

Mortality rate of Tanner crab

bycatch discarded by Alaska bottom trawlers



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Cooperative research to address fisheries management questions

- Scientists working and fishing industry working together on management issues – understand or reduce
- Trawling issues
 - Bycatch – catch of fish not wanted or allowed to be kept
 - Additional non-target mortality (escape / unobserved)
 - Effects on seafloor and habitats

Bycatch management for Alaska groundfish fisheries

- Many valuable managed stocks occupy same grounds
- Many area / time closures
- Prohibited species catch (PSC)
- PSC are fish/crabs that other fisheries rely on – trawlers must discard
 - Salmon
 - Halibut
 - Crabs
 - Other groundfish
- Concerns increase for bycatch stocks is in trouble

Bycatch management for Alaska groundfish fisheries

- Track bycatch through observer sampling and stop fishing when a set amount is exceeded
 - By fishery – all boats in a pool no individual incentive to improve
 - Allocated to vessel or cooperative – requires more data
- Estimate mortality rate from experimental studies
 - For example, halibut and crab can often survive, while salmon rarely do

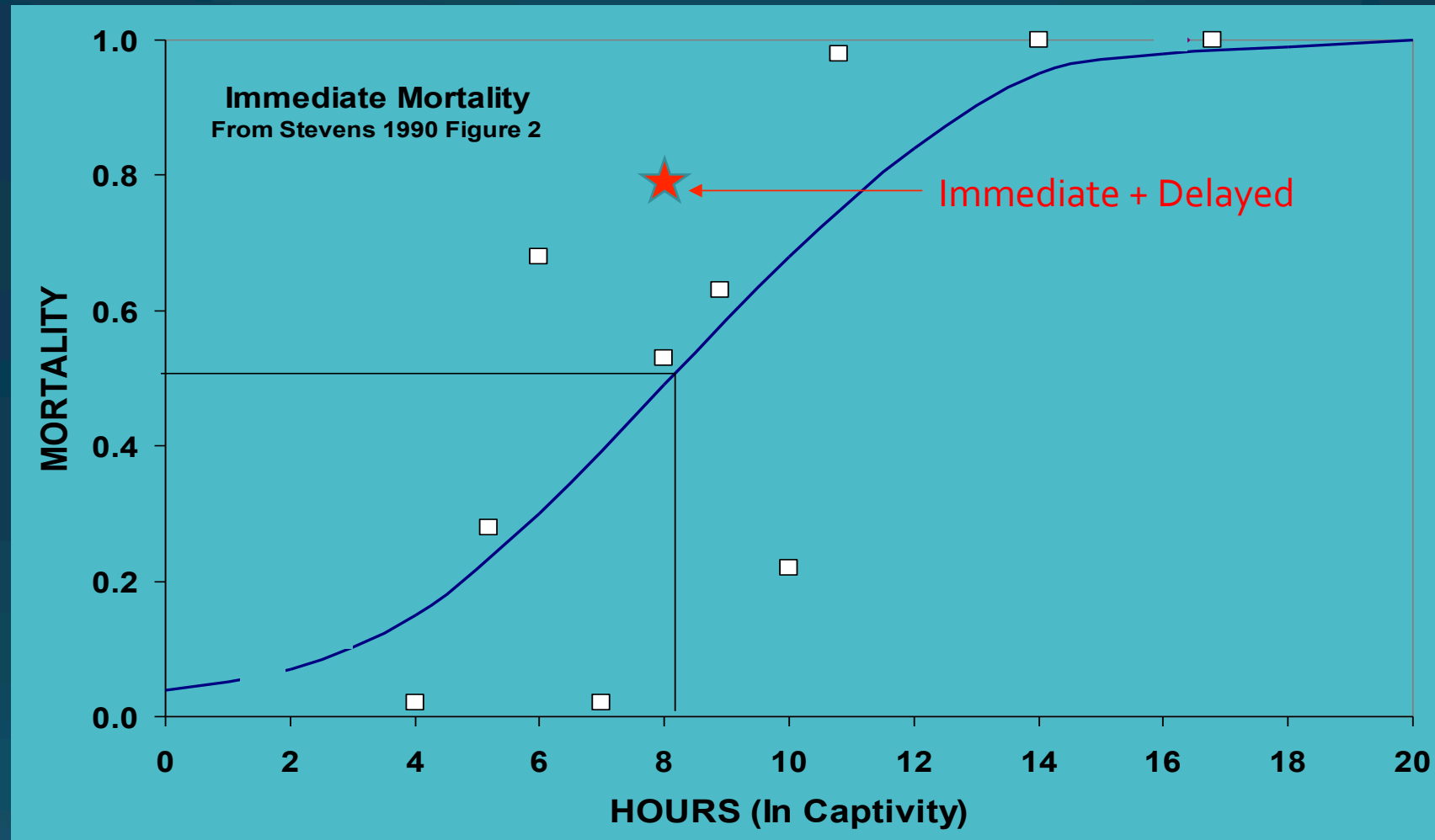
Crab mortality from trawl fisheries

- Unobserved mortality
 - Crabs damaged from encountering trawls on seafloor, but not captured (Hammond et al. 2013, Rose et al. 2013)
- Discard mortality
 - Crabs captured, sorted out aboard the vessel, and released
 - Immediate mortality – easiest to assess
 - Delayed mortality – occurs after release (not directly observable)
- Our study – estimating immediate and delayed mortality rates for Tanner crabs discarded from trawl catches

Previous estimate for Tanner crab discard mortality

- Brad Stevens (Kodiak NMFS lab) 1987 – published 1990
- Held crabs from trawl catches during Bering Sea trawl experiment on avoiding crab bycatch
- Foreign (Soviet Union) processor with catches delivered from U.S. vessels
- Long times on-deck – increased mortality (up to 12.8 hours)
- Held crabs in on-deck tanks, 'vitality' assessments
 - Vitality assessment included one RAMP reflex (mouth)
- Overall average mortality 78%

