**Updated Gulf of Mexico Lane Snapper OFL and ABC using the Itarget Model application with MRIP_FES estimates and for MRIP_MRFSS estimates of recreational Landings**

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## Executive Summary

This document updates the DLMtool 'Itarget' data-limited results for ABC and OFL advice for lane snapper since the SEDAR 49 OFL/ABC estimates and also provides an overall summary of the previous updates provided by Cummings (January 2020) and Cummings and Sagarese (September 2019). The Itarget DLM method was used in the updates and followed the procedures described in Cummings and Sagarese (September 2019) and the SEDAR 49 Gulf of Mexico Data Limited Stock Evaluation (SEDAR 49 SAR). The Itarget method uses the recent (2014-2018) headboat index (Cummings 2019), which showed a 57% increase over the reference period (1999-2008) and uses estimates of total commercial and recreational catches. The previous OFL/ABC updates provided by Cummings and Sagarese (September 2019) and those provided by Cummings (January 2020) are also provided herein and a history of the updates is given. Additionally, OFL/ABC estimates in landings only are provided.

## SEDAR 49 Itarget Model Update History

1. Cummings and Sagarese (September 2019) provided updated OFL/ABC estimates in total removals for the SEDAR 49 Itarget model estimates using MRIP_MRFSS units for the recreational data and presented the results to the September 2019 meetings of the Gulf of Mexico Fishery Management Council (GMFMC), Science and Statistical Committee (SSC) Meeting and the GMFMC September meeting.
2. The results of Cummings and Sagarese (September 2019) were further presented to the October GMFMC Reeffish Advisory Panel.
3. Cummings (January 2020) further updated the SEDAR 49 OFL/ABC estimates however, for this update, estimates of recreational data were taken from the MRIP_FES set of estimates. All other inputs into the Itarget model were identical to the inputs from the September 2019 model runs (i.e., commercial landings and the updated headboat CPUE index). Recently, the MRIP_FES recreational data has been determined to be the best available and most appropriate data available for the recreational fleets for GMFC stocks.
4. The January 2020 OFL/ABC results were presented to the January 2020 GMFMC Meeting. OFL/ABC results were in units of total landings including dead discards.
5. Subsequent to the Cummings January 2020 update the Council requested the SEDAR 49 update of OFL/ABC be available in units of landings only (i.e., without dead discards).
6. The purpose of this document is to provide the updated SEDAR 49 OFL/ABC estimates in units of landings only. It is important to note that the two previous updates of lane snapper OFL/ABC from Cummings and Sagarese (September 2019) and Cummings (January 2020) were in units of recreational (AB1+B2 dead discards) and commercial landings. Further, it should be noted that in the application of the Itarget model inputs are in units of total removals (i.e., total recreational (AB1 + B2 dead discards) and commercial landings).

7. The need to provide OFL/ABC estimates in units of 'landings' only was necessary as the current annual catch limits (ACLs) are defined using the Generic ACL/AM amendment using MRFSS landings data (i.e., AB1 landed fish) and thus this additional update was carried out at the request of the NMFS, Southeast Regional Office (SERO) and Council staff.

**Methods for OFL/ABC Calculations**

Procedures used in the September 2019 (Cummings and Sagarese) and the January 2020 (Cummings) updates of the SEDAR 49 estimates of lane snapper OFL and ABC, using the data limited Itarget model (i.e., 'Itarget_0.5_0.7_1.0'), were identical and followed Cummings and Sagarese (2019). The only change between the September 2019 and January 2020 updates was the source inputs for the recreational data. As detailed by Cummings and Sagarese, the September update used MRIP_MRFSS units of recreational inputs while the January 2020 update used the MRIP_FES units of recreational data. Further, the Itarget model results provide estimates of OFL/ABC in units of total removals. Thus, in the lane snapper application, recreational estimates of AB1 and B2 dead discards were incorporated. For the SEDAR 49 lane snapper application of the Itarget model, commercial discards were assumed zero and that assumption was carried forward in the September 2019 and January 2020 updates.

