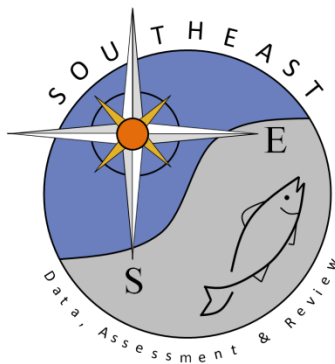


# SEDAR 84 Commercial fishery landings of Yellowtail Snapper (*Ocyurus chrysurus*) in Puerto Rico, US Caribbean, 2012-2022

Stephanie Martínez Rivera, Kimberley Johnson, and M. Refik Orhun

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# SEDAR 84 Commercial fishery landings of Yellowtail Snapper (*Ocyurus chrysurus*) in Puerto Rico, US Caribbean, 2012-2022

Stephanie Martínez Rivera<sup>1</sup> \*, Kimberley Johnson<sup>2</sup>, and M. Refik Orhun<sup>1</sup>

February 08, 2024

<sup>1</sup>*National Marine Fisheries Service, Southeast Fisheries Science Center Sustainable Fisheries Division, 75 Virginia Beach Drive, Miami, FL 33149*

<sup>2</sup>*National Marine Fisheries Service, Fisheries Statistics Division, 4700 Ave. U, Galveston, TX 77551*

\*Corresponding author: [stephanie.martinez@noaa.gov](mailto:stephanie.martinez@noaa.gov)

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## **1. Introduction**

Commercial fishery landings in Puerto Rico were obtained from self-reported fisher logbook data (Caribbean Commercial Logbook, CCL) the fishers mail or deliver monthly to the Puerto Rico Department of Natural and Environmental Resources. Commercial landings were reported by species, fishing gear, and the fishing center where the catch was landed. Puerto Rico commercial landings have been incompletely reported throughout the available time series (Caribbean Fisheries Data Evaluation Final Report, 2009) and correction factors have been used to estimate total landings. Commercial fishery landings data for Yellowtail Snapper in Puerto Rico were available for the years 1983-2022.

## **2. Methods**

Commercial landings of Yellowtail Snapper were compiled from 1983 to 2022. The commercial landings were produced in pounds and number of trips by year, coast, and fishing gear.

### *2.1 Correction factors*

Compilation of commercial fishery landings of 1983-2002 (see Appendix 1) used a single, island-wide, correction factor. For the years 2003 to 2022, correction factors were coast-specific (north, south, east, west). Reported landings were assigned to a coast based upon the fishing center reported for a trip.

Based on recommendations in the SEDAR 57 stock assessment for Spiny Lobster, the correction factor for 2005 landings was replaced with the means of 2004 and 2006 correction factors (SEDAR 57, 2019).

Data needed to calculate corrections factors in 2017 were not collected due to the hurricanes that affected Puerto Rico that year. The correction factors for 2017 landings, therefore, were replaced by the correction factors for 2016.

Since 2020, some fishers have reported landings using an electronic reporting system. The database of electronically reported data has not been fully integrated with the CCL database. Calculation of correction factors cannot be completed until all data is integrated into the CCL database. Based on the recommendation from the SSC for SEDAR 80 for Queen Triggerfish, the mean coast specific correction factors for the period 2014-2019 were used to estimate landings during the years 2020-2022.

### *2.2 Gear groups*

In order to classify the landings into gear groups by the individual gears (or GEAR NAMES) with similar size selectivity, length composition data of Yellowtail Snapper from the Fishery Dependent (FD) Trip Interview Program (TIP) database were analyzed using generalized linear models (GLMs). The statistical analysis conducted by Godwin et al. (2024) showed which gears had significantly different length distributions.

Based on the result of the GLMs and reported commercial landings, commercial landings of Yellowtail Snapper were classified into 4 gear groups (Table 1).

Table 1: The classification of the commercial logbook gears into gear groups.

<b>ERDMAN GEAR NAME</b>	<b>GEAR GROUP</b>
BOTTOM LINE	LINES
LONG LINE	LINES
HAND LINE	LINES
ROD AND REEL	LINES
TROLL LINE	LINES
BOTTOM LONG LINE	LINES
HAND TROLL LINE	LINES
SCUBA DIVING	OTHER
GILL NET	OTHER
CAST NET	OTHER
SPEAR FISHING	OTHER
SILK HAUL	OTHER
TRAMMEL NET	OTHER
OTHER GEAR	OTHER
SKIN DIVING	OTHER
SNARE	OTHER
BY HAND	OTHER
FREE DIVING	OTHER
GILLNET	OTHER
BEACH SEINE	SEINES
FISH POT	TRAPS
LOBSTER POT	TRAPS
FISH TRAP	TRAPS
LOBSTER TRAP	TRAPS

### 2.3 Outliers

Outlier removal was conducted by using a mean and standard deviation method. In Puerto Rico, fishers combined landings from multiple trips in single logbook reports in several years, therefore, we used reported landings (not expanded landings) divided by the number of trips for the outlier analysis. If the landings of Yellowtail Snapper reported on a trip were greater than three standard deviations from the mean (i.e., 99.73% quantile) they were removed from the dataset. In Results 3.2, we calculate the values to define outliers by gear group (Table 2). And in Results 3.3, we calculated the values to define outliers by year and gear group. Due to the outlier removal, the yearly commercial landings for Yellowtail Snapper compiled may not match with previous SEDARs.

Table 2: Commercial landings of Yellowtail Snapper in pounds equal to three standard deviations from the mean (i.e., 99.73% quantile) by gear group used for the outlier analysis. Trips with pounds landed greater than the indicated value were removed from the dataset.

<b>GEAR GROUP</b>	<b>gear quant99</b>
LINES	322.0
OTHER	300.0
SEINES	500.0
TRAPS	159.2

## 2.4 Confidentiality

Confidential data were determined based on the number of fishers that reported commercial landings by year and gear group. If the number of fishers is less than 3 then it is considered confidential. The analysis found no confidential data for Yellowtail Snapper commercial landings in Puerto Rico.

## 3. Results

### 3.1 Commercial landings no outlier analysis

Landings of Yellowtail Snapper from 1983 to 2022, are provided in pounds in Table 3 and Figure 1. Trips with reported Yellowtail Snapper landings per year varied between approximately 2,496 and 19,586 in Table 3 and Figure 2. The commercial landings by year and gear group are shown in Table 4 and Figure 3, and the number of trips in Figure 4. The commercial landings by year and coast are shown in Figure 5 and the number of trips in Figure 6.

Table 3: Commercial landings of Yellowtail Snapper in pounds and the number of trips that reported Yellowtail Snapper landings in Puerto Rico.

<b>Year</b>	<b>Landings (lbs)</b>	<b>Trips (n)</b>
1983	274,642	8,912
1984	227,434	9,225
1985	250,542	11,180
1986	124,992	4,948
1987	123,024	3,398
1988	137,865	2,836
1989	178,542	4,196
1990	209,973	5,394
1991	291,274	8,503
1992	248,505	6,686
1993	304,948	8,503
1994	290,964	8,945
1995	409,451	18,147
1996	382,775	19,586
1997	349,802	18,726
1998	322,521	13,431
1999	356,542	18,047
2000	632,458	17,528

2001	465,127	16,762
2002	338,019	16,697
2003	282,201	6,302
2004	344,518	4,929
2005	262,076	4,094
2006	274,593	3,524
2007	206,437	2,923
2008	373,610	2,663
2009	222,592	2,663
2010	214,799	2,497
2011	149,589	2,822
2012	208,152	3,191
2013	131,267	3,573
2014	192,808	4,254
2015	177,591	4,123
2016	188,121	3,767
2017	125,338	2,496
2018	149,199	2,615
2019	164,293	3,487
2020	124,185	2,473
2021	148,981	3,218
2022	174,936	3,730
Total	10,034,686	290,994

Table 4: Commercial landings of Yellowtail Snapper in pounds by gear group in Puerto Rico.

TRIP YEAR	LINES	OTHER	SEINES	TRAPS
1983	149,406	12,731	25,970	86,535
1984	131,087	11,551	26,058	58,738
1985	144,349	23,561	12,145	70,487
1986	62,075	31,456	5,455	26,006
1987	73,055	23,371	1,856	24,742
1988	90,913	22,997	2,553	21,402
1989	123,814	18,500	13,088	23,140
1990	158,339	12,152	15,525	23,957
1991	224,461	16,816	11,469	38,528
1992	188,932	21,243	10,375	27,955
1993	236,203	20,143	18,335	30,267
1994	216,496	20,705	19,672	34,091
1995	351,076	18,991	8,930	30,454
1996	298,343	40,440	5,103	38,889
1997	277,622	32,134	5,512	34,534
1998	273,493	19,860	3,554	25,614
1999	300,224	21,774	5,277	29,267

2000	539,669	39,279	15,409	38,101
2001	380,300	33,715	17,982	33,130
2002	268,390	24,396	11,666	33,567
2003	222,036	14,943	19,559	25,663
2004	274,280	23,940	13,494	32,804
2005	232,924	9,601	3,771	15,780
2006	248,891	9,500	196	16,006
2007	189,707	7,887	132	8,711
2008	354,259	12,030	183	7,138
2009	196,272	6,470	1,935	17,915
2010	194,288	4,057	2,491	13,963
2011	127,667	10,105	1,383	10,434
2012	173,240	14,356	2,006	18,550
2013	111,739	5,086	2,079	12,363
2014	169,273	5,941	2,689	14,905
2015	156,712	4,011	2,216	14,652
2016	168,254	5,119	1,863	12,885
2017	109,539	5,002	2,029	8,768
2018	127,408	8,417	895	12,479
2019	142,782	9,262	336	11,913
2020	97,231	17,347	462	9,145
2021	113,007	23,143	132	12,699
2022	136,046	24,596	1,162	13,132
Total	8,033,802	686,628	294,947	1,019,309

