LiMPETS  Long-term Monitoring Program and Experiential Training for Students

MPAs & Youth-Based Citizen Science

Amy Dean
Farallones Marine Sanctuary Association
OVERVIEW

Objectives –

Results –

- Beach & rocky intertidal trends
- Teacher and student impact data

Outcomes –

- Scientific outcomes for state MPAs
- Outcomes for students, teachers, community/society
LiMPETS: program objectives

**Education**
- Enhance scientific skills
- Achieve deeper levels of learning
- Increased interest in science & ocean stewardship

**Science**
- Built a robust, long-term dataset
- Inform Sanctuary and university/marine management partners
LiMPETS: MPA baseline objectives

**Education**
- Quantitative assessment of citizen engagement
- Description of educational opportunities
- Description of value of citizen scientist involvement in MPA monitoring

**Science**
- Compilation & description of historic data set (01-11)
- Description / analyses of trends
- Spatial analyses
- Recommendations
OVERVIEW

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♦ Beach & rocky intertidal trends
♦ Teacher and student impact data

Outcomes –

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## DATA SUMMARY: sandy beach

### LiMPETS beach sites & survey effort

<table>
<thead>
<tr>
<th>Beach name</th>
<th>County</th>
<th>Year established</th>
<th>Survey effort: total # surveys completed since site establishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon Creek</td>
<td>Sonoma</td>
<td>2002</td>
<td>19</td>
</tr>
<tr>
<td>Doran Beach</td>
<td>Sonoma</td>
<td>2001</td>
<td>9</td>
</tr>
<tr>
<td>Limantour Beach</td>
<td>Marin</td>
<td>2004</td>
<td>25</td>
</tr>
<tr>
<td>Stinson Beach</td>
<td>Marin</td>
<td>2001</td>
<td>32</td>
</tr>
<tr>
<td>Muir Beach</td>
<td>Marin</td>
<td>2002</td>
<td>55</td>
</tr>
<tr>
<td>Rodeo Beach - North</td>
<td>Marin</td>
<td>2003</td>
<td>19</td>
</tr>
<tr>
<td>Rodeo Beach - South</td>
<td>Marin</td>
<td>2006</td>
<td>13</td>
</tr>
<tr>
<td>Baker Beach</td>
<td>San Francisco</td>
<td>2001</td>
<td>19</td>
</tr>
<tr>
<td><strong>Ocean Beach</strong></td>
<td>San Francisco</td>
<td>2001</td>
<td><strong>252</strong></td>
</tr>
<tr>
<td>Fort Funston</td>
<td>San Francisco</td>
<td>2002</td>
<td>29</td>
</tr>
<tr>
<td>Linda Mar State Beach</td>
<td>San Mateo</td>
<td>2006</td>
<td>36</td>
</tr>
<tr>
<td>Montara Beach (south)</td>
<td>San Mateo</td>
<td>2006</td>
<td>8</td>
</tr>
<tr>
<td>Surfer's Beach</td>
<td>San Mateo</td>
<td>2002</td>
<td>64</td>
</tr>
<tr>
<td>Dunes Beach</td>
<td>San Mateo</td>
<td>2002</td>
<td>10</td>
</tr>
<tr>
<td>Pescadero State Beach</td>
<td>San Mateo</td>
<td>2007</td>
<td>10</td>
</tr>
</tbody>
</table>
Trends in abundance and recruitment of *E. analoga* at Ocean Beach: Fall 01 – Summer 12
DATA SUMMARY: abundance

- High variability
- 10 yr period, 2 spikes in abundance caused by recruitment
- 5 yr period, 06-09, when abundance was near zero.
DATA SUMMARY: spatial trends

Emerita analoga abundance and recruitment at LiMPETS beach sites in the southern portion of the NCC MPA region, Spring 2010 & 2011
DATA SUMMARY: spatial trends

During ‘baseline’ year 2010 (spring):
- large regional pulse of recruitment on beaches south of Pt. Reyes
- small recruitment & low abundance on beaches north & south of Montara SMR

During ‘baseline’ year 2011 (spring):
- Low recruitment on beaches throughout the region
- Populations dominated by adults, abundance lower
- Very low abundance on beaches north & south of Montara SMR
DATA SUMMARY: rocky intertidal

LiMPETS intertidal sites & survey effort

<table>
<thead>
<tr>
<th>Rocky intertidal site:</th>
<th>County:</th>
<th>Year established</th>
<th>Survey effort: total # surveys completed since site establishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duxbury Reef SMCA</td>
<td>Marin</td>
<td>2004</td>
<td>48</td>
</tr>
<tr>
<td>Montara SMR</td>
<td>San Mateo</td>
<td>2006</td>
<td>95</td>
</tr>
<tr>
<td>Pillar Point</td>
<td>San Mateo</td>
<td>2009</td>
<td>21</td>
</tr>
<tr>
<td>Pigeon Point</td>
<td>San Mateo</td>
<td>2006</td>
<td>29</td>
</tr>
</tbody>
</table>
DATA SUMMARY: *Fucus gardneri*