The commercial landings data component and the updated standardized catch per unit of effort (CPUE) index of abundance was identical between the September 2019 and the January 2020 updates. Appendix Table 1 and Appendix Figure 1 provides the updated CPUE index presented by Cummings, 2019 and that same CPUE index was used in the September 2020 and the January 2020 OFL/ABC updates.

Finally as noted above, in this summary of the SEDAR 49 OFL/ABC update using the Itarget model, the resulting OFL/ABC estimates were adjusted to provide OFL/ABC in units of landed fish. The OFL/ABC outputs from the Itarget model were multiplied by the recent three-year (2016-2018) average of the ratio of AB1 landings to total recreational landings (AB1 + B2-dead discards).

As in Cummings and Sagarese (2019) and Cummings (2020), all references herein to the SEDAR 49 SAR refer to the SEDAR 49 Stock Assessment Report.

**Results**

Table 1 and Figure 1 provide updated estimates of recreational landings (AB1, B2-dead discards) and commercial landings of Gulf of Mexico lane snapper 1986-2018. The source of the recreational data component for this update of OFL/ABC was the MRIP_FES data source, which is recognized as the best practice source of input for recreational data. The data indicate that since 1986 that from 94 to 99 % of the total recreational (AB1 + B2-dead discards) landings was AB1 landed fish and the three-year (2016-2018) average for the MRIP_FES data source was 96.3%.

The resulting updated OFL/ABC values in units of total removals, are presented in Table 2 resulting from two separate applications of the Itarget model varying only the source of recreational catches (AB1 + B2 dead discards), i.e., MRIP_FES vs MRIP_MRFSS. As mentioned earlier, the Itarget model provides OFL/ABC in native units of total removals (i.e., recreational AB1+B2- dead discards and commercial landings) therefore, it was necessary to adjust the values to provide estimates of OFL/ABC in units of landed catch only (AB1). This adjustment was added at the request of the NOAA, Southeast Regional Office (SERO) as the annual catch is monitored in landed catch only (AB1 recreational + commercial landings). The adjustments were performed by multiplying the OFL/ABC values output from each separate application of the Itarget model by the three-year (2016-2018) average estimate of the ratio of AB1 landings to total (AB1 + B2-dead discards) recreational landings (i.e., 96.3% MRIP_FES and 98.3% MRIP_MRFSS respectively).

Table 3 provides the adjusted updated OFL and ABC in landings only for the two separate sources of recreational landings (i.e., MRIP_FES estimates and the MRIP_MRFSS estimates) after applying the AB1/AB1+B2 ratios.

Appendices Tables 2 – 4 provide detailed inputs on data inputs and OFL/ABC results for the September 2019 update. As in SEDAR 49, the ABC was set at the 30$^{th}$ percentile of the OFL.

**References**

Cummings, Nancie J. and Skyler Sagarese. September 2019. Updated Calculations of OFL and ABC for Gulf of Mexico Lane Snapper using the Itarget Data Limited Method (DLM). NOAA Fisheries, SEFSC, SFD, 11pp. Manuscript prepared for September 2019 GMFMC SSC Meeting, Tampa FL.

Cummings, Nancie J. September 2019. Updated Catch per Unit of Effort (CPUE) Indices and Effort Time-series for Lane Snapper from the Gulf of Mexico Recreational Headboat Fishery (1986 - 2018). 6pp. Manuscript prepared for September 2019 GMFMC SSC Meeting, Tampa FL.

SEDAR 49 Stock Assessment Report. Gulf of Mexico Data-limited Species: Red Drum, Lane Snapper, Wenchman, Yellowmouth Grouper, Speckled Hind, Snowy Grouper, Almaco Jack, Lesser Amberjack. December 2016. SEDAR 4055 Faber Place Drive, Suite 201, North Charleston, SC 29405. 618pp.

