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Projections and Diagnostics for Puerto Rico Spiny Lobster SEDAR 91 Sensitivity Runs

SEDAR 91 Addendum – Projections (Draft: FOR REVIEW ONLY)

July 2026

NOAA Fisheries, SEFSC, Sustainable Fisheries Division, Caribbean Fisheries Branch

Summary

- CFMC SSC Recommended (April 2026) sensitivity run incorporating commercial logbook abundance indices.
- Fundamentally isolates changes in stock biomass due to natural recruitment fluctuations.
- The updated framework indicates the stock is not overfished and overfishing is not occurring.
- Additional analyses to refine short-term management projections: two index data-weighting thresholds ($SE = 0.2$ vs. $SE = 0.1$) and two forward-looking recruitment scenarios (Stock Recruitment Relationship and Recent Average)



Data Weighting & Performance Diagnostics

Two Configurations Evaluated:

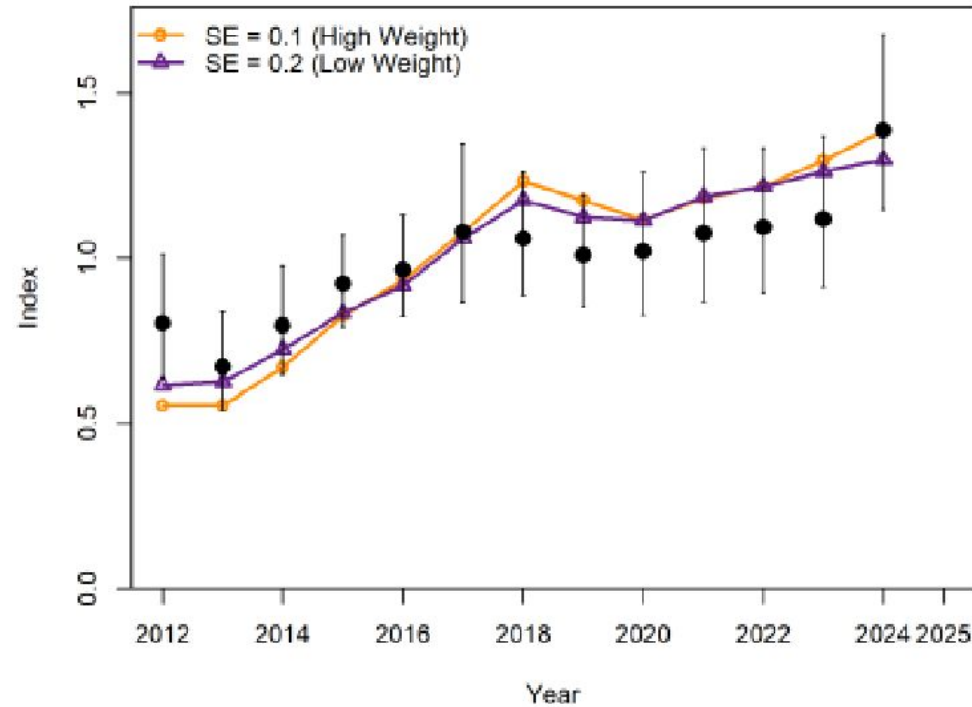
- Low Weight Indices: Scaled Standard Error (SE) of 0.2.
- High Weight Indices: Scaled SE of 0.1 (Developed as an alternative matching empirical trends).

Diagnostics:

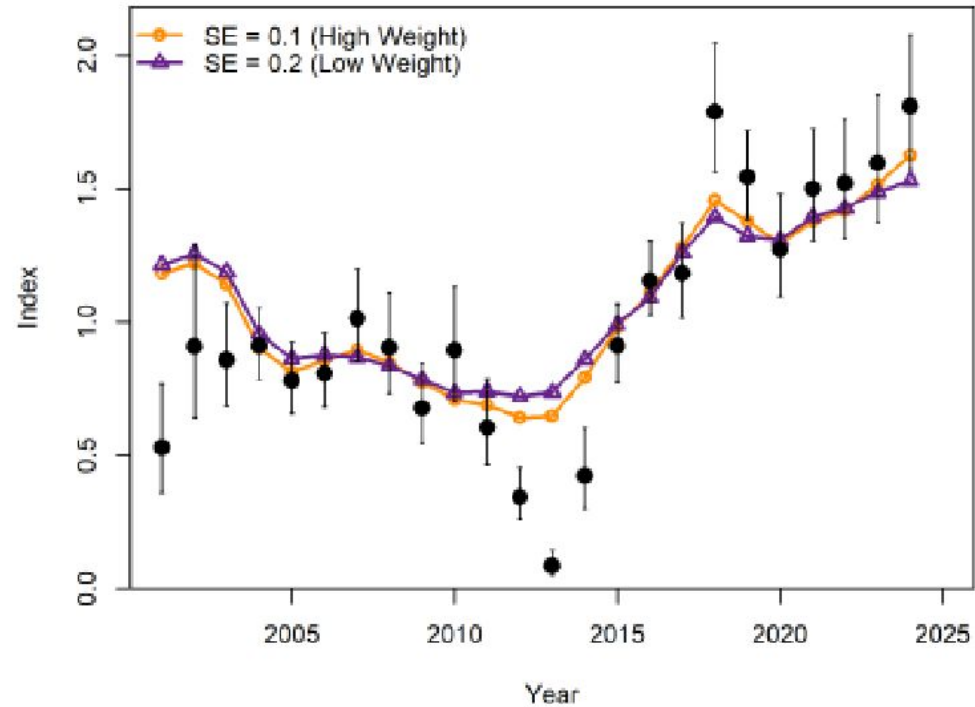
- Tested via a 5-year retrospective hindcast cross-validation.
- While both runs exhibit a systematic retrospective pattern, the High Weight (SE = 0.1) scenario achieved a slightly lower forecasting error (supported by lower Mean Absolute Scaled Error scores).



Fleet-Specific Index Fits



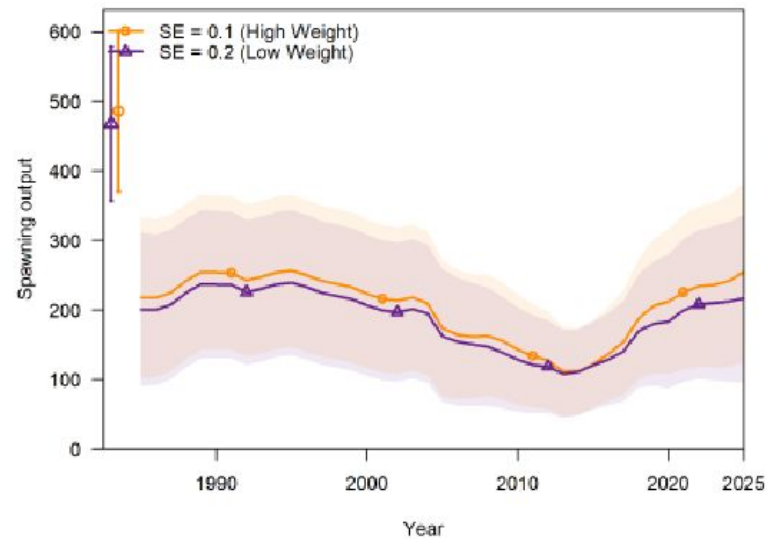
(a) Diving Fleet CPUE Index Fits



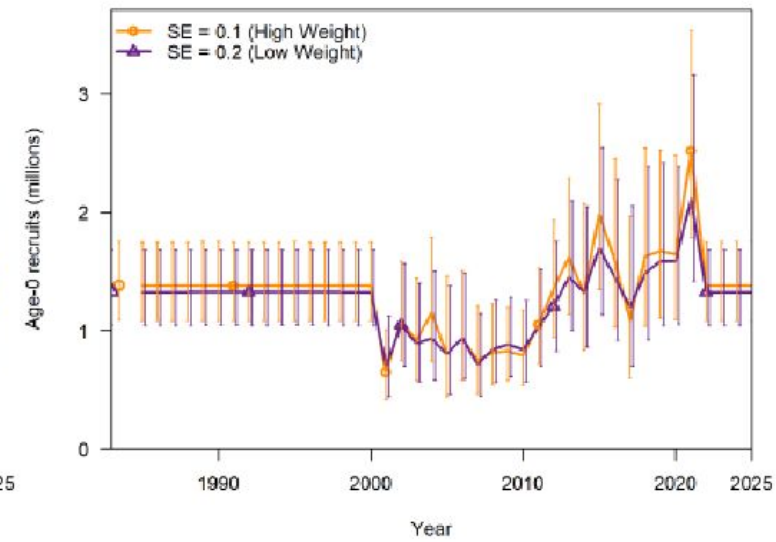
(b) Trap Fleet CPUE Index Fits

- Tightening the error threshold to $SE = 0.1$ forces the model to track recent annual fluctuations more closely.