Previous estimate for Tanner crab discard mortality – Stevens 1990



Captivity includes ½ tow time – approximate average 1 hour more than air exposure

Reflex scans of crabs discarded from Gulf of Alaska (Kodiak) trawlers

- Six vessels hosted scientists to ride aboard and assess the crabs as they were returned to the sea (1265 crab assessments from two major fisheries with Tanner bycatch)
 - Mar Del Norte arrowtooth flounder 7 tows
 - Marathon arrowtooth flounder 7 tows
 - Chelissa arrowtooth flounder 6 tows
 - Excaliber II shallow water flatfish 11 tows
 - New Life shallow water flatfish 13 tows
 - Caravelle shallow water flatfish 11 tows

Reflex scans of crabs discarded from Gulf of Alaska (Kodiak) trawlers

- On deck sorting, 5 with Conveyor belts



Reflex scans aboard a Bering Sea processor trawler

- Hosted AFSC scientist for a one week trip
- Generally longer times (1 - 3 hours) before release than the Kodiak trawlers
- Several tows at end with very long onboard times 7 to 24 hours



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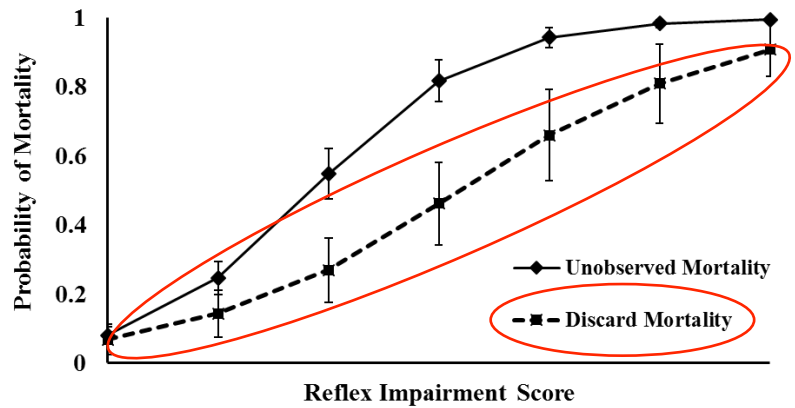


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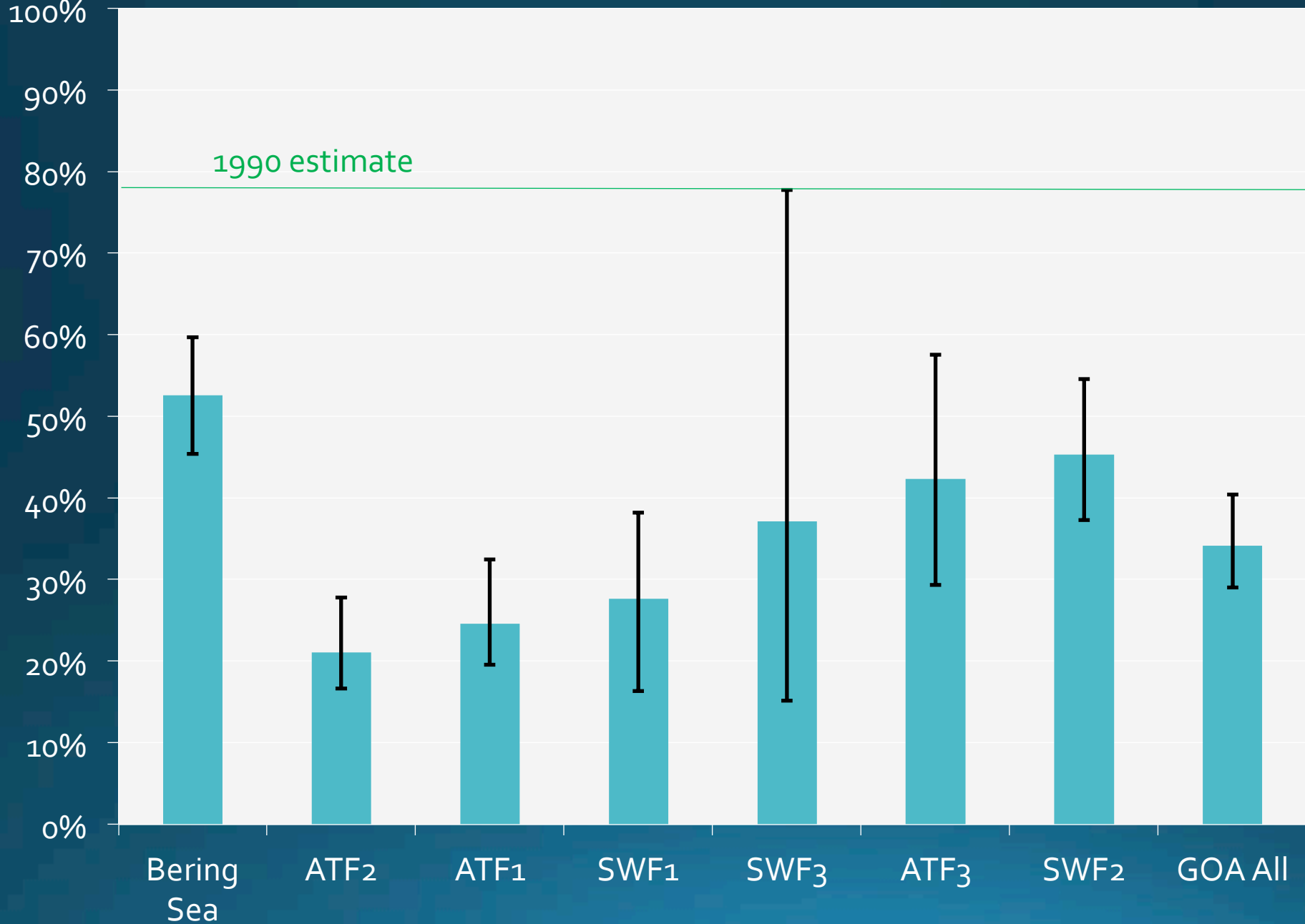


