collaborative fisheries research: a transition from data-poor to data-rich management

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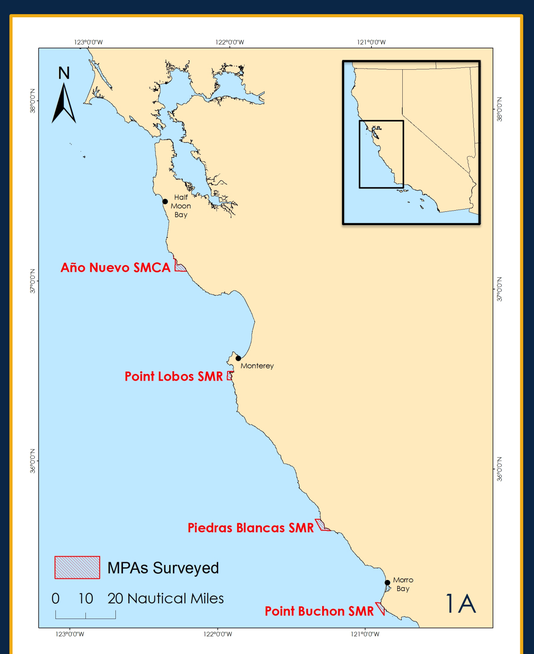
Objectives

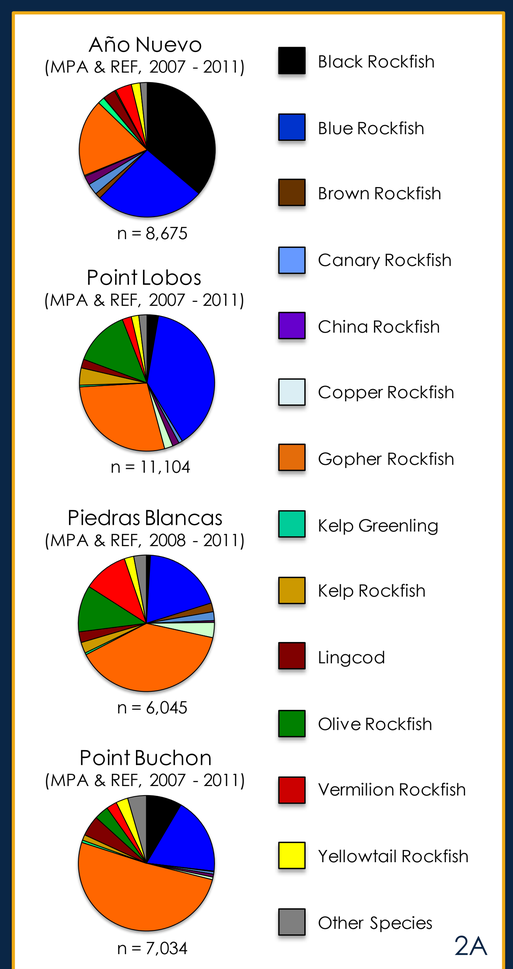
The California Collaborative Fisheries Research Program (CCFRP) has several overarching goals:

