The little fish in California's water supply: delta smelt "DRERIP" conceptual model overview

Matt Nobriga and Bruce Herbold

for

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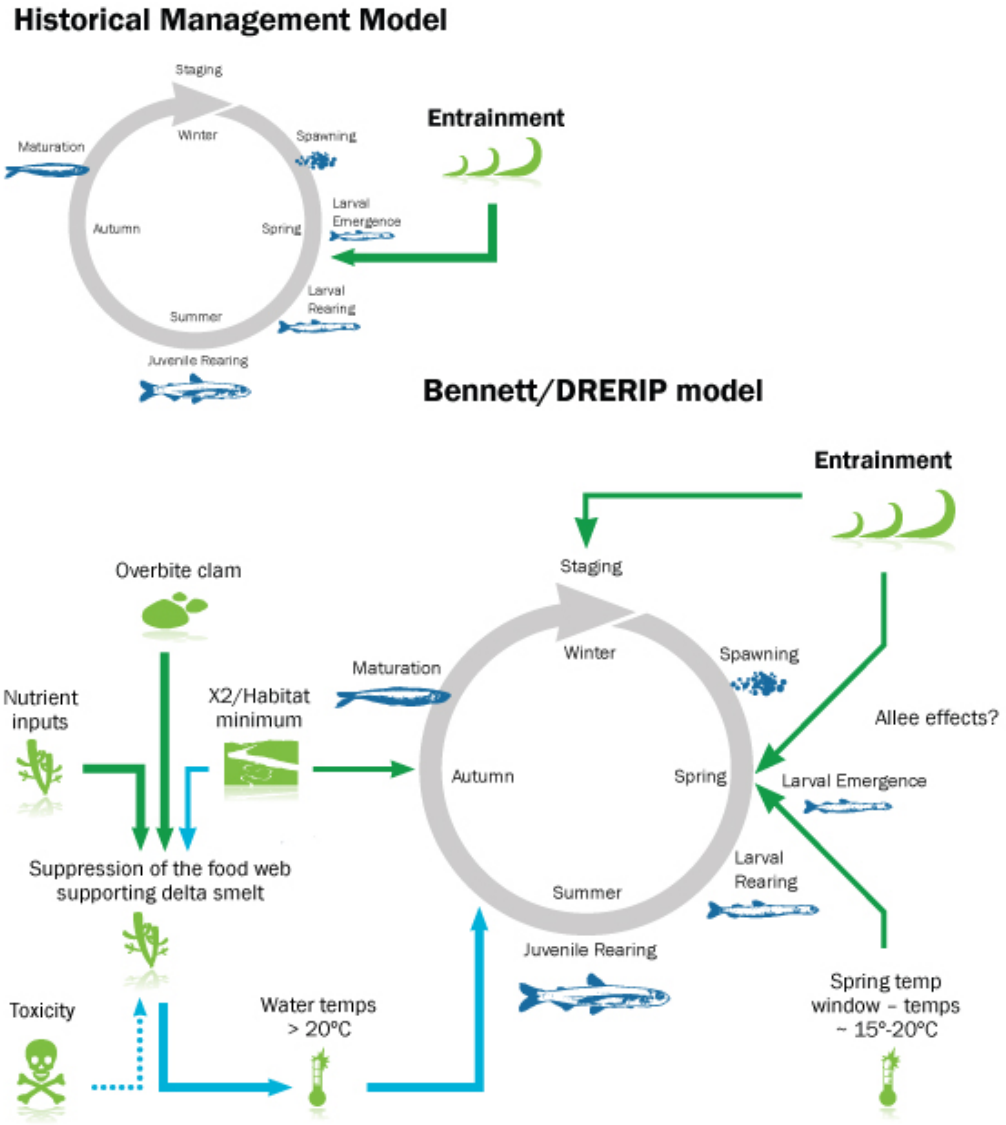
“DRERIP”

- One of several regional ecosystem restoration plans
- Conceptual models
- Support ecosystem restoration
- Standardized, semi-technical statements of state of scientific understanding
  - Stressors operating throughout the life cycle

