

HMSMT Report on Drift Gillnet Fishery Hard Caps

Hard Cap



Boot Strap

Pacific Fishery Management Council meeting
June 12, 2022

Bootstrap Simulation for 2015 Hard Caps ROA

1. Used observer, landings, and cost data to construct the empirical distribution function (EDF) of observed DGN fishing experience
2. Resampled logbook data to simulate a fishing season's worth of effort for each vessel we expect to fish
3. Resampled observer, landings, and cost data to simulate catch, bycatch, landings, and revenues for each simulated season
4. For a given hard caps alternative, figured out when the closure would apply within the simulated season, and summarized economic and bycatch outcomes at the point when the season ended
5. Over many simulated seasons, obtained simulated distributions of capped species interactions and economic performance

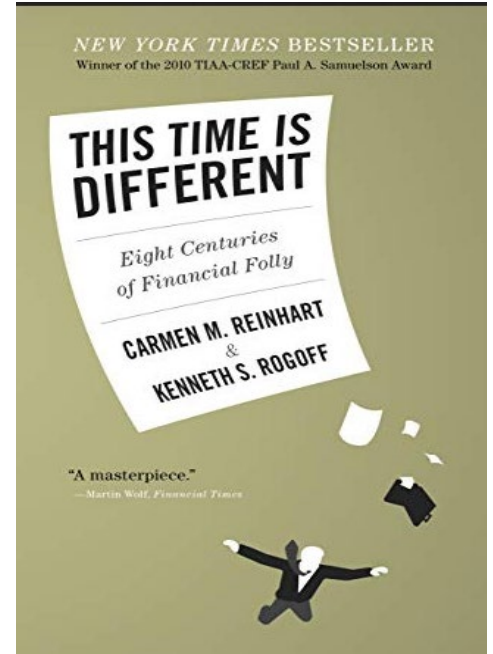
Proposed Updated Approach

- The previous approach with updated data should be applicable to analyze Alternative 1 No Action and Alternative 2 Council 2015 FPA
- The methodology needs to be extended to include Alternative 3: In-Season Individual Vessel and Fleetwide Closures



Requirements for Alt. 3

- Last time:
 - All closures were fleetwide
 - No special rules applied to unobservable vessels
 - Closure lengths did not depend on date a cap was reached
- **THIS TIME IS DIFFERENT!**
- Necessary adjustments to bootstrap methodology:
 - Need to model individual vessels to capture partial-fleet closures
 - Use day in season to capture date-dependent closure lengths
 - Assumed # of unobservable vessels subject to individual closures (easiest to assign or randomly draw before constructing a simulated season)



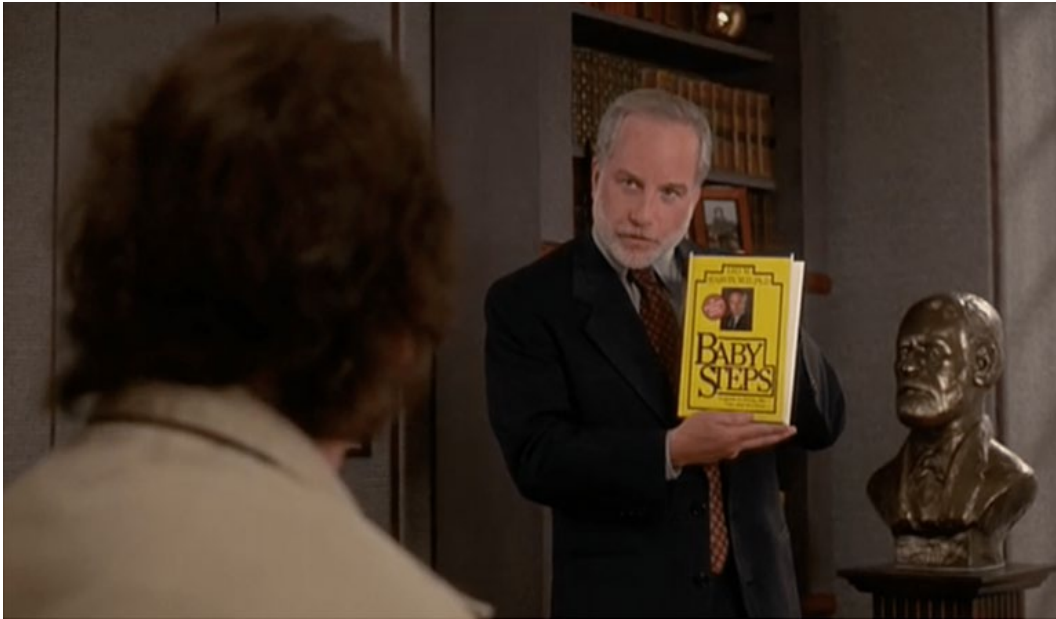
Observed/unobserved, observable/unobservable

- At any given point in time a vessel may be “observed” meaning it is carrying a fishery observer, “observable but unobserved” meaning it is capable of carrying an observer but is not carrying one, or “unobservable” meaning it is incapable of carrying an observer.

