

Pacific Bluefin Tuna Research Activities

Domestic & International

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Activities

- **Biological Sampling**
- **Catch Size Sampling**
- **Fishery Independent Estimation of Spawning Biomass**
 - **Close-Kin Mark Recapture**
- **Impacts of Climate Change**
- **Research Plan (3-5 years)**

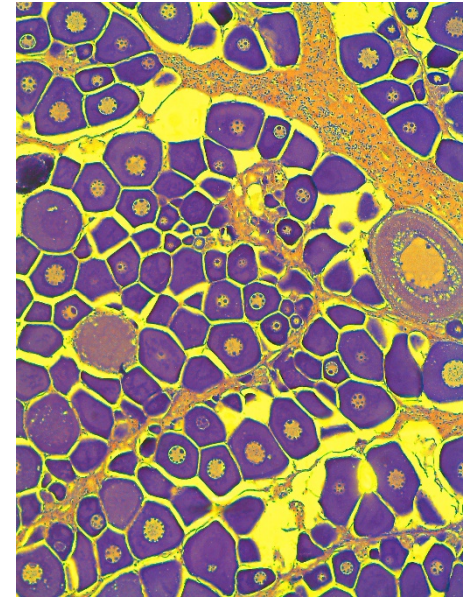
Pacific Bluefin Tuna collections - 2015

Working with SAC and CPFV fleet to collect biological samples – as Sept. 2015

- **Number collected: 150**
- **Size range collected: 61 to 160 cm fork length**
- **Weight range collected: 12 to 194 pounds**
- **Dates collected: January-March/ May-current**
- **Samples collected:**
 - **Stomachs: foraging ecology**
 - **Gonads: reproductive maturity**
 - **Otoliths: ageing/microchemistry**
 - **DNA: stock structure**
 - **Muscle/liver tissue: stable isotope analysis (feeding) and stock structure**

Reproductive maturity

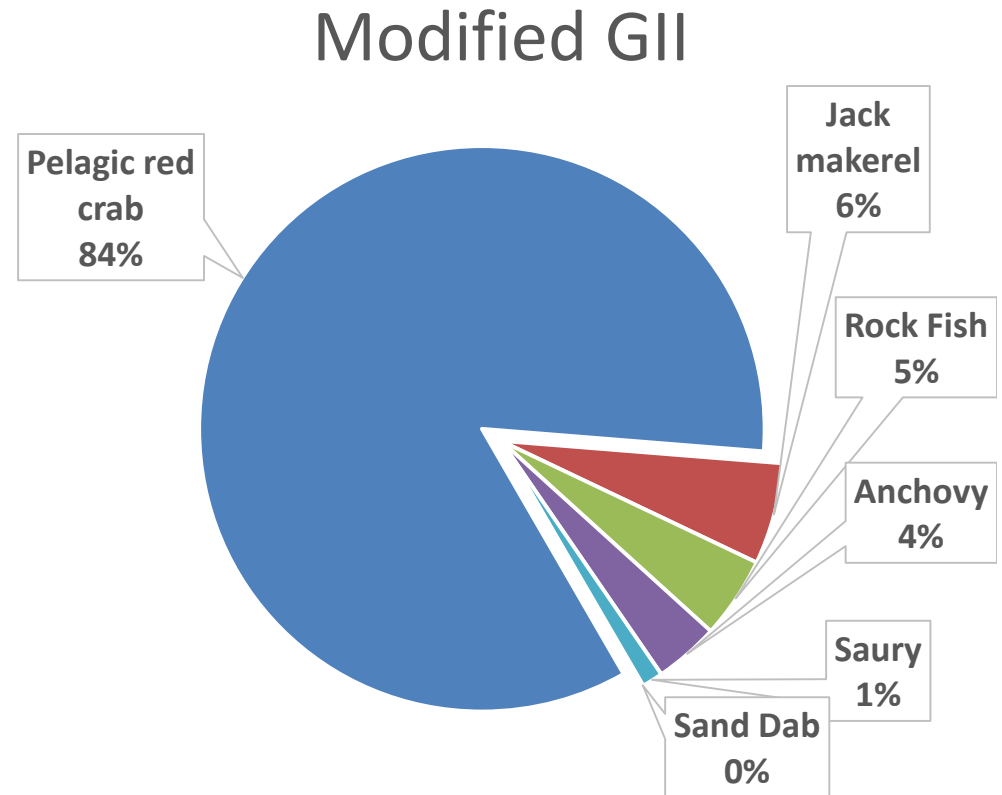
- **Samples sent out for histology**
 - Females: N=11
 - Males: N=3
 - Length range: 134-160 cm fork length
 - Weight range: 94 – 120 pounds
- **Preliminary results (pending further expert review):**
 - Males: all immature
 - Females: all immature (either unyoked or early yoking stages)



