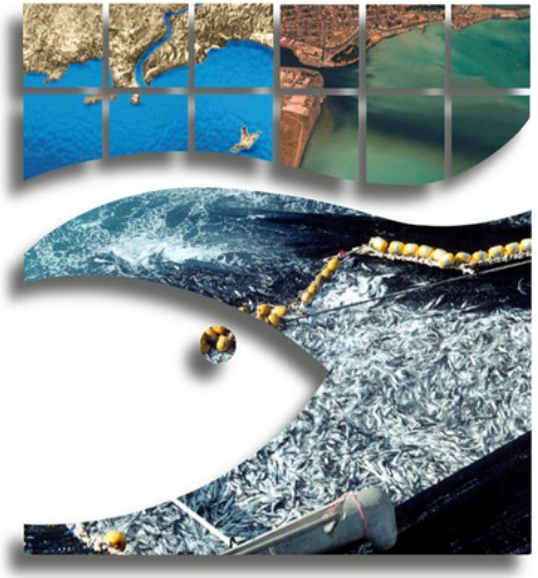


Instituto de Investigación Pesquera
(INPESCA)

SPRFMO
South Pacific Regional Fisheries Management Organisation

Interannual variability in distribution, size structure, and biomass of Chilean jack mackerel (*Trachurus murphyi*) estimated from fishery-dependent acoustics

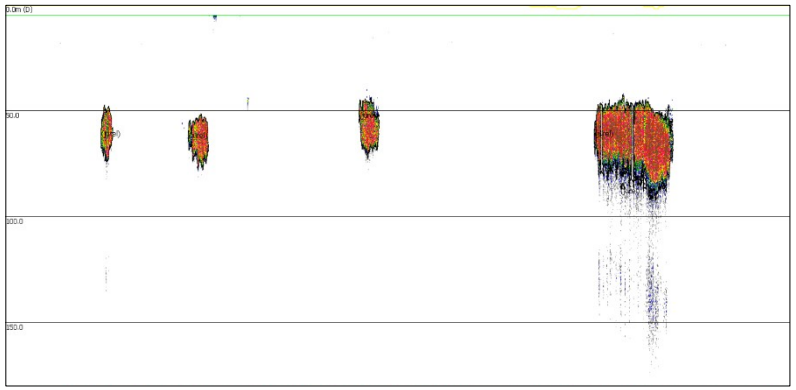
Nicolás Alegría L. and Aquiles Sepúlveda O.
nalegria@inpesca.cl

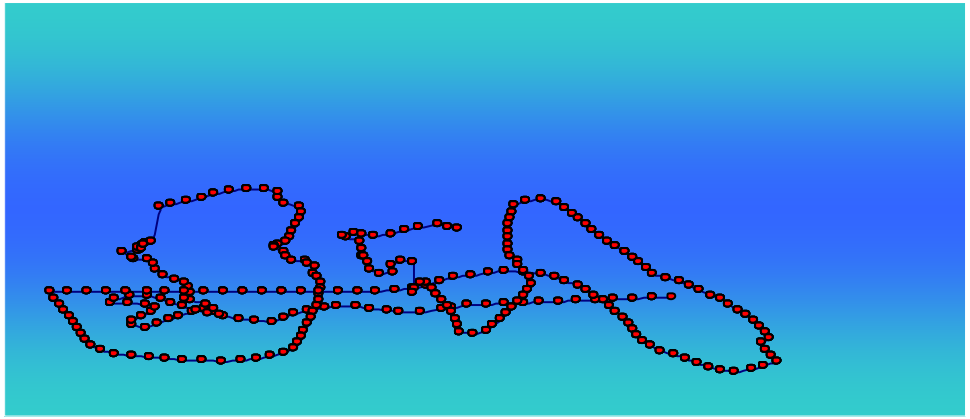
The acoustic information was obtained from fishing trips made by vessels of the Jack mackerel national fleet during the first quarter of 2026 .

DON EDMUNDO (SIMRAD EK60, 38 y 120 kHz)

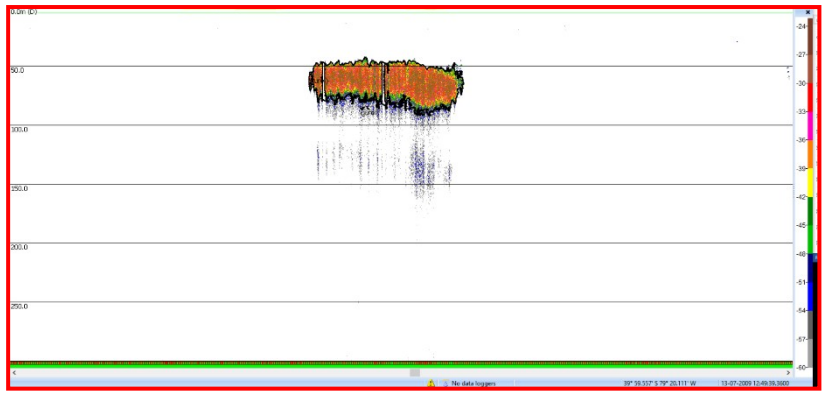
CAZADOR (SIMRAD EK60, 38 y 120 kHz)

DON JULIO (SIMRAD EK60, 38 kHz)

