

**Pelagic FMP Amendment 18  
Final SEIS**

**Appendix III**

**Observed Captures and Estimated Mortality of Sea Turtles in the  
Hawaii Shallow-set Longline Fishery, 2004-2007**

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MEMORANDUM FOR: William L. Robinson  
 Regional Administrator

FROM: Chris Yates *Chris Yates*  
 Assistant Regional Administrator

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 Assistant Regional Administrator

SUBJECT: Observed captures and estimated mortality of sea turtles in the  
 Hawaii shallow-set longline fishery, 2004-2007

The February 23, 2004, biological opinion on ‘Proposed Regulatory Amendments to the Fisheries Management Plan for the Pelagic Fisheries of the Western Pacific Region’ (Pelagics FMP BiOp) analyzed effects of the Hawaii shallow-set longline fishery on ESA-listed sea turtles. The BiOp’s incidental take statement (ITS) estimated the annual number of turtles expected to be captured or killed in this fishery (‘ITS Limits’ columns in Table 1 below). The ITS estimate of number killed was intended to include turtles that died after being hooked or entangled but before being brought on board, as well as projected post-hooking mortality of turtles that were captured alive and released. This memo summarizes the actual number of sea turtles that were captured in this fishery from when the fishery resumed in late 2004 to the end of 2007 (‘Actual # captured’ columns in Table 1), and provides an estimate of mortality resulting from these interactions (‘Estimated # killed’ columns in Table 1).

Table 1. Sea turtle interaction limits (ITS Limit columns) and total number of interactions by year for the Hawaii shallow-set fishery (individual interactions shown in Tables 2 – 5 below).

Species	Captured (# turtles)						Killed (# turtles)					
	ITS Limit	Actual # captured					ITS Limit	Estimated # killed				
		2004	2005	2006	2007	Total		2004	2005	2006	2007	Total
Loggerheads	17	1	12	17	15	45	3	0.25	2.70	3.61	2.65	9.21
Leatherbacks	16	1	8	2	5	16	2	0.15	1.26	0.60	1.55	3.56
Olive Ridleys	5	0	0	0	1	1	1	0	0	0	0.01	0.01
Greens	1	0	0	0	0	0	1	0	0	0	0	0
Hawksbills	0	0	0	0	0	0	0	0	0	0	0	0
Total		2	20	19	21	62		0.40	3.96	4.21	4.21	12.78

Although not specifically defined as such, interactions between the Hawaii shallow-set longline fishery and sea turtles are effectively limited to hooking, entanglement, or a combination of hooking and entanglement in the fishing gear. As used in Table 1, the word ‘captured’ refers to those interactions that result in a turtle being restrained by the fishing gear until it is observed by



the crew or the observer. 'Killed' is a subset of that group, consisting of turtles that were either observed or estimated to have suffered mortality as a result of the interaction.

The actual number of sea turtles captured in the fishery was determined with 100 percent observer coverage in 2004 - 2007, and each individual interaction is shown in Tables 2 – 5 below. All turtles captured in the fishery during this period were released (or escaped) alive. The likelihood of a captured turtle dying after being released (post-hooking mortality) was estimated based on the species, the type of injury, and the release condition of each turtle, as summarized in the footnotes for Table 2. These post-hooking mortality criteria were developed at the 2004 'Workshop on Marine Turtle Longline Post-Interaction Mortality' by a panel of experts, including representatives from the NMFS Office of Protected Resources and the Pacific Islands Fishery Science Center<sup>1</sup>.

There are two discrepancies between this memo and the annual Observer Program reports for sea turtle interactions in the shallow-set fishery:

1. In 2005 and 2006, the final tallies for total sea turtle interactions in this fishery (all sea turtle species combined) were given as 18 and 21, respectively, in the final Observer Program reports<sup>2</sup>. However, as shown above in Table 1, the actual tallies for 2005 and 2006 were 20 and 19 sea turtles captured, respectively. The discrepancy is due to the fact that observer reporting is based on arrival dates, and the final two loggerheads captured in 2005 were captured in December 2005, but did not arrive in port until January 2006.
2. The 2006 Observer Program annual report notes that two 'unidentified hardshells' were captured in the fishery. However, based on the observers' narratives on the data sheets, both were considered to be loggerheads and thus added to the final loggerhead tally for 2006.

