

An Uber- brief Overview of fish and water quality linkages in the Sacramento-San Joaquin Delta

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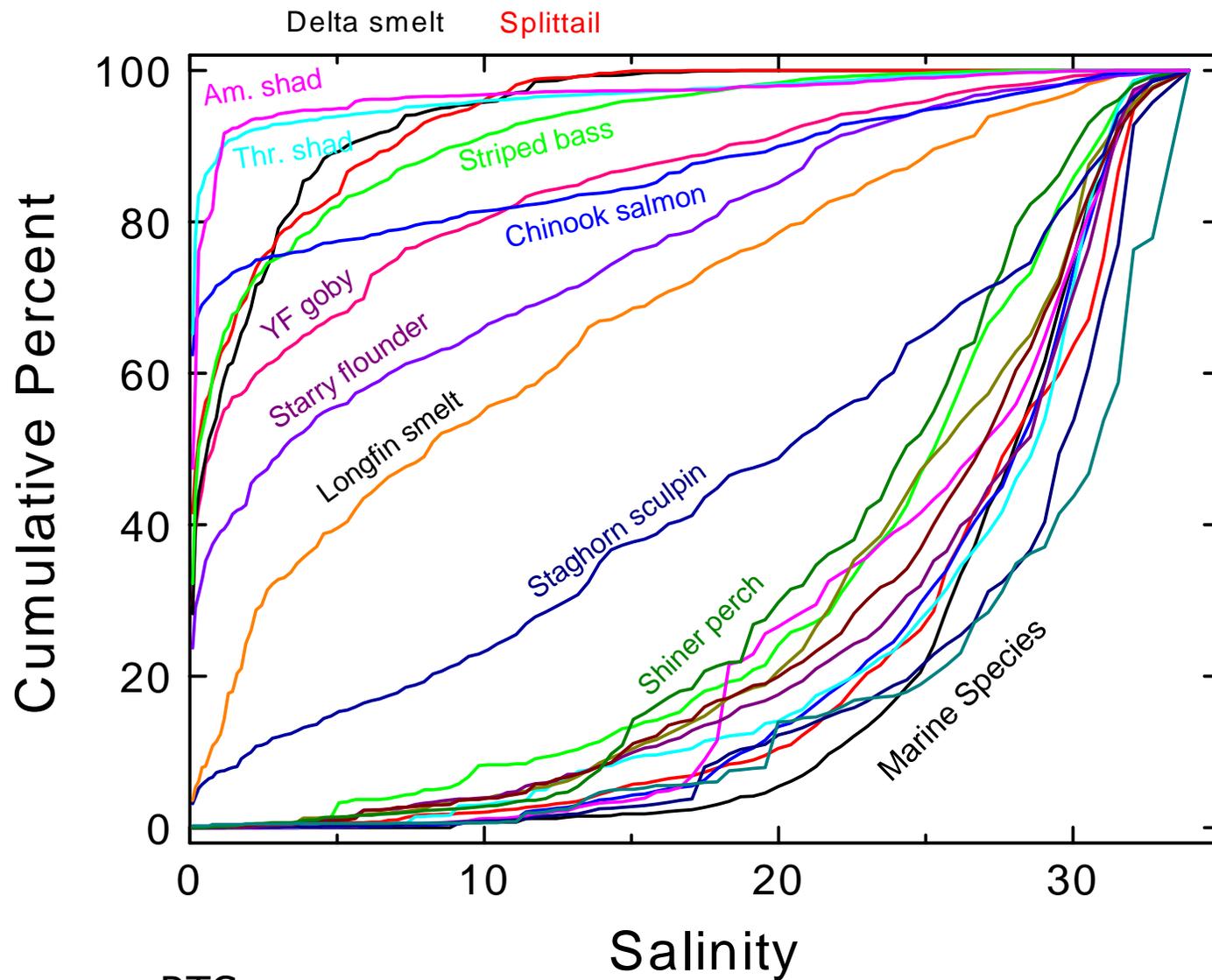
“Freshwater flow defines an estuary.” (Kimmerer 2002)

Is the water quality suitable?

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graph TD; A[Is the water quality suitable?] --> B[Is there enough food in the water?]; B --> C[Can a fish find its way to a suitable spawning or rearing habitat?];
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Is there enough food in the water?

