

Dolphin Wahoo MSY, OFL, ABC, & ACL Options

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I. Dolphin

The following is taken directly from Appendix B. Exploratory Dolphin Stock Assessment (Prager 2000) contained in the Dolphin Wahoo FMP:

Table 4. Benchmark estimates from production model of dolphinfish in north Atlantic Ocean. Bias-corrected (BC) estimates shown, along with upper and lower bounds of nonparametric 80% confidence interval; all derived from bootstrapping.

Benchmark	BC estimate	80% LCB	80% UCB
MSY, mt/yr	12,241	8,506	21,110
F_{MSY} , proportion/yr	0.49	0.34	0.85
B_{1998}/B_{MSY}	1.56	1.22	1.77
F_{1997}/F_{MSY}	0.51	0.26	0.92

6 Reference Points and Proxies

It has been recommended that limit reference points be specified as part of the information supplied for fishery management (FAO 1995; Restrepo et al 1998), and this approach has become increasingly important. The production model estimates above provide one set of estimates of limit reference points: $MSY = 12,241$ mt/yr and $F_{MSY} = 0.49$ /yr (Table 4). Because of uncertainty in those estimates, it seems desirable to seek another set of reference points for comparative purposes.

In data-limited situations, the use of proxies for MSY and F_{MSY} has been suggested, along with the necessity of "bringing the knowledge base at least up to data-moderate standards" (Restrepo et al 1998). The same document suggests that suitable proxies for F_{MSY} can lie between $F = 0.75M$ and $F = M$. Given the range of estimates of M developed in §3.3 ($0.68 \leq \hat{M} \leq .80$), the corresponding range of proxies would be $0.51 \leq F \leq 0.80$.

Restrepo et al (1998) also suggest that "if there is no reliable information to estimate fishing mortality or biomass reference points, it may be reasonable to use the historical average catch as a proxy for MSY , taking care to select a period when there is no evidence that abundance was declining." Using that approach, one could take an average of the last ten years' catch and arrive at a proxy for MSY of $Y = 7,204$ mt/yr. The choice of ten years is somewhat arbitrary, but the suggestion is to use a recent time period. If the last five years' catch are averaged, the proxy for MSY becomes $Y = 8,089$ mt/yr.

The benchmark estimates from the surplus production model and their proxy counterparts are comparable, but the production model estimates that a larger sustainable yield might be possible through application of a lower rate of fishing mortality. Unfortunately, current knowledge does not allow a scientific statement about which set of benchmarks is closer to the truth.

Sustainability Status (Source: FishWatch)

Biomass: There are no current estimates of biomass.

Overfishing: No (South Atlantic and Gulf); Unknown (Pacific)

Overfished: No (South Atlantic and Gulf); Unknown (Pacific)

Fishing and habitat: Any effects are minimal and temporary.

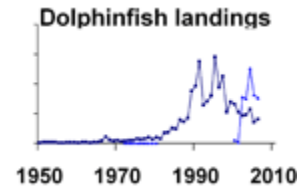
Bycatch: Regulations in the South Atlantic Fishery Management Council's **Dolphin-Wahoo FMP** for the Atlantic address requirements to reduce bycatch and mortality of bycatch. Longline vessels must also comply with sea turtle protection measures.

Aquaculture: There is currently no commercial aquaculture of mahi mahi in the U.S.

Landings (Source: FishWatch)

Landings refer to the amount of catch that is brought to land.

Note: The landings presented are domestic commercial landings.



A. Maximum Sustainable Yield (MSY)

- Option 1. No action.** Maximum Sustainable Yield (MSY) for dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico is between 18.8 and 46.5 million pounds.
- Option 2. MSY = 26,986,790 pounds (12,241 mt).** This figure is from a production model by Prager (2000) and would apply for dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico.
- Option 3. MSY = 15,882,100 – 17,833,190 pounds.** This range is based on average landings from a 10 year and 5 year period respectively (Prager 2000) and would apply for dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico.
- Option 4.** Specify MSY separately for the Atlantic at _____ million pounds.
- Option 5.** Others???

B. Overfishing Level (OFL)

- Option 1. No action.**

A maximum fishing mortality threshold (MFMT) - In the Atlantic, U.S. Caribbean, and Gulf of Mexico overfishing for dolphin is defined as a fishing mortality rate (F) in excess of F_{MSY} ($F_{30\%Static SPR}$).

A minimum stock size threshold (MSST) – In the Atlantic, U.S. Caribbean, and Gulf of Mexico the minimum stock size threshold for dolphin is defined as a ratio of current biomass ($B_{current}$) to biomass at MSY or $(1-M)*B_{MSY}$, where $1-M$ should never be less than 0.5. Using the best available estimates of natural mortality ($M = 0.68-0.80$) in the formula results in a MSST of 50% B_{MSY} . The stock would be overfished if current biomass ($B_{current}$) was less than MSST and would be recovered when current biomass was equal or greater than the biomass at MSY.

- Option 2. $OFL = F_{MSY} = 0.49$** based on a production model (Prager 2000; Table 4).
- Option 3.** Specify OFL separately for the Atlantic at _____.
- Option 4.** Others??