Table 1.Gulf of Mexico Lane Snapper landings (Commercial and Recreational (AB1 and B2 dead discards)) for 1986-2018. Source for MRIP_FES landings was NOAA Fisheries, SEFSC, Fishery Statistics Division. Source for 1986-2014 commercial landings was SEDAR 49 SAR. Source for 2015-2018 commercial landings was Ryan Rindone pers. com. Units are pounds, whole weight (ww).

| Year | MRIP_FES AB1 Landings, Pounds | MRIP_FES B2 Dead Discards, pounds | Total Recreational (AB1+B2) , pounds | Commercial Landings | Total Landings Pounds |
|---|---|---|---|---|---|
| 1986 | 368,194 | 3,290 | 371,484 | 60,174 | 431,658 |
| 1987 | 589,309 | 2,379 | 591,689 | 51,972 | 643,661 |
| 1988 | 966,750 | 8,368 | 975,118 | 57,659 | 1,032,777 |
| 1989 | 2,657,650 | 12,275 | 2,669,926 | 93,596 | 2,763,522 |
| 1990 | 415,682 | 1,983 | 417,665 | 81,358 | 499,023 |
| 1991 | 2,067,207 | 58,928 | 2,126,135 | 119,289 | 2,245,424 |
| 1992 | 1,133,906 | 30,601 | 1,164,508 | 99,127 | 1,263,635 |
| 1993 | 876,845 | 41,108 | 917,953 | 107,136 | 1,025,089 |
| 1994 | 637,160 | 29,907 | 667,067 | 91,729 | 758,796 |
| 1995 | 557,726 | 31,788 | 589,514 | 71,294 | 660,808 |
| 1996 | 428,450 | 21,081 | 449,532 | 54,581 | 504,113 |
| 1997 | 1,334,461 | 24,670 | 1,359,131 | 61,251 | 1,420,382 |
| 1998 | 771,827 | 12,030 | 783,858 | 31,750 | 815,608 |
| 1999 | 460,715 | 12,262 | 472,977 | 49,233 | 522,210 |
| 2000 | 224,367 | 14,641 | 239,008 | 47,684 | 286,692 |
| 2001 | 809,588 | 14,078 | 823,665 | 48,782 | 872,447 |
| 2002 | 448,574 | 23,634 | 472,208 | 52,970 | 525,178 |
| 2003 | 538,859 | 14,298 | 553,157 | 50,584 | 603,741 |
| 2004 | 566,717 | 15,723 | 582,440 | 50,755 | 633,195 |
| 2005 | 582,079 | 10,677 | 592,756 | 39,951 | 632,707 |
| 2006 | 511,238 | 6,403 | 517,641 | 49,340 | 566,981 |
| 2007 | 536,277 | 15,342 | 551,619 | 29,222 | 580,841 |
| 2008 | 361,438 | 19,733 | 381,171 | 25,475 | 406,646 |
| 2009 | 521,135 | 18,592 | 539,728 | 35,848 | 575,576 |
| 2010 | 175,207 | 6,220 | 181,427 | 17,262 | 198,689 |
| 2011 | 152,319 | 5,918 | 158,236 | 14,365 | 172,601 |
| 2012 | 413,331 | 7,744 | 421,075 | 28,928 | 450,003 |
| 2013 | 454,495 | 18,120 | 472,615 | 23,189 | 495,804 |
| 2014 | 458,953 | 17,581 | 476,534 | 29,948 | 506,482 |
| 2015 | 433,851 | 18,140 | 451,991 | 44,840 | 496,831 |
| 2016 | 603,892 | 32,310 | 636,202 | 34,142 | 670,344 |
| 2017 | 1,256,278 | 29,159 | 1,285,436 | 42,419 | 1,327,855 |
| 2018 | 795,045 | 31,321 | 826,366 | 25,974 | 852,340 |

*Discards removed for OFL and ABC calculation.