Historical Management: Delta Smelt

Figure 9



Delta smelt life-history basics

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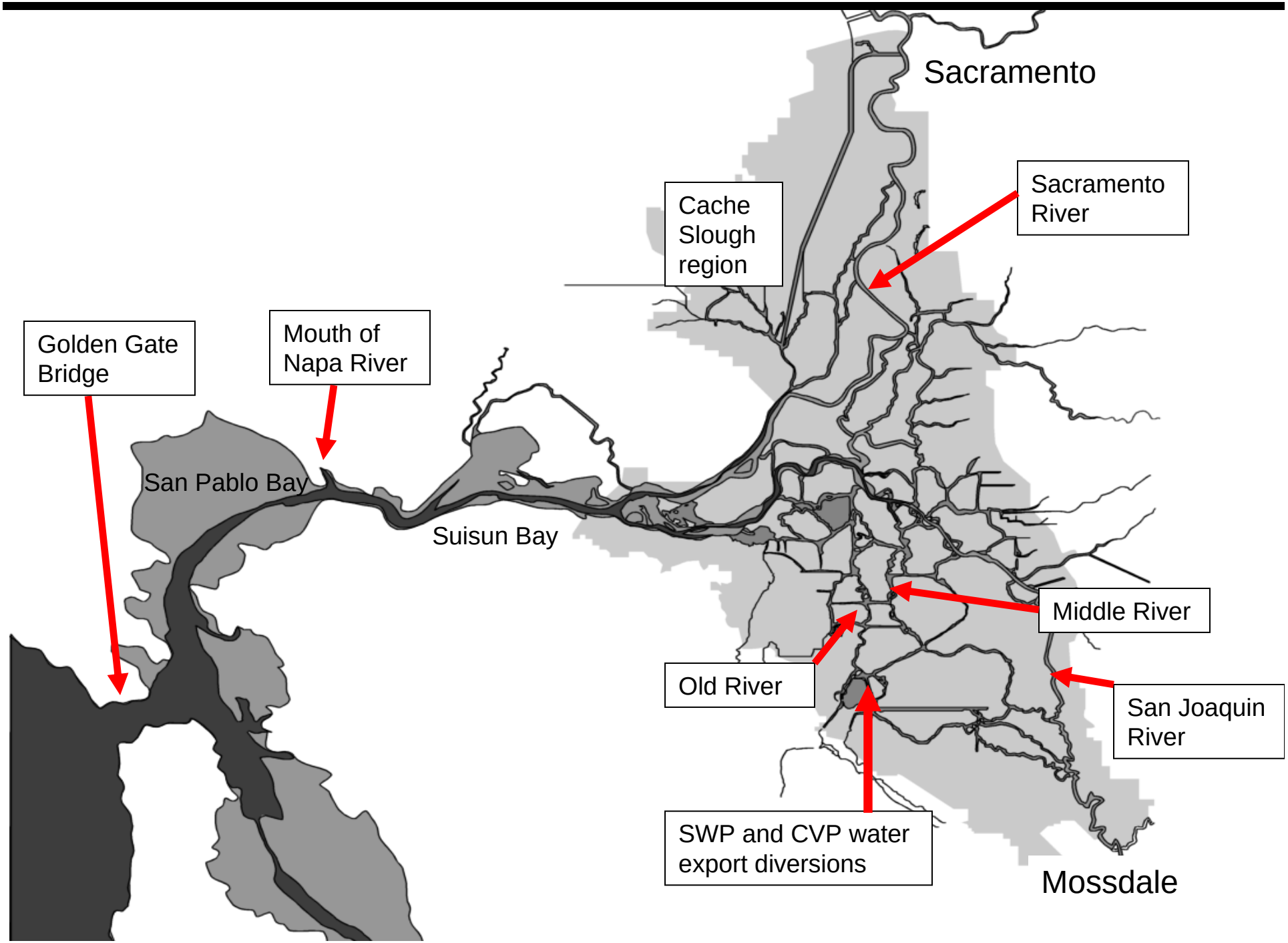
