



**NOAA  
FISHERIES**

SW Fisheries  
Science Center

# Balancing Assessments, Research, Science Engagement - SWFSC

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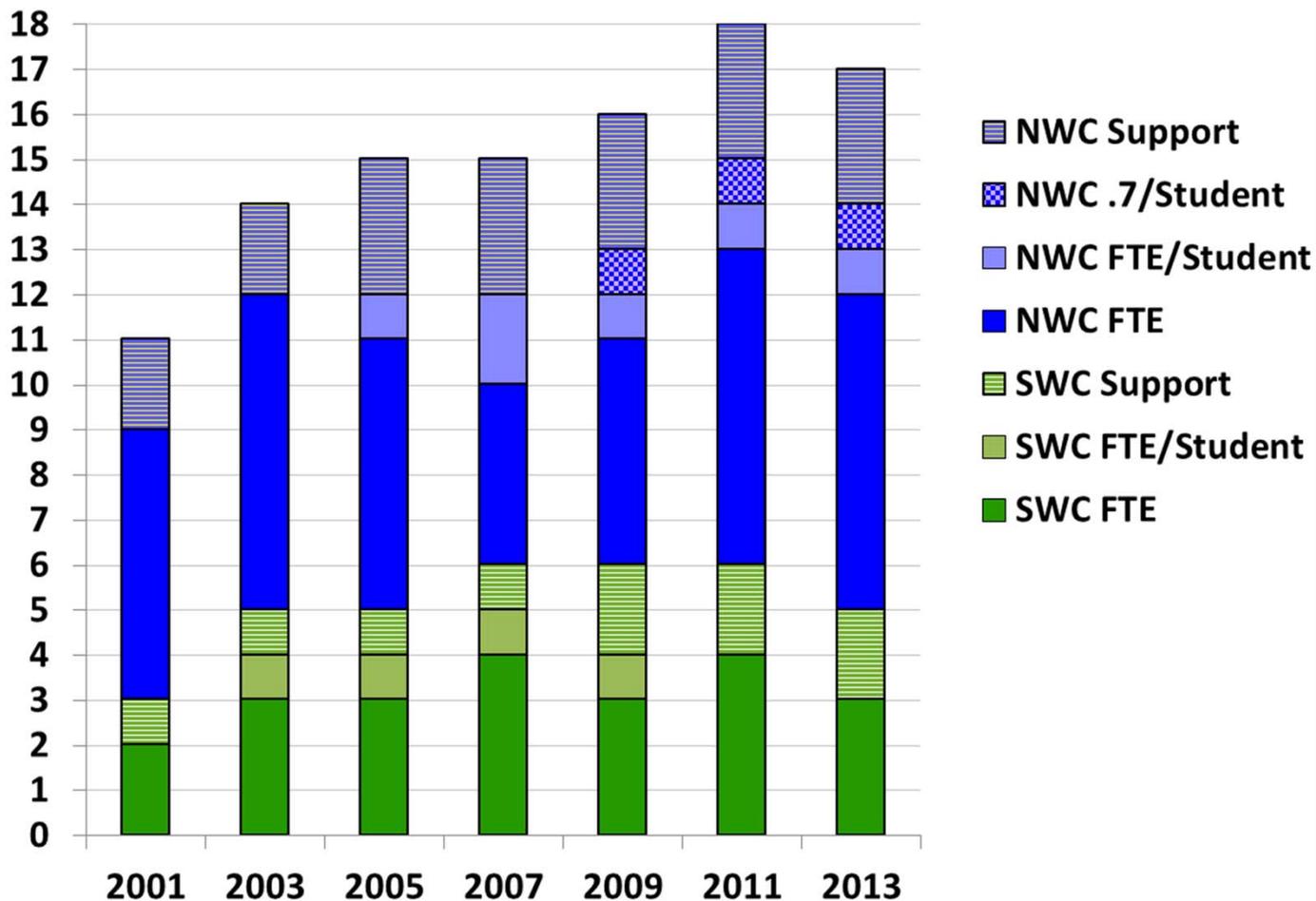
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# Overview

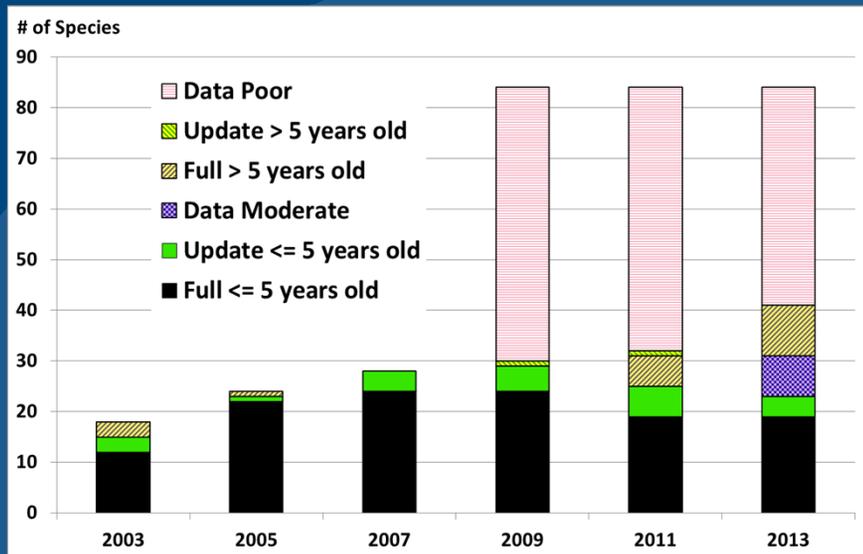
- SWFSC has different organization, but like NWFSC, “assessment people” do more than just assessments!
- Groundfish team does a mix of assessments, methods development, survey (rockfish recruitment), CalCOM, aging, life history studies, cooperative research and other activities
- Other SWFSC teams that do groundfish work include Habitat Ecology (Yoklavich), Early Life History (Sogard), Economics (Thomson), Advanced Technology (Stierhoff, FRD, La Jolla)- we collaborate with all at some level
- Close relationship with UCSC Center for Stock Assessment Research (CSTAR, M. Mangel) and California Department of Fish and Wildlife (M. Key is liason, resides in our building)