Bluefin foraging ecology – 2015 results to date

- Number of stomachs: 68

Common name	Modified GII
Pelagic red crab	84.6
Jack mackerel	5.8
Rockfish	4.65
Anchovy	3.7
Saury	1.2
Sand dab	0.05



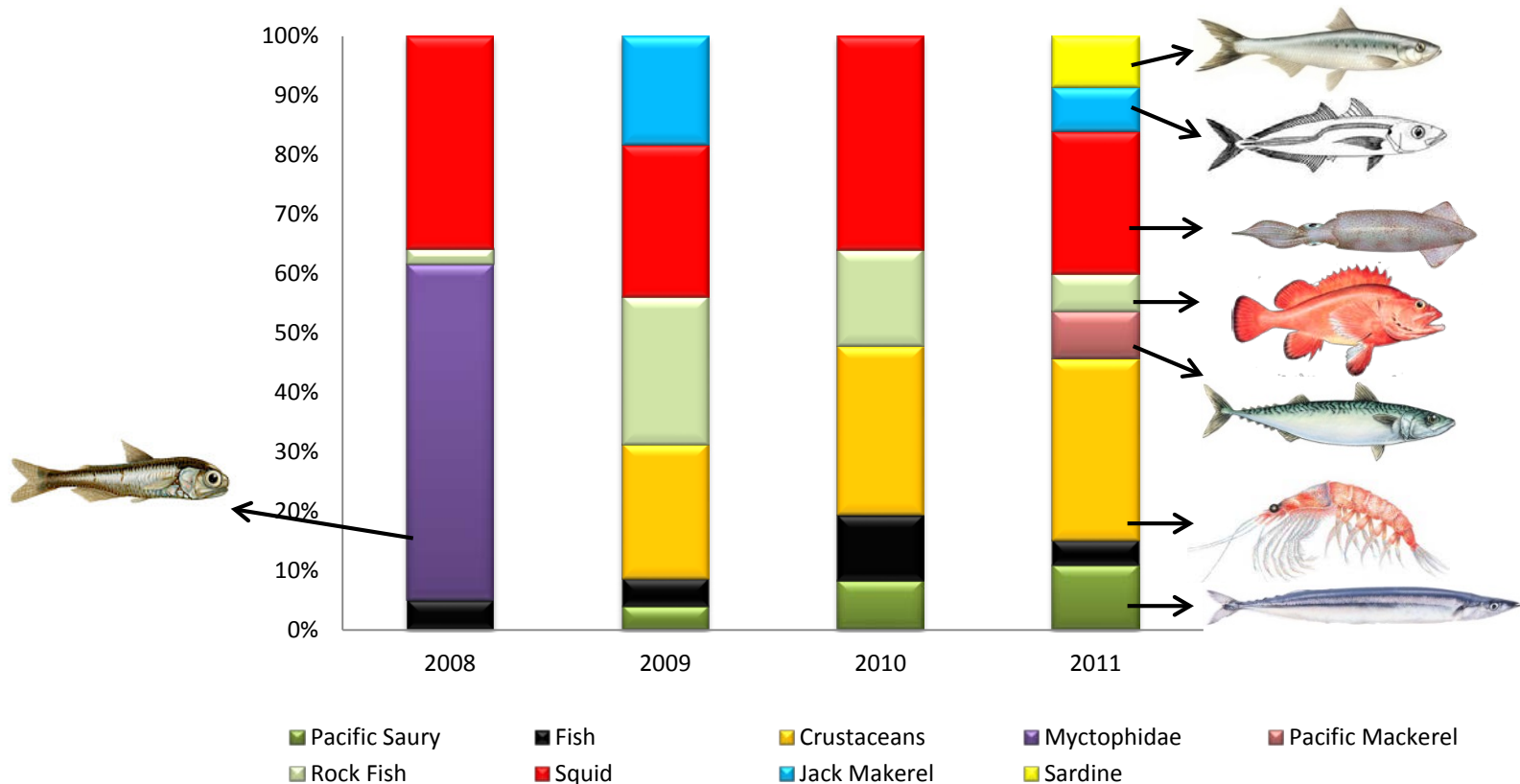


For all size classes most stomach contents were dominated by red crab. Also pictured is a sand dab found in one stomach

Bluefin foraging ecology – prior results

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bluefin Collected	0	75	78	54	189	294	171	106	ongoing

Bluefin Tuna Diets



Bluefin have a varied diet across years.

