Appendix D4: Counterfactual Estimate of the Impacts of ESA Regulation of US West Coast Swordfish Fisheries on Pacific Sea Turtle Bycatch

Science, Service, Stewardship

Counterfactual Estimates of the Impacts of ESA Regulation of U.S. West Coast Swordfish Fisheries on Pacific Sea Turtle Bycatch

NMFS Economics of Protected Species Workshop
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PR Economics Research Interests (1)

- Estimating rare event bycatch rates and predicting counts from incomplete observer samples (Kvamsdal and Stohs, AJAE 2013; Martin, Stohs and Moore, EA 2014)
- Metrics to compare protected species bycatch impacts across U.S. commercial fisheries (with Heidi Gjertsen and Heidi Dewar)
- Economic impacts of rare event bycatch management under hard caps

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PR Economics Research Interests (2)

- PR Regulatory Effectiveness
- Unintended consequences of unilateral domestic conservation regulation on transboundary protected species stocks
- Bren School project to consider alternatives for revitalizing the west coast commercial swordfish fishery

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Bycatch Comparisons

- How do protected species bycatch impacts compare across U.S. commercial fisheries?
- Possible equity issue (NS4: Do not discriminate between residents of different states; any allocation of privileges must be fair and equitable)
- CEA Consideration: Given scarce resources, where should bycatch conservation efforts be focused to best address known concerns?

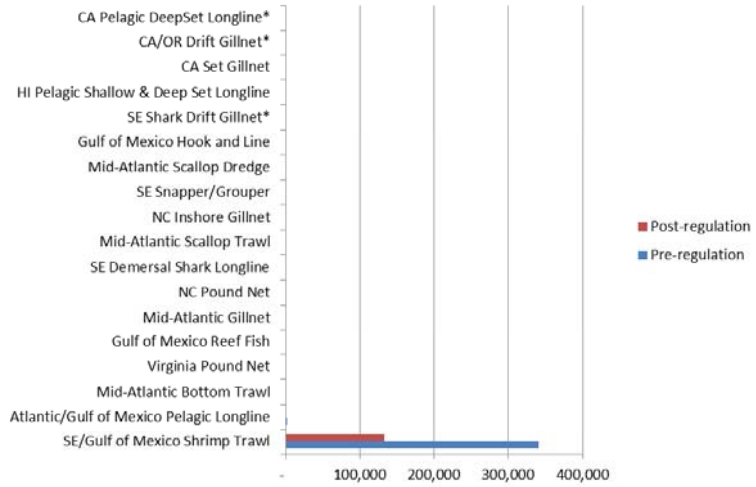
ESTIMATED ATLANTIC AND PACIFIC MEAN ANNUAL SEA TURTLE BYCATCH

Fishery	Pre-regulation	Post-regulation
SE/Gulf of Mexico Shrimp Trawl	340,500	133,400
Atlantic/Gulf of Mexico Pelagic Longline	1,600	1,400
Mid-Atlantic Bottom Trawl	1,100	600
Virginia Pound Net	600	600
Gulf of Mexico Reef Fish	600	600
Mid-Atlantic Gillnet	400	300
NC Pound Net	200	200
SE Demersal Shark Longline	200	200
Mid-Atlantic Scallop Trawl	100	100
NC Inshore Gillnet	100	100
SE Snapper/Grouper	100	100
Mid-Atlantic Scallop Dredge	300	90
Gulf of Mexico Hook and Line	10	10
SE Shark Drift Gillnet*	10	10
HI Pelagic Shallow & Deep Set Longline	700	100
CA Set Gillnet	10	10
CA/OR Drift Gillnet*	**30**	**10**
CA Pelagic DeepSet Longline*	10	10

*Figures of 10 on these lines are estimated upper bounds

Source: Table 4, Finkbeiner, E.M. et al., Biol. Conserv. (2011)