# History of Staffing Levels

# of Assessment Staff



# Annual Assessments, by Type

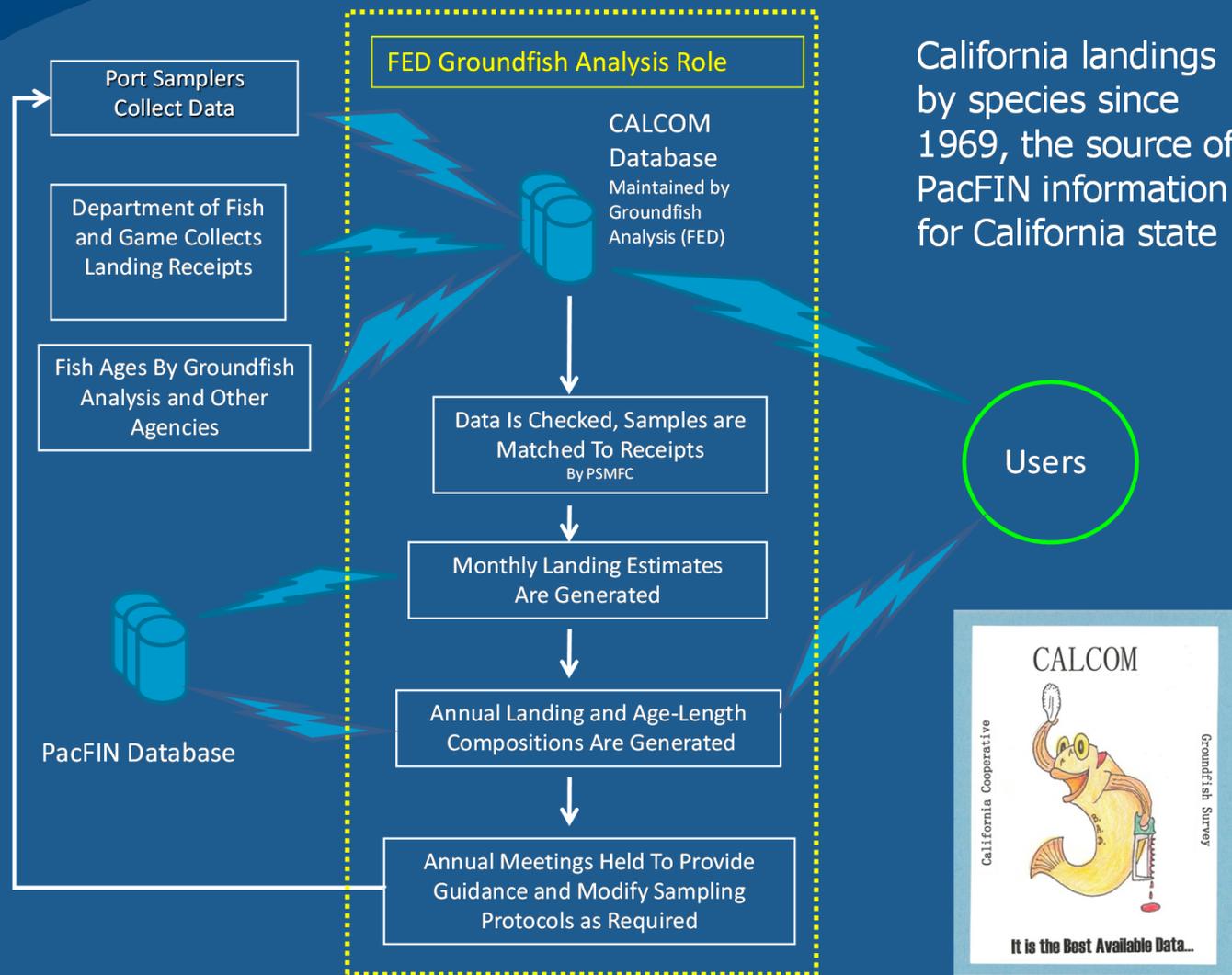


- Historically (pre-2000), SWFSC did ~1/3<sup>rd</sup> of “full” stock assessments, slightly less in period since (greater role of NWFSC, declining role of states, others)
- Focus on southern rockfish, particularly nearshore and shelf spp. of high importance to recreational fisheries and other CA stakeholders (data poor/data moderate methods)
- In 2013, did full assessments of cowcod (DM methods) and Pacific sanddab (not adopted), update of bocaccio, data moderate assessments of China, Brown, and Copper rockfish (nearshore spp.)
- Did >40 data poor in 2010-2011 (DCAC and DB-SRA)