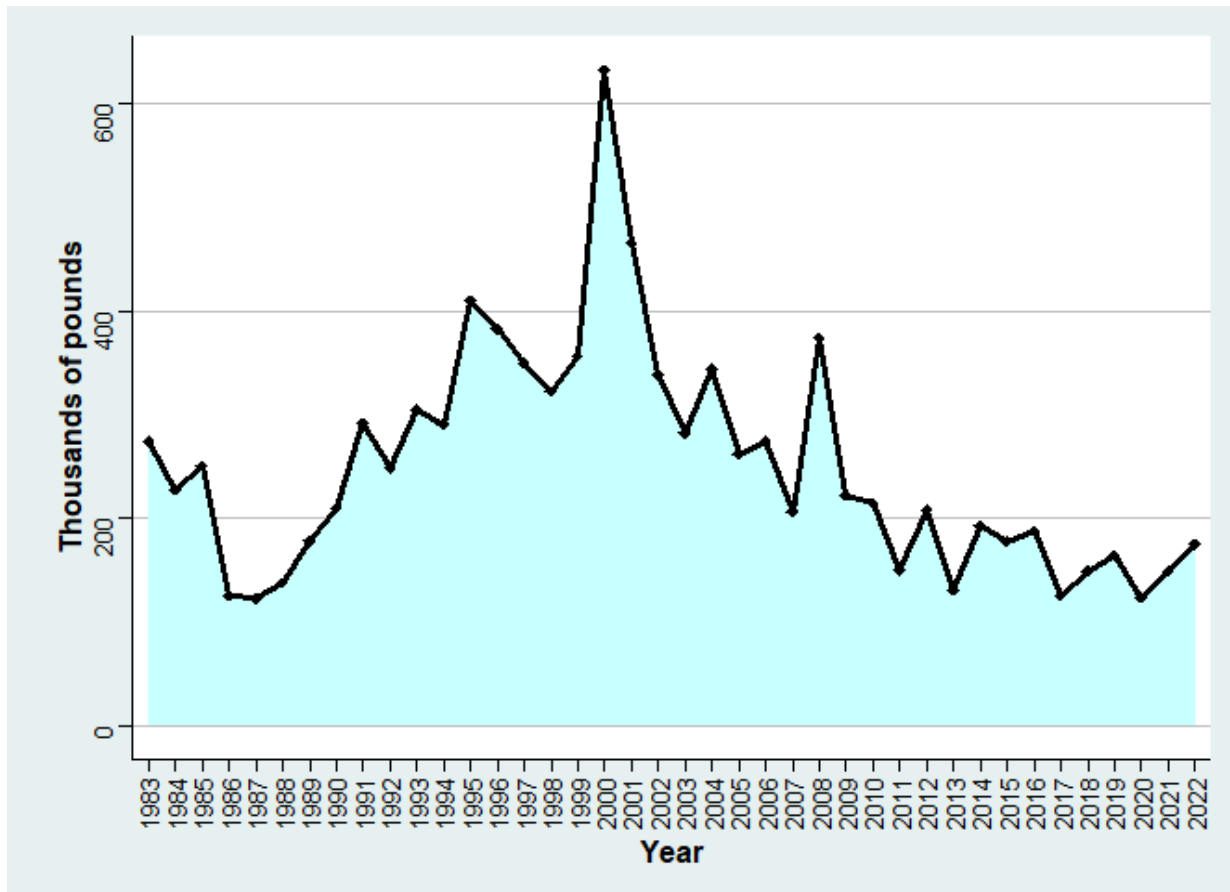


Figure 1: The time series of commercial landings in pounds of Yellowtail Snapper in Puerto Rico.

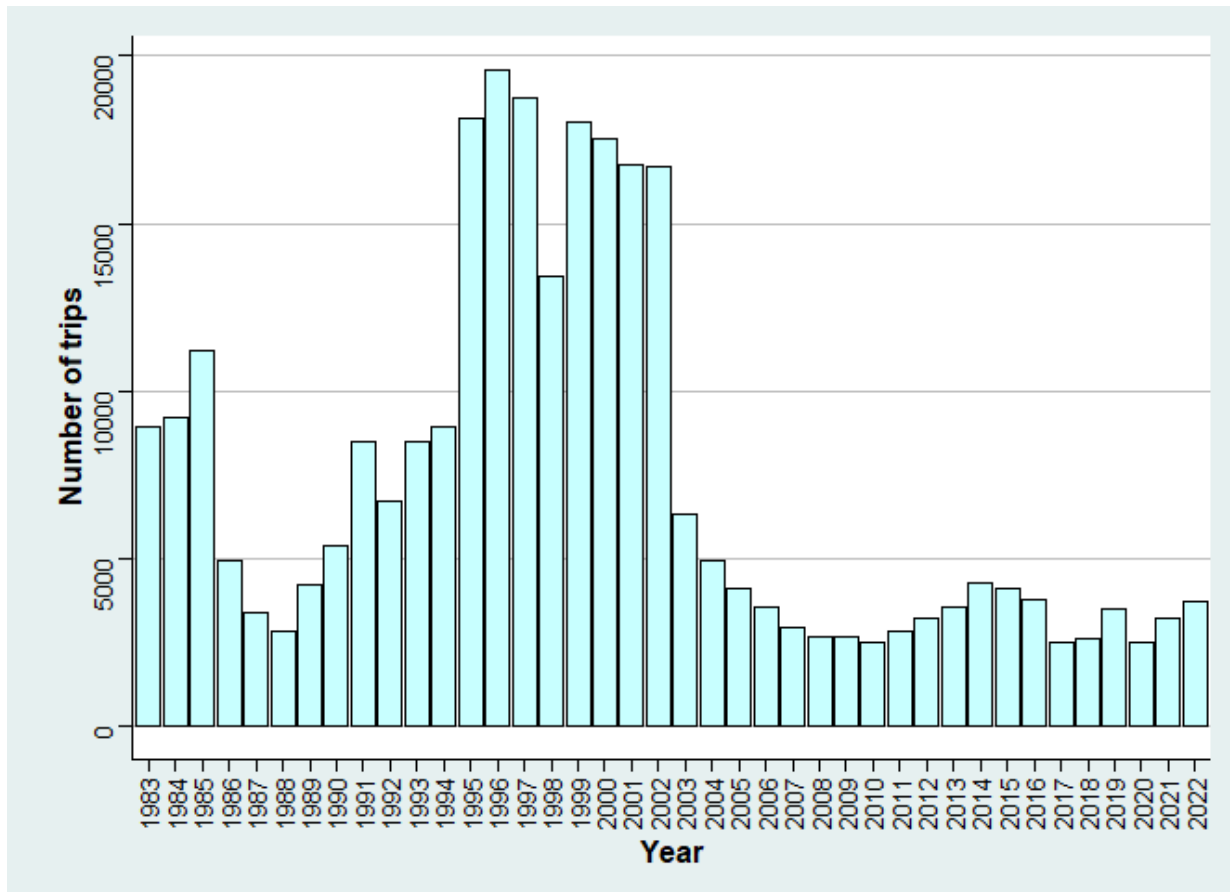


Figure 2: The time series of number of trips with reported landings of Yellowtail Snapper in Puerto Rico.

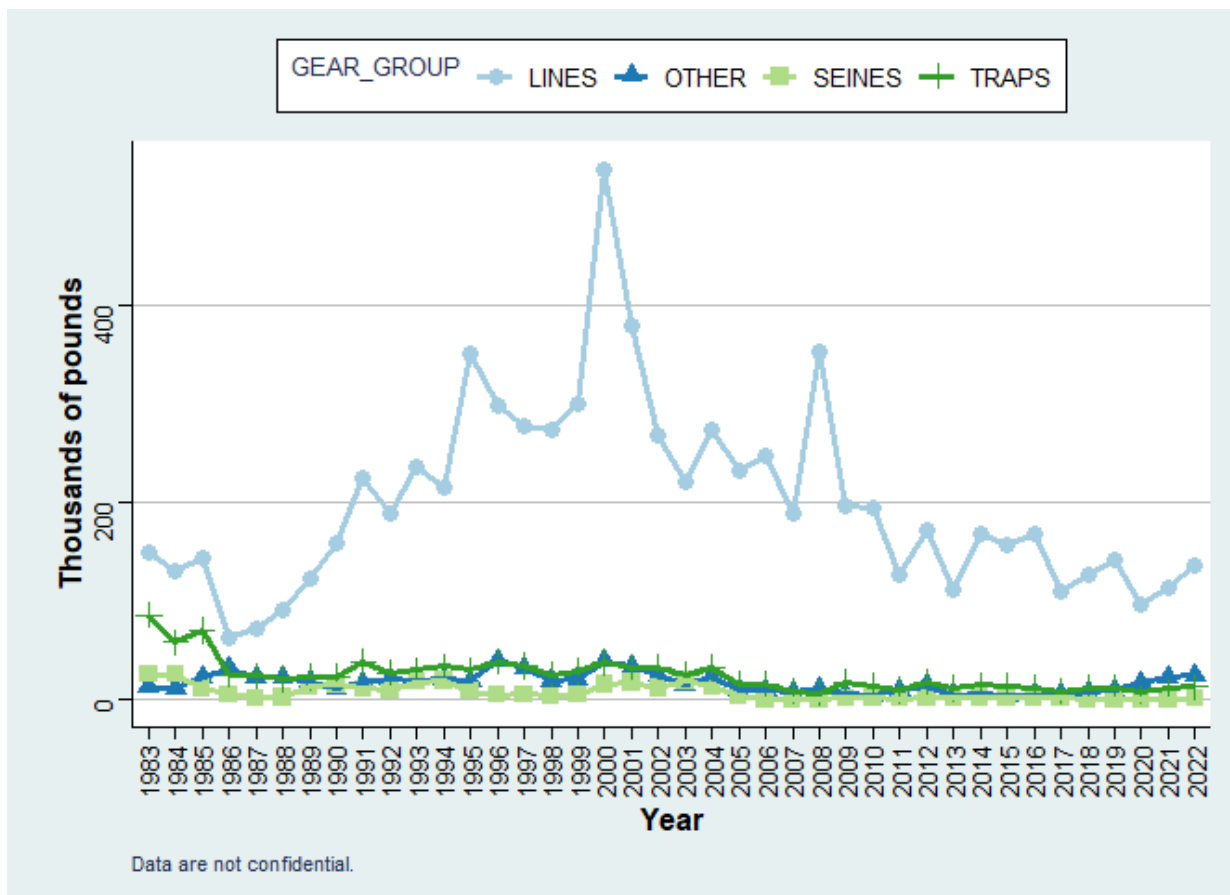


Figure 3: Commercial landings in pounds of Yellowtail Snapper by year and gear group in Puerto Rico.