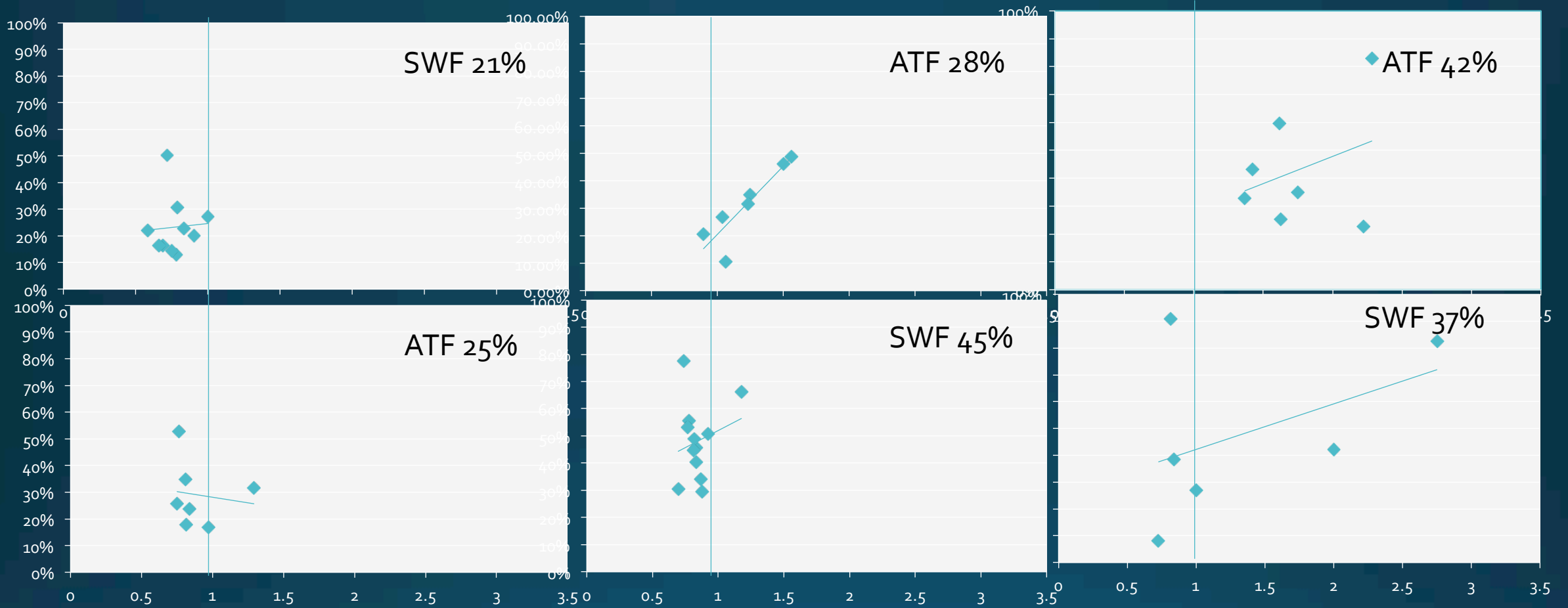
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Discard mortality RAMP from previous talk (Yochum et al.) applied to reflex scans