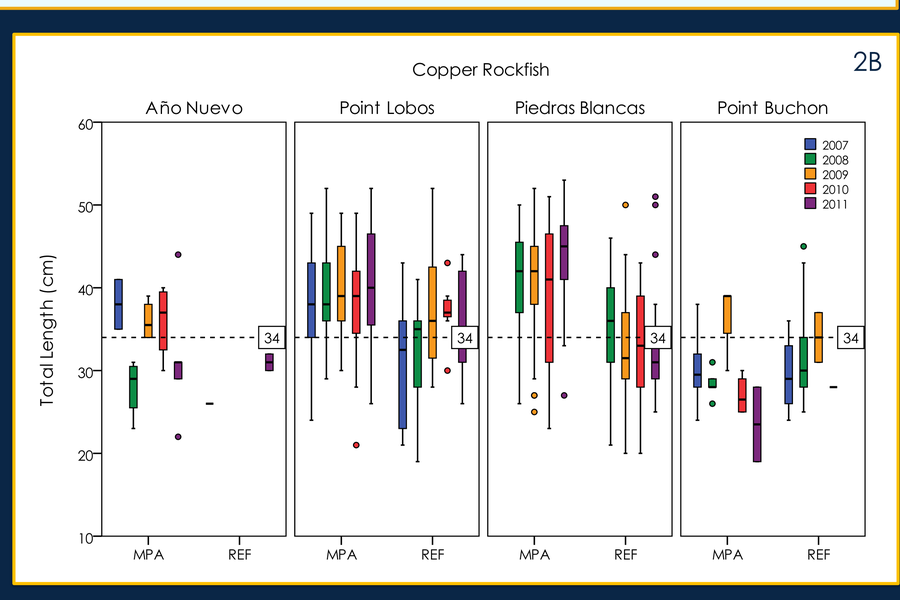
- conduct scientifically sound research to better inform resource managers
- collaborate with local fishing communities to collect data on nearshore fish assemblages
- provide rigorous baseline and monitoring data for the evaluation of marine protected area (MPA) performance
- better understand nearshore fish stocks and the ecosystems upon which they rely
- educate the general public about marine conservation, stewardship and research

Current project objective:

- test data-poor fishery models that use differences between MPA and reference (REF) sites to set various control rules







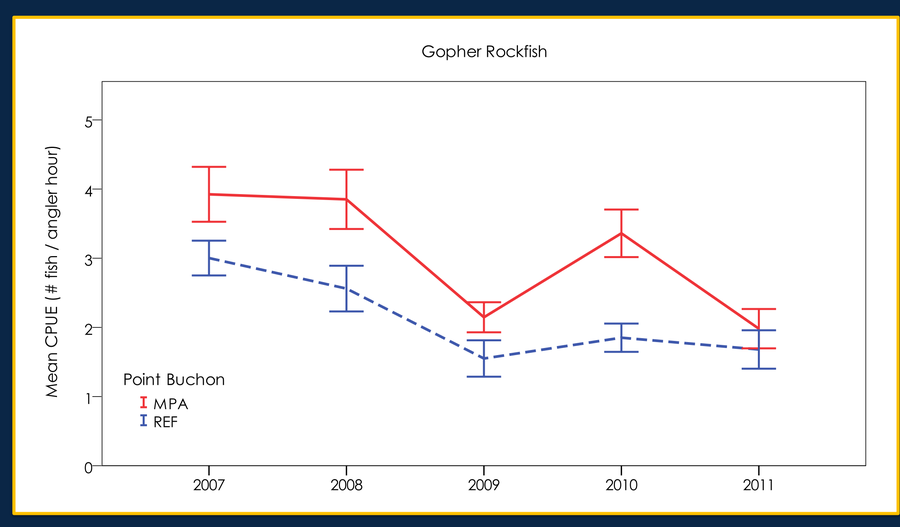


Figure 1.

(A) map of central California study area
(B) volunteer angler holding a recently caught Vermilion Rockfish
(C) science crew members tagging an Olive Rockfish and recording data
(D) science crew member venting a Copper Rockfish to relieve the effects of barotrauma prior to release
(E) science crew member using an Ace Calloway descending device on a Gopher Rockfish

Figure 2.

(A) species composition by area; sites and years combined
(B) Copper Rockfish lengths by area, site and year (+ 95% confidence intervals)
- horizontal line at 34 cm denotes the average length at 50% maturity
(C) mean CPUE (± 1 std error) for Gopher Rockfish at Point Buchon, over time

Methods

From 2007-2011, CCFRP scientists worked with volunteer anglers to collect fisheries-independent data onboard charter boats off of central California (fig 1). In order to gather information on species compositions, sizes and catch rates of nearshore fishes both in and around local MPAs, we have:

- conducted 179 days of standardized hook-and-line surveys
- utilized over 4,855 volunteer fishing hours from 582 individuals
- caught, tagged and released 32,858 fishes from 42 different species

Results & Conclusions

To date, species compositions, lengths, catch per unit effort (CPUE) and biomass estimates have demonstrated great similarity between MPA (est. 2007) and associated reference sites (fig 2).

