

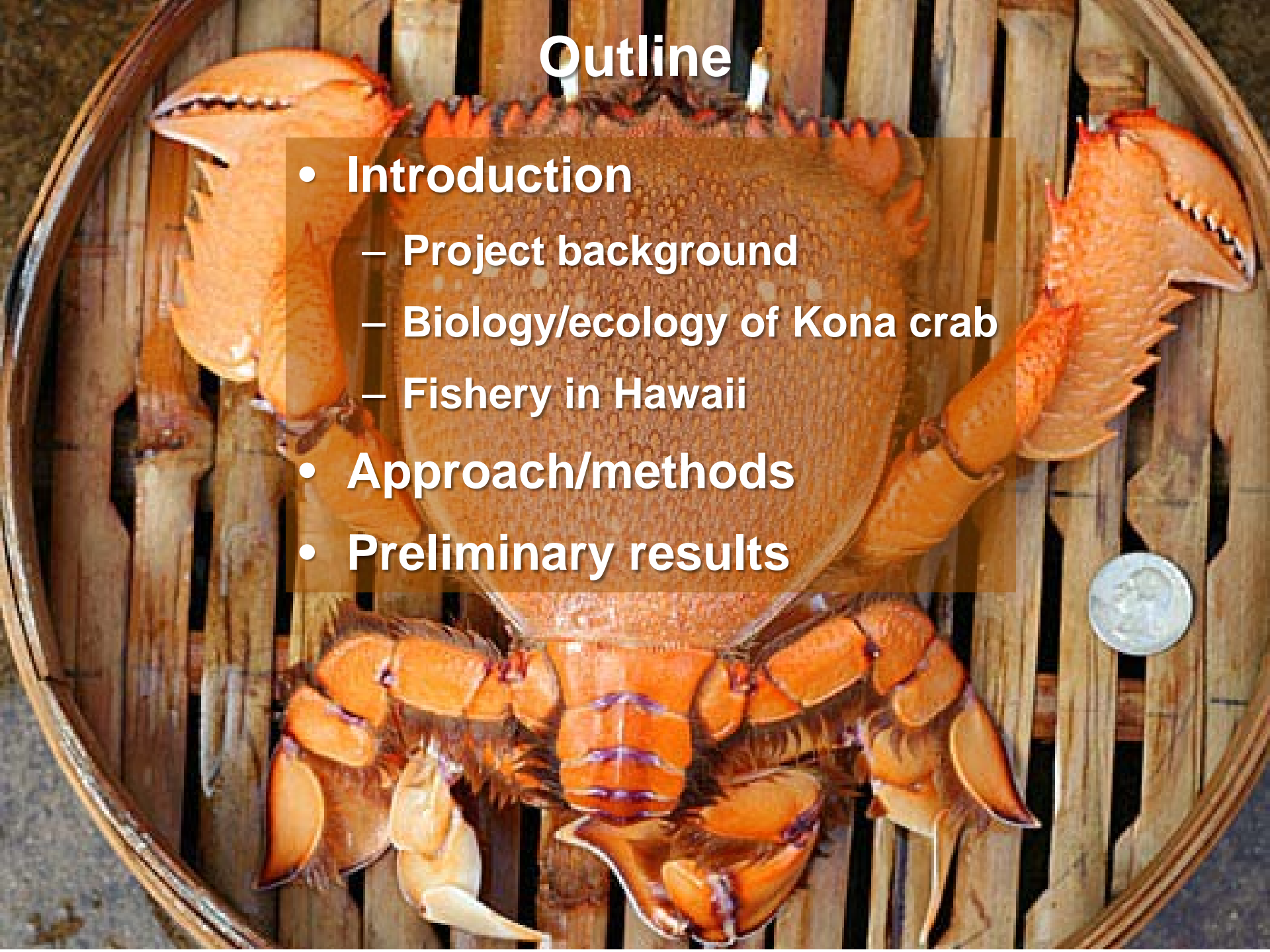
Characterizing the Kona crab (*Ranina ranina*) fishery in the Main Hawaiian Islands

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Outline

- **Introduction**
 - Project background
 - Biology/ecology of Kona crab
 - Fishery in Hawaii
- **Approach/methods**
- **Preliminary results**



Fisheries cooperative project

- **Sponsored by Western Pacific Regional Fisheries Management Council (West Pac)**
- **Collaboration with Hawaii DLNR Division of Aquatic Resources (DAR) for data interrogation and data quality control**
- **Collaboration with NOAA National Marine Fisheries Service (NMFS) Pacific Islands Fisheries Science Center (PIFSC) on methods & modeling**
- **Bulk of work performed by Hawaii Pacific University (HPU) graduate student**

Project objectives

- **Conduct an assessment of the Kona crab stock in the Main Hawaiian Islands**
 - Began in October 2008
- **Develop fisheries management skills**
 - HPU masters thesis project
- **Foster collaboration between HPU, NOAA, and State of Hawaii**
- **Project deliverables**
 - Report to West Pac March 2010
 - Peer reviewed publication
 - Presentations of findings

Ranina ranina

- **Common names**
 - Kona crab, spanner crab, frog crab, red frog crab
- **Indo-Pacific, marine brachyuran crab**
 - Tropics and subtropics
 - Sandy substrata
 - 2 to 200 m depth
 - Near coral reefs
- **Commercial fisheries**
 - Australia, Japan, Thailand, Philippines, and Hawaii
- **Predators include sharks, rays, jacks, turtles, and occasionally marine mammals**



