

# EXPLORATORY ANALYSIS OF AVAILABLE DATA OF PACIFIC BONITO (*Sarda chiliensis lineolata*) IN THE NORTH PACIFIC OCEAN

ANÁLISIS EXPLORATORIO DE LOS DATOS DISPONIBLES DE  
BONITO DEL PACÍFICO (*Sarda chiliensis lineolata*) EN EL  
OCÉANO PACÍFICO NORTE



COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL  
COMITÉ CIENTÍFICO ASESOR

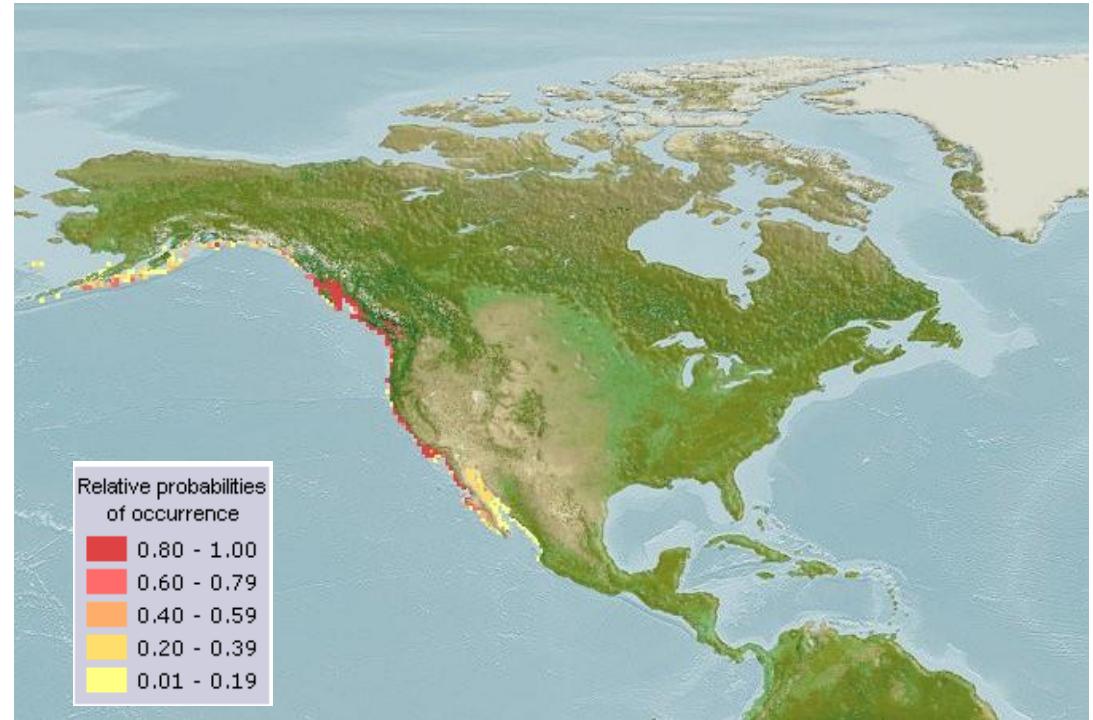
10<sup>a</sup> REUNIÓN

La Jolla, California (EE.UU.)

13-17 de mayo de 2019

DOCUMENTO SAC-10 INF-J

SOFIA ORTEGA GARCIA & ULIANOV JAKES COTA  
INSTITUTO POLITECNICO NACIONAL-CICIMAR

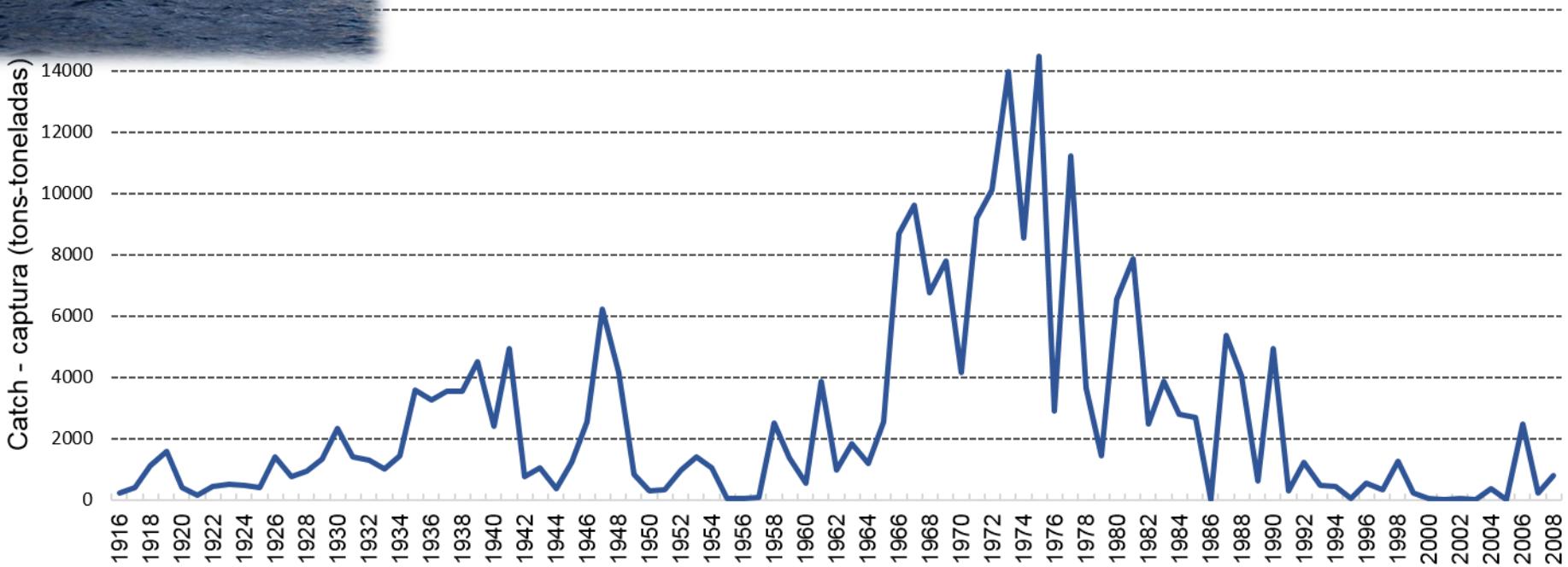


Distribution of the two species of the Pacific bonito *Sarda chiliensis lineolata* in the north hemisphere and *Sarda chiliensis chiliensis* in the southern hemisphere (Taken from *The IUCN Red List of Threatened Species: Sarda chiliensis – published in 2011.* <http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T170352A6763952>)



# HISTORICAL CATCHES

troll gear, gillnets, pole and line gear



**FIGURE 1.** Commercial historical catches of Pacific bonito in California and Baja California waters  
(Source: Collins and MacCall 1977; Leet et al. 2001; Larinto 2010).

