Agenda Item E.3.a
Supplemental HMSMT PowerPoint
(Electronic Only)
June 2015

HMSMT Report on Swordfish Management and Monitoring Plan

Agenda Item E.3.a

Pacific Fishery Management Council

June 2015 Meeting

Overview

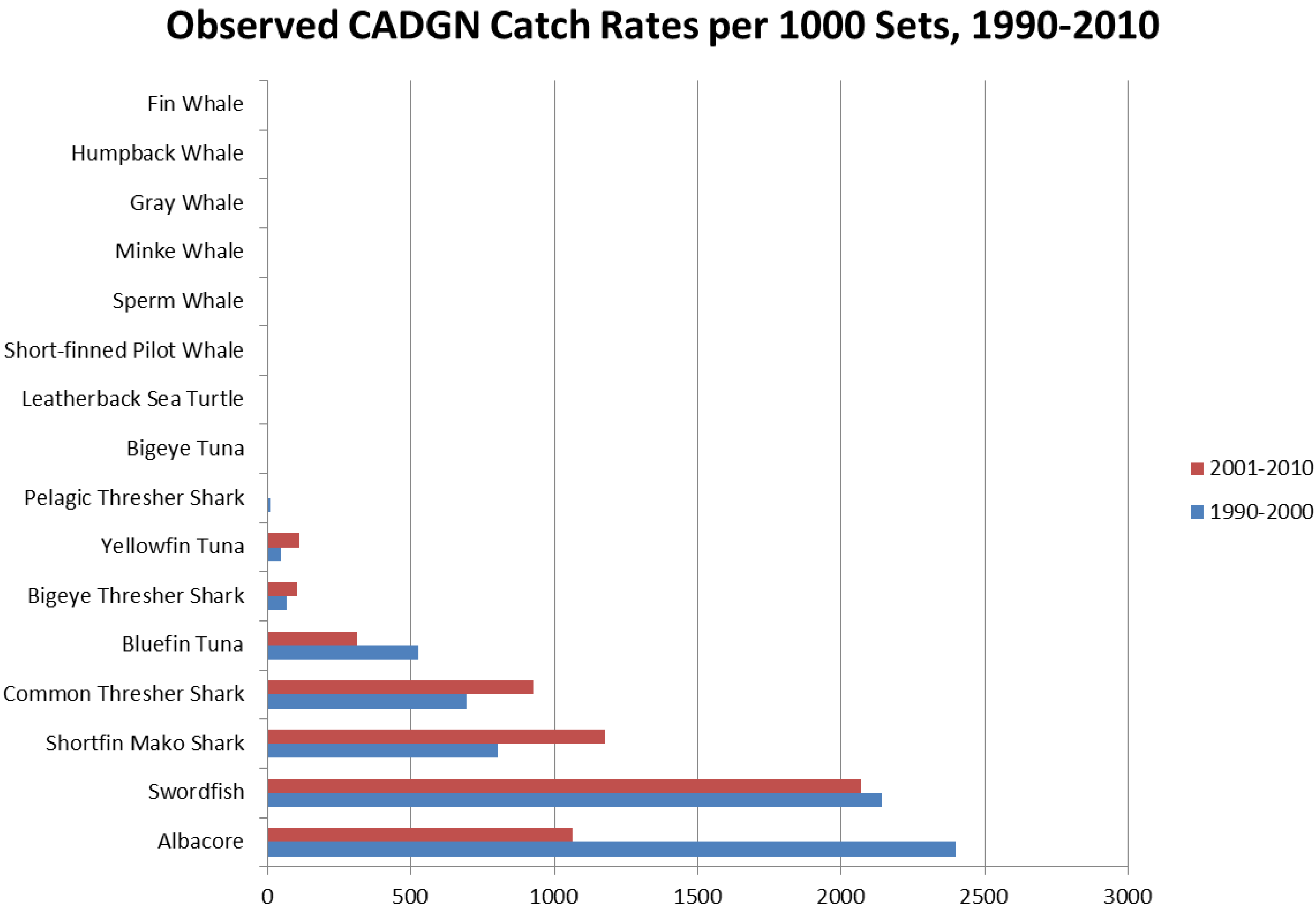
- Briefing Book HMSMT Report
  - Updates the description and evaluation of the Plan
  - Addresses questions from March 2015 Council deliberations regarding rare event bycatch
- Supplemental HMSMT Report
  - Provides input from the May 2015 Swordfish Meeting
  - Describes a potential alternative for two-year caps
  - Includes finfish bycatch tables
  - Summarizes HMSMT discussion of bootstrap results
  - Offers guidance on future workload planning
  - Suggests clarifications on the effects of 100% observer coverage and electronic monitoring