Hawaii Kona Crab Fishery

- **Recreational and commercial fishery regulated by State of Hawaii**
- **Small, commercial fishery since 1948**
- **Current regulations**
 - **Minimum size 4-inch carapace length (1938)**
 - **Closed breeding season May-August (1938,1993)**
 - **No spearing (1958)**
 - **No taking female (2006)**
- **Last stock assessment performed 30+ yrs ago**
 - **Vansant (1978)**

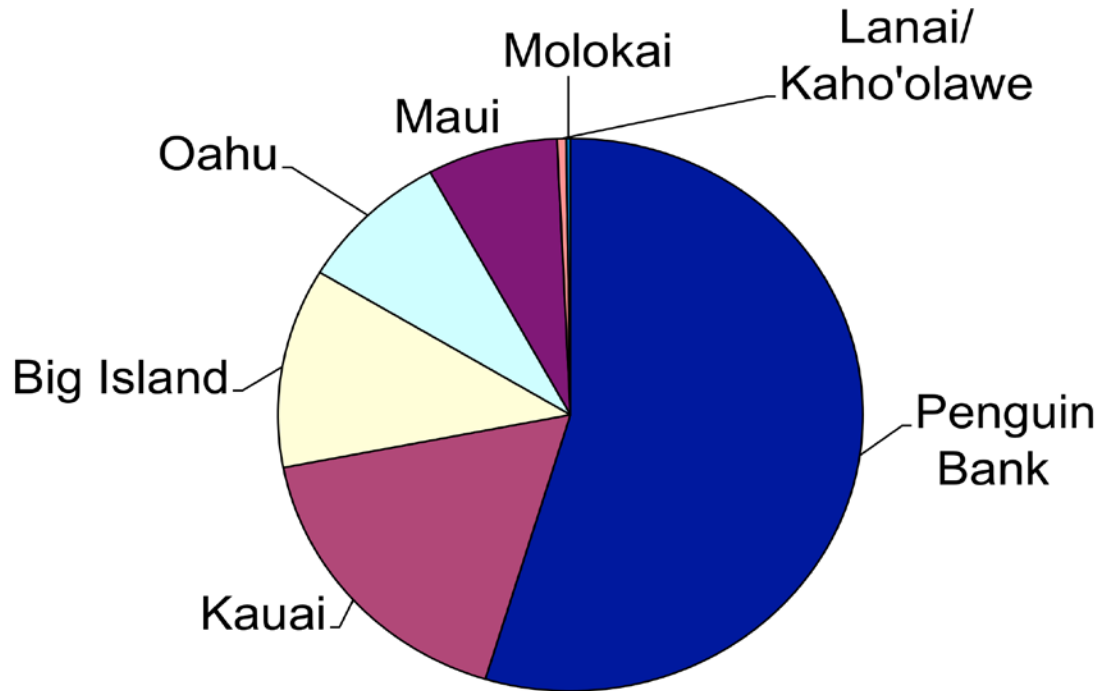
General approach

- 1) Query commercial catch & effort data from State of Hawaii**
 - No recreational catch & effort data available
- 2) QC, confirm, repair, format, and aggregate data**
 - More detailed data available 2002-2009
- 3) Analyze for spatial and temporal patterns**
- 4) Apply fisheries assessment models**
- 5) Report & publish findings**
 - Aggregate data to preserve confidentiality

