Analysis of the population status of the skipjack tuna *(Euthynnus lineatus)* with data on weight, size (2022–2025) and spines for the artisanal fishery in Puerto Ángel, Oaxaca

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1. Introduction

The black skipjack *Euthynnus lineatus* Kishinouye 1920, is a key resource for artisanal fishing in the Mexican Pacific, especially in Puerto Ángel, Oaxaca. However, the scarce updated information on its structure population limits sustainable management actions. This study is based on systematic monitoring carried out within the framework of the Improvement Project Fisheries (FIP), black skipjack in Puerto Ángel, Oaxaca.

2. Objective

Evaluate the population status of the black skipjack, through data analysis biometrics (weight and height) from 2022 to 2025, comparing the age structure obtained by reading spines (2013 to 2014), for the skipjack fishery in Puerto Angel, Oaxaca.

Figure 1. Black skipjack *Euthynnus lineatus* adult. (FOCN photo).

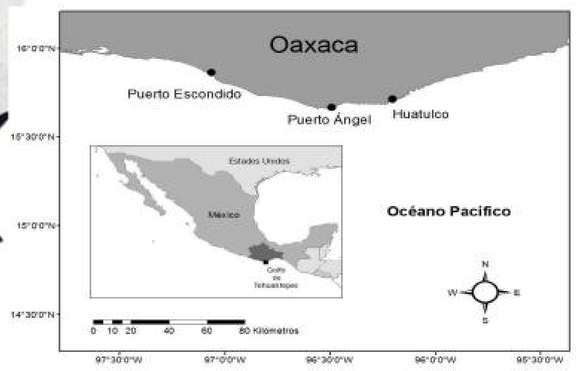

Figure 2. Study area. Designed by: Roberto Velásquez

3. Materials and methods

2,644 records of size and weight of *E. lineatus* were analyzed between 2022 and 2025. the artisanal black skipjack fishery in Puerto Ángel, Oaxaca.

1. 16,933 catch records, to identify main fishing sites,
   Temporal variation, active vessels, and species associated with the fishery.
2. Size structure using histograms and cohort analysis using
   Maximum likelihood. Akaike criterion (AIC) for selecting the best model.
3. Population growth parameters, with the Von Bertalanffy model.
4. Comparison of ages from size analysis with those obtained with reading of spines collected between 2013 and 2014 (UMAR).

