

# Incidental Mortality in Mark- Selective Salmon Fisheries

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# Overview

- Components of incidental mortality
- Estimation
- What we think we know
- How well we know it
- Potential to reduce incidental mortality in selective fisheries.

# Types of Incidental Mortality

- Release mortality
  - Applies to
    - Sublegal fish
    - Legal-sized fish in non-retention fisheries
    - Unmarked stocks in mark-selective fisheries
  - Immediate mortality
  - Delayed mortality
  - Long-term mortality
- Dropoff (dropout) mortality
  - Applies to all encountered fish
  - Escaped fish that die
  - Fish removed by predators

# Estimation of Release Mortality

- Confinement studies
  - Onboard holding tanks
  - Broodstock tubes
  - Net pens
- Mark-recapture estimates
  - Enumeration
  - Differential recovery

# Estimation of Dropoff Mortality

- Escapees
  - ????????
- Predator removals
  - Observation

# Incidental mortality rates used for commercial Chinook fisheries

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		sublegal	Legal	dropoff
CTC	Troll - AK	0.255	0.211	0.008
	Troll – BC	0.255	0.211	0.017
	Troll – OR,WA	0.220	0.185	0.025
	Net	0.9	0.9	0.0
STT	WA-CA	0.26	0.26	0.05
WDFW	Puget Sound-seine	0.45	0.33	

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# Incidental mortality rates used for recreational Chinook fisheries

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		sublegal	Legal	dropoff
CTC	AK-CBC	0.123	0.123	0.036
	SBC-Col R	0.123	0.123	0.069
	Puget Sound	0.123	0.123	0.145
STT	WA-N CA	0.14	0.14	0.05
	Central CA	avg	avg	0.05
WDFW	Puget Sound	0.20	0.10	0.05

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# Incidental mortality rates used for commercial coho fisheries

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		sublegal	legal	dropoff
STT	WA-CA troll	0.26	0.26	0.05
DFO	BC troll	0.26	0.26	
	BC gillnet	0.60	0.60	
	BC seine	0.25	0.25	

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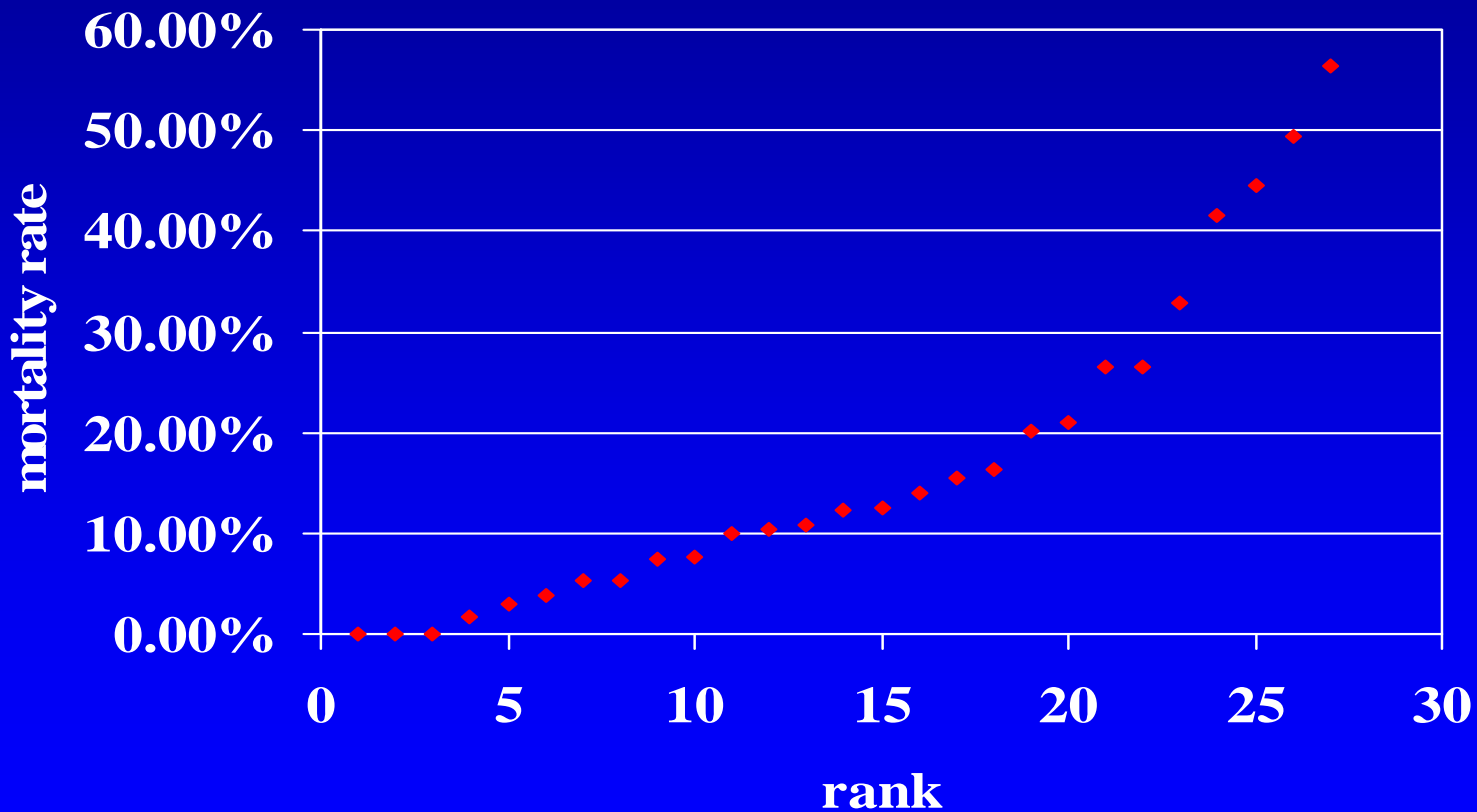
# Incidental mortality rates used for recreational coho fisheries