ESTIMATED ATLANTIC AND PACIFIC MEAN ANNUAL SEA TURTLE BYCATCH



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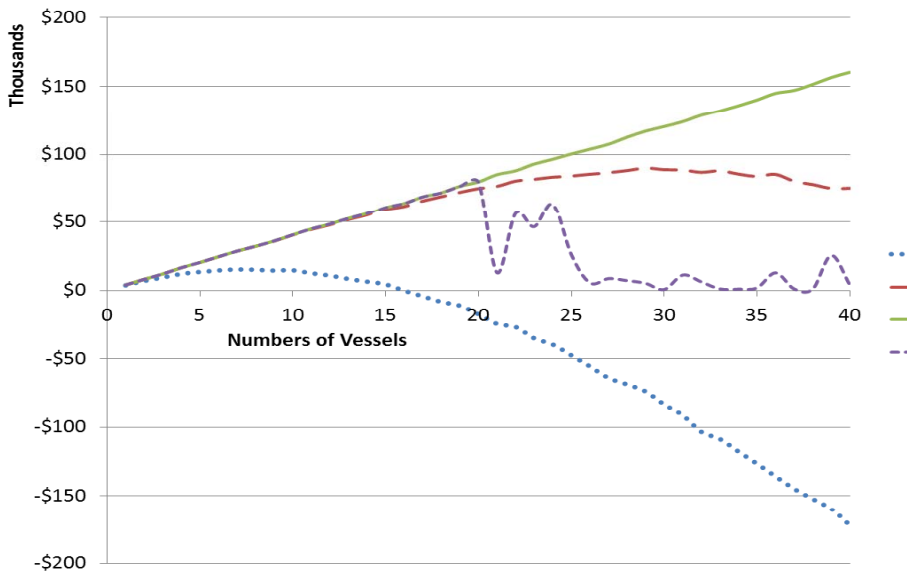
DGN Hard Cap Scenarios

1. Fixed number of 20 DGN vessels fishing, no caps
2. 1-year caps for ESA-listed species (leatherback, loggerhead, olive ridley and green sea turtles plus fin, humpback and sperm whales) with 100% observer coverage
3. 5-year rolling caps at 5X 1-year cap levels with 100% observer coverage
4. Conservation banking with upper limits of 2X 5-year cap levels and reversion to 1-year caps if bank balance is exhausted for a species; assumes 100% observer coverage
5. 5-year rolling caps with 30% observer coverage (estimate unobserved set takes at average rates observed since 2001)

Means of Simulated Potential Fleet Profits on Numbers of Vessels under Alternative Cap Polic



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Counterfactual: Background

- A 2001 ESA regulatory closure of the HI SSLL fishery led to numerous research efforts regarding the transfer effect on sea turtle bycatch
- ESA regulations in the west coast drift gillnet (2001) and shallow-set longline (2004) fisheries may have similarly generated sea turtle bycatch transfer effects

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Research Objective

- Use a counterfactual approach to estimate net sea turtle bycatch impacts of unilateral domestic regulation of west coast U.S. swordfish fisheries
- A counterfactual approach is necessary to estimate what would have occurred in the absence of regulation

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Harpoon

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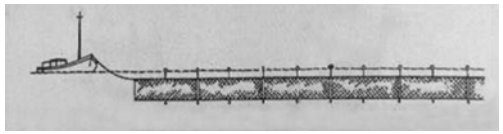
Drift Gillnet



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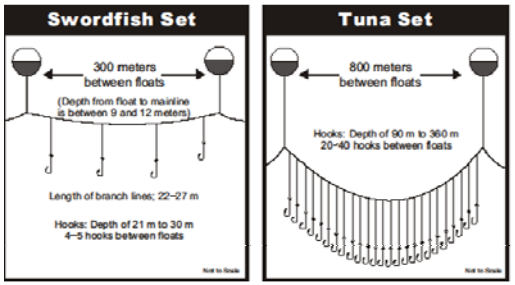
Longline



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ESA Regulation

- HI SSLL Closure 2001-2004; fishery reopened subject to gear standards
- DGN Time-Area Closure 2001-
- West Coast SSLL Closure 2004-