What is a Rare Event?

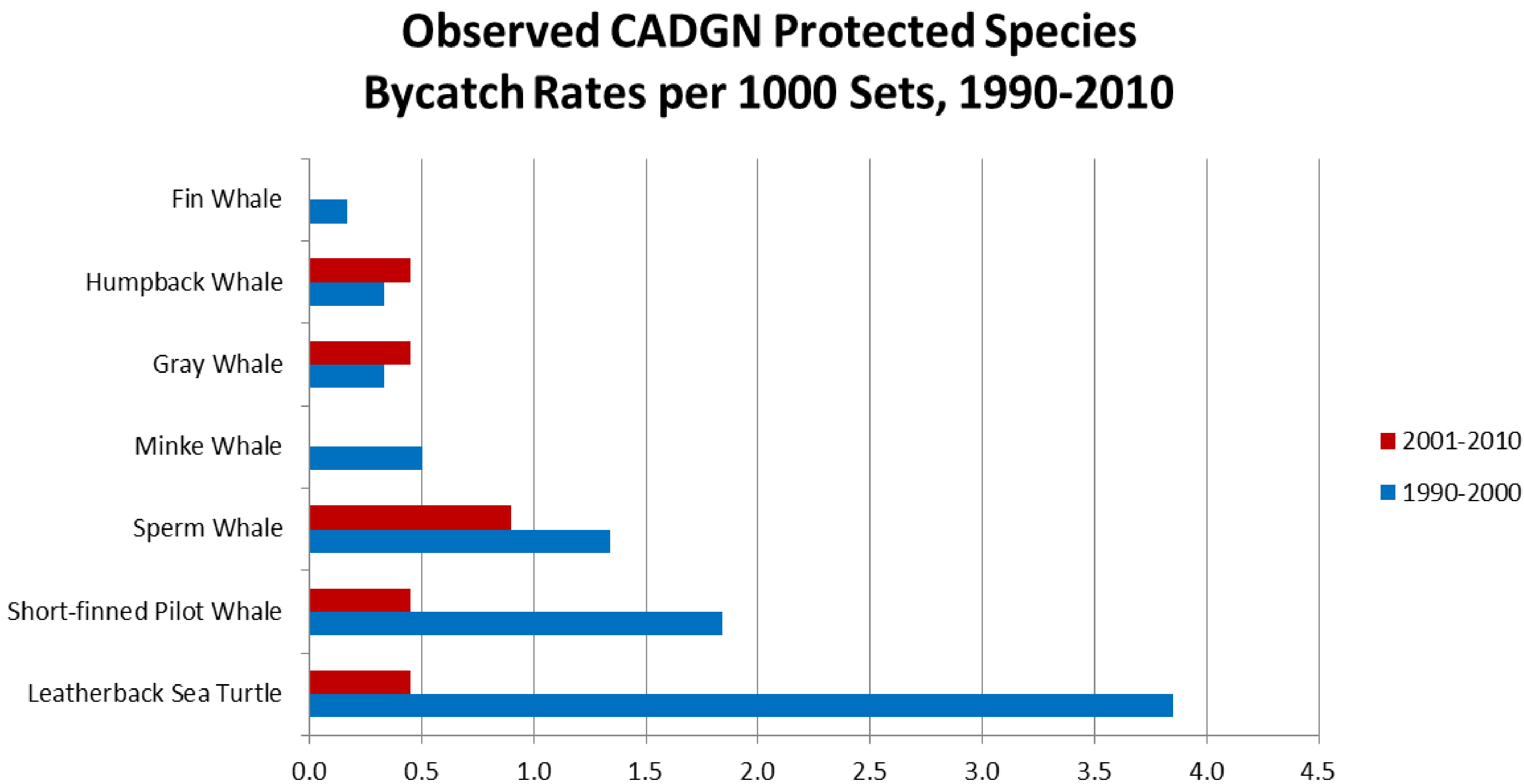
- Infrequent occurrence
- Long intervals between incidents (average number of sets between interactions is on the order of 100 or more)
- A given set has a very high probability of zero takes, a low probability of one or more takes, and extremely low incidence of many takes (e.g. all sets of DGN fishing with a leatherback or humpback interaction had a single interaction)
- Resulting estimation challenges:
  - Very large sample sizes required to estimate rates of interaction or mortality & serious injury
  - Ratio estimators from a single season’s data have large CVs

