The Scientific Basis for Estuarine Habitat Protection

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FACTORS INFLUENCING THE ENTRAPMENT OF SUSPENDED MATERIAL IN THE SAN FRANCISCO BAY-DELTA ESTUARY

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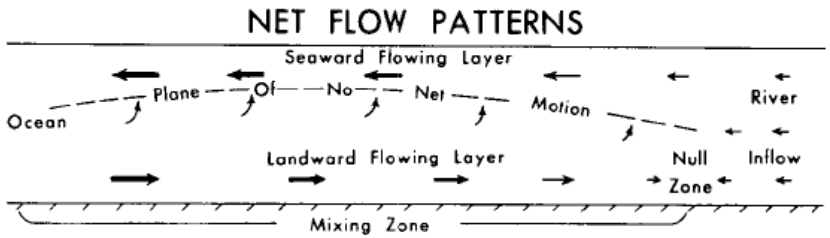


Fig. 2. Theoretical net flow patterns in a two-layered flow with vertical mixing estuary.

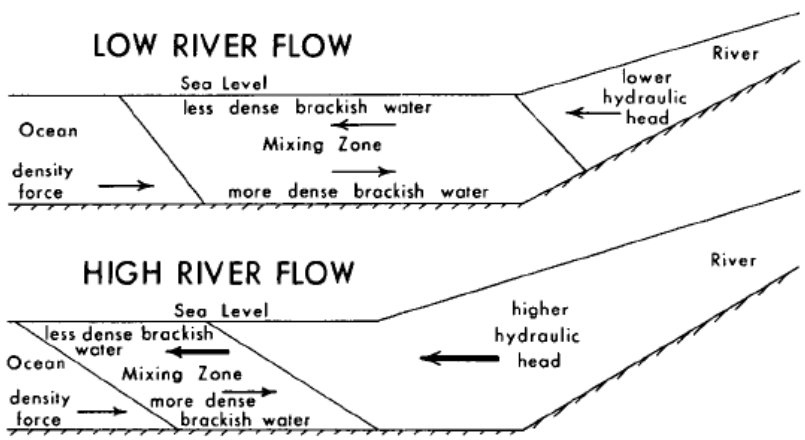


Fig. 3. The primary driving forces controlling two-layered flow circulation in the estuary.

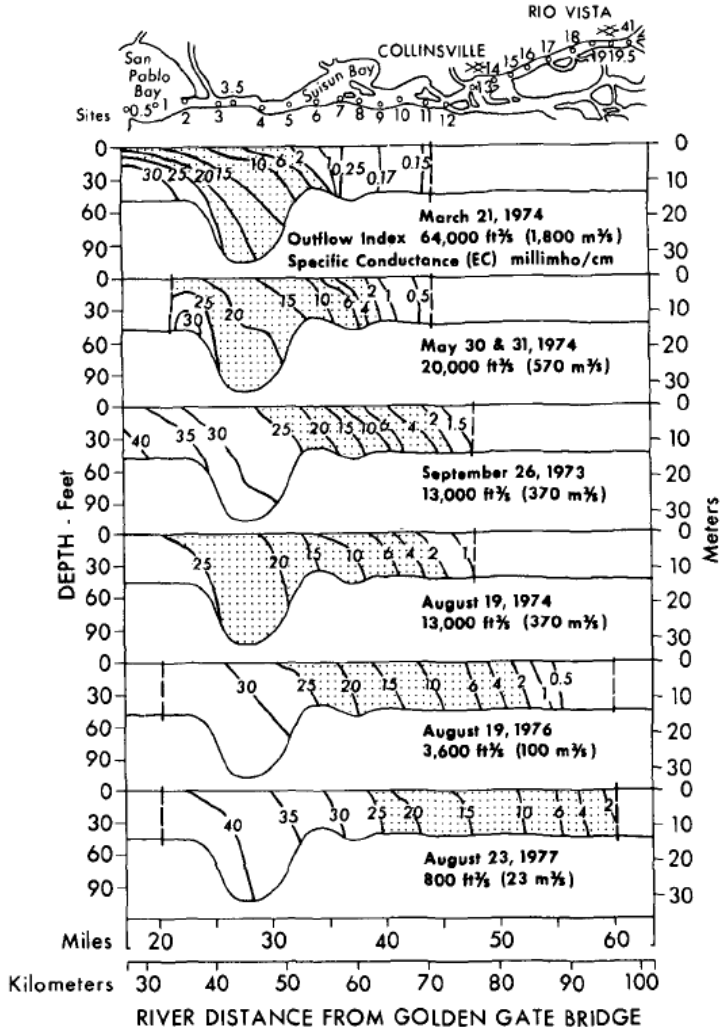


Fig. 6. Isoconductivity (salinity) contours measured on high slack tides at various Delta outflows (the 2-25 millimho/cm EC range has been arbitrarily shaded).

Salinity Intrusion

The 2 millimho/cm specific conductance (1 ‰ salinity) isocontour shifted nearly 45 km over the range of DOI studied (23-1,800 $m^3 \cdot s^{-1}$) (Fig. 6).

Distribution of Dissolved Materials

Dissolved constituents, of course, are not subject to entrapment by two-layered flow circulation. The concentration of nitrate+nitrite (Fig. 12), ammonia and orthophosphate generally increased with water depth and peaked downstream of the entrapment zone (see also Peterson 1979; Conomos et al. 1979).

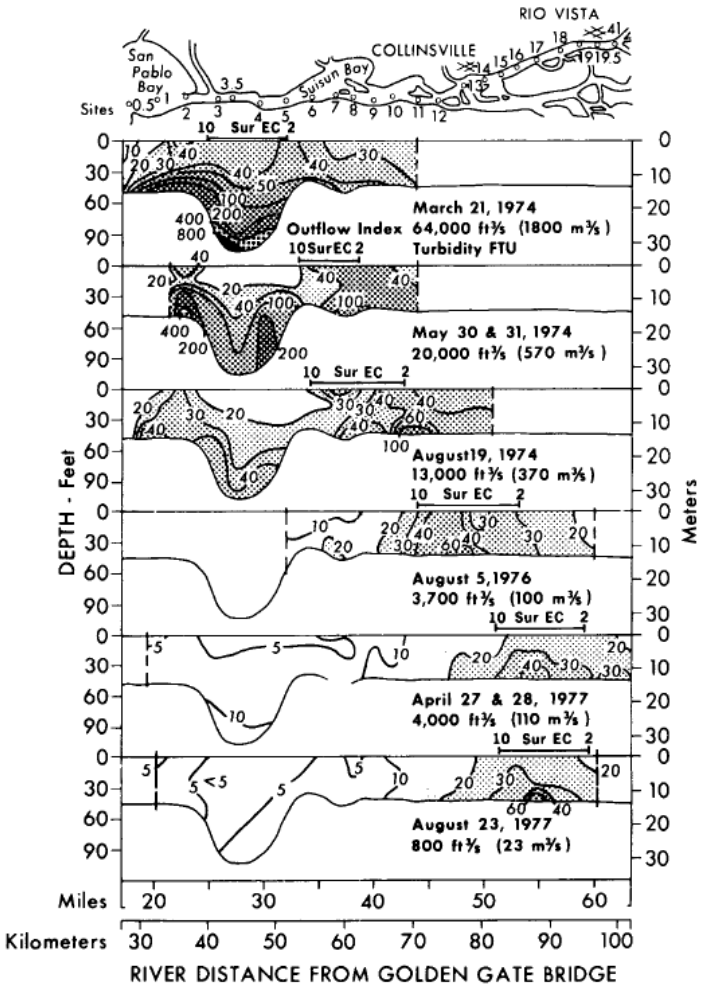


Fig. 9. Turbidity distribution relative to salinity on high slack tides at various Delta outflows.