## TUNA PURSE-SEINE



## WET VESSELS (Sardine, anchovy)



# BIOLOGICAL ASPECTS

**SPAWNING :** Klawe 1961; Pinkas 1961; Sokolovskii 1971; Black 1979; Larinto 2010

**FEEDING HABITS:** Fields 1965; Pinkas et al. 1971

**SIZE, AGE AND GROWTH:** Kuo (1970); Campbell and Collins 1975

**MIGRATION:** Campbell and Collins 1975; Collins and MacCall 1977; Collins et al. 1980

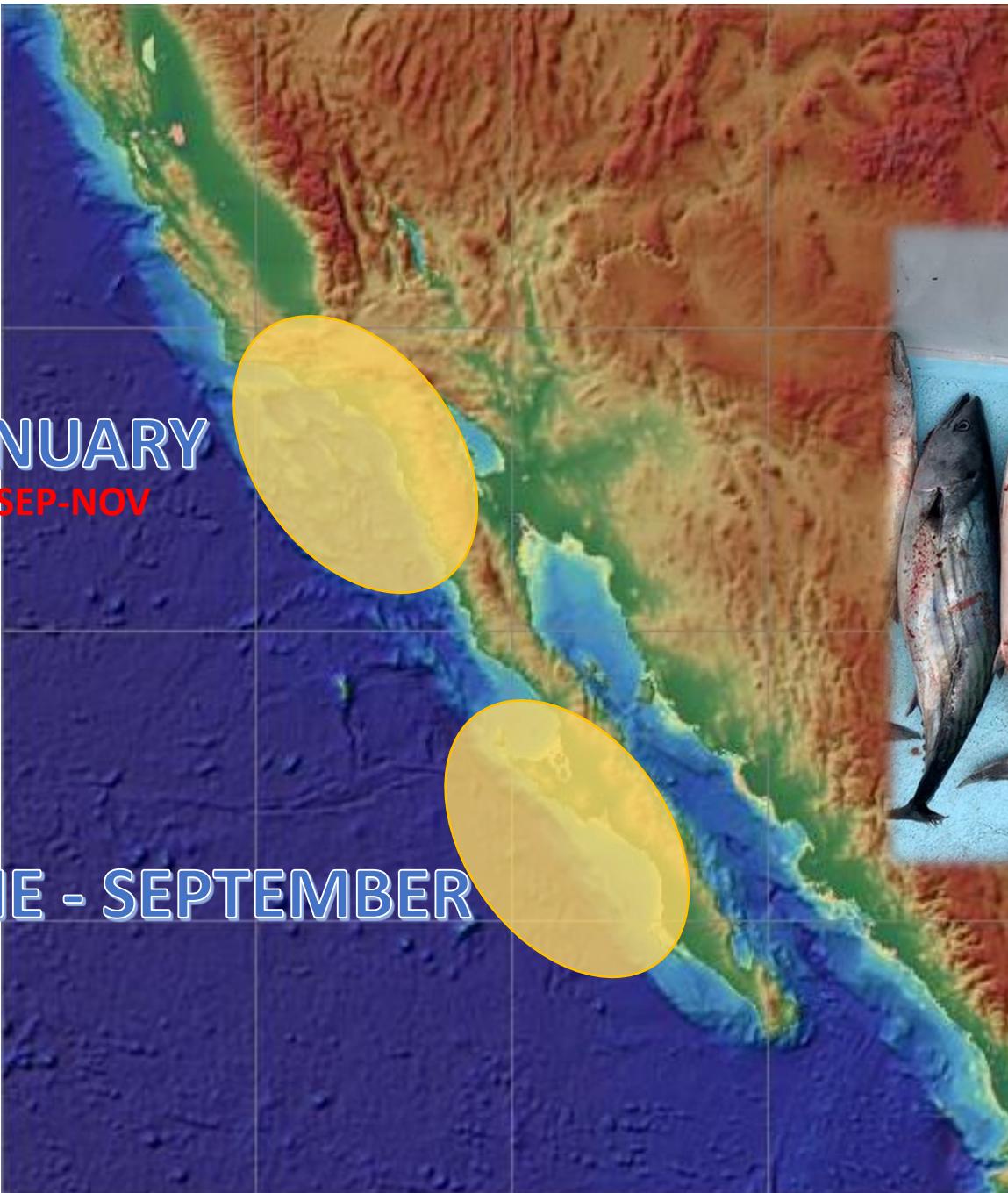
**ENVIRONMENTAL INFLUENCES :** Pinkas et al. 1971; Radovich 1973; Jarvis et al. 2004; Bellquist 2015