Results

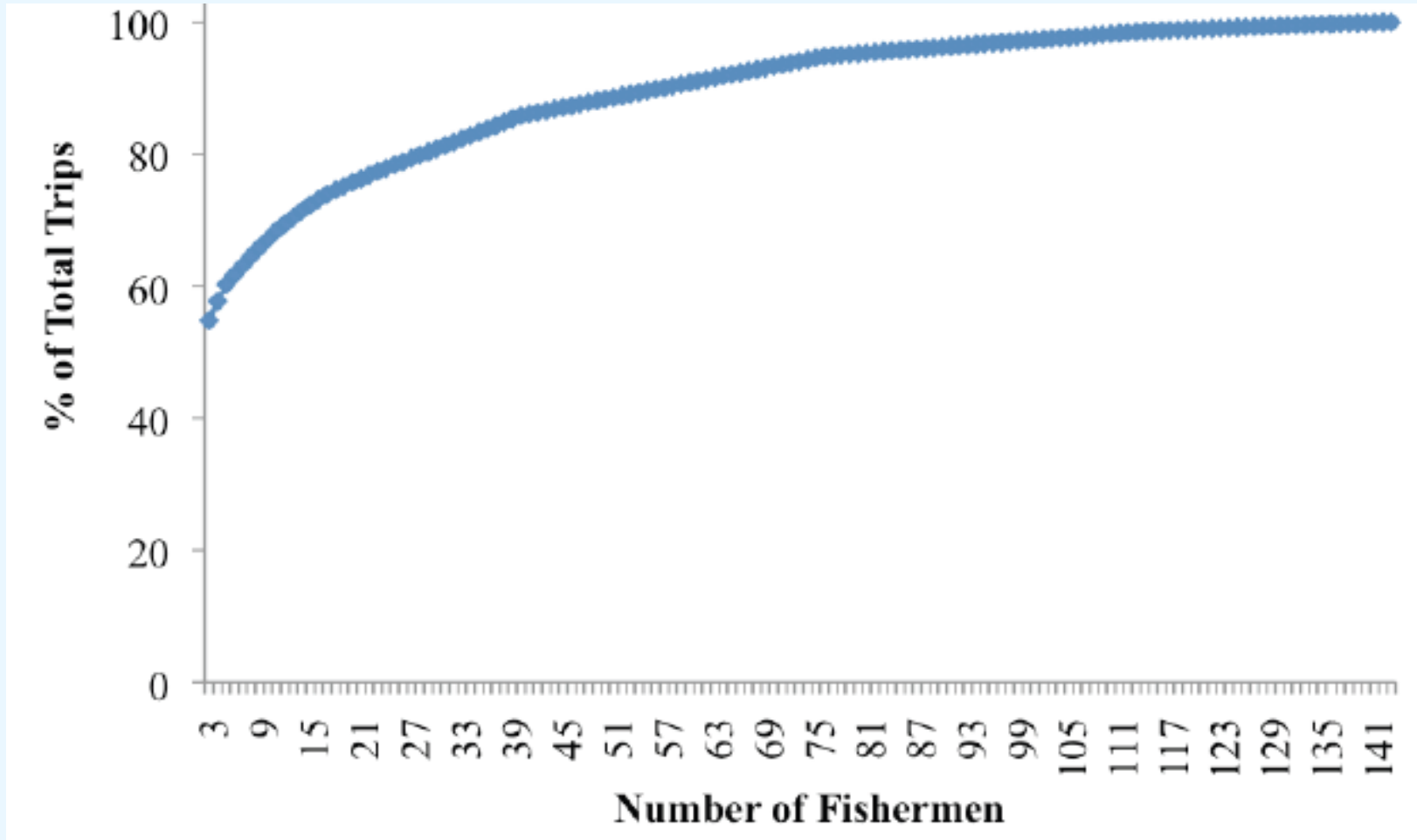
- **QC and data repair successful**
 - Only 19 out of 1424 reports were removed (2002-2009)
 - 1.3% of trips, 0.8% of effort, 0.7% of landings
- **Concentrated fishery dominated by a three fishermen and fishing at Penguin Bank**
- **Significant changes across time**
- **CPUE varies by location, month/season**
 - Relative distribution of effort across these parameters varied by year

Landings by island



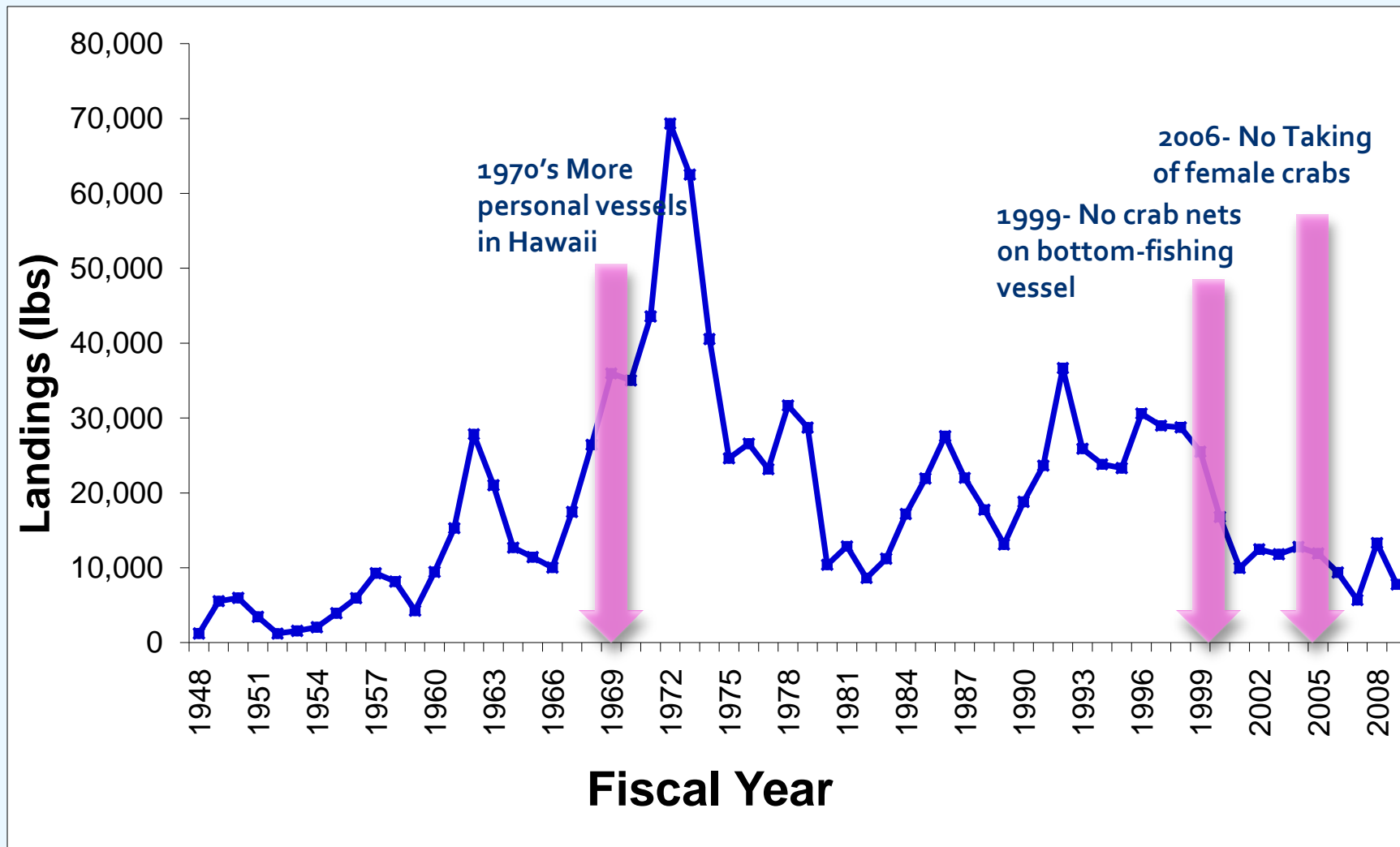
Percent landings (lbs) by island in the Kona crab commercial fishery from 10/01/2002-12/31/2009

