



**Instituto de Investigación Pesquera  
(INPESCA)**

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

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



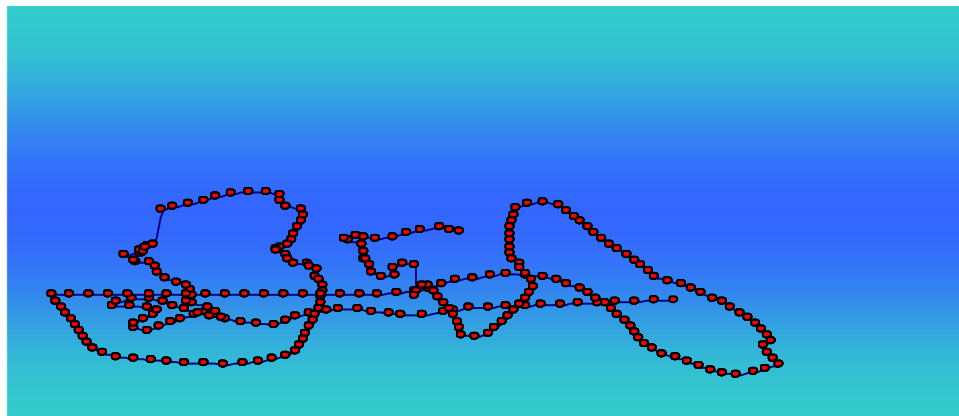
**DON EDMUNDO (SIMRAD EK60, 38 y 120 kHz)**