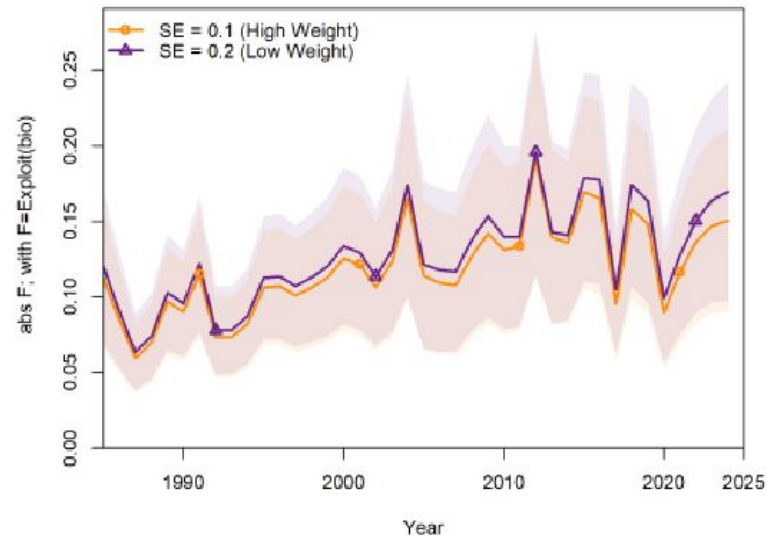
Population Trajectories:



(a) Spawning Biomass Comparison

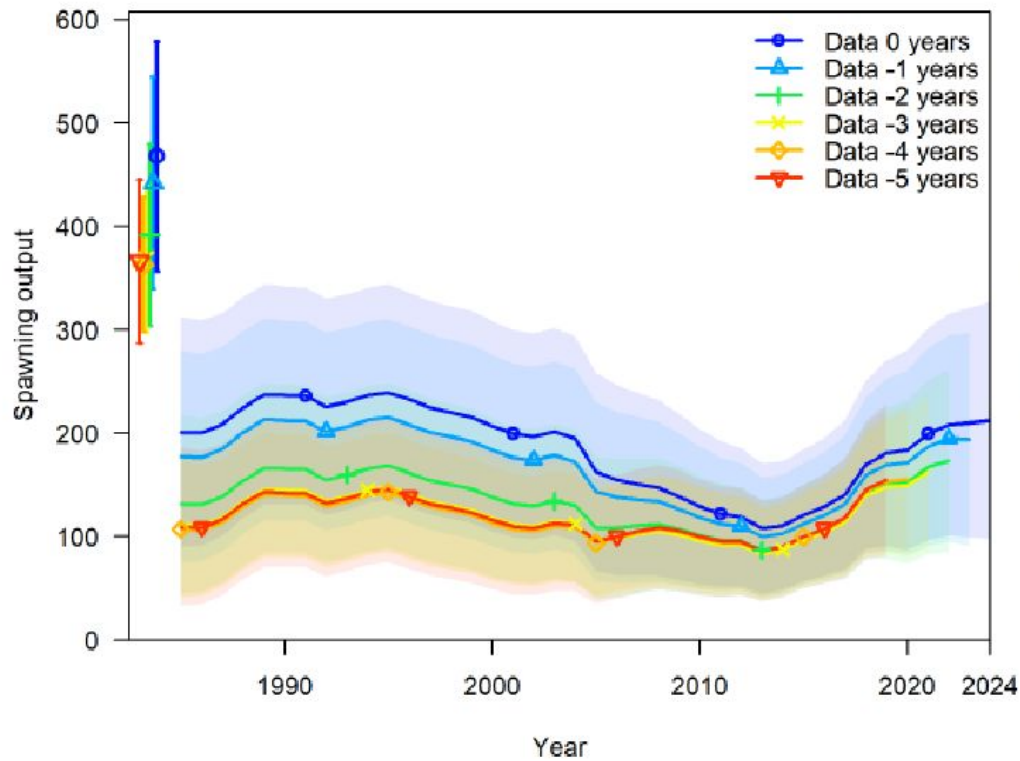


(b) Recruitment Comparison

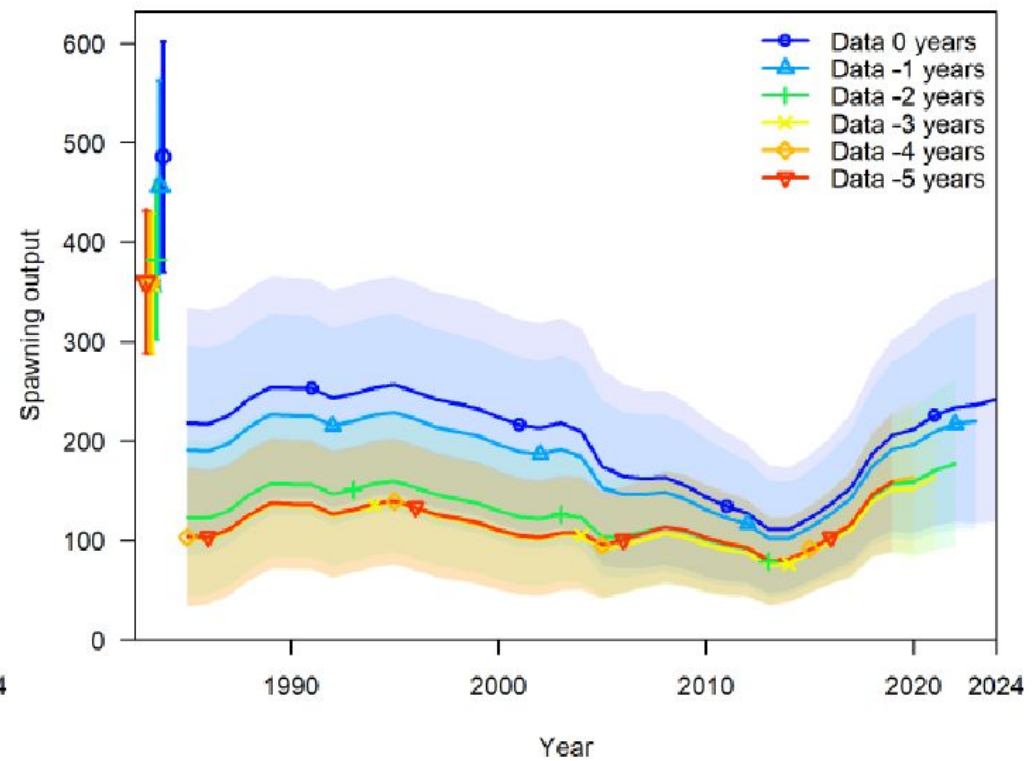


(c) Fishing Mortality Comparison

Retrospective trajectories for Spawning Stock Biomass

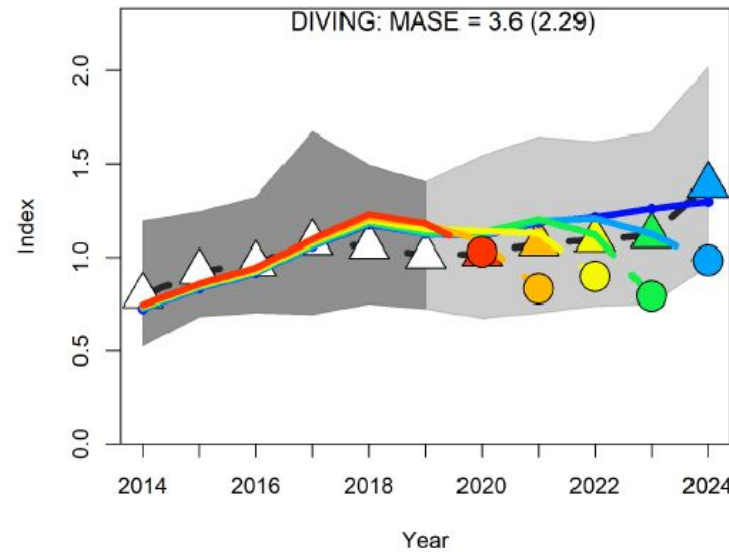


(a) Scenario $SE = 0.2$ Retrospective Peels

