Horizontal and vertical movements of juvenile bluefin tuna (*Thunnus orientalis*) in relation to seasons and oceanography in the eastern Pacific
A model for Pacific bluefin migration constructed by Bayliff (1980)
Objectives are:

- to examine the differences in horizontal and vertical movement patterns among seasons in relation to the oceanographic conditions in the EPO.

- and to examine their deep vertical movements through the thermocline in relation to the occurrence of feeding events.
Archival tag (LTD2310, Lotek Wireless Inc., CA)

- Depth
- Ambient temp
- Peritoneal cavity temp
- Light intensity → geolocation

- Sampling interval 32-120 sec.

160 fish released in 2002 to 2003 (FL 87 to 125 cm, 2-3 yrs)

Monterey
South California Bight

LA
Oct. to Nov.
Off Central California

Winter: offshore excursion

Track of the bluefin tuna #333 estimated by an archival tag

Hotspot?
Time series data for bluefin #333 in 2002

Aug. 2002 (South California Bight)

Nov. 2002 (Off Central California)

Upwelled water
Time series data for bluefin #333 in 2003

Starting offshore excursion

May. 2003 (South California Bight, Stratified season)
Ingestion of food and seawater

Rapid drops

Peritoneal temp.

Feeding event

Water temp.

November 05, 2002

0:00
12:00

Temperature (°C)

10
15
20
30
Why do they move to Off Central California?

Pearson correlation:
\[ r = -0.920, \quad p < 0.0001 \]

High frequency in summer in Southern California Bight—HOTSPOT
The relationship between upwelling indices and fish geolocations

- Upwelling indices: the magnitude of the offshore component of Ekman mass transport is considered to be an index of the amount of water upwelled from the base of Ekman layer (m³/S/100m).
Composite satellite images and estimated distribution for Bluefin #333.

1-8 Nov., 2002
Food item for Bluefin in EPO

Fish landing in California

Anchovy

Pacific sardine
Sardine Landing data in 2002

Migration?

Monterey

Los Angels

Southern California Bight

Jan Mar May Jul Sep Nov
Time series in Nov. for obtained from # 333 swimming off Central California

Temporary drops in ambient temperature

Passing through the front
In winter to summer, bluefin were found primarily in the Southern California Bight and along the continental shelf of Baja California (HOT SPOT FOR BLUEFIN TUNA). The fish made use of the top of the water column undertaking frequent, brief forays to depths below the thermocline.
Conclusion-2 schematic model for feeding behavior of Pacific bluefin off Central California region
Thank you for your attention.