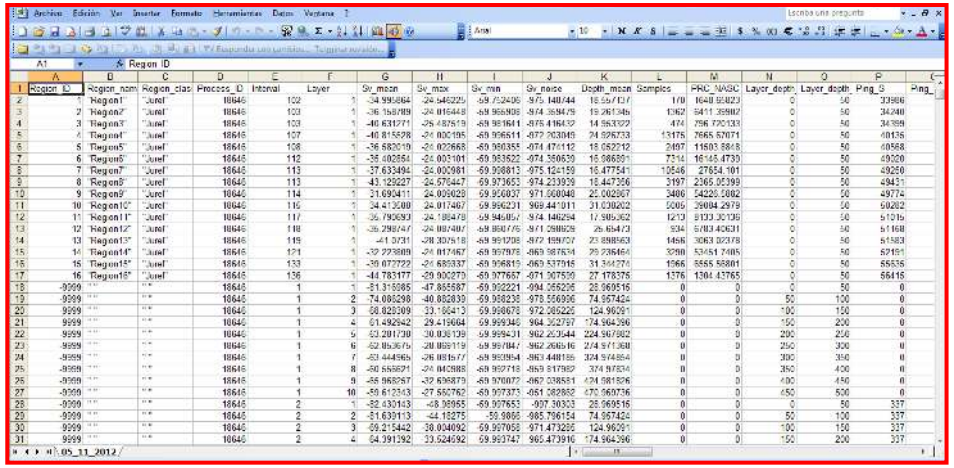


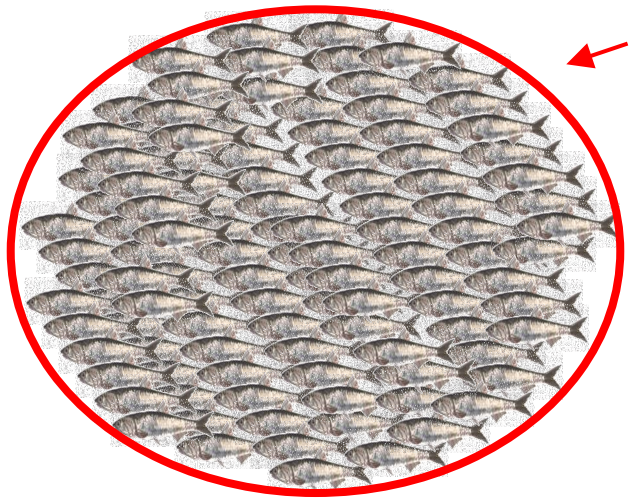


Opportunistic Survey or free desing



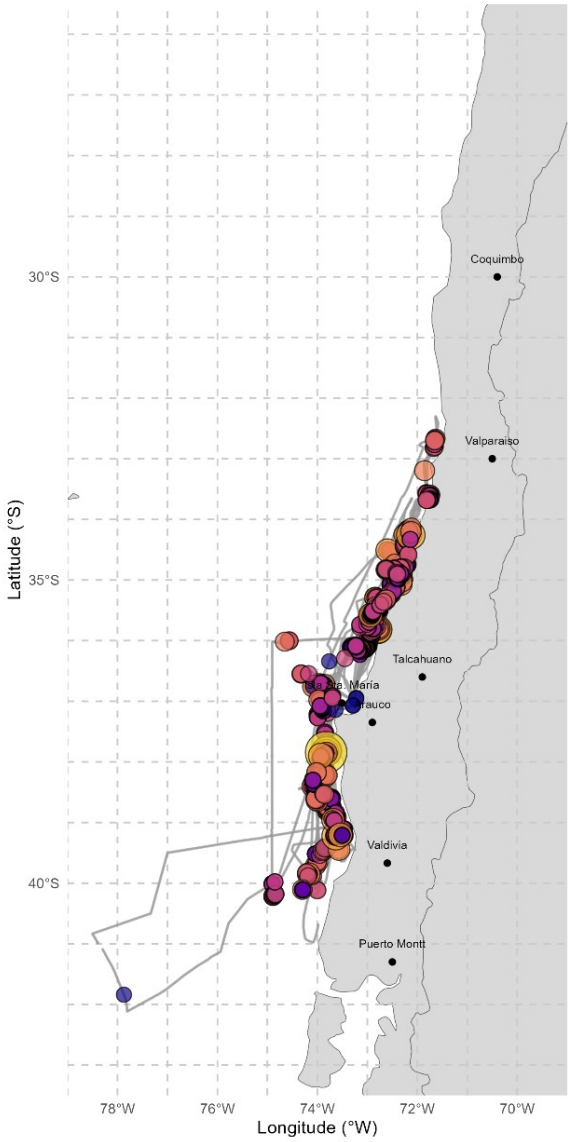
- **INTEGRATE AND EXPORT**



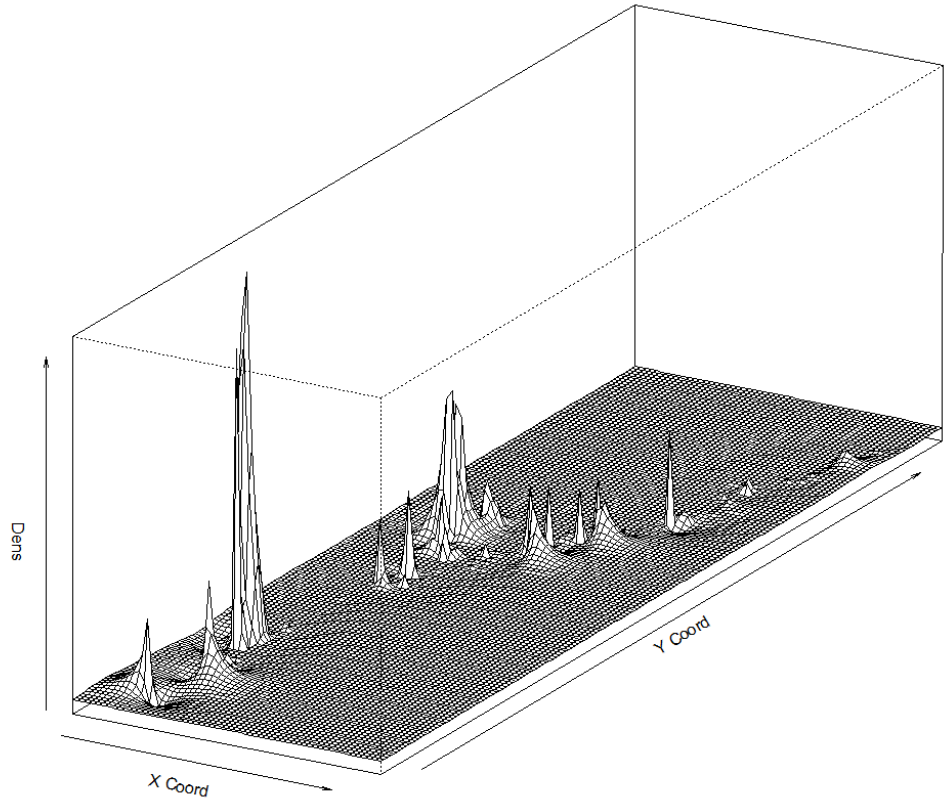


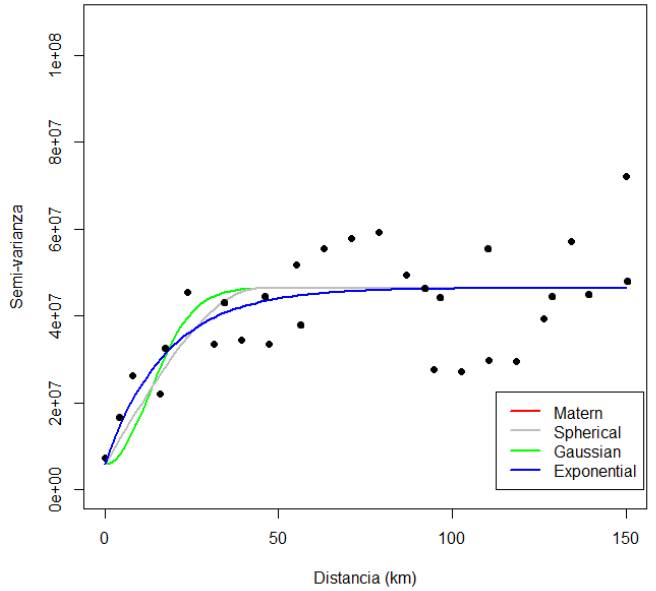
Density
Abundance
Biomass

Ecological information and behavior of schools.



Geostatistical Method





$$Z(V)^* = \frac{1}{N}\sum_i Z^*(x_i)$$

$$A_t = \frac{Z(V)^* \cdot A_V}{\sigma}$$

$$\sigma = 4 \cdot \pi \cdot 10^{TS/10}$$

$$B_t = A_t \cdot \overline{W}$$