Table 2. Updated Lane Snapper OFL and ABC (Pounds, ww) in total removals from the Itarget_0.5_0.7_1.0 data limited model using MRIP_FES landings and MRIP_MRFSS. OFL and ABC are as defined in Cummings and Sagarese (2019). Recreational inputs are in units of AB1+B2-dead discards.

| | ABC | | | | | |
|---|---|---|---|---|---|---|
| **OFL/ABC Source** | **30%** | **40%** | **OFL** | **SD** | **SE** | **CV** |
| Updated Itarget0.5_0.7_1.0, Cummings January 2020: Using MRIP_FES Recreational Catch Estimates | 1,068,508 | 1,081,903 | 1,094,324 | 50,102 | 501 | 0.046 |
| Updated Itarget0.5_0.7_1.0, Cummings and Sagarese 2019: Using MRIP_MRFSS Recreational Catch Estimates | 588,965 | 596,349 | 603,195 | 27,616 | 276 | 0.046 |
| Itarget0.5_0.7_1.0 SEDAR 49, March 2017 | 355,501 | 360,059 | 364,082 | 16,965 | 170 | 0.047 |

Table 3. Adjusted Lane Snapper OFL and ABC (Pounds, ww) in landings only from the Itarget_0.5_0.7_1.0 data limited model using two sources of recreational data: MRIP_FES and MRIP_MRFSS landings. OFL/ABC Units are in landed fish, Pounds, Whole weight. Adjustments were made by multiplying the OFL/ABC estimates in Table 2 by the three-year (2016-2018) average of the ratio of AB1 landings to total (AB1 + B2-dead discards) recreational landings (i.e., 96.3% MRIP_FES and 98.3% MRIP_MRFSS respectively).

| | ABC | | | | | |
|---|---|---|---|---|---|---|
| **OFL/ABC Source** | **30%** | **40%** | **OFL** | **SD** | **SE** | **CV** |
| January 2020: Using MRIP_FES Recreational Catch Estimates | 1,028,973 | 1,041,873 | 1,053,834 | 50,102 | 501 | 0.046 |
| Updated Itarget0.5_0.7_1.0, Cummings and Sagarese 2019: Using MRIP_MRFSS Recreational Catch Estimates | 578,953 | 586,211 | 592,941 | 27,616 | 276 | 0.046 |