- QUESTIONS?!



Updating the Previous Analysis: Baby Steps



Updating the Previous Analysis: Details (Done / To do)

- 1) Clean up old code to only retain analysis of Alternative 1: No Action and Alternative 2: The Council 2015 FPA
- 2) Create a duplicate copy of the old code for developing new analysis
- 3) Add placeholders for Alternative 3: In-Season Individual Vessel and Fleetwide Closures
- 4) Compare Alternative 1 and 2 results from old and new loop method, (s/b nearly the same)
- 5) Build in elements needed to support analysis of Alternative 3 Options A-C
 - a) Include vessel number in simulated season data structure ('VesNum')
 - b) Observable vessel indicator ('Observable' = TRUE if observable, FALSE if unobservable)
 - c) Observed vessel indicator ('Observed' = TRUE if observed, FALSE if not)
 - d) Translate days since May 1 (in data) into dates when caps change (e.g. November 1 = 184)
 - e) Bump up coverage level for observable vessels to simulate 25% fleetwide level
- 6) Build in analysis of new Alternative 3
 - a) Track cumulative progress towards reaching individual caps for observed vessels & capped species
 - b) Track cumulative progress towards reaching fleet caps relative to appropriate date (e.g. November 1 for Alt 3 Opt C Sub-opt II, otherwise from beginning of season)
 - c) Use a 'Fishing' indicator variable to indicate which days in a simulated season are open under each alternative
 - d) For alternatives that span multiple seasons (Alt 2, Alt 3 Opt C Sub-opt II), add logic to implement multi-season closure
- 7) Summarize and compare results across alternatives
 - a) Track fleet-level results (same as previous approach)
 - b) Future work to consider: Track results by vessel groupings, if desired. Possible comparisons:
 - i) Unobservable versus observable vessels, to see whether there is a differential economic impact on unobservable vessels
 - ii) Vessels that hit a cap versus vessels that don't hit a cap, to compare incentives across alternatives
- 8) Update data through the 2021-2022 season (for completeness, unlikely to significantly change results)

Review of HMSMT Report 1

- The report presents results for a preliminary bootstrap analysis of Alternatives 1 and 2
- Results are given for the three effort scenarios
- Also includes background, technical details of the analysis, and a summary of next steps needed to complete an analysis of the five sub-options of Alternative 3

Figure 3. Violin plot showing the distribution of ex-vessel revenue across bootstrap replicates for Alternatives 1 and 2 under Scenario 2.

