



**ASSESSMENT OF THE PACIFIC SARDINE  
(*Sardinops sagax caerulea*) POPULATION  
FOR U.S. MANAGEMENT IN 2006**

**by**

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# *Acknowledgments*

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- Washington Department of Fish and Wildlife
- Canada Department of Fisheries and Oceans
- Southwest Fisheries Science Center – La Jolla
- Scripps Institution of Oceanography



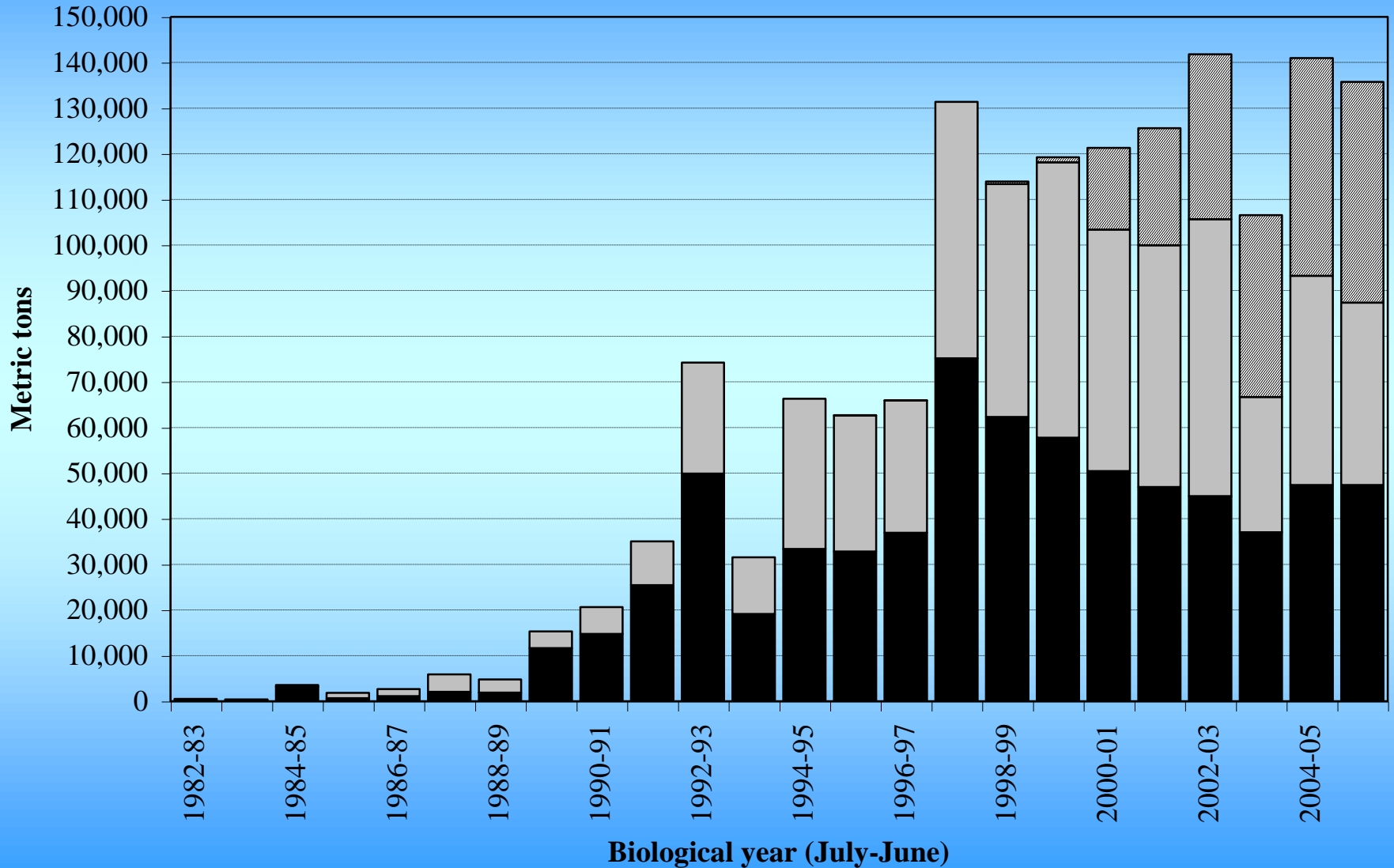
# *2005 Stock Assessment*

## *Data Sources and Changes from 2004*

- **Three Fisheries:**
  - **California, Ensenada (No. Baja), and Pacific NW (OR+WA+Canada)**
    - *New landings and port samples from CA & NW for 2004-05;*
    - *New landings data from Ensenada for Jan 2000 through July 2005.*
- **Two Indices of Abundance (Central & Southern CA):**
  - **Annual egg production surveys (DEPM estimates of SSB)**
    - *New estimate from April 2005 survey;*
  - **Spotter pilot index (pre-adults)**
    - *New So. Cal. data in 2004 & 2005; updated GLM through 2004-05;*
- **Environmental Data:**
  - **SST at Scripps Pier (La Jolla)**
    - *Complete 3-year running average recalculated through June 2005.*

