

SEDAR 84 Puerto Rico

CFMC SSC Meeting
April 9, 2026



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Background

- SEDAR 84 was a Benchmark assessment and addresses the stocks of Caribbean Yellowtail Snapper in Puerto Rico and St. Thomas/St. John and Stoplight Parrotfish in St. Croix.
- The process consisted of an in-person Data Workshop in 2024, a series of assessment webinars, and a in-person Review Workshop in 2025.
- The Stock Assessment Report (SAR) for US Caribbean Spiny Lobster – Puerto Rico was disseminated to the public in August 2025.
- In September 2025, and in anticipation of a full CFMC SSC review of these stock assessments, the SSC and the SEFSC Caribbean Branch discussed additional model runs.
- The supplemental runs extend the terminal year from 2022 to 2024 and investigate alternative parameterizations for steepness, average length at maximum age, and the degree of dome-shaped selectivity for the NCRMP fishery-independent survey.
- The SSC is tasked with recommending whether the assessments represent Best Available Science, whether the results are useful for providing management advice and developing fishing level recommendations.

Current Management

Island-based fishery management plans effective as of October 2022

- Puerto Rico Management Plan
- Annual Catch Limits for Stocks and Stock Complexes

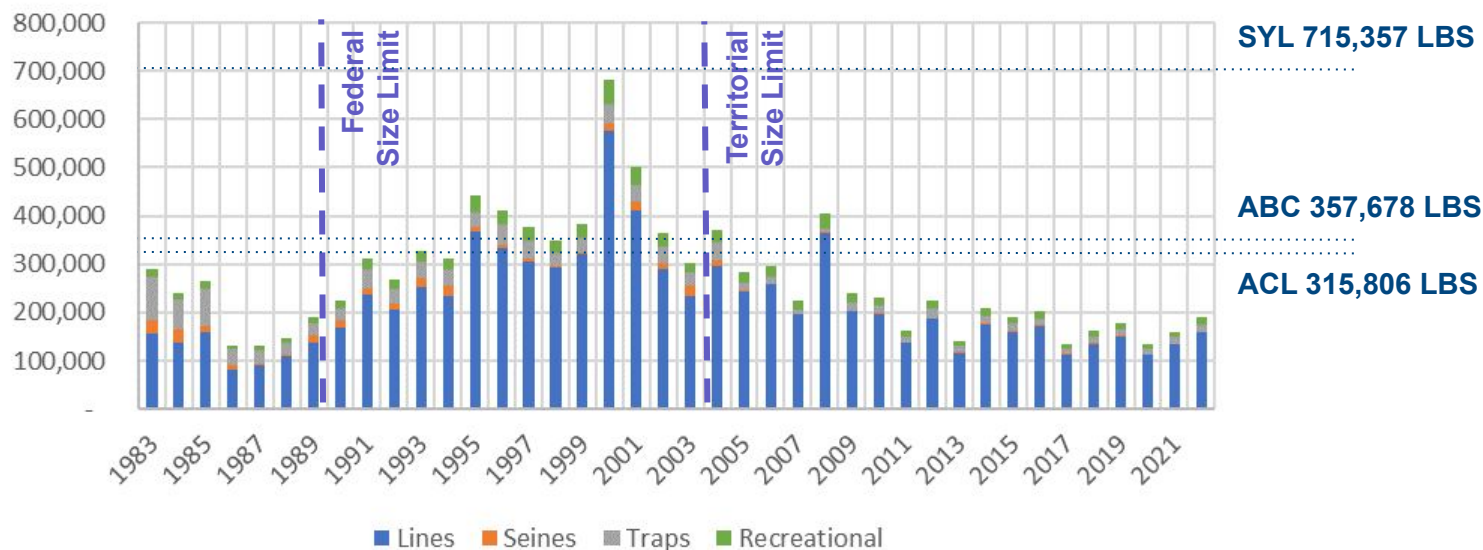
2022 ACL for Snapper 5 (Yellowtail Snapper)— 315,806 lbs

- 1988—2011 reference
- Based on commercial landings but applies to all harvest
- Accountability measures apply if ACL is exceeded

Recreational landings are calculated as 7.78% of the Commercial Lines landings, derived from 2012–2016 MRIP comparisons

“The SYL represents a level of catch or yield that the Council’s SSC has confidence a stock can sustain through time based on historical trends in catch and the SSC’s evaluation of the best scientific information available, including life history information and analysis of the susceptibility of the stock to fishing pressure.”

PR Yellowtail Snapper Landings for SEDAR 84



Management History

Federal Waters

- 1986 8-inches total length size limit; increased one inch per year
- 1989 12-inches total length size limit
- 1990 requirement for heads, fins, and tails to be landed intact
- 2005 FMP comprehensive amendment
- 2012 recreational bag limit 5 per person/day, and 15 per vessel/day
- 2012 ACL for Com. Puerto Rico Snapper 4 (Yellowtail Snapper) 373,295 lb (1999-2005 reference)
- 2012 ACL for Rec. Puerto Rico Snapper 4 (Yellowtail Snapper) 28,509 lb (2000-2005 reference)
- 2022 ACL for Snapper 5 (Yellowtail Snapper)— 315,806 lbs (1988-2011 reference)