The mortality estimates are not rounded to give whole numbers. This is because the total mortalities (and limits on them) are very low, often < 5 individuals, resulting in the difference in two whole numbers being a large percentage of the total. Thus, rounding may substantially understate or overstate mortality. For example, rounding down the 1.26 leatherbacks in 2005 would result in a mortality estimate of 1 turtle, an approximately 20 percent underestimate for a species that is critically endangered. Likewise, rounding up the 0.01 olive ridleys in 2007 would result in a mortality estimate of 1 turtle, a vast overestimate that also happens to be the annual limit.

During 2004 – 2007, the fishery captured a total of 45 loggerheads, 16 leatherbacks, 1 olive ridley, and no greens or hawksbills (Table 1). All turtles were released (or escaped) alive with various injuries and release conditions (Tables 2 – 5), resulting in total estimated mortality of

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<sup>1</sup> See Table 1 in Ryder et al. 2006 (Report of the Workshop on Marine Turtle Longline Post-Interaction Mortality, NOAA Technical Memorandum NMFS-OPR-29).

<sup>2</sup> Pacific Islands Regional Observer Program Shallow Set Annual Status Reports for 2005 and 2006. Pacific Islands Regional Office. National Marine Fisheries Service. [http://www.fpir.noaa.gov/OBS/obs\\_hi\\_ll\\_ss\\_rprts.html](http://www.fpir.noaa.gov/OBS/obs_hi_ll_ss_rprts.html)

9.21 loggerheads (20.5% estimated mortality rate of captured loggerheads), 3.56 leatherbacks (22.3% estimated mortality rate of captured leatherbacks), and 0.01 olive ridleys (estimated mortality rate not calculated due to one sample).

These estimates do not reflect the reproductive cost of the mortalities to the species as a whole or to individual sub-populations. For example, they do not take into account the sex, size, or age class of the turtles. The reproductive value of the turtles and the impact of their loss will be analyzed in subsequent NEPA and ESA analyses of the fishery.

Tables 2 – 5: Individual sea turtle interactions by year and species for Hawaii shallow-set longline fishery, 2004 – 2007.

<b>Table 2.</b> <b>2004</b>	Date of Interaction	Type of Interaction	Injury Category <sup>3</sup>	Release Condition <sup>4</sup>	Mortality Coefficient <sup>5</sup>
Loggerheads	11/30/2004	Hooked	III	D	0.25
<b>2004 Total Estimated Loggerhead Mortality:</b>					<b>0.25</b>
Leatherbacks	11/30/2004	Hooked	I	B	0.15
<b>2004 Total Estimated Leatherback Mortality:</b>					<b>0.15</b>

<sup>3</sup> Injury Categories from Table 1 of Ryder et al. 2006 (Report of the Workshop on Marine Turtle Longline Post-Interaction Mortality, NOAA Technical Memorandum NMFS-OPR-29):

- I. Hooked externally with or without entanglement.
- II. Hooked inside beak (ramphotheca).
- III. Hooked inside soft tissue of mouth where hook insertion point is visible.
- IV. Hooked in esophagus (or deeper) such that insertion point is not visible.
- V. Entangled only, no hook involved.
- VI. Comatose/resuscitated.

In some cases, injury category was ambiguous because turtle could not be examined, in which case a range of categories was assigned, and the mean mortality coefficient calculated.

<sup>4</sup> Release Condition from Table 1 of Ryder et al. 2006 (citation given in Footnote 1):

- A. Released with hook and trailing line  $\geq$  ½ carapace length.
- B. Released with hook and trailing line  $<$  ½ carapace length.
- C. Released with hook and entangled (line not trailing).
- D. Released with all gear removed.

<sup>5</sup> From Table 1 of Ryder et al. 2006 (citation given in Footnote 1): Mortality coefficient is a function of Injury Category and Release Condition, and varies between hardshell species and leatherbacks.