Fishing effort contribution



Cumulative percent of effort (trips) expended by fishermen in the Kona crab commercial fishery from 10/01/2002-12/31/2009

Landings across time



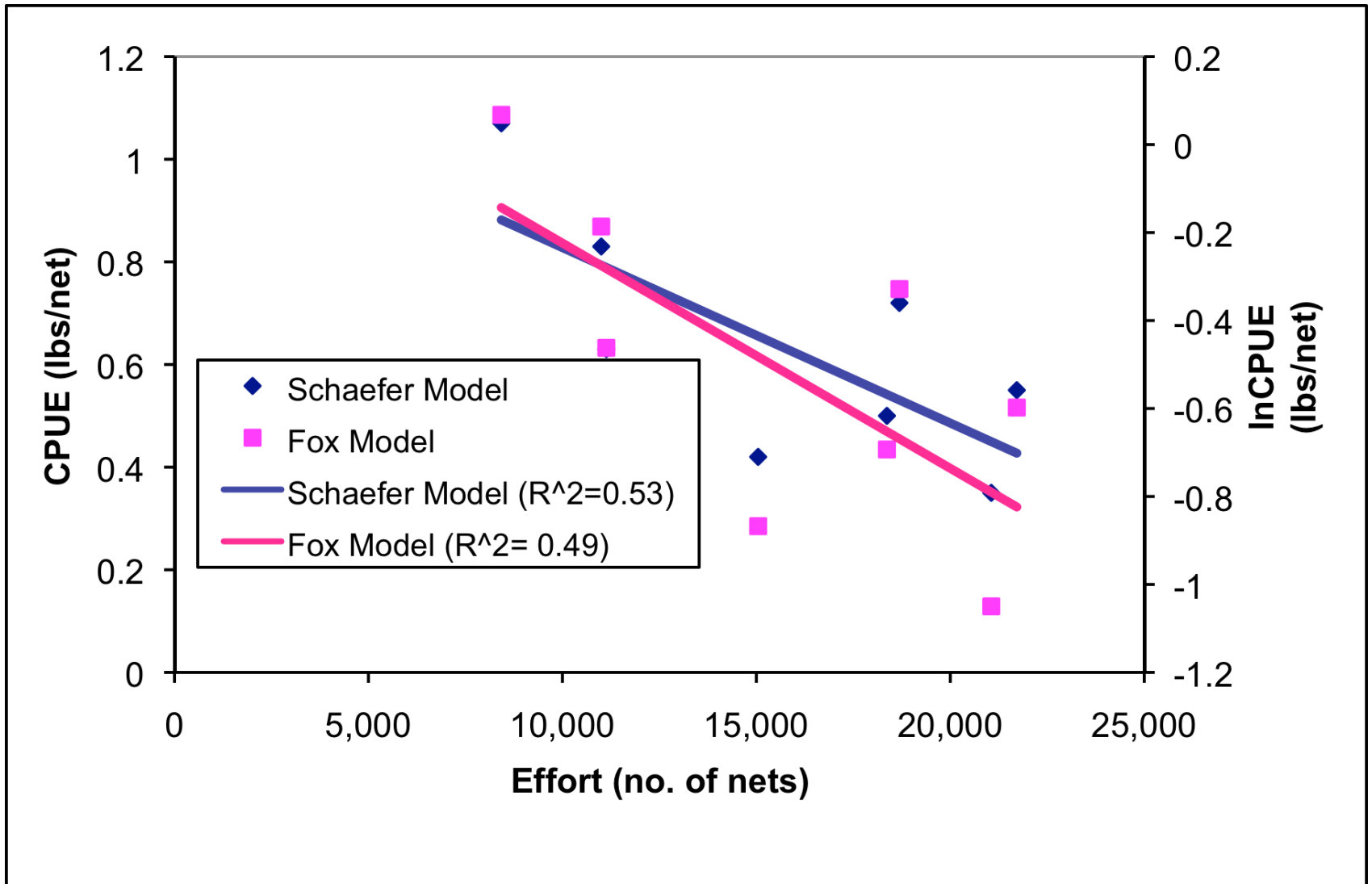
Factors influencing stock indices

- **1970's Hawaii's fishermen begin purchasing personal vessels and can now take day trips to Penguin Bank**
- **1993 Closed breeding season extended by one month**
- **1999 Bottom-fish fishermen can no longer carry nets aboard their vessels**
- **2006 No taking of female crabs**
- **2010 Bottom-fish fishermen allowed to carry nets aboard their vessels**