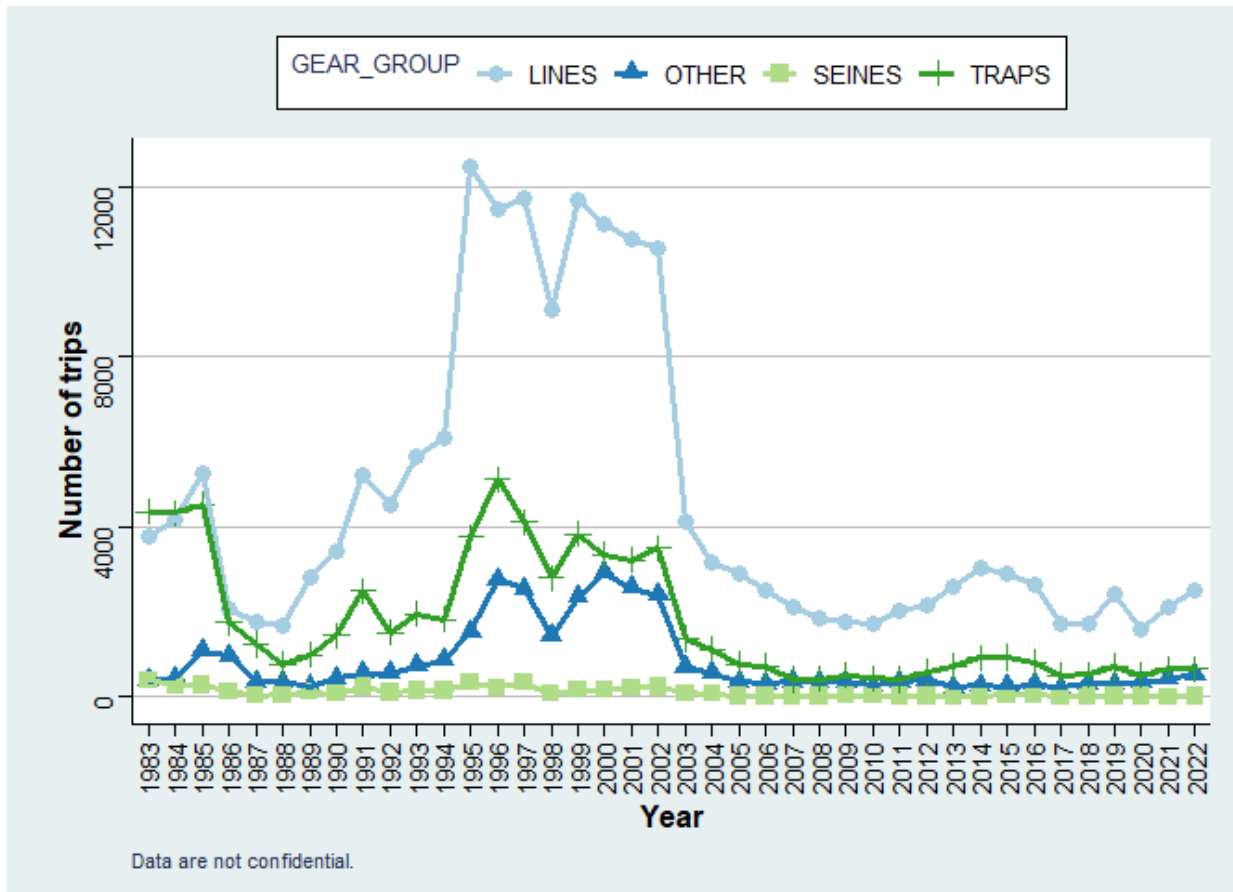


Figure 4: Number of trips with reported landings of Yellowtail Snapper by year and gear group in Puerto Rico.

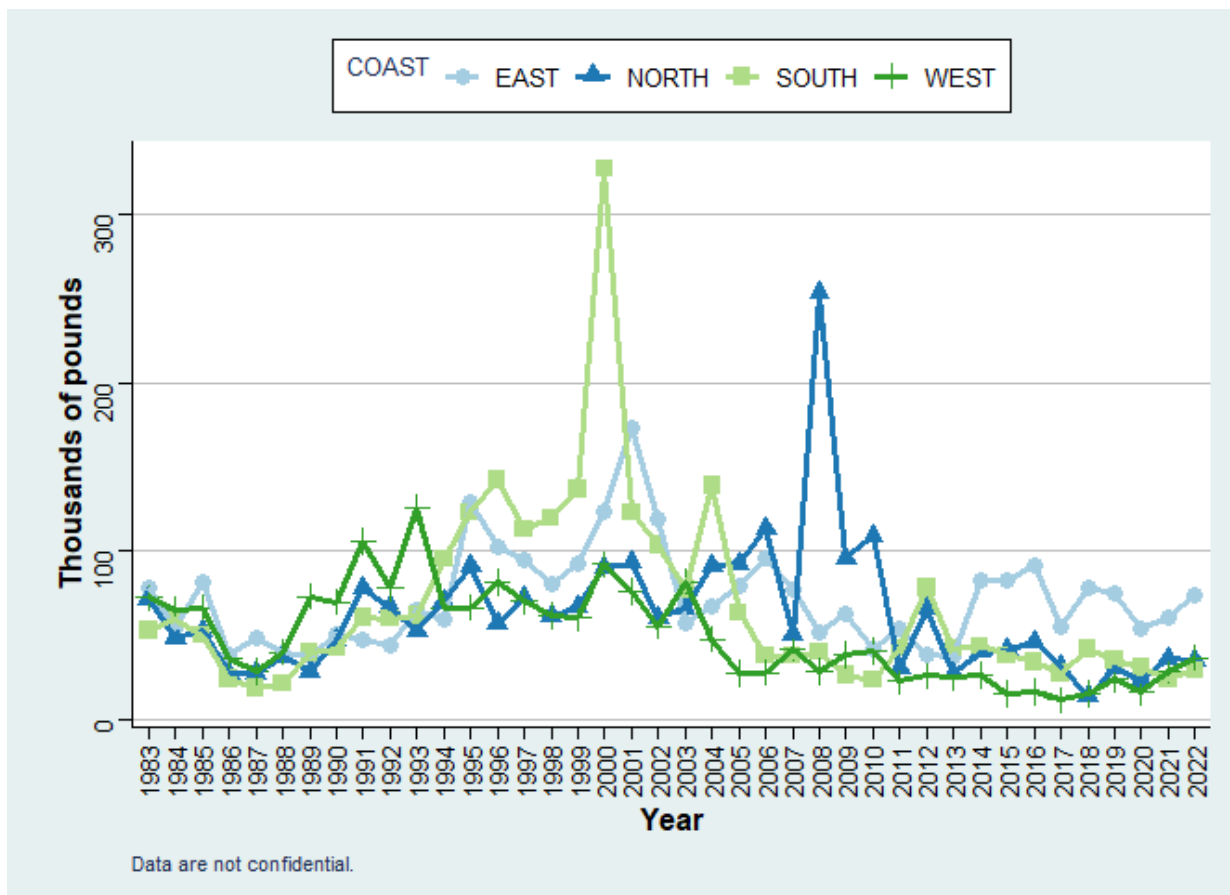


Figure 5: Commercial landings in pounds of Yellowtail Snapper by year and coast in Puerto Rico.

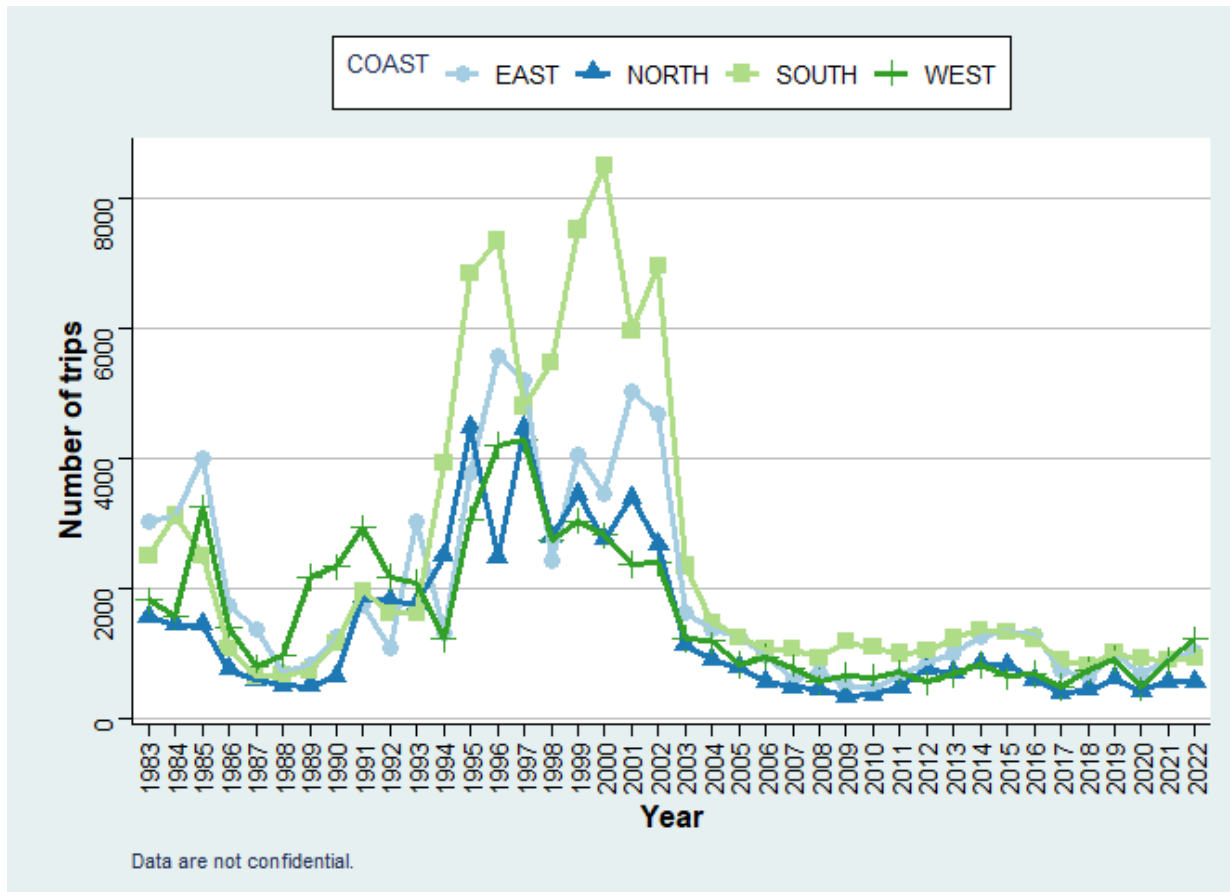


Figure 6: Number of trips with reported landings of Yellowtail Snapper by year and coast in Puerto Rico .

### 3.2 Commercial landings after outlier removal by gear group

Landings of Yellowtail Snapper from 1983 to 2022 are provided in pounds in Table 5 and Figure 7. Trips per year varied between approximately 2,473 and 19,567 in Table 5 and Figure 8. The commercial landings by year and gear group are shown in Table 6 and Figure 9, and the number of trips in Figure 10. The commercial landings by year and coast are shown in Figure 11 and the number of trips in Figure 12.

