Have growth parameters of the Argentine anchovy (*Engraulis anchoita*) changed over the last thirty years?

Evidence of stable growth dynamics despite declining landed size in the Northern *stock*

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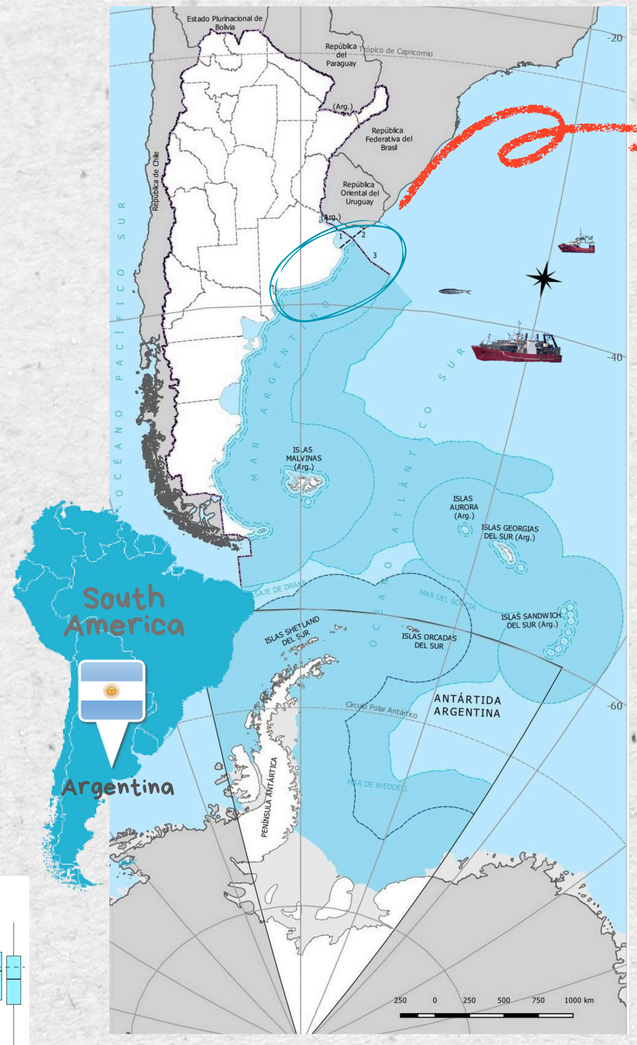
INTRODUCTION

The Argentine anchovy (*Engraulis anchoita*) is a keystone small pelagic species in the Southwest Atlantic (1) and, even with smaller landings, it supports an important fishery for local and regional communities in its Northern *stock* (34–41°S), historically categorized as underexploited (2). Recent declines in landed body size (3) raise questions about potential changes in population dynamics.

In small pelagic fishes, growth is highly sensitive to environmental variability and *stock* structure (4). Evaluating long-term growth patterns is therefore critical to disentangle fishing effects from environmentally driven variability and to ensure robust *stock* assessment.

Aim: To evaluate whether growth parameters of the Northern *stock* of the Argentine anchovy (*Engraulis anchoita*) have changed over the last three decades.

METHODOLOGY



Data source

- 34° - 41° LS.
- Years 1997-2025.
- Total length (mm) and total weight (g).
- Age determined from sagittal otolith readings.
- Annual age–length keys constructed.

Growth model

VBGF: $L_t = L_\infty * (1 - e^{-K*(t-t_0)})$ → 1997-2024

L_∞ (asymptotic length)
K (growth coefficient)
t_0 (theoretical age at zero length)

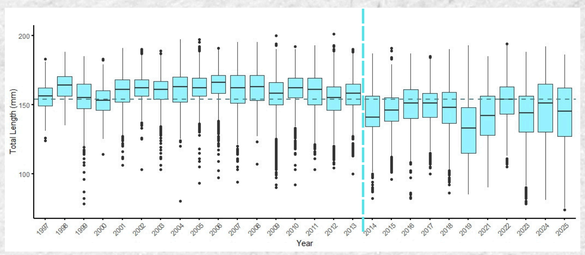
Temporal comparison

- Mean landed length and weight were analyzed to contrast size structure vs intrinsic growth.
- Temporal trends were evaluated.
- Annual growth parameters were compared across years.