C. Allowable Biological Catch (ABC)

- a. **Option 1. No action. There is no ABC specified for dolphin.**
- b. **Option 2.** A potential ABC range = 17,541,414 – 22,938,772 pounds based on 65% to 85% of MSY Option 2 and would apply for dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico. This likely ABC range is presented for initial discussions; the SSC will provide their OFL and ABC recommendations at their June or December 2009 meeting.
- c. **Option 3.** Specify ABC separately for the Atlantic at _____ pounds.
- d. **Option 4.** Others??

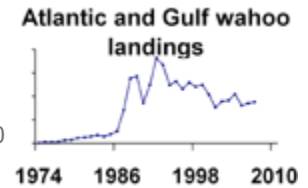
D. Annual Catch Limit (ACL)

- a. **Option 1. No action. There is no ACL specified for dolphin.**
- b. **Option 2.** ACL = 17,541,414 pounds based on 65% of MSY Option 2 and would apply for dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico.
- c. **Option 3.** ACL = 20,240,093 pounds based on 75% of MSY Option 2 and would apply for dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico.
- d. **Option 4.** ACL = 22,938,772 pounds based on 85% of MSY Option 2 and would apply for dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico.
- e. **Option 5.** Specify ACL separately for the Atlantic at _____ pounds.
- f. **Option 6.** Others??

II. Wahoo

Landings (Source: FishWatch)

Landings refer to the amount of catch that is brought to land. The first recorded commercial landings of wahoo were 1,000 pounds caught off Florida in 1974. From 1987 to 1993, landings ranged between 160,000 and 370,000 pounds. Commercial landings have since decreased and have fluctuated between 160,000 and 250,000 pounds. Recreational landings have ranged between 300,000 and 1.8 million pounds since 1981. In the last ten years, recreational landings have been fairly stable averaging 1.2 million pounds annually.



Note: Only domestic commercial landings data are shown in the graph.

Sustainability Status (Source: FishWatch)

Biomass: Unknown

Overfishing: Unknown

Overfished: Unknown

Fishing and habitat: In the South Atlantic, wahoo are caught by trolling surface lures, so there is little or no impact on habitat.

Bycatch: Dolphin, tunas, and other pelagic species are incidentally caught while targeting wahoo. Bycatch in the fishery also includes sailfish and white and blue marlin, but in low numbers.

Aquaculture: There is currently no commercial aquaculture production of wahoo in the United States.

A. Maximum Sustainable Yield (MSY)

- Option 1. No action.** The MSY proxy in the Atlantic, U.S. Caribbean, and Gulf of Mexico is between 1.41 and 1.63 million pounds (NMFS SEFSC based on 5-10 year catch history; letter dated 1/8/01).
- Option 2. MSY = x.xx – y.yy million pounds.** These figures could be based on updated 5-10 year time periods using more recent data and would apply for dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico.
- Option 3.** Specify MSY separately for the Atlantic at _____ million pounds.
- Option 4.** Others???

B. Overfishing Level (OFL)

- Option 1. No action.**

A maximum fishing mortality threshold (MFMT) - In the Atlantic, U.S. Caribbean, and Gulf of Mexico overfishing for wahoo is defined as a fishing mortality rate (F) in excess of F_{MSY} ($F_{30\%Static SPR}$).

A minimum stock size threshold (MSST) – In the Atlantic, U.S. Caribbean, and Gulf of Mexico the minimum stock size threshold for wahoo is defined as a ratio of current biomass ($B_{current}$) to biomass at MSY or $(1-M)*B_{MSY}$, where $1-M$ should never be less than 0.5. The stock would be overfished if current biomass ($B_{current}$) was less than MSST and would be recovered when current biomass was equal or greater than the biomass at MSY.

- b. **Option 2.** Specify OFL and MSST separately for the Atlantic at _____ and _____ pounds.
- c. **Option 3.** Others??

C. Allowable Biological Catch (ABC)

- a. **Option 1. No action. There is no ABC specified for wahoo.**
- b. **Option 2.** A potential ABC range = a.aa – b.bb million pounds based on 65% to 85% of MSY Option 1 or 2 and would apply for dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico. This likely ABC range is presented for initial discussions; the SSC will provide their OFL and ABC recommendations at their June or December 2009 meeting.
- c. **Option 3.** Specify ABC separately for the Atlantic at _____ pounds.
- d. **Option 4.** Others??

D. Annual Catch Limit (ACL)

- a. **Option 1. No action. There is no ACL specified for wahoo.**
- b. **Option 2.** ACL = c.cc million pounds based on 65% of MSY Option 1 or 2 and apply to dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico.
- c. **Option 3.** ACL = d.dd million pounds based on 75% of MSY Option 1 or 2 and apply to dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico.
- d. **Option 4.** ACL = e.ee million pounds based on 85% of MSY Option 1 or 2 and apply to dolphin in the Atlantic, U.S. Caribbean, and Gulf of Mexico.
- e. **Option 5.** Specify ACL separately for the Atlantic at _____ pounds.
- f. **Option 6.** Others??