Table 5: Commercial landings of Yellowtail Snapper in pounds and the number of trips that reported Yellowtail Snapper landings in Puerto Rico.

Year	Landings (lbs)	Trips (n)
1983	272,354	8,907
1984	225,728	9,222
1985	249,476	11,178
1986	115,866	4,933
1987	110,585	3,382
1988	131,922	2,828

1989	170,217	4,184
1990	205,342	5,389
1991	285,211	8,496
1992	233,250	6,668
1993	283,662	8,479
1994	275,370	8,923
1995	389,674	18,122
1996	372,211	19,567
1997	328,188	18,688
1998	299,913	13,394
1999	336,897	18,018
2000	596,566	17,491
2001	433,541	16,718
2002	325,605	16,674
2003	275,807	6,294
2004	330,700	4,927
2005	253,478	4,088
2006	271,765	3,522
2007	203,520	2,920
2008	373,060	2,662
2009	221,852	2,661
2010	213,999	2,496
2011	149,258	2,821
2012	207,631	3,190
2013	131,267	3,573
2014	192,808	4,254
2015	177,591	4,123
2016	186,624	3,765
2017	124,004	2,495
2018	147,998	2,613
2019	161,539	3,483
2020	124,185	2,473
2021	147,010	3,216
2022	174,936	3,730
Total	9,710,610	290,567

Table 6: Commercial landings of Yellowtail Snapper in pounds by gear group that reported Yellowtail Snapper landings in Puerto Rico.

TRIP YEAR	LINES	OTHER	SEINES	TRAPS
1983	148,586	12,731	25,970	85,067
1984	130,514	11,551	26,058	57,605
1985	144,349	22,936	12,145	70,046
1986	61,094	24,491	5,455	24,826

1987	70,051	14,646	1,856	24,032
1988	87,380	20,926	2,553	21,063
1989	120,305	16,736	12,102	21,074
1990	155,183	10,677	15,525	23,957
1991	219,565	15,649	11,469	38,528
1992	176,697	20,576	10,375	25,602
1993	224,530	19,226	18,335	21,571
1994	204,713	19,351	19,672	31,634
1995	336,238	18,428	6,599	28,409
1996	290,747	40,440	5,103	35,921
1997	258,958	32,134	5,512	31,584
1998	254,172	17,908	3,554	24,279
1999	282,201	21,261	4,380	29,055
2000	506,545	39,279	14,507	36,235
2001	351,304	32,612	17,982	31,643
2002	259,430	24,396	11,666	30,113
2003	216,112	14,473	19,559	25,663
2004	260,462	23,940	13,494	32,804
2005	224,890	9,601	3,771	15,216
2006	246,669	9,500	196	15,400
2007	186,790	7,887	132	8,711
2008	353,709	12,030	183	7,138
2009	195,532	6,470	1,935	17,915
2010	193,488	4,057	2,491	13,963
2011	127,667	10,105	1,383	10,103
2012	173,240	14,356	2,006	18,029
2013	111,739	5,086	2,079	12,363
2014	169,273	5,941	2,689	14,905
2015	156,712	4,011	2,216	14,652
2016	166,757	5,119	1,863	12,885
2017	108,205	5,002	2,029	8,768
2018	126,373	8,417	895	12,313
2019	140,797	9,262	336	11,144
2020	97,231	17,347	462	9,145
2021	111,036	23,143	132	12,699
2022	136,046	24,596	1,162	13,132
Total	7,785,290	656,297	289,831	979,192

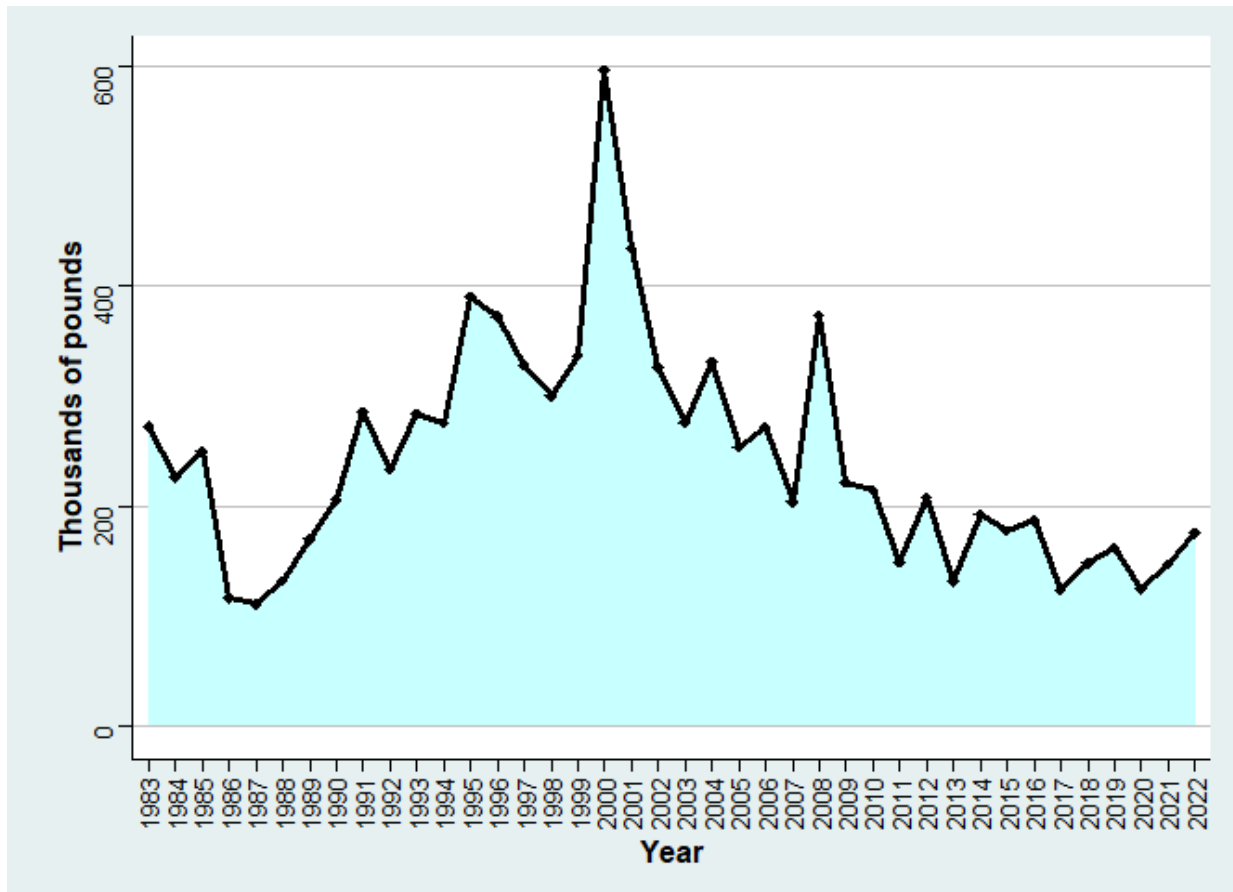


Figure 7: The time series of commercial landings in pounds of Yellowtail Snapper in Puerto Rico.

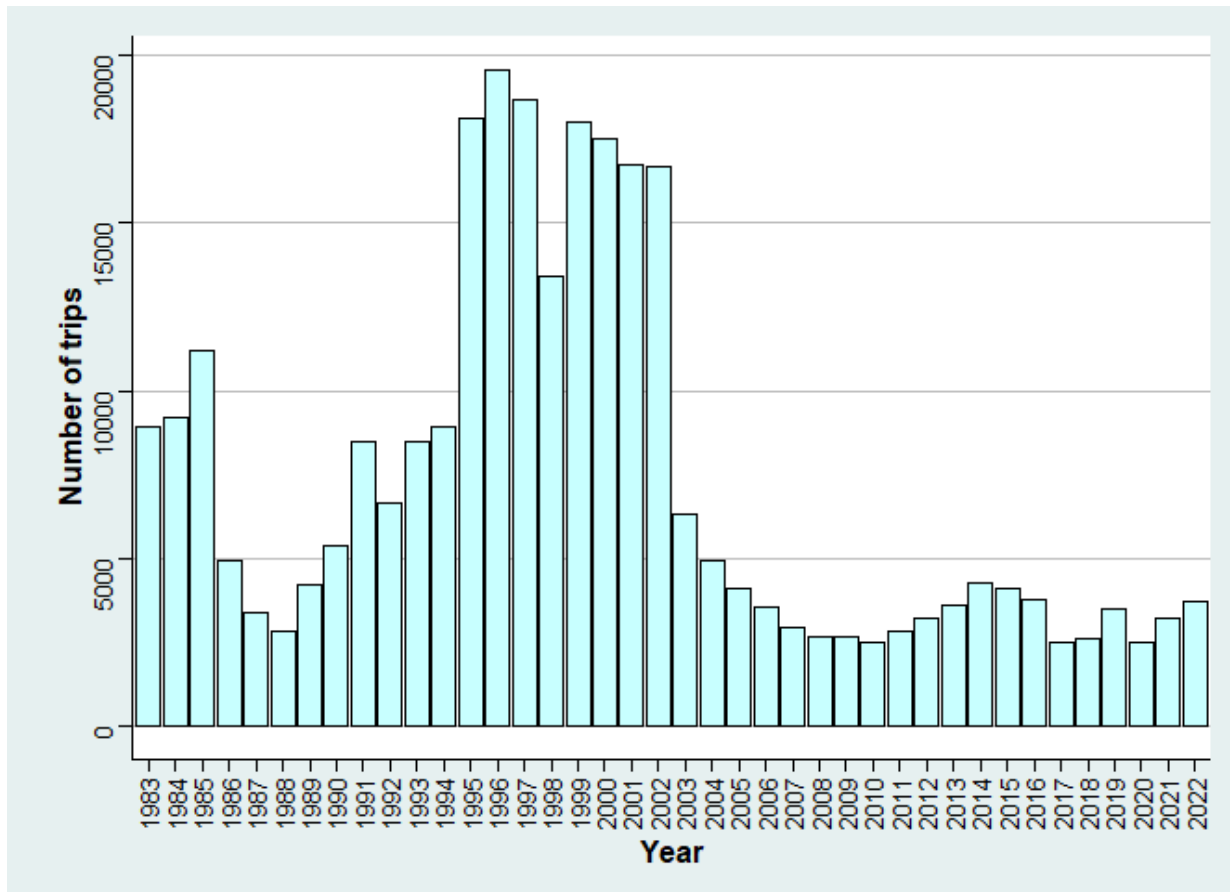


Figure 8: The time series of number of trips with reported landings of Yellowtail Snapper in Puerto Rico.