Revised estimates

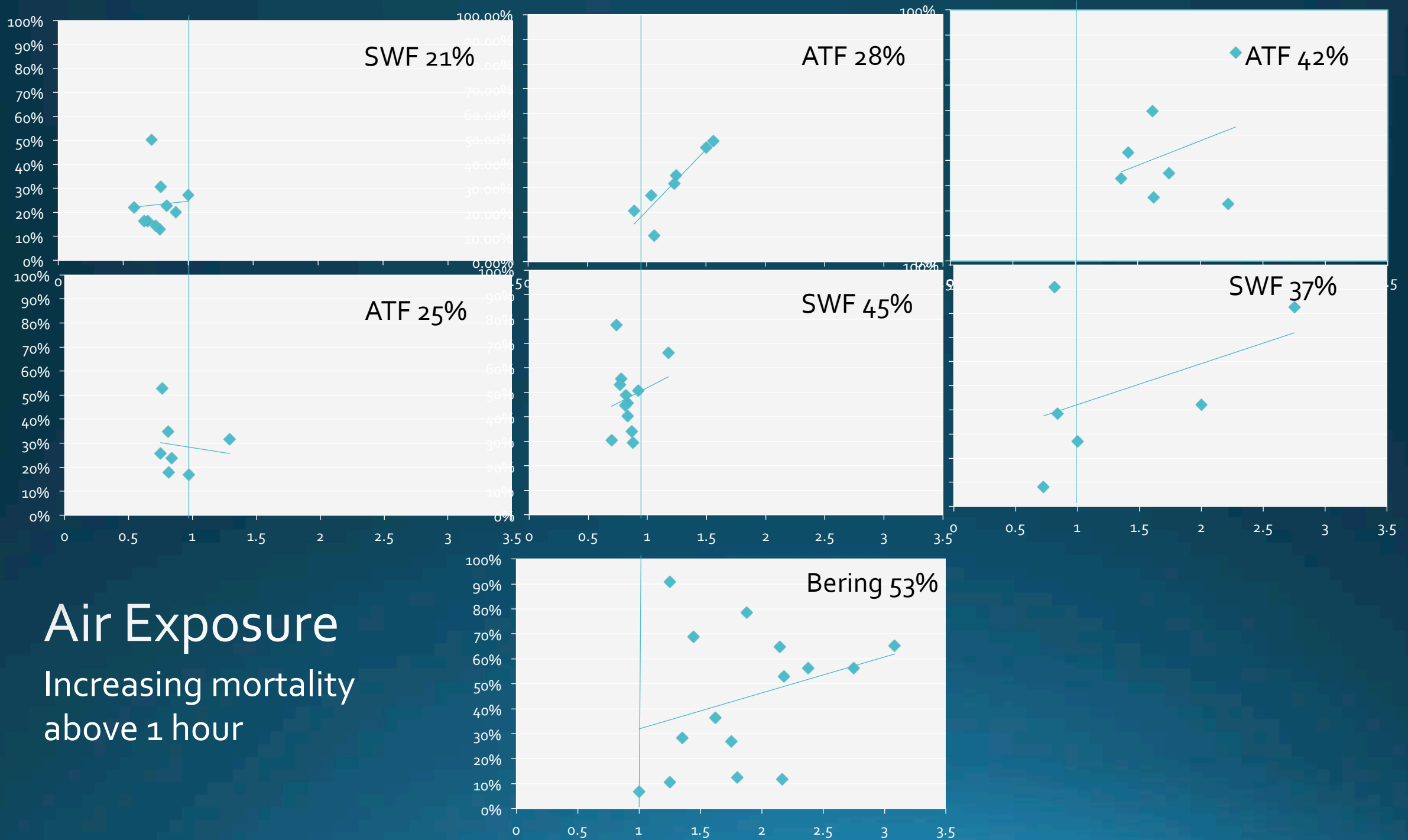




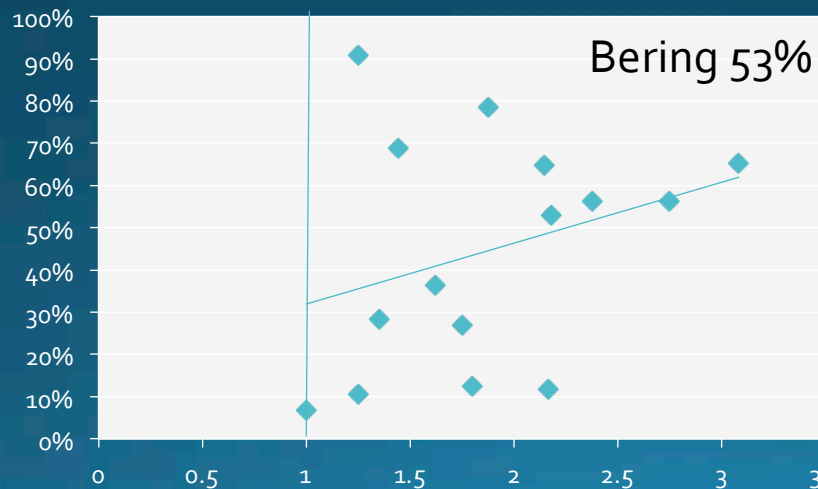
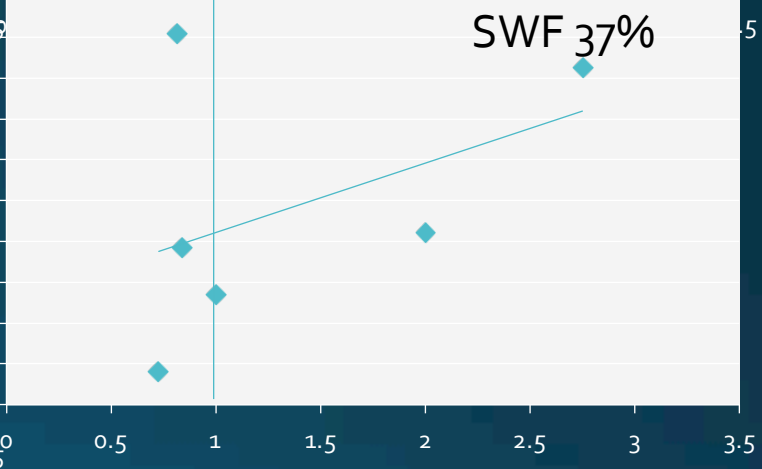
