Comisión Interamericana del Atún Tropical
Inter-American Tropical Tuna Commission

CIAT
IATTC

Longline data: : catch, CPUE and length frequency

Outline

Annual Submission

Catch:

- algorithm
- distribution

Longline catch per unit of effort

Longline length frequency

Annual submission

IATTC Resolution C-03-05

IATTC resolution C-03-05 on Data Provision established that "the data be provided, by species and fishing gear, where practical, via vessel logbooks and unloading records, and otherwise in aggregated form as in the following table, with Level 3 catch and effort data as a minimum requirement, and, whenever possible, Levels 2 and 1 catch and effort data and length-frequency data."

Category	Level	Resolution	Data
Catch and effort	1	Set-by-set, logbook data with information on **gear configuration and target species**	**Total catch in numbers, and weight if available; fishing effort**
	2	1°x1°–month, with information on **gear configuration and target species**	
	3	5°x5°–month, with information on **gear configuration and target species**	
Length frequency	1	Set position, start or end of set	**Length or weight of individual fish**
	2	Grid position, best possible spatial-temporal resolution of area of capture	

The following exceptions shall apply to the immediate entry into force of this resolution:

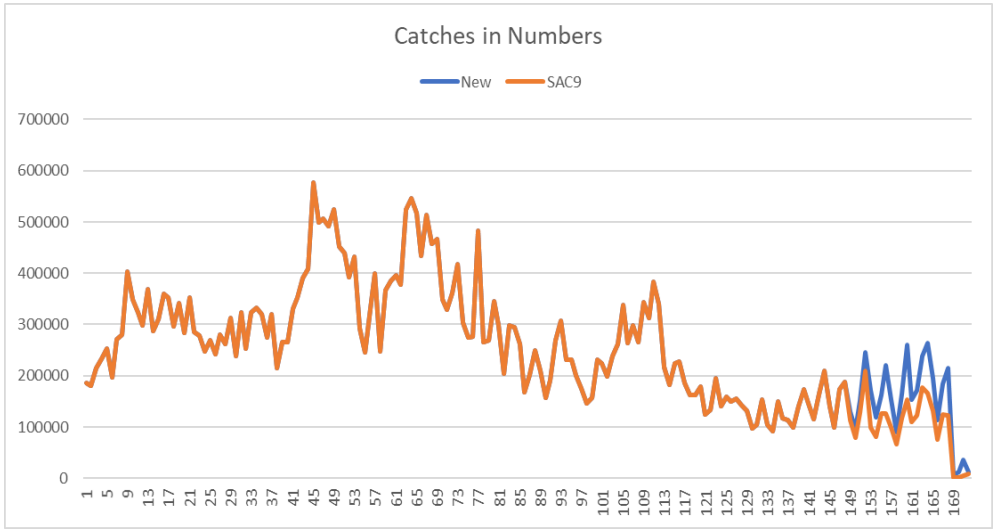
a. For vessels of less than 24 meters in length overall, the requirements of this resolution shall not enter into force until 1 January 2007. However, each member shall make its best efforts to provide as much data as possible for these vessels.

b. Catch data from artisanal vessels may be reported as total annual catches, without data on fishing effort.

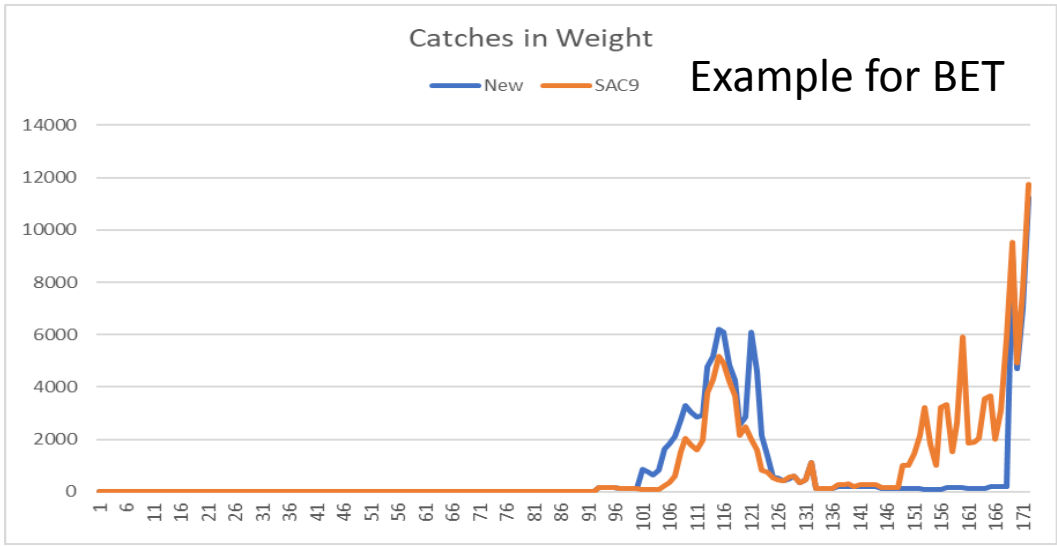
c. Catch data from recreational fishing vessels may be reported as total annual catches, without data on fishing effort.

Longline catch calculation

- Algorithm in R
- Rules for:
  - Substitution
  - Allocation in space
- Catch in numbers and catch in weight (as separate fisheries