Bluefin Recreational Catch Size Sampling



- NOAA started sampling in 2014, previously done by IATTC
- 1,772 fish measured in 2014
- In April 2015 SWFSC with IATTC revised the algorithm for estimating catch in tons; the U.S. historical recreational catch time series was updated†
- 2015 sampling to date:
 - Short- and long-range trips
 - 6/7 to 9/3/2015
 - 441 length frequencies,
 - Sizes: 59.8 cm to 165.1 cm FL (ages 1 to 6)
 - Average length of 89.37 cm FL



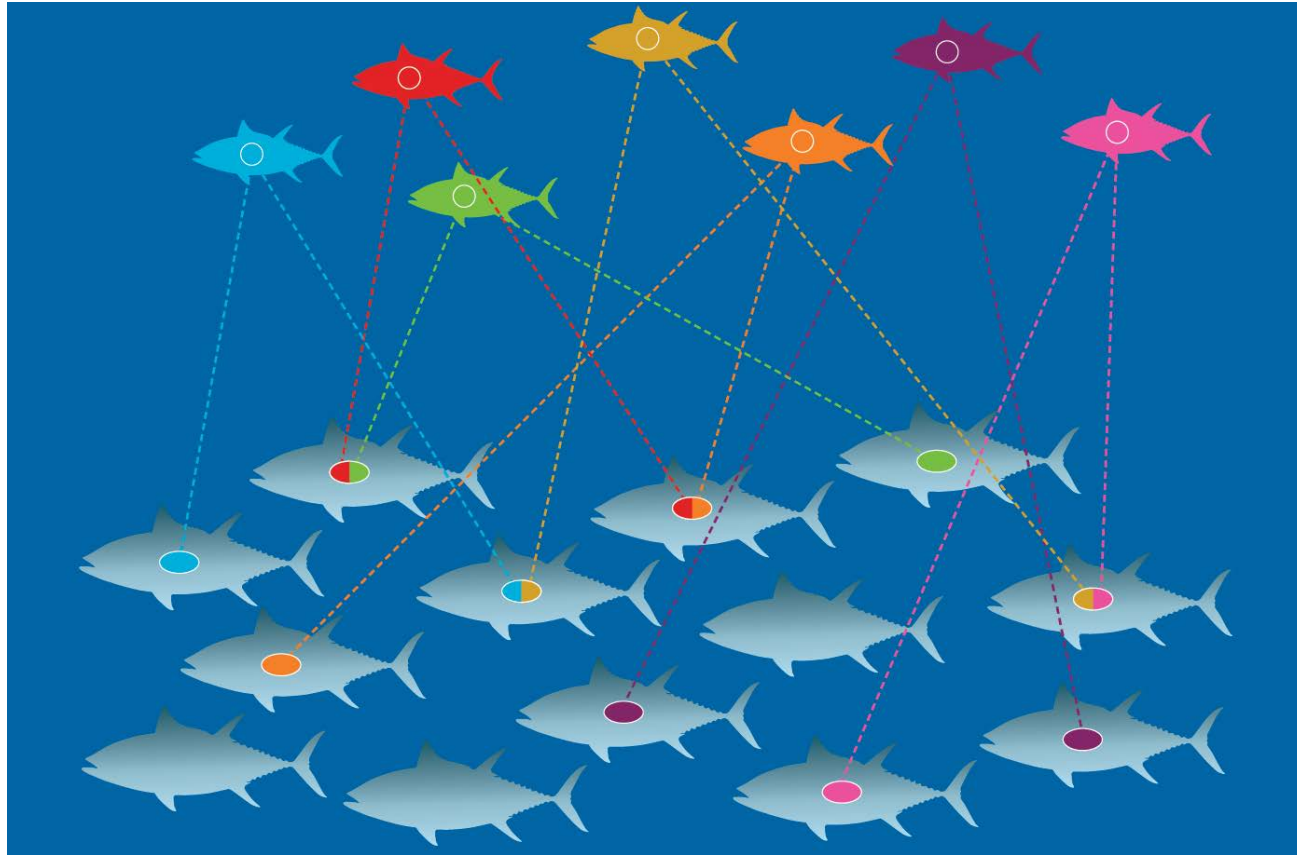
†Teo et al. (2015) Revision of estimates of catch in weight from the US recreational fishery from 1993 to 2014. ISC/15/PBFWG-1/03. http://isc.ac.affrc.go.jp/pdf/PBF/ISC_2015_PBF_1/ISC_15-1_PBFWG_03_Teo.pdf

Close-Kin

What is Close-Kin

- A new method which makes use of the rapidly advancing field of genetic research.
- Goal is to take advantage of genetic information that can be collected from each and every individual sampled and use this to obtain an estimate of the **spawning stock biomass**
- Data used in the estimation process are parent-offspring-pairs, or POPS – Every offspring requires parents
- The basic idea - each juvenile "tags" its two parents, so the number of tags found (via pairwise comparisons) and their pattern in time can be used similarly to conventional mark-recapture.