$$\rho_i(x,y) = \frac{NASC\ (\mathrm{m}^2 / mn^2)}{\sigma_{Ton}\ (\mathrm{m}^2 / Ton)}$$

Sigma depends on mean weight and length

$$\bar{\sigma} = 4\pi 10^{\mathrm{TS}/10}\ (\mathrm{m}^2)$$

Fork length

$$\sigma_{Ton} = \bar{\sigma} / \bar{W}_{Ton}\ (\mathrm{m}^2 / Ton)$$

Target strength

$$TS = 20\log(\mathrm{LH}) - 68.91$$ (Lillo *et al*, 1996)

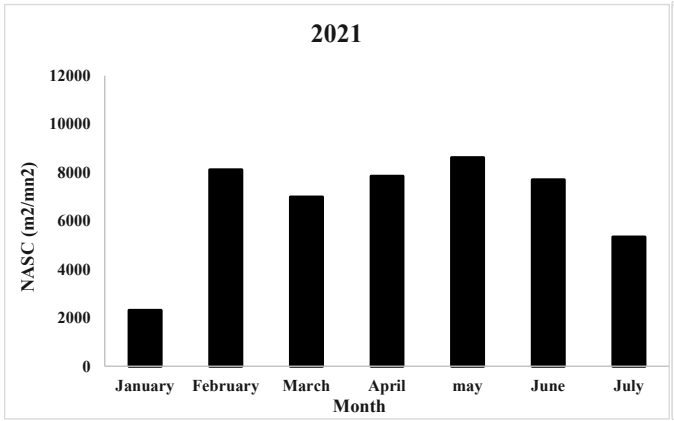
Range of TS values (J Mackerel)

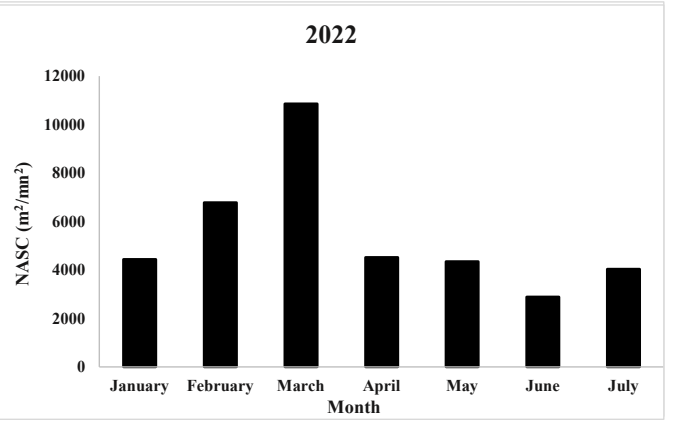
Jack mackerel	FL (cm)	TS (dB)
Juveniles	10 - 17	-48.910 a -44.301
Recruits	17 - 24	-44.301 a -41.306
Adults	24 - 68	-41.270 a -32.260