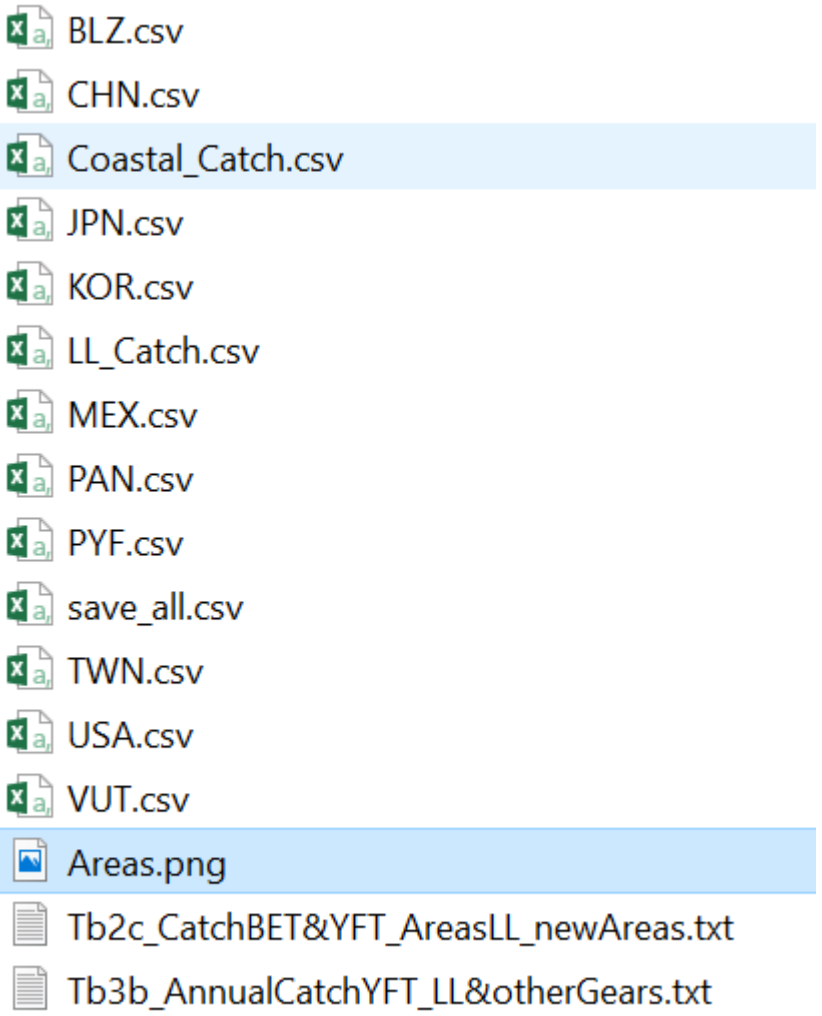
Model time step: year_quarter



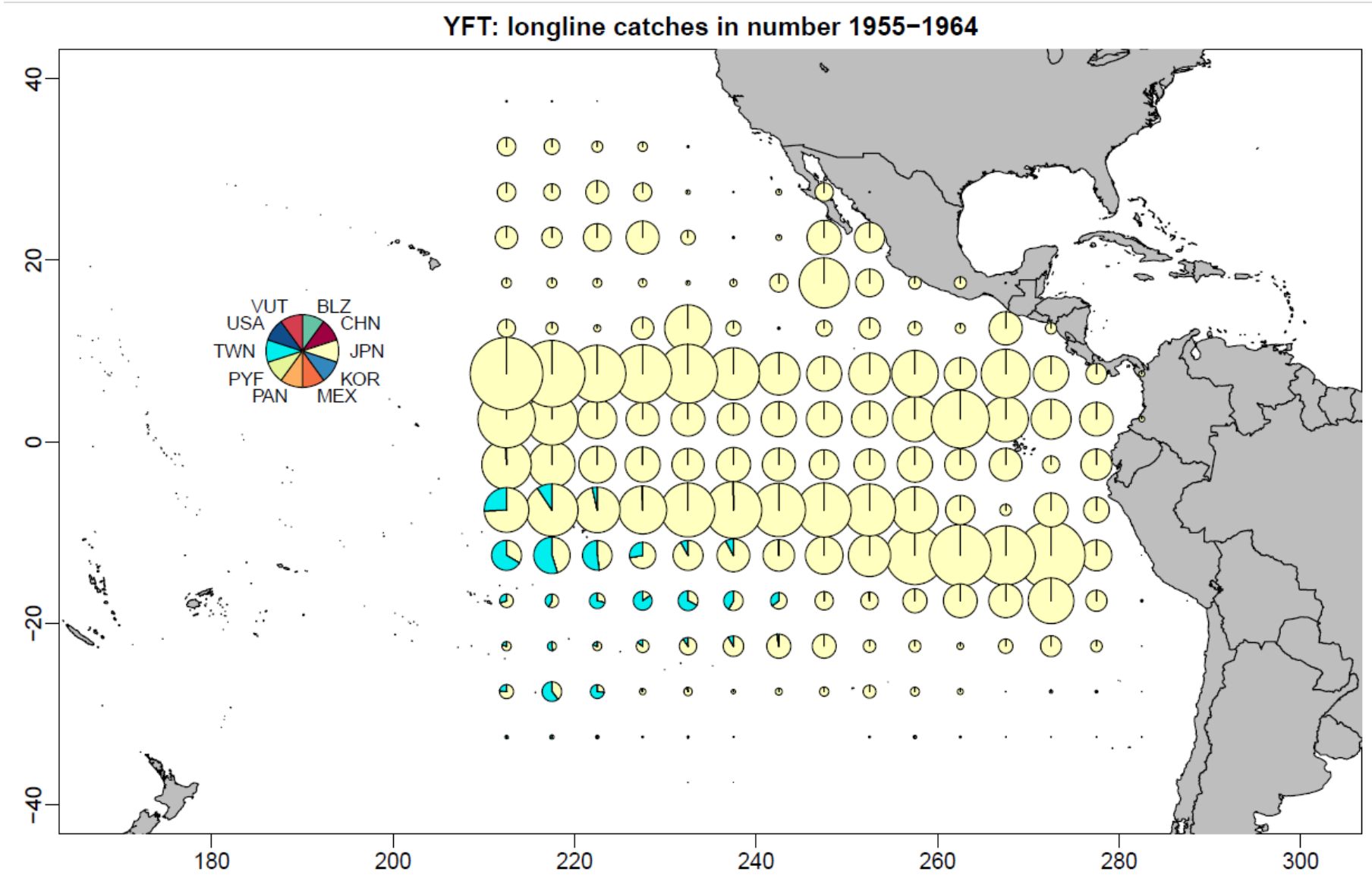
Model time step: year_quarter