<b>Table 3.</b> <b>2005</b>	Date of Interaction	Type of Interaction	Injury Category	Release Condition	Mortality Coefficient
Loggerheads	1/27/2005	Hooked	III	D	0.25
	2/17/2005	Hooked	I	D	0.05
	2/18/2005	Entangled	V	D	0.01
	2/20/2005	Hooked	III	D	0.25
	2/21/2005	Entangled	V	D	0.01
	2/23/2005	Hooked	I	D	0.05
	2/24/2005	Hooked	II-III	D	0.175
	2/25/2005	Hooked	III	D	0.25
	3/20/2005	Hooked	I	D	0.05
	11/15/2005	Hooked	III	D	0.25
	12/10/2005	Hooked and Entangled	IV	C	0.85
	12/17/2005	Hooked	IV	B	0.50
	<b>2005 Total Estimated Loggerhead Mortality:</b>				
Leatherbacks	1/1/2005	Hooked and Entangled	I	D	0.10
	1/6/2005	Hooked	I	D	0.10
	4/23/2005	Hooked	I	B	0.15
	4/23/2005	Entangled	V	D	0.01
	5/4/2005	Hooked	I	A	0.30
	5/11/2005	Hooked	I	A	0.30
	6/30/2005	Hooked	I	D	0.10
	11/16/2005	Hooked	I	A	0.30
<b>2005 Total Estimated Leatherback Mortality:</b>					<b>1.26</b>

<b>Table 4.</b> <b>2006</b>	Date of Interaction	Type of Interaction	Injury Category	Release Condition	Mortality Coefficient
Loggerheads	1/7/2006	Hooked	I	D	0.05
	1/10/2006	Hooked	III	D	0.25
	1/19/2006	Hooked	I	D	0.05
	1/20/2006	Hooked	I	D	0.05
	1/25/2006	Hooked	I-II	D	0.075
	1/28/2006	Hooked	IV	B	0.50
	1/31/2006	Hooked and Entangled	I-II	D	0.075
	2/2/2006	Hooked	III	D	0.25
	2/2/2006	Entangled	V	D	0.01
	2/7/2006	Hooked	IV	B	0.50
	3/3/2006	Hooked	I	D	0.05
	3/5/2006	Hooked	IV	B	0.50
	3/7/2006	Hooked	III	D	0.25
	3/8/2006	Hooked	III	D	0.25
	3/10/2006	Hooked	I	D	0.05
	3/14/2006	Hooked	I	D	0.05
	3/16/2006	Hooked and Entangled	III-IV	A-C	0.65
<b>2006 Total Estimated Loggerhead Mortality:</b>					<b>3.61</b>
Leatherbacks	3/3/2006	Hooked	I	A	0.30
	3/17/2006	Hooked	I	A	0.30
<b>2006 Total Estimated Leatherback Mortality:</b>					<b>0.60</b>

<b>Table 5. 2007</b>	<b>Date of Interaction</b>	<b>Type of Interaction</b>	<b>Injury Category</b>	<b>Release Condition</b>	<b>Mortality Coefficient</b>
Loggerheads	2/2/2007	Hooked	I	D	0.25
	2/12/2007	Hooked	I	D	0.05
	2/19/2007	Hooked	III	D	0.25
	3/2/2007	Hooked	III	D	0.25
	2/17/2007	Hooked	I	D	0.05
	2/10/2007	Hooked	I	D	0.05
	3/3/2007	Hooked	III	D	0.25
	3/11/2007	Hooked	II-III	D	0.175
	3/26/2007	Hooked	I	D	0.05
	3/21/2007	Hooked	I	D	0.05
	3/31/2007	Hooked and Entangled	I	D	0.05
	3/30/2007	Hooked	III	D	0.25
	4/3/2007	Hooked	II-III	D	0.175
	5/2/2007	Hooked and Entangled	III	D	0.25
	8/8/2007	Hooked	IV	B	0.50
<b>2007 Total Estimated Loggerhead Mortality:</b>					<b>2.65</b>
Leatherbacks	1/5/2007	Hooked	I	A	0.30
	2/1/2007	Hooked	I	D	0.10
	4/4/2007	Hooked	I	B	0.15
	4/29/2007	Hooked	I	B	0.15
	4/29/2007	Hooked	III	C	0.85
<b>2007 Total Estimated Leatherback Mortality:</b>					<b>1.55</b>
Olive Ridleys	4/5/2007	Entangled	V	D	0.01
<b>2007 Total Estimated Olive Ridley Mortality:</b>					<b>0.01</b>

## RECOMMENDATION

Recommend that you concur with the final NMFS estimation of post-hooking mortality in the shallow set fishery 2004-2007.

*William J. Robinson*

2/1/2008

1. I concur. \_\_\_\_\_ (Date)

2. Let's discuss. \_\_\_\_\_ (Date)

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