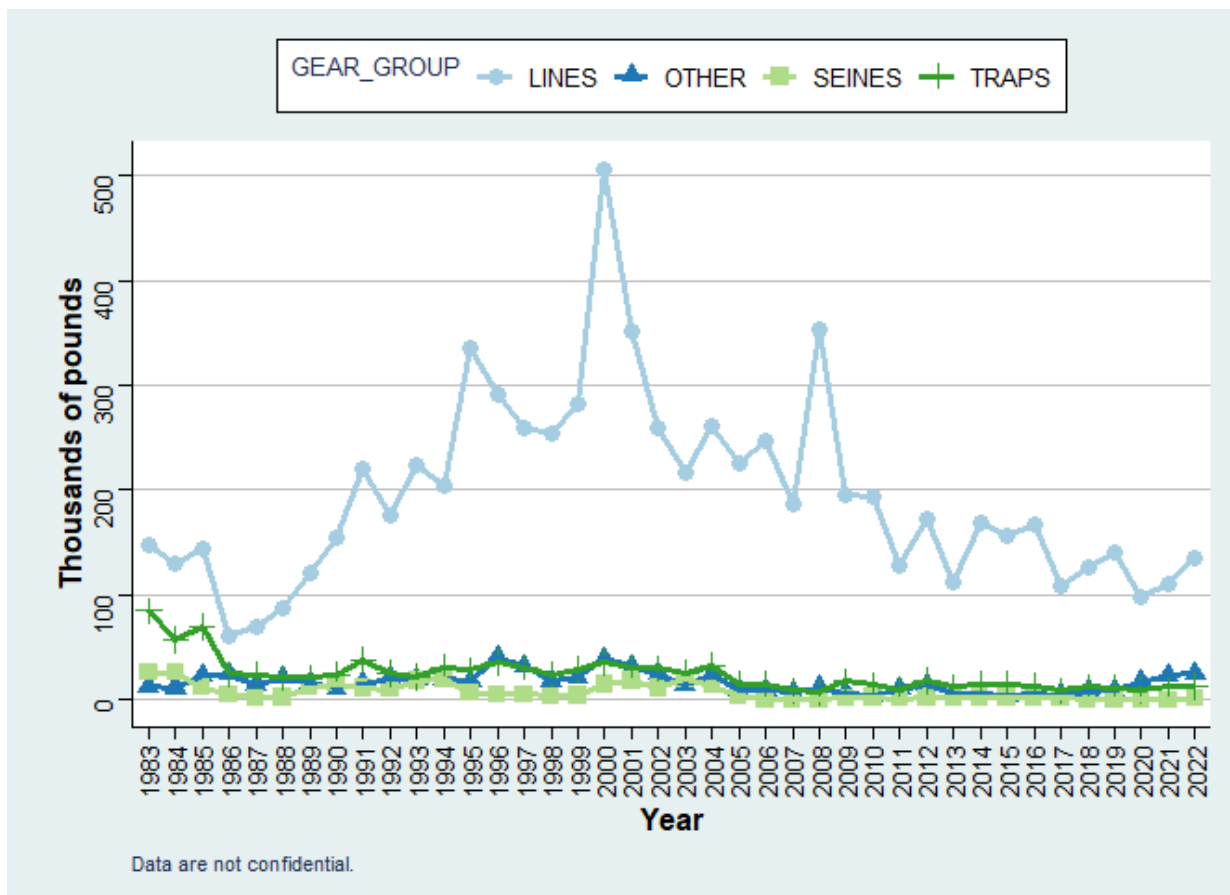


Figure 9: Commercial landings in pounds of Yellowtail Snapper by year and gear group in Puerto Rico.

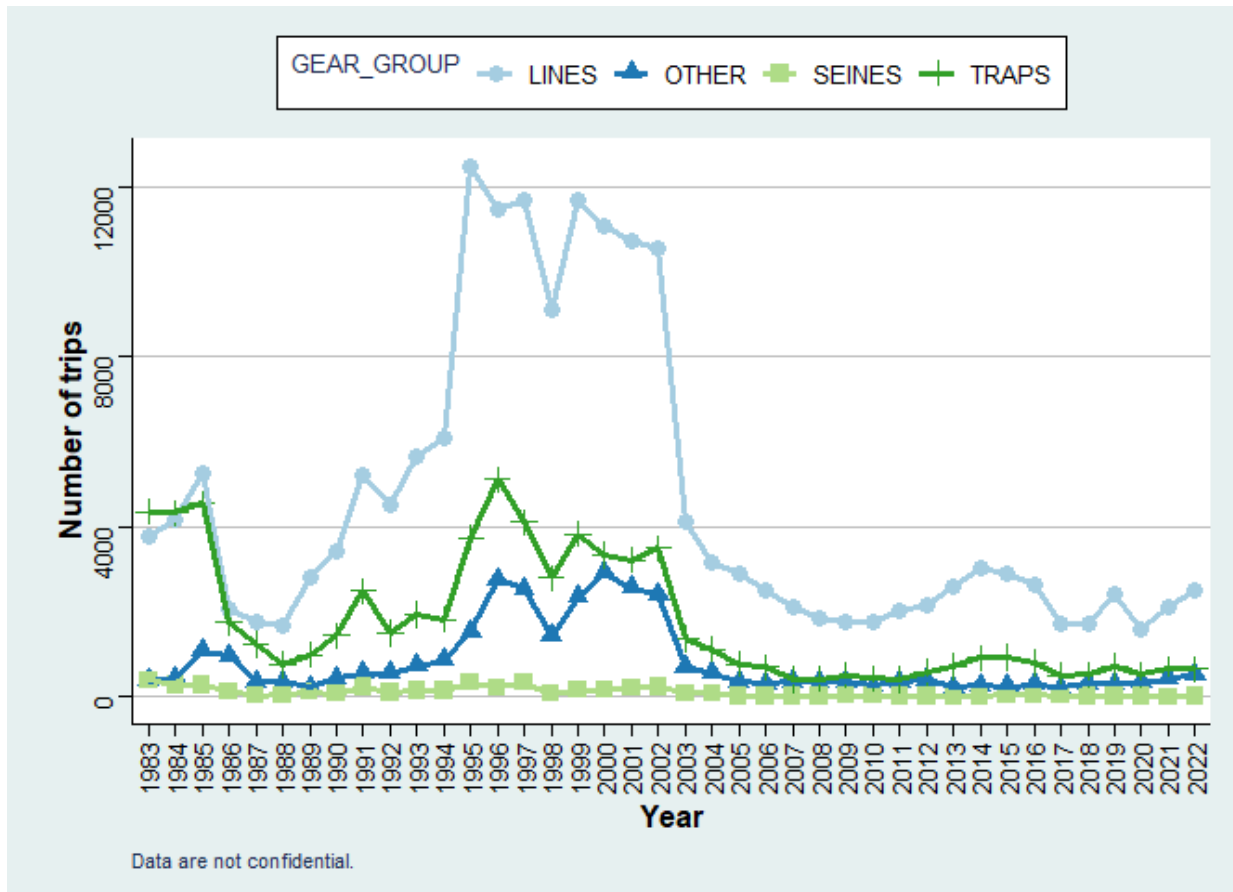


Figure 10: Number of trips with reported landings of Yellowtail Snapper by year and gear group in Puerto Rico.

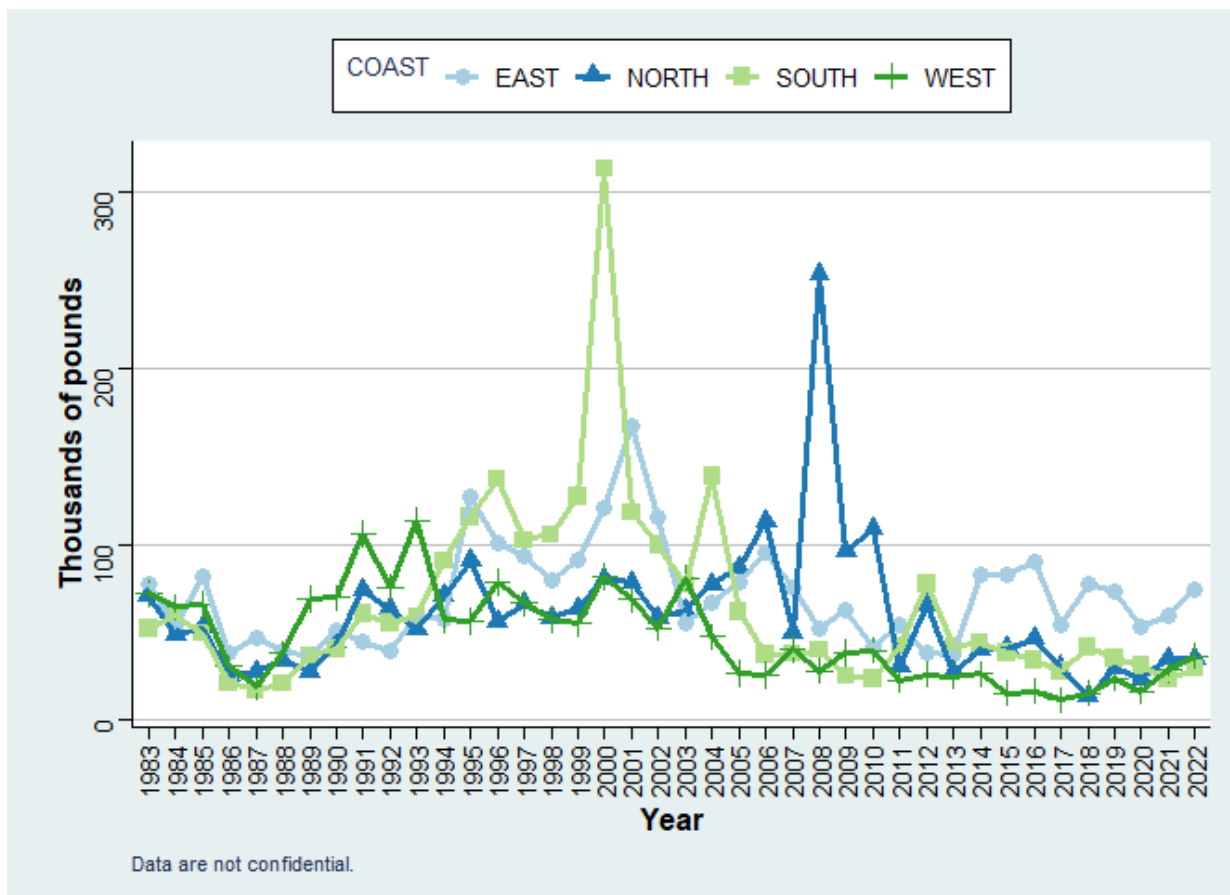


Figure 11: Commercial landings in pounds of Yellowtail Snapper by year and coast in Puerto Rico.

