

Trapping and mark-recapture of nearshore fishes in Carmel Bay



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Introduction

The collection of essential fisheries information (EFI) is necessary for implementation of fisheries management plans used to manage populations of nearshore rocky reef fishes. Recent reviews in California have listed several nearshore species, including kelp greenling (*Hexagrammos decagrammus*) and cabezon (*Scorpaenichthys marmoratus*) as lacking EFI. Specifically, there was uncertainty regarding kelp greenling age, growth, mortality and abundance estimates (Cope and MacCall 2006). A recent stock assessment also revealed limited information on natural mortality, population biology and changes in biomass for cabezon (Cope and Punt 2006). Kelp greenling and cabezon are two of 19 finfish species included in the Department's Nearshore Fishery Management Plan (NFMP). Successful implementation of the NFMP requires collection of missing EFI, including species abundance and mortality. By using short-term (daily) and long-term (monthly) tag data, various models can be used to determine these parameters (Pine et al 2003). Beginning in July 2008, the California Department of Fish and Game initiated a mark-recapture study to collect some of this missing information for several nearshore fishes.

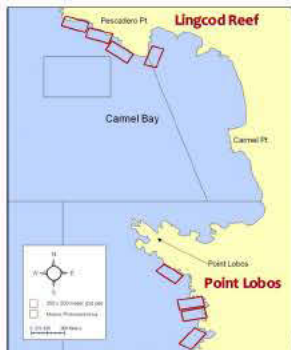
Methods

Trapping in Carmel Bay

- Two sites: Lingcod Reef and Point Lobos SMR
 - Four months: July – October 2008
 - Four grid cells per site (250 x 500 m)
 - Three depth strata: <30 ft, 31-45 ft, and 46-60 ft
 - Up to 3 sets per day x 3 days per month per site
 - 12 baited traps per 60 minute set
- Each day, sets in all 3 depth strata were attempted in 1 randomly chosen grid cell (no resampling)
- Total length, weight, sex (kelp greenling) recorded
- Each fish marked with a 3 or 4 mm t-bar anchor tag
- Fish were vented or released with a descending device



Tagging a black-and-yellow rockfish



Left: Map of study sites with grid cells
Above: D. Haas measures a lingcod
Below: Anchor tag in a cabezon



Preliminary Results

- 696 traps deployed over 20 days of sampling
- 549 fish from 12 species captured and tagged
- Average catch per unit effort (CPUE) = 0.79 fish/trap
- Black-and-yellow rockfish (*Sebastes chrysomelas*) and gopher rockfish (*S. carnatus*) most common
- Greater CPUE at Lingcod Reef, significant for cabezon
- Greater CPUE at 46-60 ft, skewed by gopher rockfish
- Mean total length significantly greater at Point Lobos for black-and yellow and gopher rockfish



S. Hoobler with a kelp greenling



Tagged kelp greenling and cabezon.



Table 1. Catch per unit effort (CPUE) for all species caught by site and depth

Target Depth (ft)	Lingcod Reef	Point Lobos
<30	0.68	0.58
31-45	0.57	0.48
46-60	1.15	1.13

Recaptures to date

- Gopher rockfish and black-and-yellow rockfish
 - Both captured and recovered at Point Lobos
 - 26 and 30 days at liberty, respectively
 - Gross movements of < 20 meters each
- Kelp greenling
 - Captured and recovered at Lingcod Reef
 - 57 days at liberty
 - Gross movements of ~ 30 meters
- Cabezon
 - Captured and recovered at Lingcod Reef
 - 136 days at liberty
 - Gross movement of ~ 500 meters



T. Maricich handles a trapped lingcod

Conclusions and Future Direction

- CPUE and species diversity were greater at Lingcod Reef
- CPUE was significantly greater in 46-60 ft at both sites, and was affected by the high abundance of gopher rockfish
- More recaptures are required for modeling abundance
- Continued trapping for three years to allow for comparisons of relative abundance and species composition
- Visual "recaptures" will be made using scuba surveys

Acknowledgments

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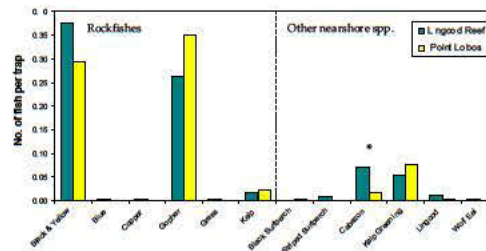


Figure 1. Catch per unit effort (CPUE) for all species caught by site. * denotes a significant difference between sites (ANOVA, $p < 0.05$).

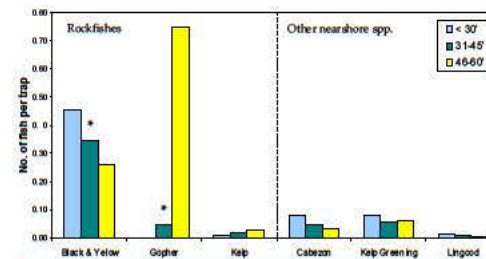


Figure 2. Catch per unit effort (CPUE) for the six most abundant species by depth. * denotes a significant difference among depth strata (ANOVA, $p < 0.05$).

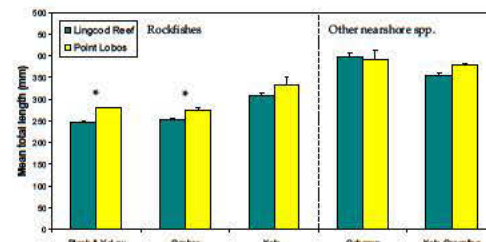


Figure 3. Mean total length of the five most abundant species by site. Error bars represent one standard error. * denotes a significant difference between sites (ANOVA, $p < 0.05$).