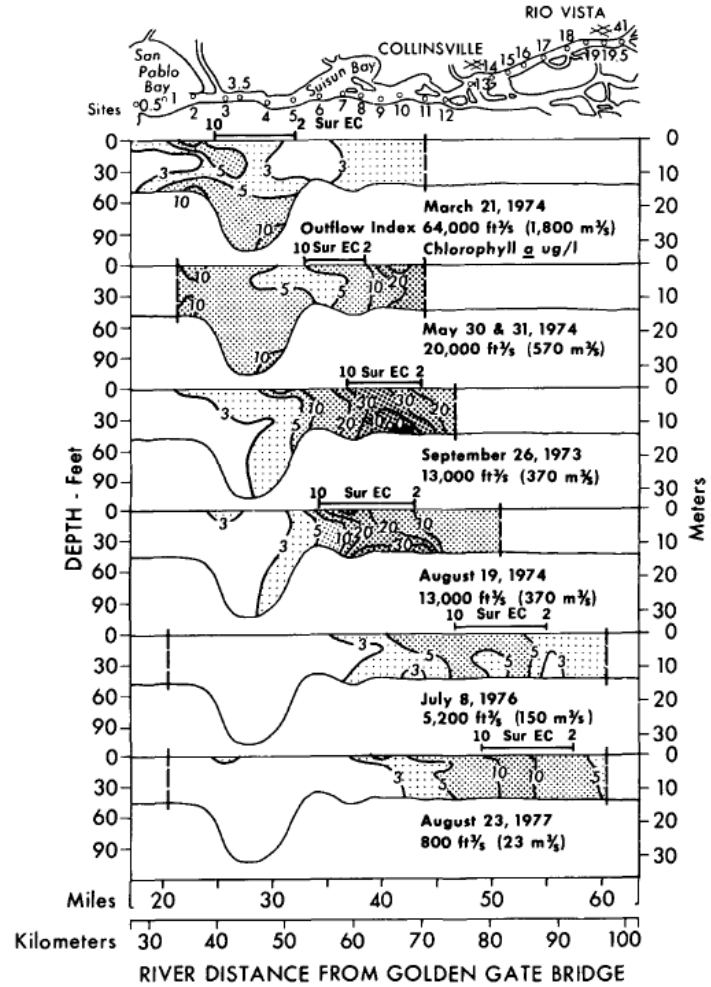


Fig. 13. Chlorophyll *a* distribution relative to salinity during high slack tides at various Delta outflows.

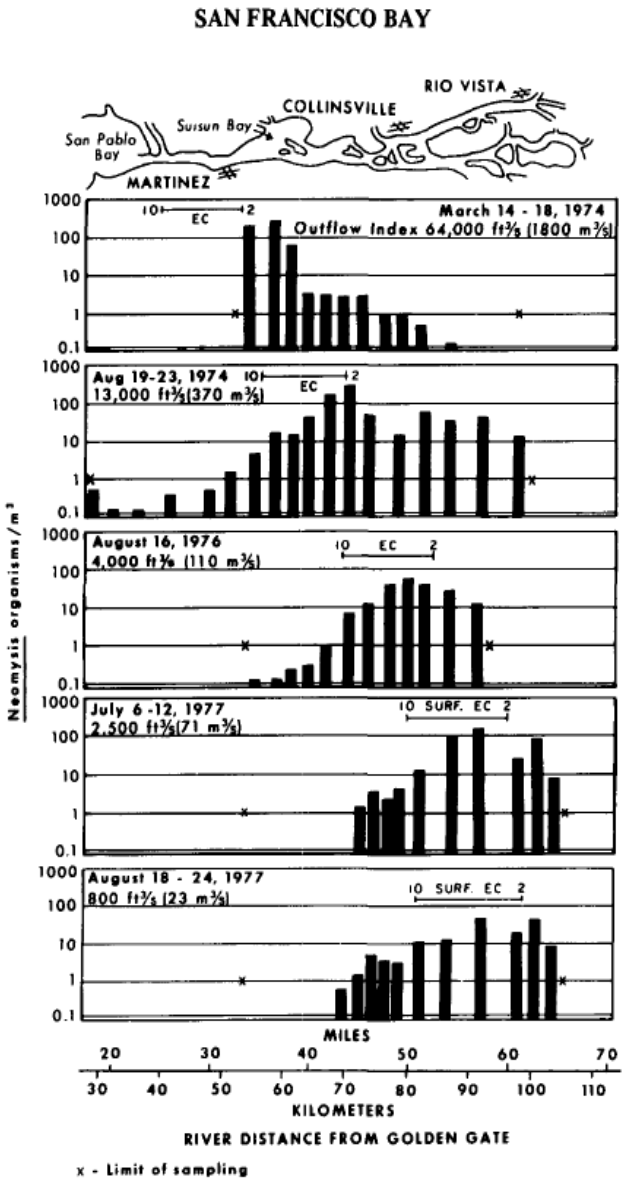


Fig. 15. *Neomysis mercedis* distribution relative to salinity on high slack tides at various Delta outflows (data collected by DFG).

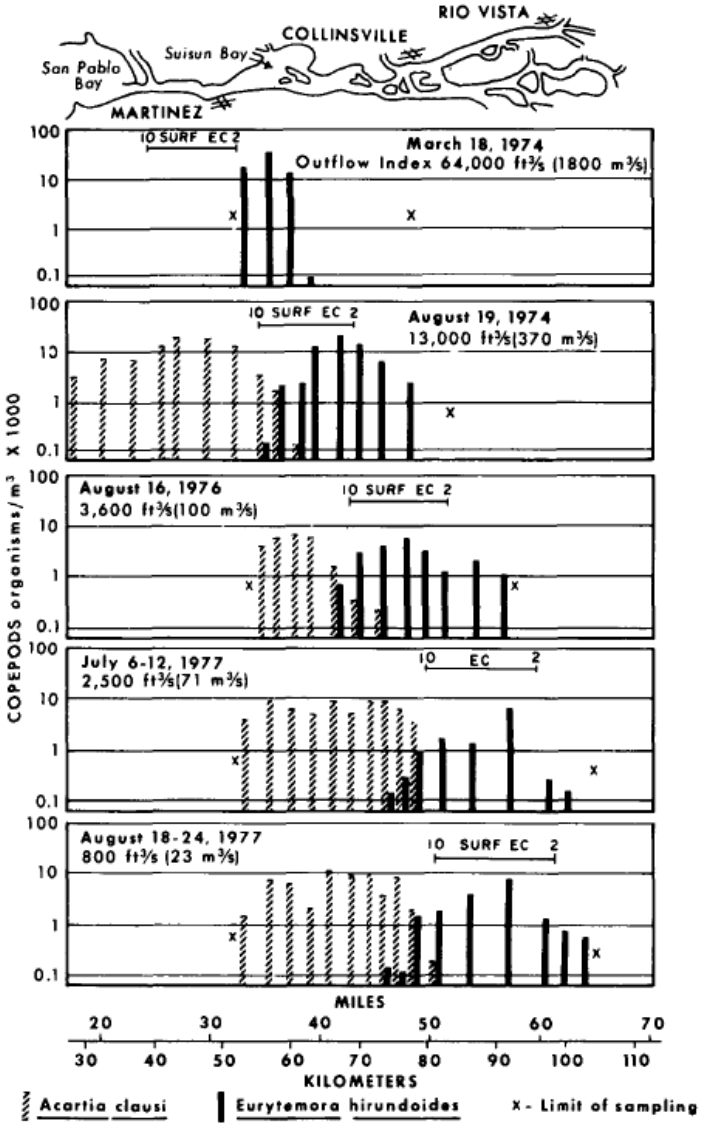


Fig. 16. Distribution of two dominant copepods (*Acartia clausi* and *Eurytemora hirundoides*) relative to salinity on high slack tides at various Delta outflows (data collected by DFG).