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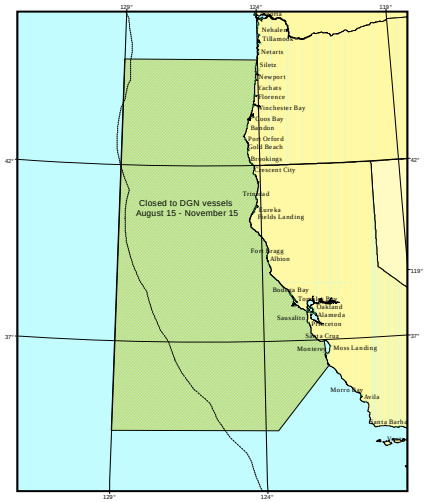
Leatherback Closure

- Established in 2001
- Annual closure 8/15-11/15
- No leatherback mortalities observed in fishery since the closure



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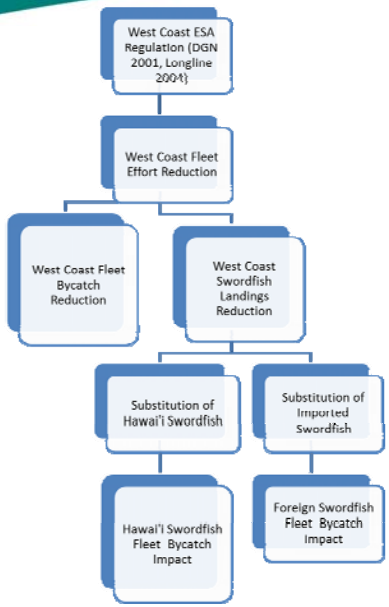
West Coast Impacts of U.S. Pacific Commercial Swordfish Regulation Changes



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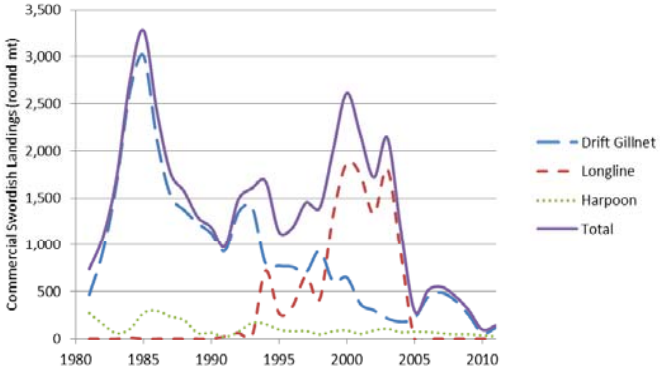
Commercial Swordfish Landings by HMS FMP Fishery (round mt), 1981-2011



Estimate of Longline Fisheries B/C Ratio

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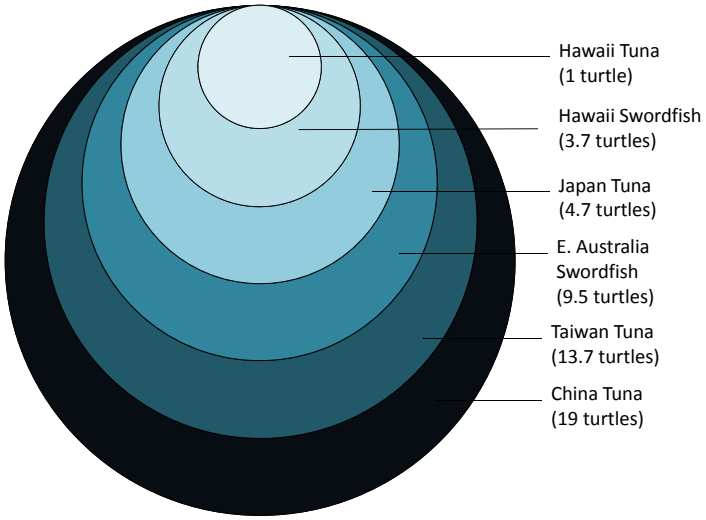
(sea turtle interactions per 190,000 kg of target fish)



Source: Bartram, P, J Kaneko and K Nakamura. 2010. Sea Turtle Bycatch to Catch ratios for differentiating longline –caught seafood products. *Marine Policy.* 34: 145-149.