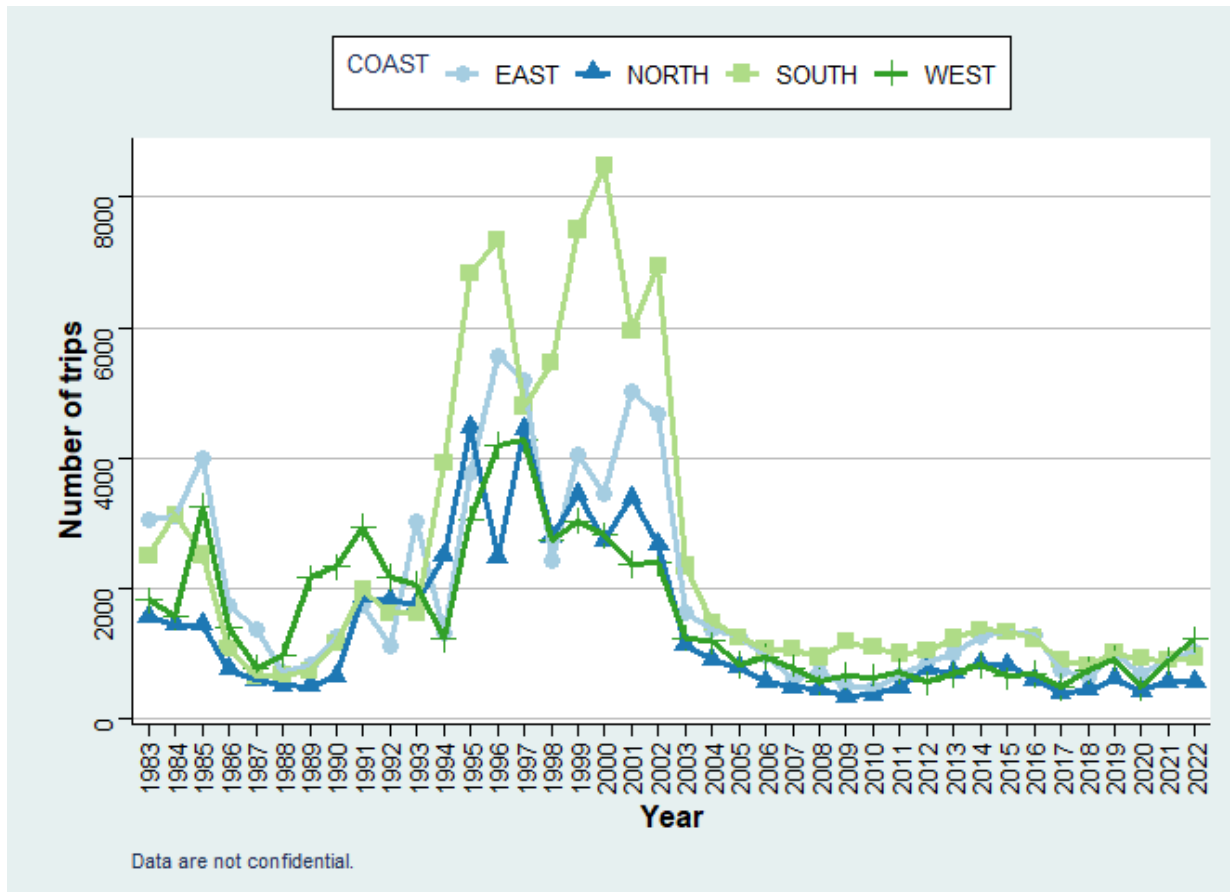


Figure 12: Number of trips with reported landings of Yellowtail Snapper by year and coast in Puerto Rico.

### 3.3 Commercial landings after outlier removal by year and gear group

Landings of Yellowtail Snapper from 1983 to 2022 are provided in pounds in Table 7 and Figure 13. Trips per year varied between approximately 2,465 and 19,566 in Table 7 and Figure 14. The commercial landings by year and gear group are shown in Table 8 and Figure 15, and the number of trips in Figure 16. The commercial landings by year and coast are shown in Figure 17 and the number of trips in Figure 18.

Table 7: Commercial landings of Yellowtail Snapper in pounds and the number of trips that reported Yellowtail Snapper landings in Puerto Rico.

Year	Landings (lbs)	Trips (n)
1983	268,303	8,896
1984	223,160	9,214
1985	241,602	11,151
1986	119,388	4,939
1987	116,893	3,389
1988	133,256	2,829

1989	171,512	4,187
1990	202,956	5,384
1991	282,720	8,490
1992	235,594	6,674
1993	290,127	8,490
1994	280,661	8,933
1995	391,947	18,127
1996	371,393	19,566
1997	335,542	18,705
1998	308,796	13,413
1999	343,957	18,029
2000	607,693	17,506
2001	446,612	16,740
2002	325,872	16,676
2003	272,098	6,284
2004	324,337	4,913
2005	251,652	4,082
2006	269,411	3,513
2007	201,544	2,913
2008	365,904	2,655
2009	219,382	2,654
2010	209,141	2,488
2011	145,412	2,812
2012	202,538	3,180
2013	128,245	3,562
2014	188,385	4,241
2015	173,347	4,110
2016	183,166	3,755
2017	121,405	2,488
2018	144,098	2,606
2019	159,455	3,477
2020	121,694	2,465
2021	144,751	3,208
2022	170,123	3,718
Total	9,694,072	290,462

Table 8: Commercial landings of Yellowtail Snapper in pounds by gear group that reported Yellowtail Snapper landings in Puerto Rico.

TRIP YEAR	LINES	OTHER	SEINES	TRAPS
1983	146,273	11,665	25,519	84,846
1984	129,677	10,746	25,600	57,137
1985	140,280	22,936	11,627	66,759
1986	60,667	28,366	5,284	25,071

1987	69,654	21,924	1,283	24,032
1988	87,380	22,997	2,073	20,806
1989	119,678	17,520	12,102	22,212
1990	154,022	10,677	14,741	23,516
1991	218,345	15,649	10,985	37,741
1992	178,385	20,576	9,645	26,988
1993	225,619	18,884	17,502	28,122
1994	209,472	19,896	18,939	32,354
1995	336,723	18,220	7,522	29,482
1996	290,302	39,313	4,810	36,968
1997	266,544	31,137	5,059	32,802
1998	262,568	18,731	3,218	24,279
1999	289,944	21,038	4,380	28,595
2000	518,132	38,514	14,507	36,540
2001	365,811	31,875	17,283	31,643
2002	259,806	23,908	11,259	30,899
2003	214,310	14,332	18,396	25,060
2004	256,573	22,606	13,038	32,120
2005	223,541	9,407	3,771	14,933
2006	244,803	9,197	102	15,309
2007	185,537	7,653	110	8,244
2008	347,326	11,590	183	6,805
2009	194,117	6,284	1,660	17,321
2010	189,409	3,963	2,344	13,425
2011	124,489	9,737	1,229	9,957
2012	169,579	13,255	1,797	17,907
2013	109,593	4,778	1,665	12,209
2014	165,761	5,638	2,331	14,655
2015	153,067	3,925	1,952	14,403
2016	163,840	5,001	1,614	12,711
2017	106,414	4,730	1,625	8,636
2018	123,619	7,875	447	12,157
2019	138,987	9,033	291	11,144
2020	95,238	17,347	273	8,836
2021	109,528	22,755	46	12,422
2022	132,657	23,720	896	12,850
Total	7,777,670	657,398	277,108	981,896

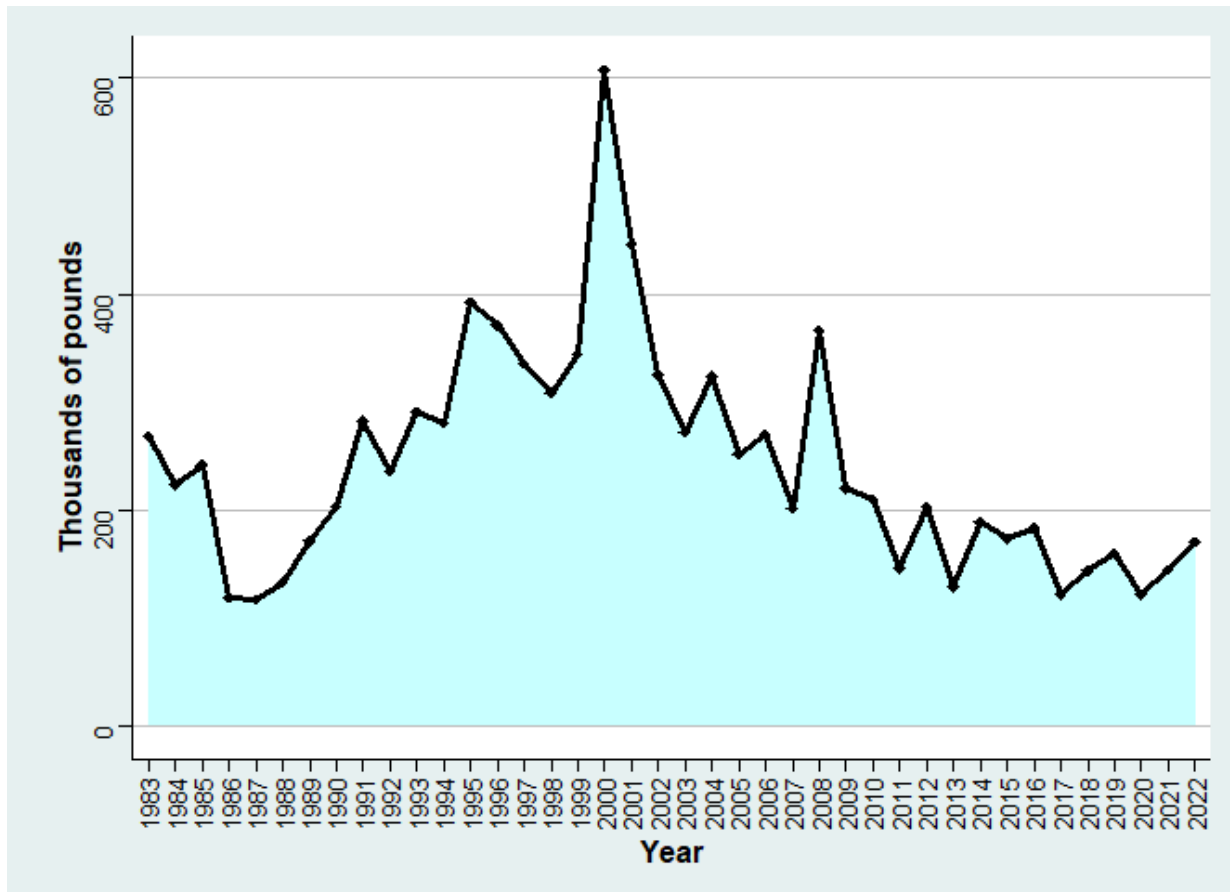


Figure 13: The time series of commercial landings in pounds of Yellowtail Snapper in Puerto Rico.