Starry Flounder (left), bocaccio (right)

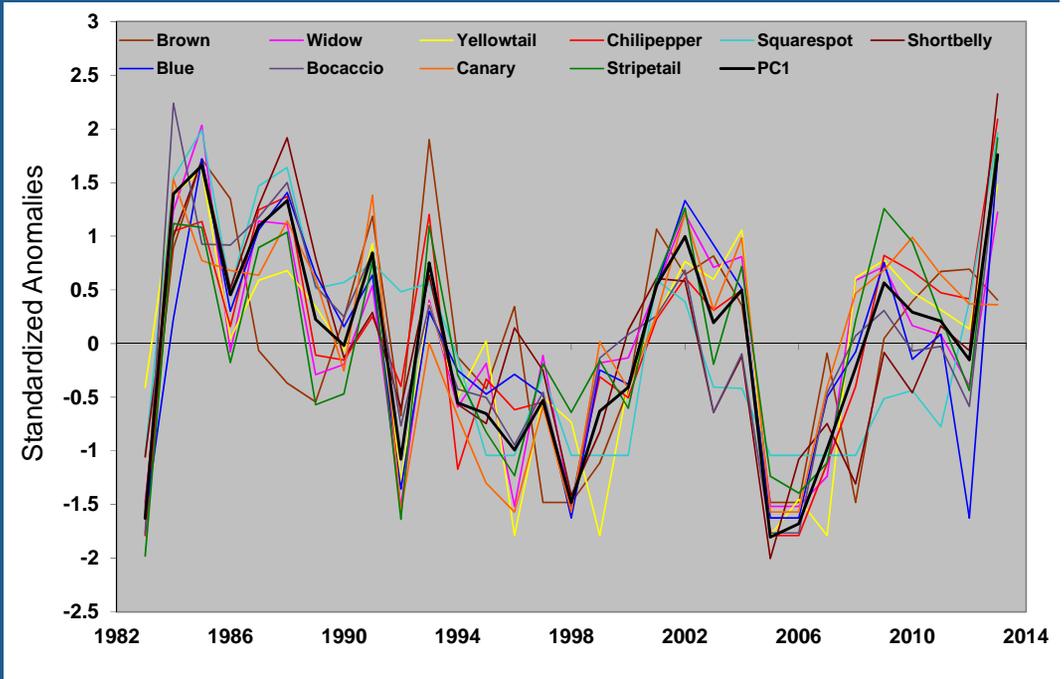
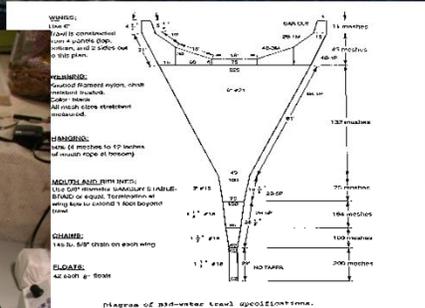
# Fishery data and assessment support - CALCOM



California landings by species since 1969, the source of PacFIN information for California state



# Rockfish recruitment and ecosystem assessment survey (1983- present)



The primary mission of the FED/SWFSC groundfish team after assessments. Assessment scientists involved in survey (~ 45 DAS), support, data analysis – a lot of reliance on collaborators to help execute survey, conduct ecosystem studies.

# Science Engagement

- **Pacific Fishery Management Council**
  - SWFSC has participated on GMT since 1980 (current participant is from Economics Team)
  - SWFSC (groundfish and other) has had strong participation on Scientific and Statistical Committee
  - Supported Ecosystem Plan Development Team
  - Additional support for Council activities such as harvest policy workshops, rebuilding guidelines, characterization of assessment uncertainty, etc.

## • Support for other Science Activities

- NMFS OST working groups on SAIP revision, Assessment Methods, NS1 workshop, Assessment Forum, Vulnerability Evaluation, Stock Assessment Prioritization
- Integrated Ecosystem Assessment support
- SWFSC Recreational Fishing Coordinator, RecFIN Statistics Subcommittee member
- California Ocean Protection Council Science Advisory Team, other working groups/efforts to improve science and management of state-managed species
- Mentors for NMFS Population Dynamics fellows (1 current, another recent), Hollings (undergrad) scholars (two recent), serve on MS and PhD committees (UCSC, Hopkins/Stanford)
- Reviews and review panels for PFMC assessments, NSF panels, CA Sea Grant, NMFS internal RFP's (Collaborative Research, Habitat, FATE, others), peer reviewed lit., etc.



# Center for Stock Assessment Research (CSTAR)

Began in 2002, ongoing but funding difficulty is increasing. Currently fully embedded in FED building.