Longline catch calculations

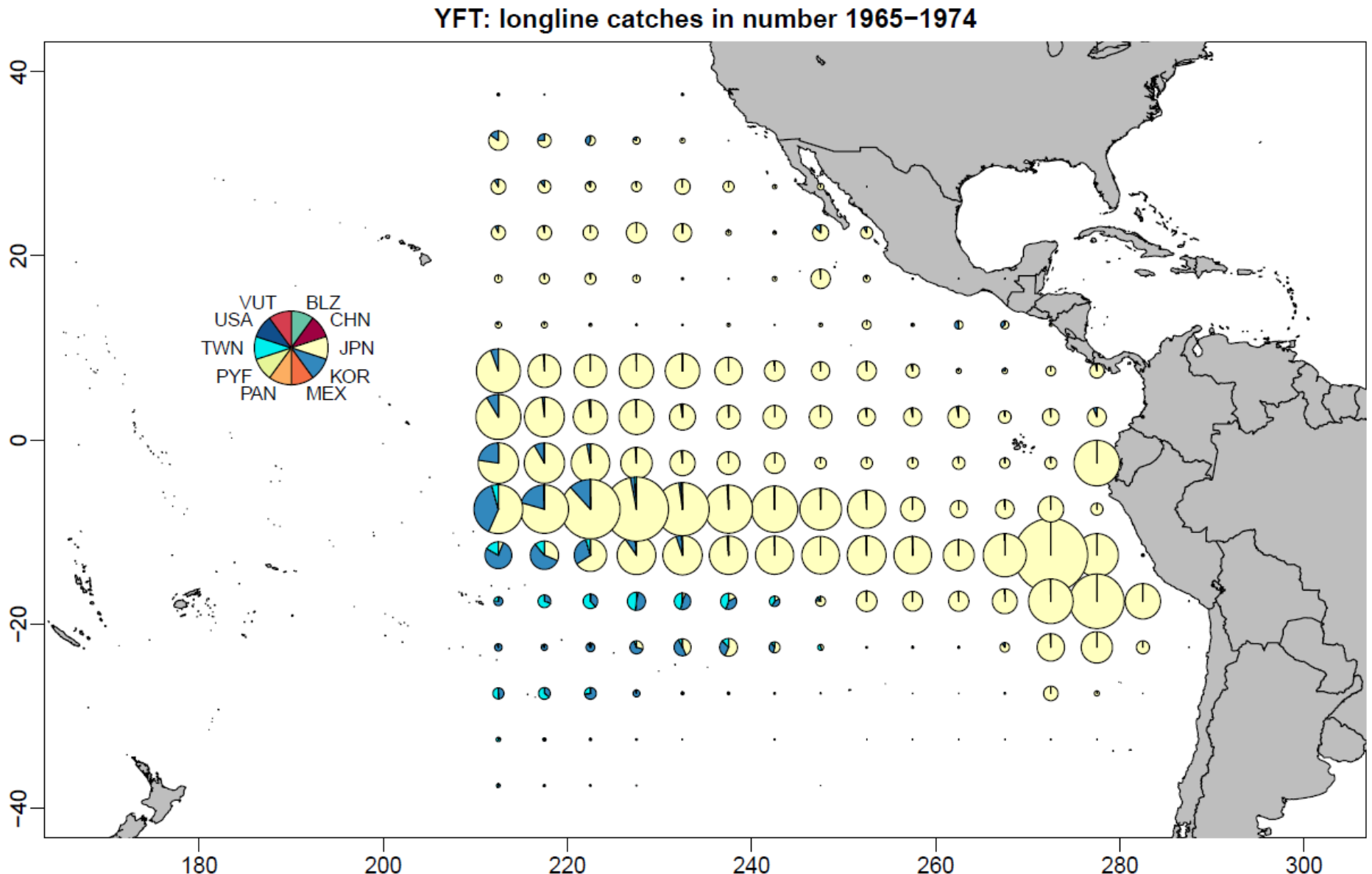
YFT



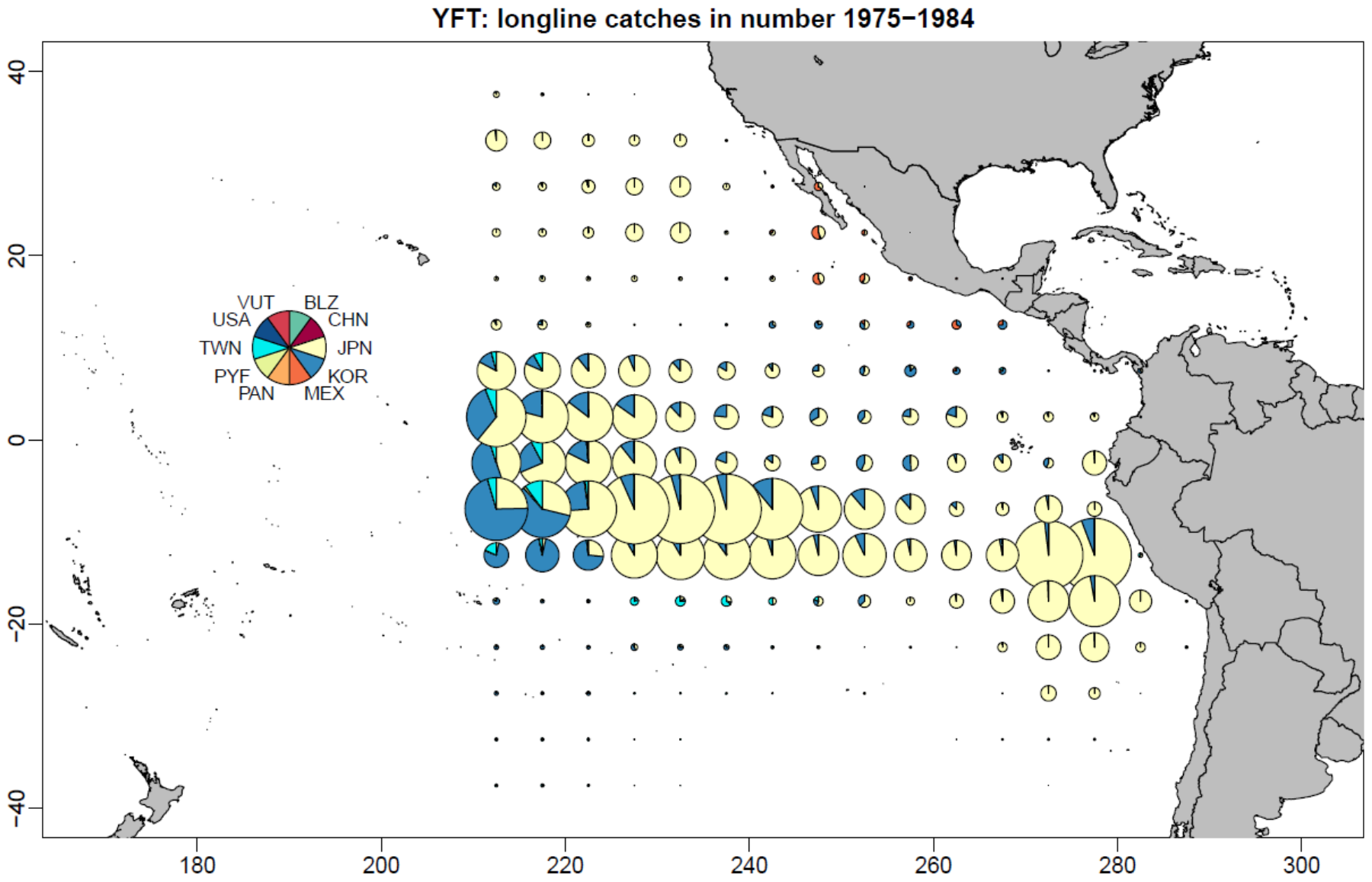
YFT catch distribution longline