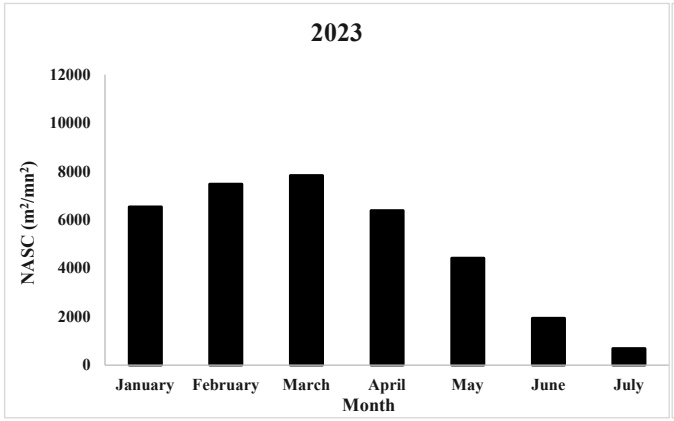
RESULTS:

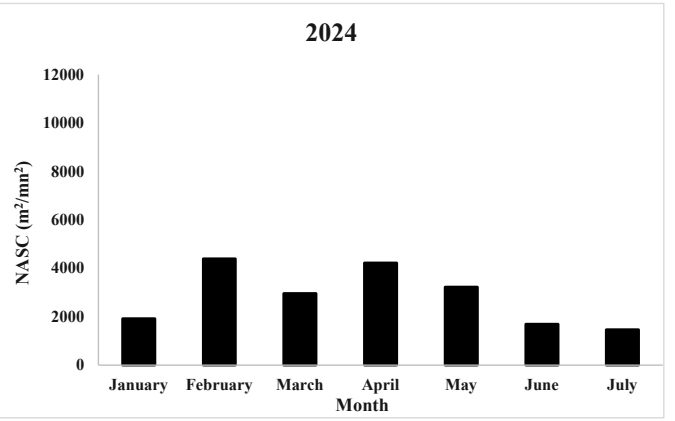
Mean Acoustic Density

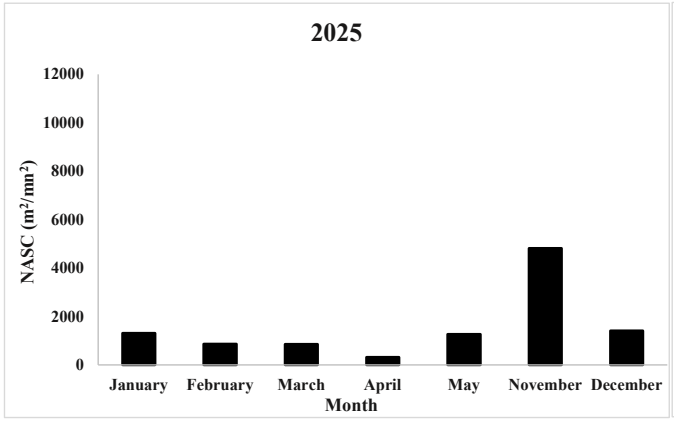
Mean monthly acoustic density from 2021 to 2026

