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Science, Service, Stewardship



Application of the Ryder et al. (2006) memo in assessing post-release mortality of sea turtles in the Hawaii longline shallow-set fishery

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Biological Opinion - Effects of the Action

NMFS must assess the probable effects of the proposed action on listed species.

Exposure analysis- identifies the number of animals expected to be exposed to the stressors of a proposed action. In the case of the shallow-set fishery this equates to the number of animals that are expected to be hooked or entangled.

Response of animals from hooking or entanglement = mortalities resulting from exposure.



Number of turtles Exposed

Number of turtles potentially exposed to the proposed action is based on past turtle interactions reported by observer program.

All turtles caught in the shallow-set fishery have been released alive so in order to estimate the number of mortalities resulting from interactions each turtle is assessed using the Ryder et al. 2006 tech memo.

Observers recorded information on hooking/entanglement, injuries, how the turtle was handled, how the gear was removed, how much was left if unable to remove, took photos and sketches in most cases.

Species	Captured (# turtles)					
	Actual # captured					
	2004	2005	2006	2007	2008	Total
Loggerheads	1	12	17	15	0	45
Leatherbacks	1	8	2	5	2	18
Olive Ridleys	0	0	0	1	2	3
Greens	0	0	0	0	1	1
Hawksbills	0	0	0	0	0	0
Total	2	20	19	21	5	67

Total captures from 2004-2008
(100% observer coverage).



Criteria for assessing post-interaction mortality and percentages.

Injury Category	Release Condition			
	Released with hook and with trailing line greater than or equal to half the length of the carapace (line is trailing, turtle is not entangled)	Released with hook and with trailing line less than half the length of the carapace (line is trailing, turtle is not entangled)	Released with hook and entangled (line is not trailing, turtle is entangled ¹)	Released with all gear removed
	Hardshell (Leatherback)	Hardshell (Leatherback)	Hardshell (Leatherback)	Hardshell (Leatherback)
I Hooked externally with or without entanglement.	20 (30)	10 (15)	55 (65)	5 (10)
II Hooked in upper or lower jaw with or without entanglement. Includes ramphotheca, but not any other jaw/mouth tissue parts (see Category III).	30 (40)	20 (30)	65 (75)	10 (15)
III Hooked in cervical esophagus, glottis, jaw joint, soft palate, tongue, and/or other jaw/mouth tissue parts not categorized elsewhere, with or without entanglement. Includes all events where the insertion point of the hook is visible when viewed through the mouth.	45 (55)	35 (45)	75 (85)	25 (35)
IV Hooked in esophagus at or below level of the heart with or without entanglement. Includes all events where the insertion point of the hook is not visible when viewed through the mouth.	60 (70)	50 (60)	85 (95)	n/a ²
V Entangled only, no hook involved.	Released Entangled 50 (60)			Fully Disentangled 1 (2)
VI Comatose/resuscitated.	n/a ³	70 (80)	n/a ³	60 (70)



2005 Loggerhead Mortality

Date of Interaction	Type of Interaction	Location	Gear remaining	Injury Category	Release Condition	Mortality Coefficient
1/27/2005	Hooked	Tongue/glottis	None	III	D	0.25
2/17/2005	Hooked	Front flipper	None	I	D	0.05
2/18/2005	Entangled		None	V	D	0.01
2/20/2005	Hooked	Side of mouth	None	III	D	0.25
2/21/2005	Entangled		None	V	D	0.01
2/23/2005	Hooked	Front flipper	None	I	D	0.05
2/24/2005	Hooked	Mouth/unknown	None	II-III	D	0.175
2/25/2005	Hooked	Ingested	None	III	D	0.25
3/20/2005	Hooked	Front flipper	None	I	D	0.05
11/15/2005	Hooked	Side of mouth	None	III	D	0.25
12/10/2005	Hooked/Entangled	unknown	11.4 m	IV	C	0.85
12/17/2005	Hooked	Ingested	.5 in	IV	B	0.50
2005 Total Estimated Loggerhead Mortality:						2.70

Post-release mortality assessed by Snover and Smith (2008).



Mortality estimated by year

Species	Estimated # killed					
	2004	2005	2006	2007	2008	Total
Loggerheads	0.25	2.70	3.61	2.65	0	9.21
Leatherbacks	0.15	1.26	0.60	1.55	0.40	3.96
Olive Ridleys	0	0	0	0.01	0.15	0.16
Greens	0	0	0	0	0.05	0.05
Hawksbills	0	0	0	0	0	0
Total	0.40	3.96	4.21	4.21	0.60	13.38

Post-release mortality assessed by Snover and Smith (2008).



2008 Biological Opinion

- 45 Loggerhead Turtles caught in the shallow-set fishery from 2004-2008.
- Each turtle assigned a mortality coefficient using Ryder et al. and observer data. Total for all loggerhead turtles was 9.21.
$$9.21/45 = .205 * 100 = 20.5\% \text{ mortality rate.}$$
- Mortality rate applied to anticipated number of interactions to calculate proposed mortalities.
$$46 \text{ loggerheads anticipated} * 20.5\% \text{ mortality rate} \\ = 9.4 \text{ (round to 10) loggerhead mortalities}$$

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Questions?