Reducing the Risk of Vessel Strikes to Endangered Whales in the Santa Barbara Channel

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Photo Credit: John Calambokidis, Cascadia Research
Whales and Ships Often Co-Occur

Photo Credit: John Calambokidis, Cascadia Research Collective
Current Management Strategy
BE ADVISED
KEEP A SHARP LOOKOUT FOR LARGE WHALES

SOUTHERN CALIFORNIA - WHALES -
POINT CONCEPTION TO POINT DUME

Large whales, including Blue whales, Humpback whales, and Fin whales, have recently been sighted in the Santa Barbara Channel and Traffic Separation Scheme between Point Conception and Point Dume. These large whales are listed as endangered species and are protected under federal law. Mariners are advised to keep a sharp lookout for these large whales. NOAA strongly recommends that vessels 300 gross registered tons or larger transiting the traffic separation scheme do so at speeds not in excess of 10 knots. Please report any collisions with whales or any observed live, injured, or dead whales, including time and position, to NOAA at 877-SOS-WHALES (877-767-9425) or the U. S. Coast Guard.

Charts: 18720 18721 18725
Vessel Traffic in the Region

June 2009

September 2009
Sanctuary observations of blue, fin and humpback whales from 1997-2010
Management Options 1 & 2: Year-Round and Seasonal Speed Reduction

Speed reduced to 10 knots
Management Option 3:
Narrow Vessel Traffic Lanes

Narrow separation between traffic lanes by 0.65 nautical miles
Decrease transit distance by 0.07 nautical miles
Management Option 4:
Shift Vessel Traffic Lanes South

Increase transit distance by 13.8 nautical miles
Evaluating Management Options

- Change in Risk
- Change in Cost

Management Options
Analyzing Whale Distribution

Sanctuary observations of blue, fin and humpback whales from 1997-2010
Representative Vessel Traffic in the Region

Vessel traffic before low-sulfur fuel regulation
Determining Relative Risk of a Lethal Strike

- Relative Probability of a Whale
- Relative Probability of a Ship
- Relative Probability of Encounter
- Ship Speed

Relative Risk of Lethal Strike
Change in Relative Risk of a Lethal Strike
Percent Change in Relative Risk of a Lethal Strike

- Year-Round Speed Reduction: -64.7
- Seasonal Speed Reduction: -32.6
- Narrow Lanes: 5.5
- Shift Lanes South: -62.8

Management Option:
- Linear Predictive Model
- Average Distribution Model
Evaluating Management Options

Change in Risk

Change in Cost

Management Options
Costs of Management to the Shipping Industry
Costs of Management to the Shipping Industry

\[
\text{Change in Total Cost} = \text{Change in Voyage Cost} + \text{Change in Operating Cost} + \text{Cost of Delay from Navy Operations} + \text{Alpha}
\]

*Change* in an individual ship’s costs resulting from management of vessel strikes
Change in Total Cost = Change in Voyage Cost + Change in Operating Cost + Cost of Delay from Navy Operations + Alpha

Change in fuel cost

Change in lubricant cost
Costs of Management to the Shipping Industry

Change in Total Cost = Change in Voyage Cost + Change in Operating Cost + Cost of Delay from Navy Operations + Alpha

Crew overtime cost

Repair and maintenance cost
Costs of Management to the Shipping Industry

\[ \text{Change in Total Cost} = \text{Change in Voyage Cost} + \text{Change in Operating Cost} + \text{Cost of Delay from Navy Operations} + \text{Alpha} \]
Cost of Delay From Navy Operations

Point Mugu
Sea Range
Costs of Management to the Shipping Industry

\[
\text{Change in Total Cost} = \text{Change in Voyage Cost} + \text{Change in Operating Cost} + \text{Cost of Delay from Navy Operations} + \text{Alpha}
\]

Additional costs

*Improves accuracy of cost estimate*
Costs of Management to the Shipping Industry

\[
\text{Change in Total Cost} = \text{Change in Voyage Cost} + \text{Change in Operating Cost} + \text{Cost of Delay from Navy Operations} + \text{Alpha}
\]

*Operator behavior: Making up time elsewhere*
Anticipated Annual Cost of Management to the Shipping Industry

<table>
<thead>
<tr>
<th>Management Option</th>
<th>Annual Cost to the Shipping Industry ($Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year-Round Speed Reduction</td>
<td>$2.44</td>
</tr>
<tr>
<td>Seasonal Speed Reduction</td>
<td>$1.07</td>
</tr>
<tr>
<td>Narrow Lanes</td>
<td>-$0.06</td>
</tr>
<tr>
<td>Shift Lanes South</td>
<td>$19.69</td>
</tr>
</tbody>
</table>
Cost to the Shipping Industry and Percent Change in Risk of Strike for Management Options
Cost to the Shipping Industry and Percent Change in Risk of Strike for Management Options

- Shift Lanes South
- Narrow Lanes
- Seasonal Speed Reduction
- Year-Round Speed Reduction

Annual Cost to the Shipping Industry (Millions)

Percent Reduction in Risk of Strike

Linear Model
No Action
Cost to the Shipping Industry and Percent Change in Risk of Strike for Management Options

- **Shift Lanes South**: 
  - **Annual Cost to the Shipping Industry**: $25 million
  - **Percent Reduction in Risk of Strike**:
    - **Average Model**: 20%
    - **Linear Model**: 20%
    - **No Action**: 0%

- **Narrow Lanes**: 
  - **Annual Cost to the Shipping Industry**: $5 million
  - **Percent Reduction in Risk of Strike**:
    - **Average Model**: 10%
    - **Linear Model**: 10%
    - **No Action**: 0%

- **Seasonal Speed Reduction**: 
  - **Annual Cost to the Shipping Industry**: $0 million
  - **Percent Reduction in Risk of Strike**:
    - **Average Model**: 5%
    - **Linear Model**: 5%
    - **No Action**: 0%

- **Year-Round Speed Reduction**: 
  - **Annual Cost to the Shipping Industry**: $0 million
  - **Percent Reduction in Risk of Strike**:
    - **Average Model**: 10%
    - **Linear Model**: 10%
    - **No Action**: 0%
Project Conclusions

Photo Credit: NOAA Photo Library
Recommendations

Risk Analysis
• Region-wide, systematic whale observation data
• Explore use of other variables for predicting whale distribution
• Robust set of AIS data
• Consider spatial resolution

Economic Analysis
• Modifications to existing model:
  o Management options being considered
  o Ship traffic in this region

Photo Credit: John Calambokidis, Cascadia Research
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*Photo Credit: John Calambokidis, Cascadia Research Collective*
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Final report available online at: http://fiesta.bren.ucsb.edu/~whales/

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