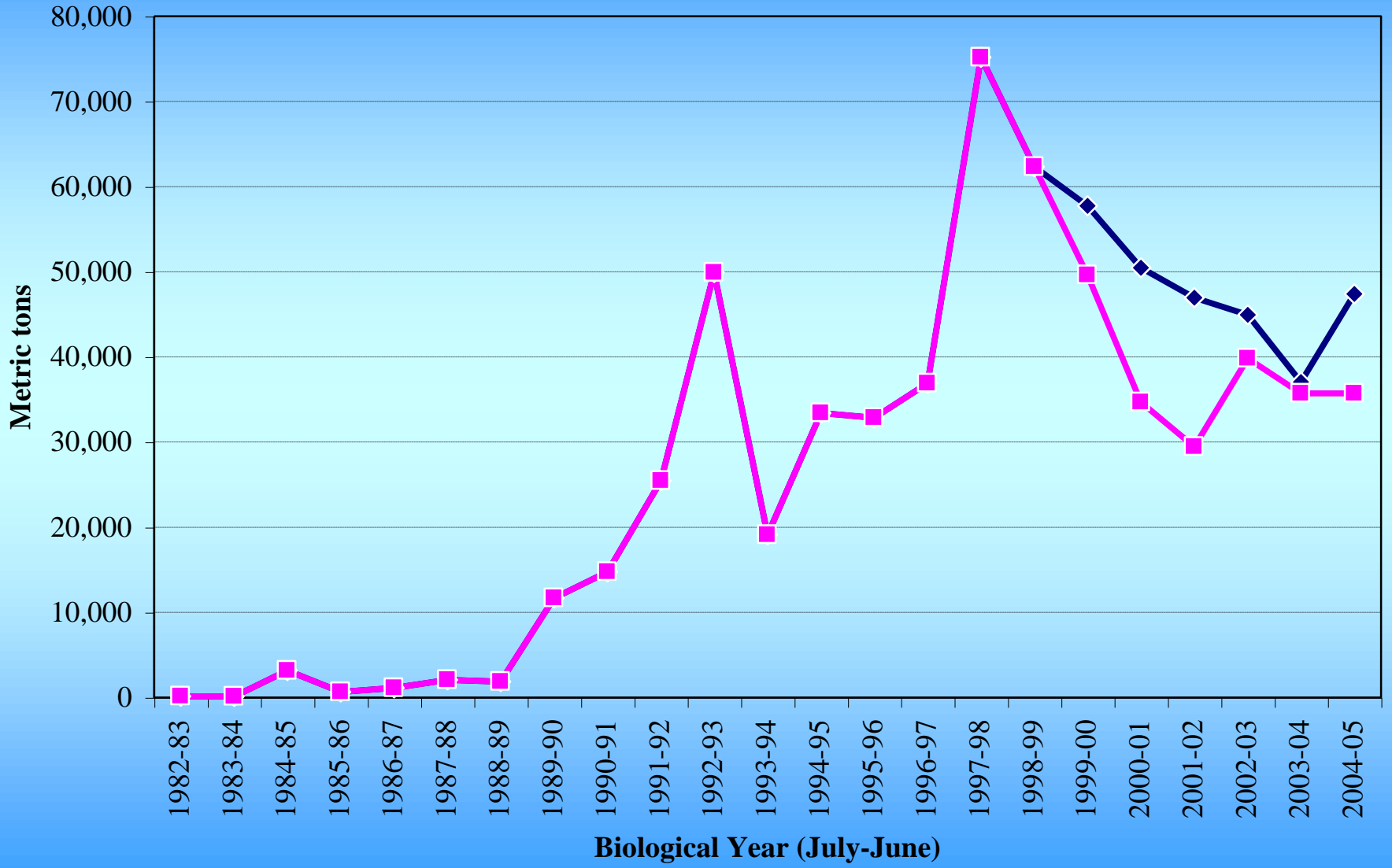
# Landings by Fishery

■ Ensenada (MX) ■ California ■ Pacific Northwest



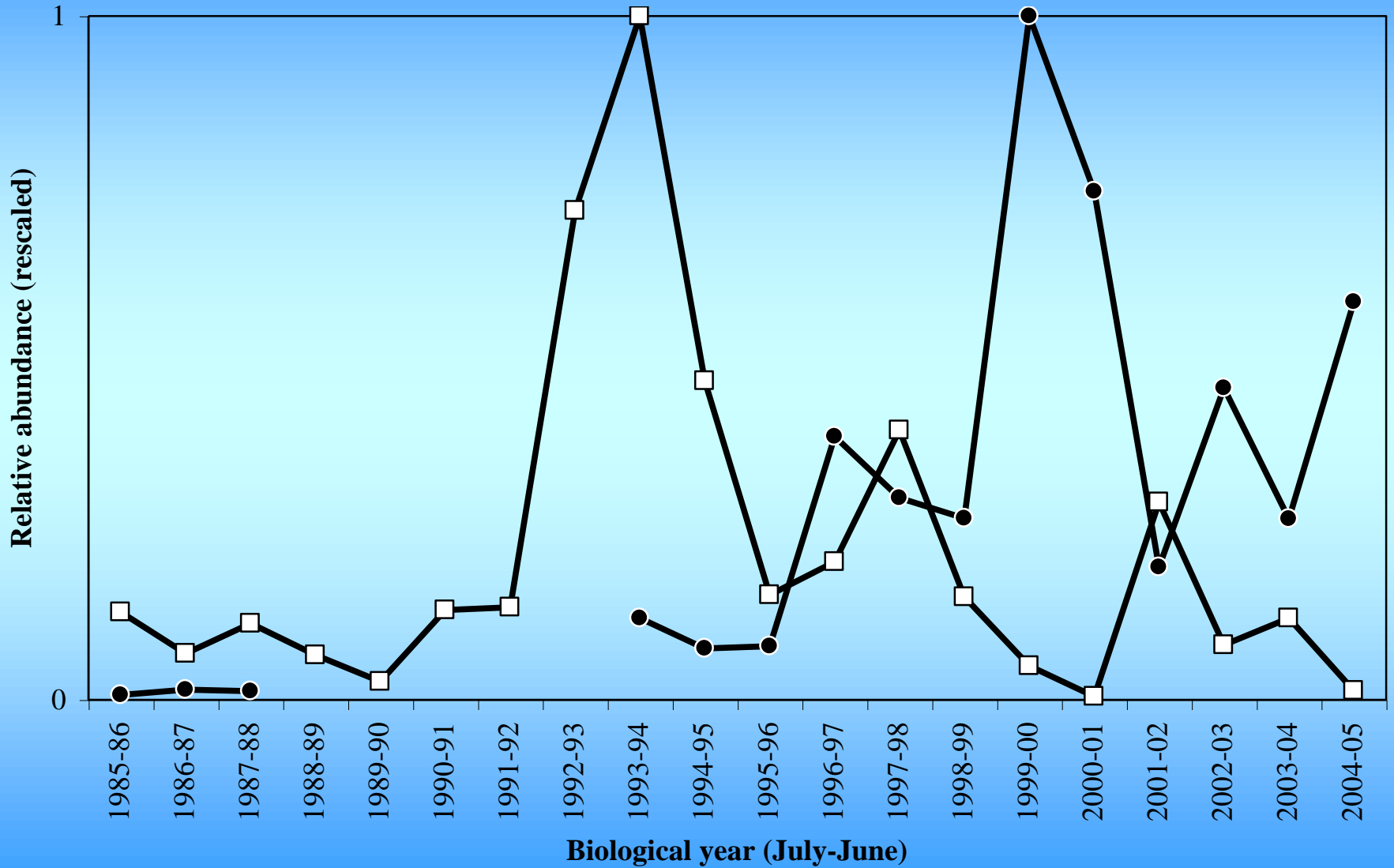