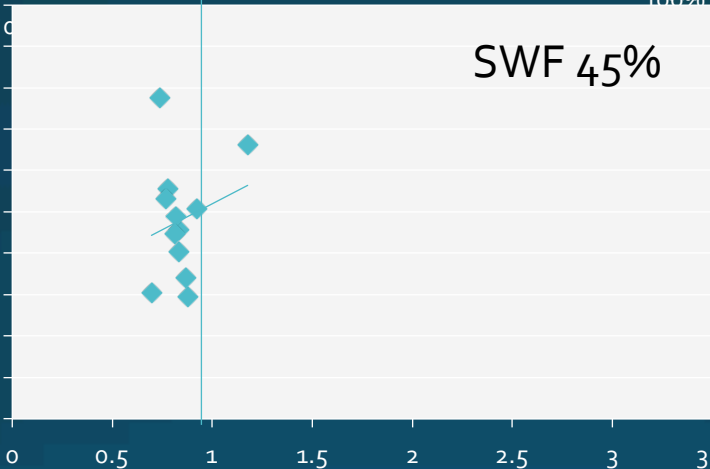
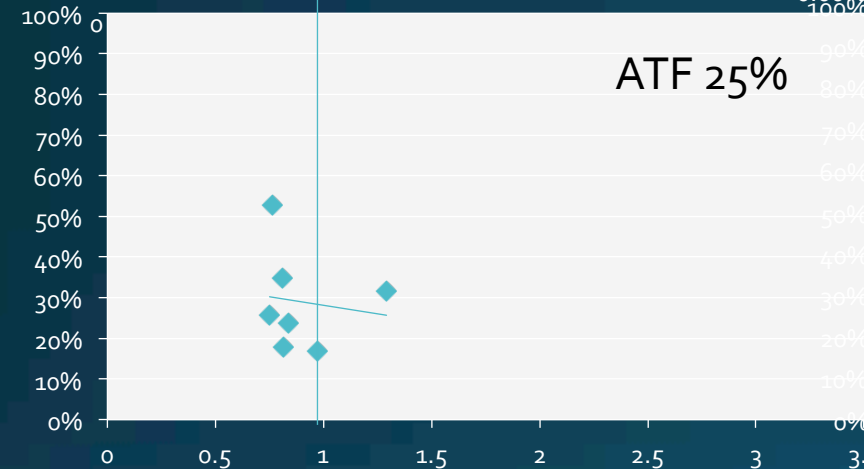
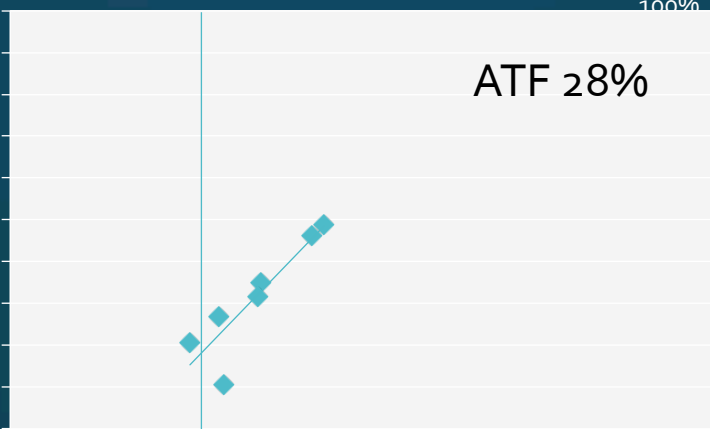
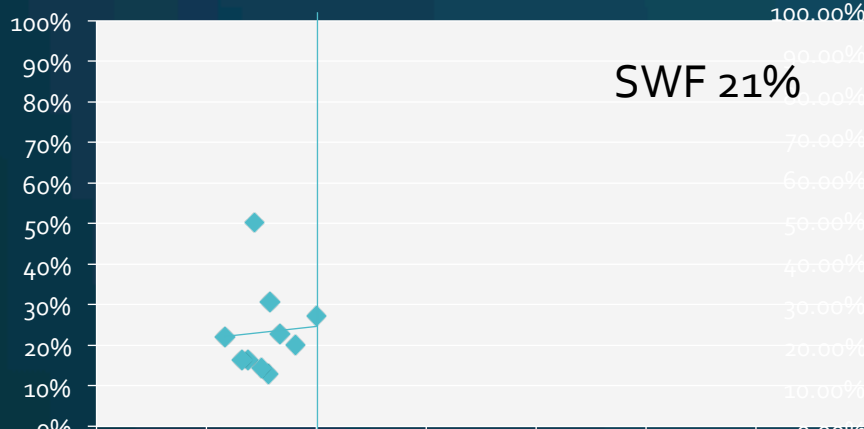
Air Exposure