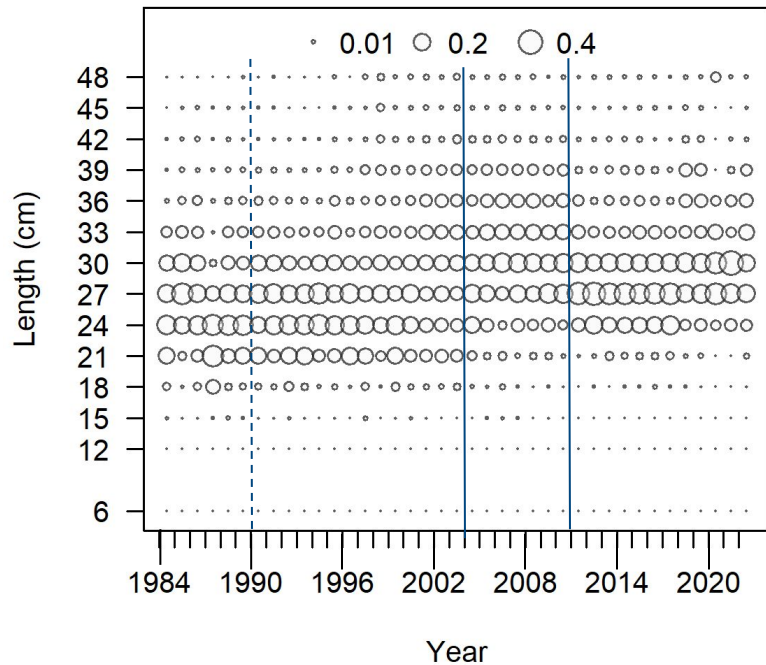
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PR Regulations

- 1936 Law 83 banned the use of nets at river mouths
- 1998 Puerto Rico Fisheries Law Regulation 278 (amended in 2004, 2005, 2009, and 2010)
- 2004 10.5-inches fork length size limit
- 2004 beach seines were prohibited within PR inner waters and river mouths
- 2007 seines prohibited in jurisdictional waters
- 2010 seines prohibited only within PR inner waters and river mouths



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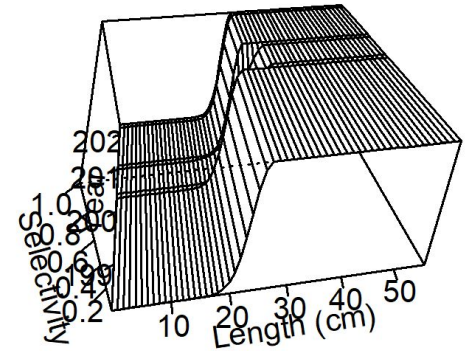
Commercial Selectivity

Blocks

1983-2003

2004-2010

2011-2023



In 2004, a size limit of 10.5 inches fork length for yellowtail snapper was implemented under Regulation 6768 (DRNA, 2004). Additionally, in 2004, beach seines were prohibited within Puerto Rico inner waters and river mouths. The seines were also prohibited in jurisdictional waters beginning in 2007. In 2010, Puerto Rico DRNA issued Regulation 7949, which superseded Regulation 6768, and permitted beach seines except within Puerto Rico inner water and within 300 meters of rivers mouths (DRNA, 2010).

Assessment History

1992 Appeldoorn et al.

- Part of a broader reef fish assessment
- Used length frequency analyses
- Limited in scope and data resolution

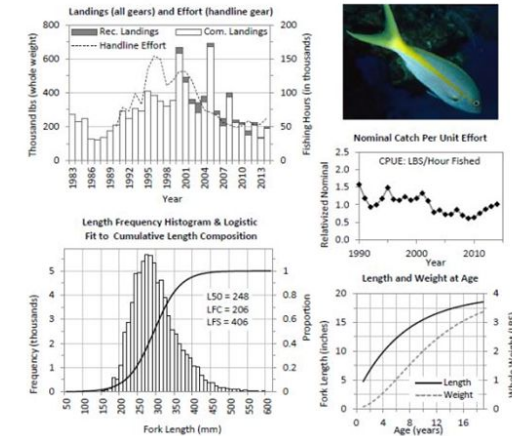
2005 SEDAR 08

- Explored CPUE trends and length frequency changes
- Insufficient data to reliably parameterize models
- Unable to determine stock status

2016 SEDAR 46

- Applied Data-Limited Methods Toolkit (Carruthers, 2018)
- Evaluated six species across island units
- Included Yellowtail Snapper in Puerto Rico
- Results ultimately not used for management advice

Yellowtail Snapper (*Ocyurus chrysurus*) Puerto Rico Handline



Life History and Selectivity											
	vbLinf	vbK	vbt0	wla	wlb	L50	AM	Mort	LFC	LFS	
	Asymptotic Len.	Growth Coeff.	Age at Len. 0	Wh-Len. at Len. 0	Wh-Len. at Len. 0	Len. at maturity	Age at maturity	Natural Mortality	Len. 1st Capture	Len. Full Selection	
Parameter	502.5	0.139	-0.96	8.45E-5	2.859	248	9.939	0.189	206	406	
CV	(0.05)	(0.16)	(0.45)	(0.05)	(0.05)	(0.15)	(0.25)	(0.083)	—	—	
Units	mm FL	yr ⁻¹	years	—	—	mm FL	years	yr ⁻¹	mm FL	mm FL	

Relevant federal regulations		
http://sero.nmfs.noaa.gov/sustainable_fisheries/policy_branch/	Start Date	End Date
Snapper, grouper, parrotfish bag limit (5 per person, 15 per vessel)	30 Jan 2012	ongoing
12 inches total length size limit (304.8 mm TL)	01 Jan 1989	ongoing

Figure 3.1.2 Summarized information available for stock evaluation of Puerto Rico yellowtail snapper using the DLMtool modeling framework.

SEDAR 46 SAR Section II

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Data & Assessment Workshop Report

S84 Assessment Overview

The Puerto Rico assessment models developed during S84 were fit to a catch time series for a single fleet, a fishery-independent index of abundance, and fishery dependent and independent length composition data using a data-limited to moderate implementation of SS3.

The Models presented in the Stock Assessment Report (SAR) were not found appropriate to use as a basis for advice by the CIE Reviewers.

- Models were deterministic and sensitive to fixed assumptions
- It was difficult to isolate and clearly identify the most influential sources of uncertainty
- Key uncertainties were identified, including: initial equilibrium catch, natural mortality (M), and steepness and population processes (growth, recruitment)

The SEFSC Caribbean Fisheries Branch conducted a phased exploration of the parameter space, and a data update through 2024.

