Bayesian[a]	Carruthers et al. (2014)	Dick and MacCall (2011)
Extended Depletion-Based Stock Reduction Analysis (XDB-SRA)	EJ Dick, Alec MacCall, Maria DeYoreo	Pacific	Index	Bayesian	Wetzel and Punt (in press)	Cope et al. (2015a); Wetzel and Punt (2016)
Delay difference model						
Collie-Sissenwine Analysis (CSA)	Jeremy Collie, Michael Sissenwine	New England	Index	Asymptotic and bootstrap with limited Bayesian capability	Mesnil (2003)	Collie and Sissenwine (1983)

[a] No index data so the posteriors are priors implied for model output.

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Accounting for spatio-temporal variation and fisher targeting when estimating abundance from multispecies fishery data

James T. Thorson[1,*], Robert Fonner[2], Melissa A. Haltuch[1], Kotaro Ono[3], Henning Winker[4,5]

Canadian Journal of Fisheries and Aquatic Sciences (online first)

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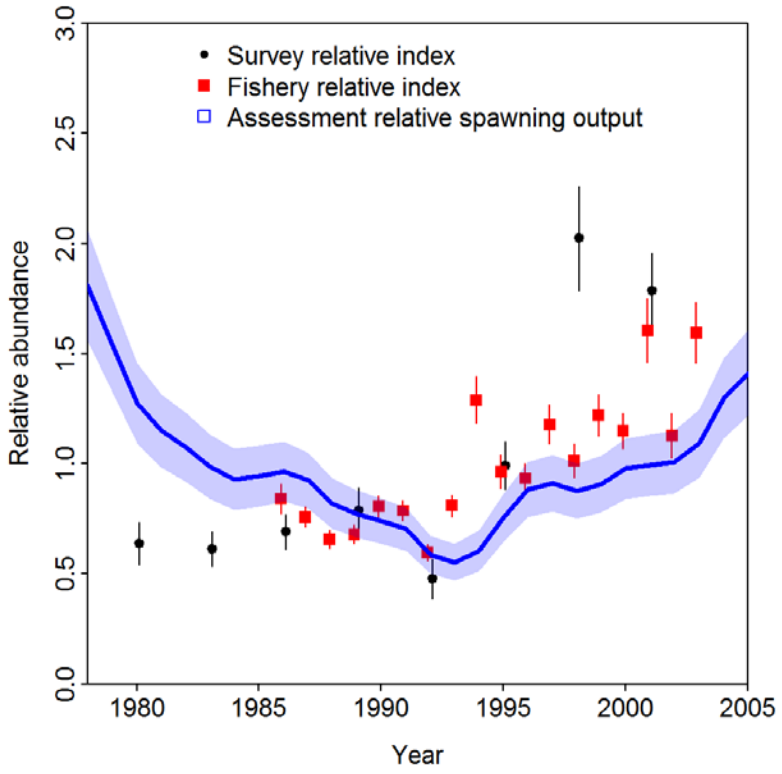
Calculate index of abundance from multispecies fishery catch rates

- Uses spatio-temporal modeling to calculate density for both target and bycatch species
- Bycatch rates are used to account for fishery targeting
- Simulation shows improved performance from spatio-temporal model
- Case-study for winter Petrale-sole fishery off Oregon-Washington (on right) shows good match to survey index



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Model-based estimates of effective sample size in stock assessment models using the Dirichlet-multinomial distribution

James T. Thorson[1], Kelli F. Johnson[2], Richard D. Methot[3], Ian G. Taylor[1]

[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

[3]NOAA Senior Scientist for Stock Assessments, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 2725 Montlake Blvd. East, Seattle, WA 98112, USA

Fisheries Research (online only)

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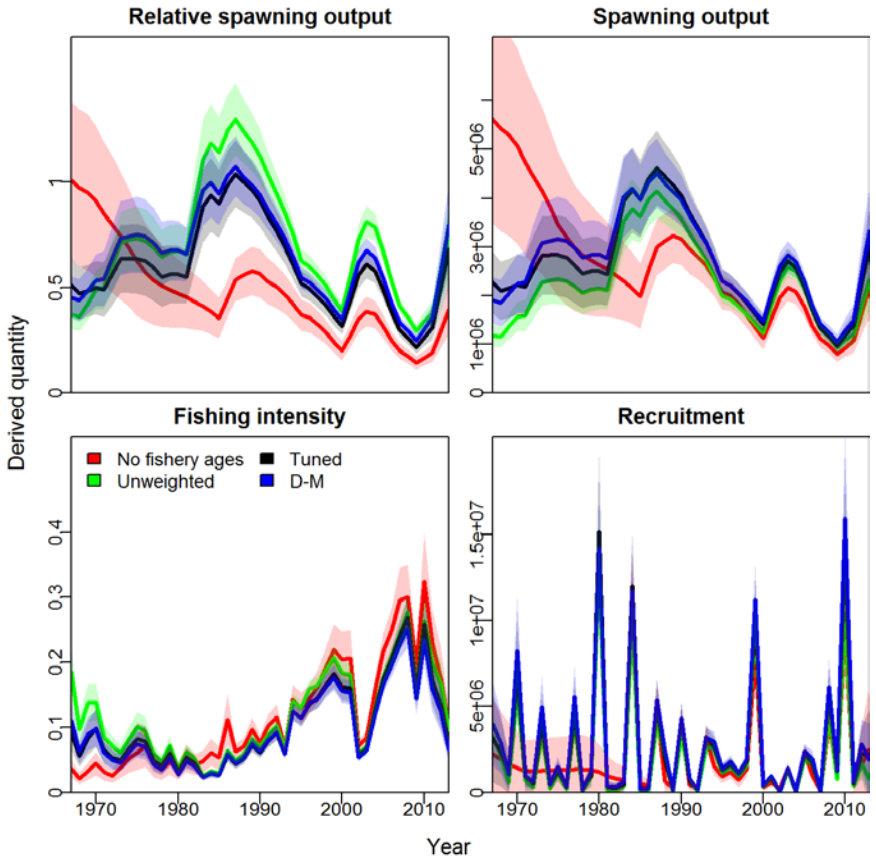
Estimate “data weighting” for age or length-composition data in Stock Synthesis