# *New Landings Data - Ensenada*

◆ MX-2005    ■ MX-2004

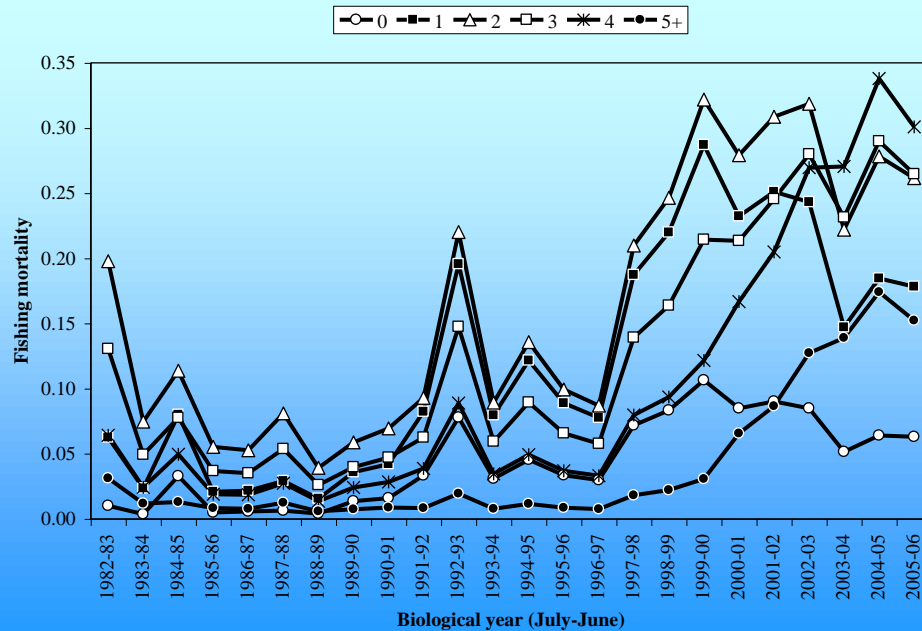
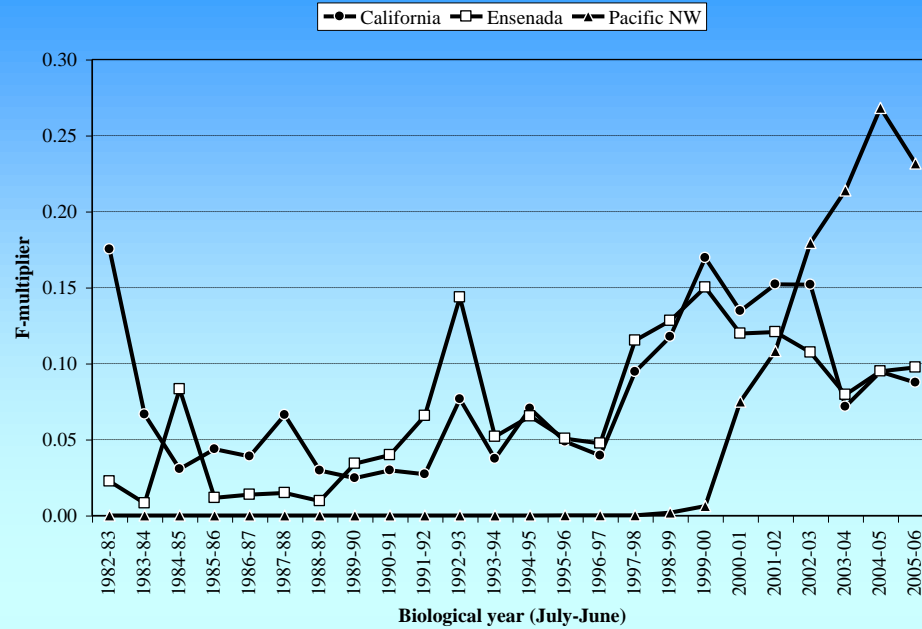