- Marc Mangel (UCSC, Dept Applied Maths and Stats) and Alec MacCall (former co-chair); Steven Munch, Michael Mohr, John Field, many others involved
- Core funding (modest) by SAIP, but provides leverage for grants and contracts (e.g., CA sheephead assessment, Antarctic krill life history research and management, transgenerational plasticity)

Production of trained stock assessment scientists (~15 graduate students and ~12 post-docs)

- Gov't FTEs: SWFSC, NWFSC, SEFSC, PIFSC, SAFMC, CSIRO
- NGO FTEs: Environmental Defense
- Post Docs: NWFSC, SWFSC, SEFSC
- Academics: Yale, NYSU Stonybrook (stock assessment training!)
- ~6 students and post-docs currently in the pipeline



# Are we striking a good balance?

- **Research**
  - Data poor/data moderate methods development
  - Reproductive ecology research (with ELH team, others)
  - Continuing investigations to support future catch reconstructions
  - Collaborative research with stakeholders to improve fishing practices (with TNC, others)
  - Recruitment survey, predictive ability, process studies, ecosystem studies, oceanographic research
  - Other research, ecosystem studies, Humboldt squid research (food habits, factors related to range expansion) many others covered elsewhere or in pubs

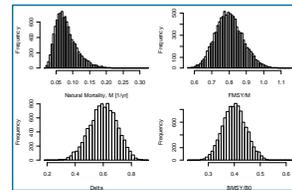
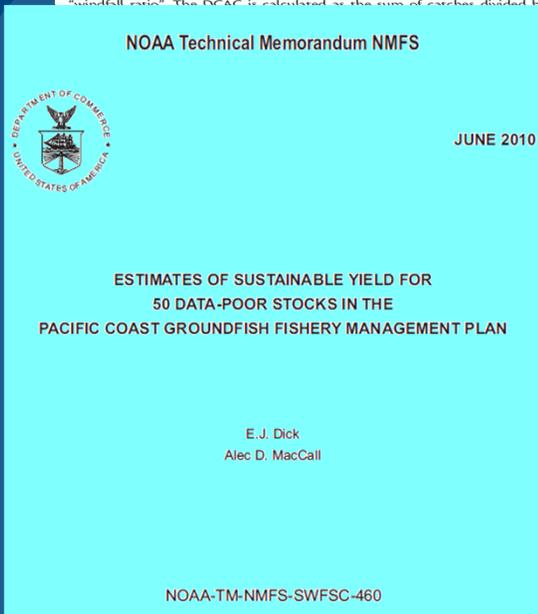
# Assessment related research

## Depletion-corrected average catch: a simple formula for estimating sustainable yields in data-poor situations

Alec D. MacCall

MacCall, A. D. 2009. Depletion-corrected average catch: a simple formula for estimating sustainable yields in data-poor situations. *Journal of Marine Science*, 66: 2267–2271.

The depletion-corrected average catch (DCAC) formula is an extension of the standard average catch formula for data-poor fisheries on long-lived species. Over an extended period, the depletion-corrected average catch (DCAC) formula is an extension of the standard average catch formula for data-poor fisheries on long-lived species. Over an extended period, the depletion-corrected average catch (DCAC) formula is an extension of the standard average catch formula for data-poor fisheries on long-lived species.



Age at maturity

Catch Time Series

Population Model

$$B_t = B_{t-1} + P(B_{t-a}) - C_{t-1}$$

$B_0$

OFL

MSY

$B_{MSY}$

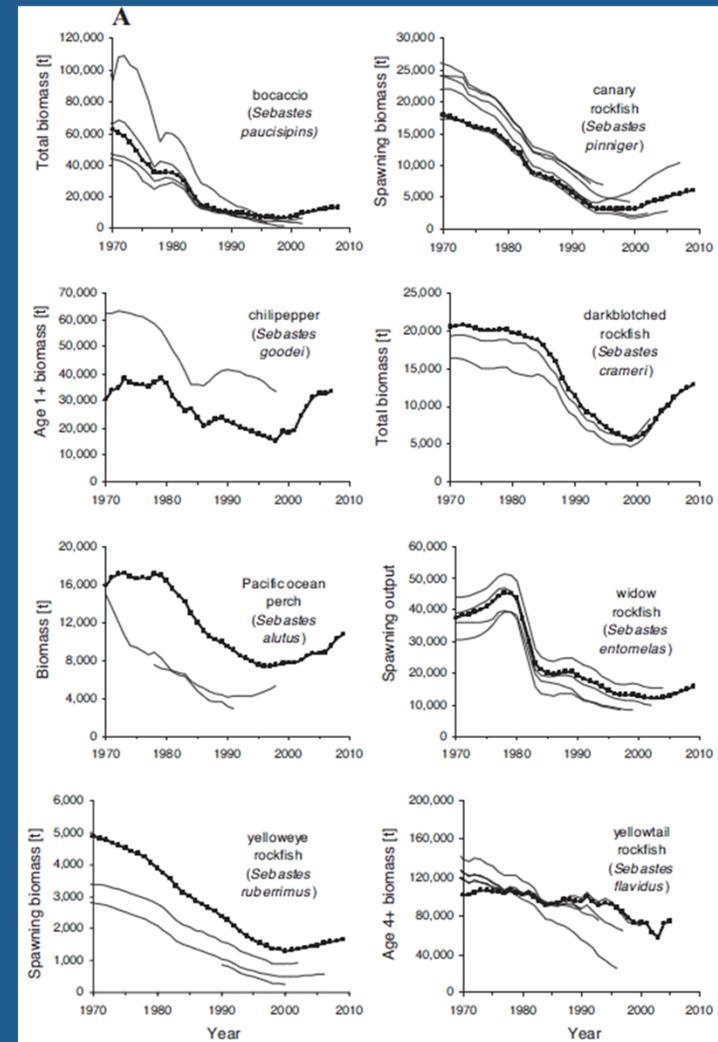
In response to management needs triggered by 2007 MSFCMA, huge investment in data poor methods development ; Depletion-Corrected Average Catch (DCAC) and Depletion-Based Stock Reduction Analysis (DB-SRA, XDB-SRA)