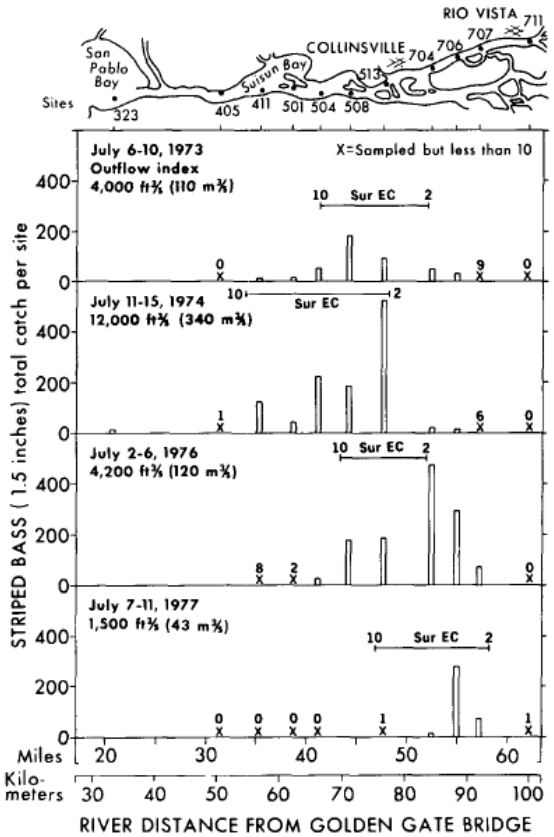


Fig. 17. Distribution of juvenile striped bass (young-of-the-year) relative to salinity on high slack tides during July 1973, 1974, 1976, and 1977 (data collected by DFG).

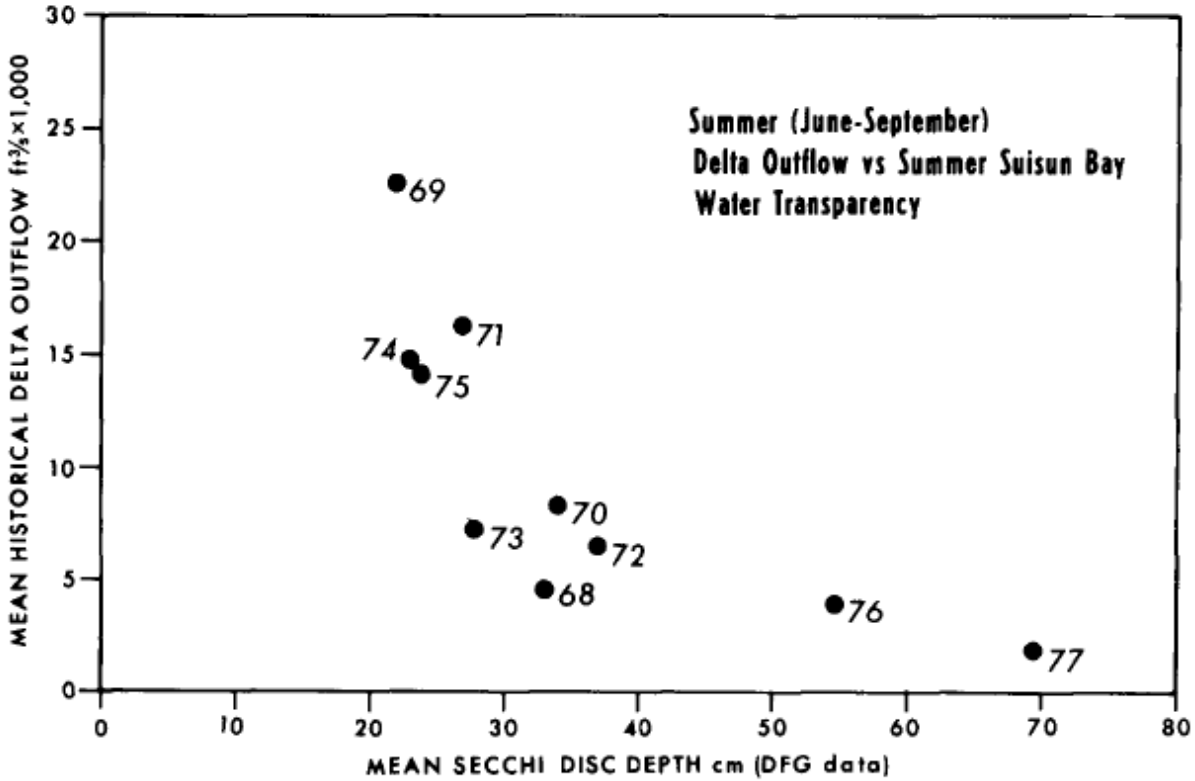
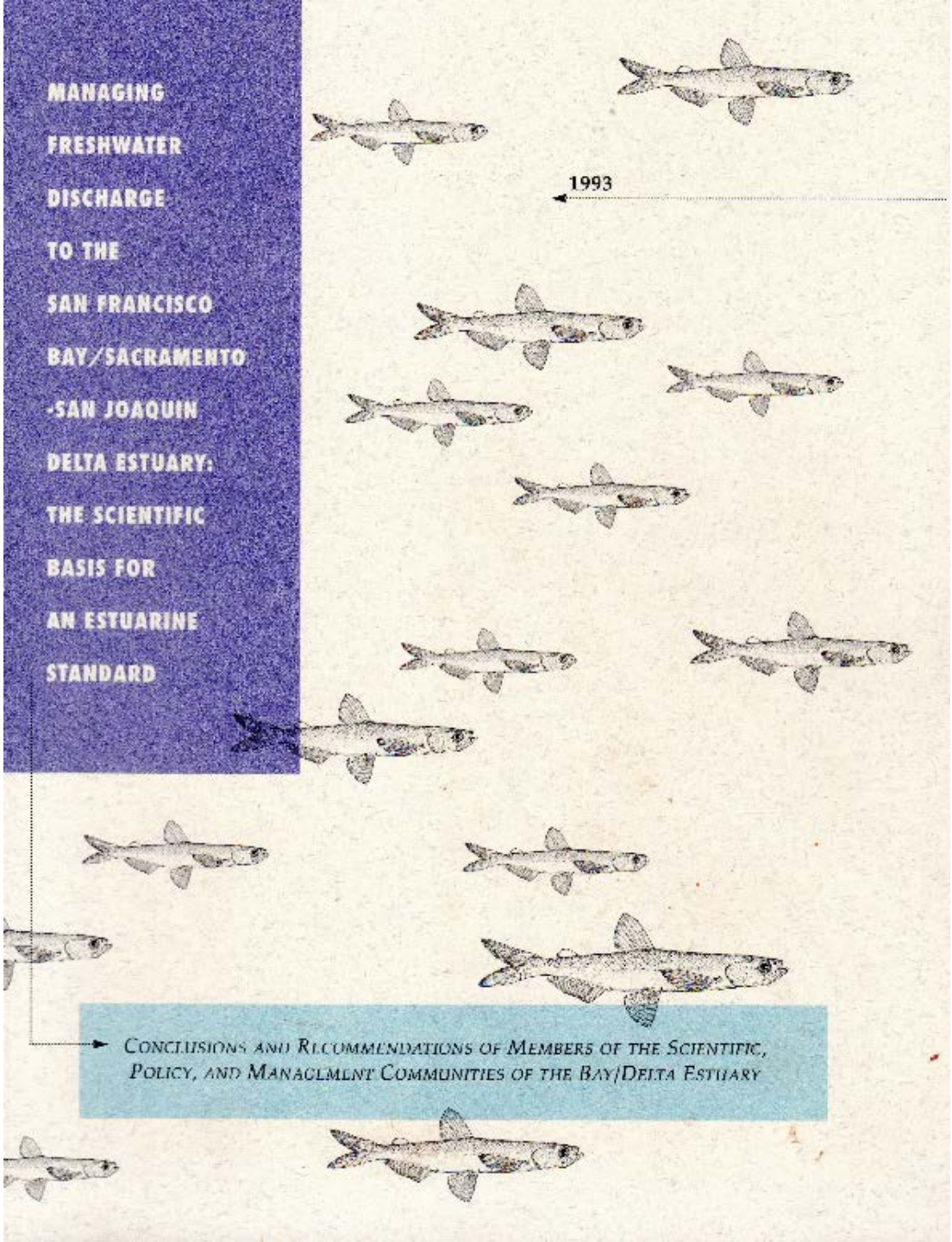