4. Results

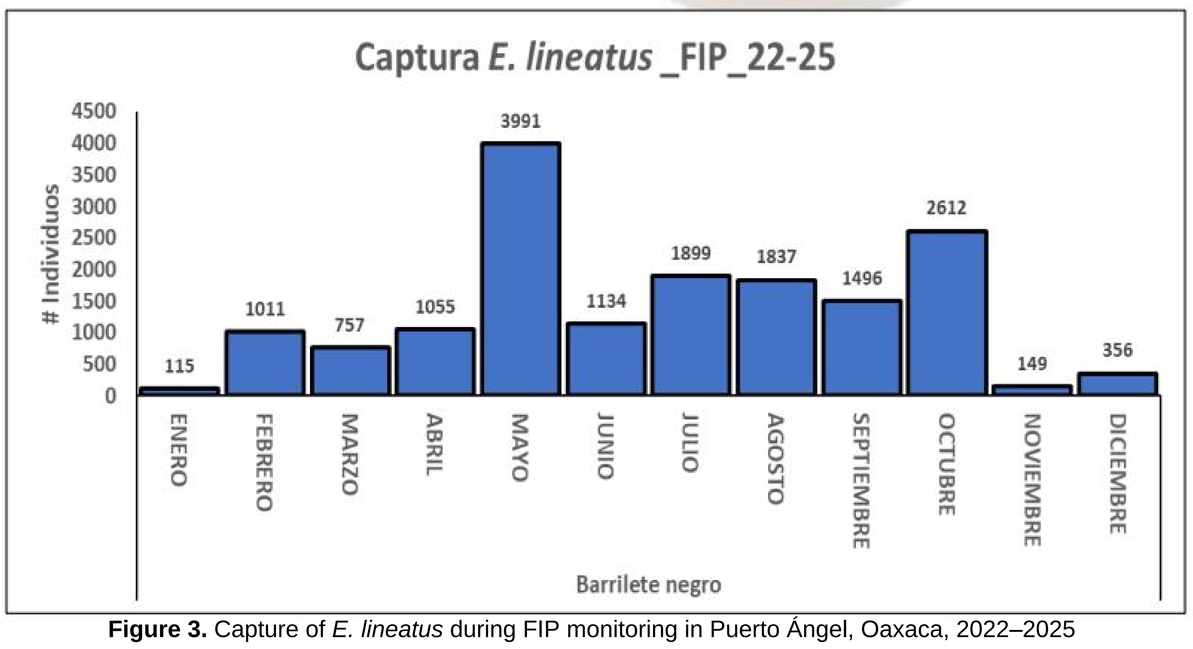

Figure 3. Capture of *E. lineatus* during FIP monitoring in Puerto Ángel, Oaxaca, 2022–2025

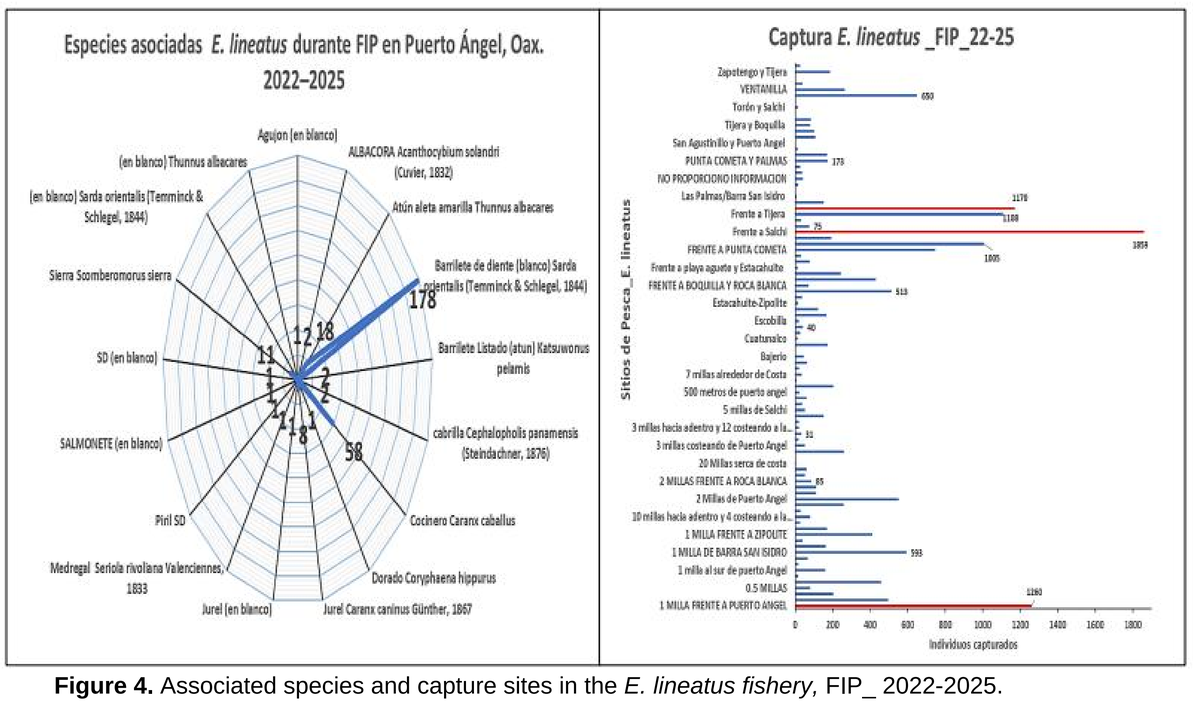

Figure 4. Associated species and capture sites in the *E. lineatus fishery,* FIP_ 2022-2025.