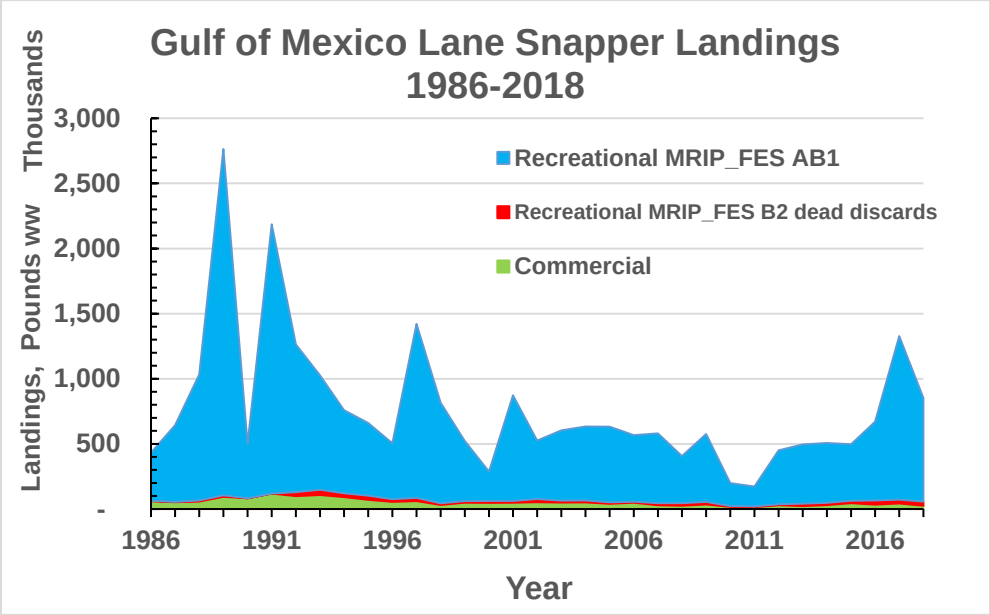



Figure 1. Updated Gulf of Mexico lane snapper recreational (AB1, B2-dead discards) and commercial landings 1986-2018. Recreational landings are in MRIP_FES units. Source for MRIP_FES and commercial landings was NOAA Fisheries, SEFSC, Fishery Statistics Division. Units are pounds, whole weight.

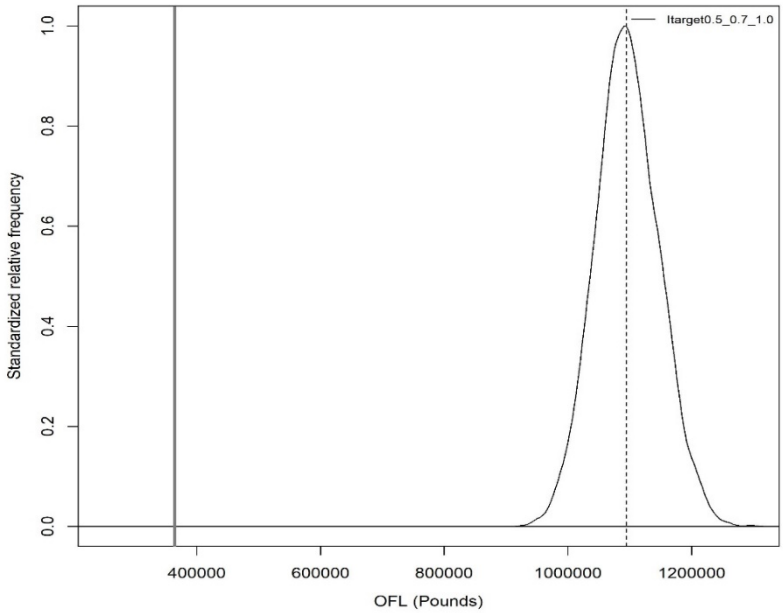



Figure 2. Standardized relative frequency of TAC for lane snapper output for the updated Itarget0.5_0.7_1.0 data limited method using the Cummings (2019) updated headboat standardized CPUE index for 1986-2018 <u>and substituting the MRIP_FES recreational landings for recreational component of the total landings</u> (Commercial landings time series remained unchanged). Thick gray line represents the calculated OFL (estimated TAC= 364,082 pounds ww) at the 50% probability of exceeding OFL from the March 2017 SSC Review of the SEDAR 49 data limited evaluation. Units are in total removals (recreational AB1 landings + B2 dead discards and commercial landings)

**Appendix Tables and Figures.**

**Appendix Table 1. Source: Cummings, 2019.**

**"**Updated lane snapper catch per unit of effort (CPUE) standardized indices of abundance from the headboat fishery 1986-2018. Indices from Smith and Rios (2016, SEDAR 49) included for comparison."

