ICE CREAM
COASTAL CLIMATE RESEARCH AND ADAPTATION PARTNERSHIP

Shifts in species abundance of sardine fisheries in southern Philippines: early signs of vulnerability to climate change?

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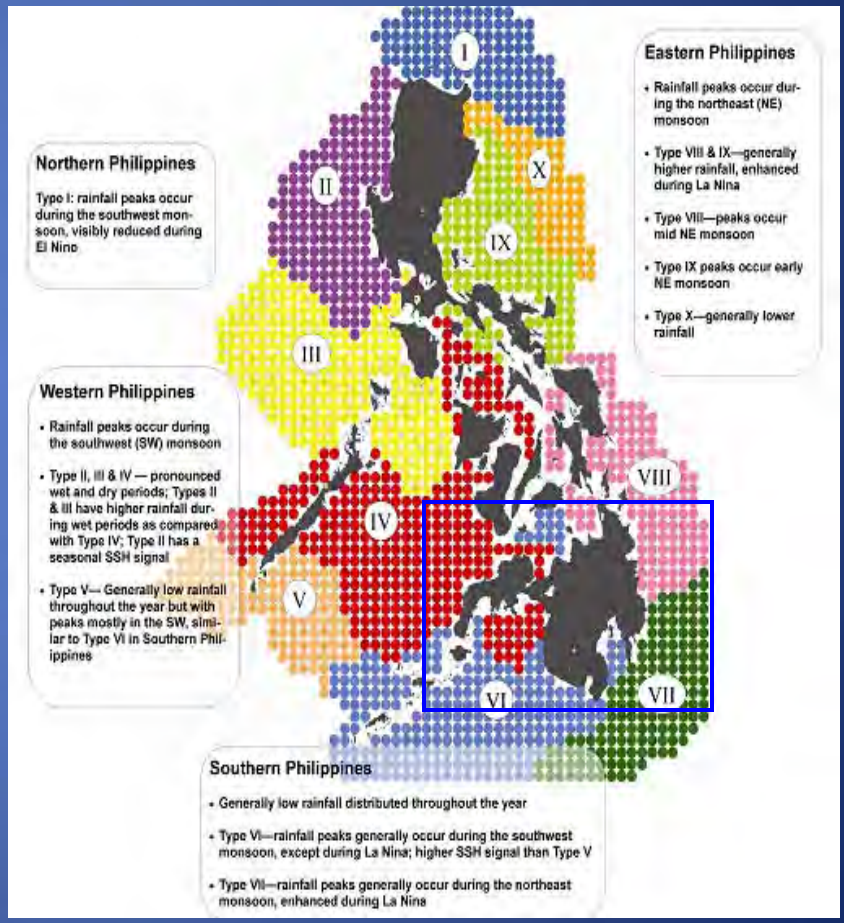
Background: the ICE CREAM Program

- 3-year collaborative climate research program funded by the Philippine government
- Utilizes pressure-state-response framework to analyze CC drivers and propose interventions
- 8 project components; 6 research institutions

Department of Science and Technology (DOST) - Philippine Council for Aquatic and arine Research and Development (PCAMRD)

Background: Coastal climate regimes of the Philipines

- 10 coastal climate typologies based on rainfall data
- Coasts around Mindanao island classified into 4 climate types ~ highly variable



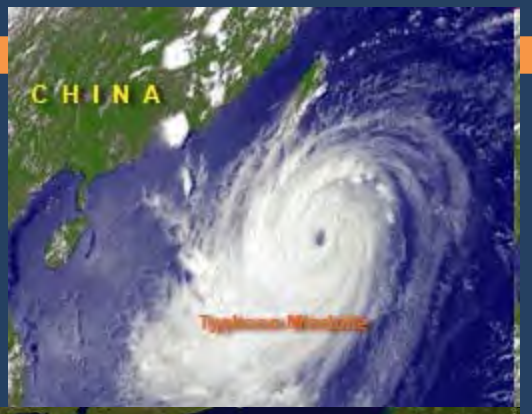
David, et al. unpub.