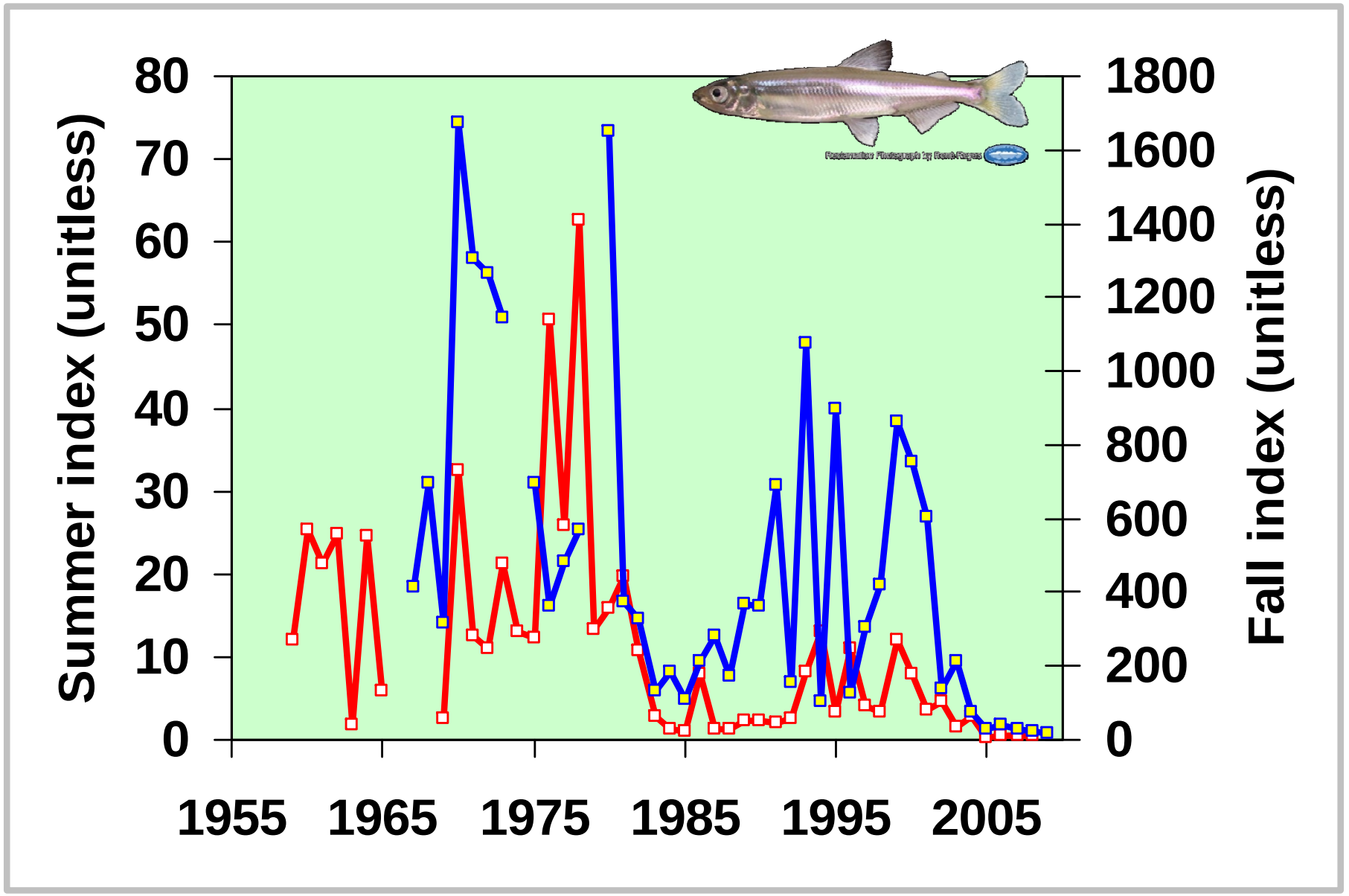
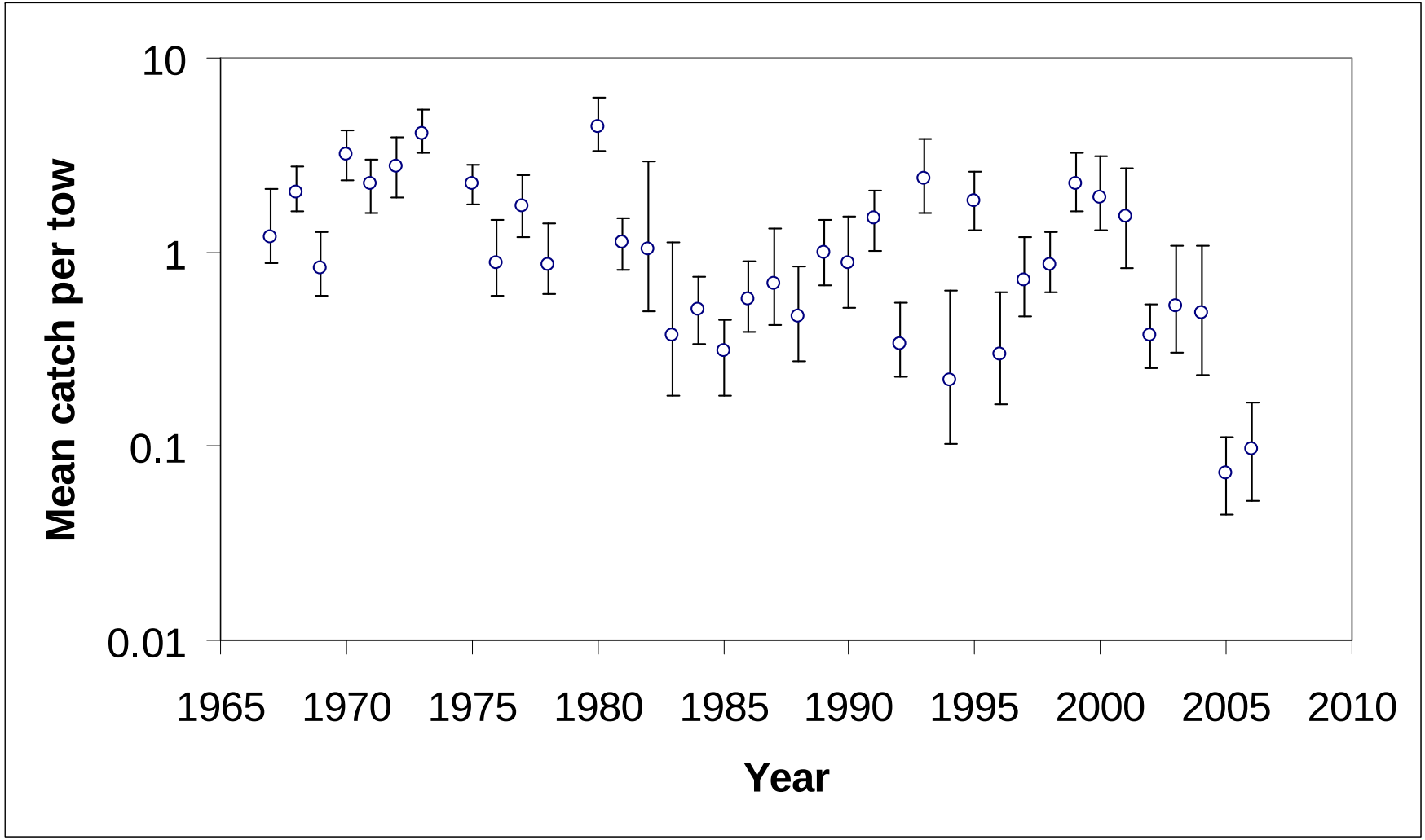
- Generally “pelagic”
  - Associated with low-salinity zone
- Can move rapidly…if motivated