Can a fish find its way to a suitable spawning or rearing habitat?



Summary of water quality influences on fish

	Distribution	Health
Salinity	√	√
Temperature	√	√
Turbidity	√	√
D. oxygen	√	√
Ammonia	√?	√
Selenium		√
Nutrients		√
Pesticides etc		√

Chinook salmon

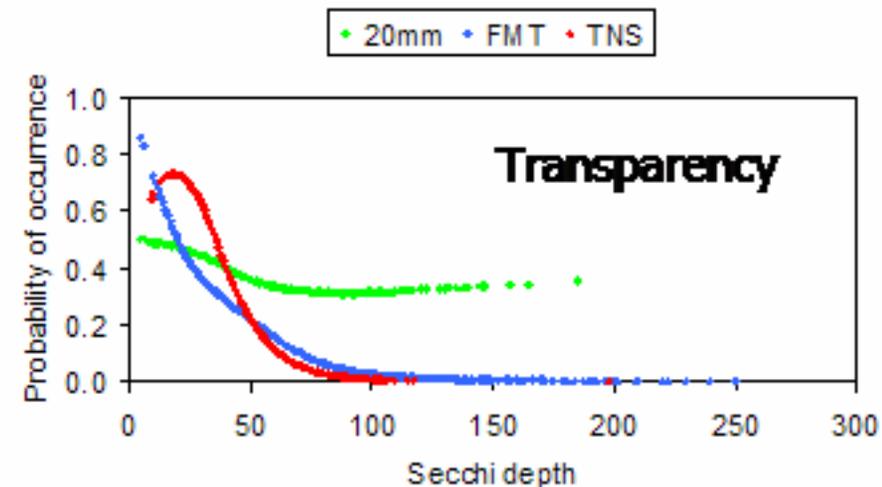
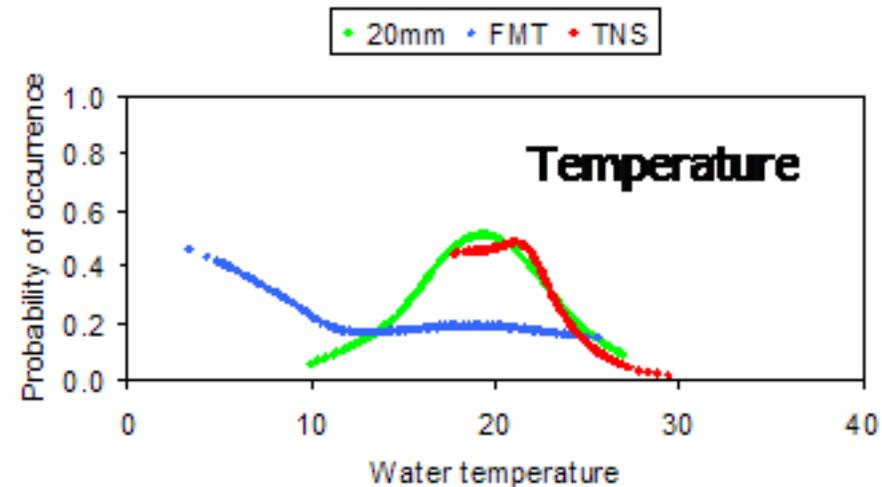
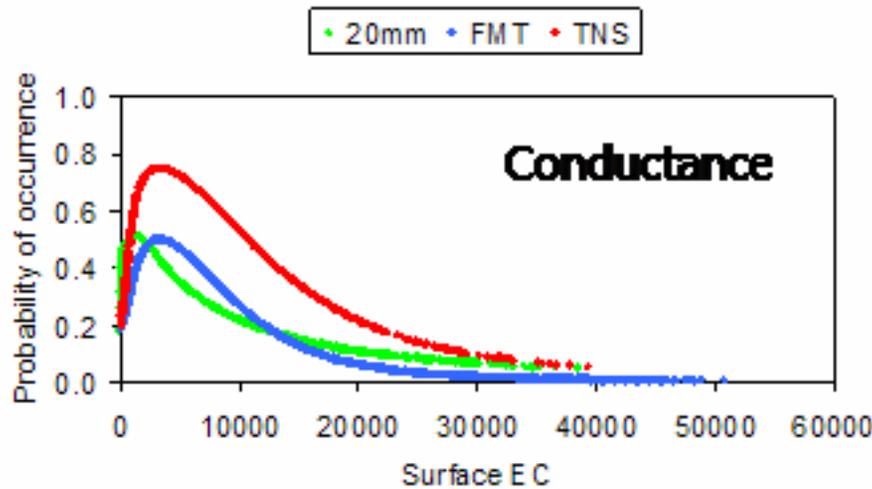
1. Highly tolerant of salinity variation (freshwater to marine)
2. Tolerant of coldwater; sensitive to warm water - problems start $\sim 17^{\circ}\text{C}$
3. Intolerant of any DO much below saturation SJ fall-run migration
4. Turbidity reduces predation risk (Fraser River)