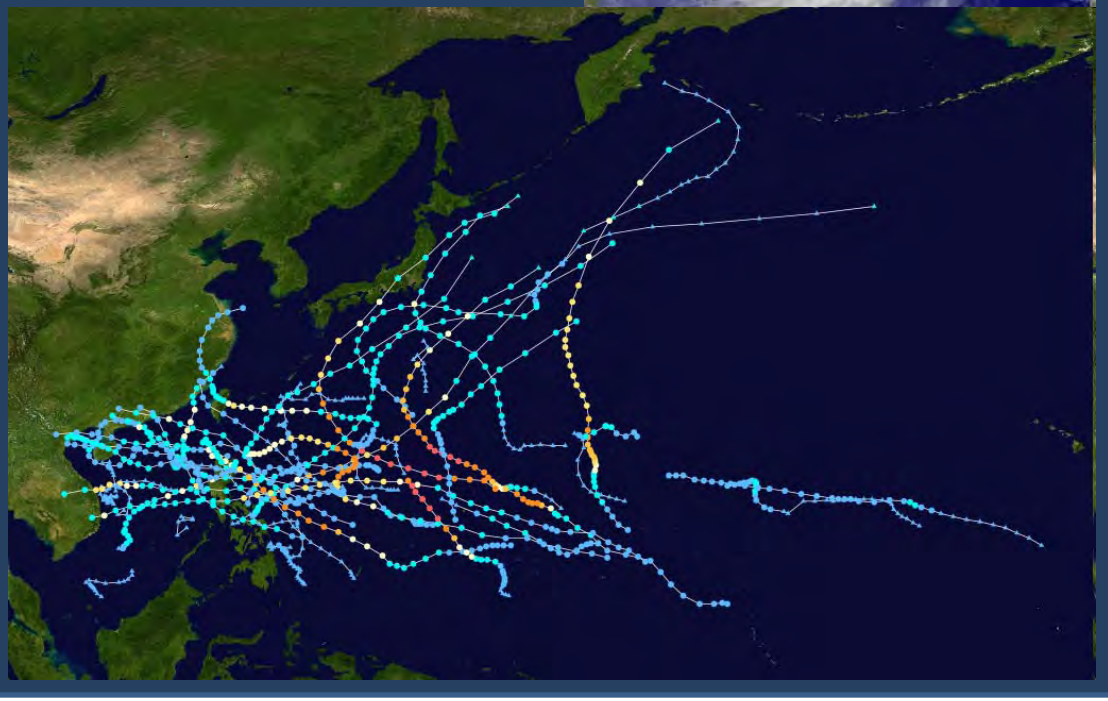
Vulnerability of Philippine coasts

- Marine biogeographical basins of Philippines integrated with coastal climate regimes
- Differential vulnerability to NE & SW monsoons and tropical storms
- ICECREAM project sites across Phil. Archipelago
- Weather/CTD stations in at least 6 locations

