Evaluating the Effects of Amendment 17A Regulations on 2005-2007 South Atlantic Red Snapper Headboat Removals

National Marine Fisheries Service
Southeast Regional Office
St. Petersburg, Florida

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Introduction/Background

A recent stock assessment of South Atlantic red snapper indicates the stock is undergoing overfishing and is severely overfished (SEDAR 15 2008). Red snapper fishing mortality during 2006 was 7.67 times higher than the fishing mortality rate associated with F_{MSY} (=$F_{40\%SPR}$) and spawning stock biomass (SSB) was 2 percent of the SSB at maximum sustainable yield (SEFSC 2009). The South Atlantic Fishery Management Council (SAFMC) is currently developing Amendment 17A, which includes management measures to address overfishing of red snapper and rebuild this stock (SAFMC 2009). Based on $F_{MSY} = F_{40\%SPR}$ and assuming average recruitment, total removals of red snapper need to be reduced to 82,000 pounds to end overfishing. This equates to a reduction in *F* of 87%.

The intent of the present analysis is to quantify changes in red snapper landings and discards associated with Amendment 17A management alternatives. These alternatives include a year-round closure of the recreational and commercial red snapper fisheries in South Atlantic (Cape Hatteras to Key West) Exclusive Economic Zone (EEZ) waters within the federal jurisdiction (3-200 miles). Additionally, because red snapper also are caught (as bycatch) when fishing for other species (particularly other snapper and grouper species) and because considerable mortality results from the bycatch (estimated at 40% of harvest for recreational red snapper fishing activities), modifications to the management regime for the entire South Atlantic snapper-grouper complex also will have to be instituted. Alternatives under consideration include:

Alternative 1 (Status quo)-This would continue the 20 inch size limit (commercial & recreational) and the recreational 2 fish bag limit (included in the 10 snapper per person limit).

Alternative 2-Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

Alternative 3-Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180 between a depth of 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m). Allow black sea bass harvest, possession, and retention in the closed area if fish were harvested with black sea bass pots with endorsements. Allow golden tilefish harvest, possession, and retention in the closed area. Allow harvest, possession, and retention

of snapper grouper species in the closed area if fish were harvested with spearfishing gear. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

Alternative 4-Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279 between a depth of 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m). Allow black sea bass harvest, possession, and retention in the closed area if fish were harvested with black sea bass pots with endorsements. Allow golden tilefish harvest, possession, and retention in the closed area. Allow harvest, possession, and retention of snapper grouper species in the closed area if fish were harvested with spearfishing gear. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

Alternative 5-Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180. Allow black sea bass harvest, possession, and retention in the closed area if fish were harvested with black sea bass pots with endorsements. Allow golden tilefish harvest, possession, and retention in the closed area. Allow harvest, possession, and retention of snapper grouper species in the closed area if fish were harvested with spearfishing gear. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

Alternative 6-Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279. Allow black sea bass harvest, possession, and retention in the closed area if fish were harvested with black sea bass pots with endorsements. Allow golden tilefish harvest, possession, and retention in the closed area. Allow harvest, possession, and retention of snapper grouper species in the closed area if fish were harvested with spearfishing gear. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

Alternative 7-Modify the bag and/or size limit.

Sub-alternative 7a-Remove the existing commercial and recreational 20 inch size limit.
Sub-alternative 7b-Reduce the bag limit to 1.

Alternative 8-Allow transit.

Sub-alternative 8a-The prohibition on possession does not apply to a person aboard a vessel that is in transit with fishing gear appropriately stowed.
Sub-alternative 8b-The prohibition on possession does not apply to a person aboard a vessel that has snapper grouper species onboard if the vessel is in transit.

Sub-alternative 8c-The prohibition on possession does not apply to a person aboard a vessel that has wreckfish onboard if the vessel is in transit.

Methods

Identification and categorization of headboats

Headboat landings data provided by the Southeast Fisheries Science Center (SEFSC), Beaufort Laboratory, were used to determine the magnitude and geographic location of red snapper headboat landings during 2005-2007 along the southeast coast of the United States. Landings in both numbers and pounds are typically summarized based on statistical areas of fishing (Table 1). These statistical areas provide insufficient geographic resolution for evaluating the effects of Amendment 17A, so landings were further summarized by logbook grid (LG) and inlet to provide finer spatial resolution. Landings were assigned by vessel and year using the location of the inlet from which each headboat departed on a fishing excursion, following Williams et al. (2009). A total of 63 headboats reported red snapper landings during 2005-2007 in South Atlantic statistical areas 1-17. These vessels berth in ports located between Cape Hatteras, North Carolina and Key West, Florida. For those vessels that reported red snapper landings, the home port and assigned inlet fields were complete. In a few instances, the home port of the vessel was a considerable distance from the assigned inlet. Additionally, some vessels share a berthing port but utilize different routes to the sea and therefore different inlets for their departure. In all cases, port agent information was used to assign and verify departure inlets (Brennan, pers. comm.).