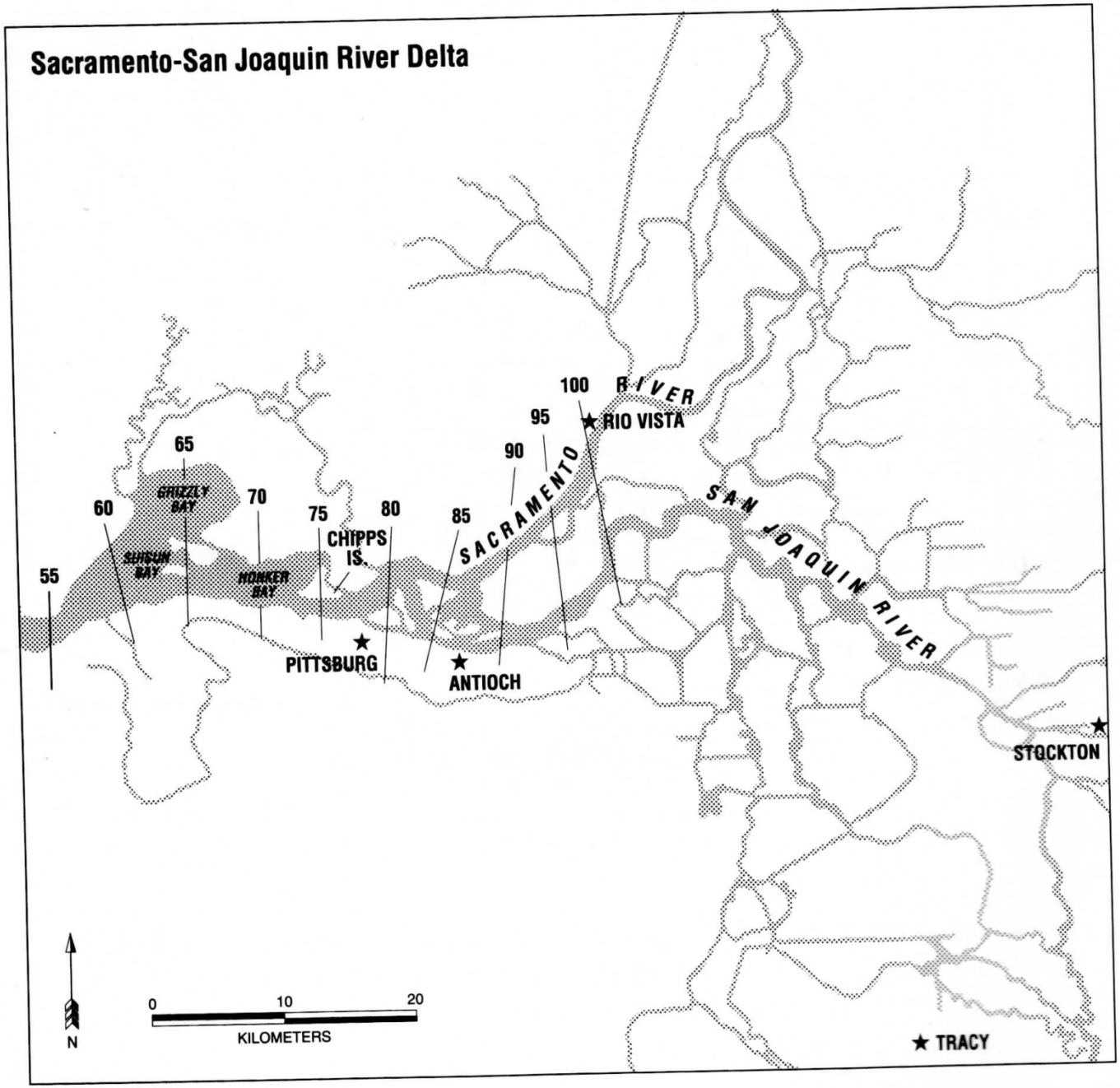
Fig. 19. Summer Suisun Bay water transparency versus summer historical Delta outflow. The 1977 outflow value was calculated as the Delta outflow index.

MANAGING FRESHWATER DISCHARGE TO THE SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA ESTUARY: THE SCIENTIFIC BASIS FOR AN ESTUARINE STANDARD