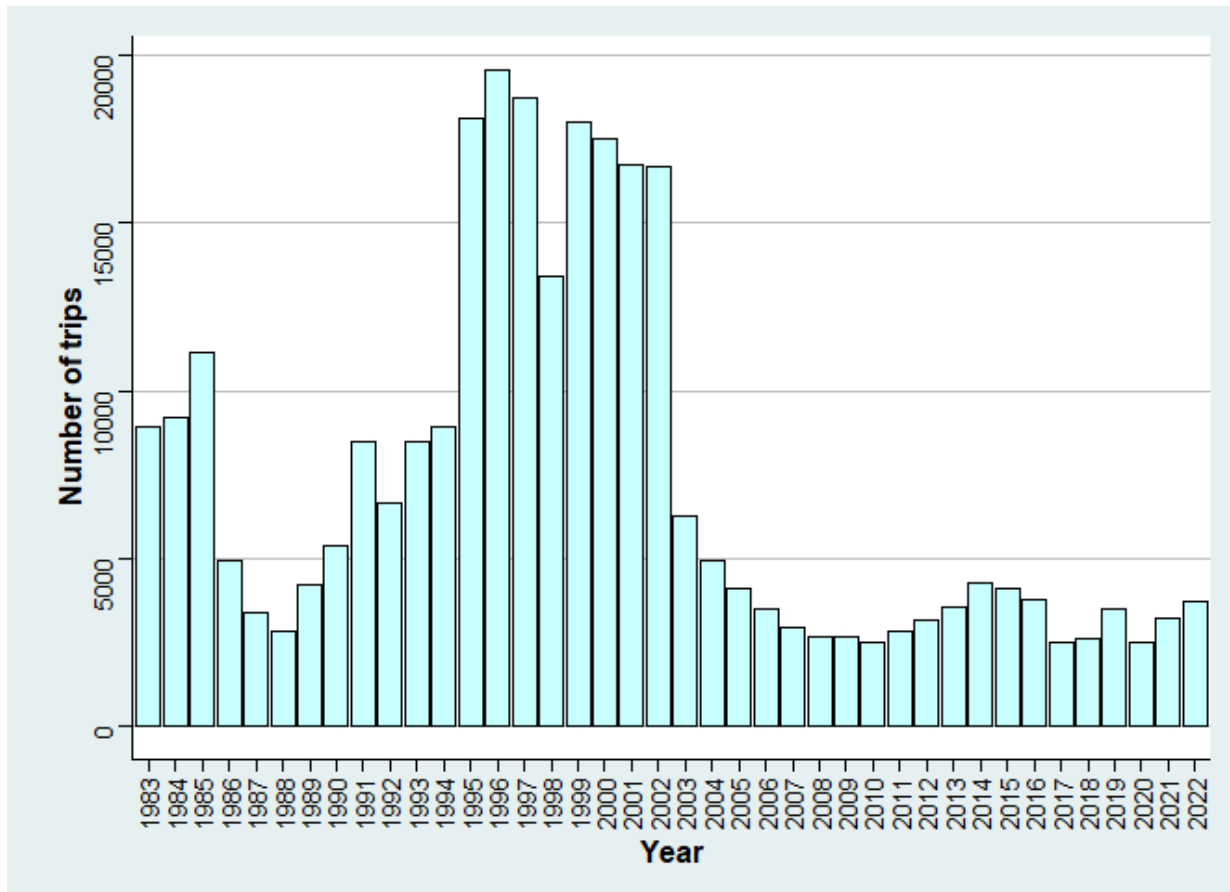


Figure 14: The time series of number of trips with reported landings of Yellowtail Snapper in Puerto Rico.

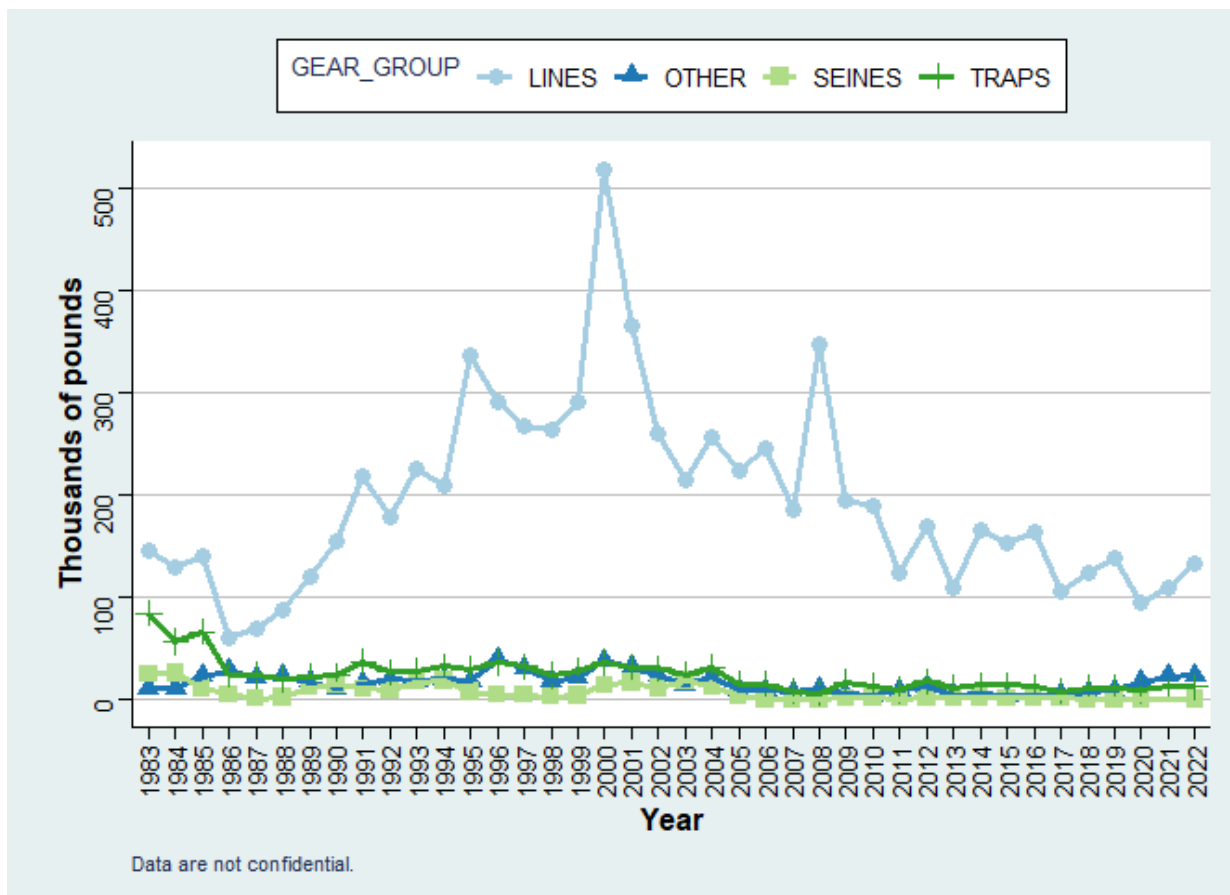


Figure 15: Commercial landings in pounds of Yellowtail Snapper by year and gear group in Puerto Rico.

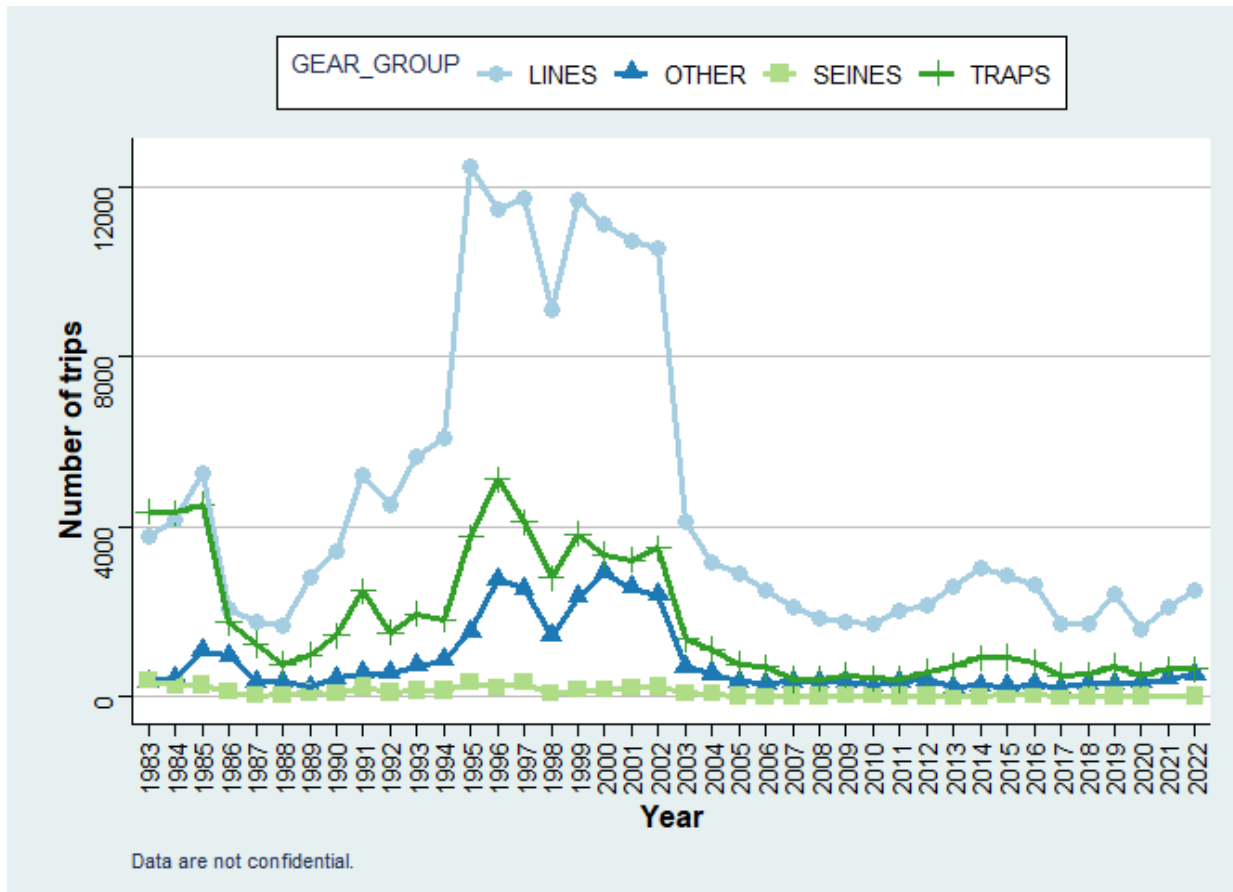


Figure 16: Number of trips with reported landings of Yellowtail Snapper by year and gear group in Puerto Rico.