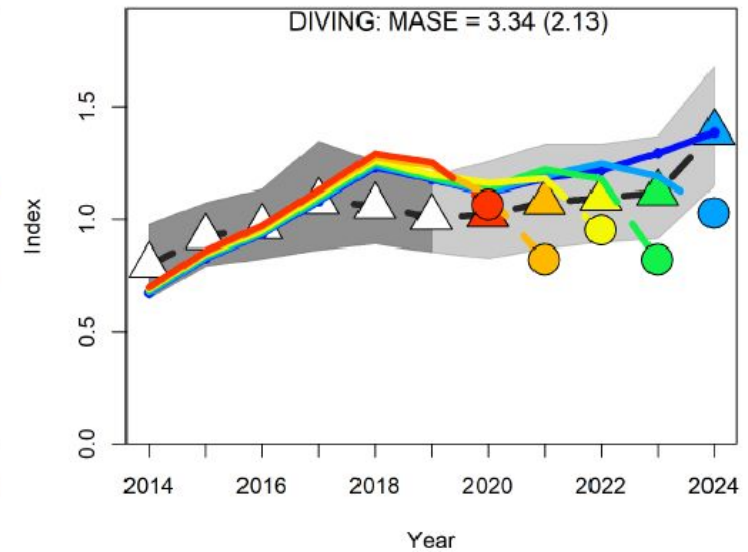


(b) Scenario $SE = 0.1$ Retrospective Peels

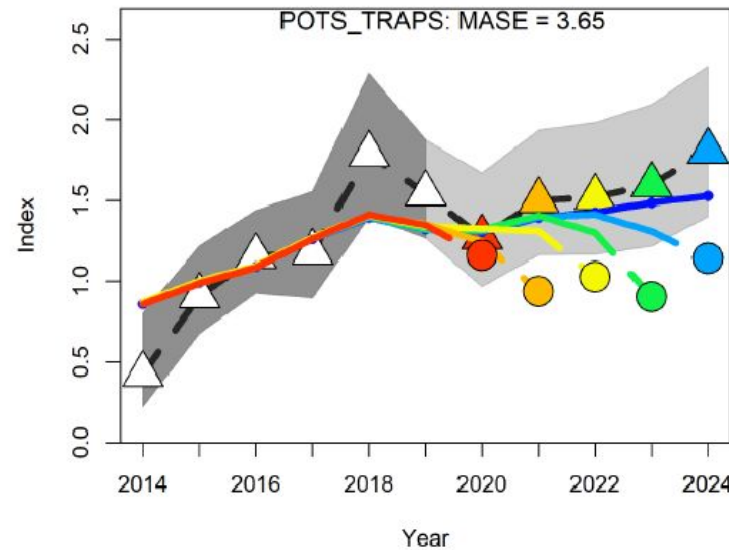
Hindcast cross-validation trajectories for both fleets and data-weighting scenarios



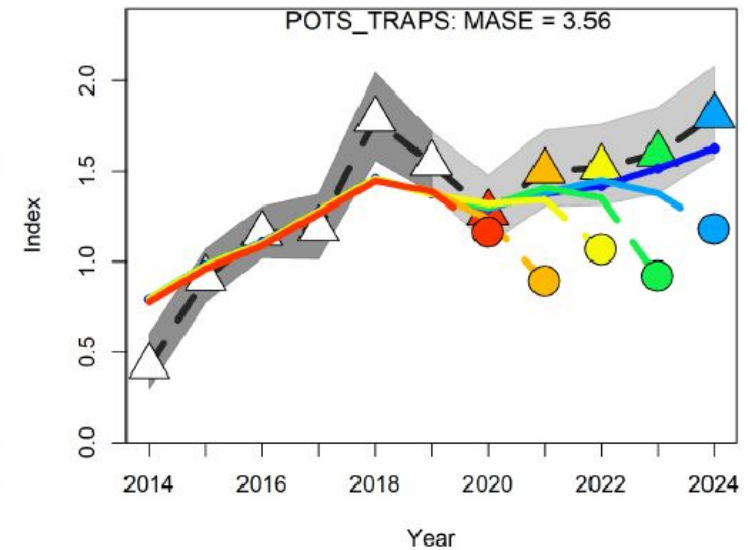
(a) Diving Fleet Hindcast (Scenario SE = 0.2)



(b) Diving Fleet Hindcast (Scenario SE = 0.1)