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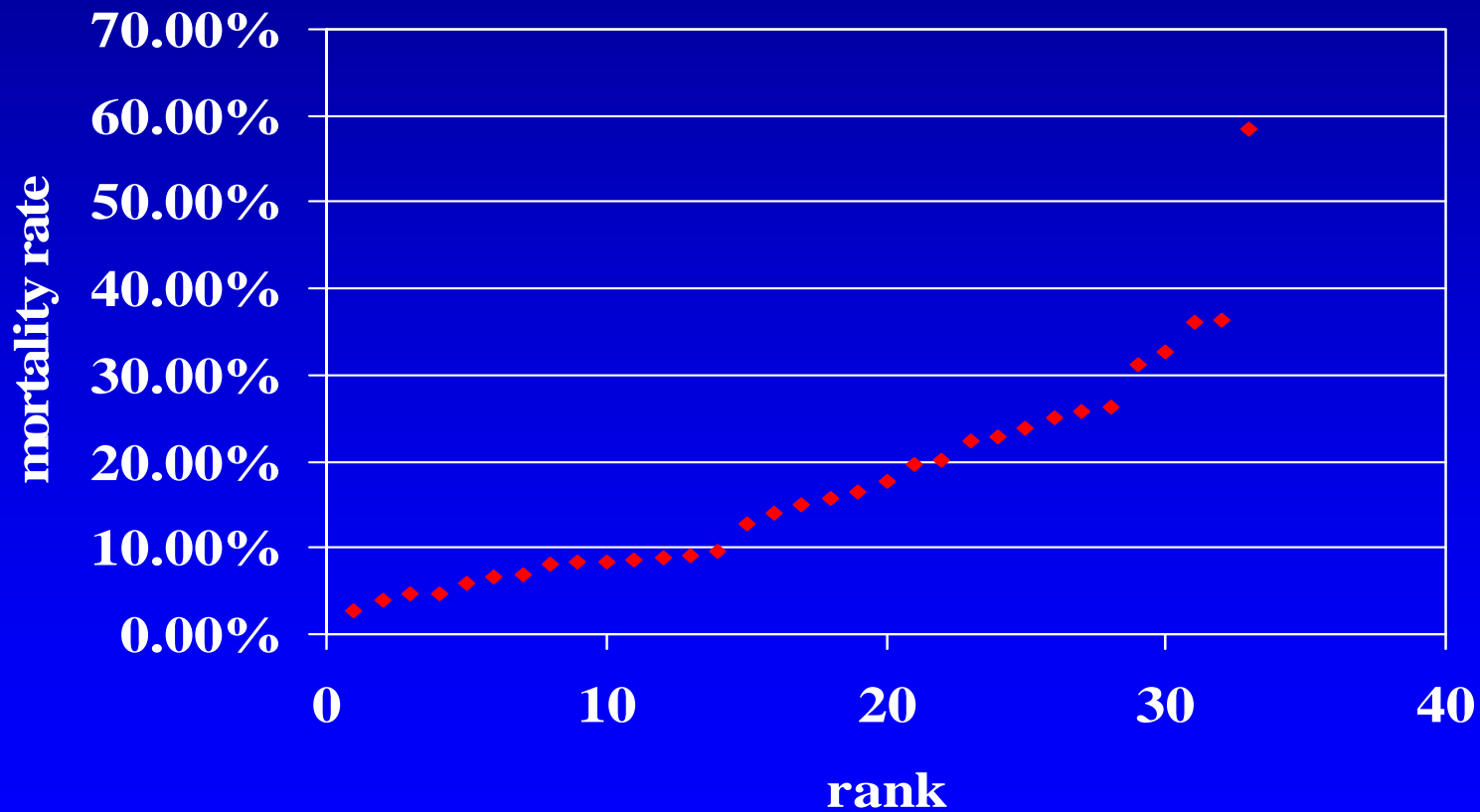
		sublegal	legal	dropoff
STT	WA-CA	0.14	0.14	0.05
DFO	BC	0.10	0.10	
WDFW	Puget Sound	0.07	0.07	0.05