# Assessment related research

## A meta-analytic approach to quantifying scientific uncertainty in stock assessments

Stephen Ralston, Andre Punt, Owen Hamel, John DeVore, Raymon Conser

- Provided the basis for ACL buffers (later adopted by PFMC) that were based on assessment (model) uncertainty, by quantifying the error around historical assessments
- Based on PFMC SST, as such a collaboration between SWFSC, NWFSC, PFMC staff
- Won Fishery Bulletin “best paper” award for 2011



# Assessment related research

## A perspective on steepness, reference points, and stock assessment

Marc Mangel, Alec MacCall, Jon Brodziak, E.J. Dick, Robyn Forrest, Roxanna Pourzand and Stephen Ralston, CJFAS

- Provides a perspective on steepness, reference points for fishery management, and stock assessment.
- Demonstrates that key reference points are fixed when steepness and other life history parameters are fixed in stock assessments that use a Beverton–Holt SR relationship, does not address full extent of uncertainty.
- Recommendations include a greater emphasis on estimating, rather than fixing, steepness and natural mortality, as well as considering more complex stock-recruitment functions.

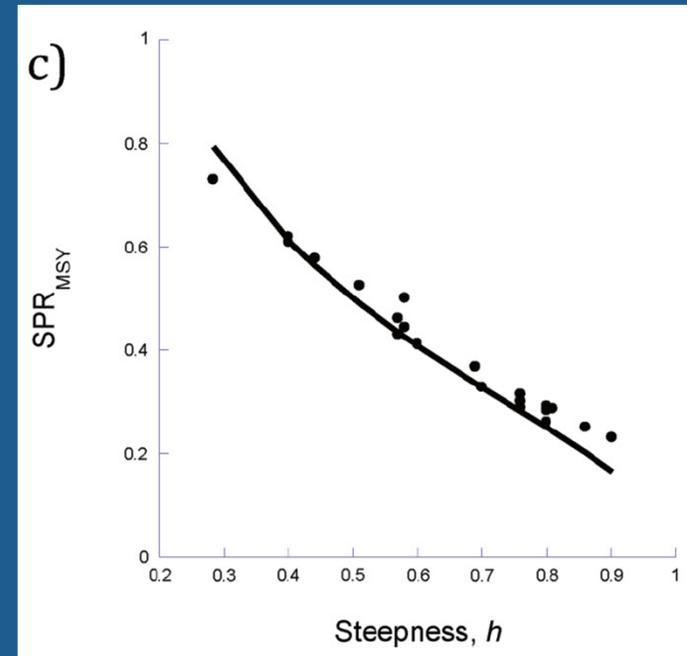
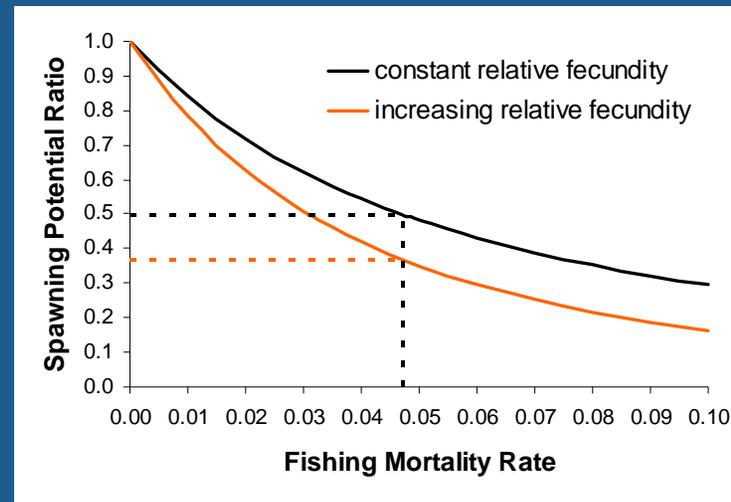
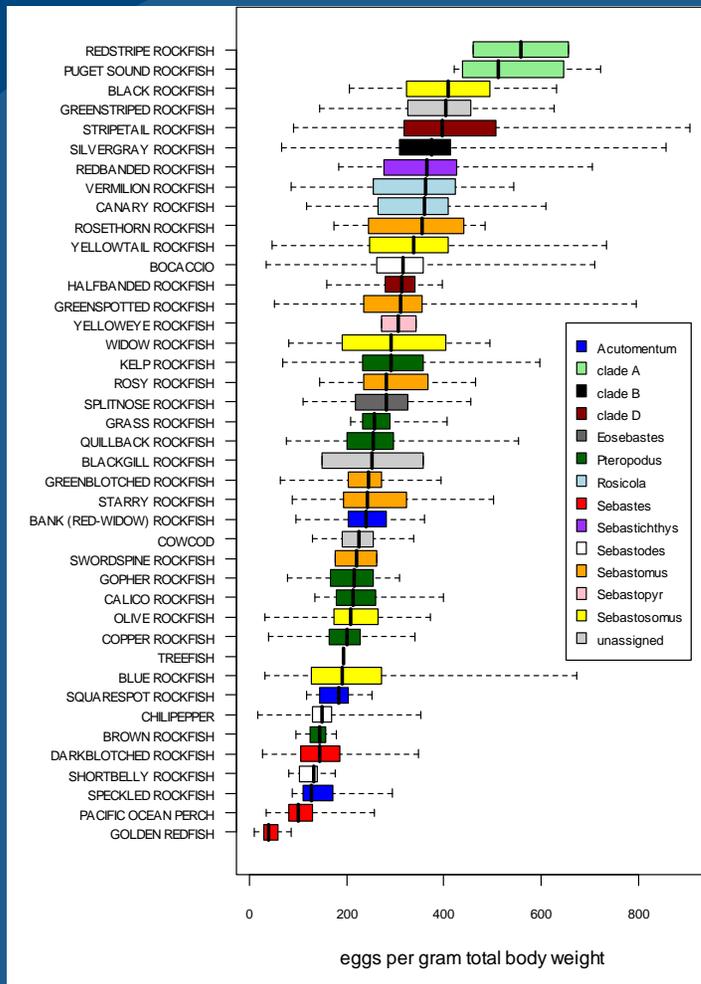