**CAZADOR (SIMRAD EK60, 38 y 120 kHz)**

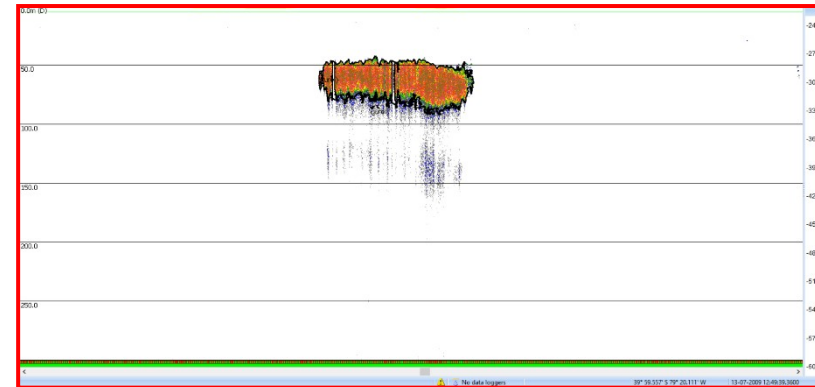


**DON JULIO (SIMRAD EK60, 38 kHz)**

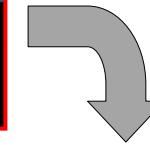


Opportunistic Survey or free desing

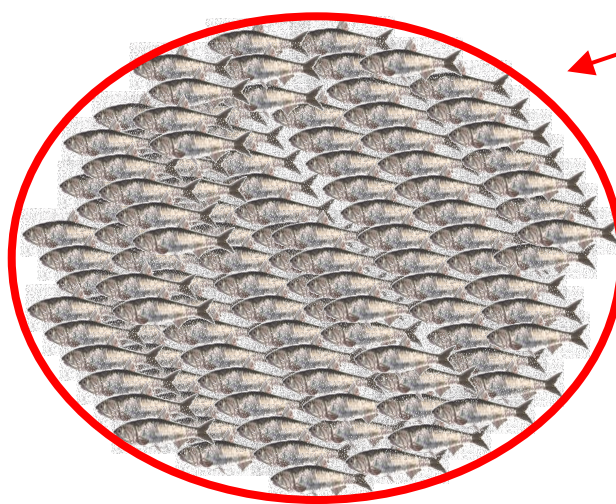




• INTEGRATE AND EXPORT



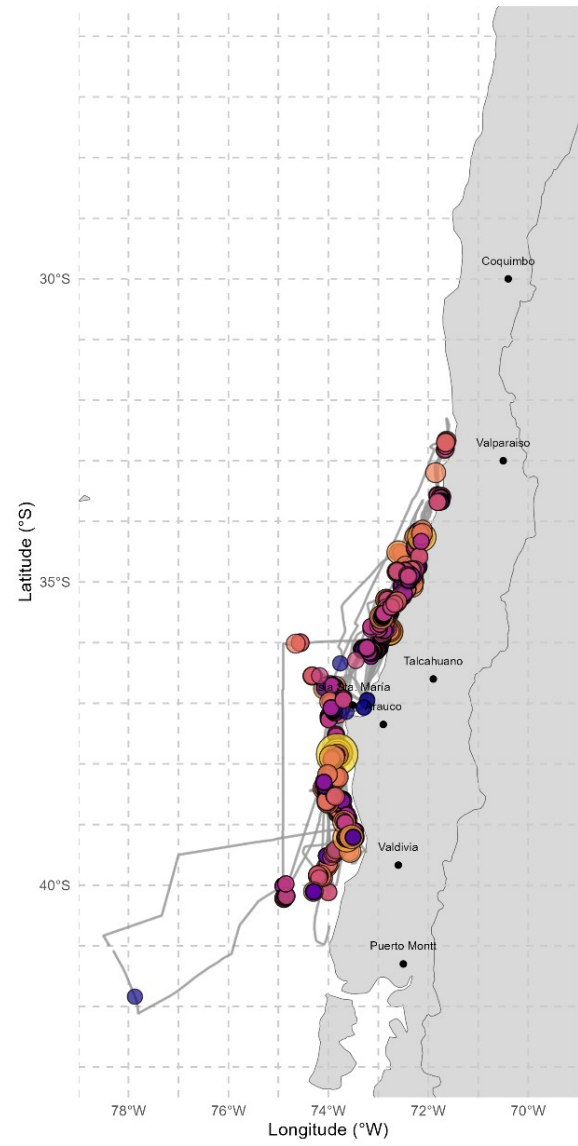
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Region ID	Region ID	Region ID	Interval	Layer	Sw. mean	Sw. max	Sw. min	Sw. range	Depth. mean	Sw. range	Sw. range	Sw. range	Sw. range	Sw. range	Sw. range	Sw. range
1	Region 1	Región 1	102	1	34.995864	24.940225	59.752405	975.140444	15.557137	110	1640.058223	0	50	0	0	23956
2	2	Región 2	103	1	-36.158788	-24.816448	-69.966309	-974.389479	15.261346	1362	5411.358802	0	50	0	0	34240
3	3	Región 3	103	1	-40.831271	-25.437619	-69.961641	-975.418439	14.563322	474	796.720231	0	50	0	0	34399
4	4	Región 4	103	1	-40.815936	-24.802195	-69.956511	-977.703805	24.979333	11475	7665.921714	0	50	0	0	48135
5	5	Región 5	108	1	-36.820210	-24.802668	-69.960355	-974.471112	15.052512	2467	11693.8818	0	50	0	0	49568
6	6	Región 6	112	1	-36.002854	-24.003101	-69.953522	-974.350620	15.086591	7314	16145.4733	0	50	0	0	49200
7	7	Región 7	113	1	-37.633494	-25.002981	-69.958613	-975.121159	15.477541	10546	27654.1901	0	50	0	0	49250
8	8	Región 8	113	1	-43.125227	-24.976477	-69.979655	-974.233930	15.447356	3197	2366.05399	0	50	0	0	49413
9	9	Región 9	114	1	-31.690411	-24.005620	-69.956037	-971.500040	25.002667	3480	54223.5362	0	50	0	0	49774
10	10	Región 10	115	1	-34.415080	-24.011467	-69.966231	-969.441911	31.030622	5005	29094.2979	0	50	0	0	50262
11	11	Región 11	117	1	-36.790593	-24.180470	-69.944604	-974.140254	17.585362	1213	8133.301395	0	50	0	0	51376
12	12	Región 12	118	1	-36.790547	-24.180470	-69.944604	-974.140254	25.854478	3341	6103.406331	0	50	0	0	51168
13	13	Región 13	118	1	-41.0731	-28.307918	-69.991208	-972.899707	23.088653	1486	3063.023168	0	50	0	0	51583
14	14	Región 14	121	1	-32.223880	-24.011467	-69.967879	-969.987654	29.238464	3290	53464.17498	0	50	0	0	52455
15	15	Región 15	133	1	-39.077222	-24.003337	-69.958819	-969.937916	31.345771	1566	5558.53881	0	50	0	0	55536
16	16	Región 16	136	1	-44.783177	-29.902270	-69.977667	-971.307520	27.178375	1376	1361.437665	0	50	0	0	56116
17	17	9999	1	1	-31.315988	-47.855587	-59.932221	-994.255205	25.069516	0	0	0	0	0	0	0
18	18	9999	1	2	-74.006296	-40.852830	-59.958235	-975.559926	74.957445	0	0	0	50	100	0	0
19	19	9999	1	3	-50.023309	-23.164733	-59.958675	-972.252225	124.962911	0	0	0	100	100	100	0
20	20	9999	1	4	-51.492442	-29.419604	-59.959346	-964.252757	174.964396	0	0	0	150	200	0	0
21	21	9999	1	5	-53.201170	-30.836129	-59.959421	-962.223444	224.967802	0	0	0	200	250	0	0
22	22	9999	1	6	-52.053676	-30.809119	-59.961041	-962.249616	214.971368	0	0	0	250	300	0	0
23	23	9999	1	7	-52.444966	-30.818171	-59.959564	-961.448169	304.974364	0	0	0	300	350	0	0
24	24	9999	1	8	-56.558621	-34.840288	-69.959718	-969.817829	374.978754	0	0	0	350	400	0	0
25	25	9999	1	9	-58.988387	-32.636879	-69.970877	-967.238511	424.981836	0	0	0	400	450	0	0
26	26	9999	1	10	-59.612513	-27.552742	-69.973731	-951.583852	475.989756	0	0	0	450	500	0	0
27	27	9999	1	11	-52.430113	-38.399855	-69.907655	-937.30353	25.069516	0	0	0	0	0	0	337
28	28	9999	2	1	-51.630113	-44.15275	-59.9885	-965.796154	74.957445	0	0	0	50	100	337	0
29	29	9999	2	2	-56.21442	-38.034092	-69.970855	-971.473255	124.962911	0	0	0	100	100	337	0
30	30	9999	2	3	-54.391292	-23.524292	-69.9593741	-965.473916	174.964396	0	0	0	150	200	337	0