Increasing mortality above 1 hour

Substantial additional variability between tows and vessels

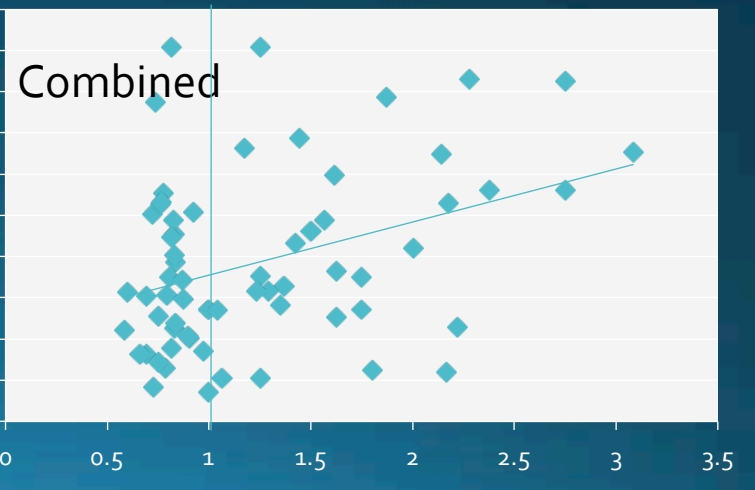
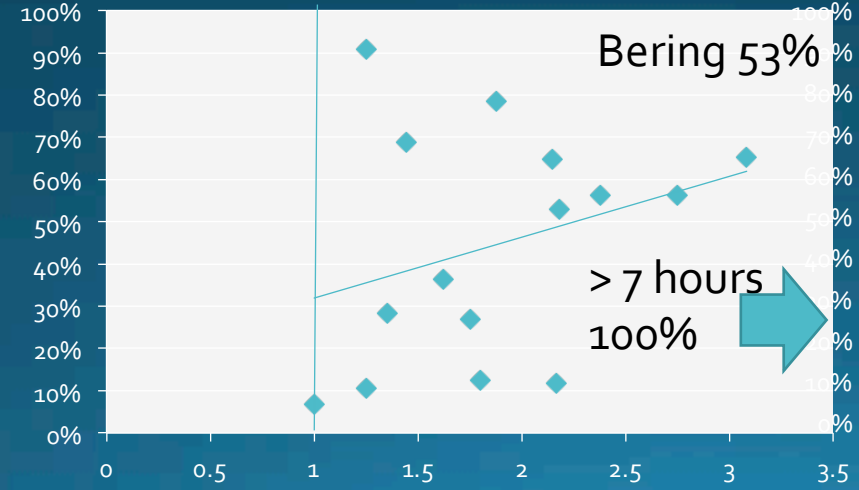