References: Martínez, DR, Albín, J., Cabaleiro, J., Pena, T., Rivera, F., & Blanco, V. 2009. The Criterion of Akaike's Information on Obtaining Statistical Performance Models. In Conference: XX Conference on Parallelism.

Aubone, A., & Wöhler, O.C. 2000. Application of the maximum likelihood method to parameter estimation and Comparison of von Bertalanffy growth curves. INIDEP technical report, 37, 1-21.

Table II. Summary of statistical indicators used to estimate the cohorts within the FIP *E. lineatus* Puerto Ángel, Oax. 2022–2025.

Year	N data	Lower lim	Upper lim	Range	No Classes	Size of class	No cohorts	Criterion of Information of Akaike
2023	832	36	59	23	11	2	3	2737.67166
2023	832	36	59	23	11	2	5	2748.78177
2024	1570	16	60	44	12	2	4	5111.974243
2024	1570	16	60	44	12	2	5	5148.114319
2025	200	20	58	38	9	2	4	1741.83376
2025	200	20	58	38	9	2	3	891.6951524
2022-2025	2664	24.5	60	35.5	13	2	4	9095.938564
2022-2025	2664	24.5	60	35.5	13	2	5	9445.387766

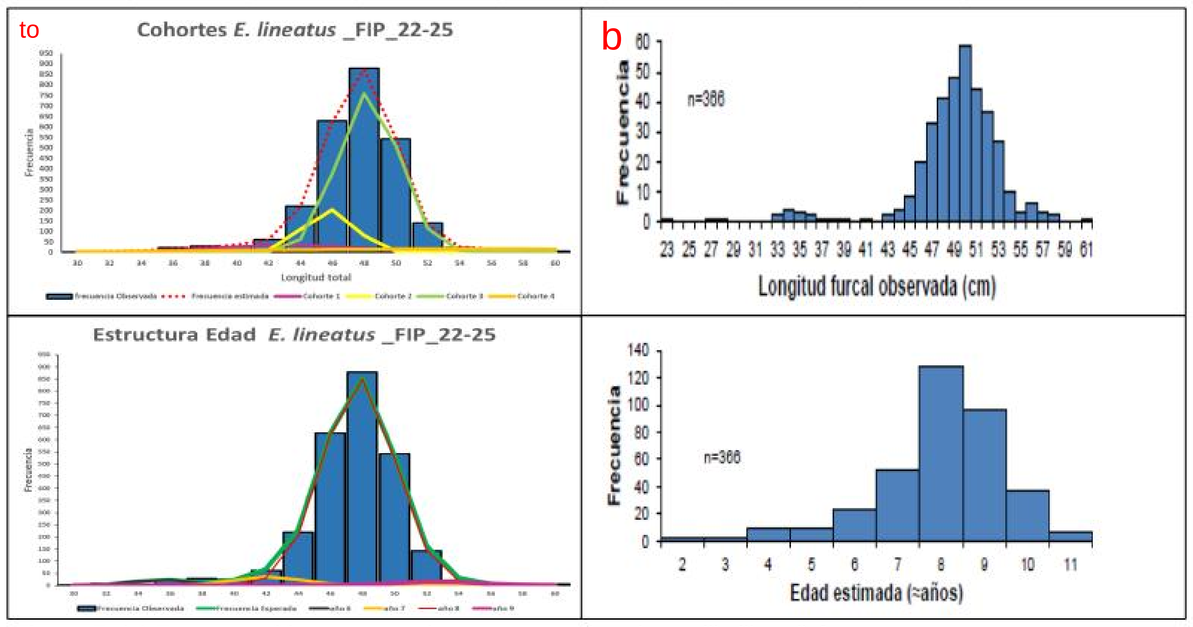

Figure 5. (a) Frequency histogram, and age structure (maximum likelihood) *for E. lineatus* FIP Puerto Ángel, Oax. 2022–2025, (b) age estimation from spine cuts from October 2013 to November 2014.

Table III. Age intervals and Von Bertalanffy growth parameters for *Euthynnus lineatus* within the black skipjack FIP Puerto Ángel, Oax. 2022–2025.