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# Confinement estimates of Chinook marine recreational hooking mortality



# Confinement estimates of coho marine recreational hooking mortality



# Hooking mortality of mature salmon

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location	jacks	adults	species
Fraser Estuary (sw)	0.30	0.16	coho
Fraser Estuary (fw)	0.43	0.18	coho
Little Susitna Estuary		0.69	coho
Kenai River (89)	0.18	0.08	chinook
Kenai River (90-91)	0.12	0.04	chinook

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# DFO Experimental gear mortality

Gear	Immediate mortality	Short term
Floating trap net	0.05	predation
Troll/revival tank	0.014	0.13
Troll/towed cage	0.011	0.10
Seine/brailed		0.045
Seine/ramped		0.173
Gillnet/revival box		0.022

# SFU Gillnet/revival tank

Fish condition	Deaths/fish held	survival
Vigorous - not bleeding	0/143	100%
Vigorous - bleeding	0/5	100%
Lethargic - not bleeding	1/202	99.5%
Lethargic - bleeding	0/3	100%
Dead - no movement	9/104	91.4%

# WDFW Columbia River tangle net studies

- M-R study with differential recovery rate
- Gillnet and tangle net with short soak times, and revival box
- Control group from Bonneville fish trap
- Immediate mortality of 0.5 to 3%
- Total mortality of 12 to 33%

# Reducing mortality on non-target stocks

- Potential benefits of mark selective fishing depend on mark rate, mortality rates, and fishery objectives
- Recreational fisheries
  - Maximize fishing opportunity (effort)
  - Mark selective fisheries work if release mortality  $< 1.0$
- Commercial fisheries
  - Maximize landed catch

- Selective fisheries work if  $MR > \frac{DOR + hrm}{1 + DOR - psl(1 - hrm)}$



# Summary

- Release mortality of traditional gears can be quite high.
- Incidental mortality rates appear to be quite variable and are difficult to estimate.
- Substantial reductions in impacts on non-target stocks appear possible through modifications of traditional fishing gear and methods.
- There is still a good deal of uncertainty about the long-term survival and viability of released fish.