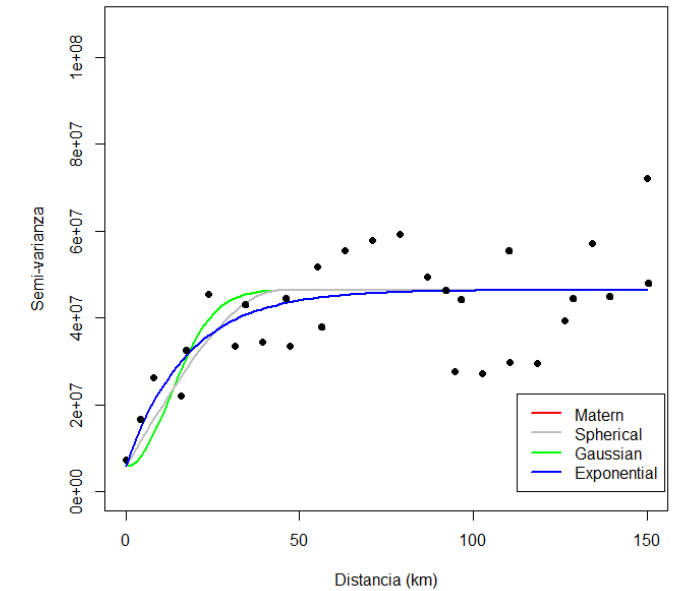
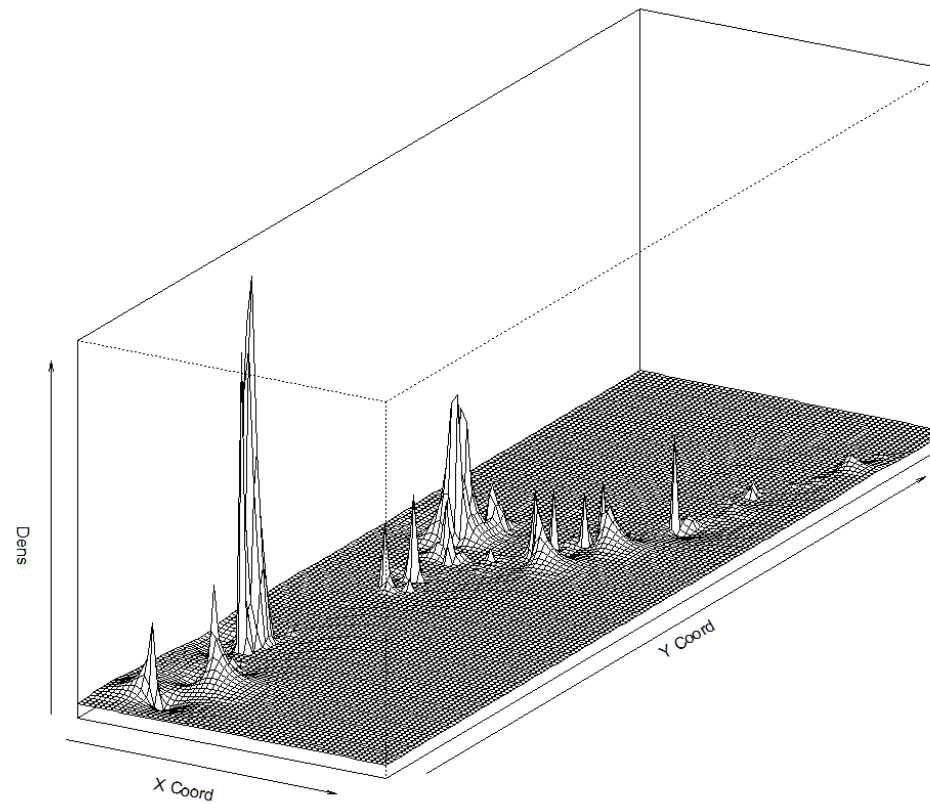
Density  
Abundance  
Biomass



Ecological information and behavior of schools.