Asia's Stormiest

- 19 of 39 TS during Pacific typhoon season hit the Philippines in 2009

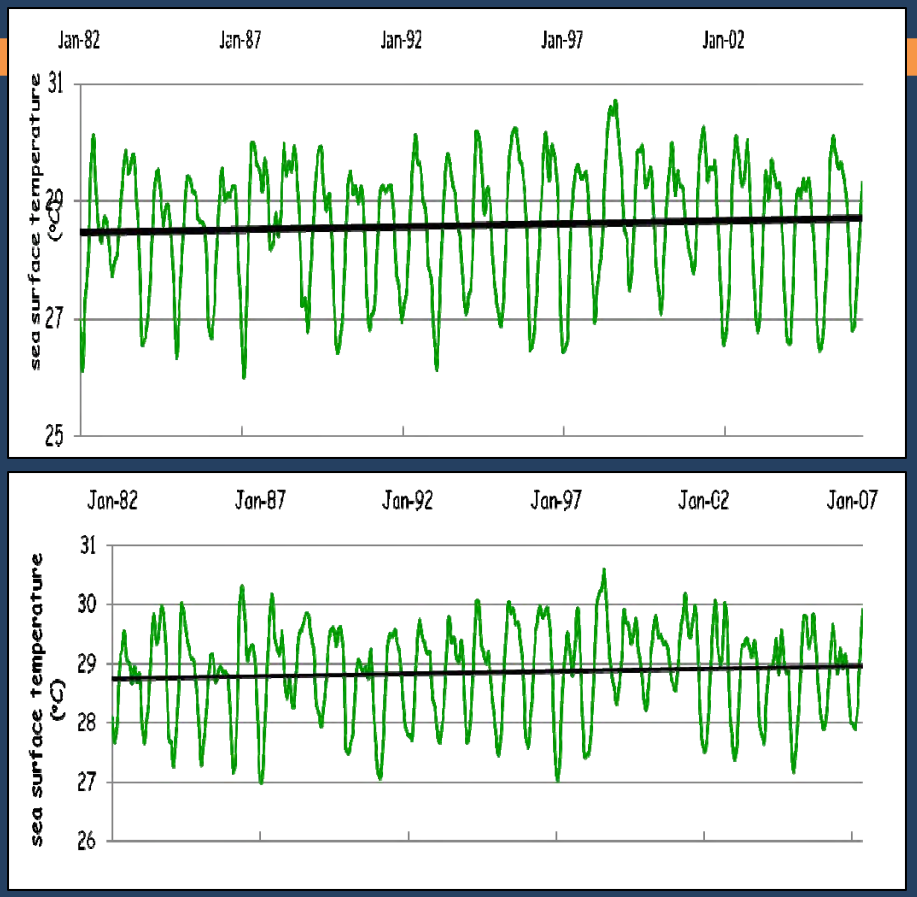




Source: Wikimedia Commons, 2009

SST along eastern Phil. seaboard

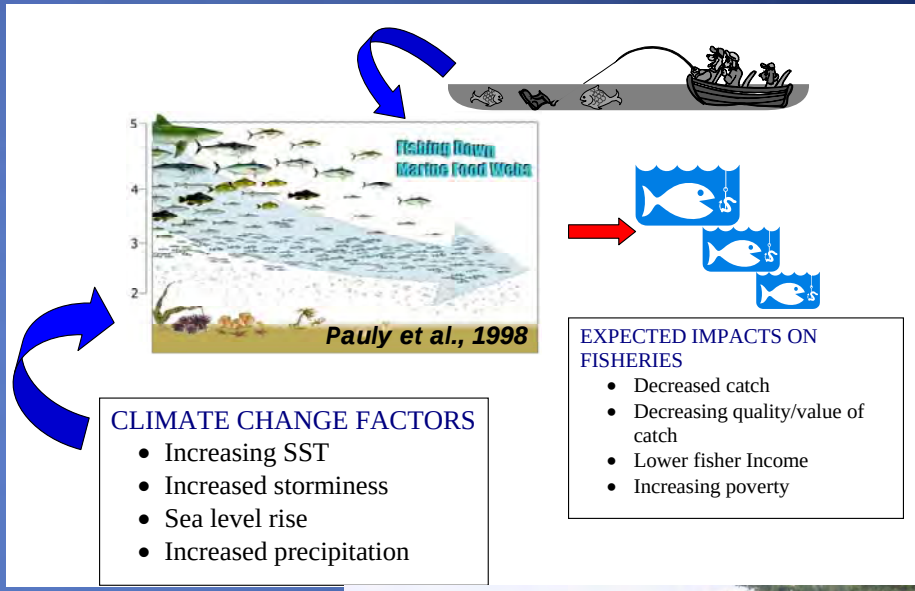
Source: PacSEA project (2007)