**STOCK ASSESSMENT:** Squire 1972; MacCall et al. 1976; Collins et al. 1980

# CATCHES

JULY - JANUARY  
maximum SEP-NOV

JUNE - SEPTEMBER



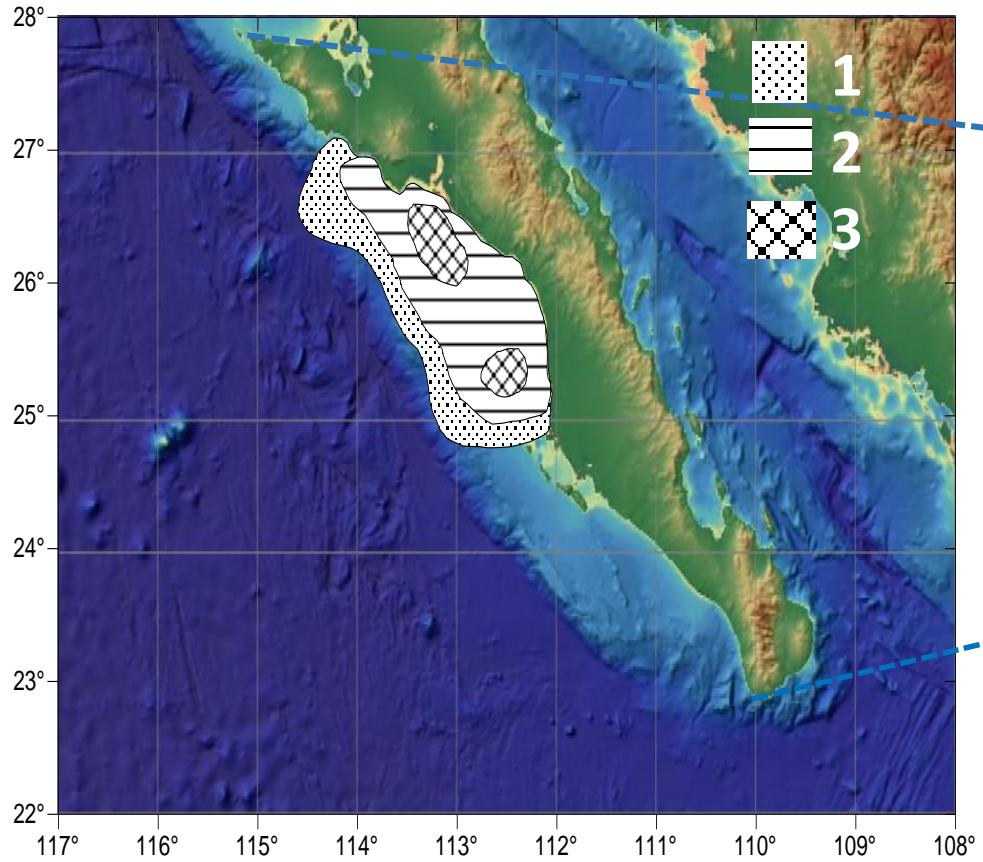


> 50 cm 100% mature



> 55 cm 97% mature

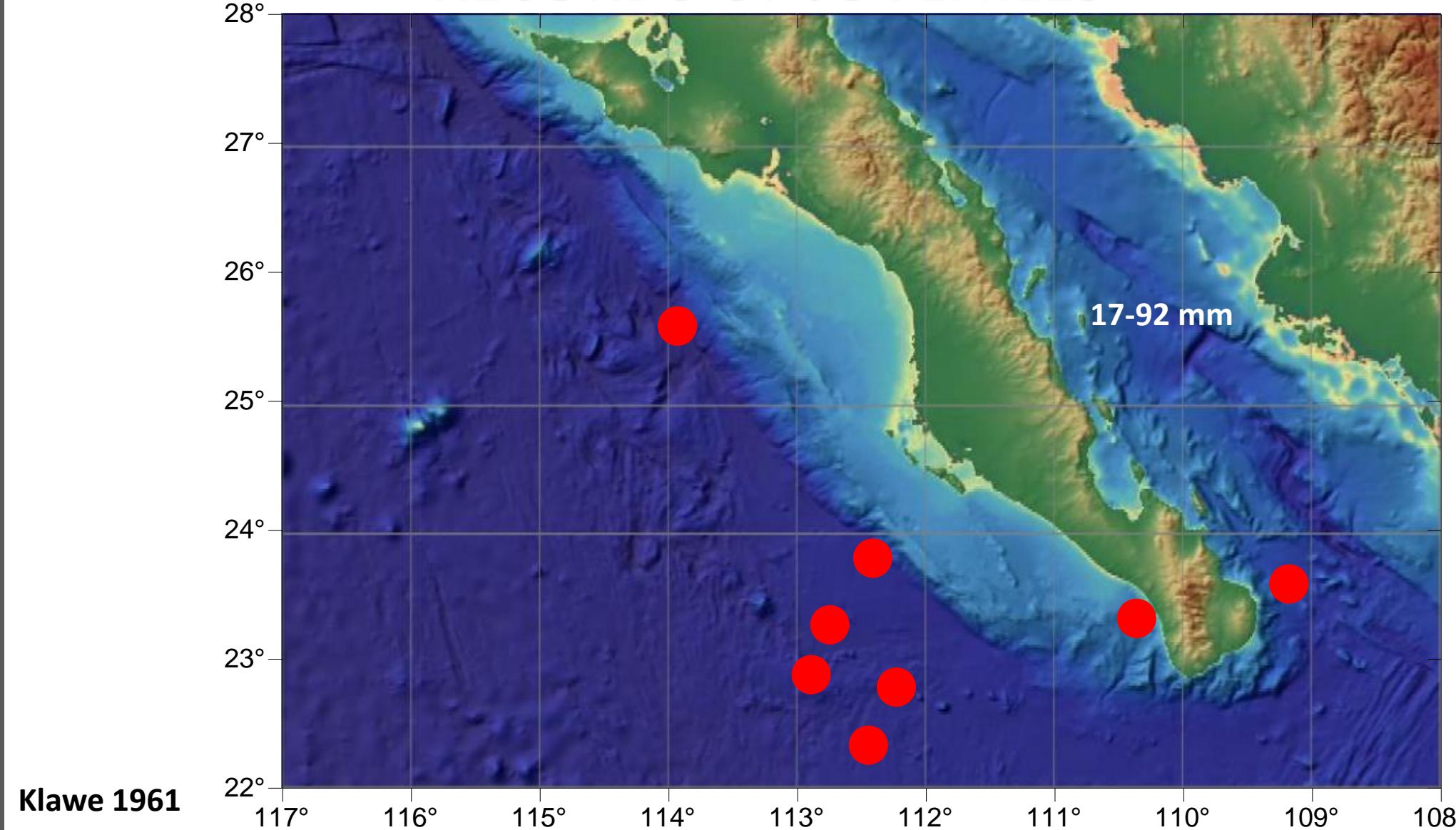
# SPAWNING



16-20 °C



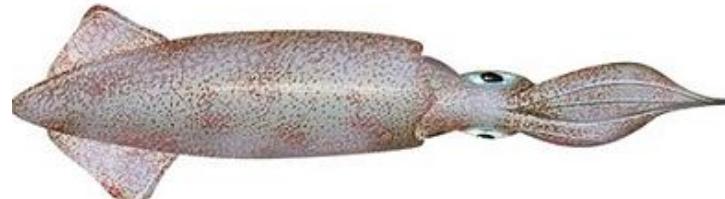
# RECORDS OF JUVENILES



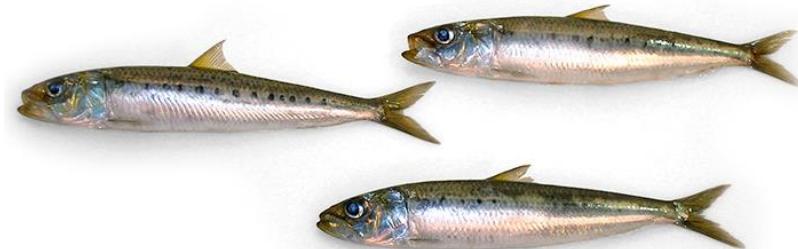
# FEEDING HABITS



*Engraulis mordax*

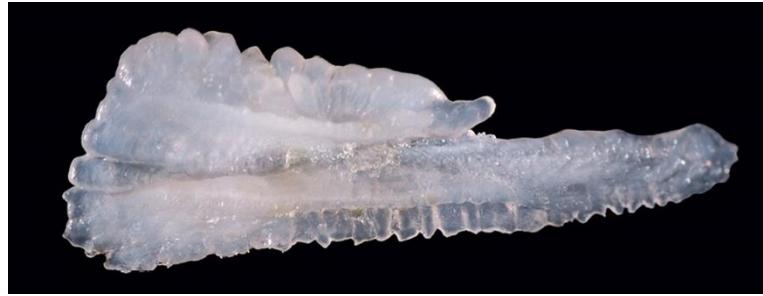


*Loligo opalescens*



*Sardinops sagax*

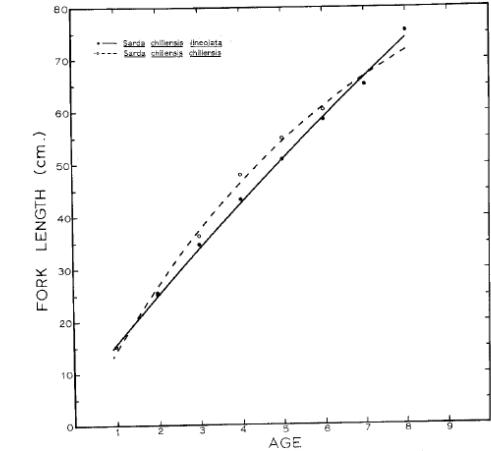
# AGE AND GROWTH



Kuo (1970)

$$L_{\text{inf}} = 266.1$$

- I 15.2 cm
- II 25.2 cm
- III 34.7 cm
- IV 43.3 cm
- V 50.9 cm
- VI 58.5 cm
- VII 65.2 cm
- VIII 75.6 cm

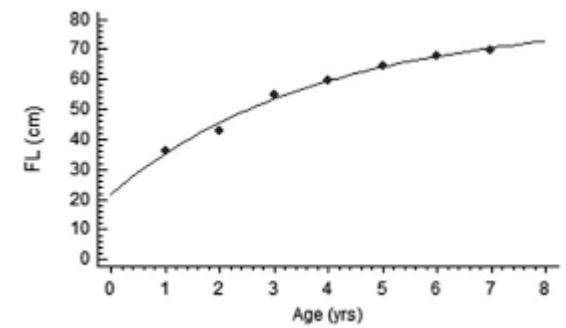


Cambell y Collins (1970)

$$L_{\text{inf}} = 76.9$$

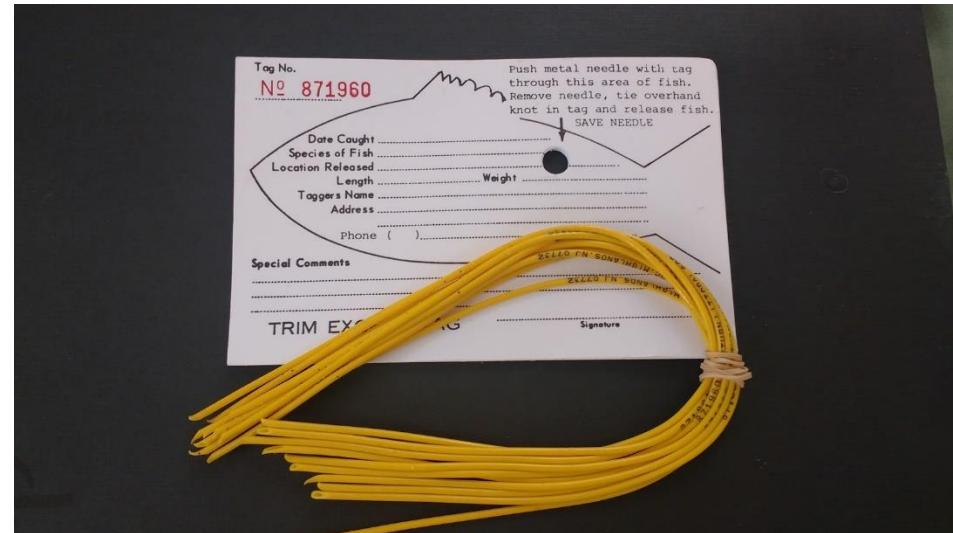


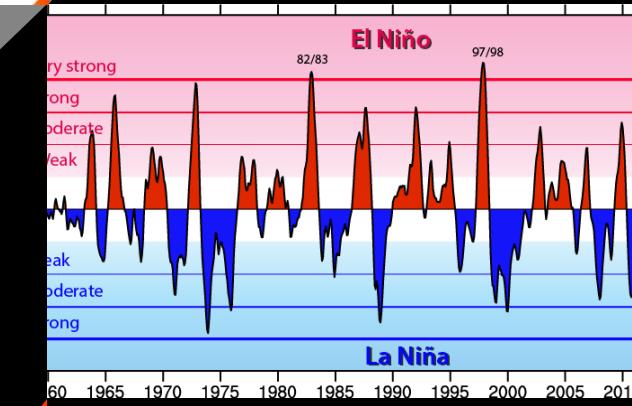
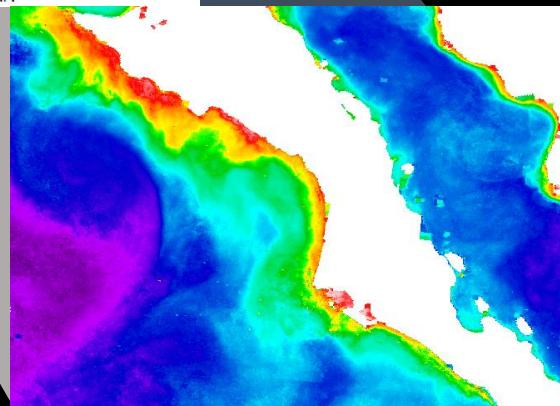
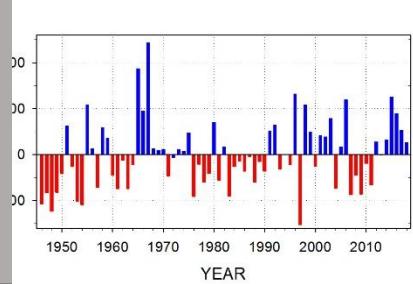
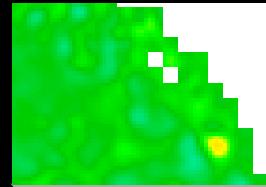
- I 51.5 cm
- II 63.3 cm
- III 69.5 cm
- IV 72.9 cm
- V 74.8 cm
- VI 75.7 cm



# .Migrations

In general fish tagged in California go northward in late summer and early fall and down southern California and Baja California coasts during winter months.