TABLE 5. Ratio estimates calculated for total takes and mortality of leatherback turtles (see Fig. 3b, c), along with previously published (indicated by †) ratio estimates and coefficients of variation.

	Total takes			Total mortality		
Year	Ratio estimate	Ratio estimate†	CV†	Ratio estimate	Ratio estimate†	CV†
1990	22	23	0.97	22	23	0.97
1991	10	10	0.94	0	0	-
1992	36	29	0.46	22	15	0.65
1993	15	22	0.53	15	15	0.66
1994	6	6	0.91	0	0	-
1995	33	32	0.47	27	26	0.55
1996	15	-	-	15	25	0.63
1997	18	-	-	9	8	0.85
1998	0	-	-	0	-	-
1999	9	-	-	0	-	-
2000	0	-	-	0	-	-
2001	0	-	-	0	-	-
2002	0	-	-	0	-	-



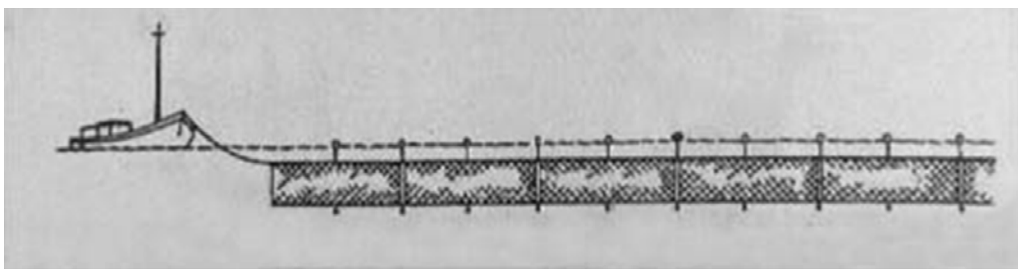
Observed CADGN Catch Rates per 1000 Sets, 1990-2010
Fin Whale
Humpback Whale
Gray Whale
Minke Whale
Sperm Whale
Short-finned Pilot Whale
Leatherback Sea Turtle
Bigeye Tuna
Pelagic Thresher Shark
Yellowfin Tuna
Bigeye Thresher Shark
Bluefin Tuna
Common Thresher Shark
Shortfin Mako Shark
Swordfish
Albacore
0
500
1000
1500
2000
2500
3000
2001-2010
1990-2000


Observed CADGN Protected Species
Bycatch Rates per 1000 Sets, 1990-2010
Fin Whale
Humpback Whale
Gray Whale
Minke Whale
Sperm Whale
Short-finned Pilot Whale
Leatherback Sea Turtle
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
2001-2010
1990-2000

Martin et al. Paper

- Model dependence of observed counts on effort and bycatch rate per unit effort (BPUE)
- Use a Poisson model to account for random factors that affect observed bycatch counts
- Develop and demonstrate method that utilizes prior years' observer data
- Use Bayesian integration of prior observations to produce stable bycatch rate estimates
- Predict unobserved bycatch counts or rates for a given level of unobserved fishing effort