Close-Kin



Schematic of parent-offspring pair (POP) relationships. Juveniles are shown in various colors at the top, and lines to larger fish represent parent-offspring connections.

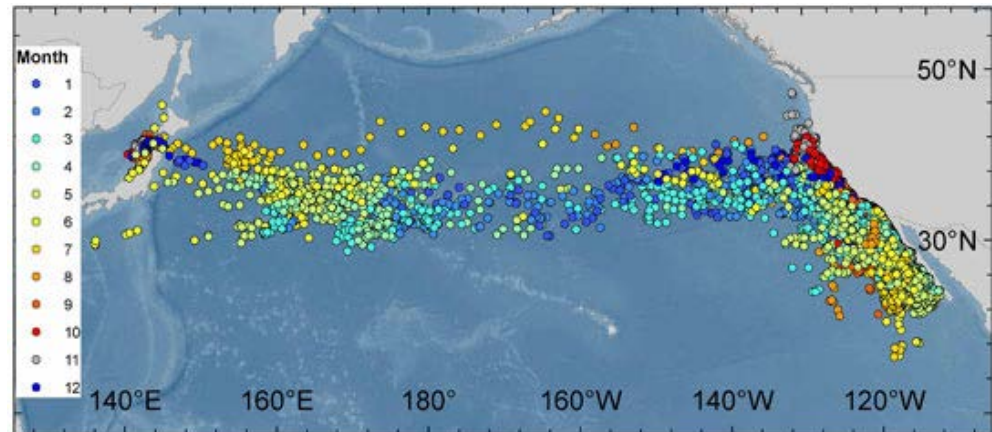
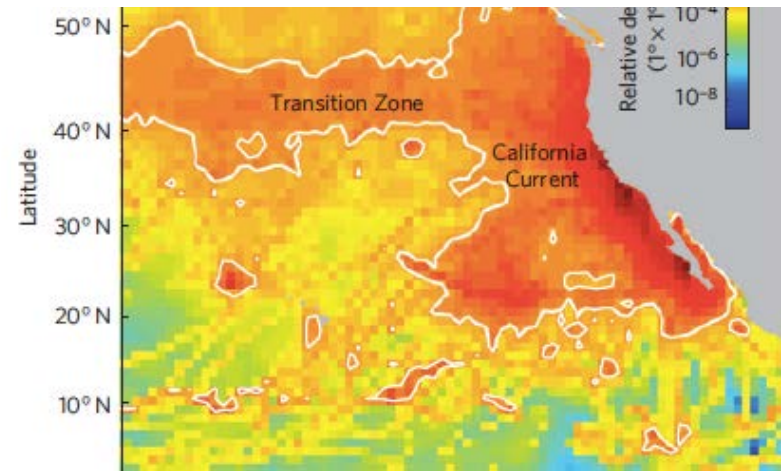
Close-Kin

Operationalizing

- **Develop Protocols**
 - data collection conducted by ISC
 - processing of samples – Joint Effort (ISC Member countries and others)
- **Analysis – Joint effort**
- **Results available in 3-5 years**
- **Validation testing – simulation modeling**

Relation to environmental signals

- Pelagic/HMS species, as well as fishermen, generally cue in on environmental signals. Having a better understanding of the oceanography and associated catch, will advance our understanding of CPUE, which in turn will provide better estimates of abundance.
- Linking tagging data with oceanography provides a basis for defining stock structure and even hot spots (persistent catch), both of which are important to the final stock assessment and in crafting CMMs (Conservation and Management Measures).



PBF Research Plan

Background

- **March 2015: Status of PBF Research and Future Needs Workshop - US focus**
- **Recent Events – Observations of large schools of PBF and large fish**

Goal

- **Identify, Integrate and prioritize PBF research (domestic and international)**
- **3-5 year time horizon**
- **Provides a blueprint for funding**

Participants and Timing

- **SWFSC (lead) and constituents (fisherman and NGOs)**
- **Complete plan by March 2016**

Thanks