# *Indices of Relative Abundance*

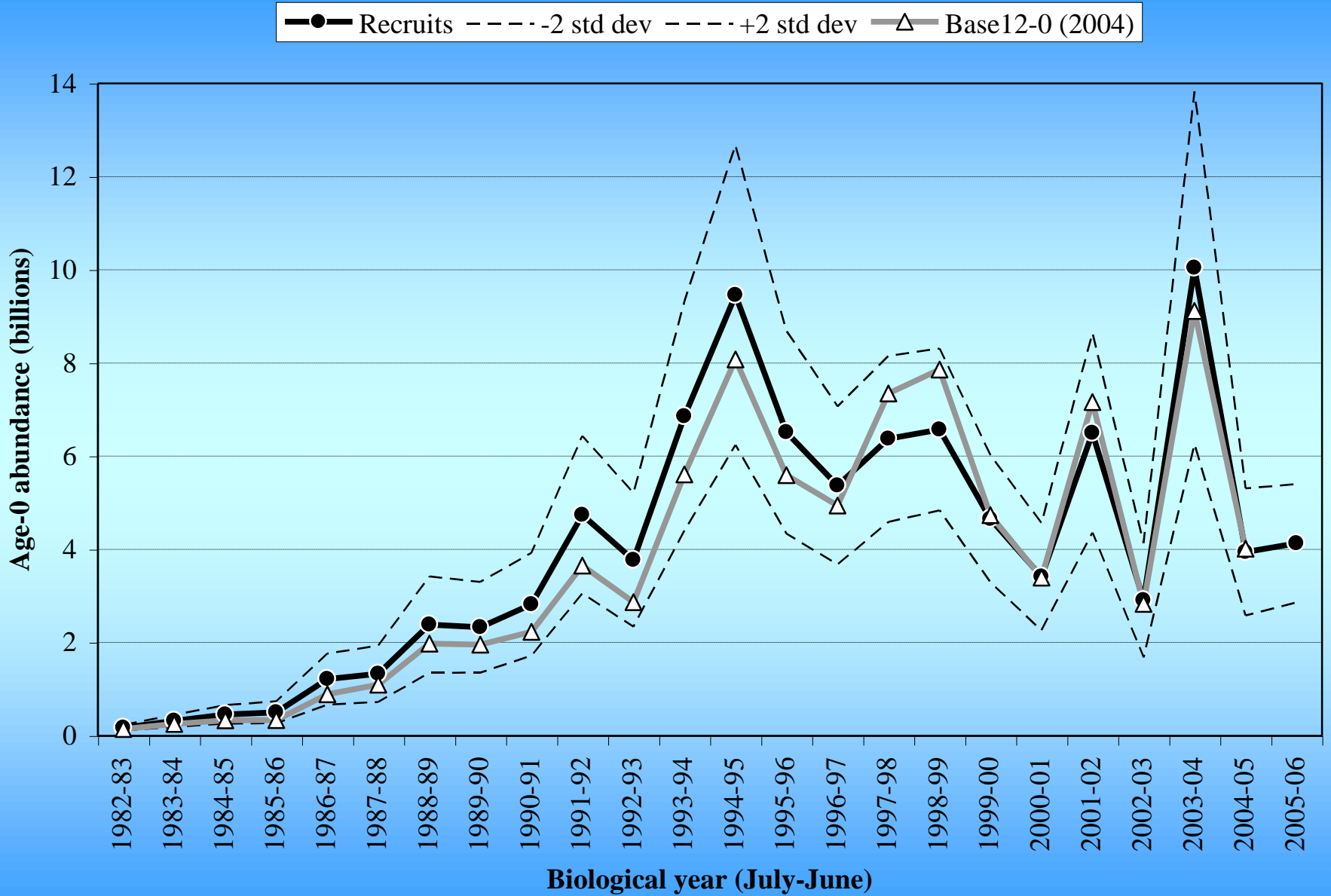
● DEPM (SSB)    □ Aerial Survey (Juveniles)