S84 Sources of Data

Puerto Rico

- Landings from self-reported commercial fisher logbooks
- Length compositions from shore-based port sampling
- Length compositions from a fishery-independent survey of reef fish
- Index of abundance from a fishery-independent survey of reef fish
- Life history information from otolith analysis and gonad histology

Data Workshop Outcomes

- Use life history data made available in SEDAR working papers
- Use commercial landings data starting in 1983
- Use coast-specific expansion factors averaged across the years 2014-2019 as proxy expansion factors to calculate 2020-2022 commercial landings
- Consider uncertainty around the landings
- Identify and flag outliers
- Assume commercial discards are negligible
- Utilize TIP lengths from 1983-2022 to inform selectivity and annual population trends
- Use the NCRMP Yellowtail Snapper data for PR from 2014 to 2022
- Do not consider the fishery-dependent information for an abundance indices



Post-Data Workshop Outcomes

- Assessment panel accepted landings outliers retained as valid trips
- Assessment panel accepted one combined commercial fleet configuration
- Stock Synthesis V3.30.22 was the modeling approach applied in the current SEDAR 84 assessment because of compatibility with the available data and consistency with standard practices. SS3 models configured with 1 area, 1 fleet, and 1 survey; 1983—2022; 40% SPR used as a proxy for MSY

Sensitivities tested using:

- Growth variability (CV on growth)
- Uncertainty in initial equilibrium catch

Diagnostics included:

- Gradients, residuals, likelihood profiles
- Retrospectives and jitter analyses

Assessment Development

Began with data-limited models using super-period length compositions

- Steepness fixed at 0.99
- Sigma R fixed at 0.7

Model progression tracked biological/data complexities:

- Adjusted length at age zero
- Continuous recruitment
- Increased catch uncertainty

Progressed to data-moderate models incorporating:

- Abundance indices
- Annual fishery-independent length compositions
- Annual fishery-dependent length compositions
- Dome-shaped fishery-independent selectivity
- Time blocks
- Recruitment deviations



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SEDAR 84 PR Yellowtail Snapper Assessment Report Models

Stage	Code	Sequential modeling steps
Initial	ct	model initialized with continuum tool (ct)
Initial	m1	ct + adjusted length at age zero
Initial	m2	m1 + continuous recruitment
Initial	m3	m2 + catch uncertainty
Scenario	null	catch and super-year length data
Scenario	a	index
Scenario	v01	index + annual fishery-independent length data
Scenario	v08	index + annual fishery-independent length data + dome-shaped fishery-independent selectivity
Scenario	v19	index + annual fishery-independent length data + dome-shaped fishery-independent selectivity + recruitment deviations
Scenario	v31	index + annual fishery-independent length data + annual fishery-dependent length data + dome-shaped fishery-independent selectivity + time block + recruitment deviations
Sensitivity	s1	higher CV on growth young
Sensitivity	s2	higher age and lower m
Sensitivity	s3	higher catch uncertainty
Sensitivity	s4	s2 + s3



SEDAR 84 PR Yellowtail Snapper Review Workshop Models

Model	Description
PR_RW_1	Single Sex, F method 2, Catch SE = 0.3, and Corrected Survey SE
PR_RW_2	PR_RW_1 + Catch SE = 2 and Estimated Growth
PR_RW_3	PR_RW_1 + La Parguera Survey and Selectivity Spline; does not converge
PR_RW_4	PR_RW_3 + Estimated Growth
PR_STTJ_RW_1	PR_RW_3 + STTJ Fleet and STJ Survey; does not converge
PR_STTJ_RW_2	PR_STTJ_RW_1 + Estimated Length at Maximum Age and Fixed Selectivity and 0.8 Steepness



SEDAR 84 PR Yellowtail Snapper

Additional sensitivity runs

Stage	Scenario	Label
Review workshop	1_23_rw_re	Review Workshop (1)
Correction to catch	2_23a_rw_re	Corrected Catch Units (2)
Removal of Recruitment Deviations	3_23b_c1	No Rec. Dev. (3)
	4_23b_c2	Catch CV 0.2 (4)
	5_23b_c3	Catch CV 0.15 (5)
	6_23b_c4	Catch CV 0.1 (6)
Terminal Year Update	7_24b_c4	End Year 2024 (7)
Structural Simplification	8_24c_p1	Lorenzen m (8)
	9_24c_p2	Adjusted growth (9)
	10_24c_p3	One settlement (10)
	11_24c_p4	Bin <= 12 cm (11)
	12_24c_p5	Adj. m, growth, settlement, and bin (12)
	13_24c_p6	Adj. m, growth, and bin (13)
	14_24c_p7	Fix selectivity (14)
	15_24c_p8	Simplified (15)

Stage	Scenario	Label
Single-Factor Sensitivity	16_24d_l1	Alt. length (16)
	17_24d_se	Est. sel. (17)
	18_24d_s1	Alt. sel. (18)
	19_24d_he	Est. h (19)
	20_24d_h1	Alt. h (20)
Multiple Factor Parameter Grid	21_24e_l1se	Alt. L, Est. sel. (21)
	22_24e_l1s1	Alt. L, Alt. sel. (22)
	23_24e_l1he	Alt. L, Est. h (23)
	24_24e_l1h1	Alt. L, Alt. h (24)
	25_24e_hese	Est. h, Est. sel (25)
	26_24e_hes1	Est. h, Alt. sel (26)
	27_24e_h1se	Alt. h, Est. sel (27)
	28_24e_h1s1	Alt. h, Alt. sel (28)
	29_24e_l1hes1	Alt. L, Est. h, Est. sel (29)
	30_24e_l1hese	Alt. L, Est. h, Alt. sel (30)
	31_24e_l1h1se	Alt. L, Alt. h, Est. sel (31)
	32_24e_l1h1s1	Alt. L, Alt. h, Alt. sel (32)
Recruitment Estimation	33_24f_re	2014-2022 Rec. Dev. (33)
	34_24f_se_re	Estimate NCRMP end Sel. (34)
	35_24f_hese_re	Estimate h and NCRMP end Sel. (35)