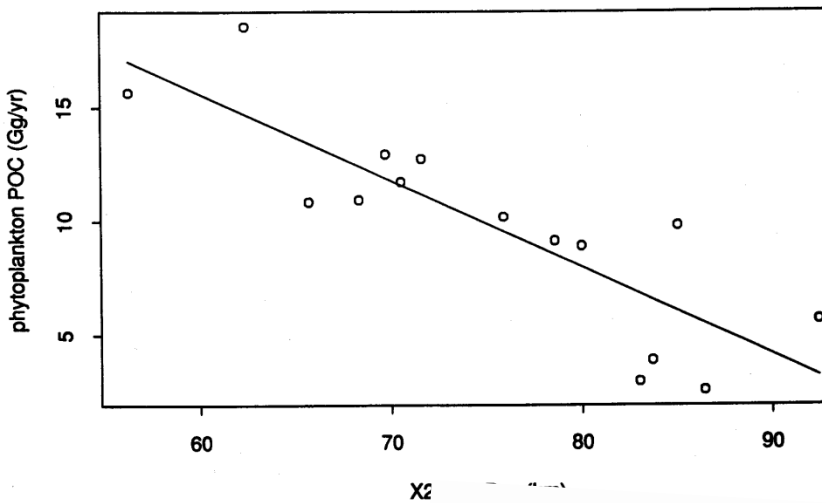
1993



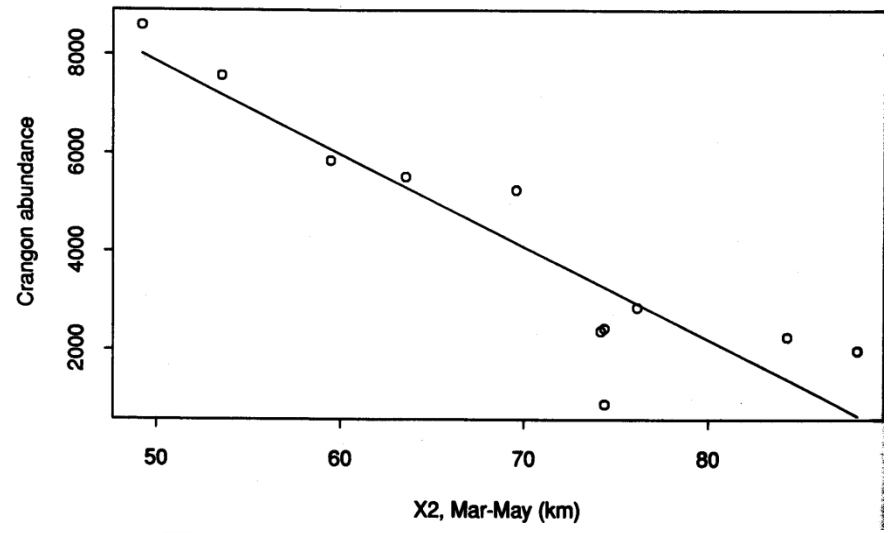
Conclusions and Recommendations of Members of the Scientific, Policy, and Management Communities of the Bay/Delta Estuary


Sacramento-San Joaquin River Delta
55
60
65
70
75
80
85
90
95
100
GRIZZLY BAY
SUISUN BAY
HONKER BAY
CHIPPS IS.
PITTSBURG
ANTIOCH
RIO VISTA
SACRAMENTO RIVER
SAN JOAQUIN RIVER
STOCKTON
TRACY
N
0
10
20
KILOMETERS