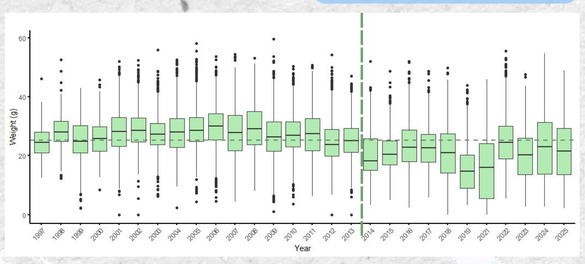
RESULTS

Interannual variation in mean length and weight

Significant interannual differences in mean length and weight were detected (ANOVA, $p \leq 0.001$).



ANOVA length: F= 626,2; p < 2e-16
ANOVA weight: F= 520,7; p < 2e-16



Temporal trends

Annual values showed fluctuations; however, mean length and weight were above the overall before 2014 and below it thereafter.

ANOVA Linf: F= 0,001; p = 0,981
ANOVA K: F= 3,85; p = 0,06
ANOVA t_0: F= 2,33; p = 0,132

VB parameters estimated in this study.

No landing sampling was conducted due to the COVID-19 pandemic.

Year	L_{inf}	K	t_0
1997	208,60	0,18	-1,88
1998	185,74	0,55	-0,84
1999	196,53	0,38	-1,15
2000	180,14	0,41	-2,26
2001	179,44	0,48	-1.89
2002	202,28	0,18	-6,18
2003	185,10	0,41	-1,89
2004	192,80	0,33	-2,50
2005	196,95	0,27	-3,23
2006	184,41	0,47	-1,27
2007	180,97	0,60	-0,84
2008	181,26	0,62	-0,71
2009	171,85	0,87	-0,29
2010	182,21	0,48	-1,55
2011	183,17	0,44	-1,69
2012	180,84	0,51	-1,26
2013	182,85	0,41	-2,13
2014	204,02	0,31	-1,82
2015	165,83	0,81	-0,52
2016	180,85	0,49	-1,31
2017	178,70	0,50	-1,37
2018	183,53	0,45	-1,42
2019	190,24	0,42	-1,13
2020	–	–	–
2021	180,17	0,51	-1,03
2022	184,67	0,45	-1,44
2023	187,60	0,42	-1,51
2024	193,97	0,44	-1,25

Interannual variation in growth parameters

No significant interannual differences in VB growth parameters were detected, suggesting stable growth dynamics over the study period.

Key findings

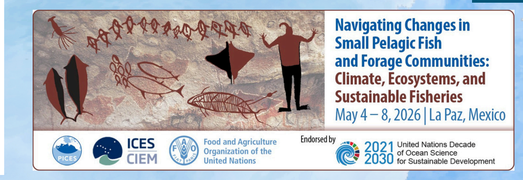
- No significant interannual differences in VB growth parameters.
- Significant variability in mean length and weight.
- Evidence of a temporal shift in size structure.

CONCLUSIONS

- Significant variability in length and weight indicates changes in population size structure.
- Von Bertalanffy growth parameters remained stable over time, with no significant interannual differences.
- Changes in size structure may reflect environmental and/or fishery-related processes.
- These results suggest a decoupling between intrinsic growth and population size structure.
- This highlights the importance of incorporating size structure into *stock* assessments.
- These findings are consistent with spatial patterns of anchovy size variation reported in related studies (see companion poster: “Are anchovy sizes shrinking? Results from a 25-year analysis of landings and research survey data”).

REFERENCES

POSTER QR



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