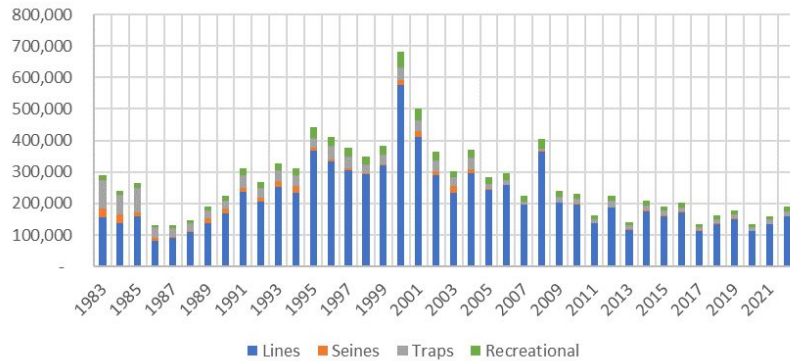


Parameter values used in the sensitivity analysis

Parameters	Simplified Parameters	Alternate Values	Estimated
L Max	42.2	50.8	no
End NCRMP Dome Sel.	-1.9	-1	yes
Steepness	0.99	0.8	yes
Rec Devs	Off	Off	yes; 2014-2022

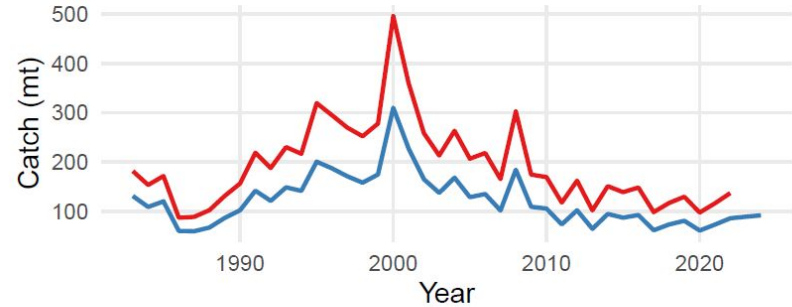


PR Yellowtail Snapper Landings for SEDAR 84



Annual Catch Comparison

Comparing updated metrics vs. error-adjusted totals

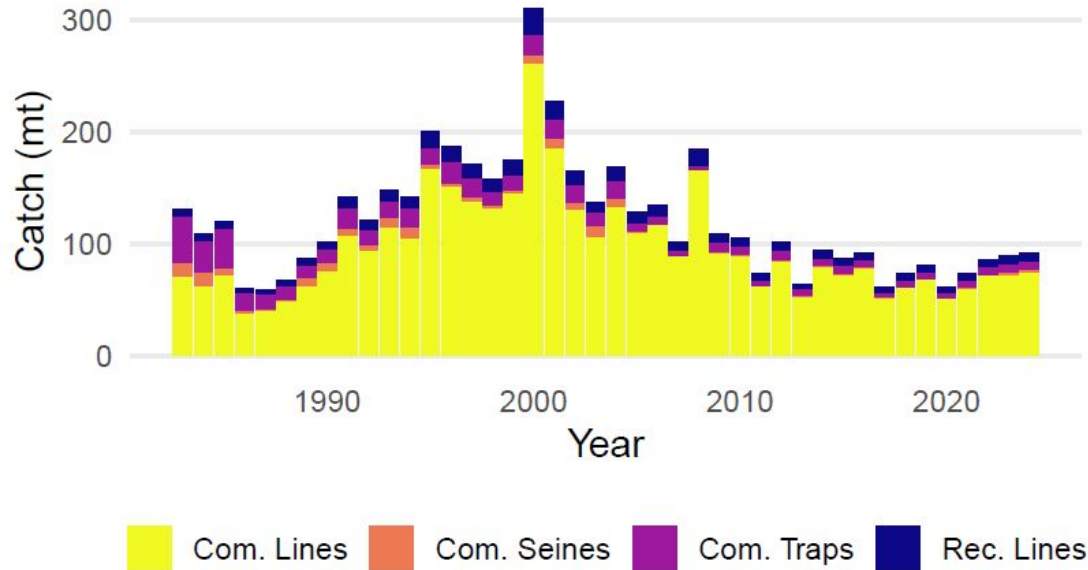


Data Source — Overexpanded (mt) — Updated (mt)



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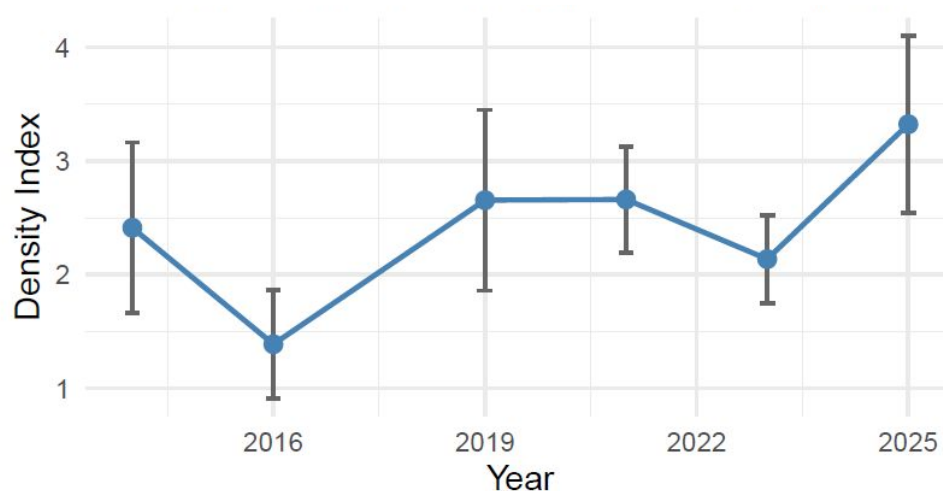
Annual Catch by Gear Component