Figure shows  $SPR@MSY$  as a function of steepness for selected West Coast groundfish assessments.

# Assessment Related Research

## Meta-analysis of relative fecundity for *Sebastes*



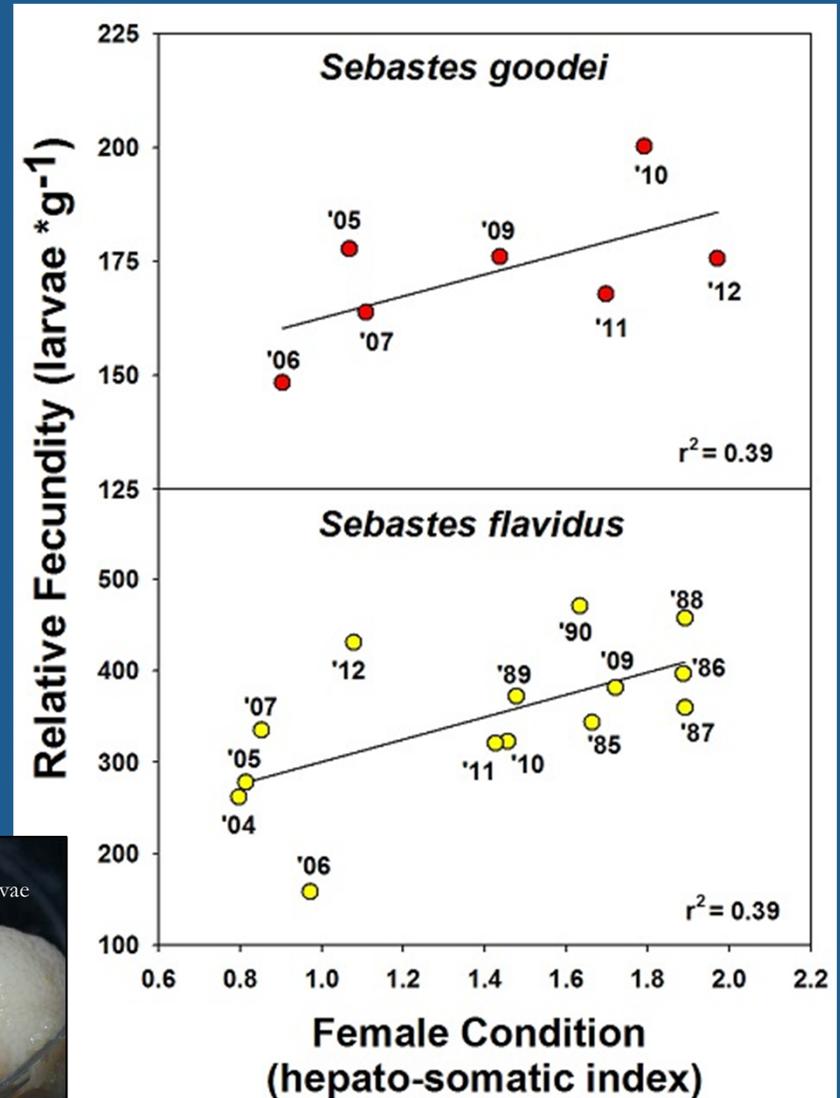
- Results of the Bayesian meta-analysis provide estimates of relative fecundity for ~40 rockfish species, were part of dissertation research by E.J. Dick (CSTAR, Mangel chair)
- Since 2008 we have nearly doubled raw data for WC species, analysis will be redone with these data in near future. Also conducting a simulation study to evaluate impact on reference points.

# Environmental Effects on Female Condition and Egg Production

- Recent and historical data suggest that a decline in female condition, often associated with poor ocean conditions (e.g., El Niño), results in years of decreased egg production.
- Multiple broods have also been known to occur during favorable environmental conditions, particularly in southern regions, but never truly considered in assessments.
- We are quantifying and validating fecundity and multiple brooding (latter using histological as well as macroscopic methods), to evaluate impacts of variable larval production on productivity.



