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INTERNATIONAL PACIFIC HALIBUT COMMISSION

Effects of historical discard mortality in non-directed fisheries (bycatch)

IPHC-2020-AM096-INF06

Purpose

To provide the Commission with a response to the Commission's request:

- "*AM095–Rec.05 (para. 67) The Commission **RECOMMENDED** that the IPHC Secretariat expand upon the analysis completed in IPHC-2019-AM095-INF08 "Treatment and effects of Pacific halibut discard mortality (bycatch) in non-directed fisheries projected for 2019", to be reviewed by the SRB at its next meeting. The objective of this work is to estimate lost yield from bycatch of Pacific halibut in non-directed fisheries for the years of 1991-2018.*"

Background

- Lost yield vs. yield gain (lb to lb) – trading sources of mortality (‘Fisheries Footprint’)
- Depends on: Growth, mortality, selectivity (of each component), discard mortality rates, overall fishing intensity, age structure of the population

Previous studies

Study	Rate
Adlerstein 1993, 1994	1.0-3.3 (Gear and season specific)
Sullivan et al. 1994	1.7
Clark and Hare 1998	1.12 for 1995
Hare and Clark 2007	1.40, 1.58
Hare and Williams 2013	1.14
IPHC-2019-AM095-INF07,INF08	1.25-1.29 (projected for 2019-2021)

Methods

- Numerical evaluation using the preliminary 2019 ensemble
- Equilibrium model (results in IPHC-2019-IM095-11)

Methods

- Remove non-directed discard mortality from assessment models in a single year
- Recalculate directed commercial fishery yield (so that results are comparable over the full time-series) at the same SPR
- Calculate the ‘yield gain’ for each IPHC Regulatory Area based on the fishery yield distribution in that year

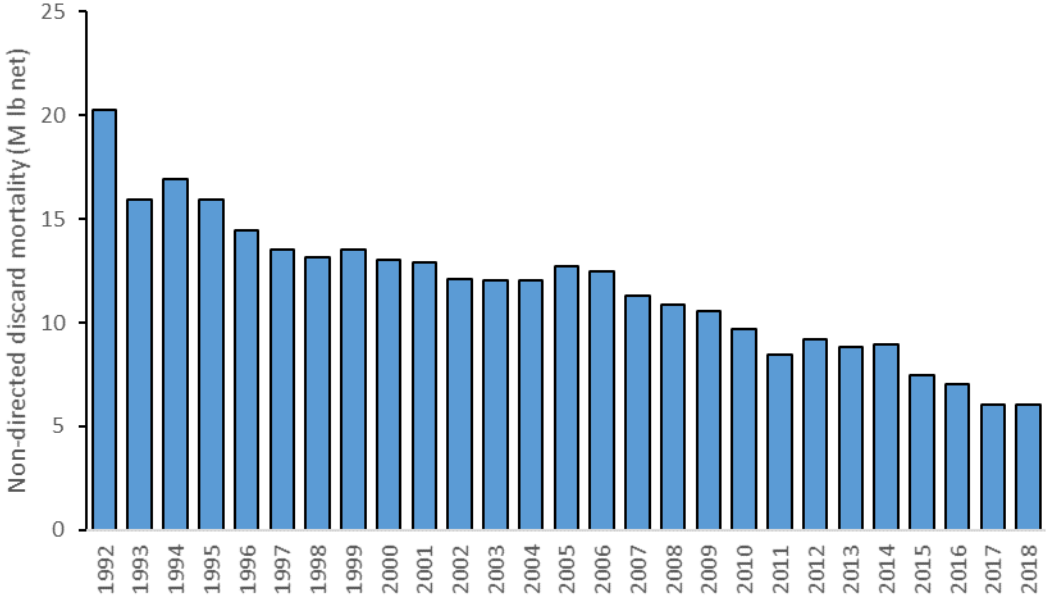
Spatial distribution of yield gain

- Transfer all O26 discard mortality in non-directed fisheries to the directed fishery in the IPHC Regulatory Area in which it occurred
- Scale all directed fishery mortality in proportion to account for U26 yield gain