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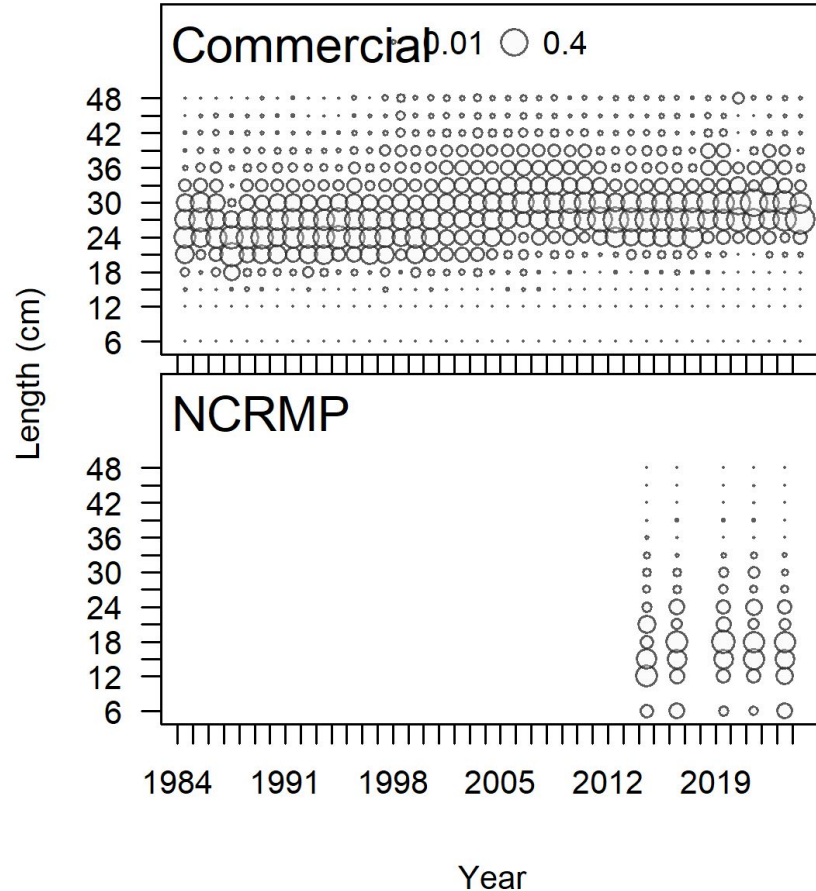
NCRMP Density Index

Points represent the mean annual density, with error bars indicating the 95% confidence interval. 2024 models do not include the NCRMP data for 2025.



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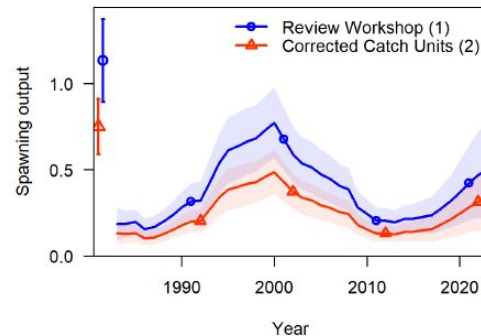
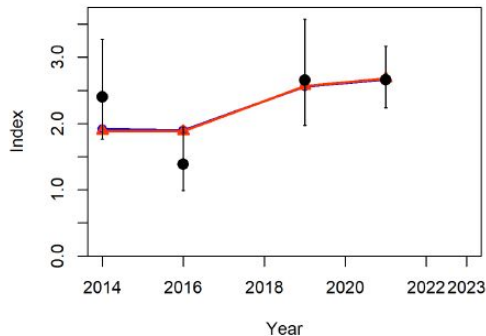
Length Data Through 2024



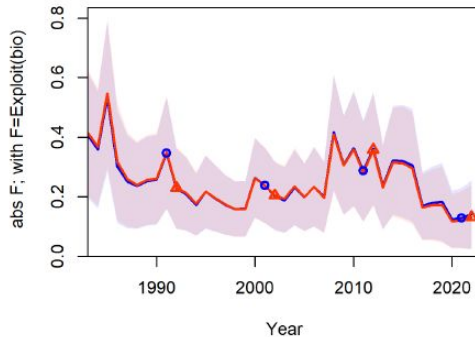
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Landings Correction

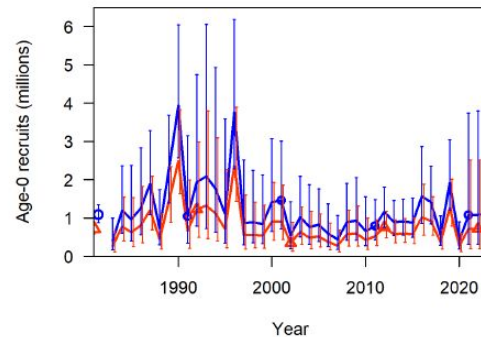
Puerto Rico Yellowtail Snapper derived quantity time series compared between the Review Workshop Model 1 (blue), as presented in the SEDAR 84 Stock Assessment Report Addendum, and of that model with corrected units for recreational catch (red).