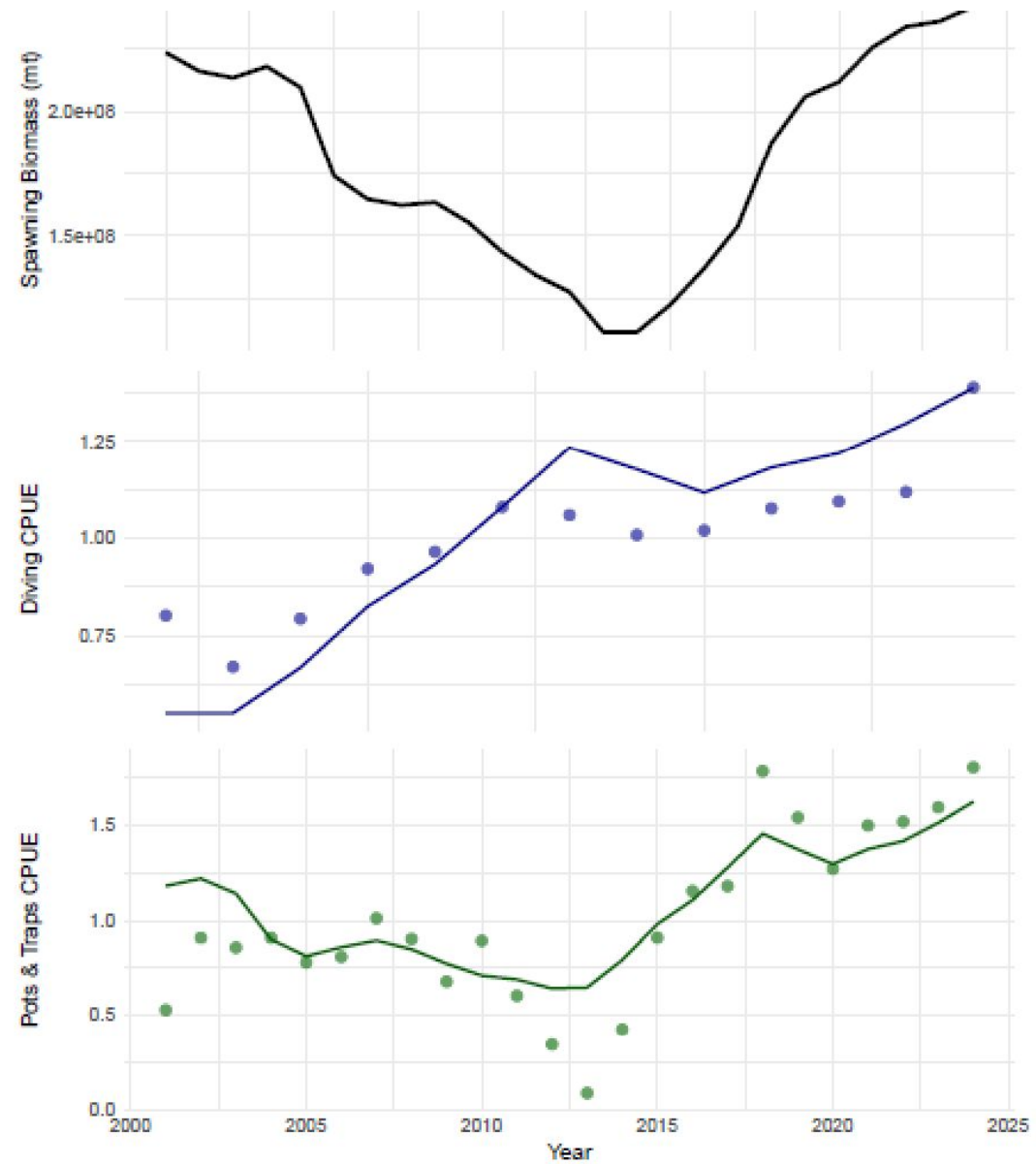
(c) Traps Hindcast (Scenario SE = 0.2)



(d) Traps Hindcast (Scenario SE = 0.1)

Recruitment

- Both configurations identify sustained period of relatively high recruitment over the past decade.
- This peak in productivity aligns with increasing catch-per-unit-effort (CPUE) and rising commercial landings.
- Isolated terminal years (2022–2024) from stable data-driven years (2020–2021)



Projection Settings

Interim Years (2025–2026):

- Catches are fixed using the 3-year geometric mean of recent landings (2022–2024) to reflect recent fishery realities.

Alternative Recruitment Projection:

- Utilizes South Atlantic SAFMC SSC Workgroup guidelines.
- Projects future recruitment based on the mean of six high-recruitment years (2015–2021).