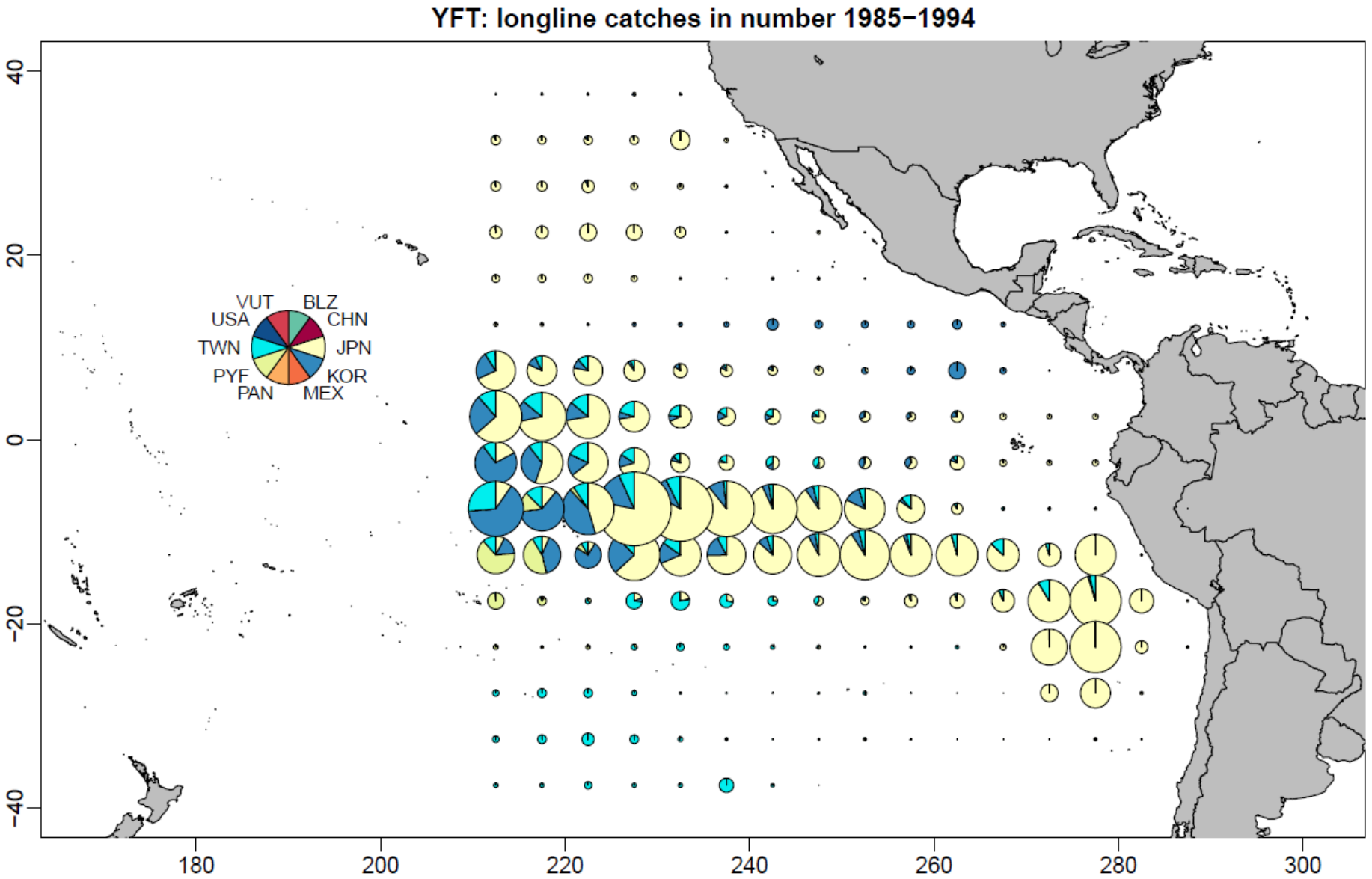
YFT catch distribution longline



YFT catch distribution longline



YFT catch distribution longline