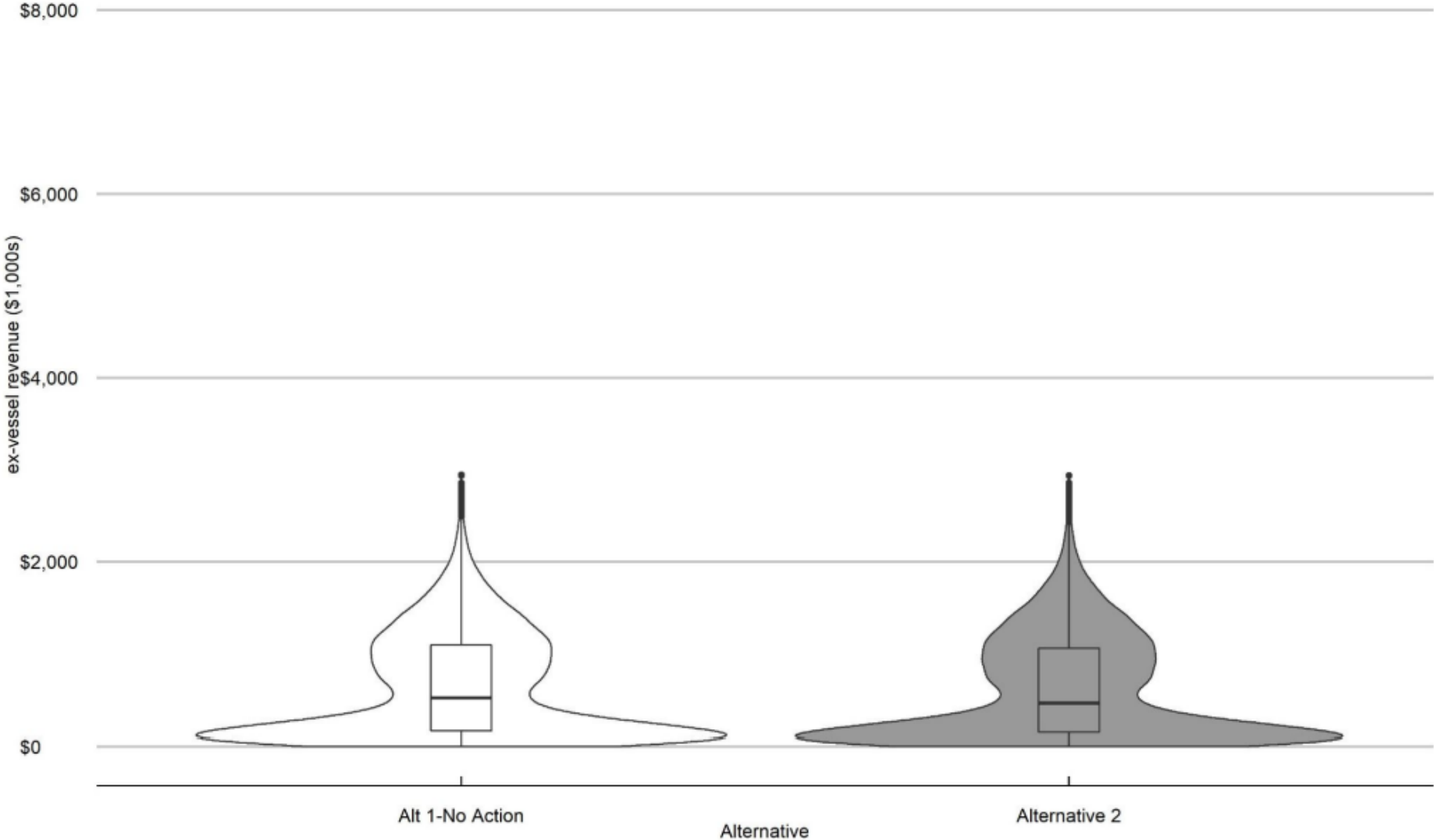
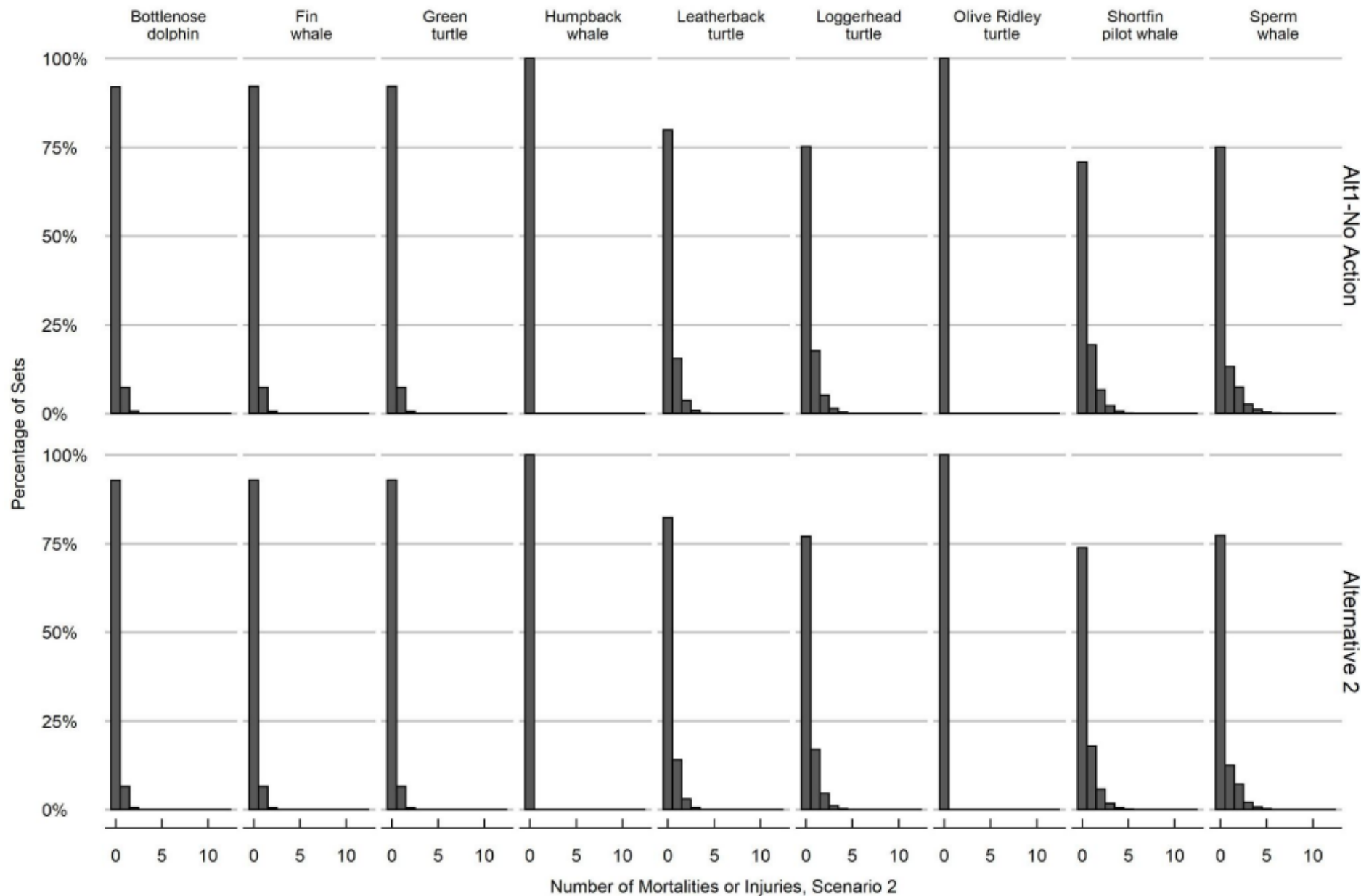