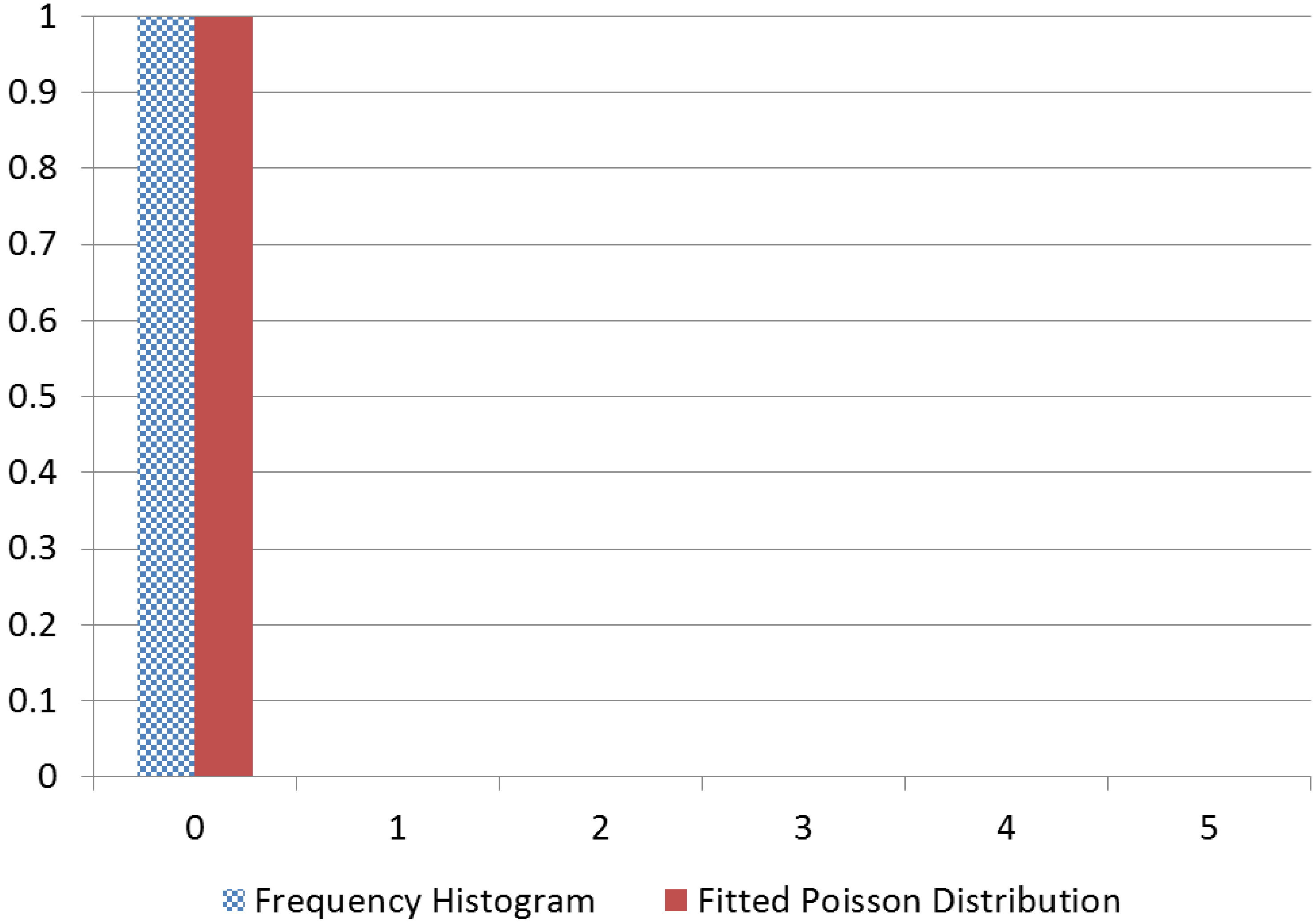
Case Study in the Paper: Large Mesh (HMS) Drift Gillnet Fishery