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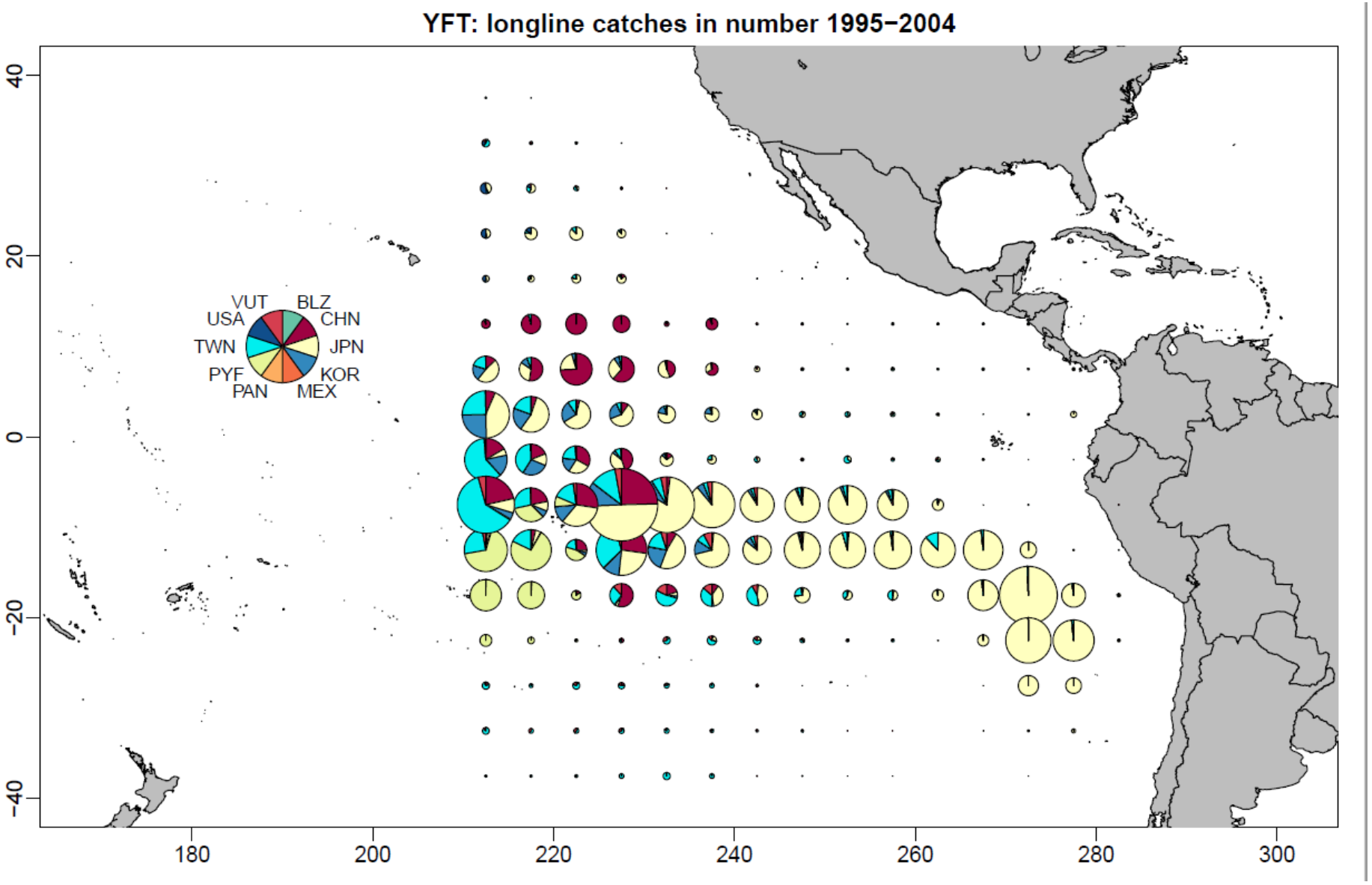
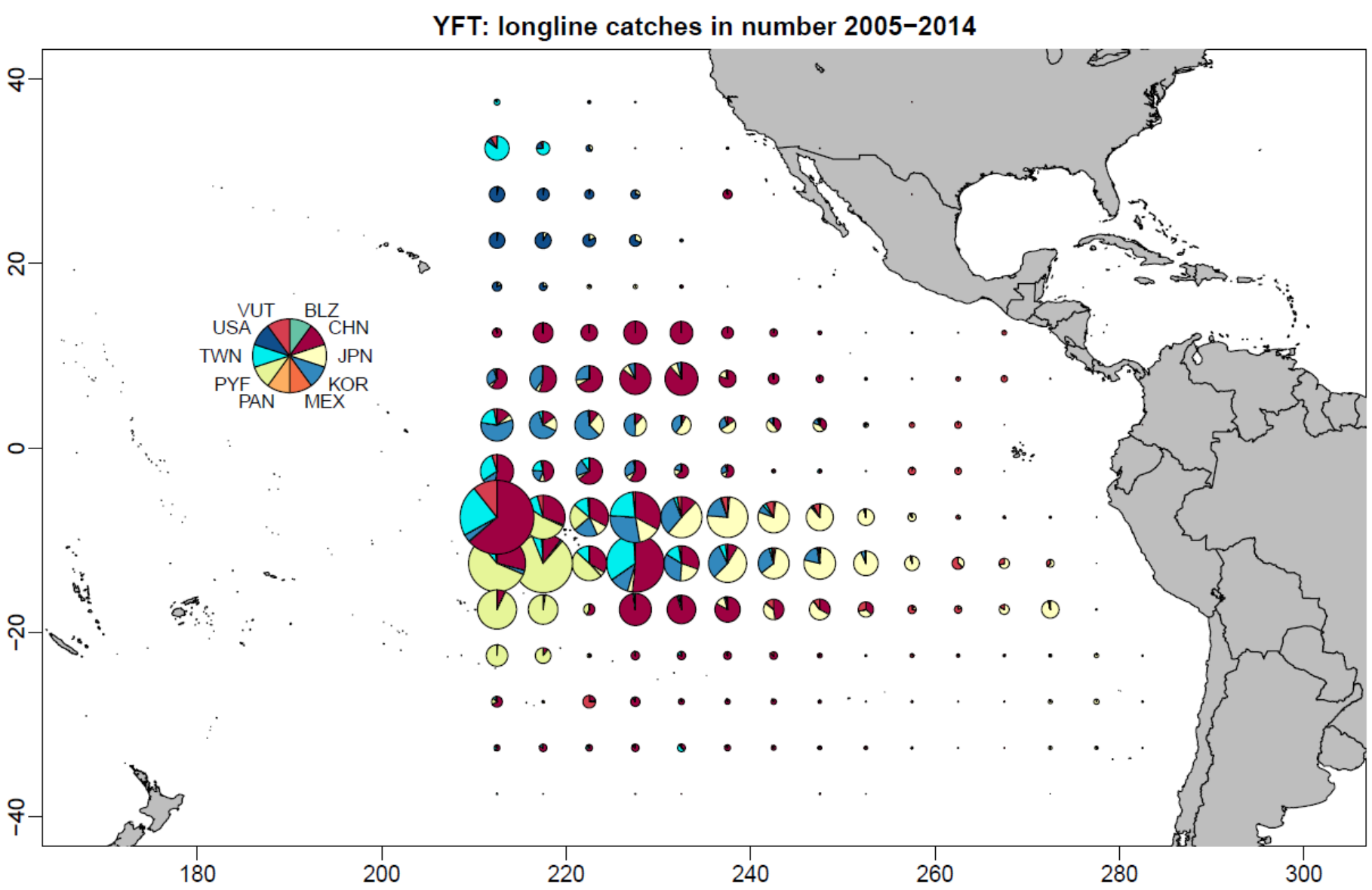