Determining fishing location, and in particular the LG of fishing, was more complex. Headboat operators report fishing location at two levels of resolution, coarsely by LG (boxes defined by latitude and longitude coordinates to the nearest hour) and at a finer scale of resolution using a subgrid embedded within each LG. The LG are squares defined by points of latitude and longitude and with sides of length 1^{o} latitude x 1^{o} longitude. Each LG originates from and is named according to the latlong coordinate in the lower right corner of the LG. LGs are further subdivided into a subgrid consisting of thirty-six 10 minute by 10 minute units. Units are denoted along the latitudinal transect by the numbers 1-6, with number 1 most northerly and number 6 most southerly, and along the longitudinal transect by the letters A-F, with the letter A most westerly and the letter F most easterly. Thus, the box F6 within LG 3280 would represent the area encompassed by 32^{o}00’ N to 32^{o}10’N latitude and 80^{o}00’W to 80^{o}10’W longitude.

Table 1. South Atlantic headboat statistical areas.

Area	Description
1	Hatteras, NC offshore
2	Cape Fear, NC inshore
3	Cape Fear, NC offshore
4	South Carolina inshore
5	South Carolina offshore
6	Georgia
7	NE Florida (St. Augustine, FL - Jekyll Island, GA)
8	East Central, FL (Ponce Inlet-Sebastian)
9	Cape Lookout, NC inshore
10	Cape Lookout, NC offshore
11	SE FL (Ft. Pierce-Miami)
12	FL Keys, Atlantic based vessels
14	North FL (general)
17	Dry Tortugas (Atlantic/Keys based vessels)

On average during 2005-2007, over 85% of headboats provided complete information on location fished during individual trips (Table 2), leaving a three-year average of almost 15% of trips that reported incomplete fishing location information or reported no location information at all. For those who reported incomplete information, the oversight involved failure to report subgrid location information. Additionally, a small component of the incomplete data involved inaccurate coordinates (e.g., LG location information was on land or far to sea). Location information is also not available for many vessels that did not provide logbook reports during 2005-2007.

Table 2. Percentage of catch records that reported red snapper with a complete location field (Complete), partially filled out location field (Incomplete), or missing location field (None) for headboats operating in the South Atlantic (Source: Williams et al. 2009, Table 1).

	Landings Location Information		
Year	None	Incomplete	Complete
2005	10.0%	6.7%	83.3%
2006	7.1%	5.8%	87.1%
2007	4.7%	9.4%	85.9%
2005-07 avg.	7.2%	7.4%	85.4%

For those vessels and dates for which we did not have complete landings locations, we undertook a hierarchical approach to assigning those landings to statistical grids. If the landings location data were complete and all landings were reported, then complete landings locations were used to assign landings by vessel, year, and month. If the landings location were

complete but some locations were inaccurate (e.g., assigned to a location on land), then landings reported to inaccurate landings locations were reassigned based on the complete landing location information reported for that vessel from other trips. In cases where the vessel reported complete landings information for some but not all trips, the landings were assigned to LG by vessel, year, and month using the complete landings location information that was provided. Reported landings were then re-scaled to account for unreported landings. If an individual vessel reported incomplete or no landings location information, the location classification hierarchy was as follows:

1) if complete location information was provided for any one year, that location information was used to assign landings from years for which no location information was provided;
2) if no landings location information was provided for the entire 2005-2007 period, then location data from 2008 was used as a proxy;
3) if no 2008 data were available, location information was derived from a similar vessel operating from the same inlet;
4) if no location data were available and no proxy vessel existed, then the landings were assigned to the LG nearest to the departure inlet (applied to vessels in SE Florida primarily).

Estimation of discards

Fish that are caught but not kept (i.e., discards) also must be accounted for when determining total mortality rates (harvest + dead discards). To estimate the number and weight of discards contributed by the headboat industry, we applied the ratio of discarded to kept fish (in numbers) derived from the Marine Recreational Fisheries Statistical Sampling (MRFSS) program (Table 3). We then multiplied this ratio by the number of red snapper landed by headboats and converted numbers of discards to weight of discards using the average discard weight data available from the Southeast Fisheries Science Center red snapper projections (2009). Total dead discards were then estimated by applying a release mortality rate of 40%. To evaluate the sensitivity of different discard mortality rates, we conducted analyses using discard mortality rates ranging from 30% to 50%.