Rationale:

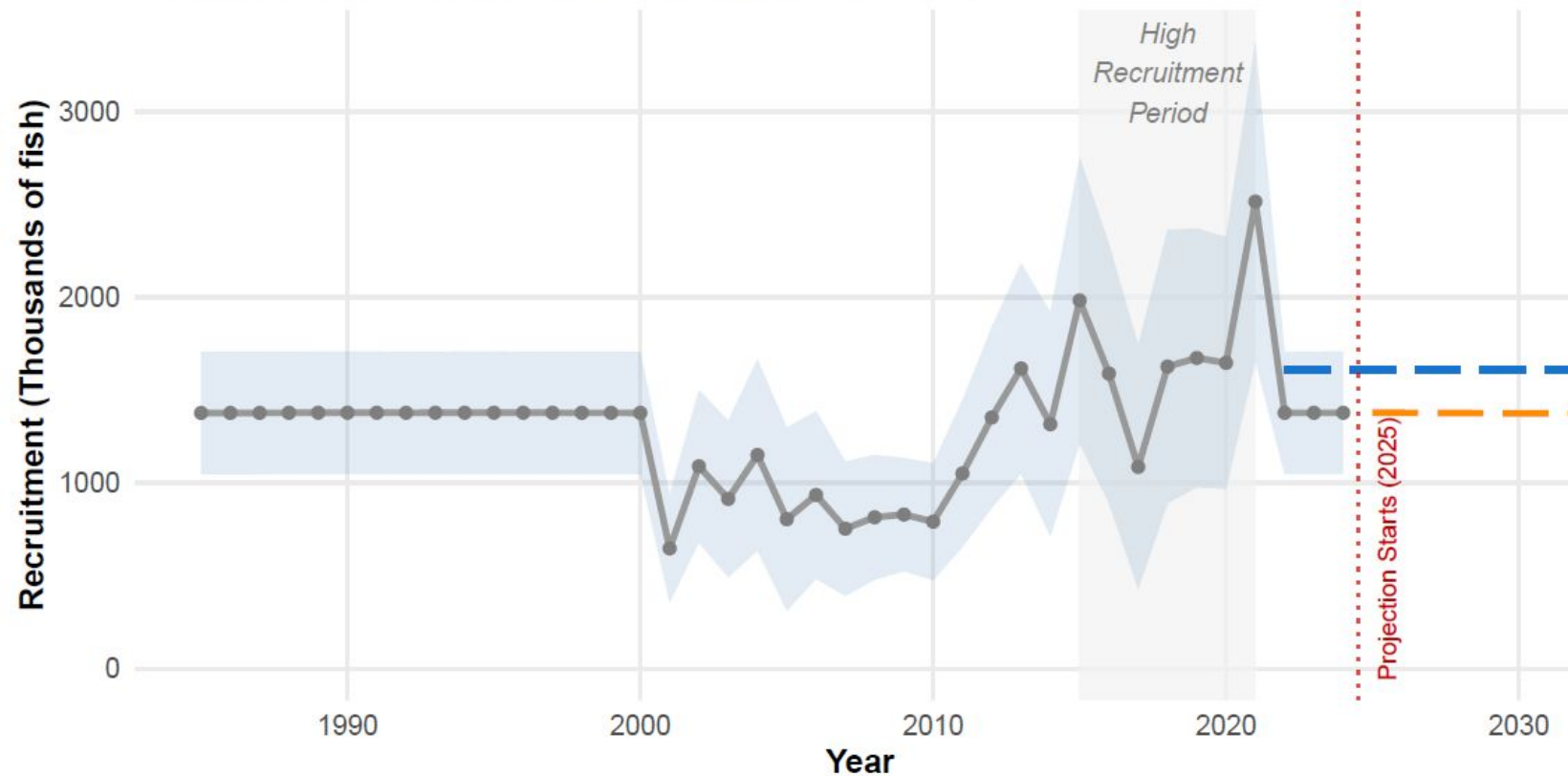
- Overall stock recruitment relationship underrepresents recent high productivity; this alternative evaluates the sensitivity of OFL advice to sustained local recruitment trends.



Projection Settings

PR Spiny Lobster: Recruitment Trajectory & Forecast

Historical trajectory, Stock Recruitment Relationship (SRR), and recent high recruitment period average (2015–2021)