Sacramento
Sacramento River
Cache Slough region
Golden Gate Bridge
Mouth of Napa River
San Pablo Bay
Suisun Bay
Middle River
Old River
San Joaquin River
SWP and CVP water export diversions
Mossdale

Delta smelt abundance has declined

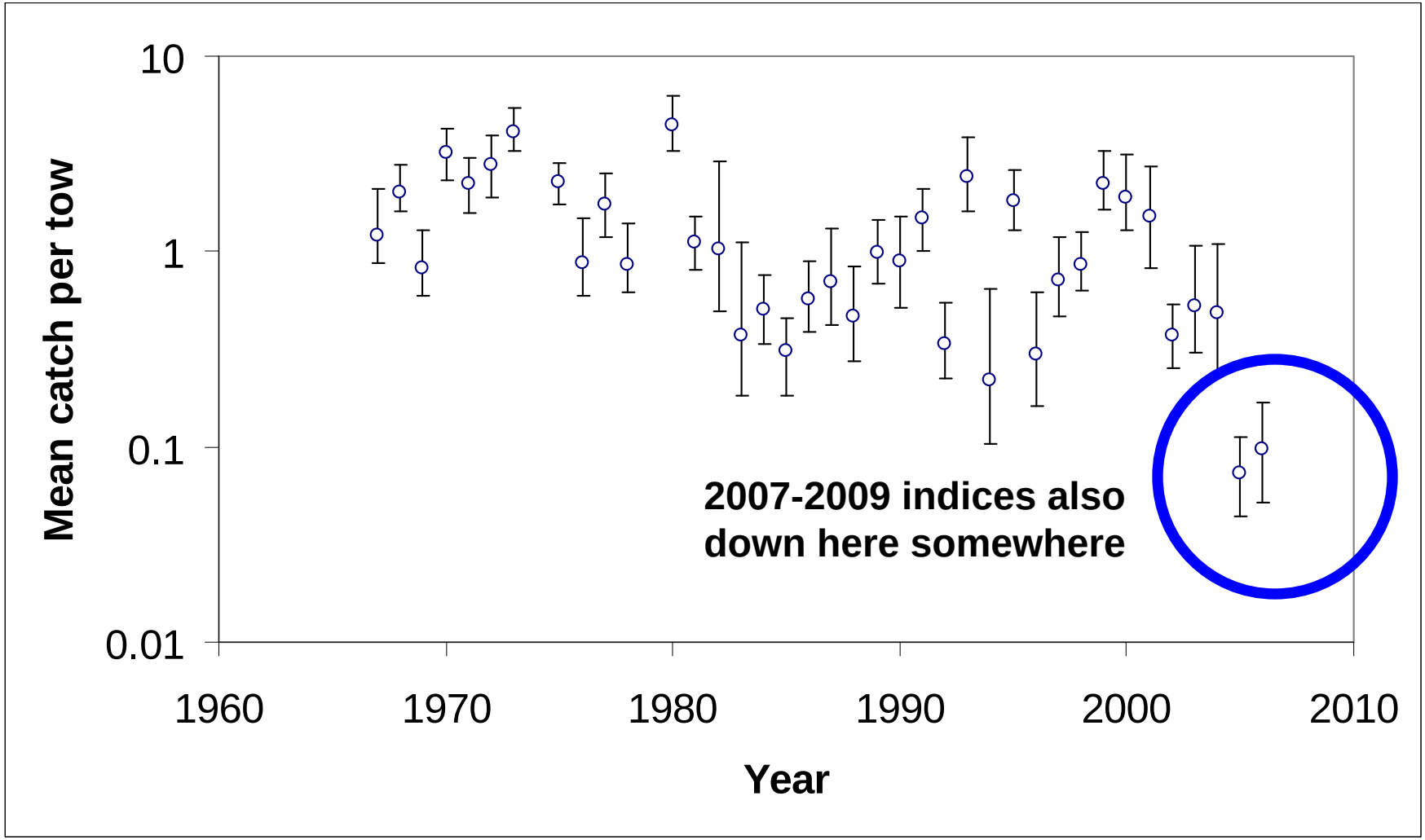


Recently declined to unprecedented low catches



Data courtesy of W. Kimmerer (SFSU)