Table 3. Estimated headboat discards in numbers and pounds based on MRFSS discard to landings ratios and average discard weight data from SEFSC (2009).

	MRFSS			Avg. discard	Headboat		
Year	# landed	# discarded	discards/landings	weight	# landed	# discarded	discards (lbs)
2005	35028	124044	3.54	1.48	8907	31542	46799
2006	25655	133707	5.21	1.48	5945	30984	45970
2007	40775	453443	11.12	1.48	6889	76610	113665
2005-07	30342	237065	7.01	1.48	7247	46379	68811

Results

Of the 109 headboats operating in the South Atlantic region, 63 had landings of red snapper during 2005-2007. Of those 63 vessels, 23 reported complete landings location information during all years with reported landings and another four reported complete landings location information for at least 90% of their trips. Of those vessels failing to report complete landings location information for at least 90% of their trips, only 10 landed a total of more than 1,000 pounds of red snapper during the three-year period. The cumulative three-year total landings of red snapper reported by the 38 vessels with < 1,000 lbs of landings was 8,470 lbs, only slightly greater than 6% of the total red snapper landings by weight in the South Atlantic during 2005-2007. The cumulative three-year total landings of red snapper reported by vessels with no reported landing locations or no complete landings locations was 26,162 lbs, representing 19% of the total red snapper landings by weight in the South Atlantic during 2005-2007. Sixty-four percent of the landings with unreported or no landing location information were contributed by four vessels operating out of various South Atlantic states.

Two LGs (2880, 2980) accounted for more than 50% of the total landings by weight of red snapper in the EEZ region between Cape Hatteras and Key West. Another six LGs (3080, 3081, 3378, 3180, 3279, and 2780) contributed 39% of landings, with the remaining 18 LGs contributing 11% of the total landings. Results provided in Table 4 enabled analysis of landings data with regard to the various proposed management alternatives (Note: in some instances logbook grid landings have been aggregated to maintain confidentiality). We considered two general scenarios. The first scenario was the most conservative and presumed Amendment 16 would have no effect and no target trips would be eliminated as a result of Amendment 17A. The second scenario was the least conservative and presumed that enactment of Amendment 16 will eliminate trips landing 25 or more vermillion snapper and/or shallow-water grouper; those landings must have also accounted for at least 25% of the overall snapper/grouper landings on the trip (see SERO 2009a for further details). This second scenario also assumes that headboat trips landing one or more red snapper per angler will be eliminated due to Amendment 17A regulations. For each of the two scenarios, we then calculated the predicted total removals of red snapper, in pounds, and the percent reduction resulting from this new total removal estimate relative to the 2005-2007 total removals estimate. For each scenario, these calculations were made for discard mortality rates of 30%, 40%, and 50%.

Results from scenario one, for each of the three discard mortality rates, indicate that only Alternative 6 (complete red snapper closure plus closure of LGs 2880, 2980, 3080, 3179, 3180, 3278, and 3279 to all fishing) will achieve the desired reduction in red snapper total removals (Table 5). Moreover, this goal will only be achieved if the discard mortality rate is 30%, but will fall short if realized discard mortality rate is 40% or 50%.

For scenario two, results suggest that Alternative 5 (complete red snapper closure plus closure of LGs 2880, 2980, 3080, and 3180 to all fishing) will achieve the needed reduction in total removals (Table 6). This goal will only be achieved if the discard mortality rate is 30%, but will fall short if realized discard mortality rate is 40% or 50%. On the other hand, Alternative 6 will

achieve the needed reduction in total removals using discard mortality rates of 30%, 40%, or 50%.

Table 4. South Atlantic headboat red snapper 2005-2007 total landings by logbook grid (LG). Logbook grids have been aggregated in some instances to maintain confidentiality. Landings for logbook grids that have not been aggregated are from 3 or more vessels.

logbook grid	landings lbs	pct landings	cum pct landings
2980	41806	30.4%	30.4%
2880	27186	19.8%	50.1%
3179, 3180, 3279	16704	12.1%	62.3%
3080	13886	10.1%	72.4%
3081	10258	7.5%	79.8%
3378	8145	5.9%	85.8%
2780	6941	5.0%	90.8%
2679, 2779, 2879	3683	2.7%	93.5%
3277, 3278	3560	2.6%	96.1%
2481, 2482	2098	1.5%	97.6%
3475, 3476, 3575	1621	1.2%	98.8%
3280	722	0.5%	99.3%
2981	489	0.4%	99.6%
3377, 3477	260	0.2%	99.8%
2480, 2579, 2580, 2680	230	0.2%	100.0%

Table 5. Anticipated percent reduction in headboat red snapper removals associated with various Amendment 17A management alternatives and discard mortality rates (r = 0.3, 0.4, or 0.5). Reductions assume no effect from Amendment 16 and target trips will not be eliminated as a result of Amendment 17A.