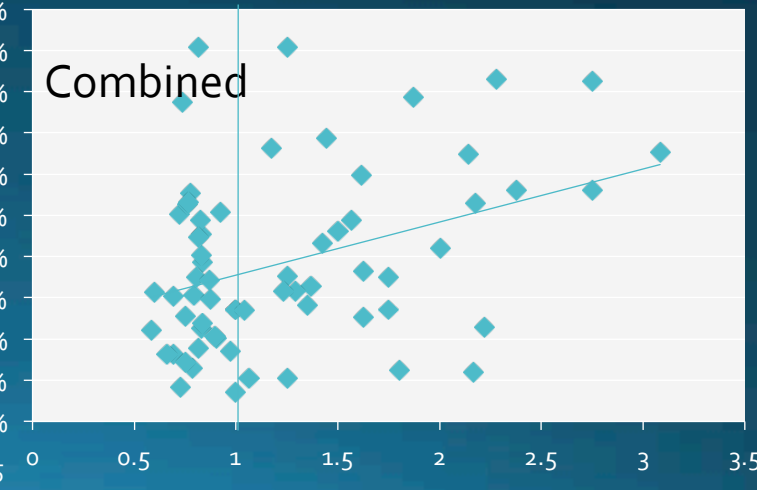
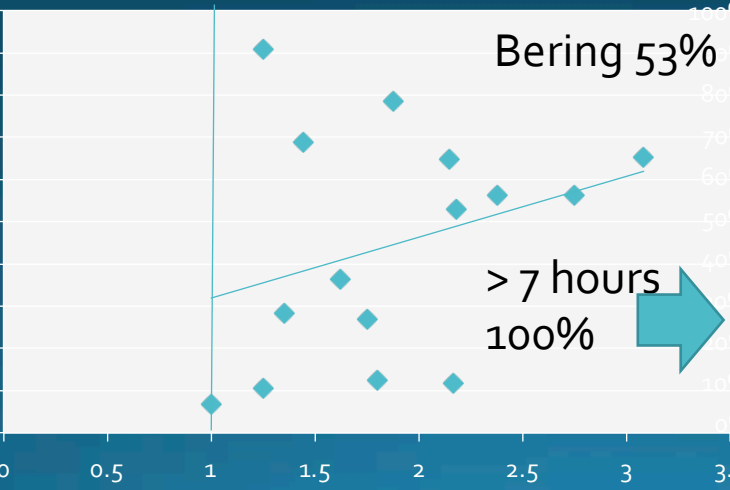
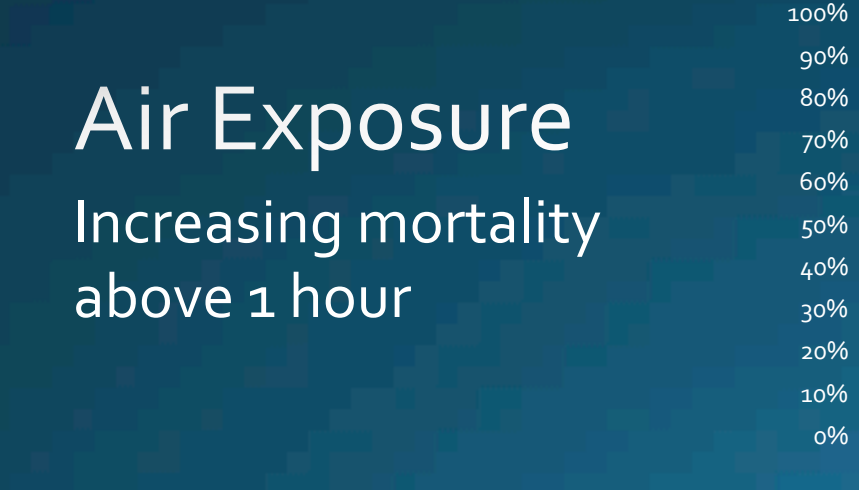
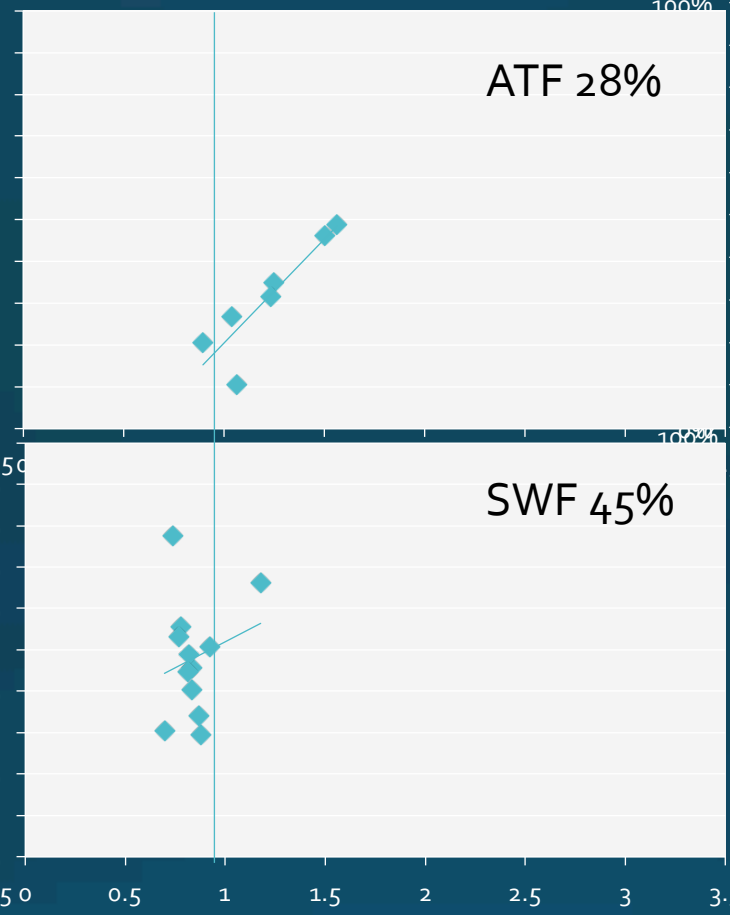
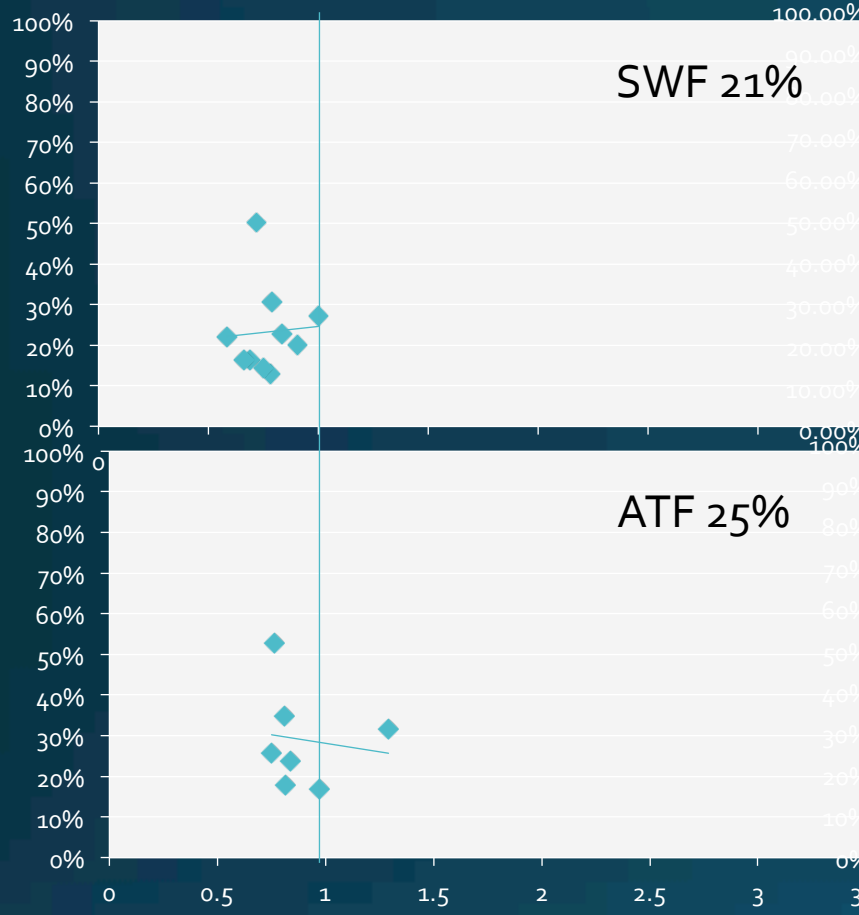


