



Evaluating the Effectiveness of Marine Protected Areas in Southern California

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INTRODUCTION

- Marine ecosystems in Southern California face pressure from overfishing, habitat loss, and climate change.
- Marine Protected Areas (MPAs) are designed to restore biodiversity and support sustainable fisheries.
- The California spiny lobster is a keystone species and an important fishery, making it an effective indicator of ecosystem health.
- This study evaluates whether MPAs increase lobster abundance compared to non-protected areas.



RESEARCH METHODOLOGIES

- **Approach:** Quantitative, observational field study comparing protected vs. non-protected sites
- **Sites:**
 - a. MPAs: Shaw's Cove, Goff Cove
 - b. Non-MPAs: Crystal Cove, Thousand Steps Beach (similar rocky reef habitats for fair comparison)
- **Data Collection:**
 - a. Repeated free-dive surveys of the same reef areas
 - b. Lobsters counted visually during dives

- **Controls:**
 - a. Same reef structures surveyed each time
 - b. Surveys conducted over consistent time intervals (Jan–Feb)
 - c. No disturbance to lobsters
- **Data Analysis:**
 - a. Compare lobster abundance and size between MPA and non-MPA sites
 - b. Used **chi-square test** to determine if differences are statistically significant
 - c. Create bar graphs to visualize trends

DATA AND FINDINGS

Figure 1: Total Lobster Count (MPA vs Non-MPA)

- Compares total lobster counts inside MPAs vs non-protected areas
- Lobster abundance is higher within MPAs
- Suggests protection increases population size
- Error bars show possible variation and data reliability