A16 - no effect, r = 0.3

Alternative	Total Removals (lbs)	% Reduction
Alt 1	73387	0.0%
Alt 2	34402	53.1%
Alt 5	11832	83.9%
Alt 6	8625	88.2%

A16 - no effect, r = 0.4

Alternative	Total Removals (lbs)	% Reduction
Alt 1	73387	0.0%
Alt 2	45870	37.5%
Alt 5	15777	78.5%
Alt 6	11500	84.3%

A16 - no effect, r = 0.5

Alternative	Total Removals (lbs)	% Reduction
Alt 1	73387	0.0%
Alt 2	57337	21.9%
Alt 5	19721	73.1%
Alt 6	14376	80.4%

Table 6. Anticipated percent reduction in headboat red snapper removals associated with various Amendment 17A management alternatives and discard mortality rates (r = 0.3, 0.4, or 0.5). Reductions assume Amendment 16 will eliminate trips landing 25 or more vermilion snapper and/or shallow-water grouper, which account for at least 25% of the overall snapper-grouper landings on a trip (see SERO 2009a for further details). Reductions also assume headboat trips landing 1 or more red snapper per angler will be eliminated due to Amendment 17A regulations.

A16 - target trips eliminated, A17 directed trips eliminated, r = 0.3

Alternative	Total Removals (lbs)	% Reduction
Alt 1	73387	0.0%
Alt 2	26626	63.7%
Alt 5	9009	87.7%
Alt 6	6964	90.5%

A16 - target trips eliminated, A17 directed trips eliminated, r = 0.4

Alternative	Total Removals (lbs)	% Reduction
Alt 1	73387	0.0%
Alt 2	35501	51.6%
Alt 5	12013	83.6%
Alt 6	9286	87.3%

A16 - target trips eliminated, A17 directed trips eliminated, r = 0.5

Alternative	Total Removals (lbs)	% Reduction
Alt 1	73387	0.0%
Alt 2	44376	39.5%
Alt 5	15016	79.5%
Alt 6	11607	84.2%

Although red snapper in the South Atlantic are landed on headboats operating throughout the area between Cape Hatteras and Key West, the predominance of landings occur off north Florida and south Georgia, with a secondary center of abundance off South Carolina (Figure 1).