| YEAR | SEDAR 49 Standardized CPUE | SEDAR 49 Updated Standardized CPUE | SEDAR 49 Updated Nominal CPUE | SEDAR 49 Update Normalized Effort |
|---|---|---|---|---|
| 1986 | 0.730 | 0.738 | 0.454 | 0.571 |
| 1987 | 0.860 | 0.881 | 0.371 | 0.677 |
| 1988 | 0.420 | 0.433 | 0.228 | 0.941 |
| 1989 | 0.650 | 0.620 | 0.392 | 0.822 |
| 1990 | 1.040 | 1.102 | 0.721 | 1.116 |
| 1991 | 1.330 | 1.324 | 0.898 | 1.212 |
| 1992 | 1.270 | 1.269 | 1.148 | 1.342 |
| 1993 | 1.570 | 1.602 | 1.819 | 1.442 |
| 1994 | 1.250 | 1.347 | 1.198 | 1.202 |
| 1995 | 0.860 | 0.880 | 0.821 | 0.964 |
| 1996 | 0.660 | 0.697 | 0.543 | 0.813 |
| 1997 | 0.600 | 0.584 | 0.351 | 0.804 |
| 1998 | 0.590 | 0.599 | 0.515 | 0.688 |
| 1999 | 0.510 | 0.515 | 0.243 | 0.641 |
| 2000 | 0.760 | 0.793 | 0.438 | 0.805 |
| 2001 | 0.590 | 0.589 | 0.399 | 0.846 |
| 2002 | 0.880 | 0.888 | 0.617 | 0.891 |
| 2003 | 1.150 | 1.134 | 1.076 | 0.817 |
| 2004 | 1.140 | 1.123 | 0.701 | 0.967 |
| 2005 | 1.520 | 1.549 | 1.125 | 0.945 |
| 2006 | 1.110 | 1.002 | 0.965 | 0.856 |
| 2007 | 1.090 | 0.980 | 0.751 | 0.954 |
| 2008 | 1.230 | 1.169 | 0.812 | 0.948 |
| 2009 | 1.410 | 1.330 | 1.134 | 1.108 |
| 2010 | 1.110 | 1.043 | 0.998 | 0.727 |
| 2011 | 1.050 | 1.063 | 1.328 | 1.027 |
| 2012 | 1.100 | 1.098 | 1.301 | 1.072 |
| 2013 | 1.120 | 1.093 | 1.425 | 1.209 |
| 2014 | 1.130 | 1.133 | 1.424 | 1.308 |
| 2015 | 1.270 | 1.422 | 1.833 | 1.359 |
| 2016 | | 1.857 | 2.467 | 1.441 |
| 2017 | | 1.812 | 2.743 | 1.228 |
| 2018 | | 1.417 | 1.761 | 1.261 |

**Appendix Table 2. Source. Cummings and Sagarese (2019).**

Commercial and recreational data inputs used in the Cummings and Sagarese (September 2019) updates of SEDAR 49 lane snapper OFL/ABC from the Itarget model.

"Updated commercial and recreational landings of Gulf of Mexico lane snapper 1986-2018. Source of data: SEDAR 49 SAR (1986-2014 for recreational and commercial components) and Ryan Rindone (email of 7 August 2019 from NMFS, SEFSC ACL data files). Recreational dead discards for 2015-2018 estimated as average for 2012-2014 using inputs from SEDAR 49. Recreational landings are in MRIP_MRFSS units.

| | Landings (whole weight) | | |
|---|---|---|---|
| Year | Commercial | Recreational | Total |
| 1986 | 60,174 | 337,741 | 397,915 |
| 1987 | 51,972 | 503,523 | 555,495 |
| 1988 | 57,659 | 389,105 | 446,764 |
| 1989 | 93,596 | 726,910 | 820,506 |
| 1990 | 81,358 | 199,003 | 280,361 |
| 1991 | 119,289 | 689,172 | 808,461 |
| 1992 | 99,127 | 501,489 | 600,616 |
| 1993 | 107,136 | 419,689 | 526,825 |
| 1994 | 91,729 | 428,976 | 520,705 |
| 1995 | 71,294 | 462,958 | 534,252 |
| 1996 | 54,581 | 210,779 | 265,360 |
| 1997 | 61,251 | 450,618 | 511,869 |
| 1998 | 31,750 | 284,505 | 316,255 |
| 1999 | 49,233 | 197,024 | 246,257 |
| 2000 | 47,684 | 149,614 | 197,298 |
| 2001 | 48,782 | 346,925 | 395,707 |
| 2002 | 52,970 | 213,264 | 266,234 |
| 2003 | 50,584 | 315,508 | 366,092 |
| 2004 | 50,755 | 309,772 | 360,527 |
| 2005 | 39,951 | 368,364 | 408,315 |
| 2006 | 49,340 | 297,855 | 347,195 |
| 2007 | 29,222 | 226,375 | 255,597 |
| 2008 | 25,475 | 234,931 | 260,406 |
| 2009 | 35,848 | 292,569 | 328,417 |
| 2010 | 17,262 | 100,942 | 118,204 |
| 2011 | 14,365 | 110,074 | 124,439 |
| 2012 | 28,928 | 215,811 | 244,739 |
| 2013 | 23,189 | 269,524 | 292,713 |
| 2014 | 29,948 | 294,521 | 324,469 |
| 2015 | 44,840 | 239,579 | 284,419 |
| 2016 | 34,142 | 272,610 | 306,752 |
| 2017 | 42,419 | 542,273 | 584,692 |
| 2018 | 25,974 | 339,454 | 365,428 |