# Fishing Mortality by Fishery and Age

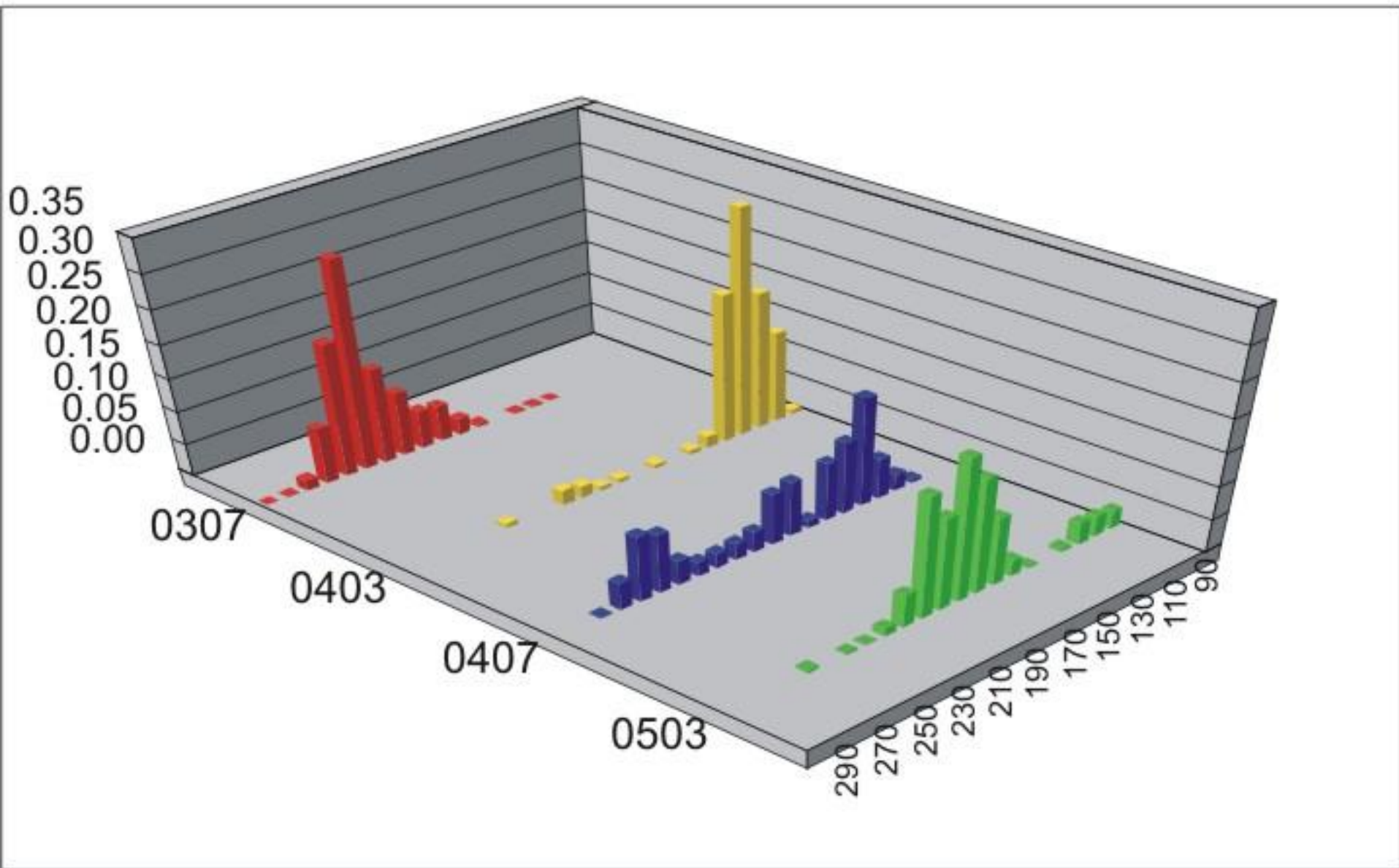


# Recruitment

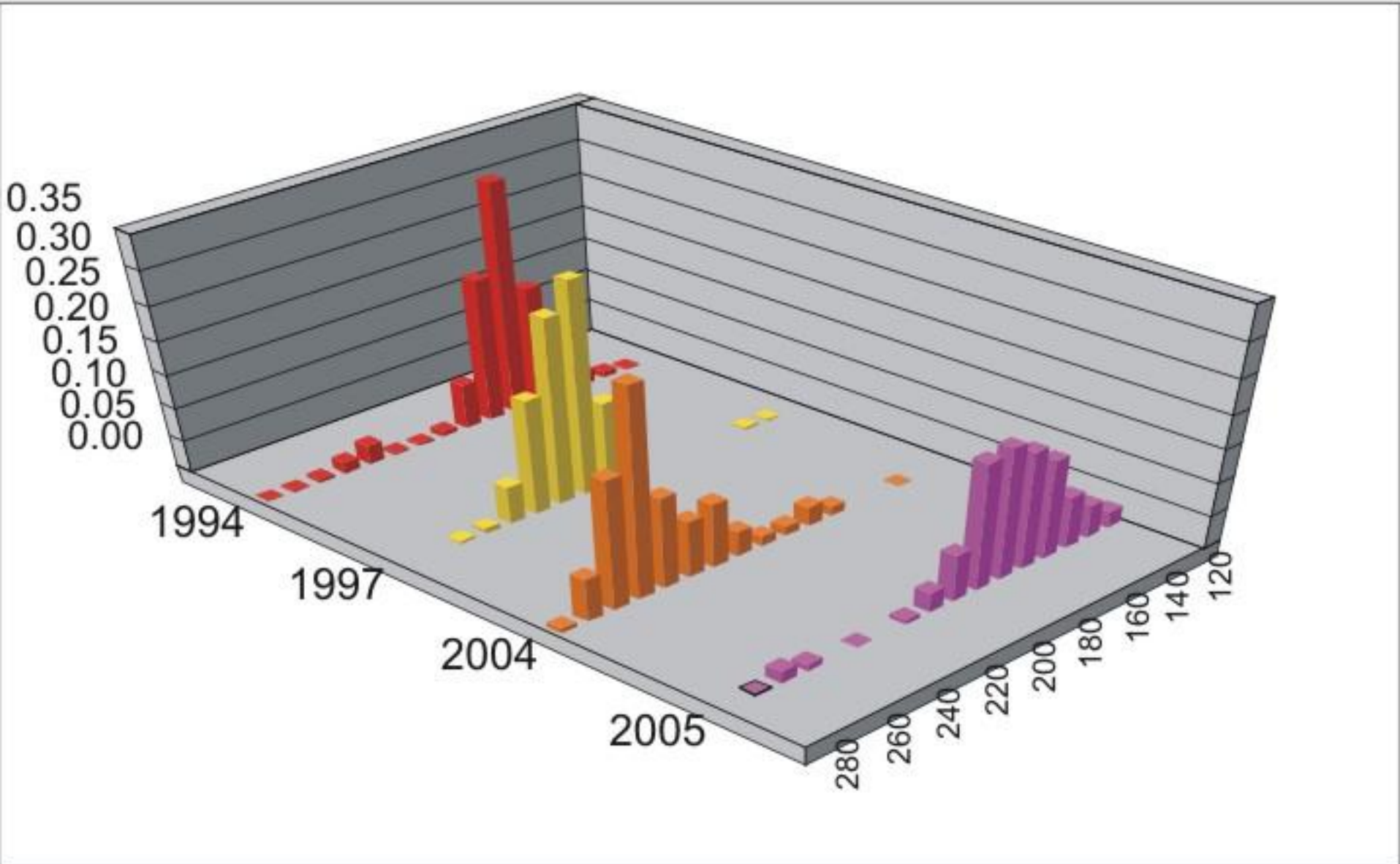