CCFRP data collected from the original Point Lobos State Marine Reserve (est. 1973), however, indicate larger sizes and higher densities of 8 out of the 11 most abundant species caught.

The conflicting results produced from new and old MPAs indicate a need for longer temporal scales in order to properly evaluate MPA performance in terms of fisheries management.

Next Steps

Compare new data-poor fishery models (most of which are based on differences in densities or length frequency distributions between MPA and REF sites), including:

- density ratio control rule [1]
- MPA-based decision tree [2]
- length-based reference point [3]
- reserve-based dynamic spawning potential ratio (SPR) [4]
- fractional change in lifetime egg production [5]
- stock synthesis [6]

Conduct management strategy evaluations (MSE) on all model results

Formulate management recommendations based on MSE (fig 3)

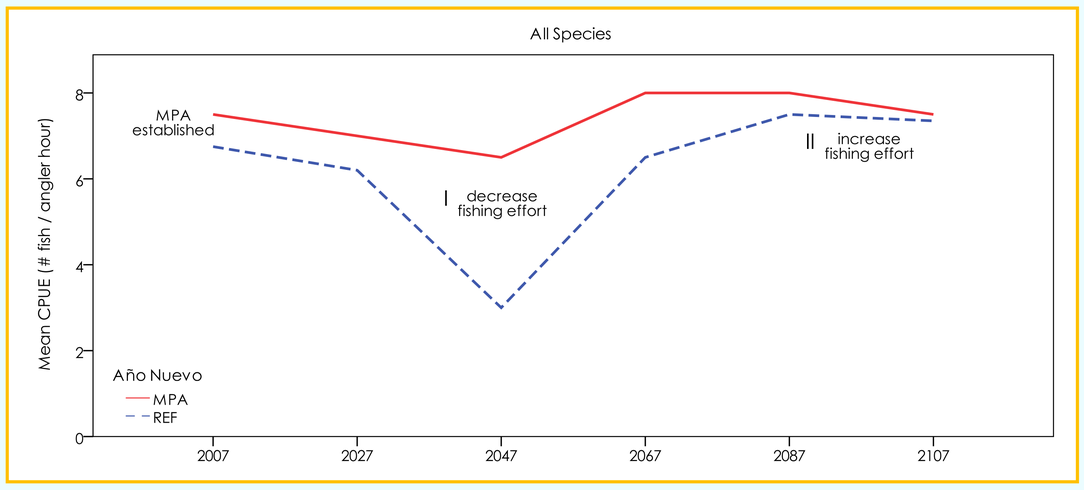


Figure 3. Management recommendations based on hypothetical CPUE data for all species found at Año Nuevo. When CPUE trends diverge (I: REF < MPA), fishing effort should be decreased. When CPUE trends converge (II: REF approaches or exceeds MPA), fishing effort can be increased.

Model References

[1] Babcock and MacCall 2010; McGilliard et al 2010
[2] Wilson et al 2010
[3] Froese 2004; Cope and Punt 2009
[4] Honey and He in prep
[5] O'Farrell and Botsford 2005; 2006
[6] Cope 2011; Dick and MacCall 2010

Acknowledgements

This current project has been made possible by funding and/or support by the Ocean Protection Council, California Sea Grant, National Oceanic and Atmospheric Administration, Santa Monica Seafood's Responsible Sourcing Vendor Partner Program, the captains and crew of F/Vs Admiral, Caroline, Fiesta, Huli Cat, New Captain Pete, Pacific Horizon, Patriot, Princess, Queen of Hearts, Rita G, Salty Lady and Tigerfish as well as countless volunteer anglers. Thank you to Tom Barnes (DFG), Jason Cope (NMFS), Kristen Honey (Stanford University), Jono Wilson (UCSB) and the large, multi-disciplinary advisory board that will help make the future directions of this project a success.