Poisson Distribution

- Standard probability model for rare event counts
- Fits set-level leatherback and humpback take data very well (perhaps not surprising!)
- Not ideally suited for modeling species with a potential for multiple takes on one set (e.g. sperm whales)

Comparison of Non-PLCA Leatherback Interactions to Fitted Poisson Probabilities



Potential Management Uses

1. Explicitly model stochastic dependence (“observation error”) of interaction and M/SI counts on effort and BPUE
2. Quantify uncertainty in estimates based on rare event bycatch data to the extent possible
3. Probability-based estimates of bycatch and mortality rates
4. Use of posterior predictive distribution for effort-based fishery management at under 100% observer coverage
5. Manage rare event bycatch under an effort limit as an alternative to hard caps
6. Model-based approach to EFP power analysis
7. Predict a range of potential bycatch for given effort level and bycatch rate per unit effort

Two-year Caps

Species	Observed Entanglement Cap*	Estimated Annual Take**	OBSERVED NUMBER OF TAKES													
			00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
Fin whale	0.6 (1)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale	0.6 (1)	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Sperm whale	0.6 (1)	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Leatherback sea turtle	0.9 (1)	3	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Loggerhead sea turtle	0.9 (1)	3	0	1	0	0	0	0	1	0	0	0	0	0	0	0
Olive ridley sea turtle	0.6 (1)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green sea turtle	0.6 (1)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-fin pilot whale C/O/W	1.5 (2)	5	0	0	0	1	0	0	0	0	0	0	0	0	0	2
Common bottlenose dolphin C/O/W	1.8 (2)	6	0	0	0	0	0	0	0	0	0	0	1	0	0	0
		Estimated number of sets:	*1,953*	*1,678*	*1,673*	*1,433*	*1,022*	*1,075*	*1,353*	*998*	*1,060*	*832*	*396*	*525*	*408*	*559*
	Highest average annual take		***0.5***		***0.5***		***0.5***		***0.5***		***0.5***		***1***		***1***	
	Would the fishery close?		***NO***		***NO***		***NO***		***NO***		***NO***		***YES***		***NO***	

Fixed or Rolling?

Biennial Period	1		2	
Season	1	2	3	4
Hypothetical Takes	1	1	1	0
Fixed 2-year Period	1	2	1	1
Rolling 2-year Window	1	2	2	1

Bootstrap Results (Table 16)

	Alternative 4: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	369	472	539	607	710	535	[illegible]17
Total Revenues	$501,190	$647,803	$743,236	$843,428	$992,493	$739,258	$169,558
Total Profits	-$7,979	$74,122	$126,075	$180,998	$265,785	$124,395	$93,013
Average Profits	-$399	$3,706	$6,304	$9,050	$13,289	$6,220	$4,651
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	0	2	0.44	0.94
Short-fin Pilot Whales	0	0	[illegible]	1	2	0.63	0.78
Bottlenose Dolphins	0	0	0	0	1	0.21	0.46

	Alternative 5: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	12	50	134	508	646	266	[illegible]40
Total Revenues	$3,160	$32,323	$121,661	$699,873	$893,355	$344,768	$349,972
Total Profits	-$253,399	-$247,782	-$215,299	$102,875	$211,958	-$83,982	$185,367
Average Profits	-$12,670	-$12,389	-$10,765	$5,144	$10,598	-$4,199	$9,268
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	0	2	0.19	0.66
Short-fin Pilot Whales	0	0	[illegible]	0	2	0.32	0.61
Bottlenose Dolphins	0	0	0	0	1	0.09	0.31

Workload Considerations

Action	2015		2016						Earliest Potential Implementation
	Sep	Nov	Mar	Apr	Jun	Sep	Nov	Mar	
Authorizing SSLL Outside EEZ / DGN Federal Permit		Scoping	ROA/PPA			FPA			Fall 2017
Authorizing Deep Set Buoy Gear					Scoping		ROA/PPA	FPA	Fall 2017
DGN Hard Caps	FPA								2016 Fishing Season
EFPs			Preliminary EFP Reports			Final EFP Reports			n/a
Biennial Specs					Scoping	ROA	FPA		Mar 2017