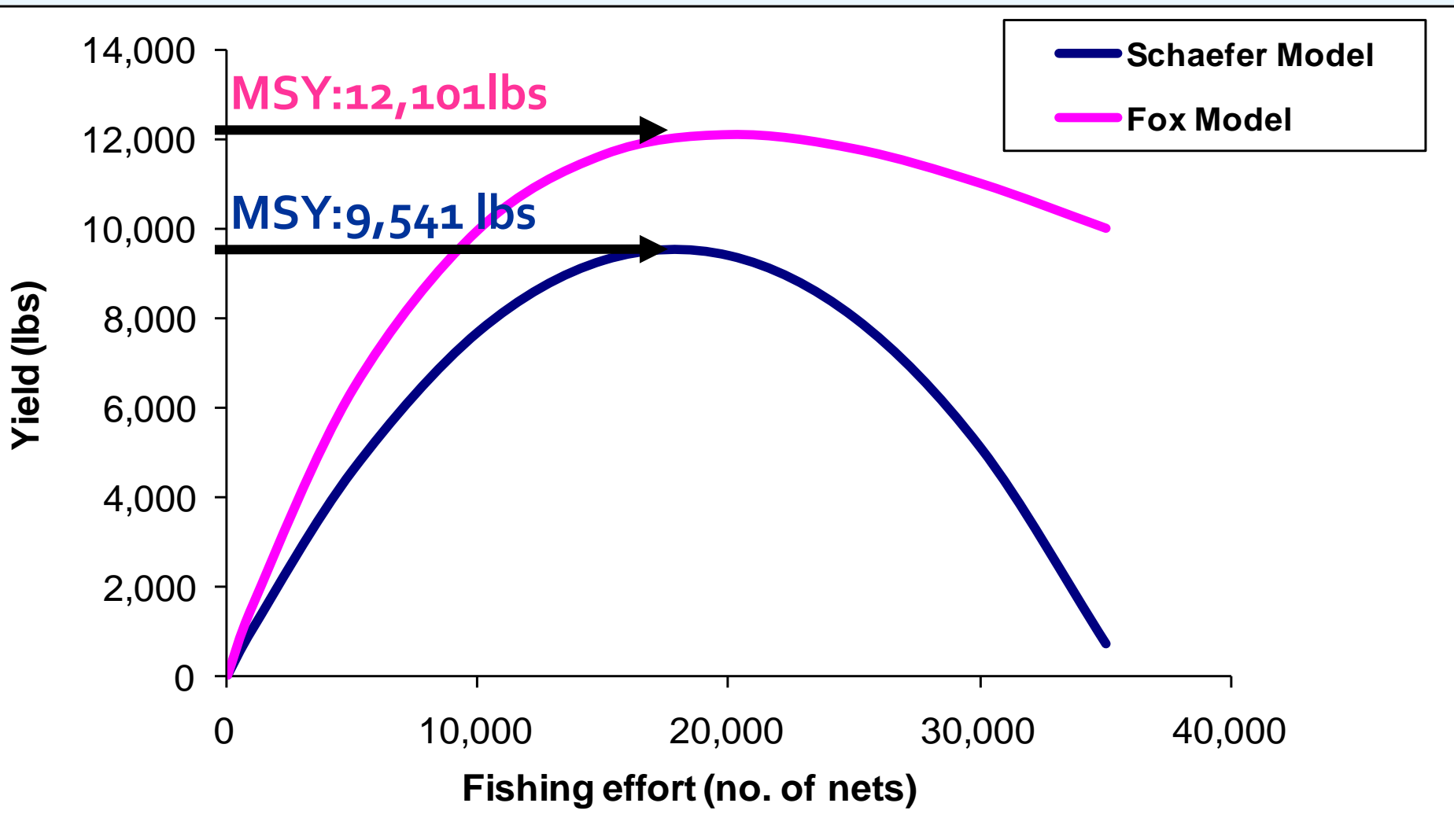
Surplus production models

- **Calculate maximum sustainable yield (MSY) using 2002-2009 data**
- **Schaefer model**
 - $C=af+bf^2$
- **Fox model**
 - $C=f*\exp[a+bf]$
- **Assumptions:**
 - Catch rates are indicative of stock biomass
 - However, recreational catch is unknown