Both sites show an overall increase of 0.5 °C from 1982 to 2007

Project 6: Coastal Fisheries

- Component looks into potential effect of CC on production variability of important fish resources
- Drivers: Climate or Fishing?
- Human-environment synergy: impacts on fisheries and marginal livelihoods



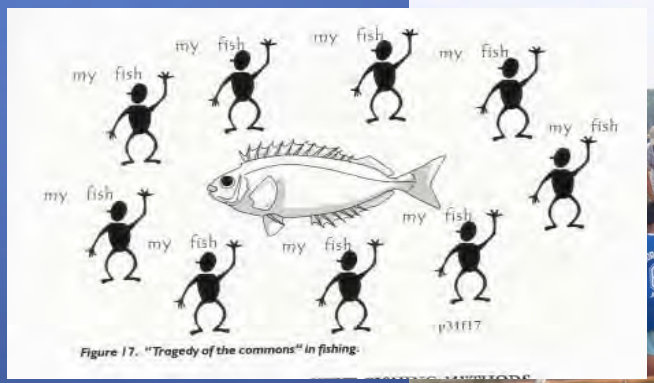


Figure 17. "Tragedy of the commons" in fishing.

Sardine as climate proxy

- Indian oil sardine *Sardinella longiceps* forms a large part of small pelagics production of nearshore fisheries
- Sardine is associated with high productivity areas; upwelling zones
- Can be a proxy to changing climate – impacts on spawning & recruitment

Methodology

- Monitoring of landed catch in two bays along the East-West gradient (Mindanao Is.)
- Data available on May 2009-March 2010
- Comparison between upwelling- and watershed-driven productivity

Methodology

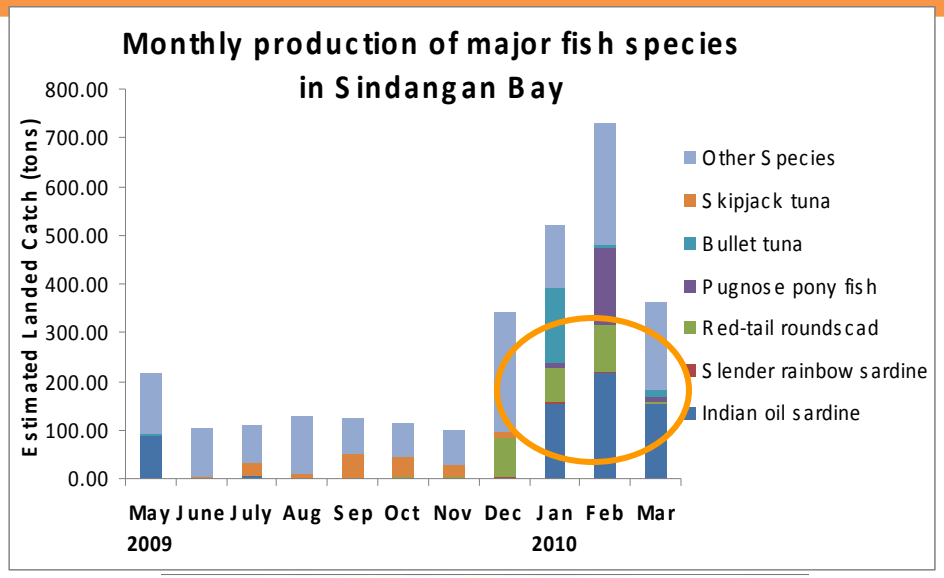
- Fish landing surveys
- Monitoring of catch and effort of major gears
- Monthly length-frequency measurements (future popdyn parameters)
- Sex ratios, gonadal maturity determination