Large female Bocaccio with fertilized eggs

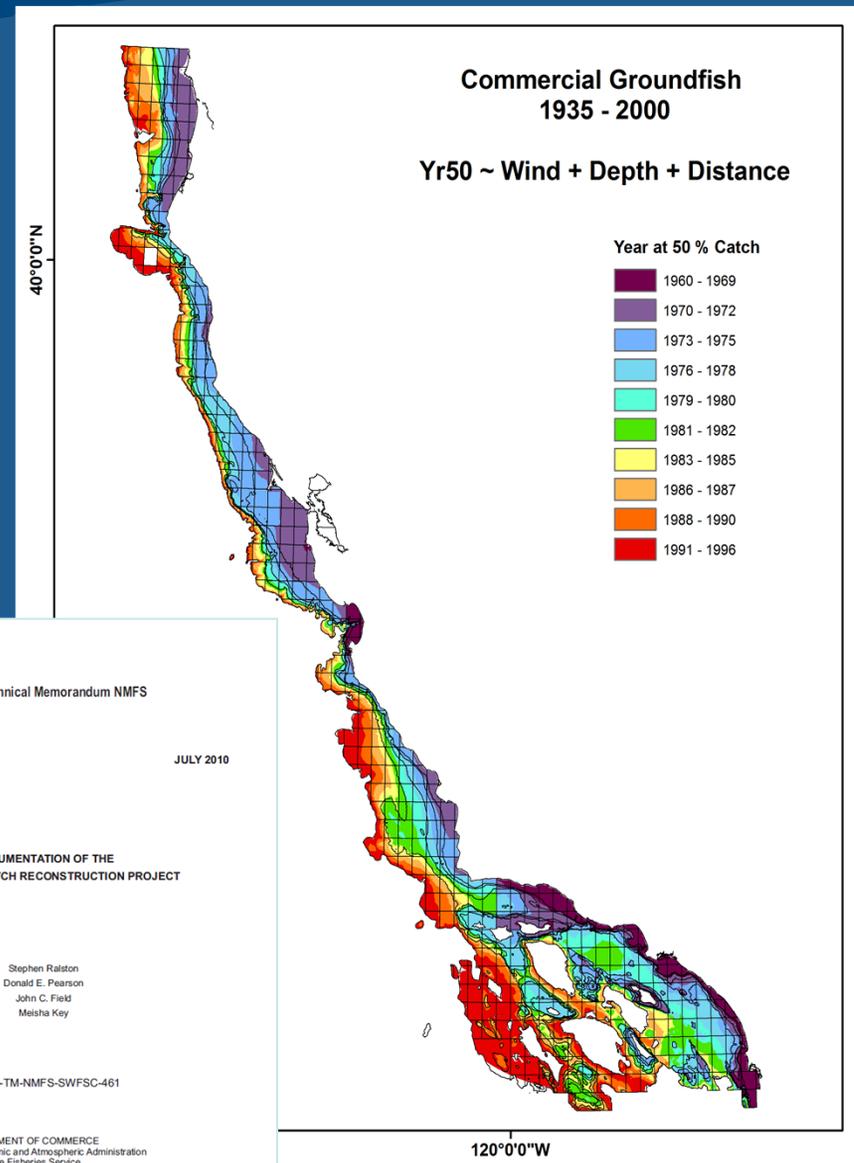


## Analysis of Historical Catch Data

Historical CDFW data meant CA had good lead on catch reconstruction efforts (completed for CA in 2010), however work is ongoing to better understand spatial patterns of fishery development

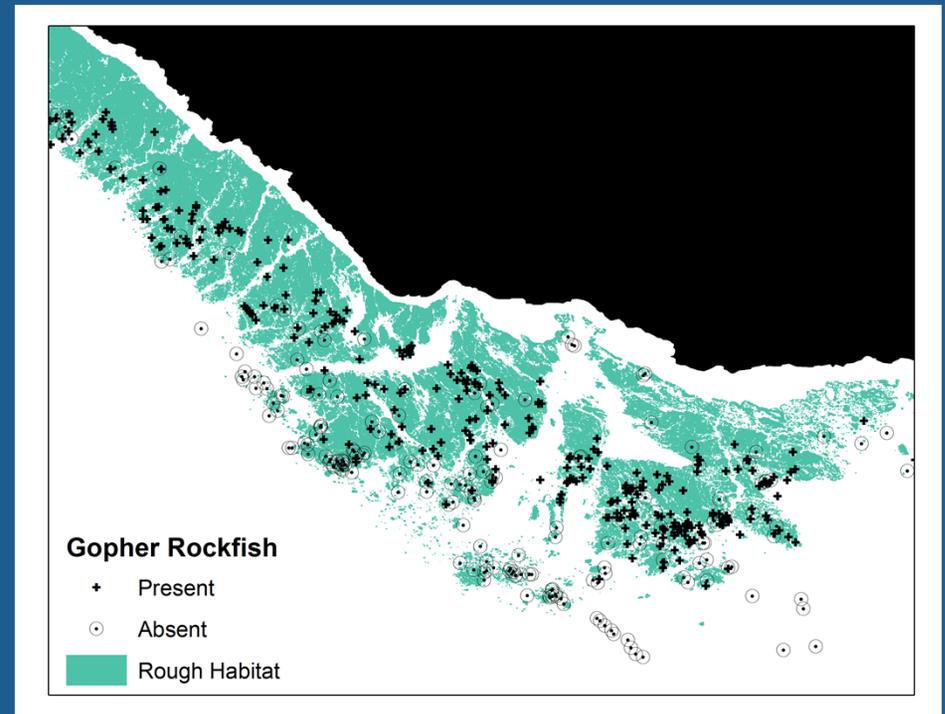
Recent results demonstrate extent to which California groundfish catches, over time, have taken place in deeper habitat, with an increasing distance between catch locations and ports, and in increasingly inclement weather conditions. These results will be helpful for future stock assessments and catch reconstruction efforts, as well as informing habitat assessments, IEA, etc.