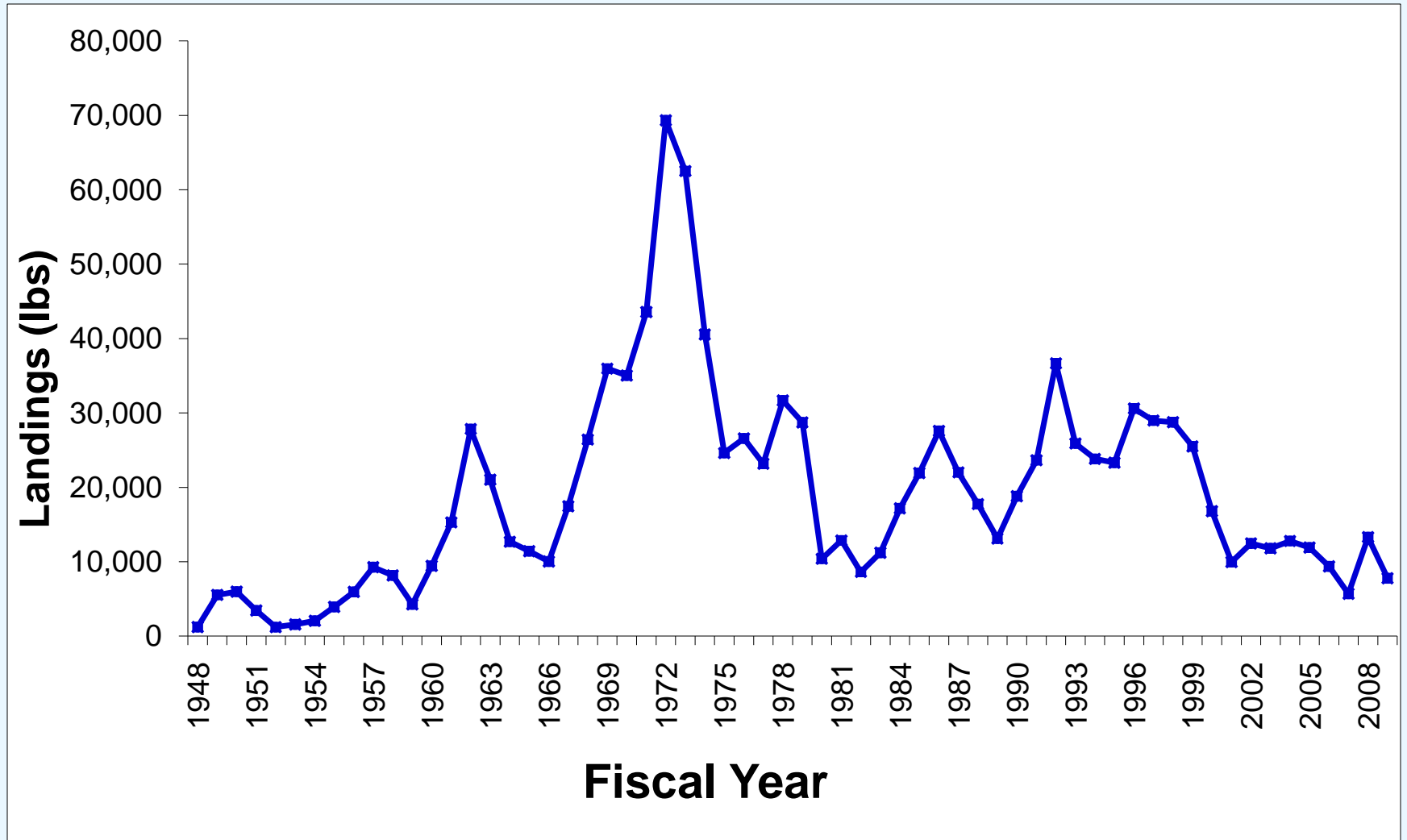
CPUE vs. Effort (2002-2009)



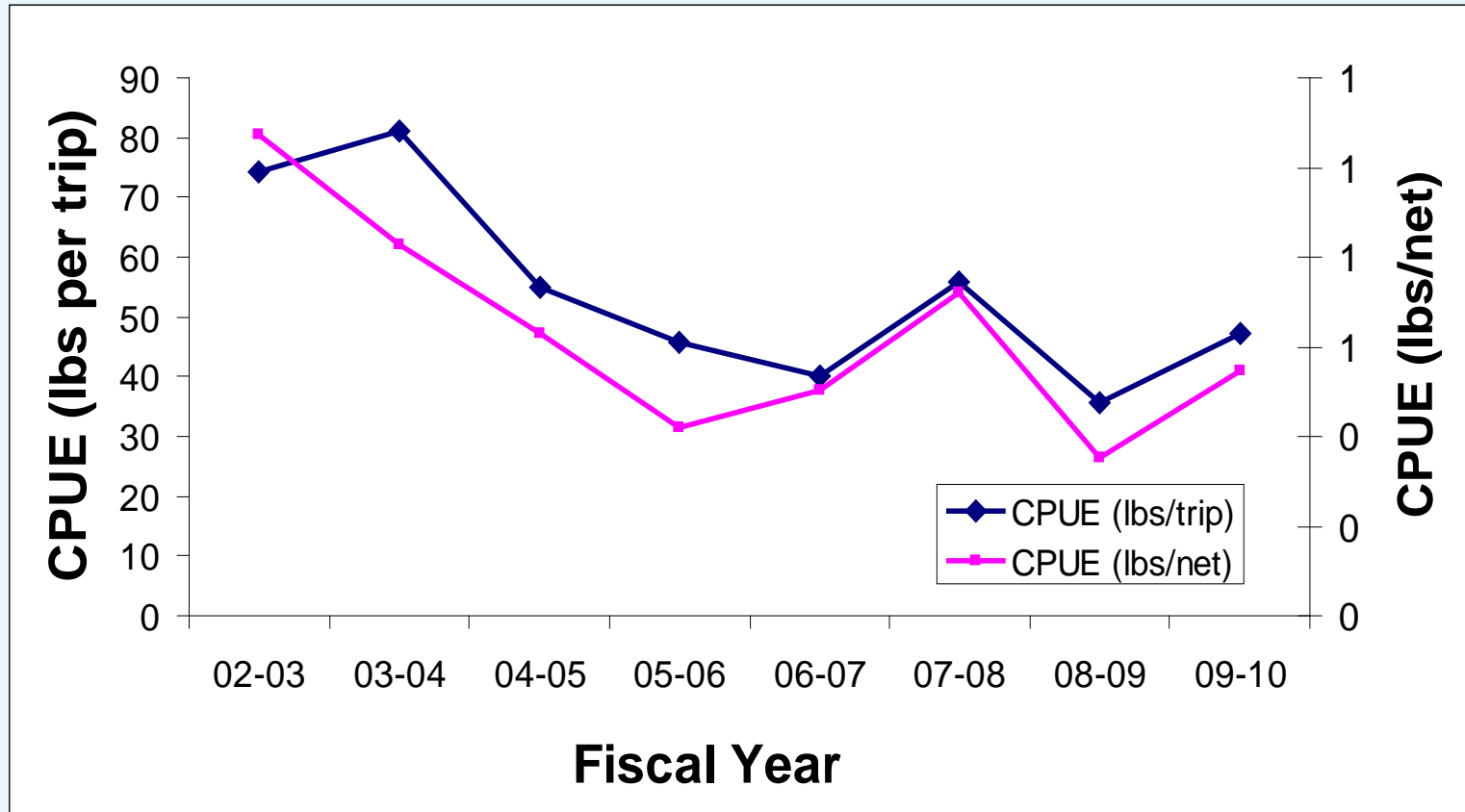
Maximum Sustainable Yield (2002-2009)