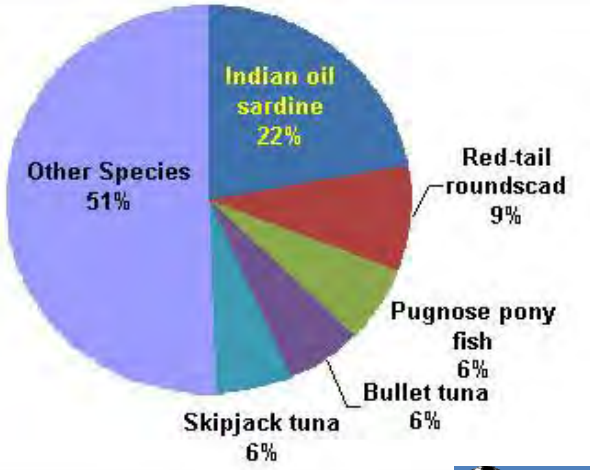
Artisanal fishing boats in Butuan Bay

Commercial bagnets in Sindangan Bay

Preliminary Results: Sardine production in Sindangan Bay

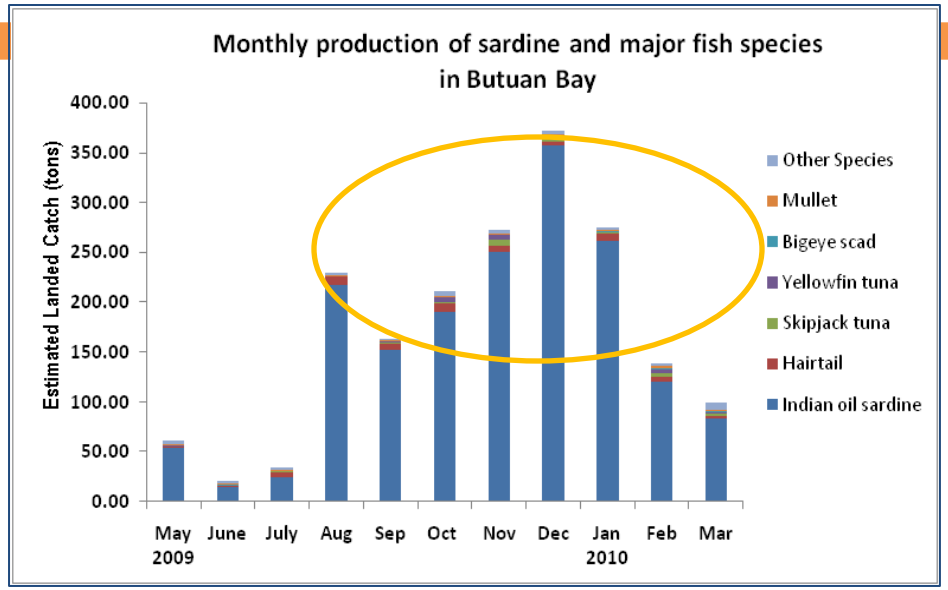
- Landed catch of Indian oil sardine *Sardinella longiceps* = 625 t
- Represents 22% of total landed catch of 2,856 t
- The rainbow sardine, *Dussumiera elopsoides,* mixes in very small proportions
- Abundant juveniles in Dec/Jan