(a) NCRMP Density



(b) Spawning Biomass

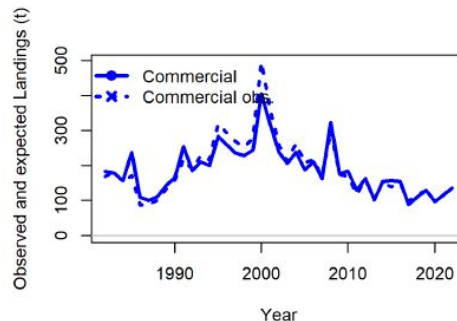


(c) Fishing Mortality

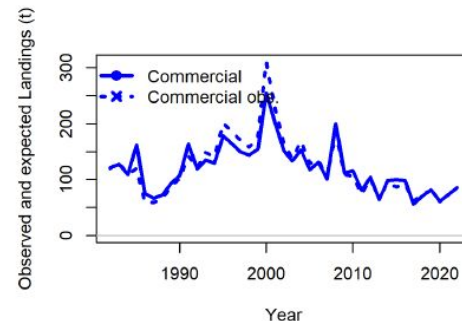
(d) Recruitment

Removal of Recruitment Deviations

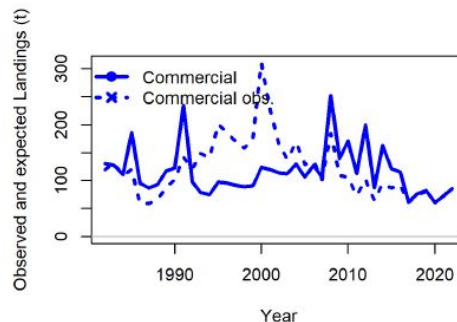
Observed (dotted) and expected landings (solid) in metric tons.



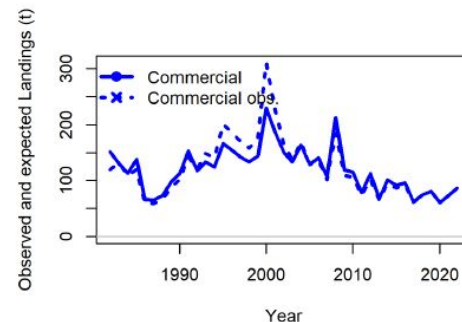
(a) Review Workshop (1)



(b) Corrected Catch Units (2)



(c) No Rec. Dev. (3)



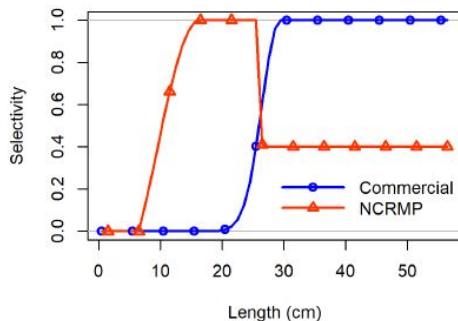
(d) Catch CV 0.1 (6)



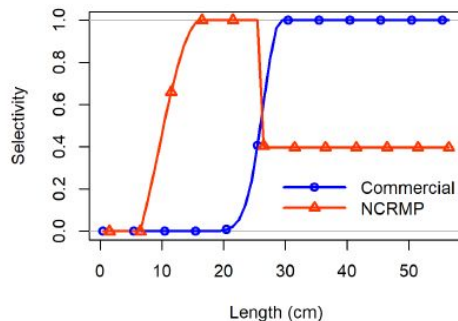
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Removal of Recruitment Deviations

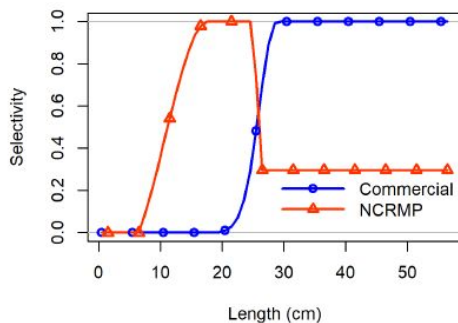
Selectivity at length for the commercial fleet (blue) and NCRMP (red)



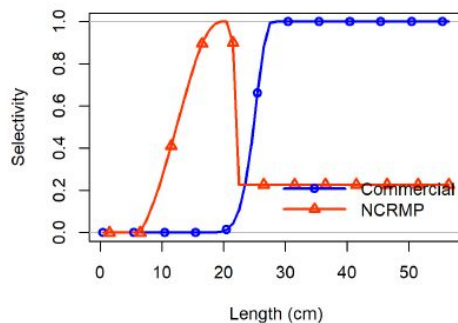
(a) Review Workshop (1)



(b) Corrected Catch Units (2)



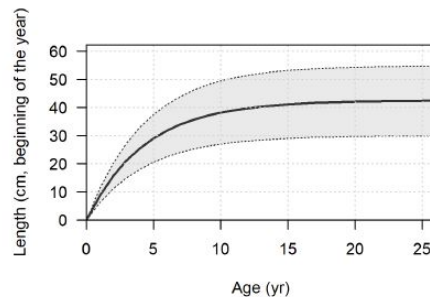
(c) No Rec. Dev. (3)



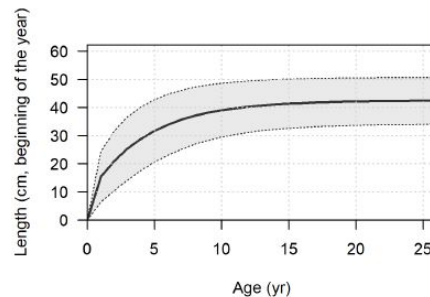
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Adjusted Biological Inputs

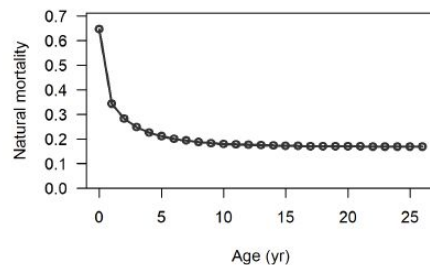
Length at age (top) and Natural mortality at age for all models after adopted changing from a single natural mortality applied equally to all ages, to a Lorenzen mortality curve that scales the overall natural mortality to be higher for younger ages.