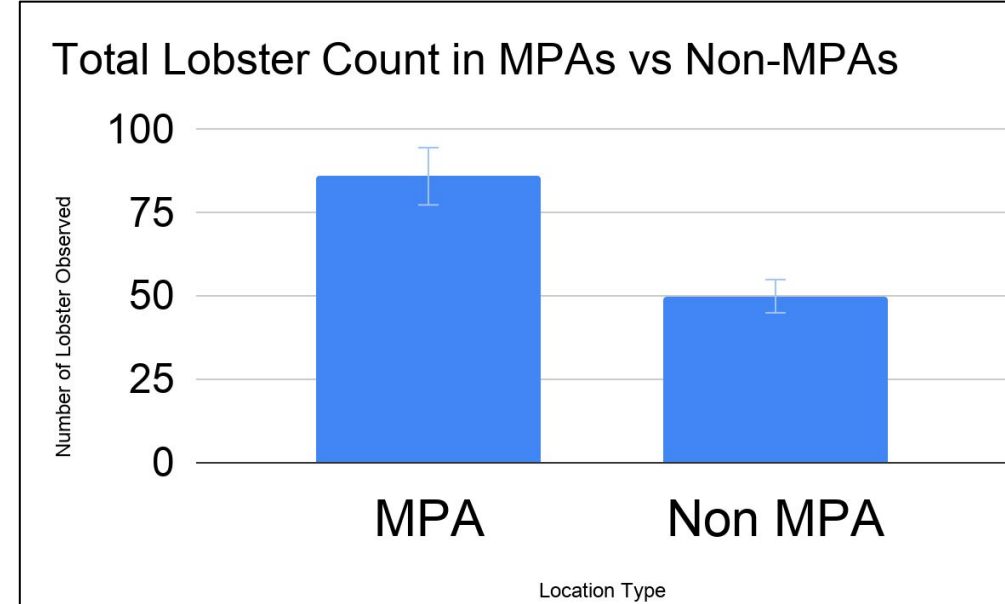
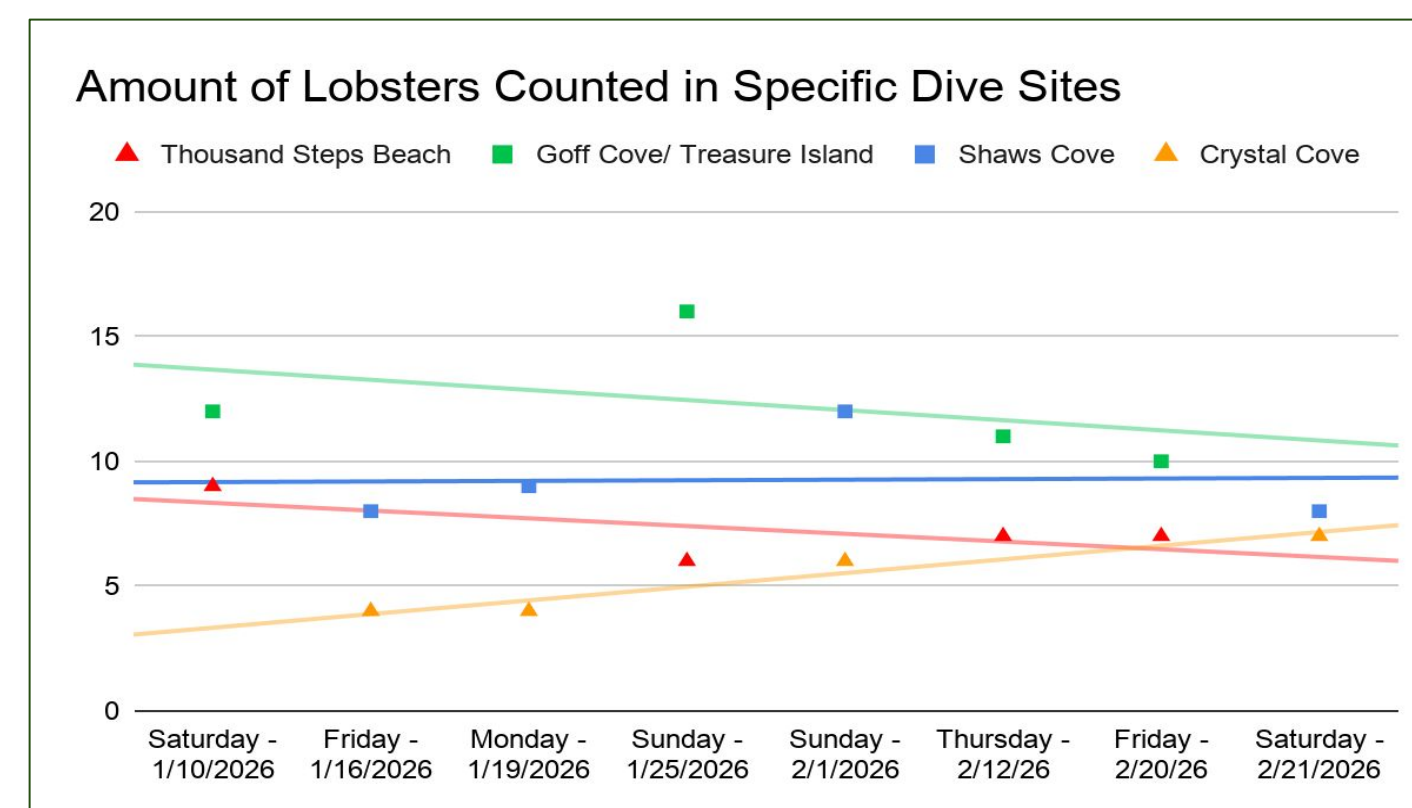