**Montara SMR**

- **2006**: 9.3 (N=18)
- **2007**: 2.7 (N=54)
- **2008**: 5.9 (N=102)
- **2009**: 8.6 (N=37)
- **2010**: 4.4 (N=103)
- **2011**: 1.2 (N=124)
- **2012**: 0.6 (N=46)
- **2013**: 0.0 (N=12)

**Duxbury SMCA**

- **2006**: 3.5 (N=10)
- **2007**: 9.9 (N=81)
- **2008**: 5.3 (N=55)
- **2009**: 13.3 (N=87)
- **2010**: 14.0 (N=130)
- **2011**: 8.9 (N=167)
- **2012**: 3.8 (N=82)
- **2013**: 0.8 (N=63)
DATA SUMMARY: *Pisaster ochraceous*

**Pigeon Point**

**Pillar Point**
DATA SUMMARY: Urchins

Montara SMR

Mean number per m²

<table>
<thead>
<tr>
<th>Year</th>
<th>Value</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>52</td>
<td>35</td>
</tr>
<tr>
<td>2008</td>
<td>35</td>
<td>11</td>
</tr>
<tr>
<td>2009</td>
<td>37</td>
<td>95</td>
</tr>
<tr>
<td>2010</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>2011</td>
<td>17</td>
<td>31</td>
</tr>
<tr>
<td>2012</td>
<td>9</td>
<td>20</td>
</tr>
</tbody>
</table>
DATA SUMMARY: Owl limpets

Montara SMR

Pigeon Point
DATA SUMMARY: in decline

Rockweed (*Fucus gardneri*):
- recent declines to near absence in 2013 at both Montara & Duxbury

Sea star (*Pisaster ochraceous*):
- 5-yr decline at Pigeon Pt

Urchins (*S. purpuratus*):
- 6-yr decline at Montara SMR

Owl limpets (*Lottia gigantea*):
- similar trends inside & outside protected areas
- larger individuals and greater density inside SMR
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LiMPETS Long-term Monitoring Program and Experiential Training for Students

STUDENT SCIENTISTS ON OUR SANCTUARY SHORES

MPETS Monitoring Sites

Sandy Beach Site

Rocky Intertidal Site

California State Marine Protected Areas
- Marine Reserve
- Marine Conservation Area
- Marine Recreational Managed Area
- Special Closure
- National Marine Sanctuary
- Seaward Limit of State Waters

San Francisco

Pigeon Point

Monterey Bay National Marine Sanctuary

Gulf of the Farallones National Marine Sanctuary

College 10%
Middle School 30%
High School 60%
RESULTS: impact on students

School Affiliation & Student Respondents (n=65) in LiMPETS Longitudinal Study: Year 1, 2012 -2013
When asked 7 months - 1 year after their LiMPETS experiences, the majority of students (53%) feel that their participation in LiMPETS has increased their interest in science.
RESULTS: interest in protecting the ocean

When asked 7 months - 1 year after their LiMPETS experiences, the majority of students (43%) feel that their personal interest in protecting the ocean had increased due to LiMPETS.

Change in Student Interest in Ocean Protection

- **negative change**: 2%
- **neutral**: 51%
- **positive change**: 43%

Less interested in protecting the ocean

No change in my attitude - never been too concerned about ocean protection

No change in my attitude - always been concerned about ocean protection

More interested in protecting the ocean

(43%) feel that their personal interest in protecting the ocean had increased due to LiMPETS.
DATA SUMMARY: student impact

Knowledge:
• > 80% retain scientific knowledge (MPAs, importance of LT monitoring, etc.)

Basic, tougher to quantify stuff:
• Higher level, meaningful way for students to engage

Interest in science / careers:
• Develop and retain interest in science & science careers

Ocean Stewardship:
• Develop personal interests and values around the ocean & stewardship.
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- Outcomes for LiMPETS
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THANK YOU TO...

Our network of dedicated students, teachers, staff, Dr. John Pearse & other science advisors, funders

GFNMS & Sanctuary partners

CalOST & MPA Monitoring Enterprise
STUDENT SCIENTISTS ON OUR SANCTUARY SHORES

LiMPETS is an environmental monitoring and education program for students, educators, and volunteer groups throughout California. Approximately 4,000 teachers and students along the coast of California are involved with the collection of rocky intertidal and sandy beach data as part of the LiMPETS network. Join us—learn the process of science and help to protect our local marine ecosystems.

“Studying shore ecology inside the classroom with books and specimens could never be as interesting or educational!”

— Tom Clark, Tamalpais High School

LIMPETS NEWS

LIMPETS Unveils Long-Term Monitoring Results to the State>
Largest Mole Crab Baby Boom in 10+ Years>
New Rocky Intertidal Field Guide>
More news >