Air Exposure
 Increasing mortality
 above 1 hour



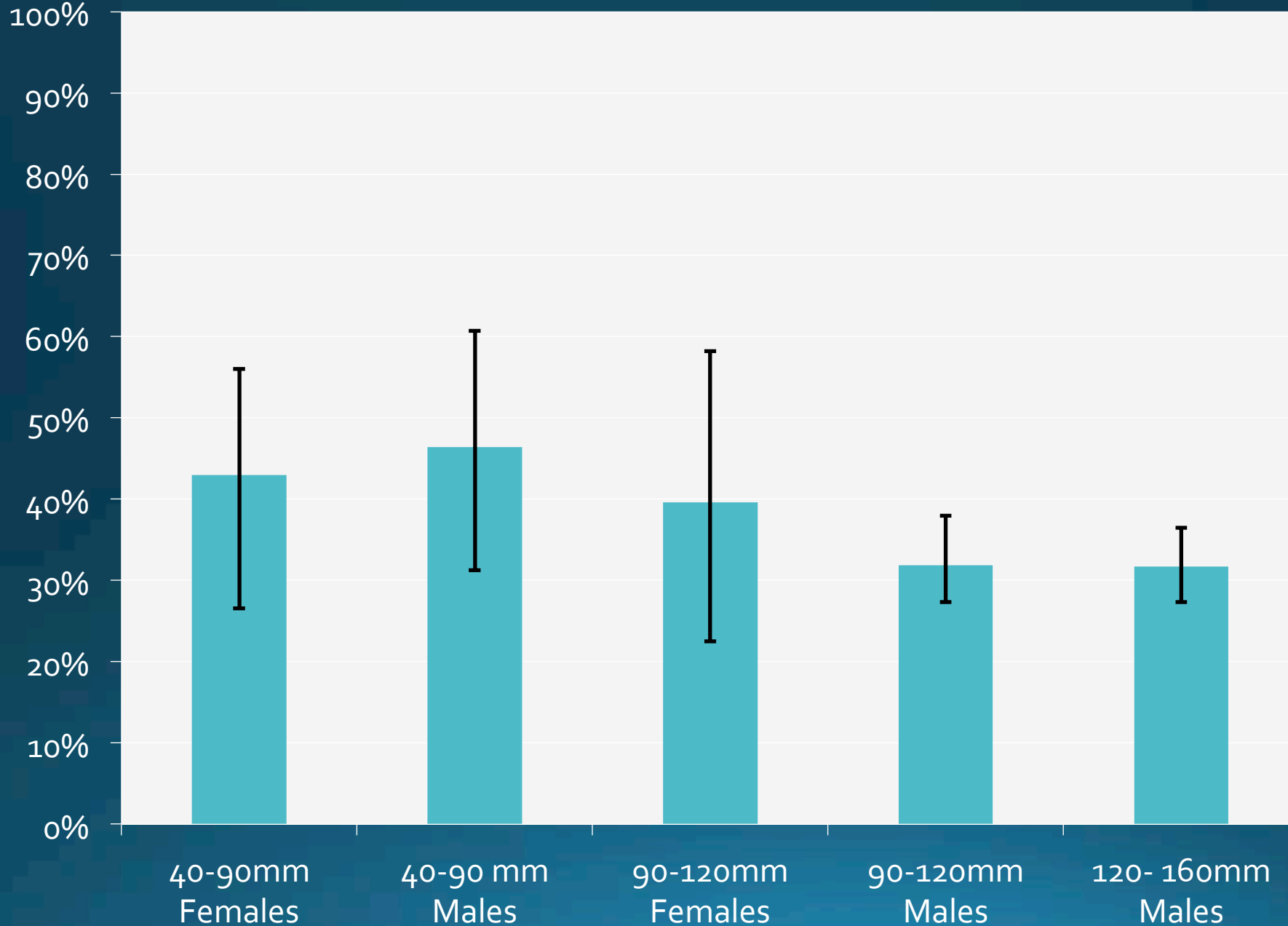
Tows > 7 hours essentially 100%

Air Exposure
Increasing mortality
above 1 hour

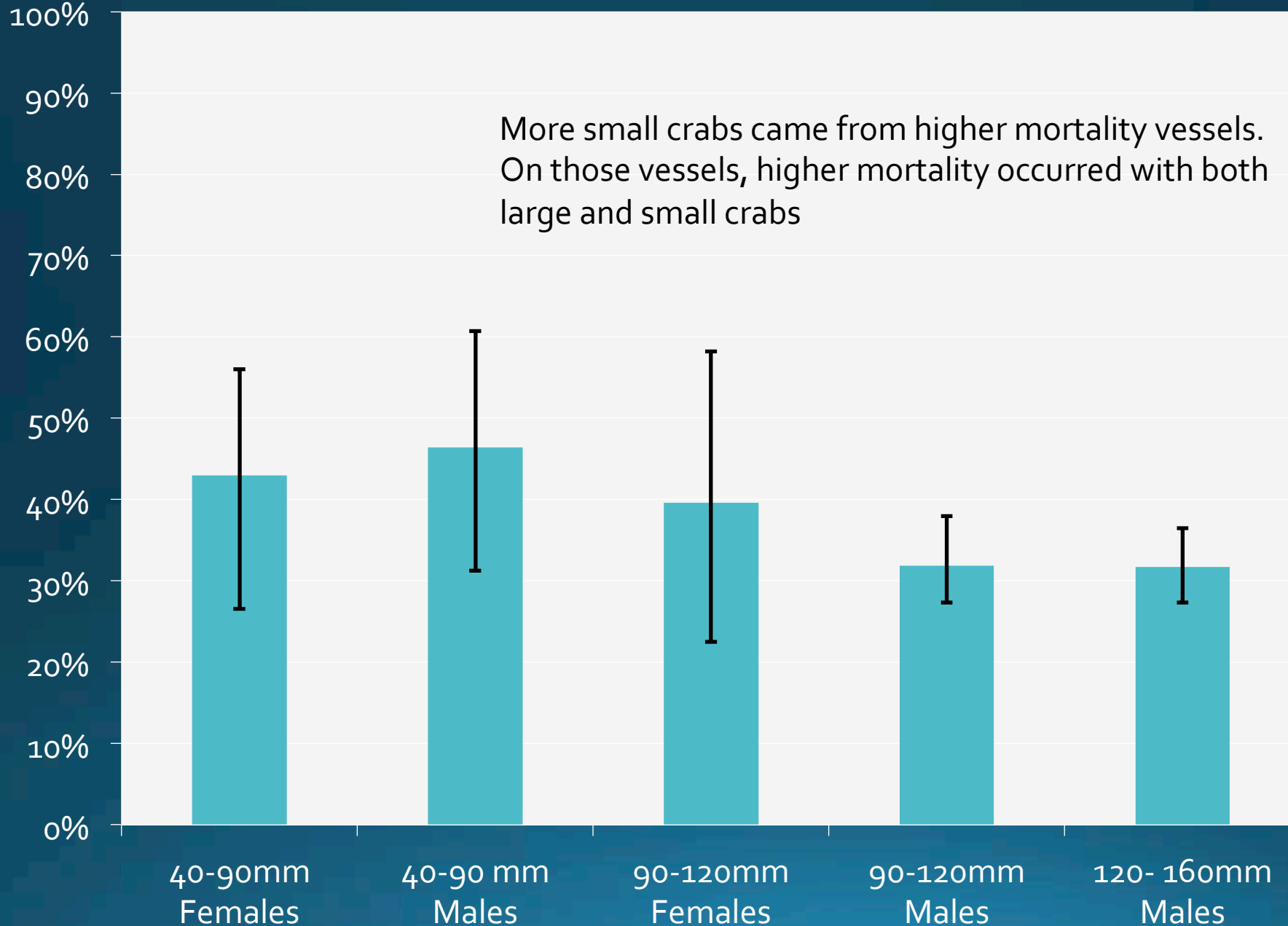


Air Exposure
Increasing mortality
above 1 hour

Size / sex effects?



Size / sex effects?



Caveats

- Mortality rates reflect holding conditions during validation
 - Longer delays not reflected – infection, molting effects
 - Some environmental factors not reflected
 - Predation
 - Temperature change from surface to seafloor
 - Negative effects of holding conditions
- However, most crabs either lively with all reflexes or moribund
 - RAMP estimates most important for remaining 10 – 40%

Conclusions

- Crab mortality rates lower than originally estimated
 - Due to long on-deck times during earlier study
- Time on deck affects mortality
 - Short sorting time, other factors more important
 - Sorting times 1 – 3 hours, air exposure becomes a significant factor
 - Sorting times > 3 hours, few survive (>7 none)
- Most vessel and tow variability not explained by time on deck
 - May indicate improvement possible with better handling

Conclusions

- Potential for improving mortality from deck handling
 - Catch handling – conveyors, improved lifts?, speed
 - Discard handling – design chutes for easy and gentle release
- Incentives for acting to reduce mortality?
 - Document release time – EM application?
 - RAMP sampling
 - Cost / benefit of sampling, estimation, management
 - Simplified reflex set