NMFS Report
SWFSC Activities
Coastal Pelagic Species

Gerard DiNardo
Dale Sweetnam
Presentation Outline

1. CPS Stock Assessments
2. Research Survey Activities/Results
   • 2017 CPS Survey, 2018 Joint CPS/MMTD Survey
   • Biomass Reports
3. Inshore Biomass Estimation
4. Recent Scientific Publications
5. Future Activities
Northern Stock Pacific Sardine

Changes to the Update Model

• Landings for 2017 updated using final data;
• Landings for 2018 were appended using preliminary data;
• Habitat model used to ascribe SCA and ENS landings to NSP;
• Revised biomass estimate and age composition from the summer 2017 AT survey;
• New biomass estimate and age composition from the summer 2018 AT survey;
• One additional recruitment deviation
Correction to Summer 2017 AT Biomass Estimate

• 2018 sardine assessment update (Hill et al. 2018) included a point estimate of biomass (36,644 mt; CV=30.1%) and age composition from the summer 2017 AT survey.
• During the course of preparing a NOAA Technical Memorandum regarding that survey (Zwolinski et al. in press), analysts discovered an error in the depth range (10-250 m) used for calculation of the integrated CPS backscatter. By extending beyond the typical depth-range of the CPS, these vertically integrated values included backscatter from non-CPS species with swimbladders (e.g., rockfishes and hake).
• The appropriate depth/potential habitat filters have since been applied, and the revised 2017 biomass estimate (24,349 mt; CV=37%) and age composition were included in this update.
### Summer 2018 AT Survey

#### Northern Sardine Biomass Density

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Transect</th>
<th>Trawls</th>
<th>Biomass (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area (nmi²)</td>
<td>Number</td>
<td>Distance (nmi)</td>
</tr>
<tr>
<td>2</td>
<td>6,201</td>
<td>12</td>
<td>657</td>
</tr>
<tr>
<td>3</td>
<td>17,240</td>
<td>37</td>
<td>1,778</td>
</tr>
<tr>
<td>4</td>
<td>335</td>
<td>19</td>
<td>213</td>
</tr>
<tr>
<td>All</td>
<td>23,776</td>
<td>68</td>
<td>2,648</td>
</tr>
</tbody>
</table>

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**Graphs:**
- Standard length frequency distribution for 2017 and 2018.
- Abundance (million) by age for 2017 and 2018.
Northern Sardine Stock Biomass Time Series & Status

July 2019 $B_{1+}=27,547$ mt

Projected 2019 Biomass < Minimum Stock Size Threshold (MSST)
# Summer 2018 AT Survey

## Southern Sardine Biomass Density

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<tr>
<td>Number</td>
<td>Area (nmi²)</td>
<td>Number</td>
<td>Distance (nmi)</td>
</tr>
<tr>
<td>1</td>
<td>9,017</td>
<td>15</td>
<td>918</td>
</tr>
<tr>
<td>All</td>
<td>9,017</td>
<td>15</td>
<td>918</td>
</tr>
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</table>
Future Improvements to the AT Survey and 2020 Benchmark Northern Sardine Stock Assessment Model

- Further efforts for inshore sampling (saildrone, aerial, industry, etc...);
- Target strength (TS) assumptions/improvements:
  - New herring TS and adjustments to all sardine estimates since 2006;
  - TS testing in SWFSC technology tank;
- Informative prior on survey catchability ($q$) in SS;
- Meta-analysis and informative prior on $M$;
- Further explore survey selectivity assumptions;
- Explore use of environmental indices to inform recent recruitment.
Research Survey Activities/Results
CPS Proportion by Survey

Summer 2015
Summer 2016
Spring 2017
Summer 2017
Summer 2018
### Distribution, Biomass, & Demography Reports

#### CONTENTS
- Survey Design
- Acoustic Sampling
- Oceanographic Sampling
- Trawl Sampling
- Data Processing/Analysis
- Distribution, Demography, and Biomass