(a) End Year 2024 (7)



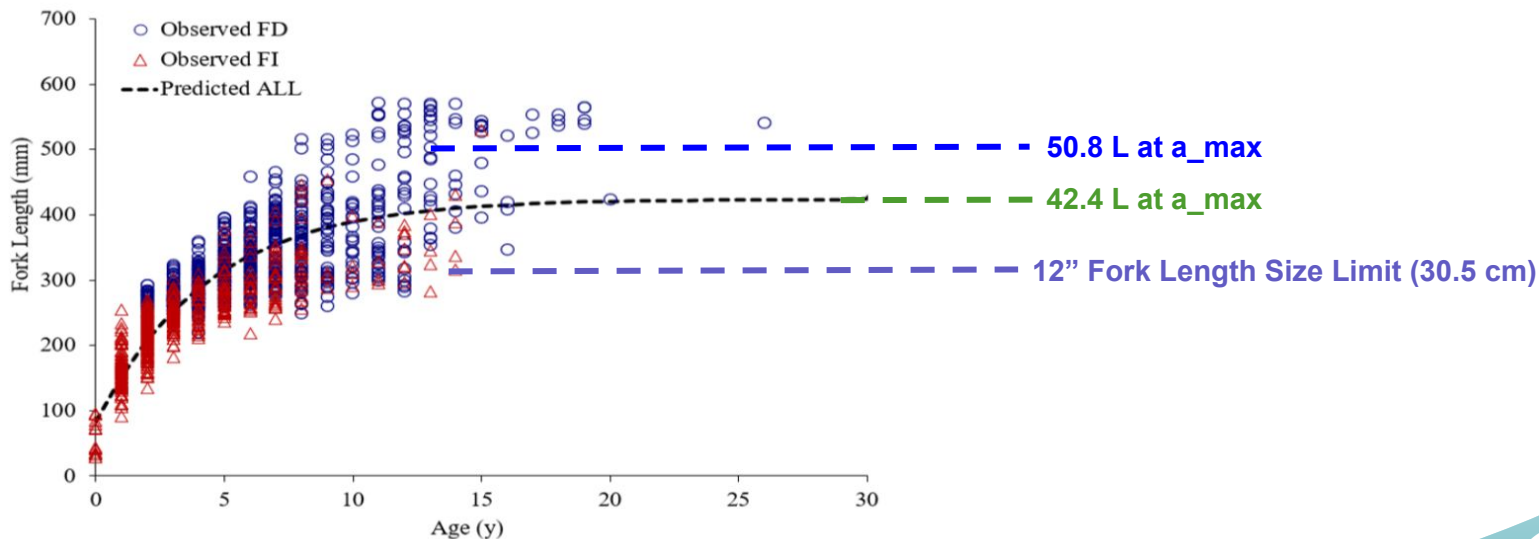
(b) Simplified (15)



(c) Simplified (15)

Model	L_{∞} (mm)	K	t_0	R^2
FL mm	508 (479-547)	0.12 (0.10-0.14)	-2.73 (-3.29- -2.26)	0.70
TL mm	653 (635-648)	0.11 (0.10-0.13)	-2.67 (-3.18- -2.18)	0.70
FL mm t_0 -fixed Carib	424 (415-434)	0.23 (0.22-0.24)	-0.96	0.68
FL mm t_0 -fixed Fla	467 (454-481)	0.16 (0.15-0.18)	-1.93	0.70

[SEDAR 96 Southeastern US Yellowtail Snapper reports a lower L-infinity of 42.3, k = 0.207 and t0 = -1.636 and a lower maximum age of 20](#)



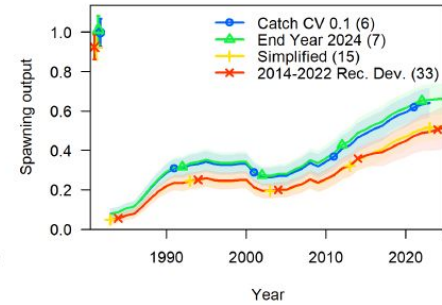
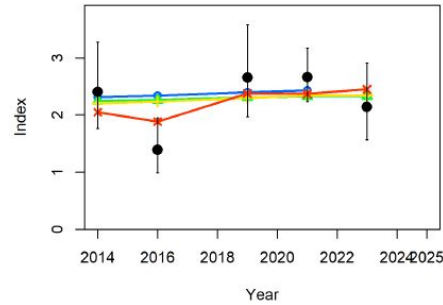
SEDAR 84 PR Yellowtail Snapper

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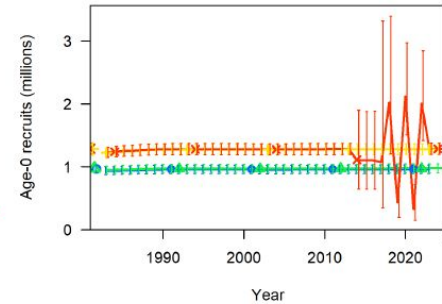
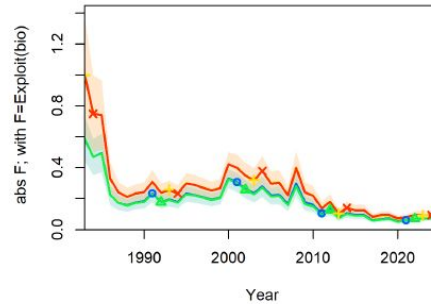
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	26_24e_hes1	Est. h, Alt. sel (26)
	27_24e_h1se	Alt. h, Est. sel (27)
	28_24e_h1s1	Alt. h, Alt. sel (28)
	29_24e_l1hes1	Alt. L, Est. h, Est. sel (29)
	30_24e_l1hese	Alt. L, Est. h, Alt. sel (30)
	31_24e_l1h1se	Alt. L, Alt. h, Est. sel (31)
	32_24e_l1h1s1	Alt. L, Alt. h, Alt. sel (32)
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	34_24f_se_re	Estimate NCRMP end Sel. (34)
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Terminal Year Update, Structural Simplification & Recruitment Estimation