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Table 1. Observed Sea Turtle Bycatch per 100 Metric Tons of West Coast Swordfish Landings

Fishery	Period	Leatherback	Loggerhead	All Turtle Species
Drift Gillnet	Pre-regulation[1]	2.32	1.71	4.23
	Post-regulation[2]	0.52	0.52	1.04
Shallow-set Longline	Pre-regulation[3]	0.57	14.00	14.85
	Post-regulation[4]	1.10	0.46	1.56

[1]Pre-2001 seasons

[2]Post-2000 seasons

[3]Pre-2005 seasons

[4]Post-2004 seasons

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Table 2. Leading California Import Sources by Pre- and Post-regulation Weight Share

	1997-2004	2005-2012	Change
MEXICO	11.9%	18.0%	6.1%
PANAMA	0.2%	4.4%	4.2%
NEW ZEALAND	3.5%	6.8%	3.3%
CHILE	2.2%	4.9%	2.7%
INDONESIA	1.6%	4.2%	2.6%
ECUADOR	0.9%	2.8%	1.9%
COSTA RICA	0.9%	2.2%	1.3%
VIETNAM	1.0%	1.9%	0.9%
AUSTRALIA	5.4%	3.7%	-1.7%
JAPAN	2.4%	0.4%	-2.0%
CHINA - TAIPEI	5.4%	1.0%	-4.3%
SINGAPORE	63.2%	46.7%	-16.5%
SHARE OF TOTAL	98.4%	97.1%	

Top Ten 1997-2004, Not 2005-2012

Top Ten 2005-2012, Not 1997-2004

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Sea Turtle Bycatch per 100 mts of Swordfish for Major Sources of CA Supply

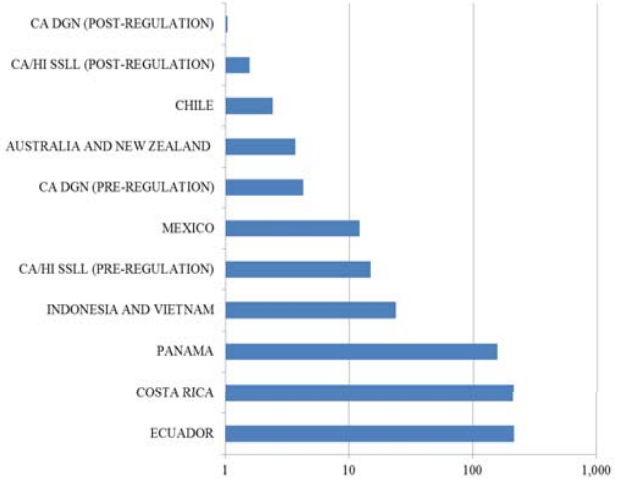

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Table 3. Weighted Average Turtle Bycatch Rate due to Import Transfer Effect

Source Country	Post-regulation CA Import Share	BPUE	CPUE	All Turtle Species B/C Ratio
MEXICO	18.0%	0.125	1.04	12.02
AUSTRALIA AND NEW ZEALAND	10.6%	0.0175	0.48	3.65
INDONESIA AND VIETNAM	6.1%	0.1904	0.80	24
CHILE	4.9%	0.025	1.04	2.40
PANAMA	4.4%	1.250	0.80	156
ECUADOR	2.8%	1.725	0.80	216
COSTA RICA	2.2%	1.700	0.80	213
	49.0%		Average	44.1

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Summary

- Commercial swordfish effort on the West Coast has been heavily regulated since the 1990s to reduce protected species bycatch impacts
- Available data shows far higher sea turtle bycatch rates per unit of SWO production than for west coast fleets, post-regulation
- A SIDS estimate of west coast SWO demand indicates substitution of imports for west coast DGN and SSLL SWO landings
- Preliminary results suggest a net increase in sea turtle bycatch due to ESA regulation