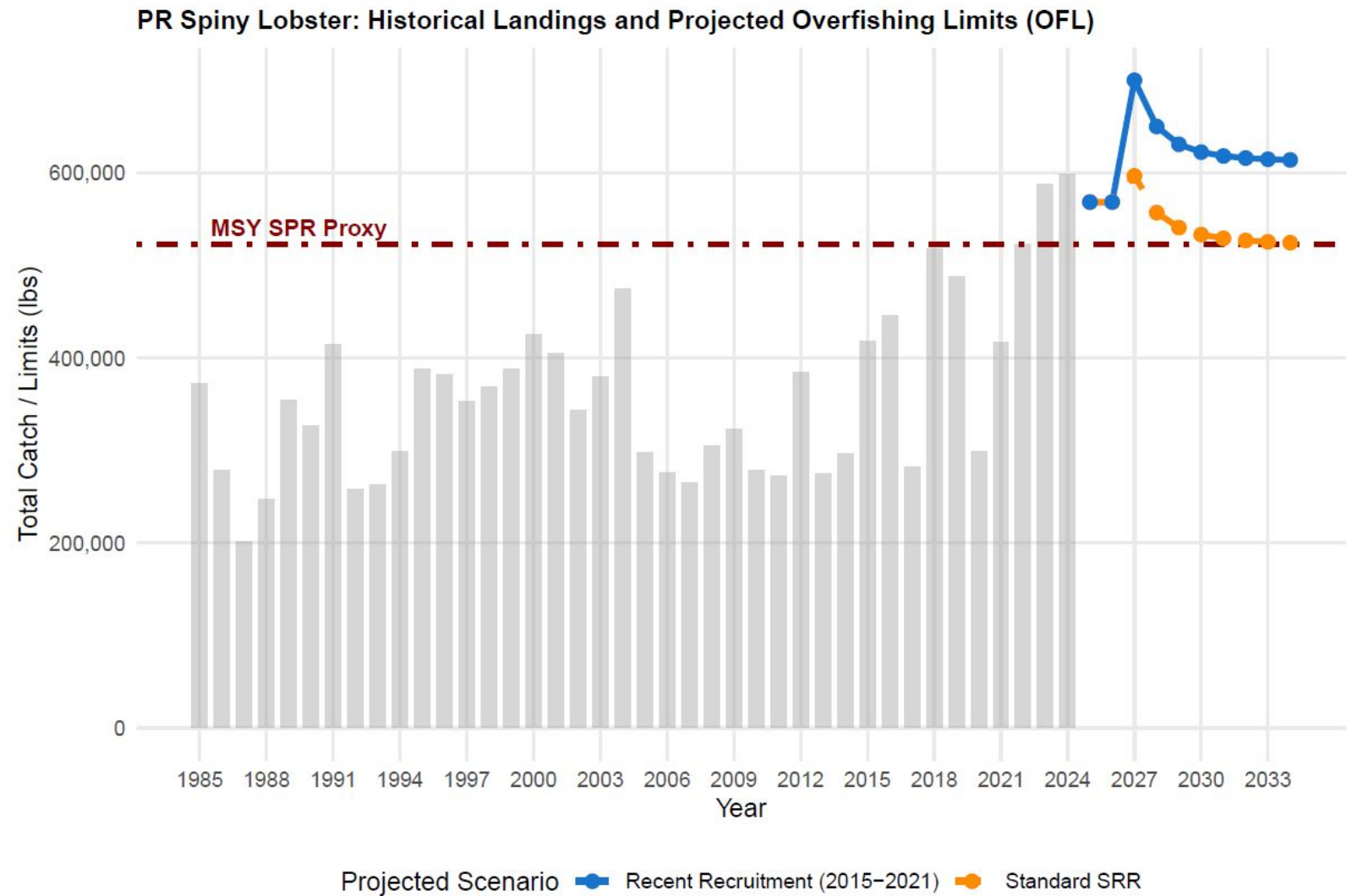
Projected Scenario:

— Recent Average (2015–2021) — Standard SRR



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Projected Overfishing Limits (OFL)



- Preferred Scenario Results: Displays projected OFLs based on the preferred SE = 0.1 framework alongside the long-term MSY proxy.

Projected Overfishing Limits (OFL)

Metric	2025	2026	2027	2028	2029	2030
	Interim	Interim				
OFL Standard SRR	568,757	568,757	597,111	557,309	541,153	533,576
OFL Recent Recruitment	568,757	568,757	700,448	650,443	631,197	622,746
MSY SPR Proxy	522,888	522,888	522,888	522,888	522,888	522,888

- Preferred Scenario Results: Displays projected OFLs based on the preferred SE = 0.1 framework alongside the long-term MSY proxy.



Summary

Best Available Framework

- The $SE = 0.1$ configuration incorporating logbook indices and accounting for sustained high recruitment provides the most accurate current measure of stock abundance.
- Offers a data-driven, quantitative tool to capture ongoing high CPUE and reports of local abundance.

These alternative projections should strictly be used for short-term management advice until fishery-independent surveys or explicit environmental recruitment mechanisms can be integrated.