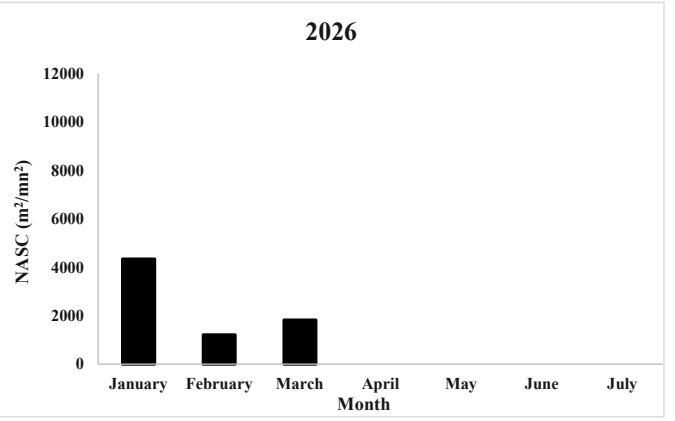






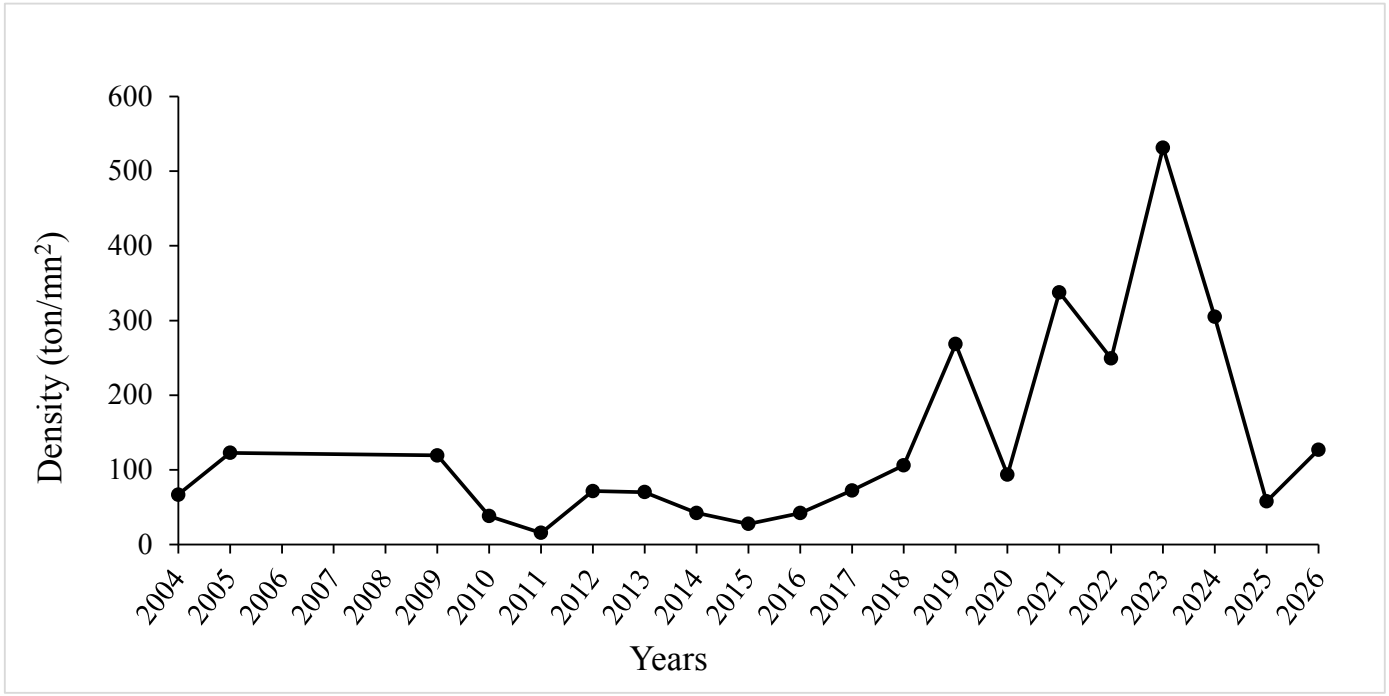




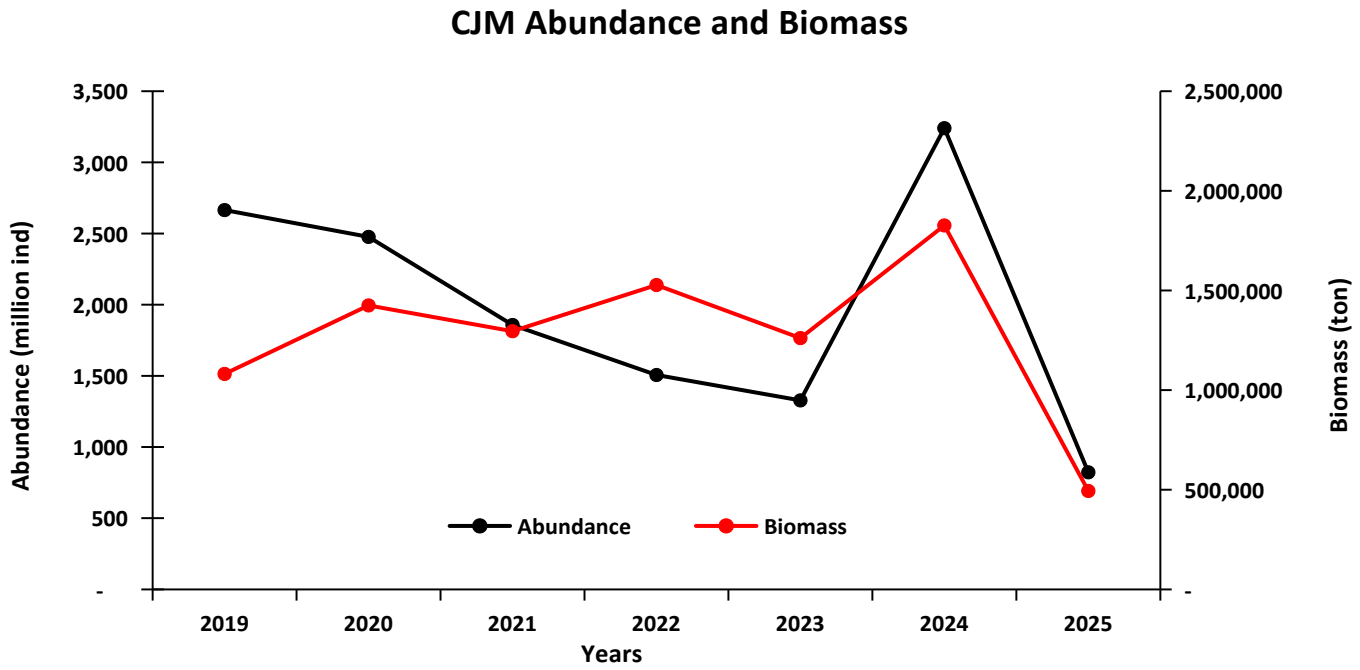


Interannual variability of jack mackerel density observed in May from 2004 to 2026.