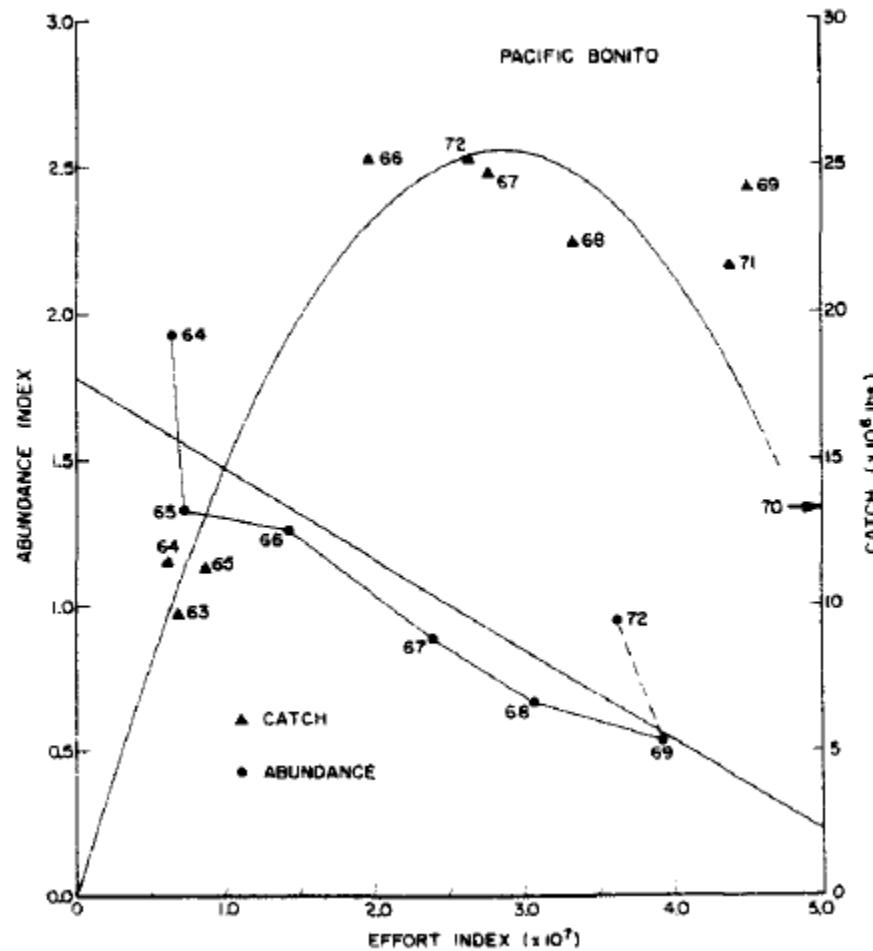


# ENVIRONMENTAL INFLUENCES

Bellquist 2015: upwelling, PDO, SST

# STOCK STATUS

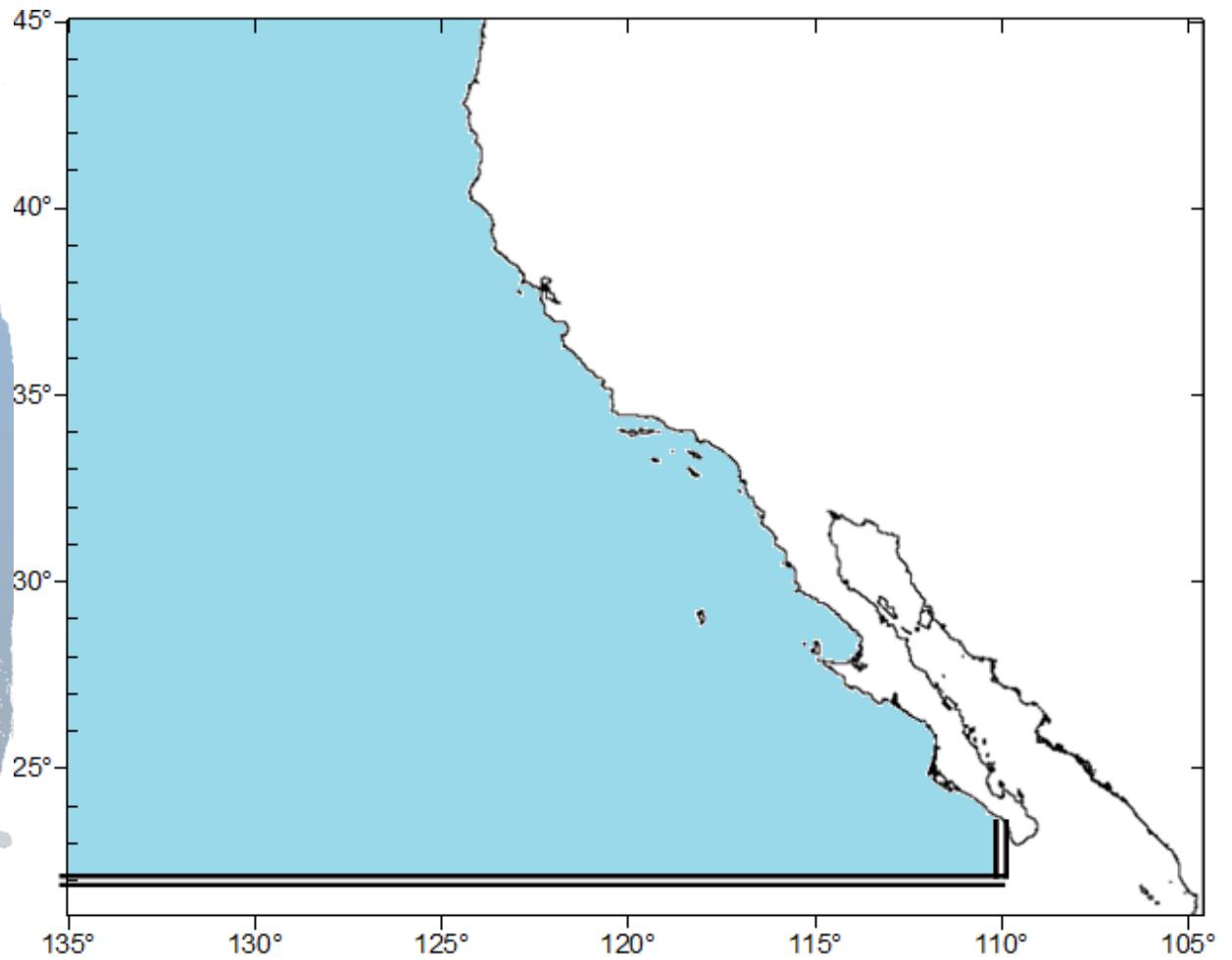
Although dedicated efforts have been made to obtain indicators of abundance through production models (equilibrium approximation) and yield per recruit models using catch data from commercial fishery and sport-fishing, the estimates have not been reliable yet and seem to overestimate the abundance and maximum sustainable yield (MSY).



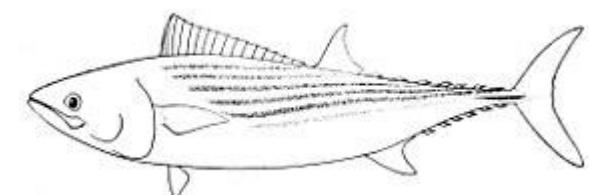
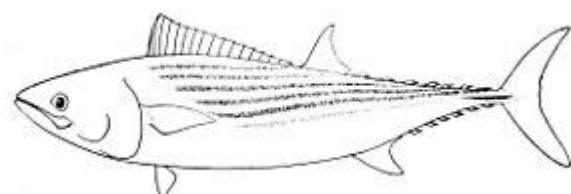
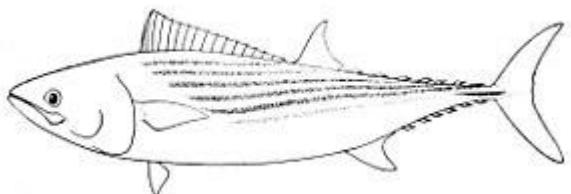
# IATTC Bonito database