### Geostatistical Method

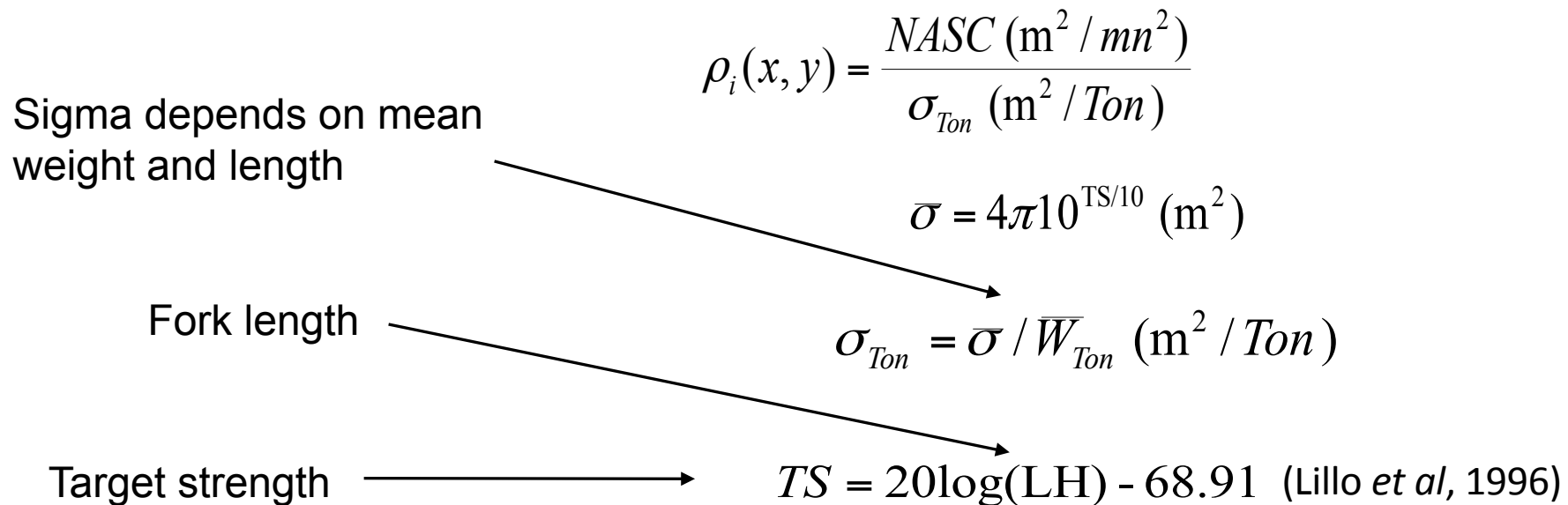


$$Z(V)^* = \frac{1}{N} \sum_i Z^*(x_i)$$

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

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

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

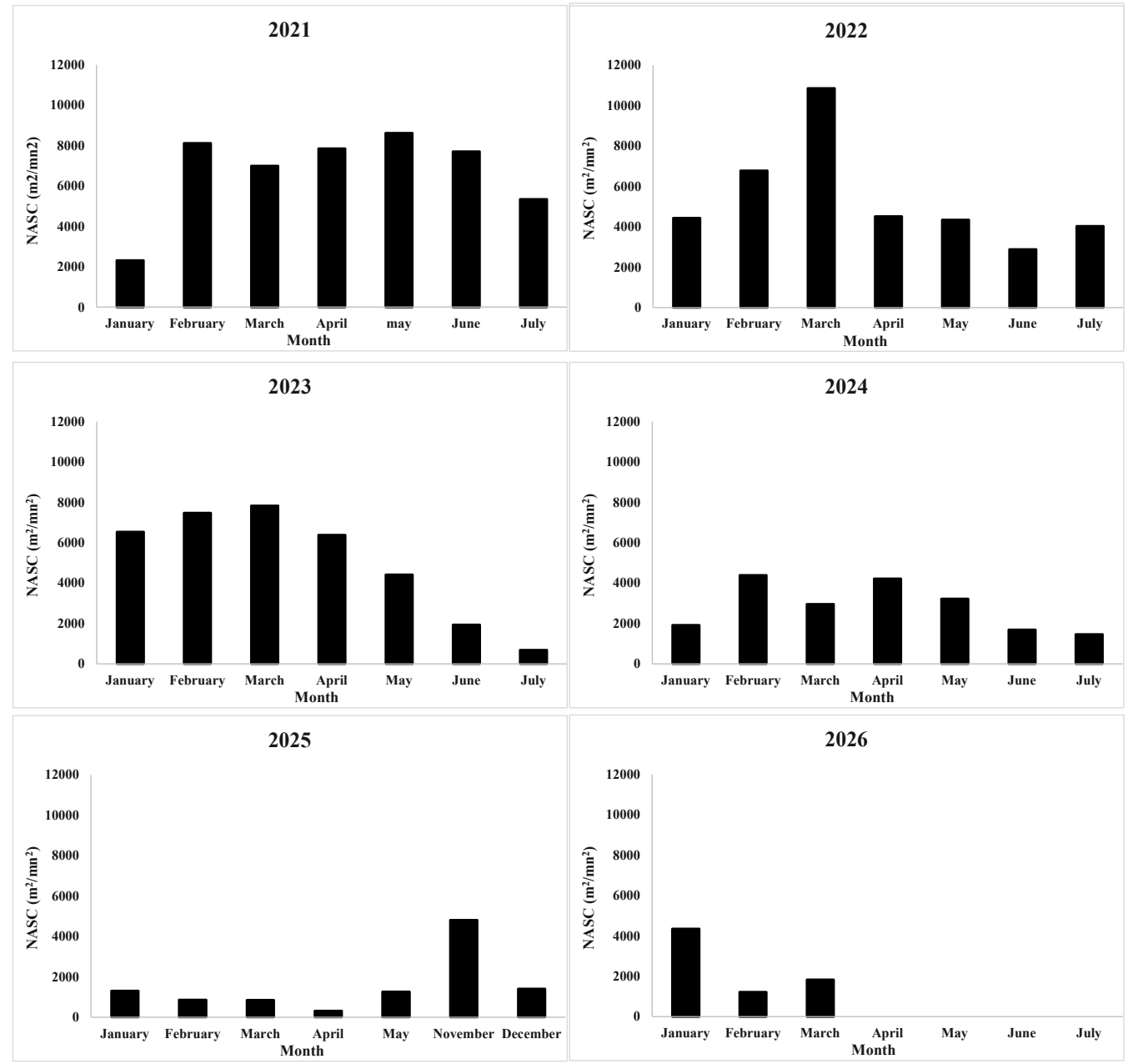


Range of TS values (J Mackerel)