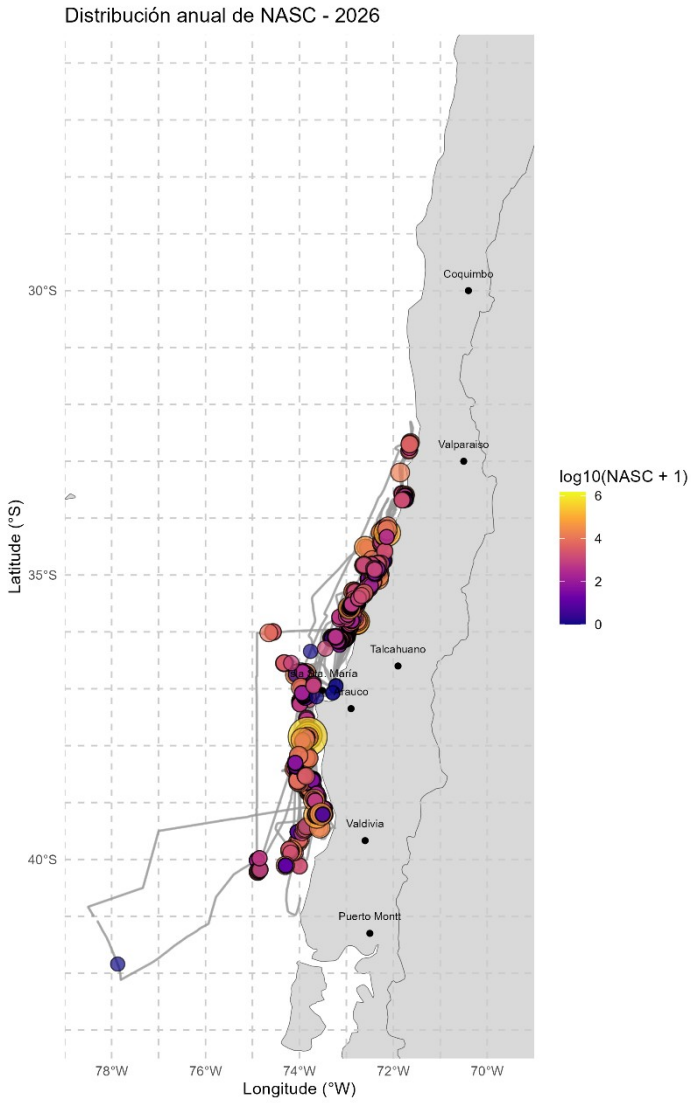
Year	Analyzed days	Number of Schools	Mean Density positive (t/mn^2)	Mean Density (t/mn^2)	Total density (t/mn^2)
2004	6	99	366.3	66.8	36,264
2005	15	1,098	462.4	122.8	507,722
2009	25	1,350	462.9	119.4	623,553
2010	24	1,474	70.0	38.2	103,182
2011	22	42	792.1	15.6	33,270
2012	18	62	1,714.6	71.6	106,308
2013	7	21	1,045.9	70.3	106,248
2014	7	24	1,526.7	42.4	36,642
2015	25	592	190.8	27.8	112,943
2016	35	655	341.0	42.1	223,365
2017	7	123	439.9	72.4	54,103
2018	19	2,871	168.1	106.1	482,744
2019	15	173	3,046.9	268.5	527,110
2020	15	520	594.8	93.4	309,274
2021	23	503	2,696.4	337.6	1,356,291
2022	22	1011	1,008.2	249.2	851,579
2023	20	593	2,126.4	531.4	1,260,948
2024	31	1051	1,254.8	305.2	1,318,738
2025	28	534	677.0	57.9	361,534
2026	24	484	1,238.6	126.8	599,472

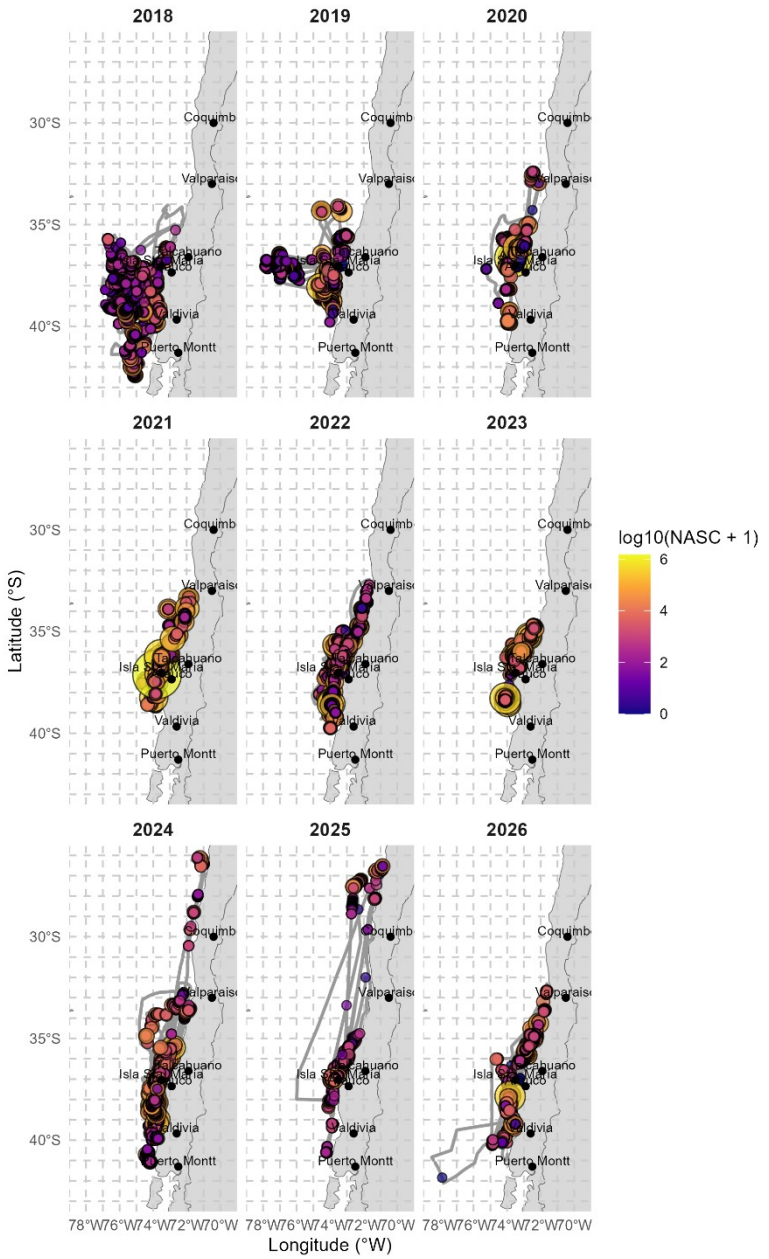


Year	2019	2020	2021	2022	2023	2024	2025
Abundance	2,665	2,476	1,857	1,506	1,328	3,240	822
Biomass	1,081,072	1,424,990	1,295,440	1,527,320	1,210,359	1,826,276	493,822
CV%	12.29	15.08	15.23	13.26	17.95	13.54	16.74