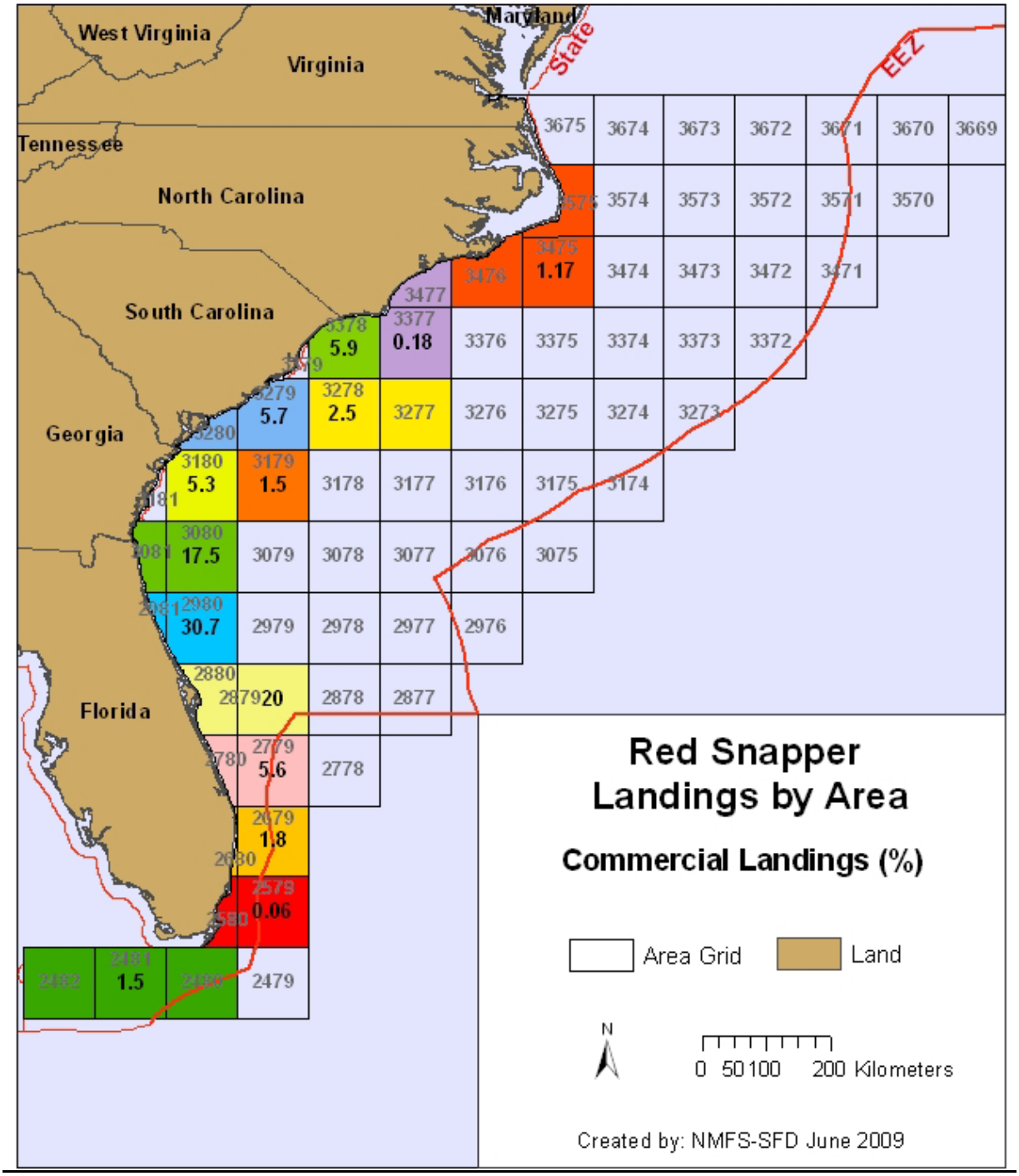

Figure 1. Percentage of headboat red snapper landings by logbook grid (LG). Logbook grids have been aggregated to maintain confidentiality.

Discussion

Red snapper in the South Atlantic are overfished and undergoing overfishing (SEDAR 2009), and several direct and indirect measures have been implemented (Amendment 13C, Amendment 16) or are being considered (Amendment 17A) to reduce take to a level that allows for rebuilding of the red snapper population. Previous analyses suggest that implementation of the regulations outlined in either Amendment 13C or Amendment 16 will not provide a sufficient magnitude of harvest reduction to achieve the needed reduction in red snapper total removals. It is apparent that more drastic harvest regulations will have to be applied to achieve the reduction goal. The alternatives proposed in Amendment 17A are designed to address the needed reductions in red snapper removals.

Analyses of headboat landings data, the outcomes of which are summarized in this document, indicate that two of the four alternatives that address area closures will achieve the desired reduction in total removals from the headboat sector. Implementation of Alternative 6, which assumes no substantial reduction in red snapper landings due to regulations implemented in Amendment 16, requires that seven LGs be closed to achieve the stated reduction. Alternative 5, assuming some contribution to reduced headboat landings from Amendment 16 and a 30% release mortality rate, predicts achievement of the reduction goal with closure of four LGs. In either case, those closures would take place in the area between Cape Canaveral and the central coast of South Carolina.

Both Alternative 3 and Alternative 4 also may achieve the necessary reductions, either in their present form or with some modification to the depth limits proposed in these two alternatives. However, predicting outcomes from these two alternatives is difficult because depth data is not reported in headboat catch files. SERO (2009b) assessed reductions from the commercial fishing sector in response to Amendment 13C, 16, and 17 provisions, but concluded that depth was an unreliable field because depth records were often unavailable and sometimes misreported.

Lastly, it should be noted that several assumptions were incorporated into our analyses. First, we consider that discards occur in the same proportional distribution as landings. We also assume that no effort shifting occurs from the closed areas, and that there is 100% compliance with the closed areas. Finally, we assume that average discard mortality remains unchanged (0.30, 0.40, or 0.50) even when areas of highest abundance and landings are closed. If compliance is less than 100% or effort shifting occurs, then reductions estimated in this report would be less optimistic. Similarly, if release mortality is lower than estimated by SEDAR 15 (2009), then reductions would be greater. Higher release mortality rates would result in lower reductions in overall removals.

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