# *Sardine Lengths: Pacific NW Surveys*

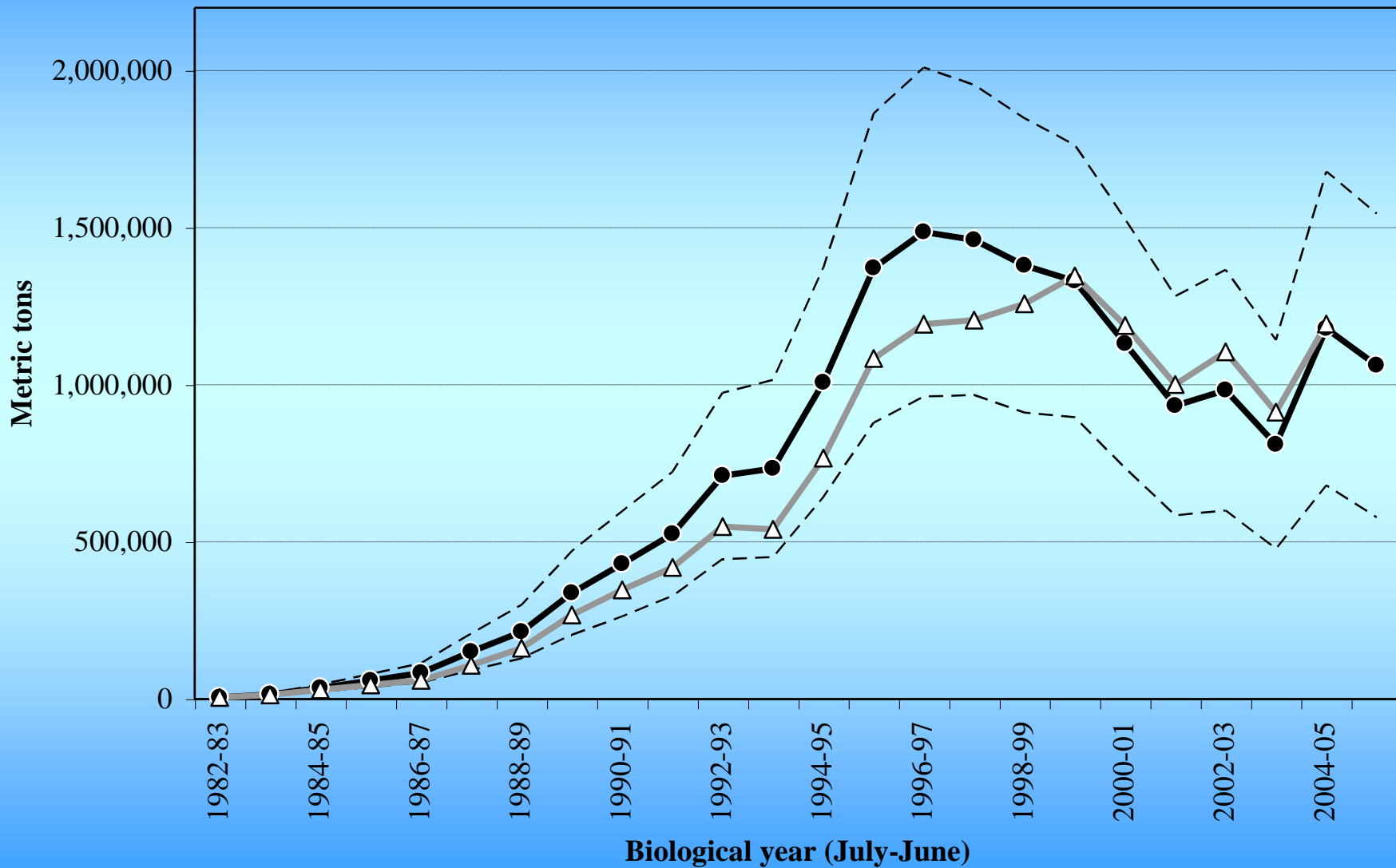


# *Sardine Lengths: California Surveys*