Recent abundance really is low



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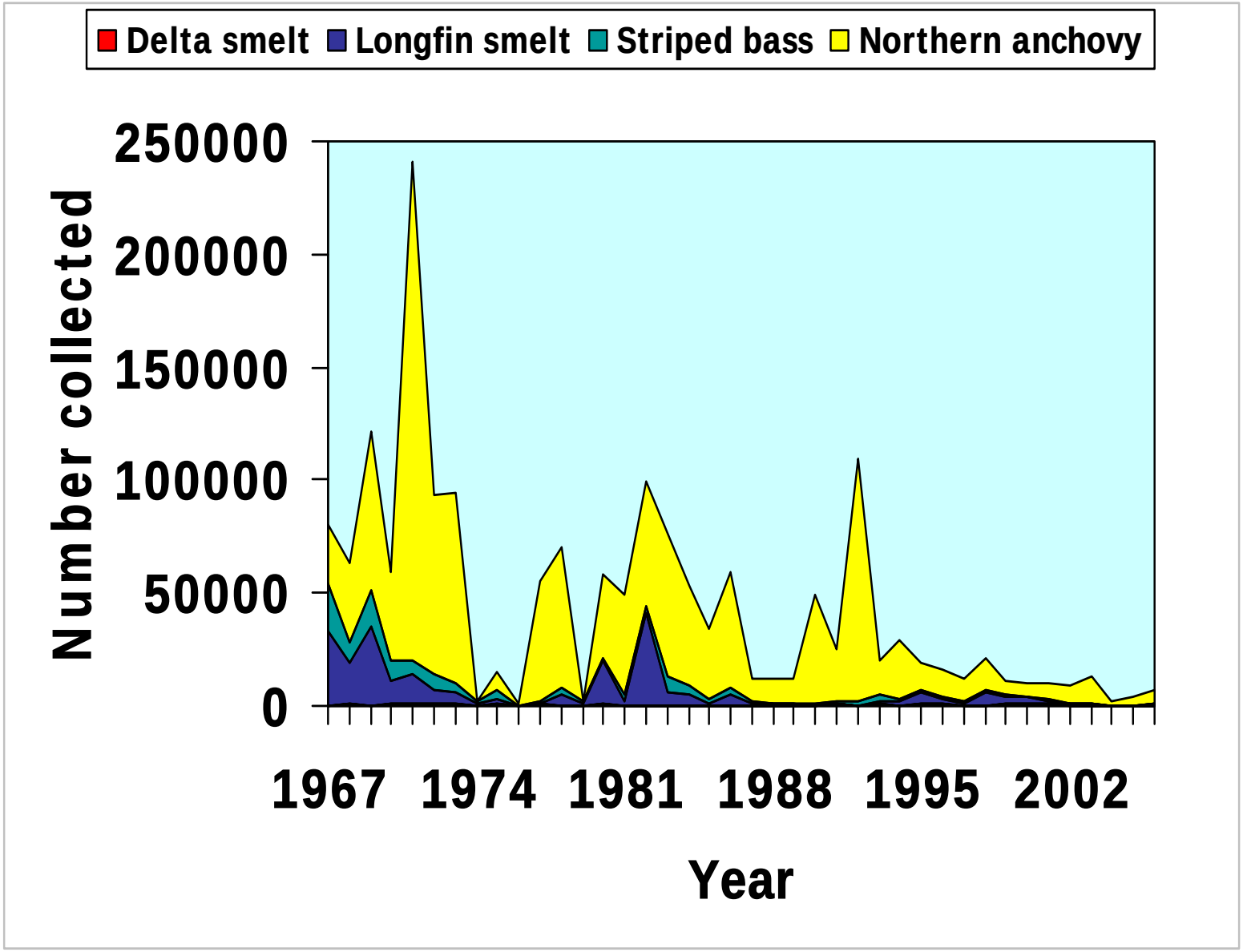
The smelt decline is part of a pelagic system decline



The fish have declined because habitat suitability has declined

- Habitat metric
  - Flow → “X2” days in Suisun Bay ÷ Sac Valley unimpaired runoff index (water year)

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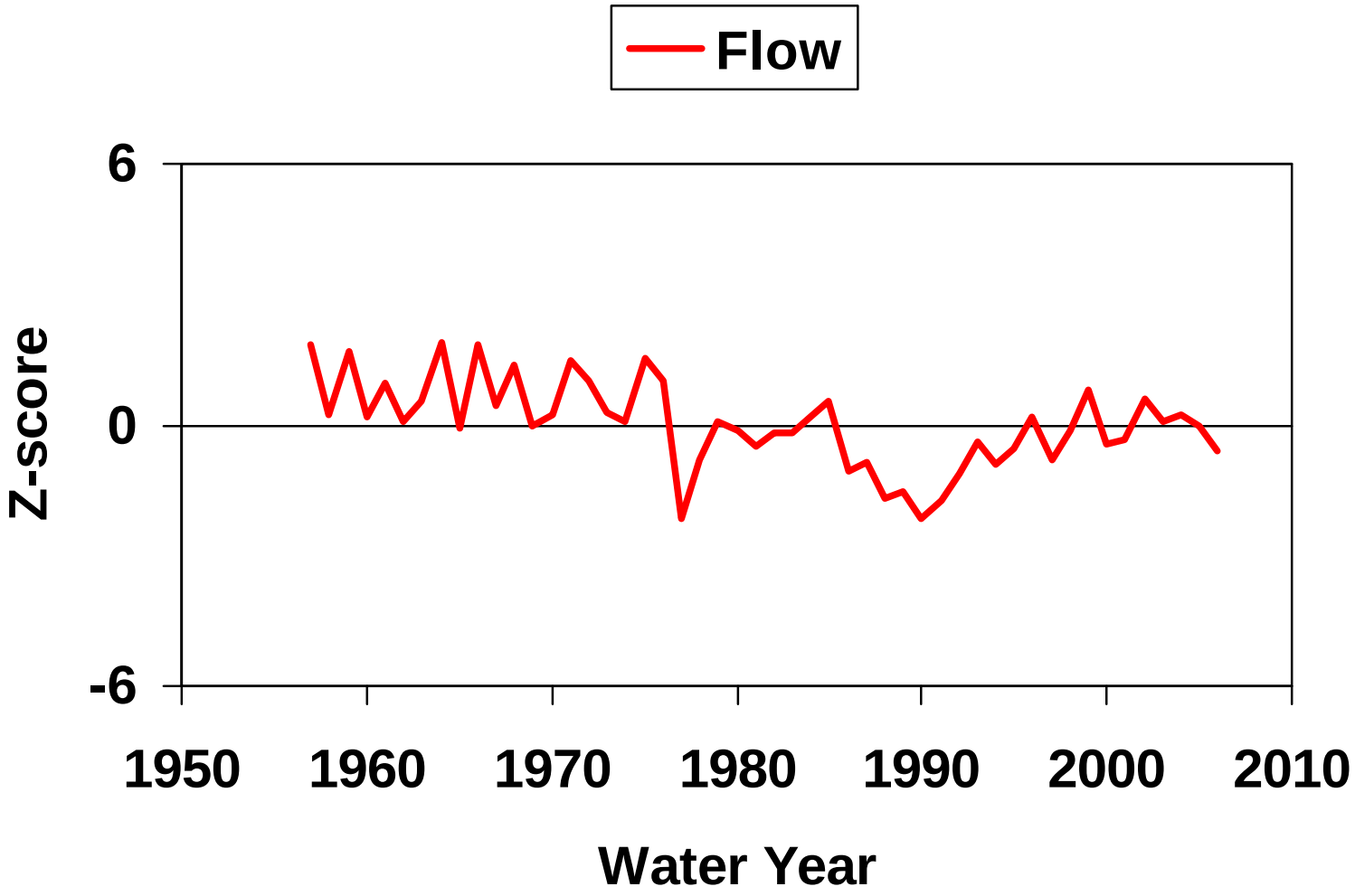