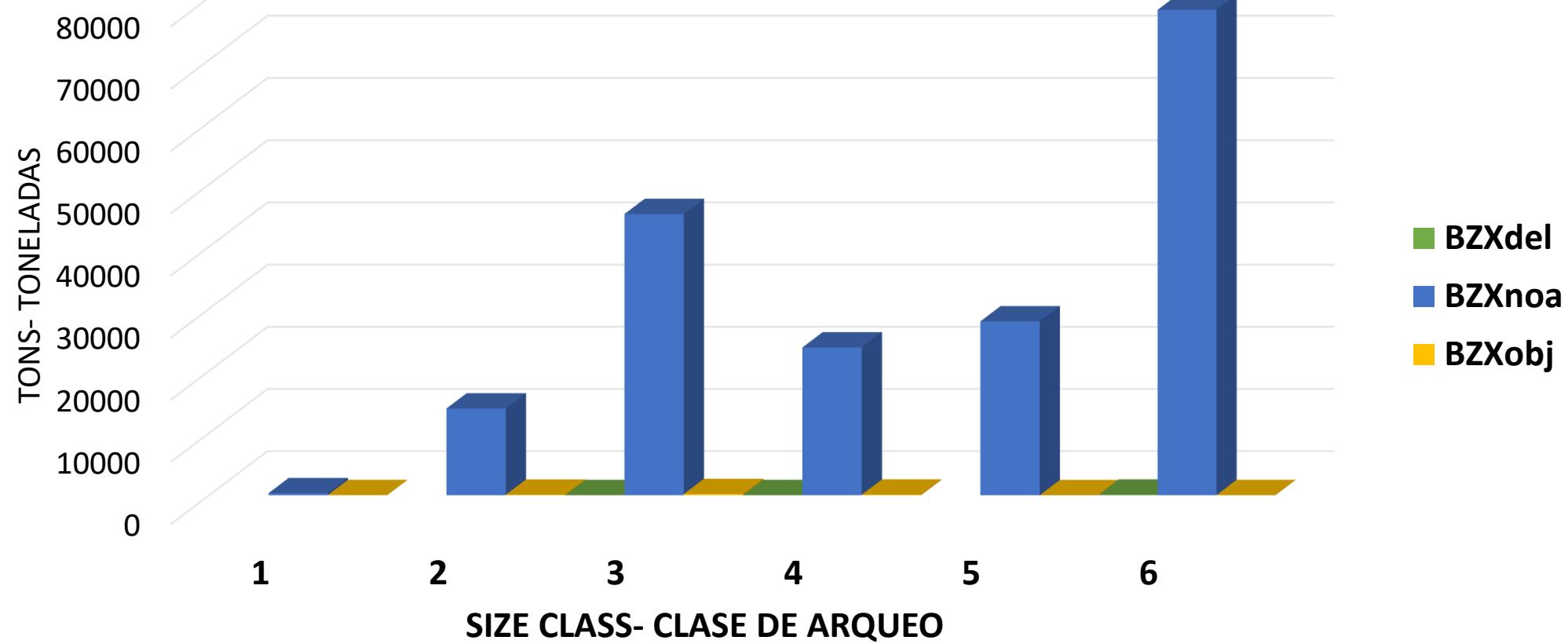


Collette et al. 2011

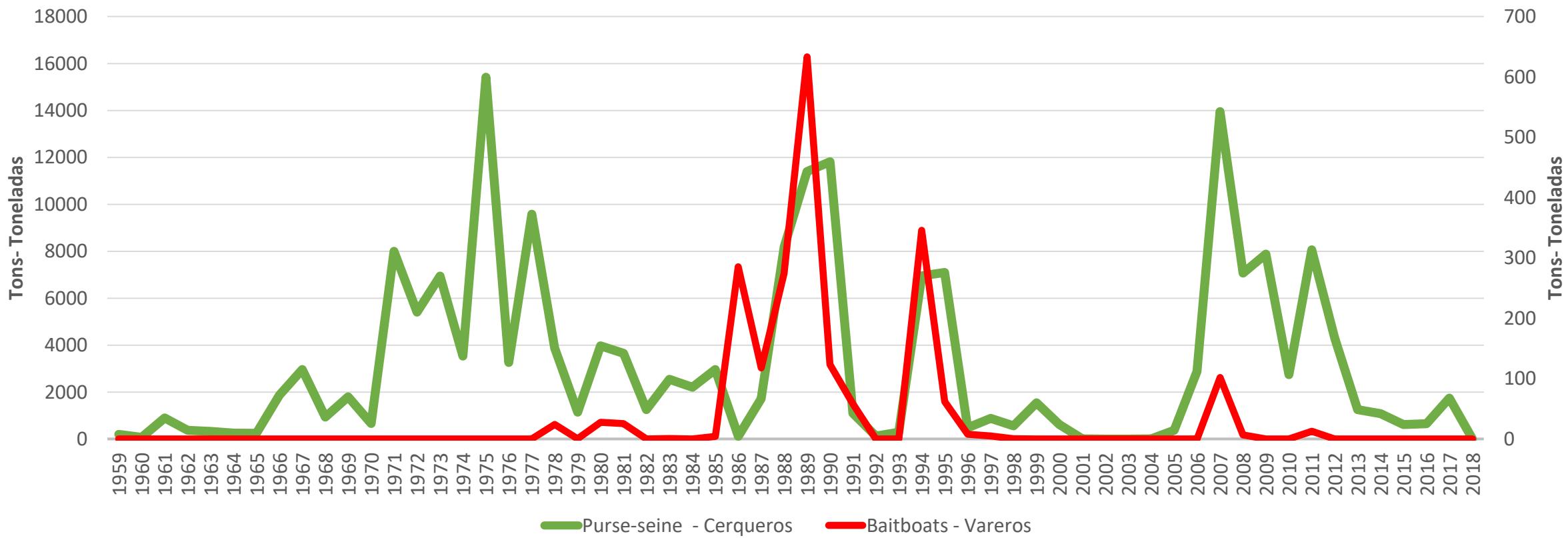


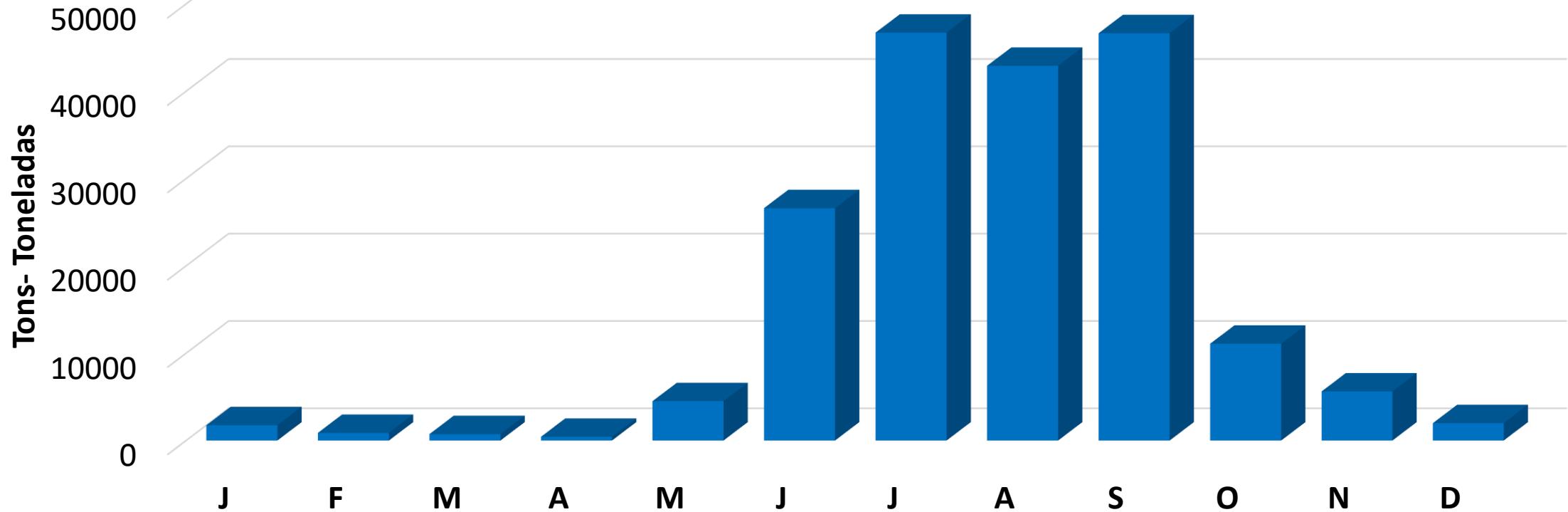
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BZXnoa	189299.4	99.71
BZXobj	411.4934	0.22
total	189855.6	100.00