Figure 4. Distributions of hard cap species mortality/injury under Alternatives 1 and 2 for Scenario 2.



Model Parameters in Updated Analysis

- Data for the reboot
 - Start w/ 1990-91 or 2001-02 season as before, end in 2020-21
- Vessel Effort Scenarios (Total / Observable / Unobservable)
 - Scenario One: 2 / 1 / 1
 - Scenario Two: 11 / 7 / 4 (*baseline assumption*)
 - Scenario Three: 30 / 24 / 6
- Assume 25% fleet-wide observer coverage
- Not practicable to model behavioral changes

Difference in Results: Alts 1 and 2

	Scenario 1	Scenario 2	Scenario 3
Sets	-1	-8	-65
Total Revenue	-\$1,149	-\$15,121	-\$122,468
Total Profits	-\$508	-\$6,927	-\$56,682
Avg. Profits	-\$254	-\$788	-\$2,338
Landings (mt)	-0.1596	-2.0898	-16.9771
Leatherback M&I	-0.0003	-0.0048	-0.0364
Loggerhead M&I	-0.0003	-0.0040	-0.0317
Olive Ridley M&I	0.0000	0.0000	0.0000
Green Turtle M&I	-0.0001	-0.0010	-0.0090
Fin Whale M&I	-0.0001	-0.0010	-0.0090
Humpback M&I	0.0000	0.0000	0.0000
Sperm Whale M&I	-0.0006	-0.0070	-0.0554
SF Pilot Whale M&I	-0.0004	-0.0069	-0.0511
Bottlenose M&I	-0.0001	-0.0011	-0.0090
Sum of mean reductions in species M/I	-0.0020	-0.0258	-0.2016
Ratio of change in profits to mean M/I reduction	\$259,776	\$268,884	\$281,184

Alternative 3 Options and Suboptions

	Alternative 3 Options				
Cap level	A.1	A.2	B	C.1	C.2
Vessel cap reached	Vessel closed 30 days if 5/1-10/31, 14 days if 11/1-1/31	Vessel closed for remainder of fishing year	Vessel closed 30 days if 5/1-10/31, 14 days if 11/1-1/31	Vessel closed 30 days if 5/1-10/31, 14 days if 11/1-1/31	
Vessel cap exceeded			Vessel closed for remainder of fishing year	Vessel closed for remainder of fishing year Fleet closed for 30 days if 5/1-10/31, 14 days if 11/1-1/31	
Fleetwide cap reached	Fleet closed for remainder of fishing year			<i>Fleet closed for 30 days if 5/1-10/31, 14 days if 11/1-1/31*</i>	
Fleetwide cap exceeded			Fleet closed for remainder of fishing year	Fleet closed until beginning of following fishing year	Fleet closed to following 10/31, with cap counts beginning 11/1 each year

* Note that since the exceedance values for vessel caps and the cap reached values for the fleet are the same, this provision duplicates the fleet provision described above.

Analysis Update and Next Steps

- HMSMT Report 2 identifies key issues with analysis and implementation of Alternative 3 sub-options
 - Individual caps present unique modeling, implementation and enforcement challenges
 - Additional implementation challenges and nuances with various sub-options
- The HMSMT concluded that sub-options B and C2 are likely to be the least adverse economically
 - Preliminary results indicate minimal differences in conservation impacts
 - Given workload concerns with analyzing the impacts and feasibility of all Alternative 3 options, the HMSMT would prioritize analyzing sub-option C2

Timeline Considerations

- The HMSMT aims to complete an ROA analysis in time for SSC review at the September Council meeting
- This would allow time to address feedback from the SSC and any additional considerations necessary to support final action by the Council at the November 2022 Council meeting