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- Habitat metric
  - Flow → "X2" days in Suisun Bay ÷ Sac Valley unimpaired runoff index (water year)
  - Turbidity → Average sediment concentration in the Sacramento River (water year)
  - Food → Average density of mysid shrimp

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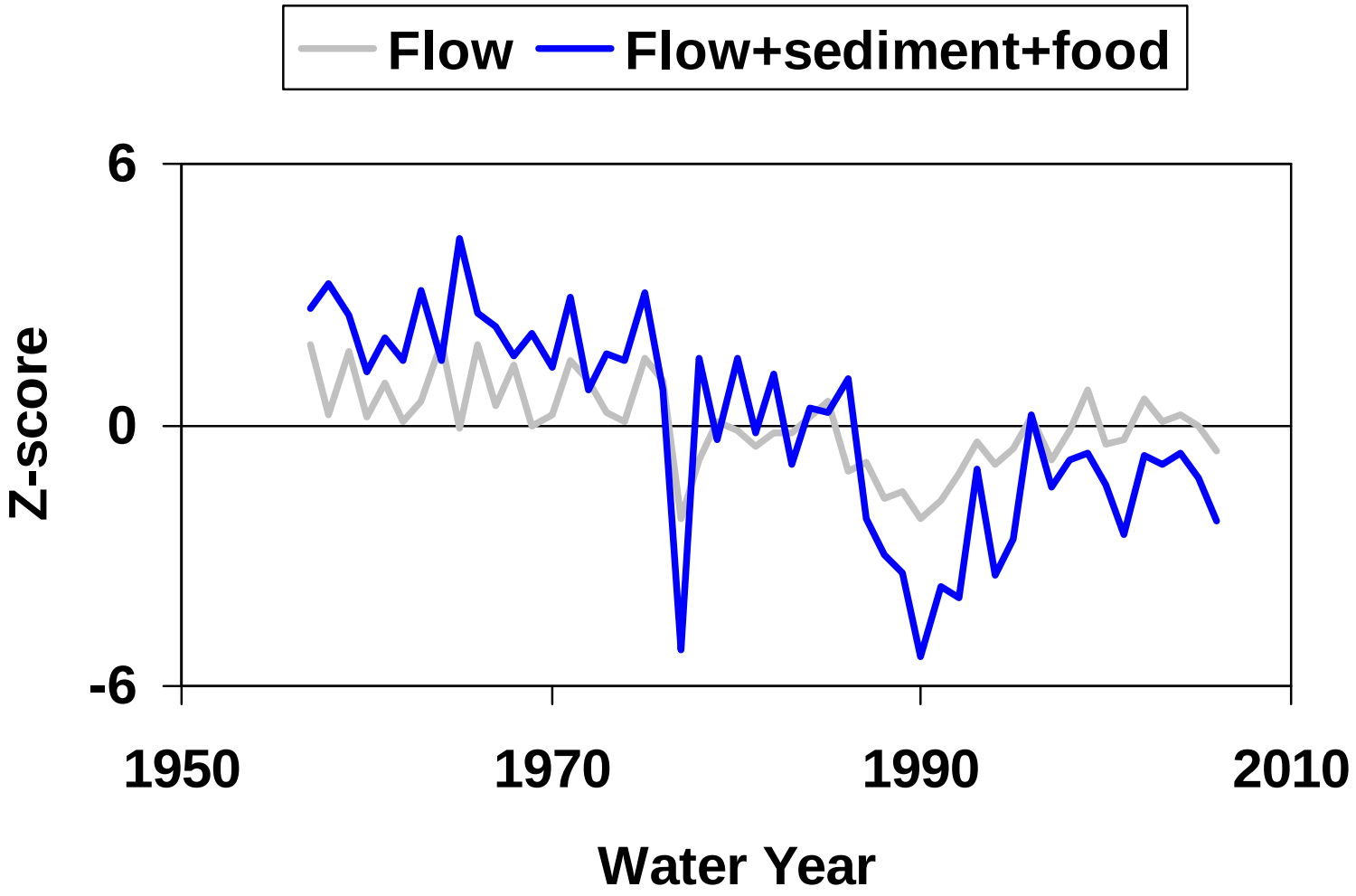
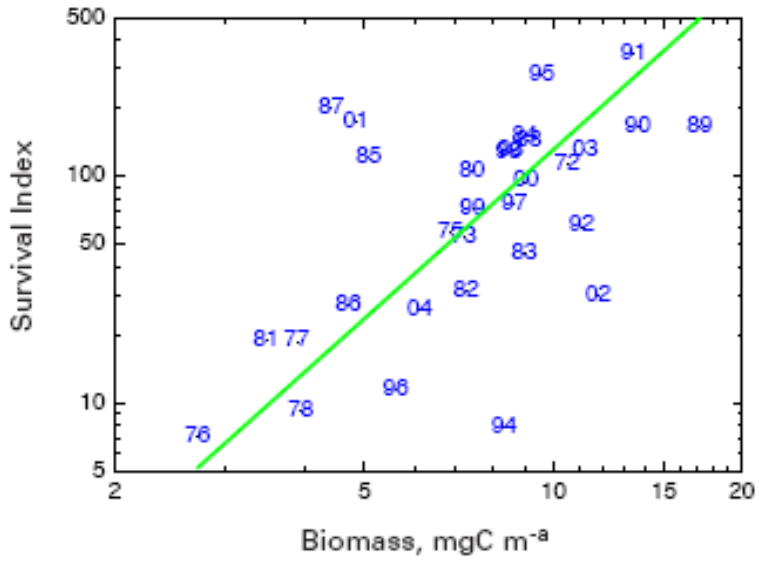