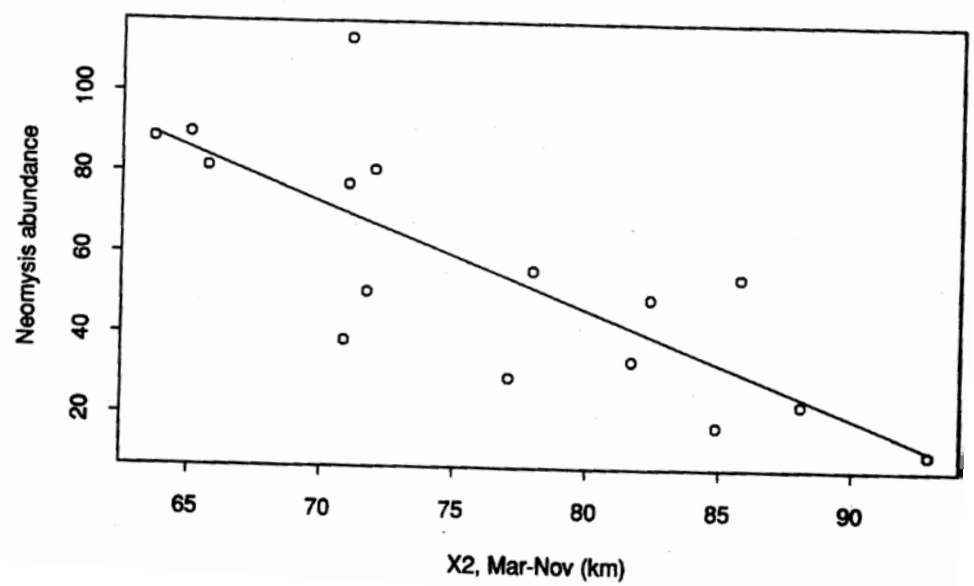
Particulate organic carbon



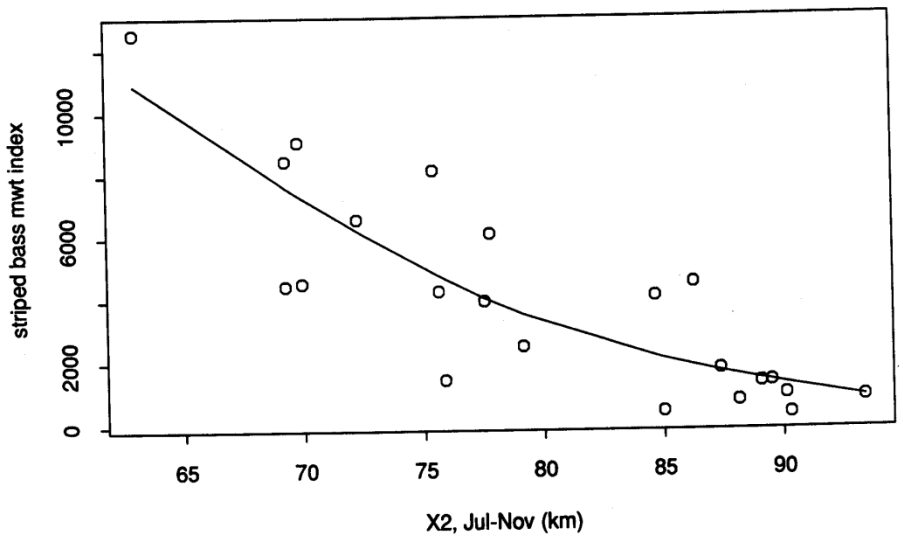
Bay shrimp *Crangon franciscorum*



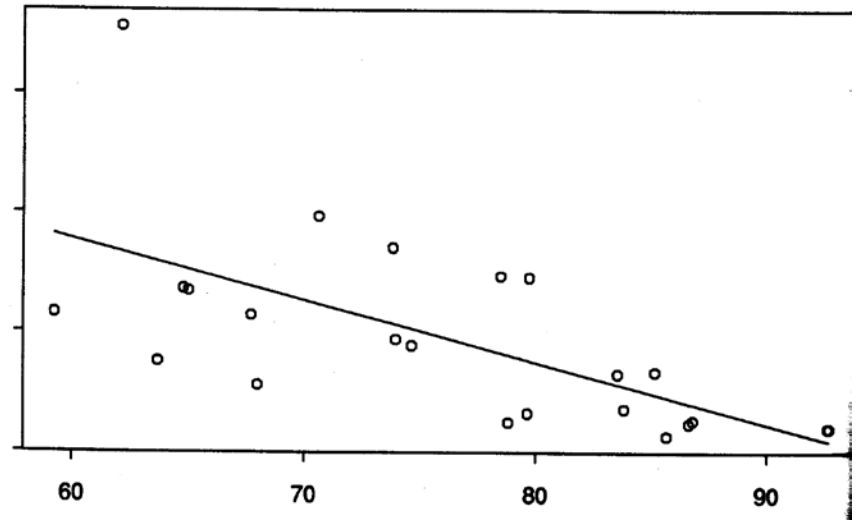
Neomysis mercedis



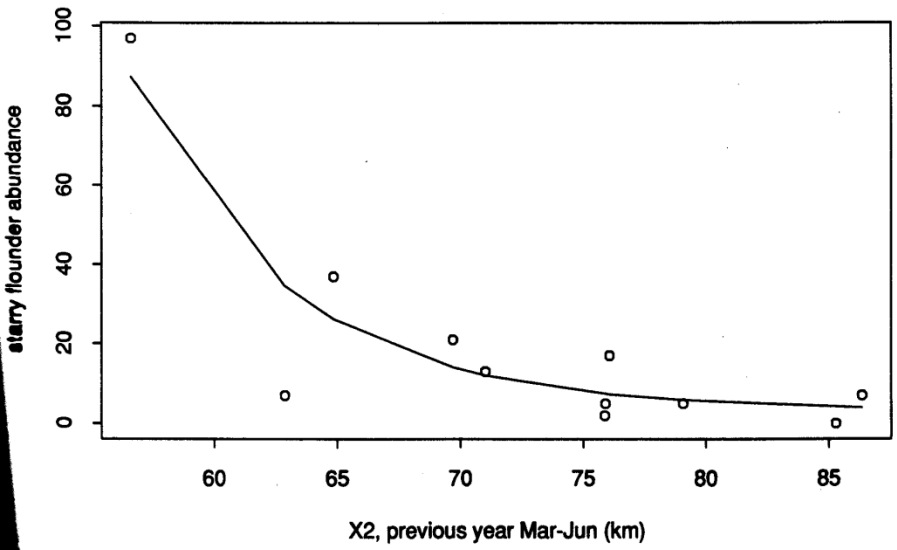
Striped Bass young of year



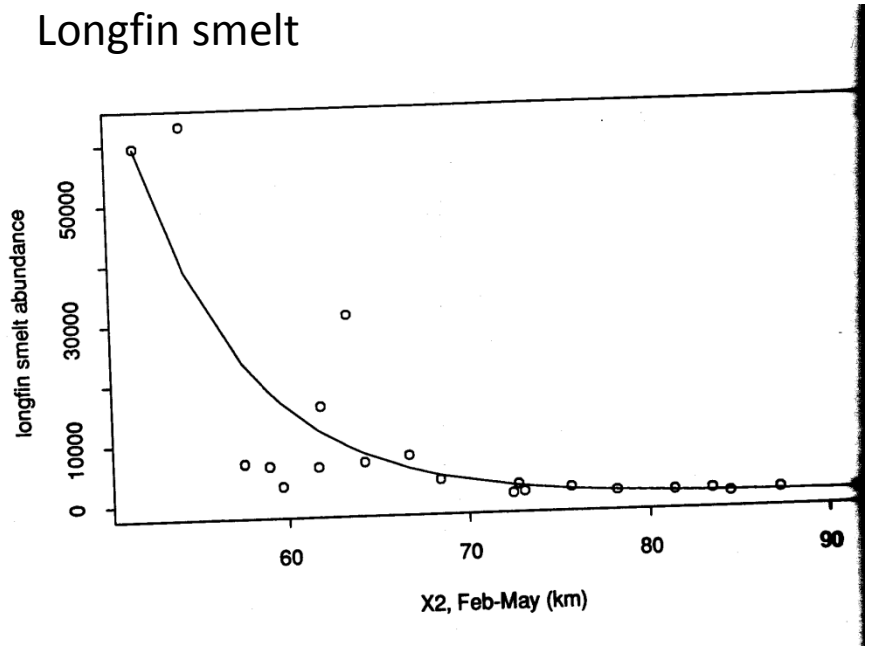
Striped Bass survival from egg