(a) NCRMP Density

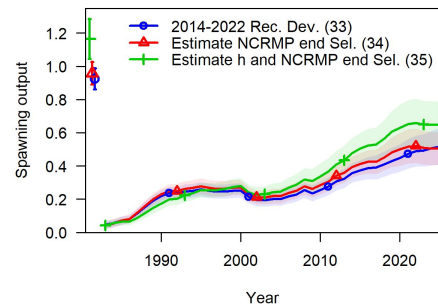
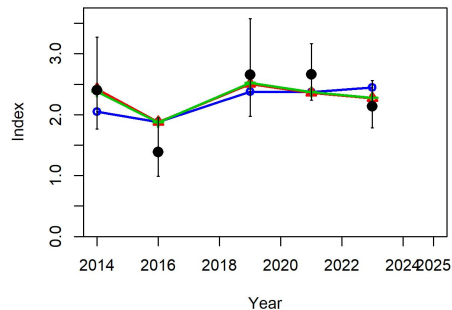
(b) Spawning Biomass



(c) Fishing Mortality

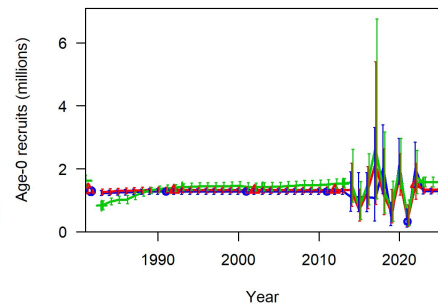
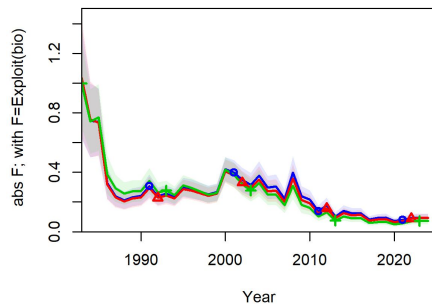
(d) Recruitment

Recruitment Estimation



(a) NCRMP Density

(b) Spawning Biomass



(c) Fishing Mortality

(d) Recruitment

Late 70s (all landings)

Table 9 CATCH AND EFFORT IN THE SHALLOW-WATER REEFISH FISHERY OF PUERTO RICO AND U.S. VIRGIN ISLANDS

Area and Year	Number of Traps	COMMERCIAL SHALLOW-WATER REEFISH LANDINGS				
		Fish Trap Landings		All Gear Landings (1000 lbs.)	Adjusted Landings by Adding Recreational Fishery a/ (1000 lbs.)	Total Effort b/
		Landings (1000 lbs.)	Catch Per Trap (Lbs.)			

Puerto Rico

1975	8191	2407	294	2828	3251	11058
1976	8967*	2881	321	3421	3932	12249
1977	9743	3074	316	3824	4395	13908
1978	12586	3036	241	4113	4728	19618
1979	15252*	3344	219	4662	5359	24470
1980	19165	2466	138	3608	4147	30051
1981	21368	N/A	-	3196	3674	-
1982	23571	N/A	-	2849	3275	-

Source: CODREMAR and U.S.V.I. Fish and Wildlife Division (Revised Figures 1983)

* Obtained by interpolation

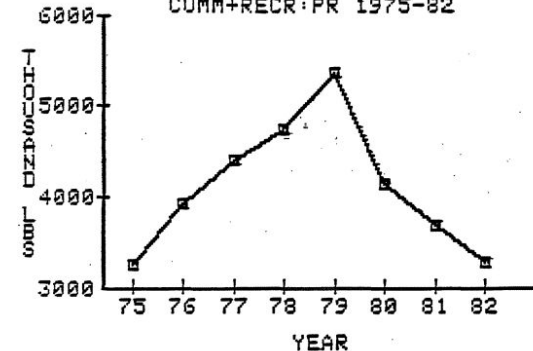
a/ Obtained by dividing all gear landings by 0.87, since recreational Shallow-Water reefish are estimated as 13% of total shallow-water reefish landings (See Table 7)

b/ For comparison purposes all effort units have been converted to traps, since more than 2/3 of all landings are caught with traps.

$$\text{TOTAL EFFORT} = \frac{\text{TOTAL CATCH}}{\text{CPUE of Traps}}$$

GRAPH 1

SHALLOW-WATER REEFISH LANDINGS
COMM+RECR:PR 1975-82



SOURCE: TABLE 9



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TABLE A-2

CFMC'S REEFISH SURVEY FINAL RESULTS*

(SIZE DISTRIBUTION OF FOUR MAIN SPECIES FROM THE 3-MONTHS SURVEY)

Size (in.)	Yellowtail Snapper	Queen Triggerfish	Red hind	Nassau Grouper
Cumulative Percentages				
Below 10 inches	11.86	15.72	29.83	8.26
Below 11 inches	22.87	31.44	52.95	14.07
Below 12 inches	42.27	49.70	74.83	30.89
Below 13 inches	55.97	68.20	85.87	45.26
Below 14 inches	71.50	82.11	92.01	63.00
Below 15 inches	82.31	90.45	95.67	71.26
Below 16 inches	89.39	95.65	98.15	80.74
Below 17 inches	95.29	99.28	99.20	83.80
Below 18 inches	97.71	99.64	99.76	87.47
Below 19 inches	98.76	99.88	99.88	90.84
Below 20 inches	99.41	100.00	99.94	92.67
Below 21 inches	99.80	100.00	100.00	95.73
Below 22 inches	99.87	100.00	100.00	97.56
Below 23 inches	99.94	100.00	100.00	98.17
Below 24 inches	100.00	100.00	100.00	98.78
Below 25 inches	100.00	100.00	100.00	99.39
Below 26 inches	100.00	100.00	100.00	100.00

*The complete report is available at Council's office.

Prior to size limit

"According to fishermen interviewed in the fact-finding meetings, yellowtail snappers are being landed at a smaller size than in previous years. The survey conducted by the Council on length-weight frequencies shows that 42 percent of yellowtail snapper landings are less than 12 inches (Table A-2, Appendix I)." [Total Length]



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SSC Review and Decisions

Decisions for OFL and ABC

Necessary assumptions for recent landings (2025 & 2026)

$P^* = 0.45$ *CFMC input for management uncertainty*

$\sigma = 0.5$ *SSC input scientific uncertainty*