Delta smelt

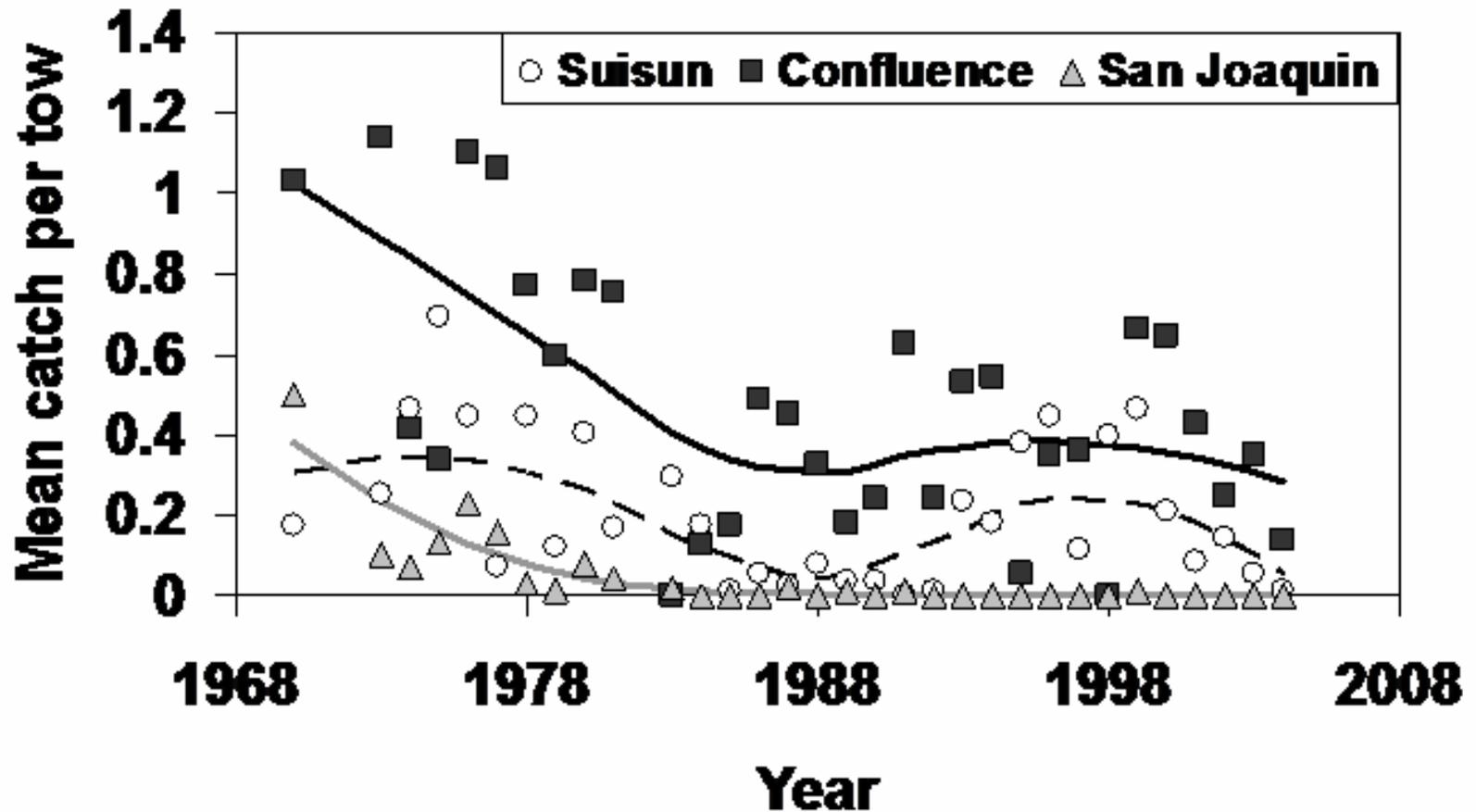
1. Moderately tolerant of salinity variation (freshwater to 19psu; rare beyond \sim 5-6 psu)
2. Tolerant of coldwater; sensitive to warm water - problems start \sim 20°C
3. Intolerant of any DO much below saturation
4. Strongly associated with turbidity as juveniles and adults (Secchi depths $<$ 0.5-0.6 m)