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

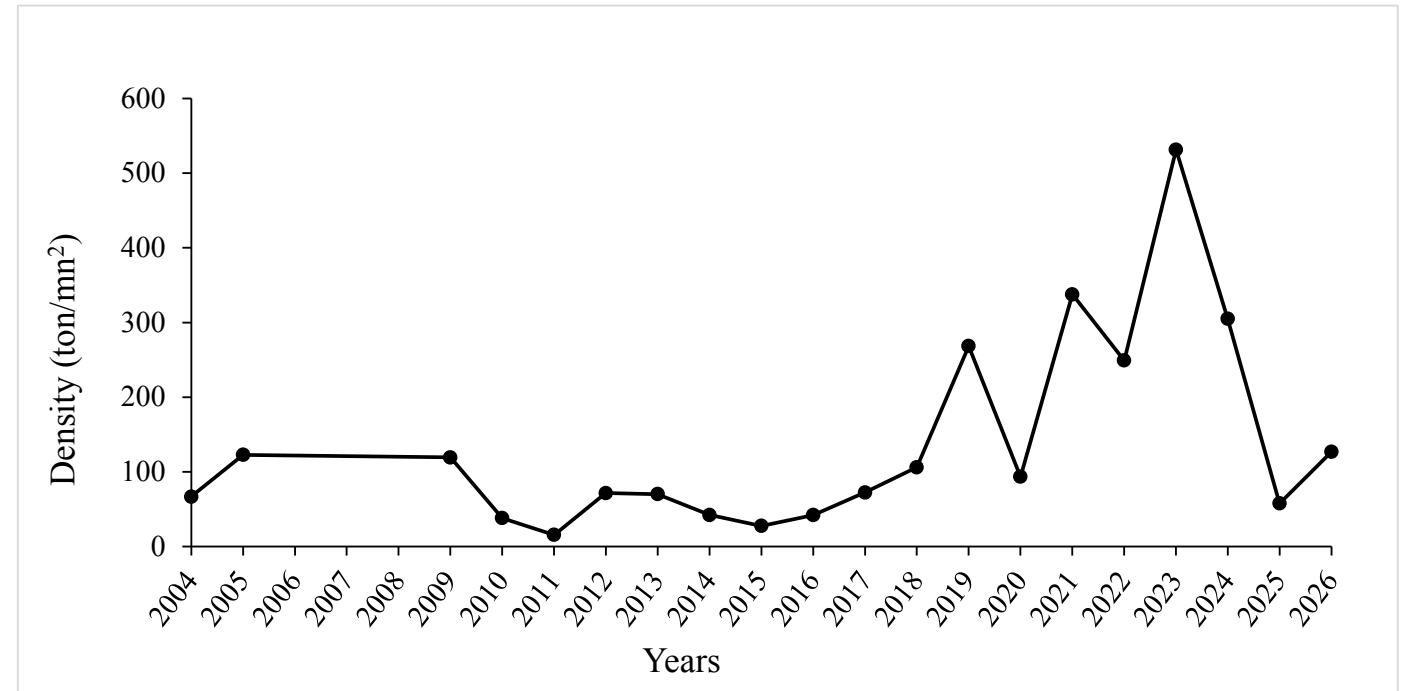


Mean monthly acoustic density from 2021 to 2026



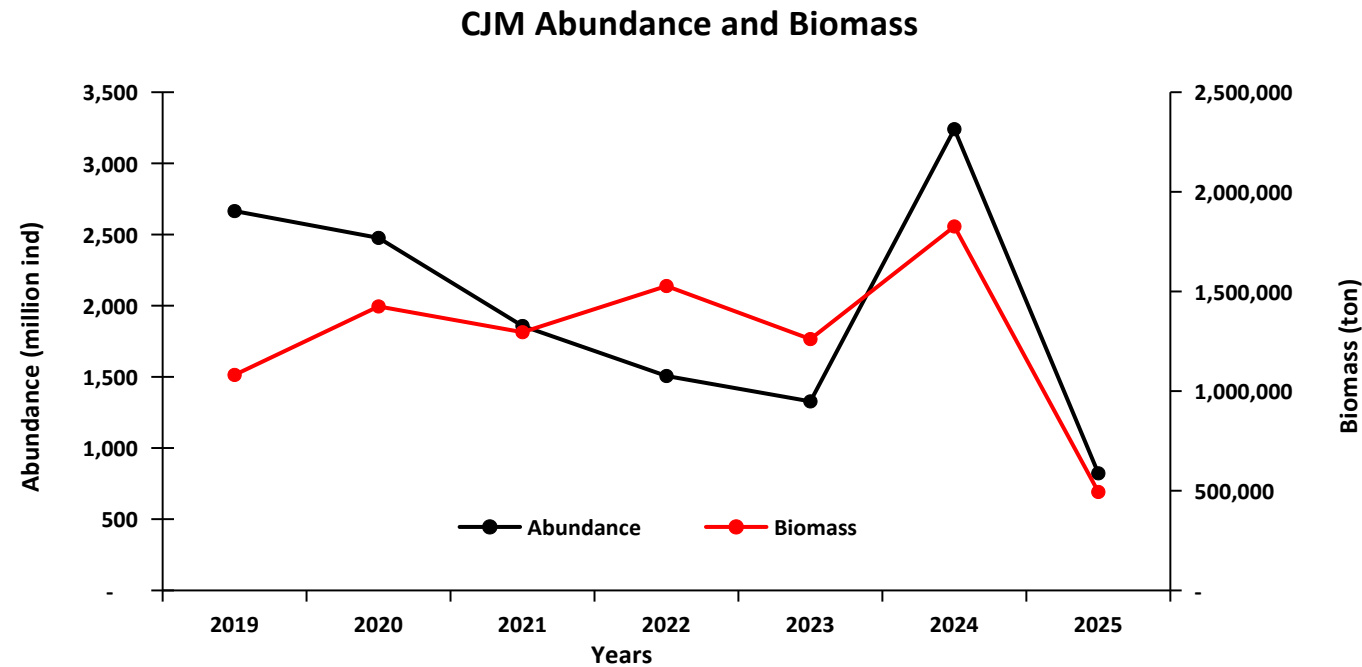
### Interannual variability of jack mackerel density observed in May from 2004 to 2026.