→ This approach is consistent with the IPHC's Interim Management Procedure

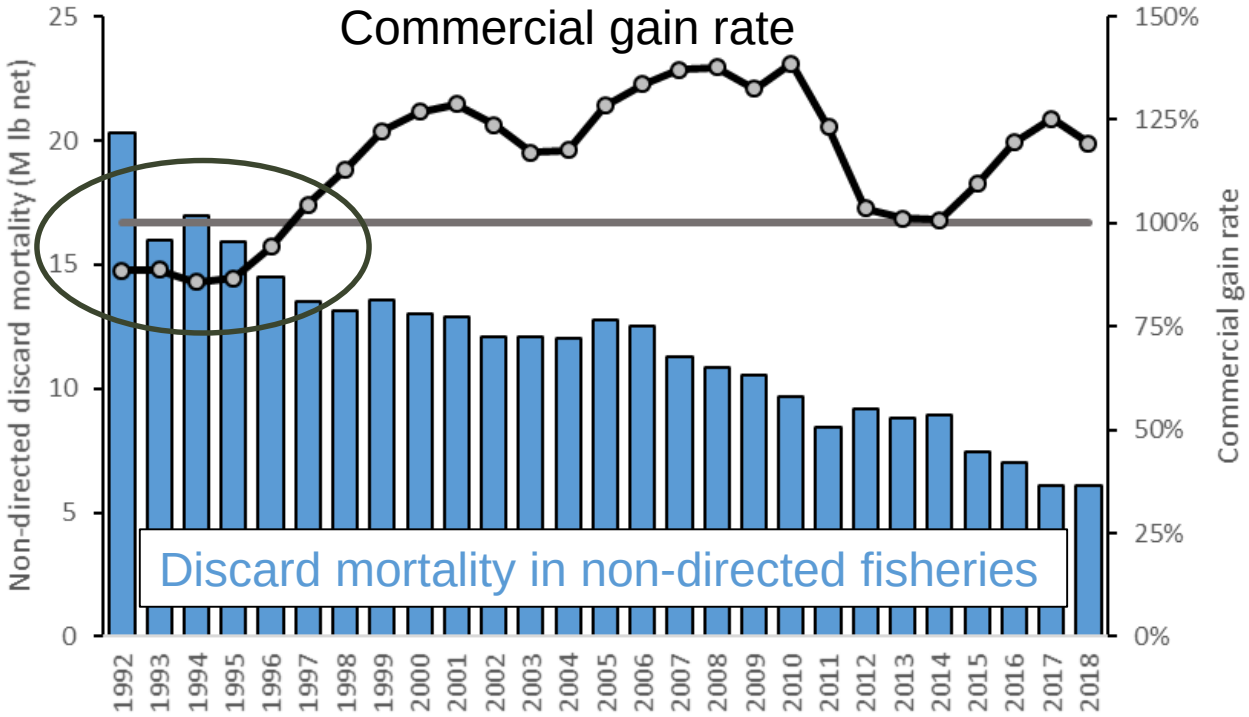
Results (ensemble)

- Discard mortality in non-directed fisheries (Table 1) ranged from 20.29 Mlb (1992) to 6.06 Mlb (2018)



Results (ensemble)

Average: 115%
Range: 86-139%



Results

Distribution (Table 4):

	2A	2B	2C	3A	3B	4A	4B	4CDE
Non-directed discard mortality	3.7%	3.7%	1.3%	22.8%	11.1%	12.4%	5.3%	39.7%
Yield gain	3.7%	8.7%	5.4%	28.0%	13.5%	8.4%	5.7%	26.4%

Equilibrium model

- Parameterized after the 2018 stock assessment
- Hold SPR at a constant value (0.46)
- Compare the yield across a range of allocation scenarios (100% directed to 100% non-directed)
- Does not include discard mortality for the directed commercial fishery

Results (equilibrium model)

Scenario	Directed fishery F	Non-directed F	Relative yield	Gain rate
1	100%	0%	1.00	--
2	80%	20%	0.83	121%
3	40%	60%	0.73	137%
4	0%	100%	0.69	144%

Discussion

- There is no constant gain rate, results depend on: Growth, mortality, selectivity, discard mortality rates, fishing intensity, age structure of the population
- This analysis is *not* a replay of history, it is a sequential analysis of each individual year
- No distributional feedback is included, evaluation of ‘downstream effects’ caused by ontogenetic movement would require a spatial model.
- The trade-off in yield among sectors is part of a management strategy, and may be best evaluated as part of the MSE

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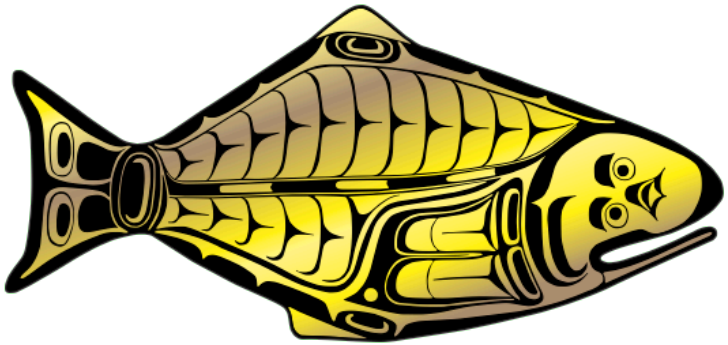

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