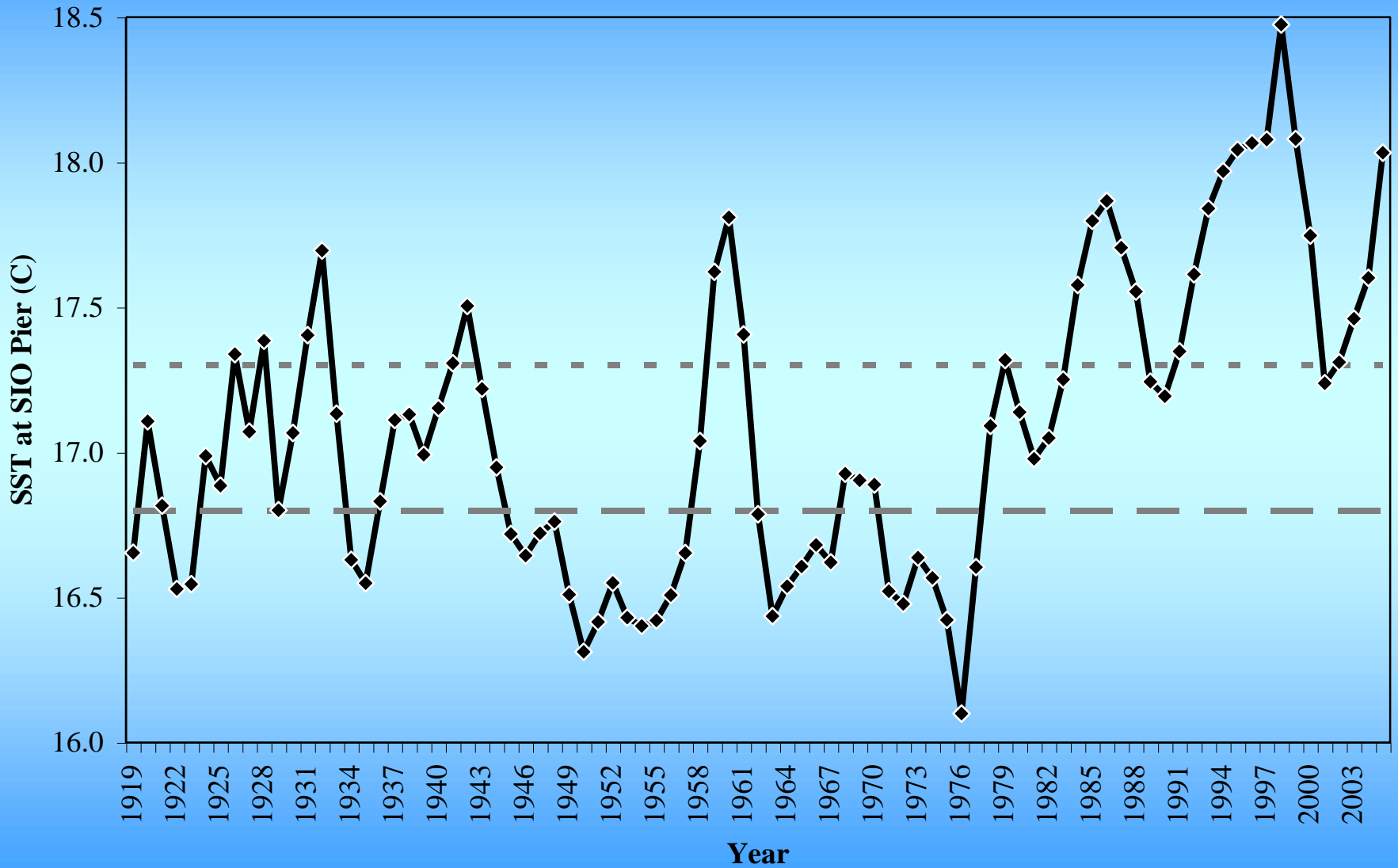
# *Stock Biomass (age 1+)*

—●— Age 1+ Biomass    - - - -2 std dev    - - - +2 std dev    —△— Base 12-0 (2004)