YFT catch distribution longline



YFT catch per unit of effort

- Japanese fleet data
- Catch in numbers per hook

Aggregated by:

- year-quarter
- 5 degrees latitude X 5 degrees of longitude
- Hooks between floats category
- Until 2018: standardized using a delta-lognormal approach (Hoyle and Maunder, 2006)

Hooks between floats

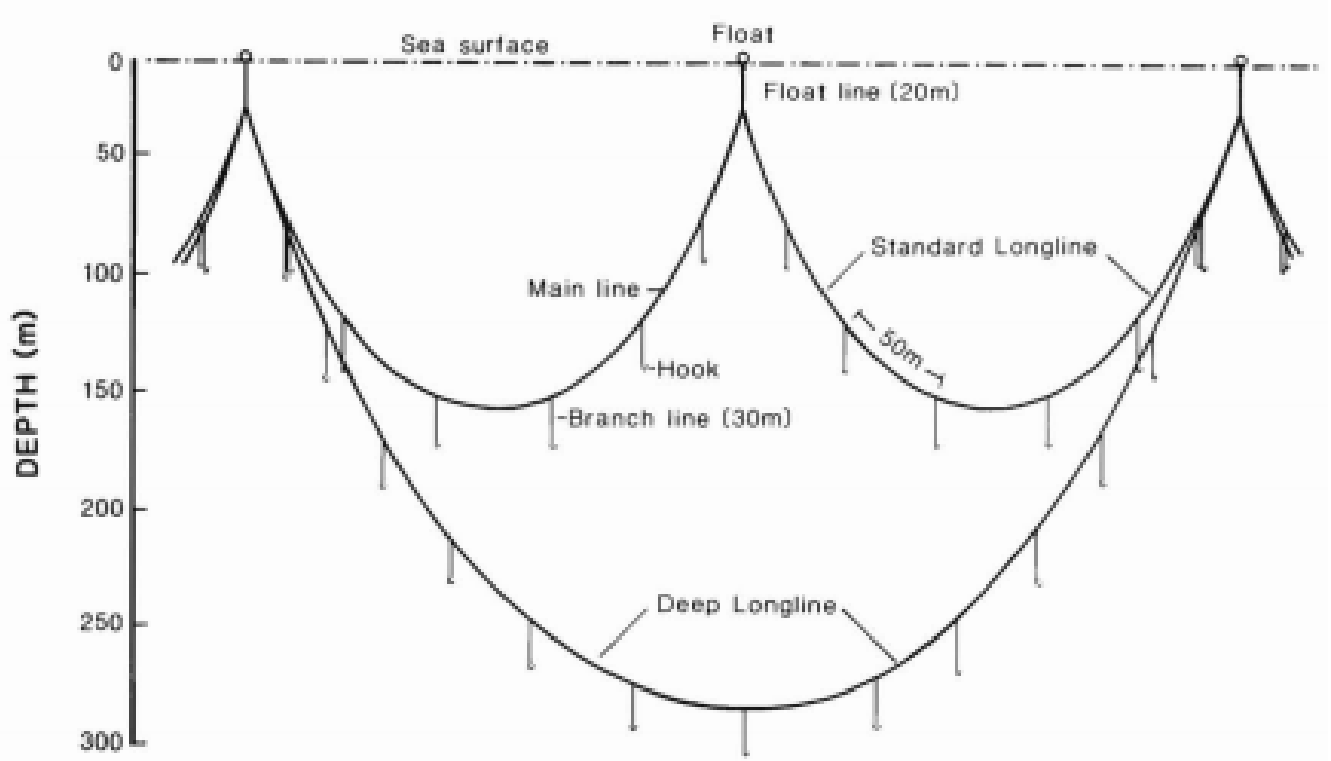


Figure 1.—Standard and deep longline gear as used by Japanese fishermen. The standard gear has an average of 6 branch lines per basket of mainline; deep-longline gear has about 13 branch lines (adapted from Suzuki et al., 1977).