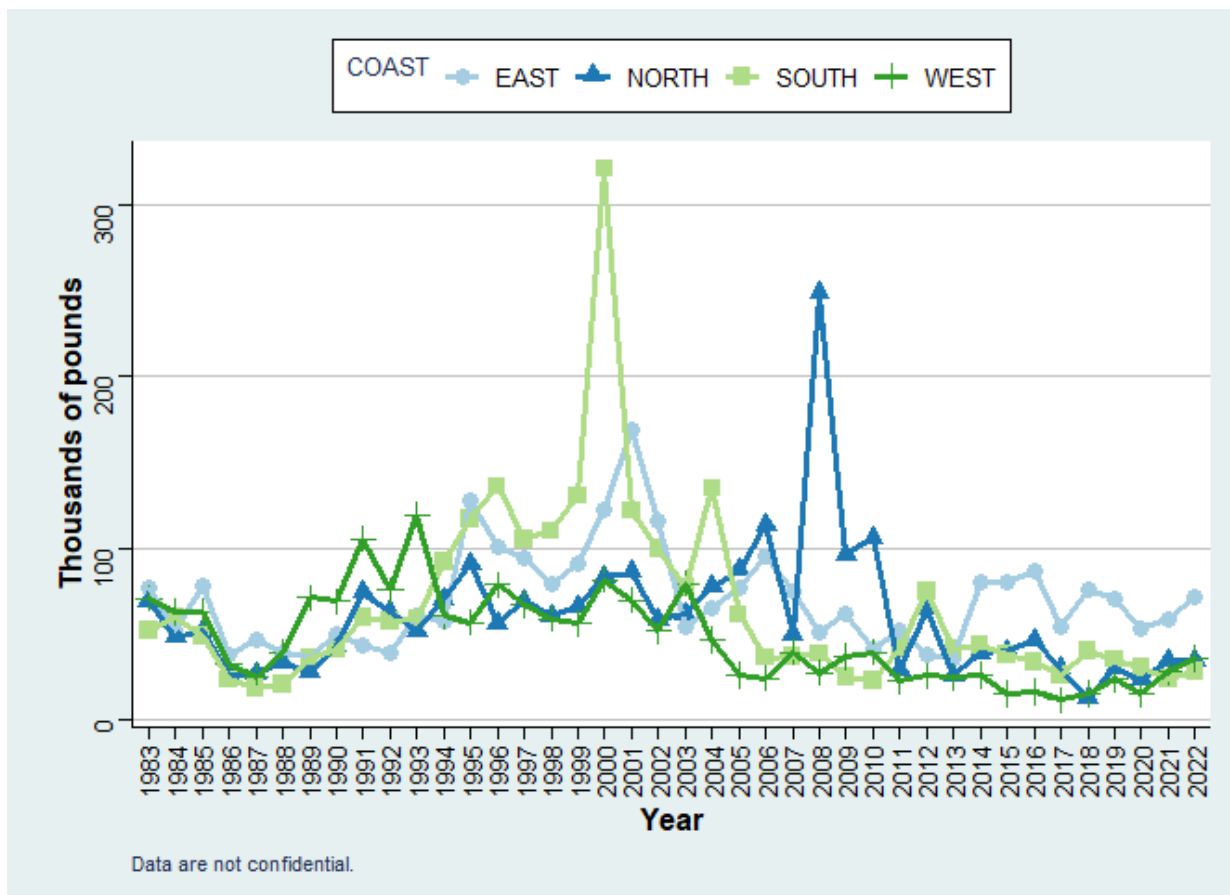


Figure 17: Commercial landings in pounds of Yellowtail Snapper by year and coast in Puerto Rico.

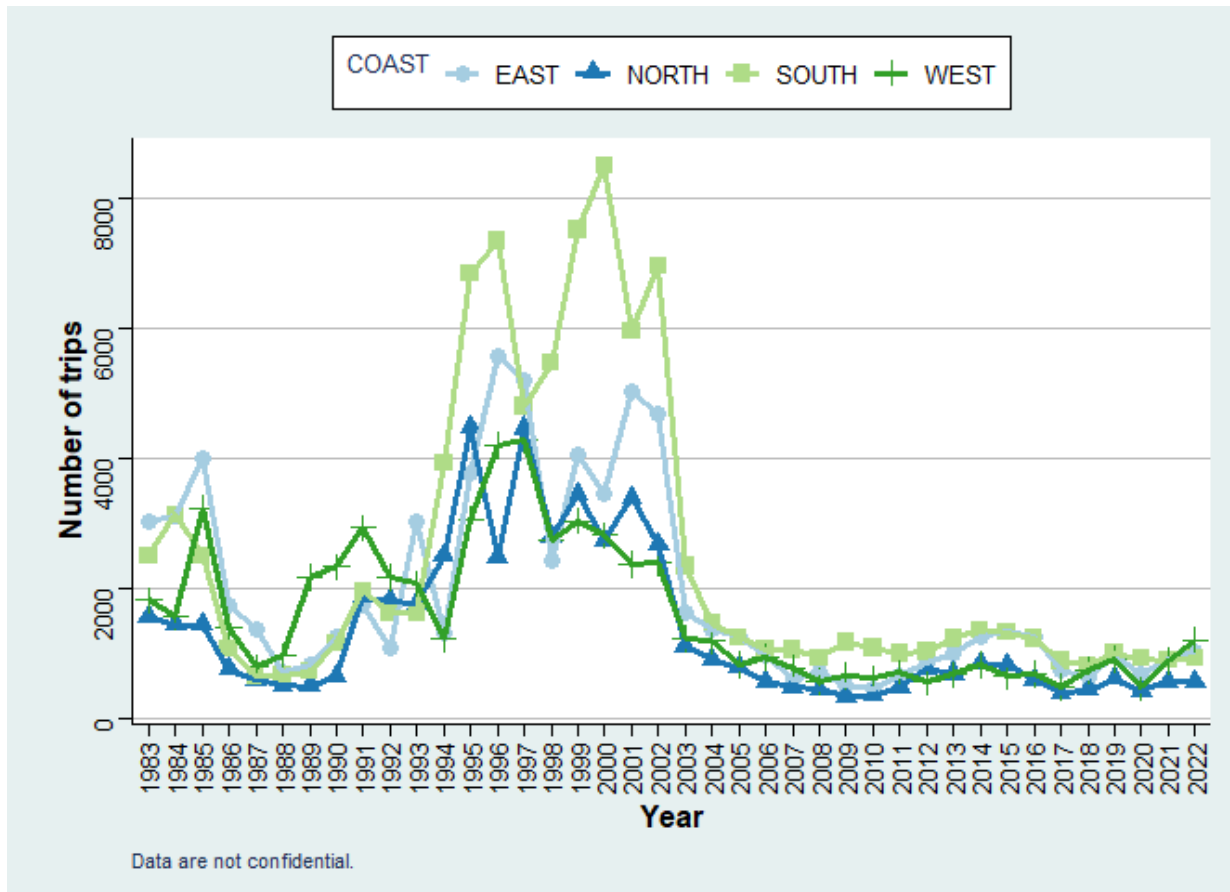


Figure 18: Number of trips with reported landings of Yellowtail Snapper by year and coast in Puerto Rico.

#### 4. Literature Cited

- SEDAR. 2009. Caribbean Fisheries Data Evaluation, Final report. SEDAR Procedures Workshop 3. 195 pp.
- SEDAR. 2019. SEDAR 57 U.S. Caribbean Spiny Lobster Stock Assessment Report. SEDAR, North Charleston SC. 232 pp. available online at: <http://sedarweb.org/sedar-57>

## Appendix 1

YEAR	Island	NORTH	EAST	SOUTH	WEST
1983	0.61				
1984	0.59				
1985	0.56				
1986	0.75				
1987	0.75				
1988	0.56				
1989	0.51				
1990	0.51				
1991	0.51				
1992	0.60				
1993	0.60				
1994	0.64				
1995	0.71				
1996	0.71				
1997	0.78				
1998	0.78				
1999	0.78				
2000	0.57				
2001	0.68				
2002	0.86				
2003		0.51	0.99	0.66	0.43
2004		0.40	0.66	0.27	0.68
<b>2005</b>		<b>0.27</b>	<b>0.48</b>	<b>0.47</b>	<b>0.84</b>
2006		0.13	0.29	0.66	0.99
2007		0.30	0.27	0.77	0.69
2008		0.06	0.43	0.57	0.68
2009		0.09	0.22	0.98	0.51
2010		0.09	0.22	0.98	0.51
2011		0.52	0.41	0.50	0.88
2012		0.33	0.74	0.33	0.65
2013		0.66	0.90	0.66	0.70
2014		0.59	0.50	0.73	0.80
2015		0.56	0.57	0.70	0.76
2016		0.43	0.48	0.73	0.80
<b>2017</b>		<b>0.43</b>	<b>0.48</b>	<b>0.73</b>	<b>0.80</b>
2018		0.96	0.31	0.47	0.93
2019		0.61	0.63	0.64	0.75
<b>2020</b>		<b>0.60</b>	<b>0.49</b>	<b>0.67</b>	<b>0.81</b>
<b>2021</b>		<b>0.60</b>	<b>0.49</b>	<b>0.67</b>	<b>0.81</b>
<b>2022</b>		<b>0.60</b>	<b>0.49</b>	<b>0.67</b>	<b>0.81</b>

2005 Correction factors were calculated using a mean of 2004 and 2006 as per SEDAR 57

2017 Due to Hurricanes, correction factors were used from 2016 as per DRNA

2020-2022 Correction factors were a mean of 2014-2019 as per SSC for SEDAR 80 (as in the text)?