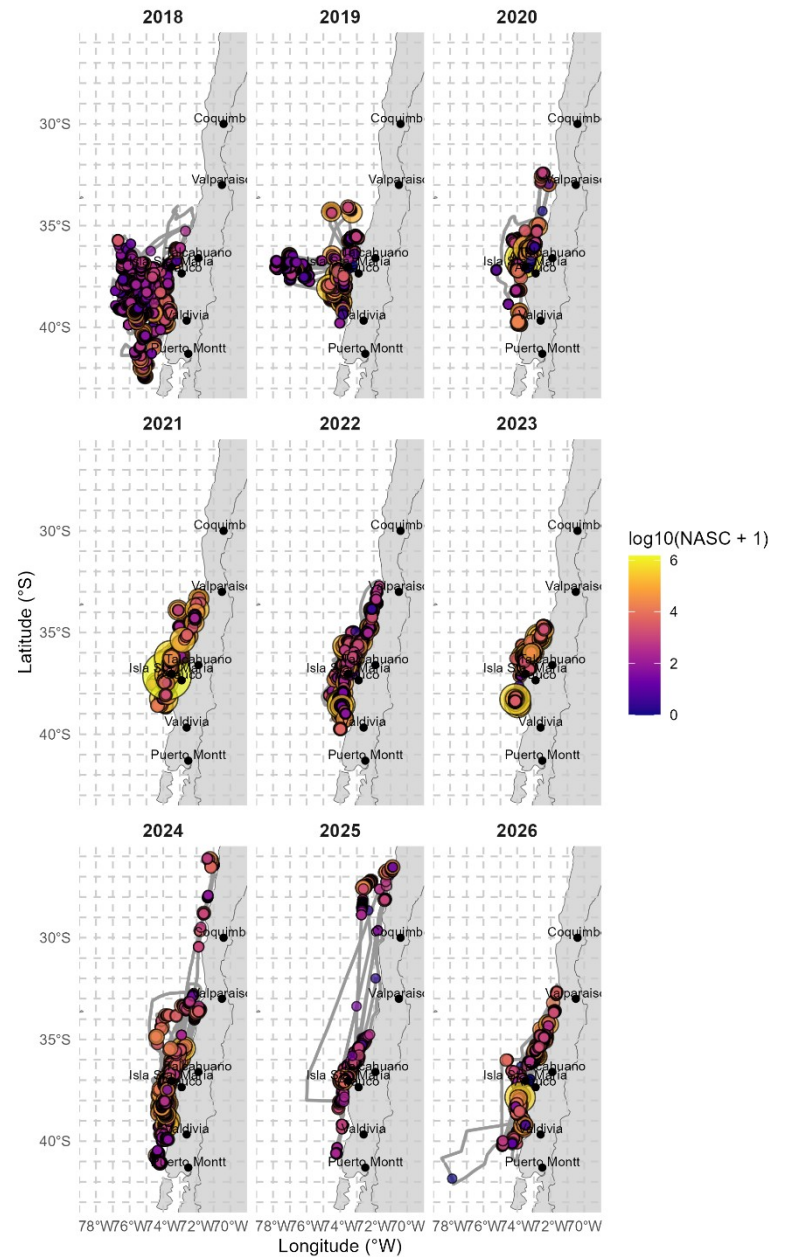
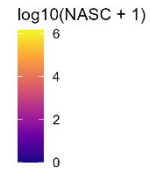
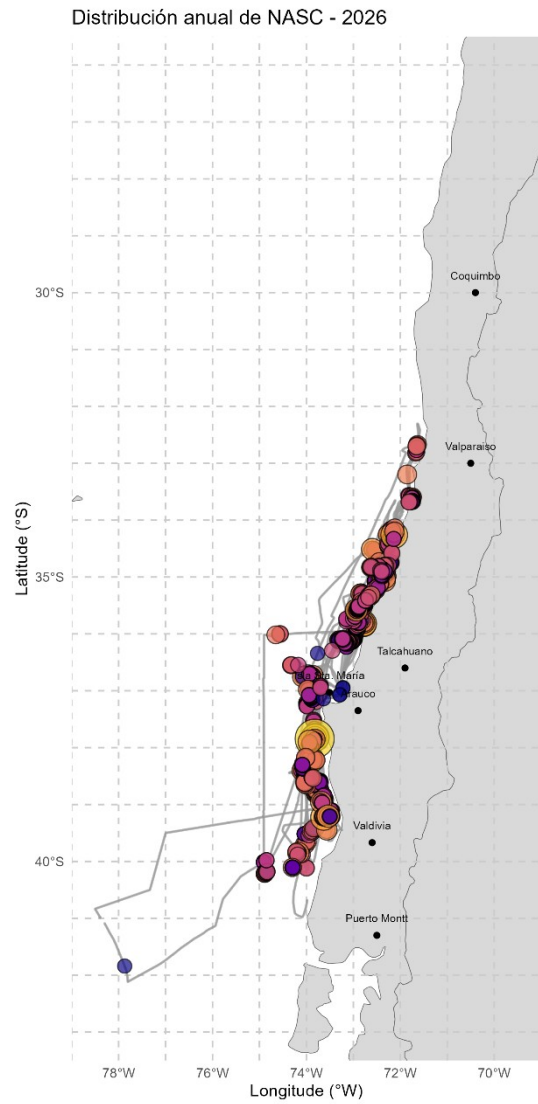
Year	Analyzed days	Number of Schools	Mean Density positive (t/mn <sup>2</sup> )	Mean Density (t/mn <sup>2</sup> )	Total density (t/mn <sup>2</sup> )
2004	6	99	366.3	66.8	36,264
2005	15	1,098	462.4	122.8	507,722
2009	25	1,350	462.9	119.4	623,553
2010	24	1,474	70.0	38.2	103,182
2011	22	42	792.1	15.6	33,270
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