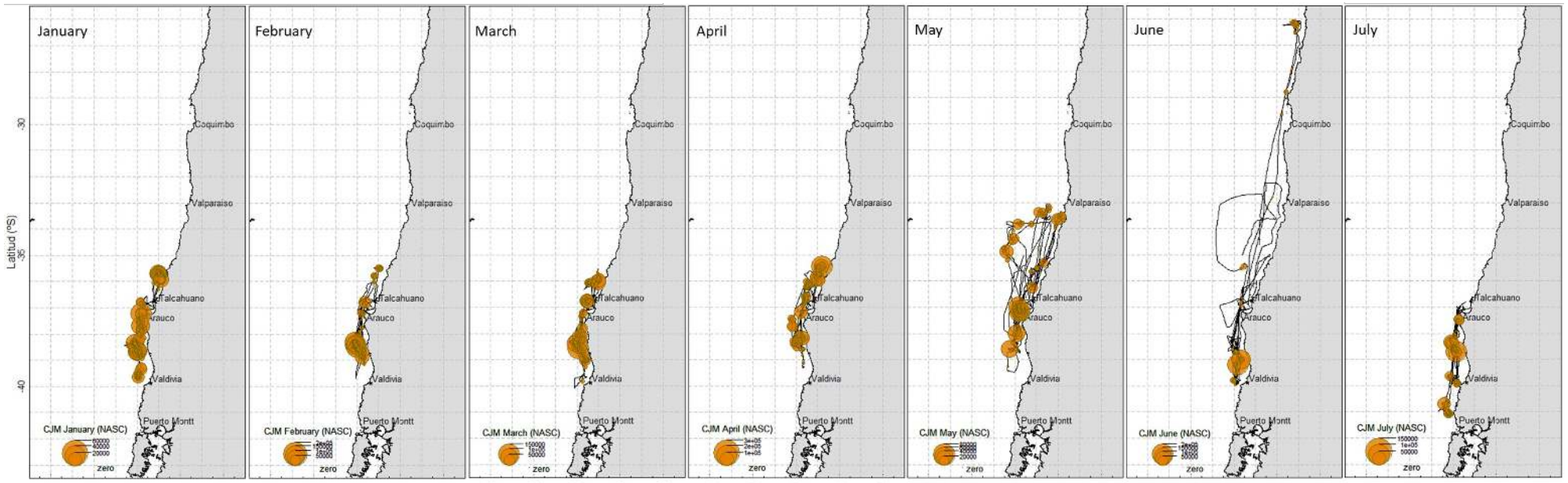
RESULTS: Chilean Jack Mackerel Spatial Distribution