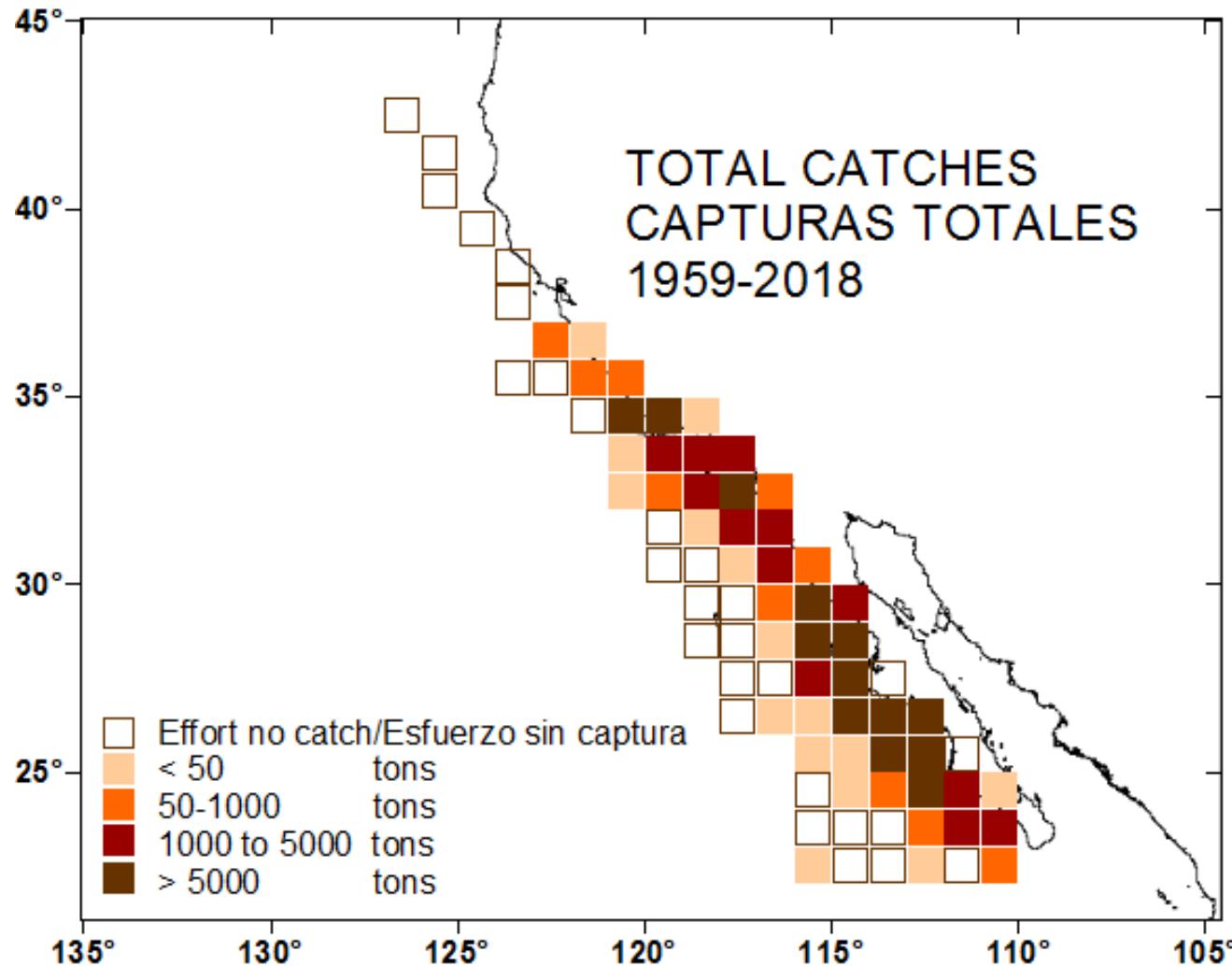
# INTERANNUAL VARIATION

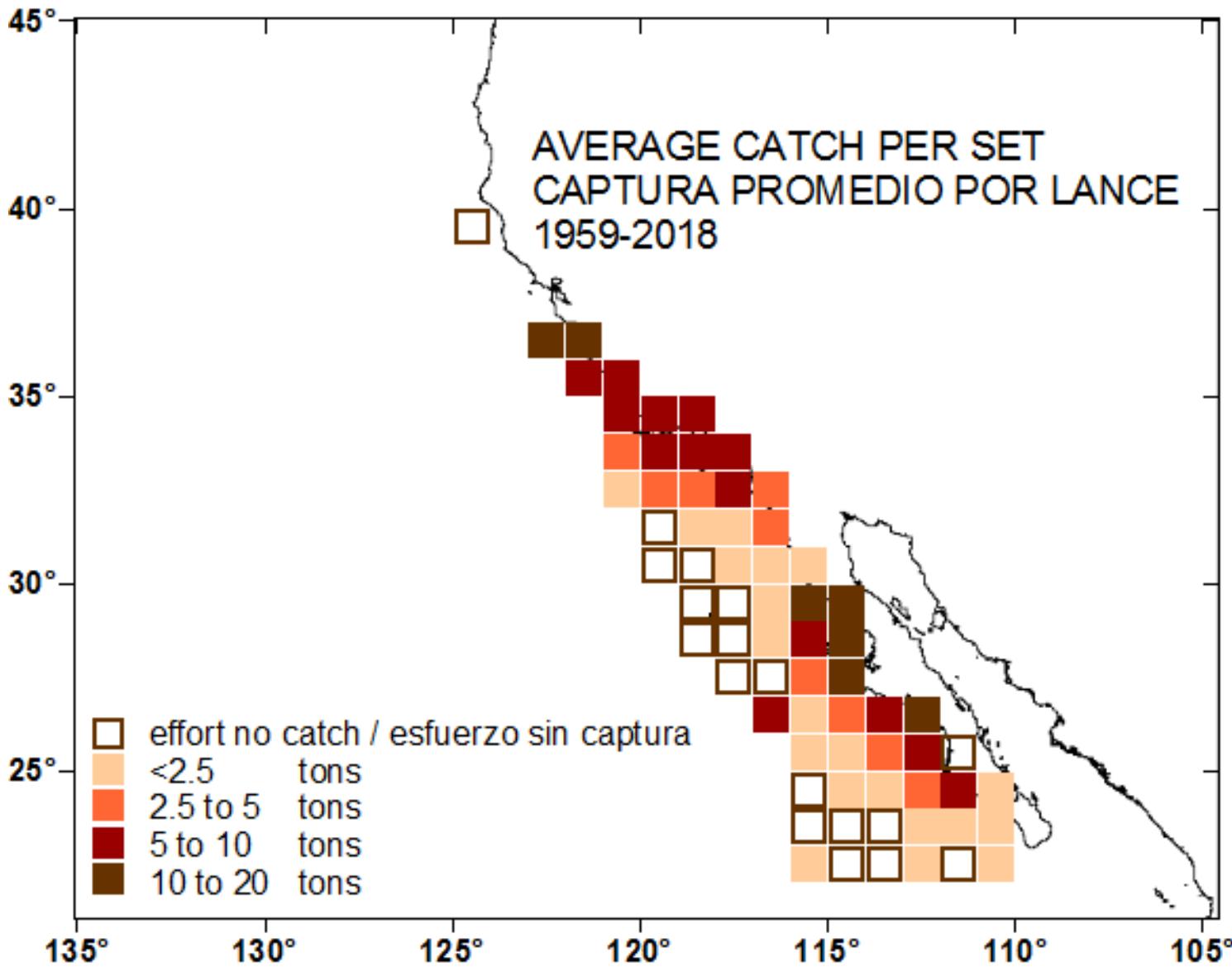


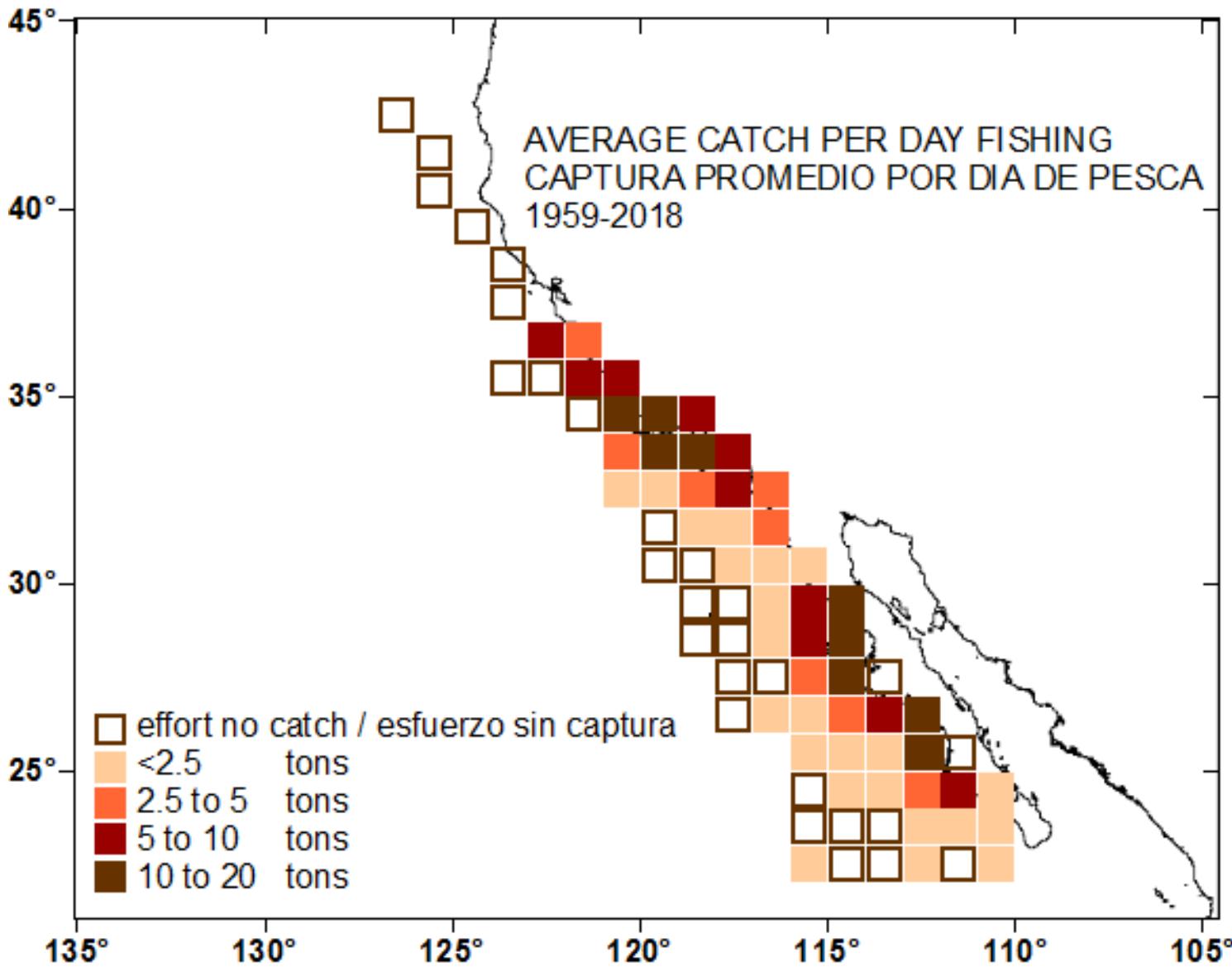


TOTAL CATCH BY MONTH (1959-2018)  
CAPTURAS TOTALES POR MES (1959-2018)