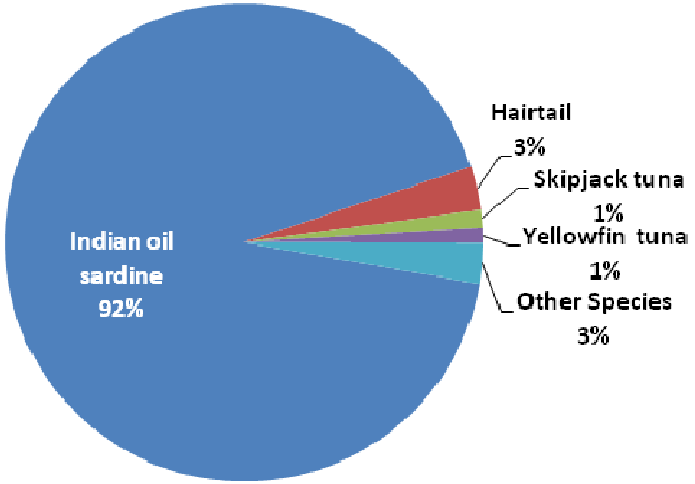




Preliminary Results: Sardine production in Butuan Bay

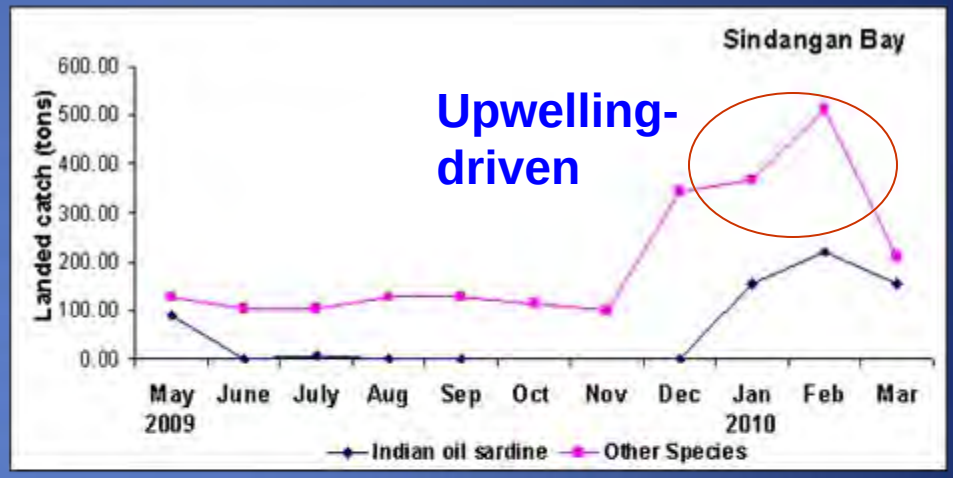
- *S. longiceps* (1,732 t) dominates landed catch (1,881 t) from Butuan Bay in same period
- 2000 assessment: dominant species was *S. melanura* – presently caught in small amounts
- Spawning: Dec-Feb

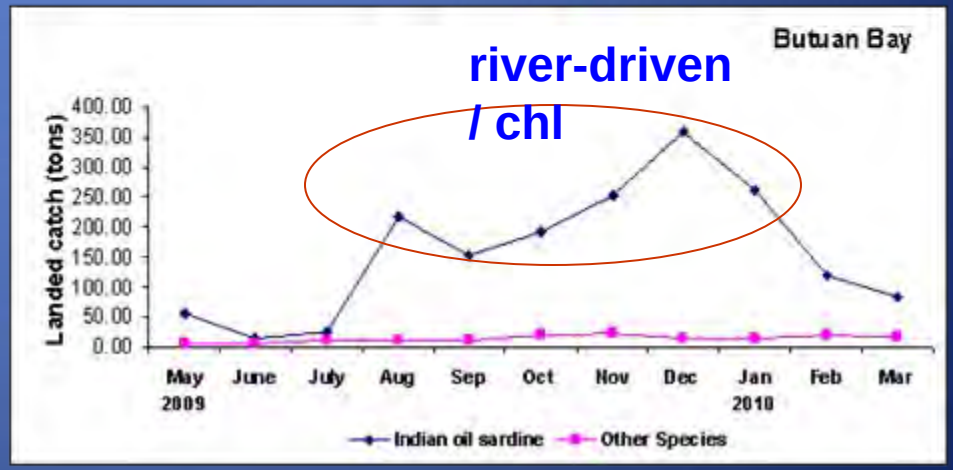




Shifts in abundance: climate related?