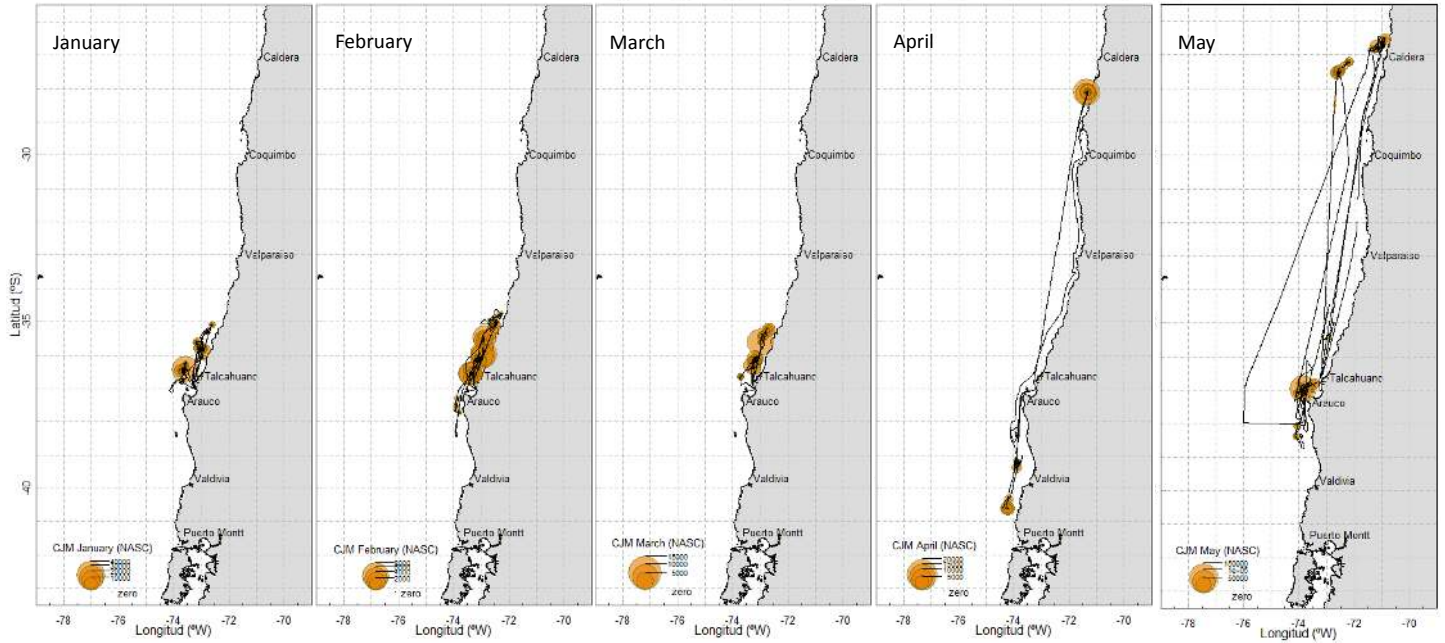


RESULTS: Chilean Jack Mackerel Spatial Distribution

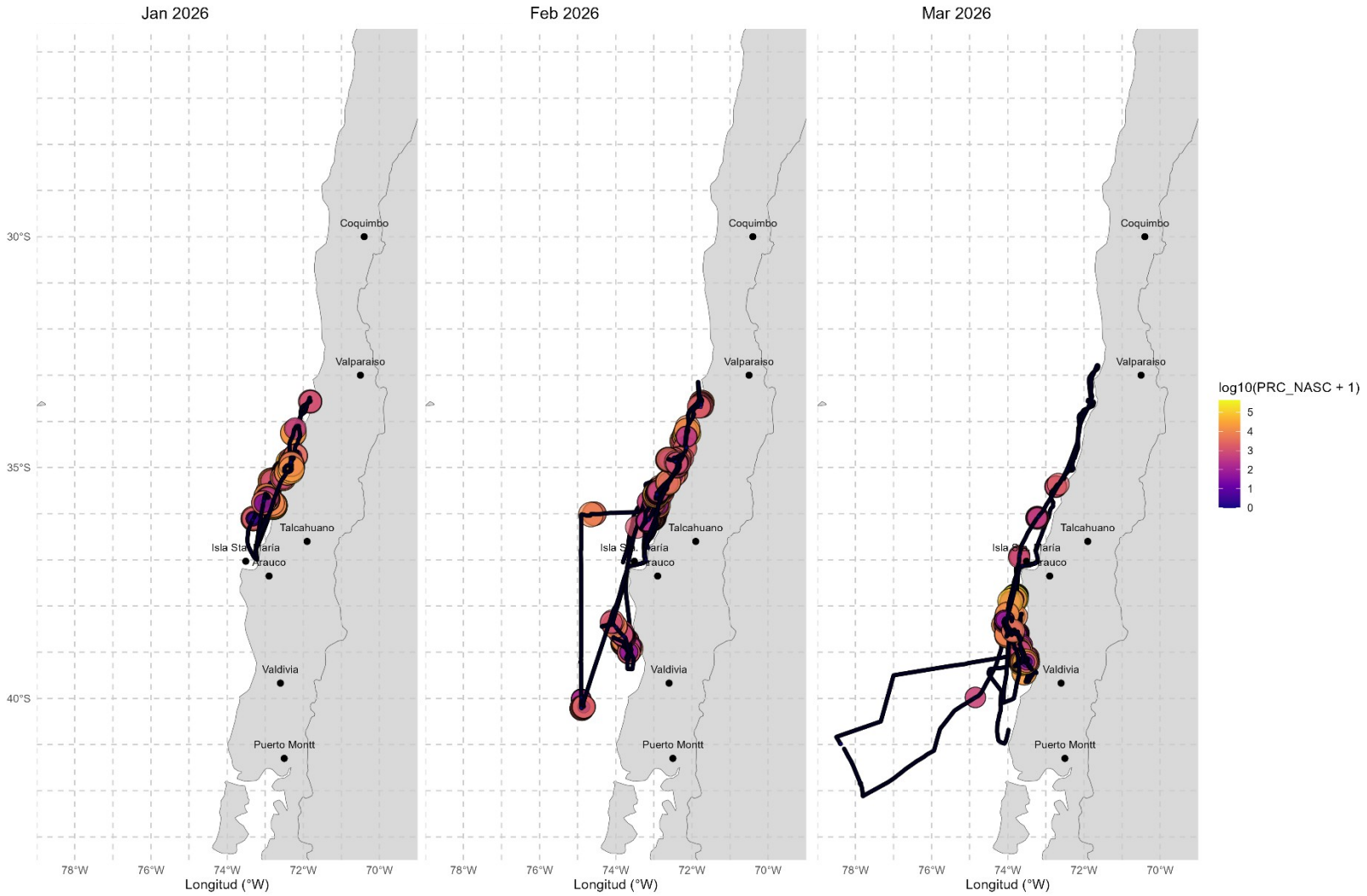
2024



2025



RESULTS: Chilean Jack Mackerel Spatial Distribution



Concluding Remarks

- ✓ **Spatial dynamics and habitat:** High spatial variability with a persistent core area in the south-central zone; shifts from expansion to coastal concentration suggest a strong environmental influence.
- ✓ **Seasonal aggregation patterns:** Clear cycle with peaks in summer–autumn and minima in winter.
- ✓ **Size structure and population dynamics:** Alternation between dominance of large fish (high biomass) and juvenile recruitment events; 2024 was dominated by small individuals.
- ✓ **Abundance–biomass decoupling:** Biomass strongly depends on fish size; lower abundance may coexist with high biomass and vice versa.
- ✓ **Interannual variability and uncertainty:** High fluctuations throughout the time series; 2025 shows an abrupt shift in stock status.
- ✓ **Implications for monitoring and assessment:** These results highlight the need to incorporate fishery-dependent acoustic data as complementary indicators in stock assessment models. The high variability observed in spatial distribution, aggregation patterns, and size structure underscores the importance of adaptive monitoring strategies, particularly under changing oceanographic conditions.


Thank you for
your attention