E. lineatus	Age range_2022-2025			99% Trust (2.54)
LimINF	LimSUP	Interval cm	Age 6	Obs frequency
41.4	43.1	41.4- 43.1		197.73
44.6	45.0	44.6- 45		412.40
47.2	47.4	47.2-47.4		1836.60
50.4	54.4	50.4-54.4		271.85
Model		**Linf**	7 8 9 **k**	**to**
Von Bertalanffy growth		80.81	0.15	2.3 9

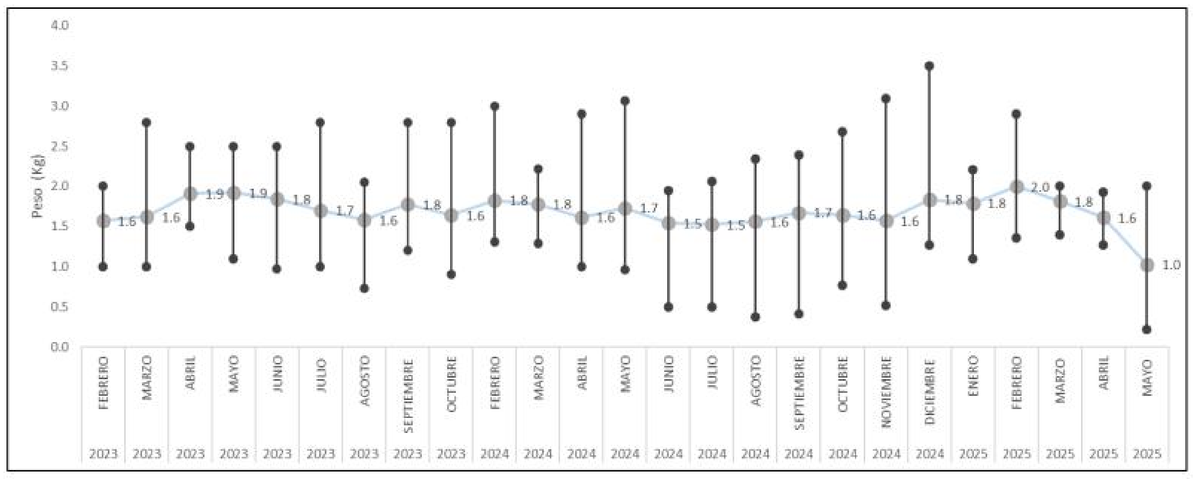

Figure 6. Monthly variation in the total weight of *E. lineatus* during the FIP-skipjack monitoring Black in Puerto Ángel, Oaxaca. 2022–2025

5. Conclusions

- Months with the highest catches: May, July, August and October.
- 14 associated species; *Sarda orientalis, Thunnus* albacares and *Scomberomorus sierra.*
- 3–4 active cohorts per year.
- 4 ages, dominates age 8 (47.2-47.4).
- Main fishing spots: Salchi, Puerto Ángel, Tijera, Zapotengo, Roca White.
- 32 vessels, 6 of which account for >40% of catches.
- Accelerated growth in the early stages of life.
- Artisanal fishing art, with high selectivity in sizes and species between 40-52 cm.

6. Recommendations

- Train to avoid identification errors.
- Consider molecular barcoding for species validation.
- Continue monitoring, and thus generate the necessary information to form the management plan for *E. lineatus* in Puerto Ángel, Oaxaca.
- Reproductive analysis with size at first maturity, fertility from histological sections of gonads.

7. Acknowledgments

This document is the result of a collective effort developed within the framework of the Improvement Project Black skipjack fishery, a collaborative initiative promoted by the Oaxacan Fund for the Nature Conservation (FOCN), the Oaxacan Committee for Aquaculture Health and Safety (COSIA), the Pochutla Technological Institute, the Punta Sacrificio Fishing Cooperative, Curricaneros and SmartFish AC This joint work seeks to promote sustainable and responsible practices in artisanal fishing, strengthening the conservation of the marine ecosystem and the comprehensive development of fishing communities on the coast of Oaxaca.