Landings across time

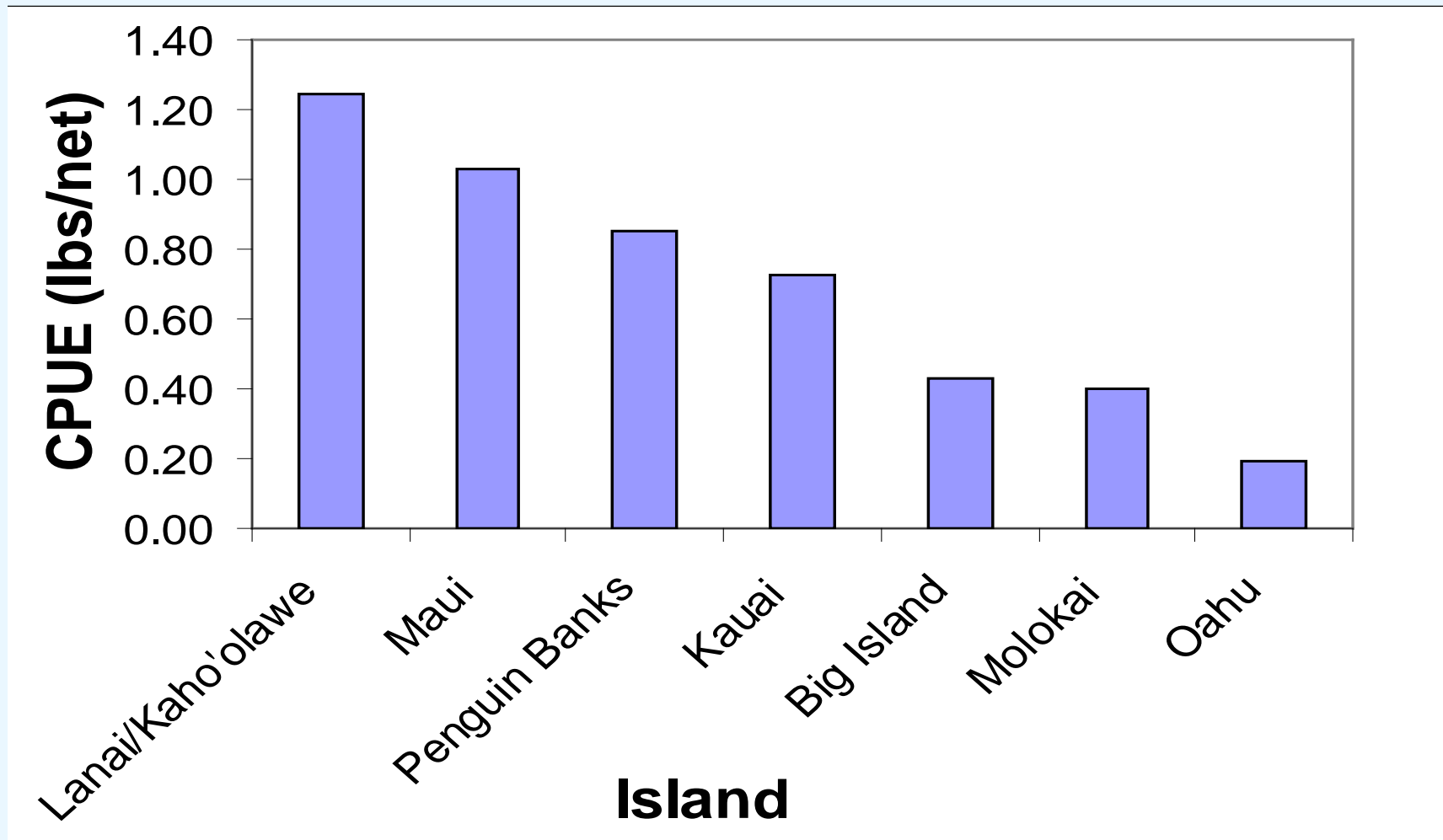


CPUE across time



CPUE (lbs per trip) and CPUE (lbs per net) by fiscal year in the commercial Kona crab fishery by fiscal year from 10/01/2002-12/31/2009