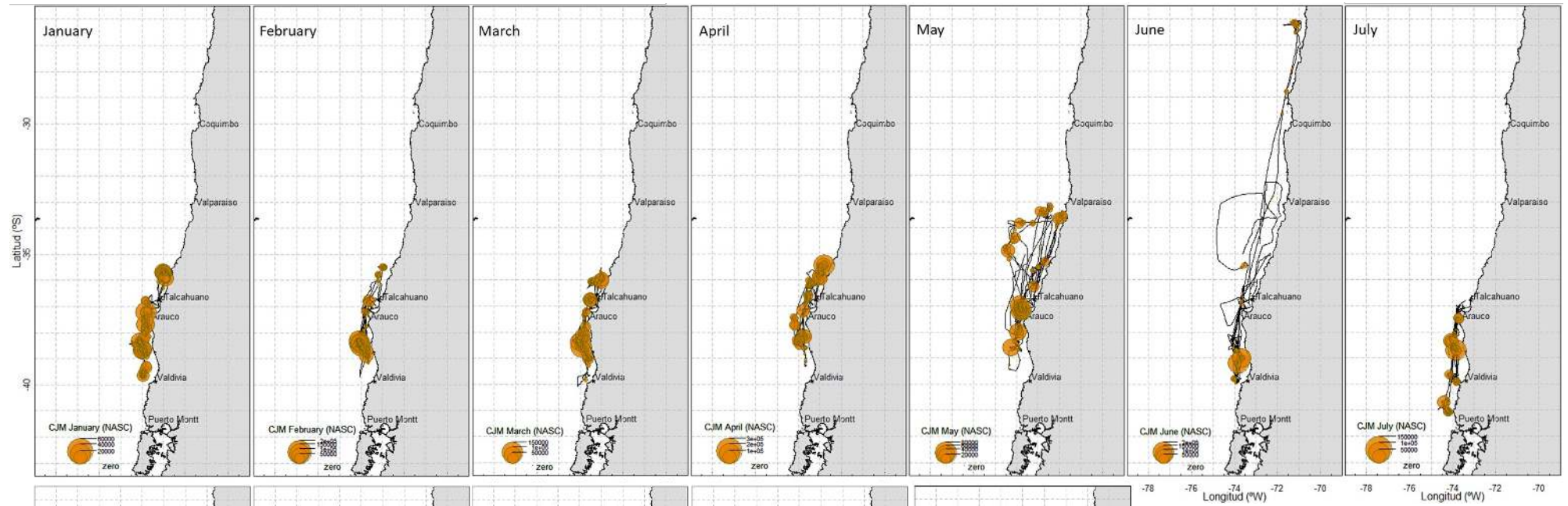




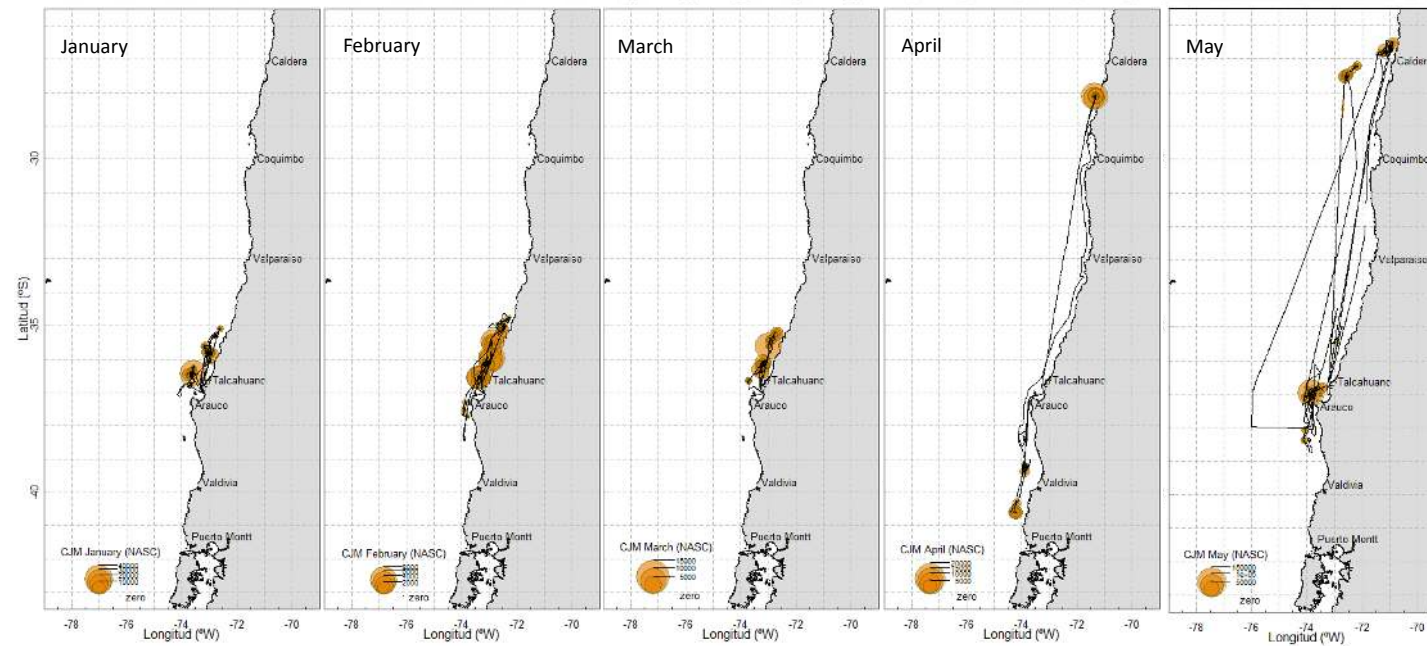
# RESULTS:

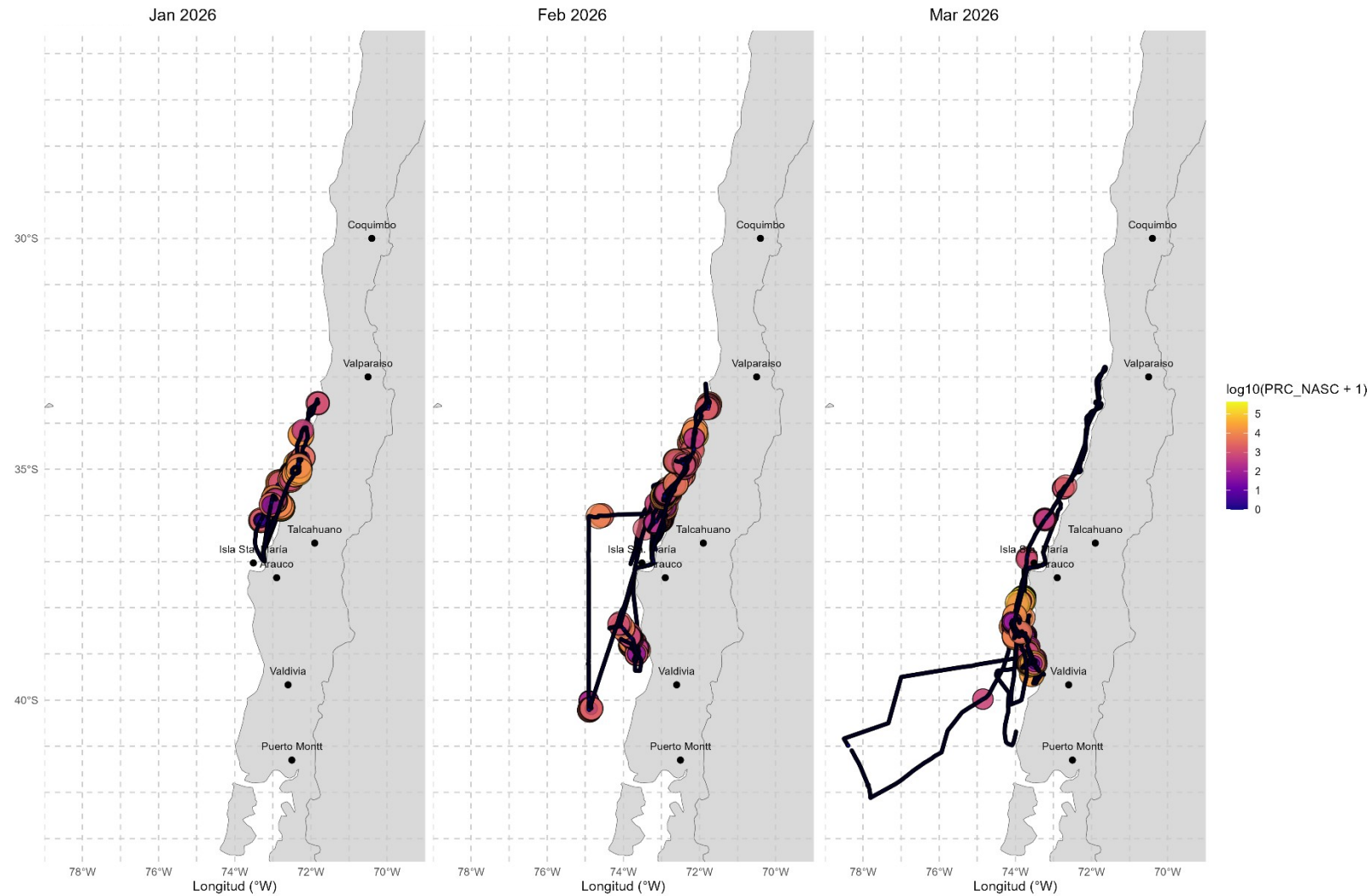
## Chilean Jack Mackerel Spatial Distribution

2024



2025





## 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