#### Biomass (t) and CV (%)

<table>
<thead>
<tr>
<th></th>
<th>NS Pacific Sardine</th>
<th>SS Pacific Sardine</th>
<th>NS Northern Anchovy</th>
<th>CS Northern Anchovy</th>
<th>Pacific Mackerel</th>
<th>Jack Mackerel</th>
<th>Pacific Herring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summer 2017</strong></td>
<td>14,103 (30)</td>
<td>22,709 (64)</td>
<td>22,709 (64)</td>
<td>153,460 (45)</td>
<td>41,139 (26)</td>
<td>128,313 (22)</td>
<td>63,418 (31)</td>
</tr>
<tr>
<td><strong>Summer 2018</strong></td>
<td>25,148 (67)</td>
<td>33,093 (44)</td>
<td>24,419 (38)</td>
<td>723,826 (17)</td>
<td>31,211 (22)</td>
<td>202,471 (17)</td>
<td>79,053 (37)</td>
</tr>
</tbody>
</table>

* Incomplete Sampling
Sardine Lengths and Biomass
Anchovy Lengths and Biomass
Inshore Biomass Estimation

Why Do

• 2018 ATM Methodology Review Recommendation
• Viable CPS Habitat
• Industry Observations & Fishing Operations
• Scientist Observations (Aerial & Direct)

No one disputes observations – but what is the proportion relative to total estimated biomass; $$
Summer 2017 Nearshore Measurements

Northern stock anchovy
Lasker – 22,607 t (CV=64%)
Lisa Marie – 102 t (CV=34%)
0.5% more anchovy nearshore
### Central Stock of Northern Anchovy

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<tr>
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<td>Number</td>
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<td>Number Distance (nmi)</td>
</tr>
<tr>
<td>1</td>
<td>815</td>
<td>12</td>
<td>42</td>
</tr>
<tr>
<td>All</td>
<td>815</td>
<td>12</td>
<td>42</td>
</tr>
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</table>
Summer 2018 Nearshore Measurements

Central stock anchovy
Lasker – 716,887 t (CV~17%)
Saildrone – 6,939 t (CV=71%)
1% more anchovy nearshore
Summer ATM Survey

2017 – Lasker only to 50m depth
2018 – Lasker and Saildrone to approximately 30m depth, Saildrone to approximately 20m depth
Nearshore Extrapolations

1. Distances were calculated for the projections of each transect to the 5-m isobath.
2. The biomass densities along these unsampled transect extensions were assigned the values measured along the sampled transects, equal distances from the eastern ends of the transects.
The biomass density data used to calculate the abundance in the nearshore strata are taken from an interval in the nearest acoustic transects, with a length equal to the distance between the transect endpoint and the 5-m isobath.

The intervals in red have the same length as the distance to the 5-m isobath – their density is assumed to reflect the near-shore density.
Nearshore Extrapolations results

The extrapolated values depend on the nearest measurements (acoustic and trawl samples) to the unsampled areas, which primarily depend on the stock distributions at the time of the survey.

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<tr>
<td></td>
<td>Biomass (t)</td>
<td>CV (%)</td>
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<td>Biomass (t)</td>
</tr>
<tr>
<td>Summer 2017</td>
<td>142 (57)</td>
<td></td>
<td>19 (42)</td>
<td></td>
<td>45,446 (28)</td>
<td>548 (43)</td>
<td>971 (38)</td>
</tr>
<tr>
<td>Summer 2018</td>
<td>308 (86)</td>
<td>1,870 (74)</td>
<td>1,310 (84)</td>
<td>4,110 (56)</td>
<td>1,320 (75)</td>
<td>9,954 (75)</td>
<td>8,449 (52)</td>
</tr>
</tbody>
</table>
Transect Dynamics

SD1024 Repeat of Lasker Transect 34 (~ 8 km), Monterey Bay

4-Day “Repeated” Transect

When and where you sample matters!
Especially important at low population levels.
Recent Scientific Publications

Future Activities

Surveys – 2019

• 2019 Spring CalCOFI survey/Gear Testing: April 3-29 – FSV Reuben Lasker
• 2019 Summer ATM CCES survey: June 13-Sept. 9 (~ 75 days) – FSV Reuben Lasker CPS Acoustic Trawl Survey with unmanned system, Industry, etc.

Data Analyses

• Saildrone Report – utility
• Trawl Selectivity

Workshops

• CPS Fishery-Dependent Monitoring
• CPS Research Coordination
Questions