**Appendix Table 3.** Gulf of Mexico Lane Snapper landings for recreational (AB1 and B2 dead discards)) for 1986-2018. Source for MRIP_MRFSS landings was NOAA Fisheries, SEFSC, and Fishery Statistics Division. Units are pounds, whole weight (ww).

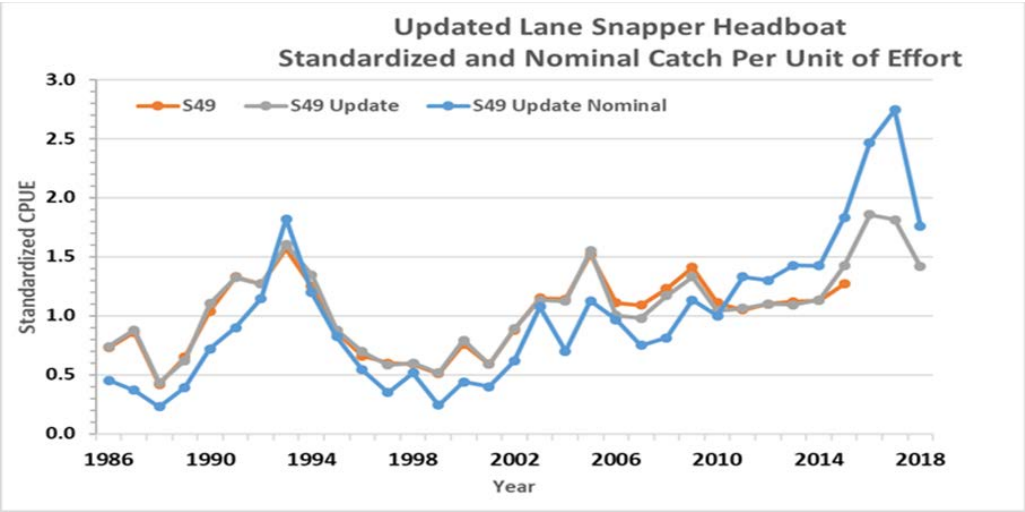
| Year | MRIP_MRFSS (AB1) Pounds | MRIP_MRFSS B2 Discards | MRIP_MRFSS Total Pounds | Commercial Landings | Total Landings Pounds |
|---|---|---|---|---|---|
| 1986 | 336,131 | 1,610 | 337,741 | 60,174 | 397,915 |
| 1987 | 502,056 | 1,467 | 503,523 | 51,972 | 555,495 |
| 1988 | 386,803 | 2,302 | 389,105 | 57,659 | 446,764 |
| 1989 | 722,596 | 4,314 | 726,910 | 93,596 | 820,506 |
| 1990 | 198,216 | 787 | 199,003 | 81,358 | 280,361 |
| 1991 | 674,031 | 15,141 | 689,172 | 119,289 | 808,461 |
| 1992 | 493,230 | 8,259 | 501,489 | 99,127 | 600,616 |
| 1993 | 406,980 | 12,709 | 419,689 | 107,136 | 526,825 |
| 1994 | 417,652 | 11,324 | 428,976 | 91,729 | 520,705 |
| 1995 | 453,172 | 9,786 | 462,958 | 71,294 | 534,252 |
| 1996 | 202,538 | 8,241 | 210,779 | 54,581 | 265,360 |
| 1997 | 443,230 | 7,388 | 450,618 | 61,251 | 511,869 |
| 1998 | 280,810 | 3,695 | 284,505 | 31,750 | 316,255 |
| 1999 | 193,570 | 3,454 | 197,024 | 49,233 | 246,257 |
| 2000 | 144,029 | 5,585 | 149,614 | 47,684 | 197,298 |
| 2001 | 342,576 | 4,349 | 346,925 | 48,782 | 395,707 |
| 2002 | 206,380 | 6,884 | 213,264 | 52,970 | 266,234 |
| 2003 | 312,097 | 3,411 | 315,508 | 50,584 | 366,092 |
| 2004 | 305,294 | 4,478 | 309,772 | 50,755 | 360,527 |
| 2005 | 363,554 | 4,810 | 368,364 | 39,951 | 408,315 |
| 2006 | 295,007 | 2,848 | 297,855 | 49,340 | 347,195 |
| 2007 | 219,537 | 6,838 | 226,375 | 29,222 | 255,597 |
| 2008 | 227,689 | 7,242 | 234,931 | 25,475 | 260,406 |
| 2009 | 285,426 | 7,143 | 292,569 | 35,848 | 328,417 |
| 2010 | 99,125 | 1,817 | 100,942 | 17,262 | 118,204 |
| 2011 | 108,201 | 1,873 | 110,074 | 14,365 | 124,439 |
| 2012 | 214,281 | 1,530 | 215,811 | 28,928 | 244,739 |
| 2013 | 262,068 | 7,456 | 269,524 | 23,189 | 292,713 |
| 2014 | 285,875 | 8,646 | 294,521 | 29,948 | 324,469 |
| 2015 | 233,702 | 5,877 | 239,579 | 44,840 | 284,419 |
| 2016 | 266,733 | 5,877 | 272,610 | 34,142 | 306,752 |
| 2017 | 536,396 | 5,877 | 542,273 | 42,419 | 584,692 |
| 2018 | 333,577 | 5,877 | 339,454 | 25,974 | 365,428 |