(Miller et al. PLOS one, in press).



# Recreational Fishery Index Development

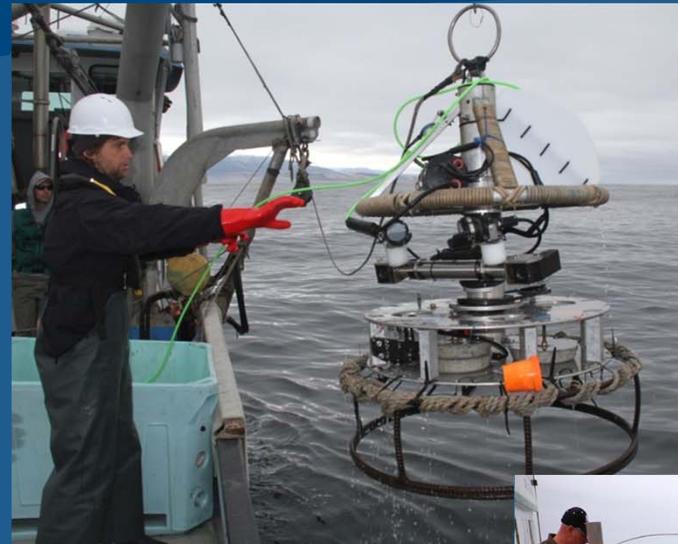
- Traditional survey data not available for nearshore groundfish stocks
- Dockside sampling collects aggregated (trip-level) catch, effort, and location information
- Created relational databases for OR & CA onboard CPFV observer programs (Monk et al., 2013, in press)
- Analysis underway of drift-level data in relation to habitat data for state waters (Monk et al., in prep.) – improve distinction between structural, observational 0's.
- Consideration of nearshore survey methods and other datasets (CA MPA monitoring data, drop cameras, ROV)



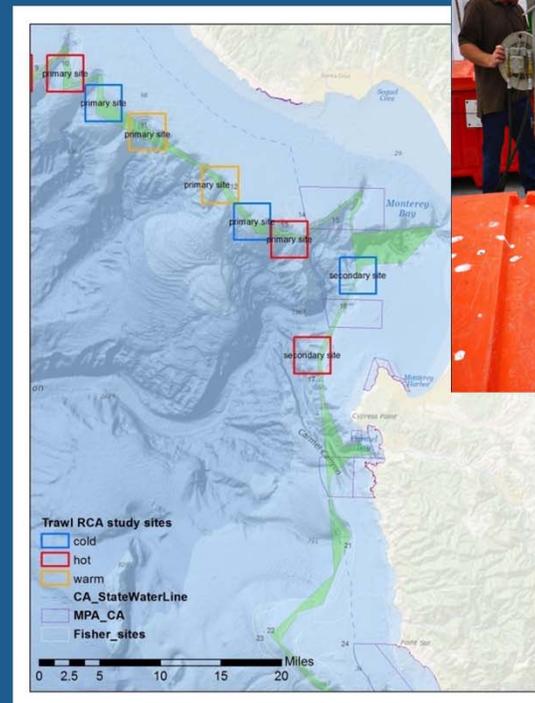
# Spatial analysis of the distribution and size of rebuilding stocks in the Rockfish Conservation Area through directed fishing surveys

- PFMC approved EFP, supported by The Nature Conservancy and NMFS collaborative research
- Objective is to target healthy stocks using vertical hook and line gear within the rockfish conservation areas (RCA's), compare catch rates to visual survey and predictive models (hotspots, coldspots)
- In 2013 caught over 1100 fish (>4000 lbs), most from healthy stocks (vermillion, chilipepper, yellowtail), 7 canary, no cowcod or yelloweye (most constraining OFS)
- Broad suite of Project Partners: The Nature Conservancy, Moss Landing Marine Laboratory, California Sea Grant, National Centers for Coastal Ocean Research, Environmental Defense, Central CA Seafood Marketing Association, California Department of Fish and Wildlife, Commercial fishermen in Morro Bay, Port San Luis, and

Monterey



Snapper Reel, 15, or 50 hooks



# Are we striking a good balance?

- **Research**

- Over 40 peer-reviewed articles in last 5 years (2010-present), by SW assessment staff
  - Lead authorship on 12
  - At least 15 on improving assessment methods
  - Others on data preparation, recruitment processes, ecosystem interactions, other



# Are we striking a good balance?

- **Assessments**
  - Adequate assessments for most important species
  - Improved OFLs for data-limited species
  - Emphasis on process with high-quality review
- **Research**
  - Lots of publications, many on improving assessments
  - Other work to improve assessment QA/QC
- **Scientific Engagement**
  - Strong support for Council & Agency committees
  - Support for and training of students and peers