- Develops method to estimate the appropriate “weight” for age or length-composition data in Stock Synthesis
- Simulation shows similar performance to previous slow and ad hoc methods
- Case study for Pacific hake (on right) shows similar performance of new method (“D-M”) and previous (“Tuned”) approaches



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Model-based inference for estimating shifts in species distribution, area occupied, and center of gravity

James T. Thorson[1*], Malin L. Pinsky[2#], Eric J. Ward[3#]

Methods in Ecology and Evolution, 7(8): 990–1002

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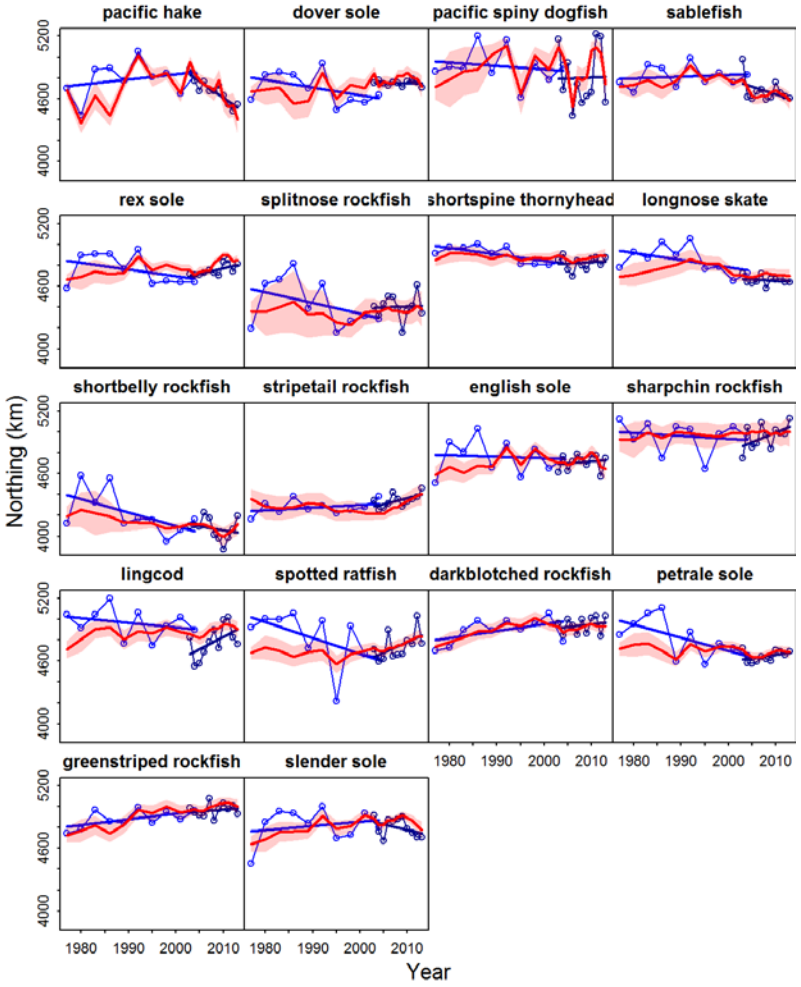
Shifts in distribution for West Coast species

- Estimates shifts in distribution for 18 important groundfishes
- Semi-pelagic species (hake, dogfish) show large variability among years
- Rockfishes show little evidence of distribution shift
- Darkblotched and greenstriped have moved northward since 1980



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Density-dependent changes in effective area occupied for sea-bottom associated marine fishes

James T. Thorson[1,*], Anna Rindorf[2], Jin Gao[1], Dana Hanselman[3], Henning Winker[4,5]

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[4] South African National Biodiversity Institute (SANBI), Kirstenbosch Research Centre, Claremont 7735, South Africa

[5] Centre for Statistics in Ecology, Environment and Conservation (SEEC), Department of Statistical Sciences, University of Cape Town, Private Bag X3, Rondebosch, 7701, South Africa

Proceedings of the Royal Society B. 283(1840): XX-XX

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Global test of "Basin model of marine biogeography"

- 120 fish populations
  - 6 regions worldwide (3 regions in US)
- Significant but weak impact of abundance on effective-area occupied for fishes
- On average, 10% increase in abundance ~ 0.6% increase in area-occupied