**Appendix Table 4. Source Cummings and Sagarese (September 2019).**

Results of OFL/ABC updates for Cummings and Sagarese (September 2019) Update of SEDAR 49 lane snapper OFL/ABC from the Itarget model. Recreational data inputs were from the MRIP_MRFSS data source and refer to landings on AB1+dead discards. OFL/ABC units are in total removals including B2-dead discards for recreational component for both September 2019 update and the SEDAR 49 evaluation of 2016.

"Updated Lane snapper catch levels (pounds whole weight) at 30%, 40% and 50% probabilities of exceeding OFL for the Itarget 0.5_0.7_1.0 data-limited methods."

| **Method** | **ABC** | | **OFL** | **SD** | **SE** | **CV** |
|---|---|---|---|---|---|---|
| | **30%** | **40%** | **50%** | | | |
| **Updated Itarget0.5_0.7_1.0 September 2019** | 588,965 | 596,349 | 603,195 | 27,616 | 276 | 0.046 |
| **Itarget0.5_0.7_1.0 SEDAR 49, March 2017** | 355,501 | 360,059 | 364,082 | 16,965 | 170 | 0.047 |




**Appendix Figure 1.Source Cummings (2019)**

"Figure 1. Updated Lane snapper standardized catch per unit of effort from the headboat fishery 1986 - 2018 (SEDAR 49 Update line). The standardized CPUE index from Smith and Rios (SEDAR 49) is included for comparison (S49 line). All time series scaled to the mean of the overlapping years (1986-2014)."