Can you be more specific about what caused the delta smelt decline?

Indices of indices: survival?

- $FMWT_{t+1} \div TNS_t \rightarrow$ Juvenile survival
  - Kimmerer (2008; SFEWS)



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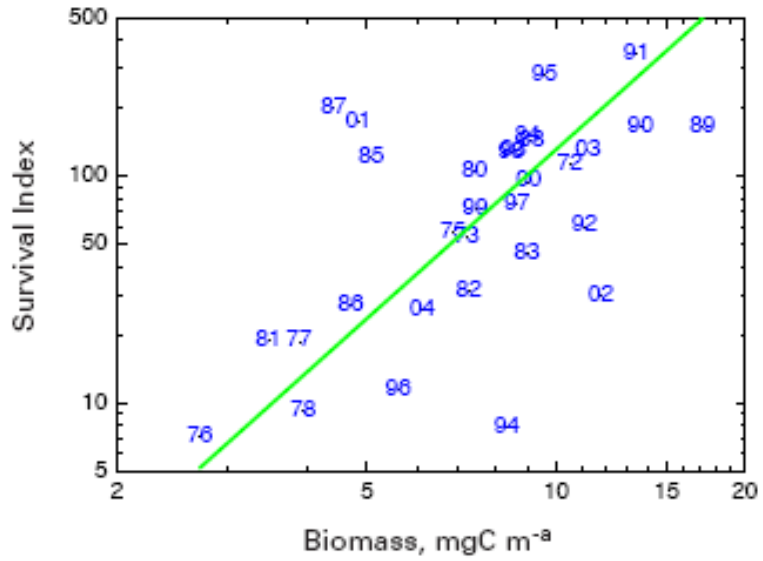
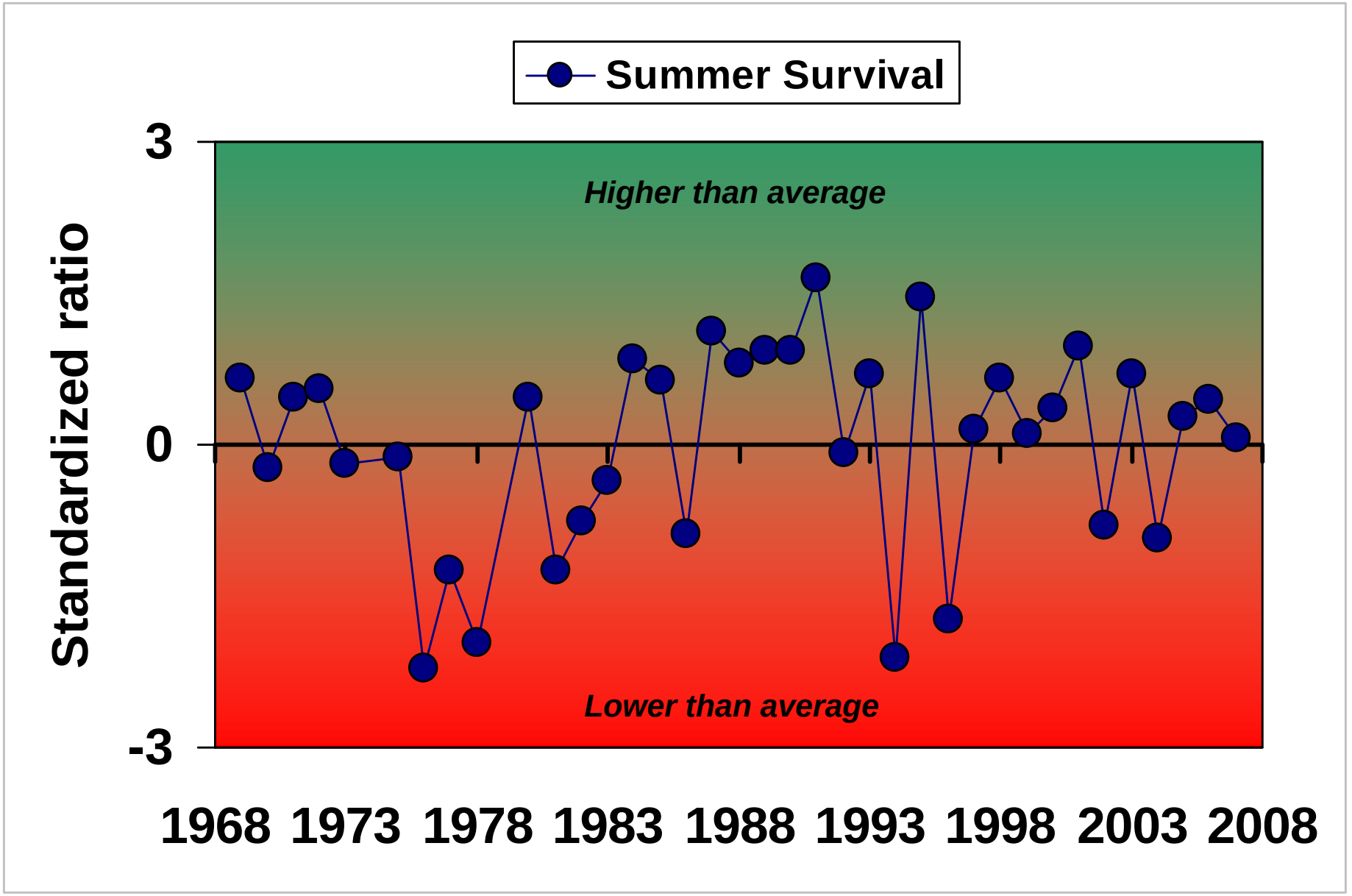
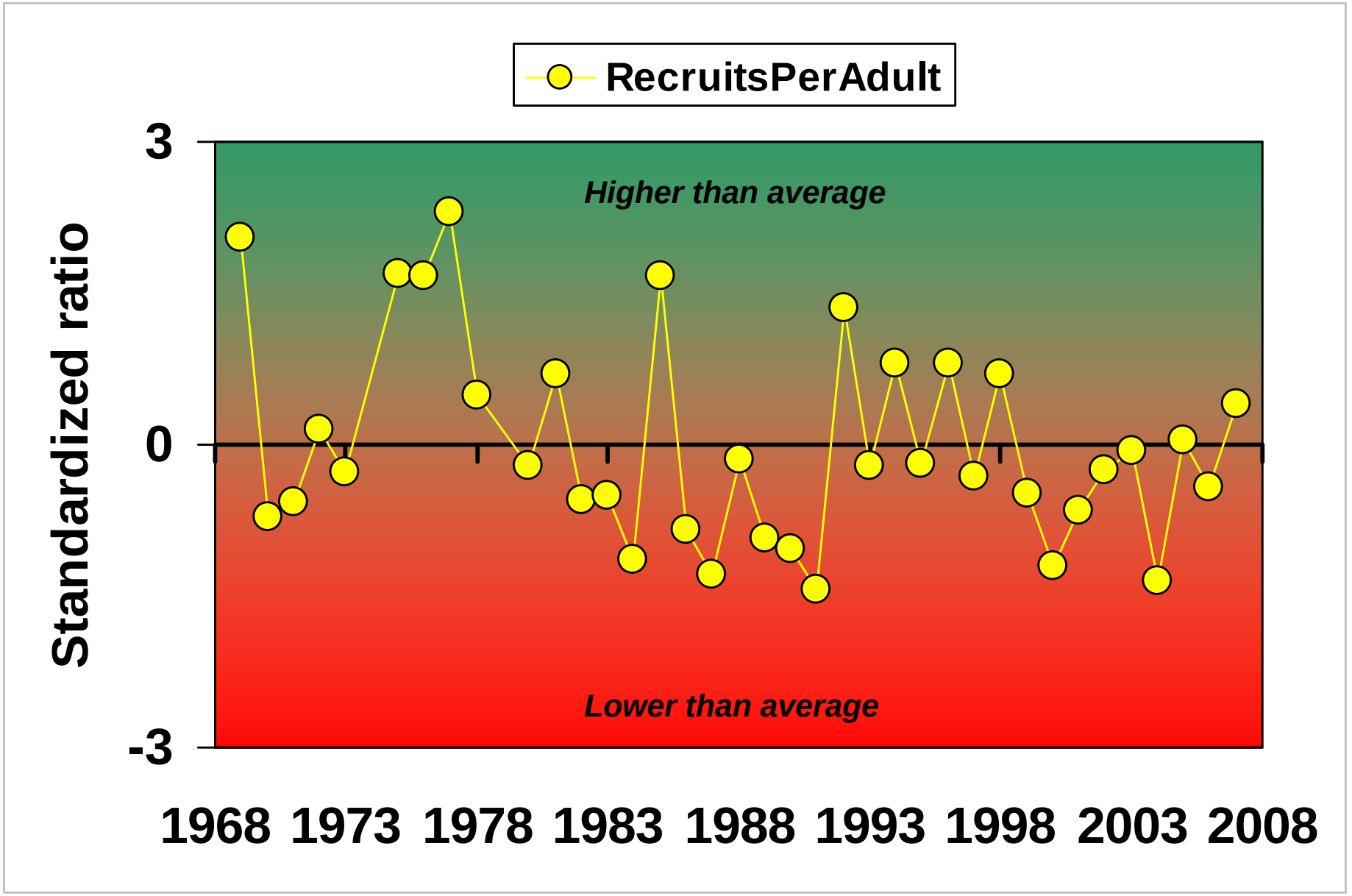


- $TNS_{t+1} \div FMWT_t \rightarrow$ Recruits per adult
  - This is where the population has usually been hit


Summer Survival
Standardized ratio
3
0
-3
Higher than average
Lower than average
1968
1973
1978
1983
1988
1993
1998
2003
2008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Conclusion

- Delta smelt biology is conceptually well-understood
  - Quantitative life-cycle models pending
- Delta smelt decline is part of a broader pelagic system decline
  - Driven mainly be factors occurring between maturation and early life of next generation
  - Conceptual support for BiOp RPAs