Figure 2: Study Site Map

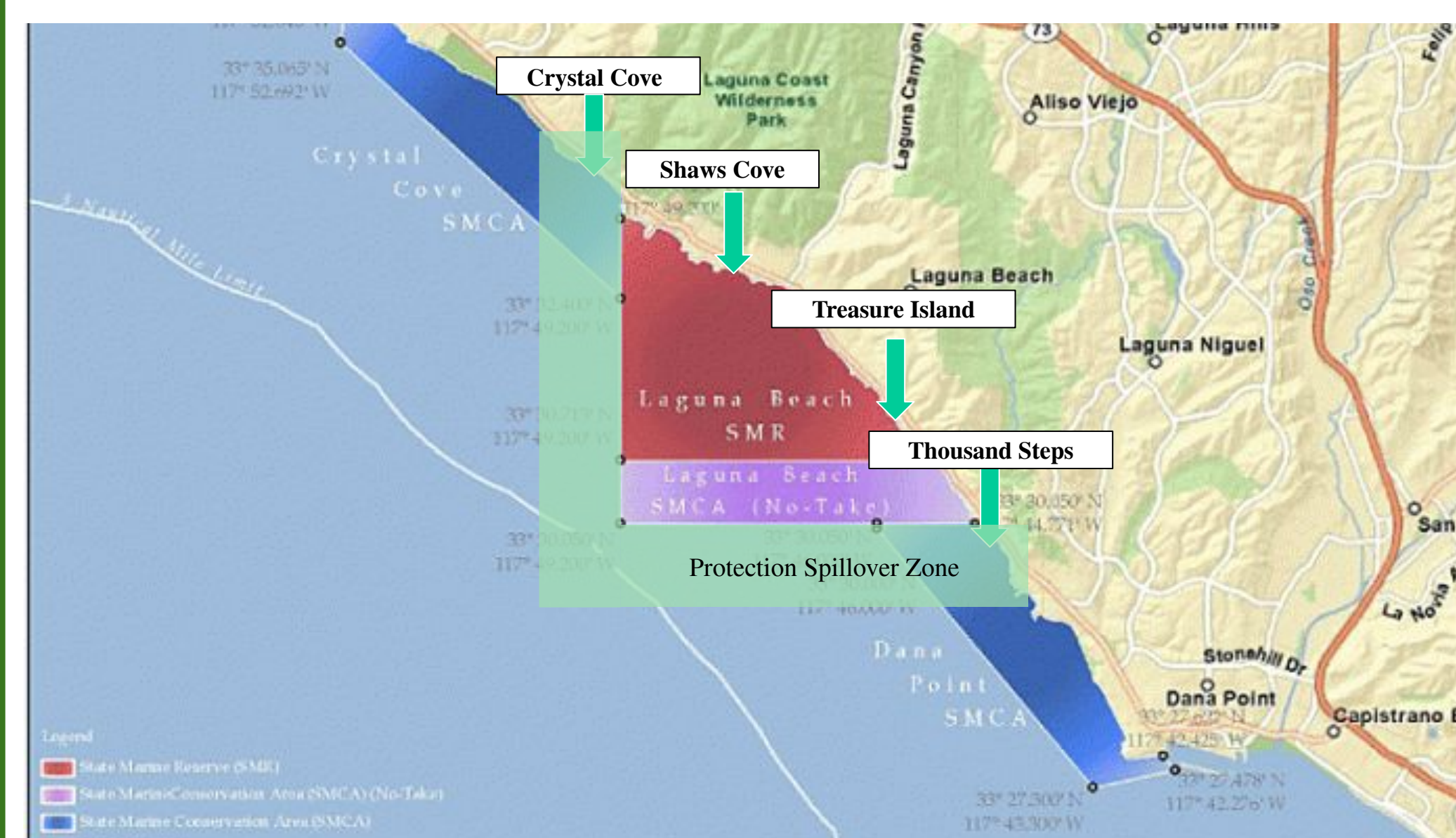
- Green arrows show the locations of my survey sites
- Blue = minimal protection or non-MPA areas
- Red/Pink = no-take MPAs (fully protected)
- Light Green = Protection Spillover Zone (Lenihan, H.S. et al.)

Figure 3: Lobster Counts by Site

- Green and Blue Points/lines are Within MPA
- Red and Orange points/lines are outside MPA
- MPA sites show consistently higher counts
- Supports overall trend of increased abundance in MPAs



Dive Site Locations



DISCUSSION, ANALYSIS, AND EVALUATION

- Results align with previous research showing MPAs increase species abundance and size.
- Higher lobster density inside MPAs suggests reduced fishing pressure allows populations to recover.
- Spillover effects may benefit nearby fisheries as lobsters migrate outside protected zones. (Lenihan, H.S. et al.)
- Limitations:
 - Short study duration (2 months)
 - Environmental variability (weather, visibility)
- Overall, findings support MPAs as an effective conservation strategy.

ACKNOWLEDGEMENTS / REFERENCES

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*****QR CODE TO FULLPAPER:**



CONCLUSIONS, IMPLICATIONS, AND NEXT STEPS

1. **Conclusion:**
 - MPAs significantly increase lobster abundance.
2. **Implications:**
 - MPAs help restore ecosystems and support sustainable fisheries.
 - Lobsters are a strong indicator of overall marine ecosystem health.
 - Spillover effects from MPAs benefit lobster populations outside of MPAs
 - This has positive effects on lobster fisheries & the ecosystems adjacent to MPA
3. **Next Steps:**
 - Extend study over longer time period
 - Include more sites for broader comparison
 - Analyze additional factors (temperature, habitat differences)