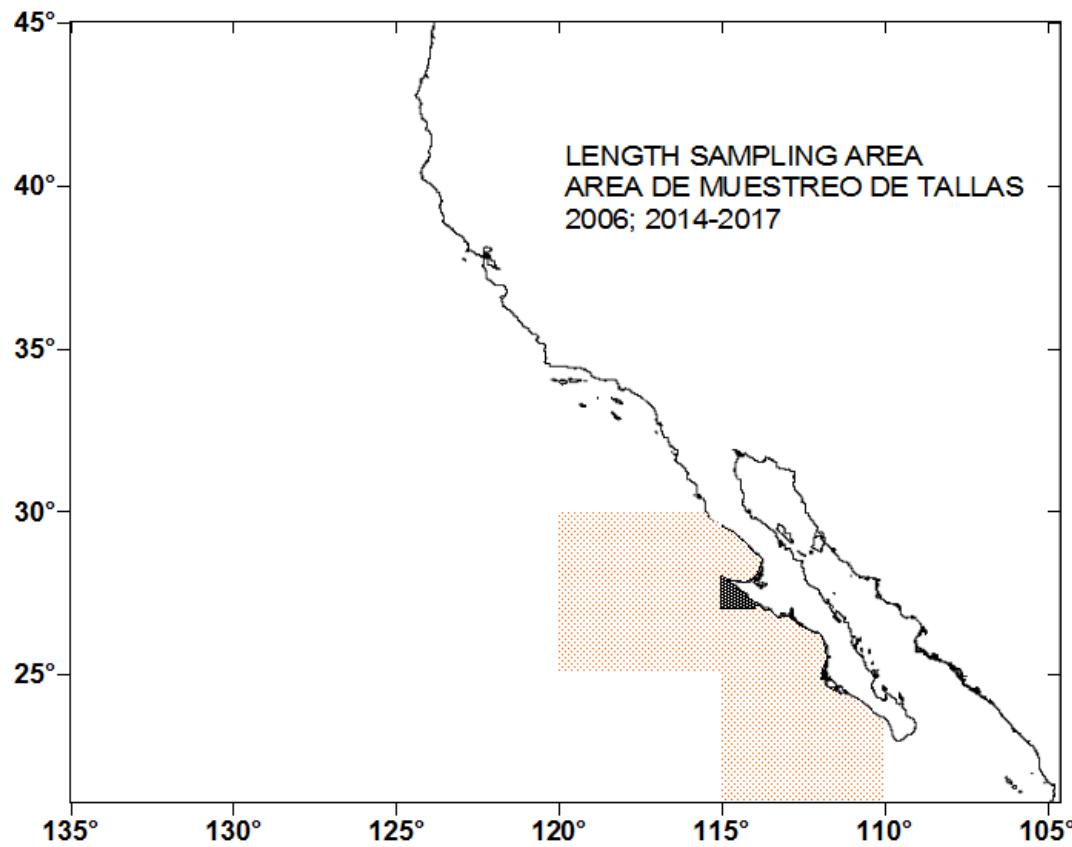
## SPATIAL DISTRIBUTION



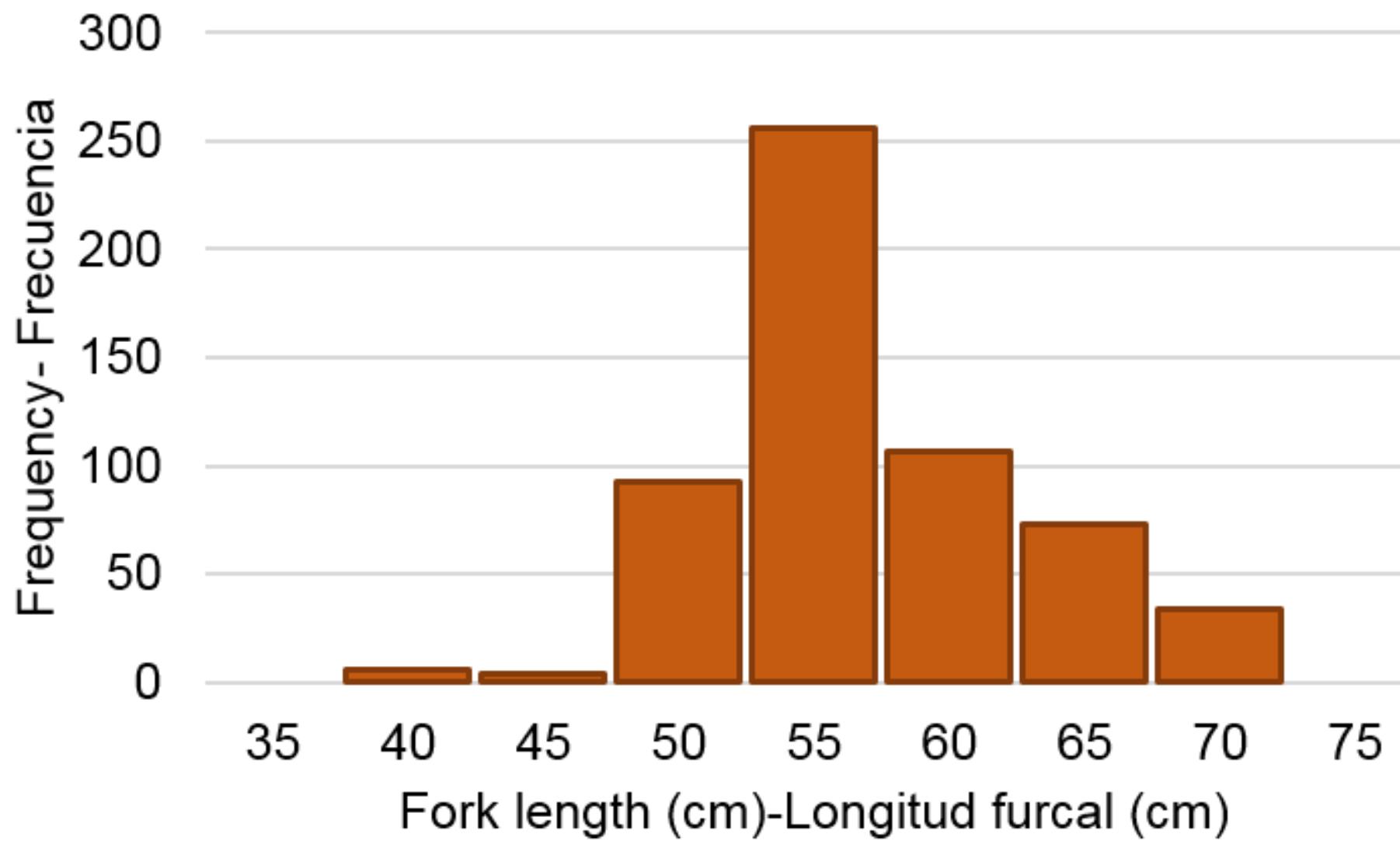




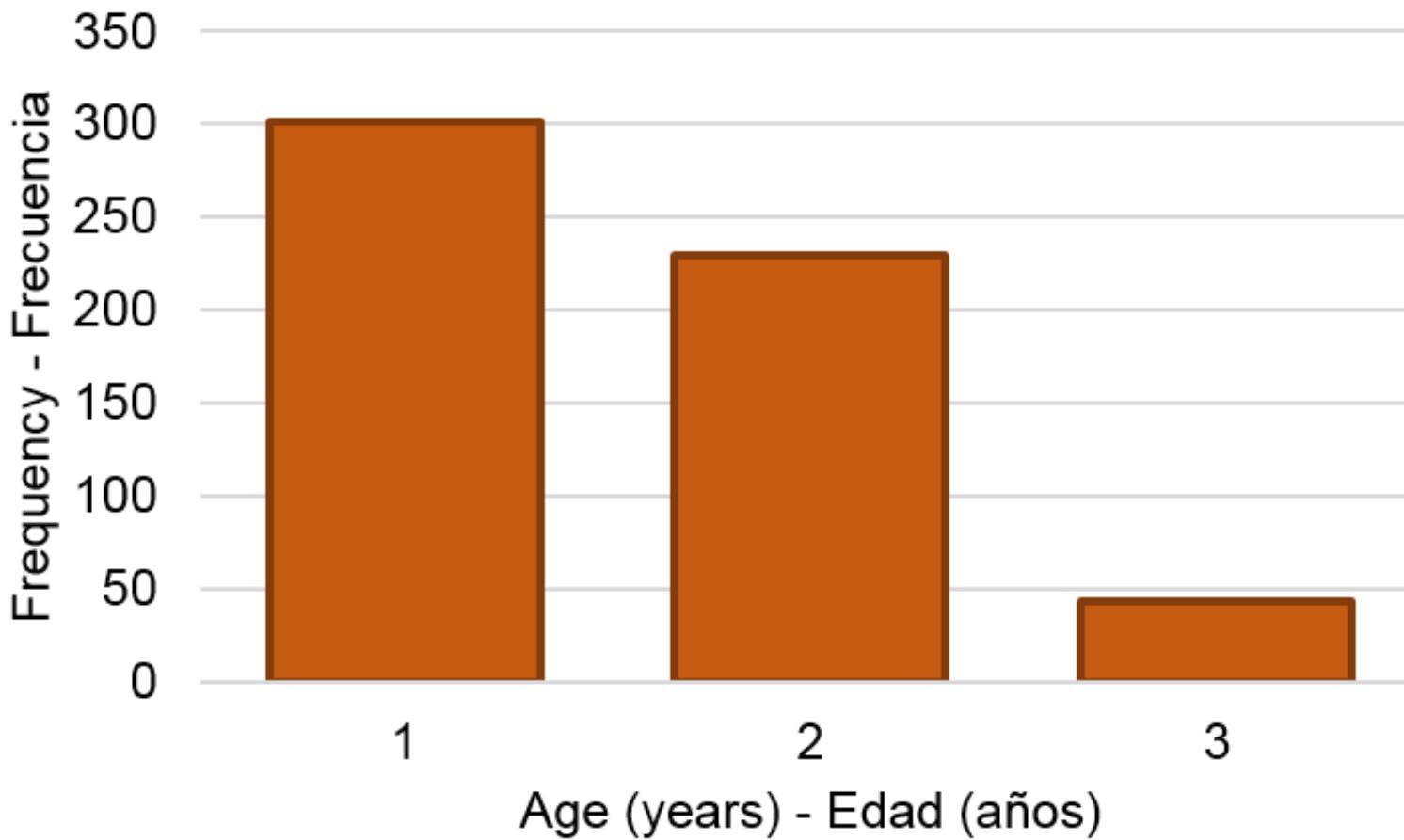
# LENGTH DATA



YEAR	MONTH	n	AVERAGE FORK LENGTH (cm)
2006	SEP	23	55.48
2014	SEP	50	51.37
2014	OCT	50	61.27
2015	SEP	50	61.33
2016	OCT	100	53.81
2017	AGO	50	50.76
2017	SEP	50	58.83
2017	OCT	100	52.68
2017	NOV	100	51.98

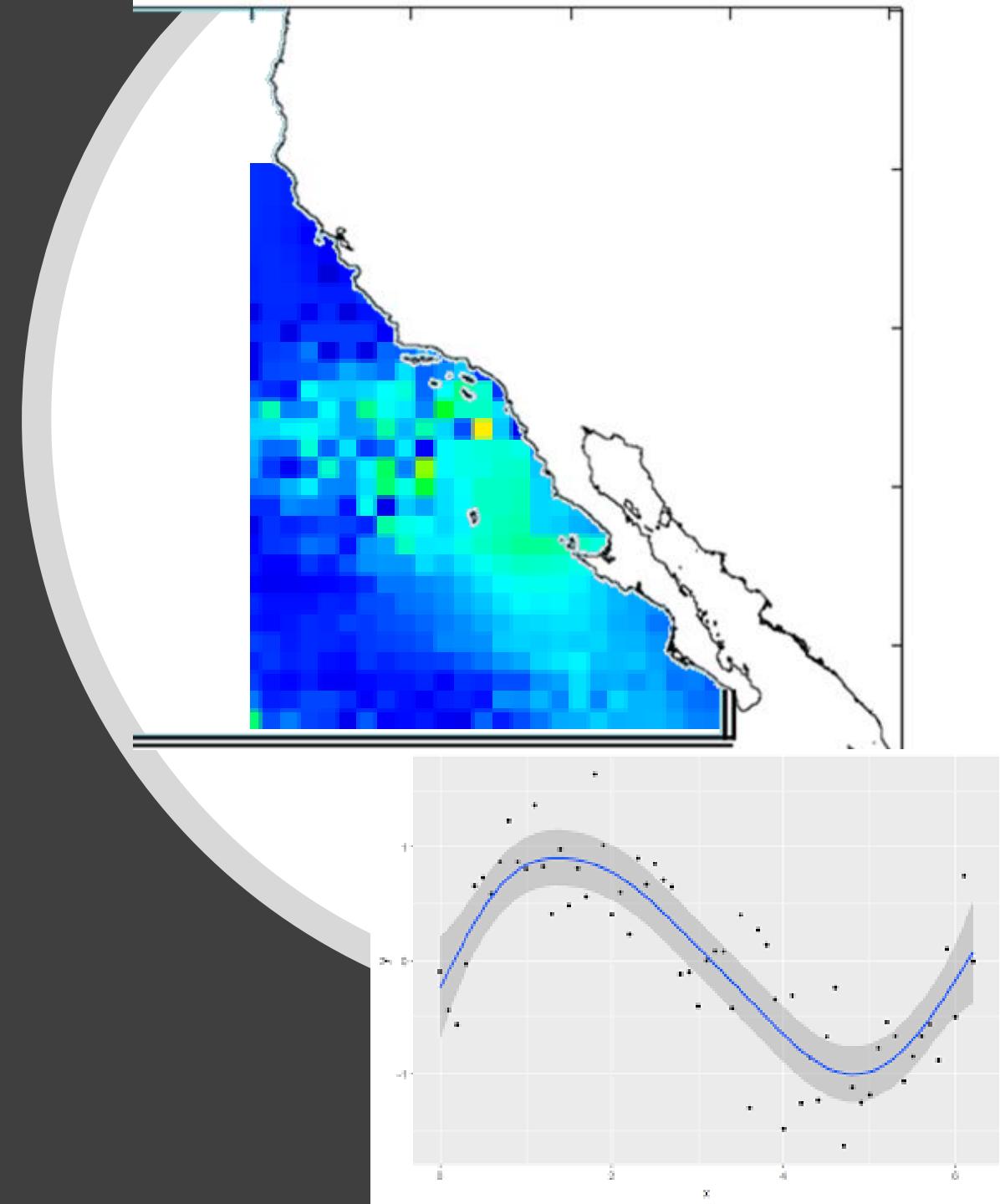


von Bertalanffy parameters (Campbell and Collins, 1975)



# FUTURES STEPS

- Generalized Additive Models (GAMs) will be used trying to determine the main environmental factors that affect its abundance





The Monte Carlo method (CMSY) proposed by Froese et al. (2017) will be explored for estimating fishery reference points from catch, resilience and qualitative stock status information on data-limited stocks.



FISH and FISHERIES, 2017, 18, 506–526

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**Estimating fisheries reference points from catch and resilience**

Rainer Froese<sup>1</sup>, Nazli Demirel<sup>2</sup>, Gianpaolo Coro<sup>3</sup>, Kristin M Kleisner<sup>4</sup> & Henning Winkler<sup>5,6</sup>

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