CPUE by island

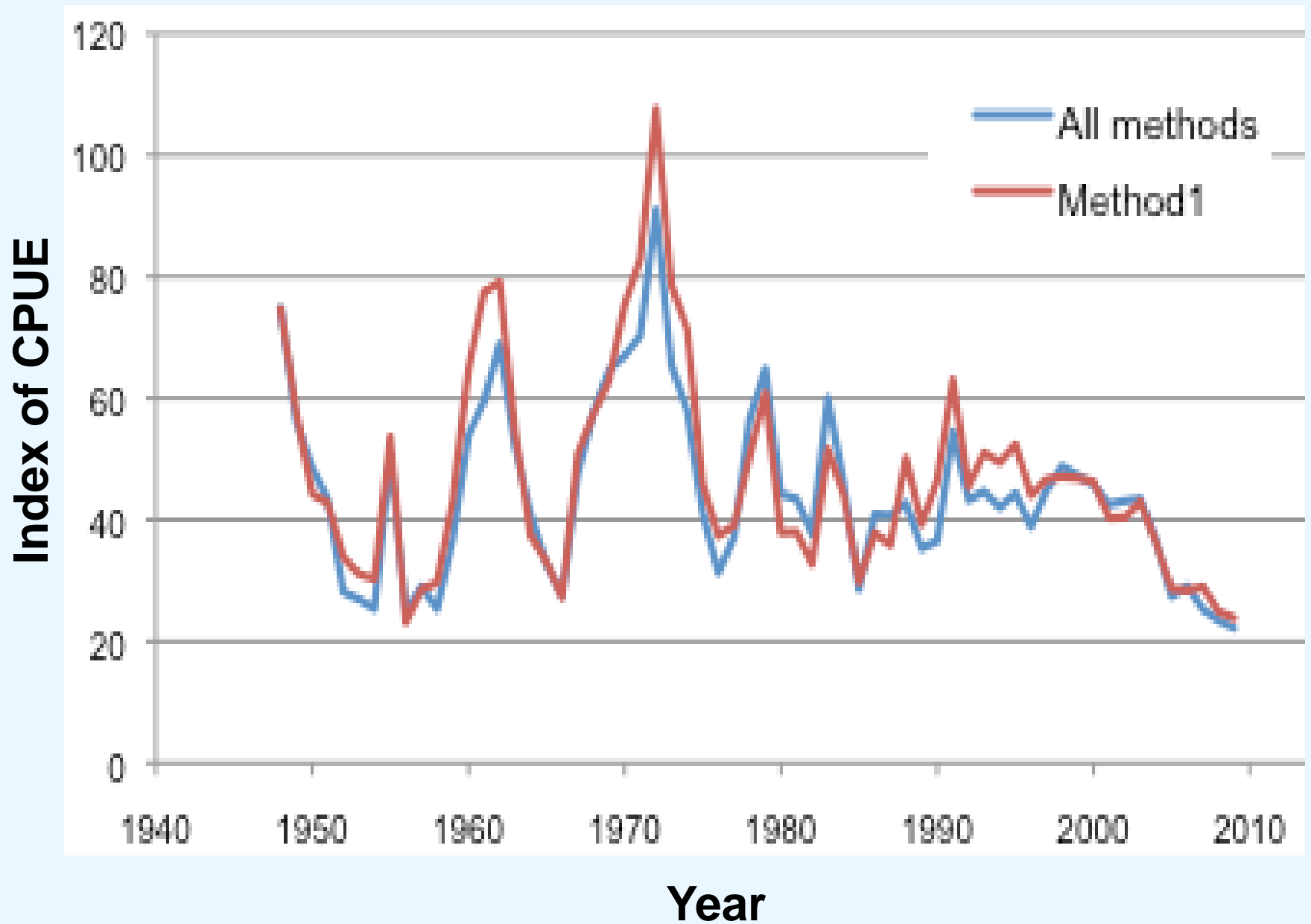


CPUE (lbs/nets) for the Kona crab commercial fishery by island from 10/01/2002-12/31/2009

Generalized Linear Model (GLM)

- **Explanatory variables included: year, season, and habitat**
 - **Habitat is described using three methods**
 - 1) By island
 - 2) Coastal Hawaii vs. offshore federal waters
 - 3) By predominate direction of exposure
- **Model iterations**
 - All habitat types
 - Each habitat type
 - Habitat not included
- **AIC values are compared**

GLM of CPUE across time



Acknowledgments

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- **Frank Farm, fisherman**
- **Derek Smith at HIMB**
- **David Hyrenbach, Pam Michaels at HPU**

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