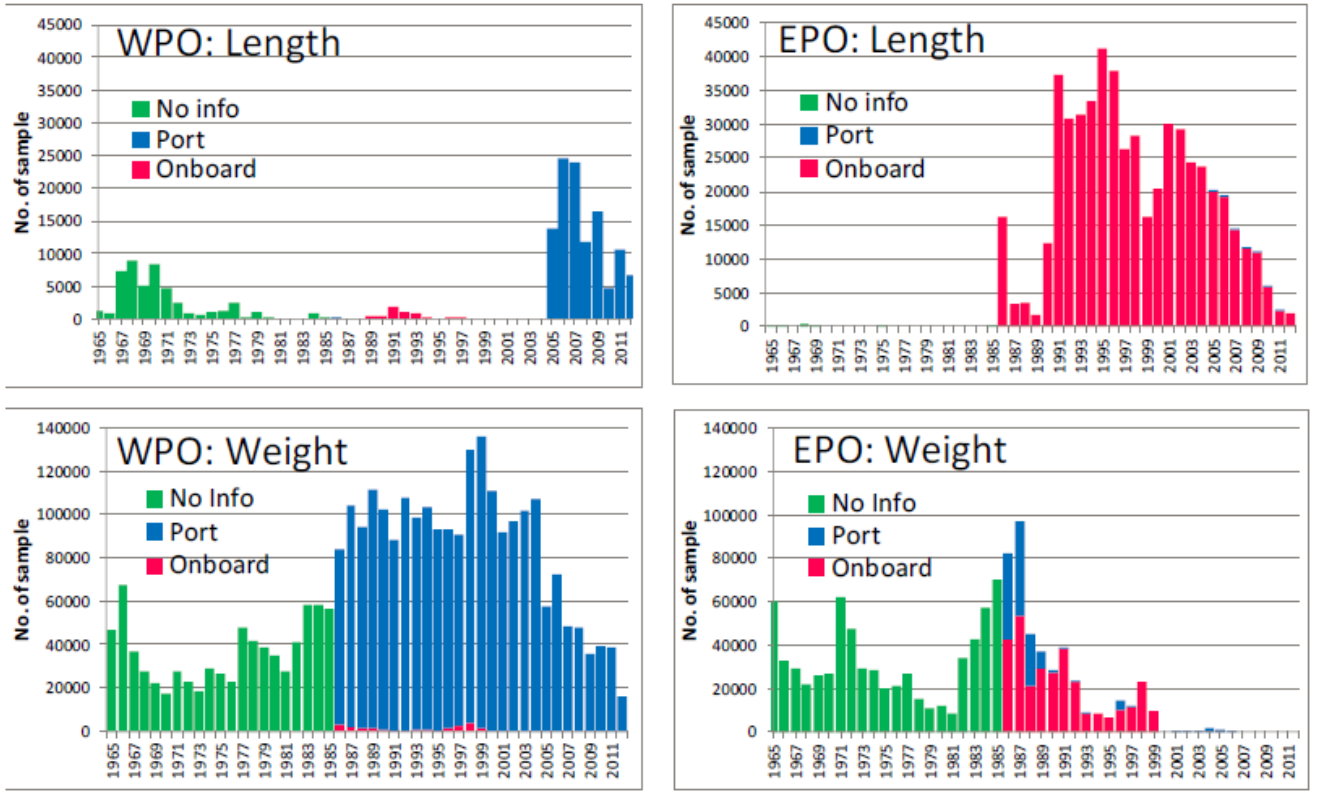
Sakagawa et al 1987

https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/MFR/mfr494/mfr4949.pdf

YFT length frequencies

WCPO assessments : mainly use weight-frequency data
EPO: length-frequency data dominates in recent years

Type of size measurement by area in the Pacific Ocean



Okamoto (2014) SAC-05 INF-D

Weight data

- Conversion factors from Langley et al (2006)

Gilled-and-gutted weight

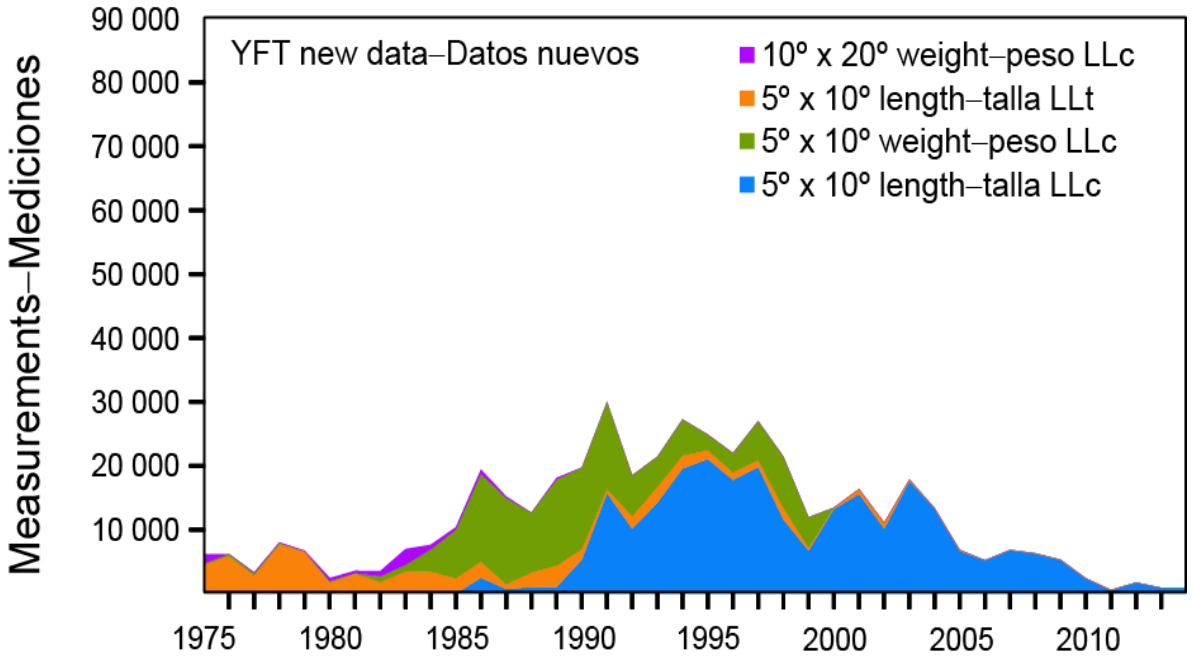
Photo credit: Peter Sharples, OFP.
Source: Langley et al (2006)

Gilled-and-gutted processing conducted by **Japanese** distant-water freezer vessels

Photo credit: Fabrice Bouyé, OFP,
Source: Langley et al (2006)

YFT length frequencies

Yellowfin tuna



LLc: commercial longline vessel
LLt: longline training vessel

- SAC 10 model:
- Catches length frequencies represented by LLc and Llo (observers)
- LLt used as “surveys” (smaller than LLc)

