Preliminary Size & Spacing Evaluations
North Central Coast Proposals

Presentation to the North Central Coast Regional Stakeholder Group
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MLPA Goals - Habitats

1. To protect the natural diversity and function of marine ecosystems.
2. To help sustain and restore marine life populations.
3. To improve recreational, educational, and study opportunities in areas with minimal human disturbance.
4. To protect representative and unique marine life habitats.
5. Clear objectives, effective management, adequate enforcement, sound science.
6. To ensure that MPAs are designed and managed as a network.
• Size Guideline #1
  – “For an objective of protecting adult populations, based on adult neighborhood sizes and movement patterns, MPAs should have an **alongshore span of 5-10 km** (3-6 m or 2.5- 5.4 nm) of coastline, and **preferably 10-20 km** (6-12.5 m or 5.4-11 nm). Larger MPAs would be required to fully protect marine birds, mammals, and migratory fish.”

  – From adult fish movement ranges
• Size Guideline #2
  “For an objective of protecting the diversity of species that live at different depths and to accommodate the movement of individuals to and from shallow nursery or spawning grounds to adult habitats offshore, MPAs should extend from the intertidal zone to deep waters offshore.”

3 miles offshore
Size Analysis Methods

- Measure individual MPA lengths and area

- Combine contiguous MPAs into single MPA complexes

- Consider level of protection

- Tabulate MPA lengths and areas relative to minimum & preferred guidelines
Better assessment of the value of different sizes and spacing

<table>
<thead>
<tr>
<th>Spacing (km)</th>
<th>Size (km)</th>
<th>Coastline In reserves (%)</th>
<th>Coastline persistent at peak (%)</th>
<th>Maximum larval dispersal that leads to persistence (with no adult movement) (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>5</td>
<td>4.8</td>
<td>6.5</td>
<td>6</td>
</tr>
<tr>
<td>100</td>
<td>10</td>
<td>9.1</td>
<td>12.7</td>
<td>12</td>
</tr>
<tr>
<td>100</td>
<td>20</td>
<td>16.7</td>
<td>23.5</td>
<td>28</td>
</tr>
<tr>
<td>50</td>
<td>5</td>
<td>9.1</td>
<td>12.4</td>
<td>6</td>
</tr>
<tr>
<td>50</td>
<td>10</td>
<td>16.7</td>
<td>23.3</td>
<td>14</td>
</tr>
<tr>
<td>50</td>
<td>20</td>
<td>28.6</td>
<td>100</td>
<td>∞</td>
</tr>
</tbody>
</table>
MPA Cluster Sizes
(Very High Protection)

Below Minimum
At Minimum
Preferable Range

Size (sq. miles)

94

Pkg 0
MPA Cluster Sizes (High Protection)

Below Minimum

At Minimum

Preferable Range

Size (sq. miles)

94
MPA Cluster Sizes
(Moderately-High Protection)

Below Minimum | At Minimum | Preferable Range
---|---|---
D | C | B

Below Minimum

At Minimum

Preferable Range

Size (sq. miles)

94
• Spacing Guideline
  – “For an objective of facilitating dispersal of important bottom-dwelling fish and invertebrate groups among MPAs, based on currently known scales of larval dispersal, MPAs should be placed within 50-100 km (31-62 m or 27-54 nm) of each other.”
Source of the Spacing Guideline

- **Seaweeds**
- **Invertebrates**
- **Fishes**

Estimated Dispersal Distance

- 1 m
- 10 m
- 100 m
- 1 km
- 10 km
- 100 km
- 1000 km
Spacing Analysis Methods

- Characterize each MPA by the habitats included

- For each habitat, measure the gaps between adjacent, high protection MPAs
How Much Habitat is Needed?

Square KM (or linear distance along coastline)

Estimated proportion of species
Capturing Depth Gradient is Important

This is why linear distances are useful for shoreline and nearshore habitats – only if entire depth gradient is included (0-30m)
Results

Soft Bottom (Trawl Data)

Intertidal (PISCO data)
# Habitat representation

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Representation needed to encompass 90% of biodiversity</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocky Intertidal</td>
<td>~0.6 linear miles</td>
<td>PISCO Biodiversity</td>
</tr>
<tr>
<td>Shallow Rocky Reefs/Kelp Forests (0-30 M)</td>
<td>~1.1 linear miles</td>
<td>PISCO Subtidal</td>
</tr>
<tr>
<td>Deep Rocky Reefs (30-100 M)</td>
<td>~0.2 square miles</td>
<td>Starr surveys</td>
</tr>
<tr>
<td>Sandy Habitat (30-100 M)</td>
<td>~10 square miles</td>
<td>NMFS triennial trawl surveys 1977-2007</td>
</tr>
<tr>
<td>Sandy Habitat (0-30 M)</td>
<td>~1.1 linear miles</td>
<td>Based on shallow rocky reefs</td>
</tr>
<tr>
<td>Sandy Beaches</td>
<td>~ 1 linear mile</td>
<td></td>
</tr>
</tbody>
</table>
Maximum Gaps
(Very High Protection)

SAT guideline for Maximum spacing

- Sandy Beach
- Rocky Intertidal
- Surfgrass/Eelgrass
- Sand: 0 - 30m
- Sand: 30 - 100m
- Rock: 0 - 30
- Rock: 30 - 100

Miles

Pkg 0  EA  EB  JA  JB  TA  TB  A  B  C  D
Maximum Gaps
(Mod-High Protection)

- Sandy Beach
- Rocky Intertidal
- Surfgrass/Eelgrass
- Sand: 0 - 30m
- Sand: 30 - 100m
- Rock: 0 - 30
- Rock: 30 - 100

SAT guideline for Maximum spacing

Miles

Pkg 0  EA  EB  JA  JB  TA  TB  A  B  C  D
MPA Replication Guidelines

• Replication Guideline
  – “‘Key’ marine habitats should be replicated in multiple MPAs across large environmental and geographic gradients to protect the greater diversity of species and communities that occur across such gradients, and to protect species from local year-to-year fluctuations in larval production and recruitment.”

  – “For an objective of providing analytical power for management comparisons and to buffer against catastrophic loss of an MPA, at least three to five replicate MPAs should be designed for each habitat type within a biogeographical region.”
Replication
(Very High Protection)

SAT guideline for replication
Replication
(High Protection)

SAT guideline for replication

O E AE BJ AJ AT B A B C D

Sandy or gravel Beaches
Soft 0 - 30m
Hard 0 - 30m
Rocky intertidal and cliff
Soft 30 - 100m
Hard 30 - 100m
Surfgrass
Average Kelp

# of MPAs

0 1 2 3 4 5 6 7 8
O EA EB JA JB TA TB A B C D

High Protection
Size, Spacing, and Replication Evaluation Summary

Few of the proposals meet size, spacing, or replication guidelines at the very high and high levels of protection.

Many more proposals meet size, spacing and replication guidelines at the moderately-high level of protection.

Unclear whether authors of proposals realized that habitats, not MPAs, are evaluated for spacing and replication.

Modifications that meet size guidelines can increase the number of habitats meeting spacing and replication guidelines.