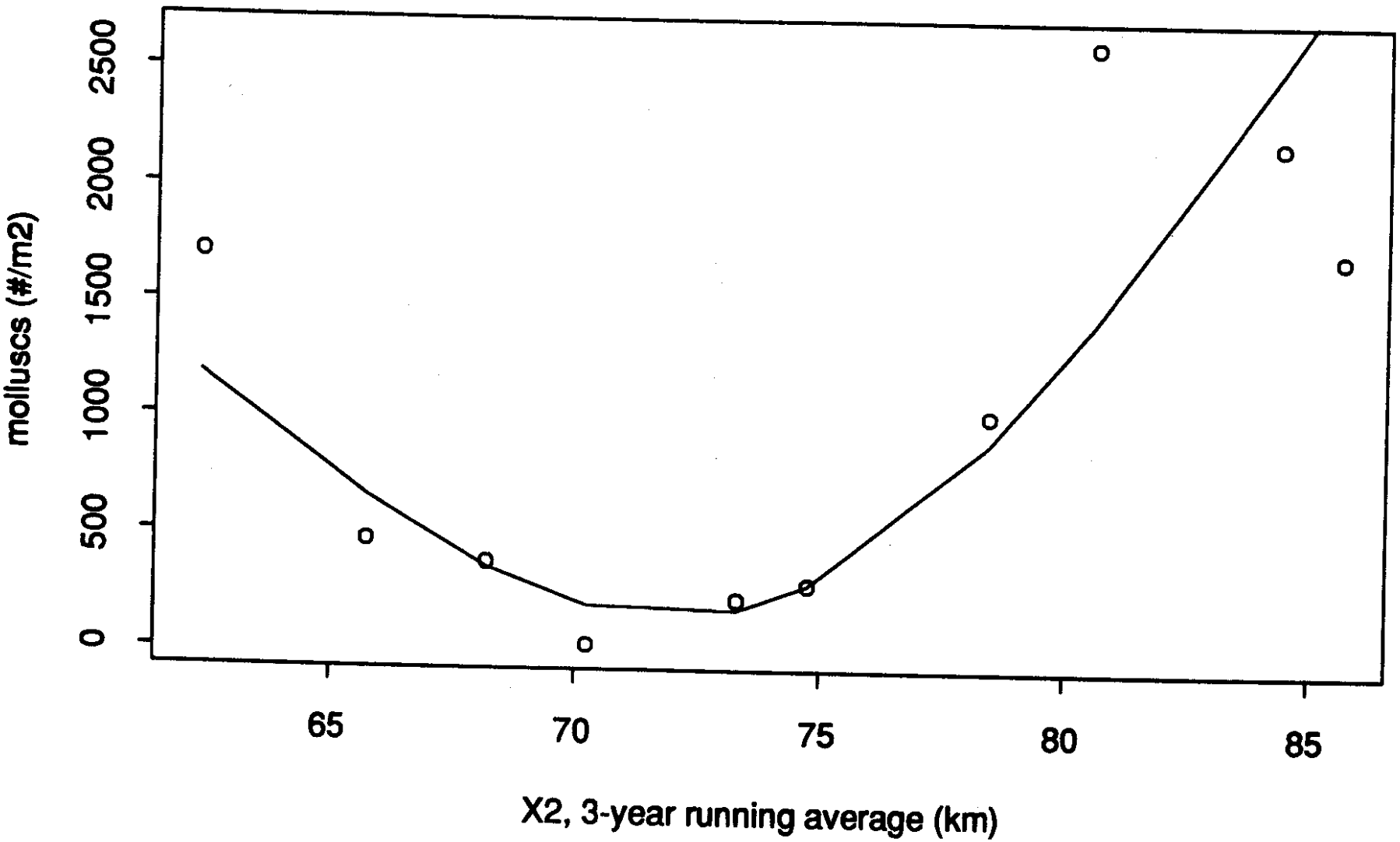
Starry Flounder



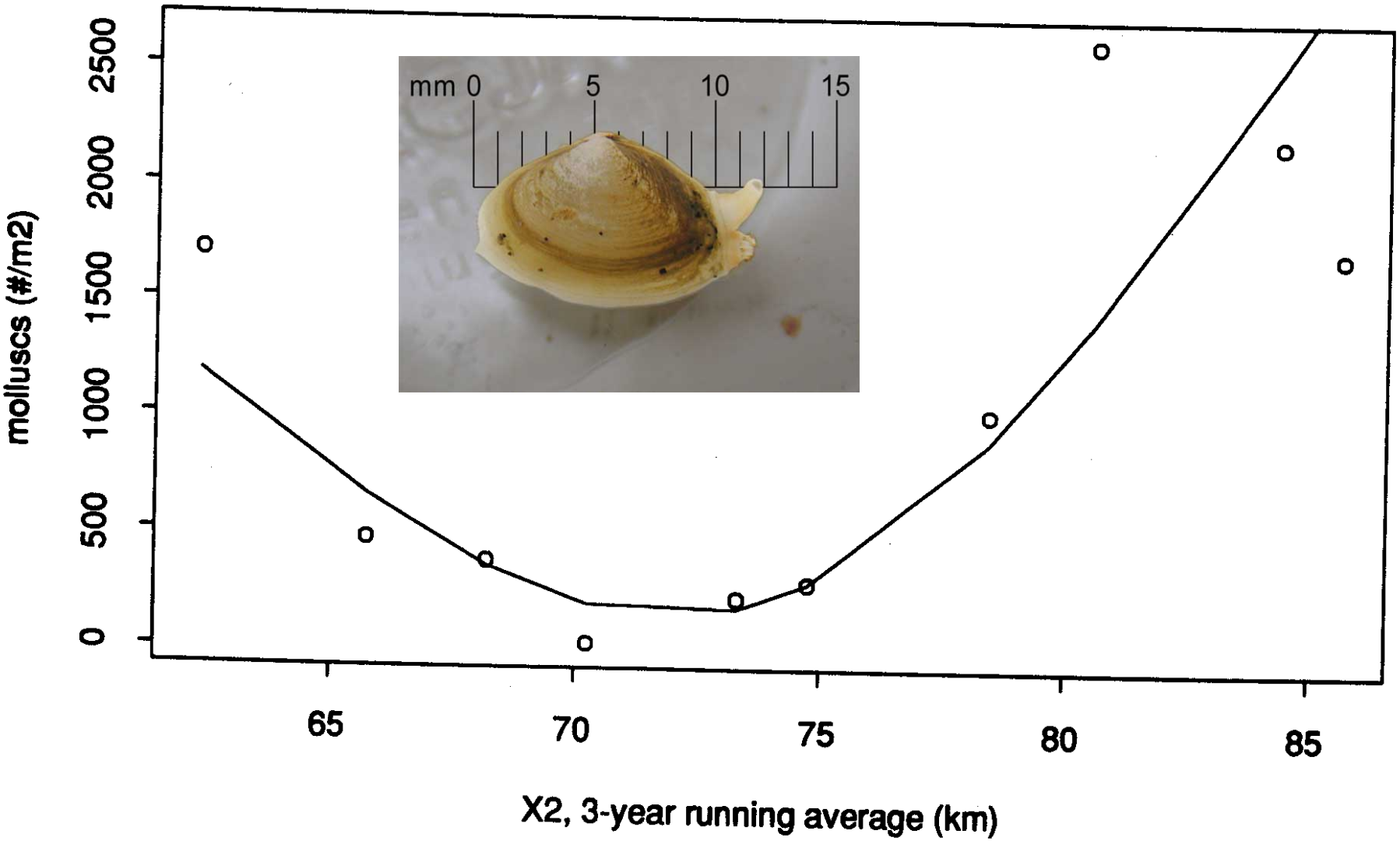
Longfin smelt



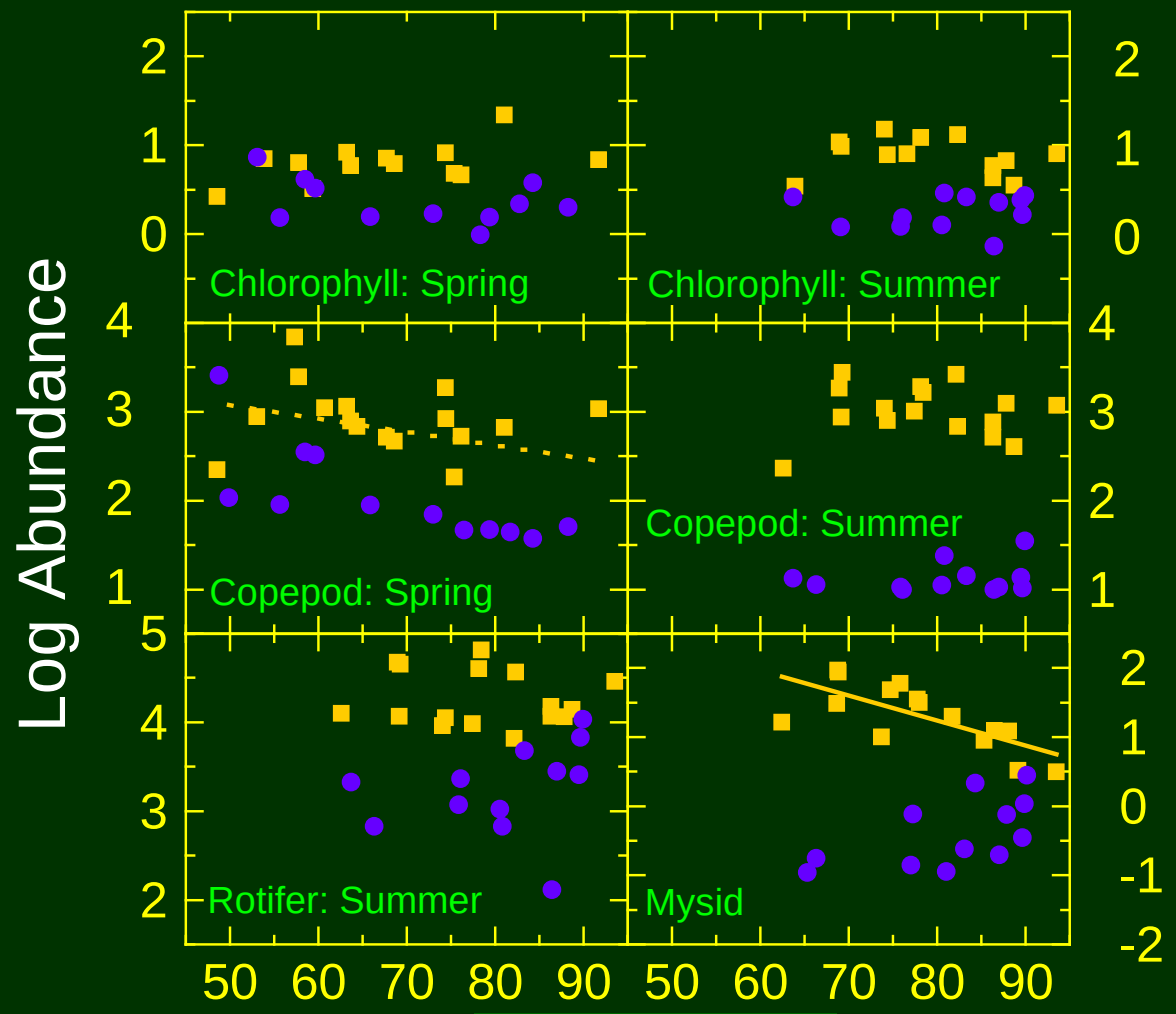
Molluscs in Suisun Bay, *Macoma baltica* at high X2, *Corbicula fluminea* at low X2



After 1986 Overbite clam *Potamocorbula amurensis* at extreme dominance (30,000/m2)