- New reference models:
- Only LLc + Llo
- Raised to the total catch

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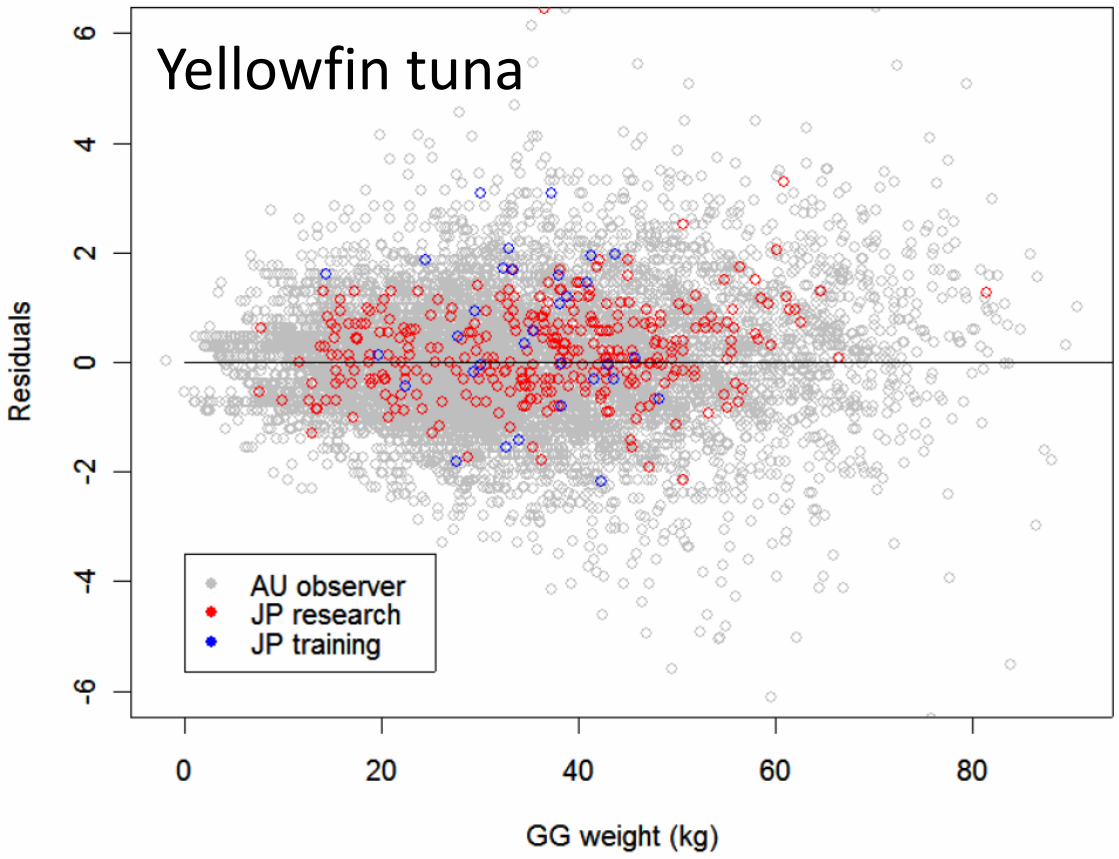
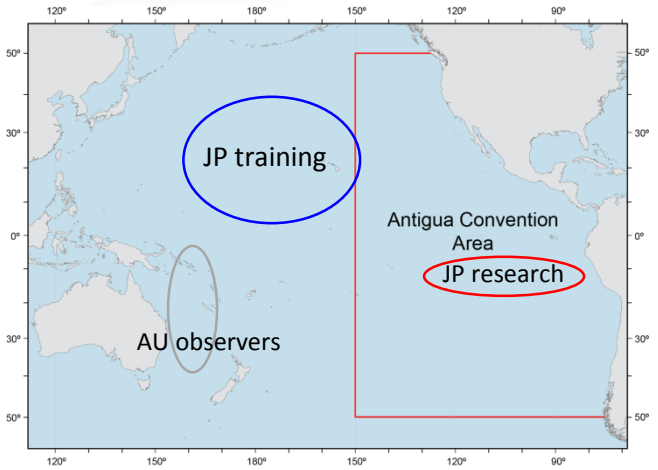
Questions

Weight data





Residuals (observed - expected) of the fit between processed (GG) weight and whole weight for **yellowfin** from three datasets combined

How are the indices obtained

INTER-AMERICAN TROPICAL TUNA COMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

WORKING GROUP TO REVIEW STOCK ASSESSMENTS

7TH MEETING

LA JOLLA, CALIFORNIA (USA)
15-19 MAY 2006

DOCUMENT SAR-7-07

STANDARDIZATION OF YELLOWFIN AND BIGEYE CPUE DATA FROM JAPANESE LONGLINERS, 1975-2004

by

Simon D. Hoyle and Mark N. Maunder

How are they computed

Input data

- Japanese fleet data
- Catch in numbers per hook
- Aggregated by:
  - year-quarter
  - 5 degrees latitude X 5 degrees of longitude
  - Hooks between floats category

Standardization model

- Delta lognormal approach:
- Two components:
  - Probability of encounter with a binomial model
  - Positive values with a lognormal model
  - Both models include the factors: year_quarter, lat_lon and hbf

How are the indices obtained

- Delta GLM approach
- Binomial distribution (probability of zero catches)
- Lognormal distribuition for the positive values
- Index as the back-transformed least squared means for the two model components

Data were analyzed with a delta GLM with a binomial distribution for the probability w of catch being zero and a probability distribution $f(y)$ for non-zero catches, as in Equation (1) (E.J. Dick, NOAA Santa Cruz, personal communication; see Stefansson (1996) for a description of the method). Analyses were carried out to estimate an index for each year, which was the product of the back-transformed least-squares means for the two model components, $(1\text{-}w)\cdot E(y|y \neq 0)$. The variance of the likelihood function was weighted by effort.

$$\Pr(Y = y) = \begin{cases} w, & y = 0, \\ (1-w)f(y) & \text{otherwise} \end{cases} \qquad (1)$$

The following combinations of explanatory variables were examined as categorical variables: latitude*longitude interaction, HBF. In the delta component, effort was also examined, since the probability of zero catch is likely to be affected by effort. Time was included as a categorical variable in all models.

$$w = g(\text{Year*quarter, latitude*longitude, HBF, effort})$$

$$f(y) = h(\text{Year*quarter, latitude*longitude, HBF})$$

Two distributions, gamma and lognormal, were examined for the non-zero data.

Hoyle and Maunder 2006, SAR 7 - 07