Delta smelt habitat is dynamic

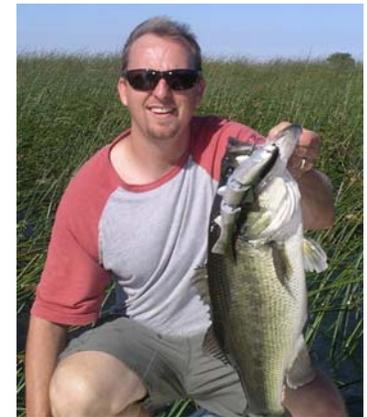
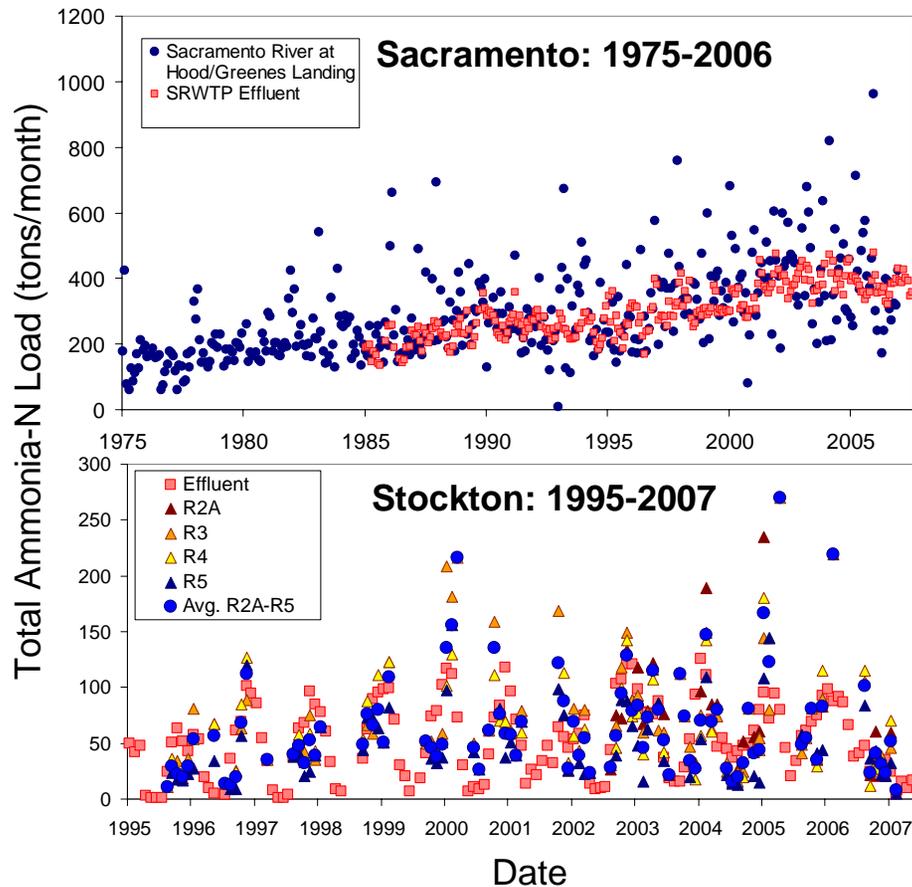
It generally isn't accurately characterizable as "Suisun Bay"



Delta smelt catches have varied by region because water quality varies by region



Nutrients may be an emerging issue



Data: A. Mueller-Solger - DWR

Conclusions

- Water quality is a fundamental characteristic of fish habitat
- ...But every species and sometimes life stage is different
- Interactions and synergies among constituents matter