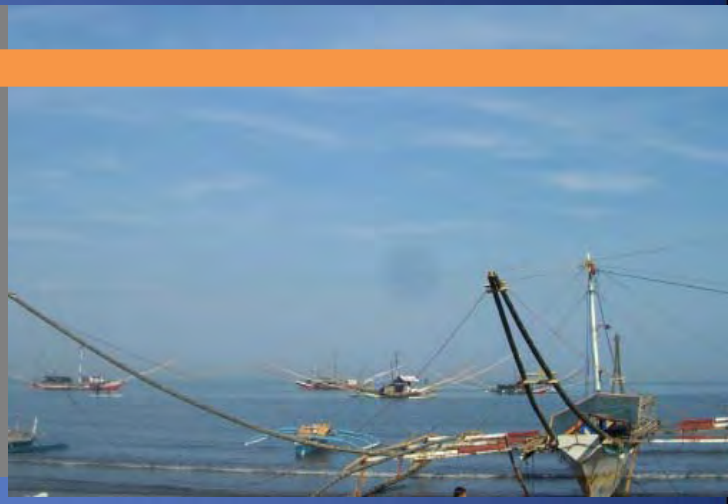
- Apparent asynchrony in abundance of sardine in two bays
- Hypothesis:
  - Seasonal recruitment oscillations (upwelling-driven vs chl or nutrient variability)
- Fisher perception: delayed appearance of juveniles in SB than in past years





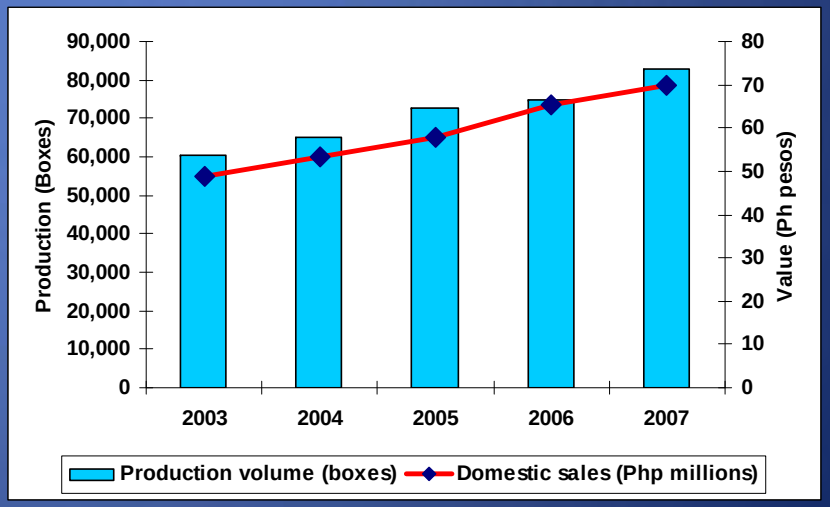
Shifts in abundance: Other potential drivers

- Migration
  - Linear shifts (inshore-offshore; shallow-deep; bay-to-bay gradients)
- Overfishing
  - Increase in demand for fresh sardine to supply post-H facilities in Sindangan Bay
  - Consequential ↑ in fishing effort



Growth of sardine postharvest industry in Sindangan Bay

- High annual production motivated rapid growth of post-harvest industry
- 20 sardine bottling companies (small, family owned enterprises)
- Low sardine catches offset by exporting sardine from other areas (large operational costs)



Generalizations

- More questions than answers
- Tropical, small-scale fisheries are high biodiversity systems
- Vulnerable to overfishing
- Experiencing 'fishing down the web' phenomenon
- Need for adaptive FM to ensure food security & income

ICECREAM's goal and challenges

- ICE CREAM is a "newborn" in climate research
- Goal: to contribute to CC and Fisheries science in data-poor systems (with no long term time-series data)
- Challenge: attribution of changes or variability in fisheries systems to Climate – disentangled from overfishing and other drivers of stock changes

Next Steps…

- Backward and forward time series C/E data
- Link fisheries production patterns with ocean/climate data from (IC Component 2)
- Need to disentangle CC and fisheries effects
- Study spawning/recruitment patterns and possible correlations with SST, salinity, etc

Man must eat…but fish has to live, too!

Thank you for your attention!

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