# Sea Surface Temperature at SIO Pier

—◆— SST at SIO Pier — Fmsy = 5% - - Fmsy = 15%



# *U.S. Harvest Guideline for 2006*

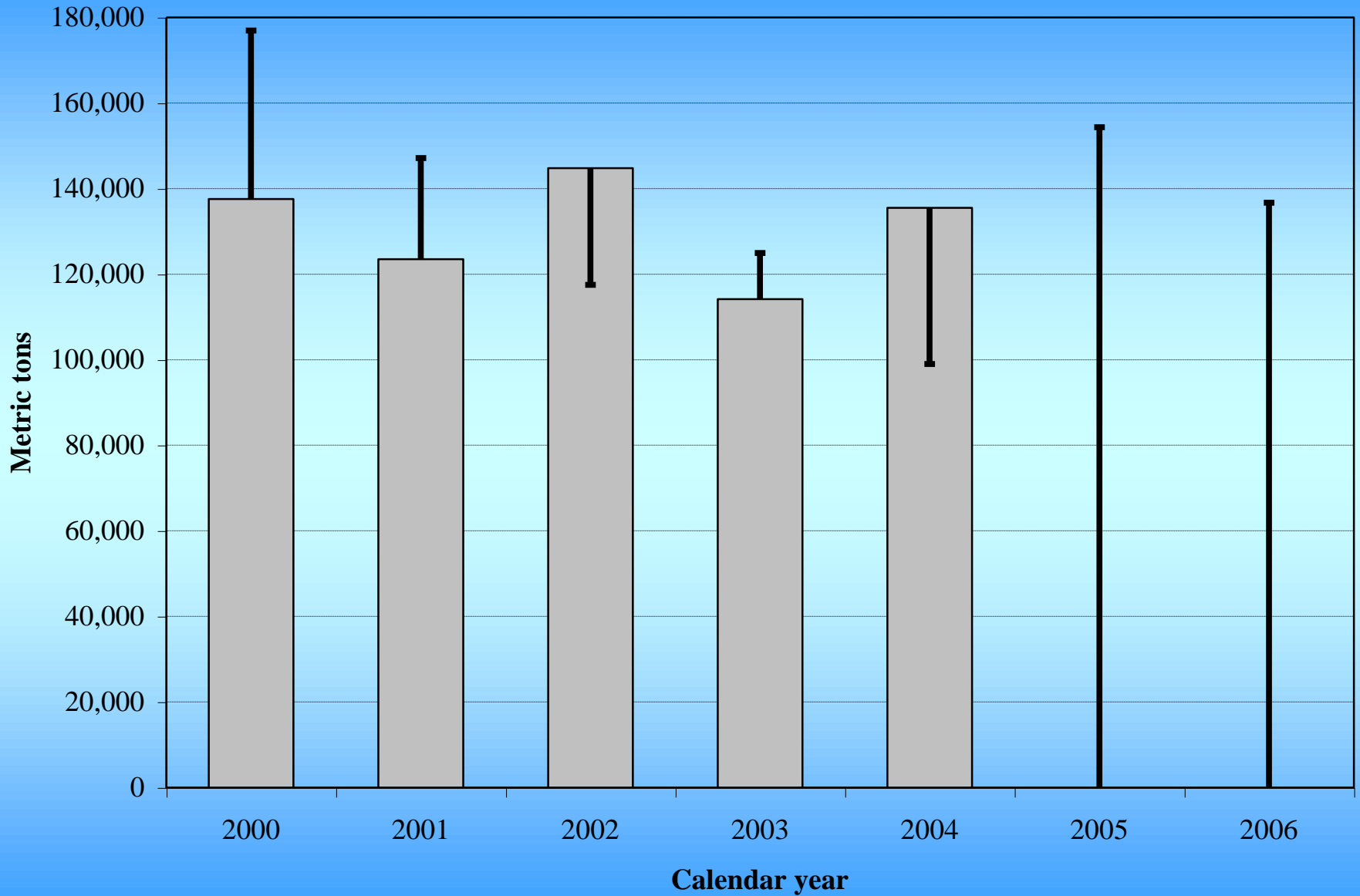
$$\text{HG}_{2006} = (\text{Biomass}_{\text{July } 2005} - \text{Cutoff}) \cdot \text{Fraction} \cdot \text{Distribution}$$

$$\text{HG}_{2006} = (1,061,391 - 150,000) \cdot 0.15 \cdot 0.87$$

$$\text{HG}_{2006} = \mathbf{118,937 \text{ mt}}$$

- 13% lower than 2005 HG
- 22,049 mt higher than peak U.S. harvest (2002)

# *Coast-wide Harvest & Retrospective HGs*





# *Principal Assessment Limitations:*

- Consistent fishery-independent surveys have been limited to waters off central & southern California. A synoptic fishery-independent index of abundance is still needed (Baja California to British Columbia);
- Biological sampling of adults has been sparse in offshore waters outside the range of the U.S., Mexican, and Canadian fisheries. Population-wide life history characteristics (growth and maturation) need refinement.
- Stock structure, migration rates, and distribution are not well understood, but should be accounted for in both the population assessment and harvest control rule.

# *Improving Coastwide Sardine Data and Stock Assessment Modeling*

*6th Trinational Sardine Forum*

**(USA, Mexico, and Canada)**

**Ensenada, Baja California, México**

**November 14-16, 2005**

*Coast-wide Sardine Survey – April 2006*

**U.S. - *David Starr Jordan & Oscar Dyson***

**México (?) – *Puma & Francisco Ulloa***

*Pacific Sardine Stock Assessment Workshop*

**Organized through MEXUS-Pacífico (INP & NMFS)**

**La Paz, Baja California Sur, México**

**2006 (dates TBD)**