Lower trophic levels show few relationships of abundance to freshwater flow



1972-1987

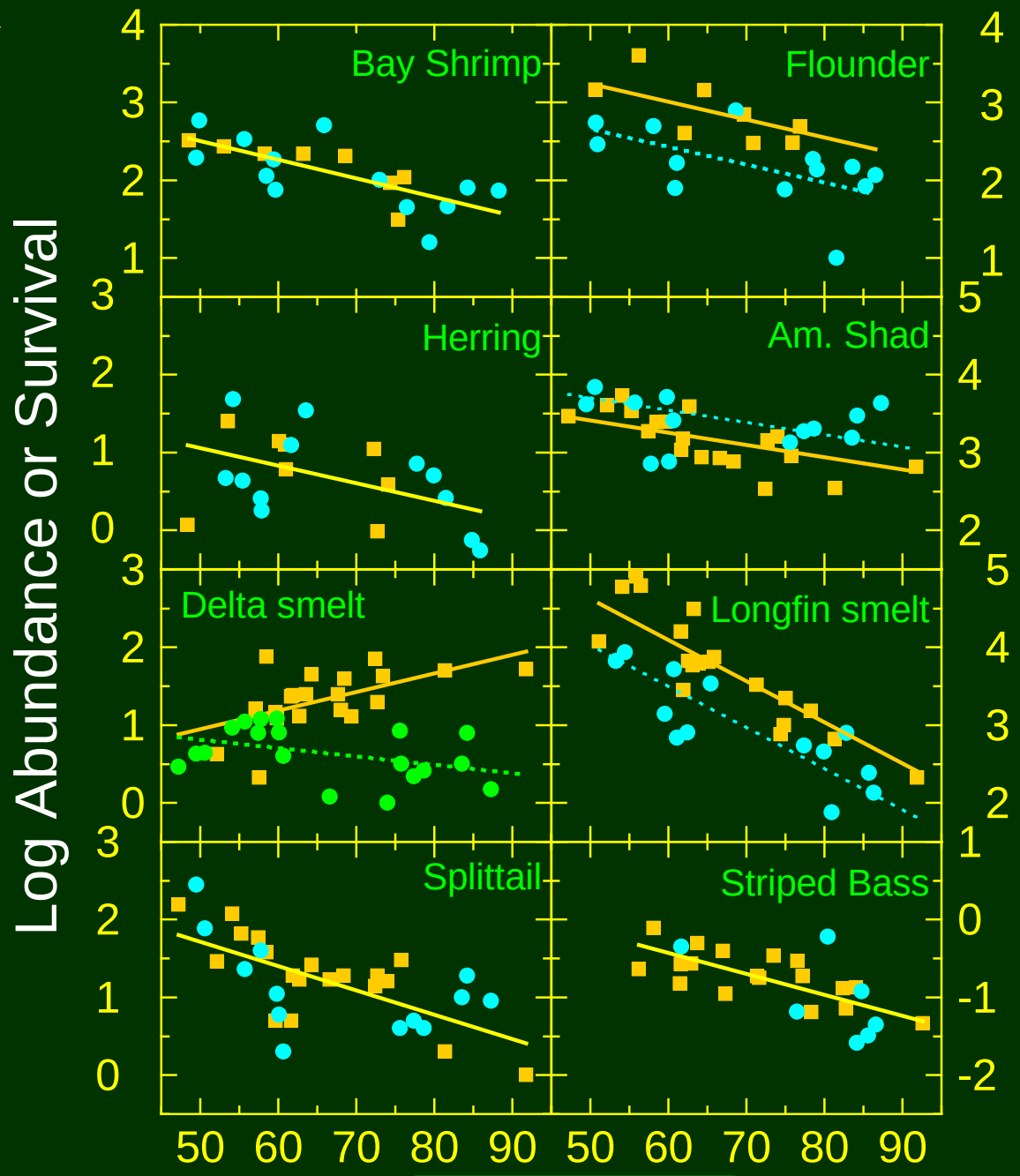
1988-2000

Source:
Kimmerer 2002 MEPS

High Flow

Low Flow

Higher trophic levels show many relationships of abundance to freshwater flow



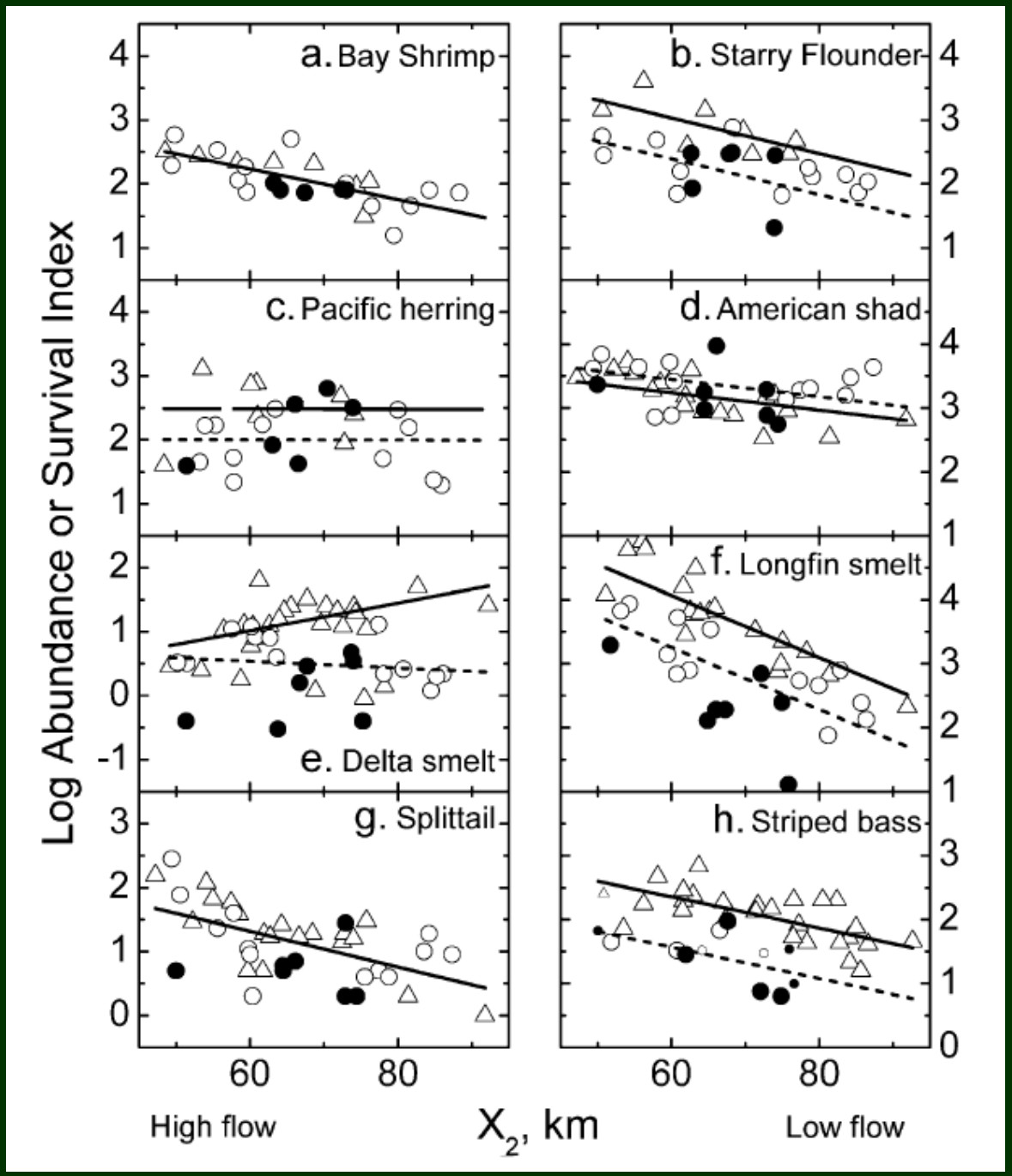
1967-87

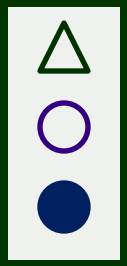
1988-2000

1982-2000 (DS)

All Years

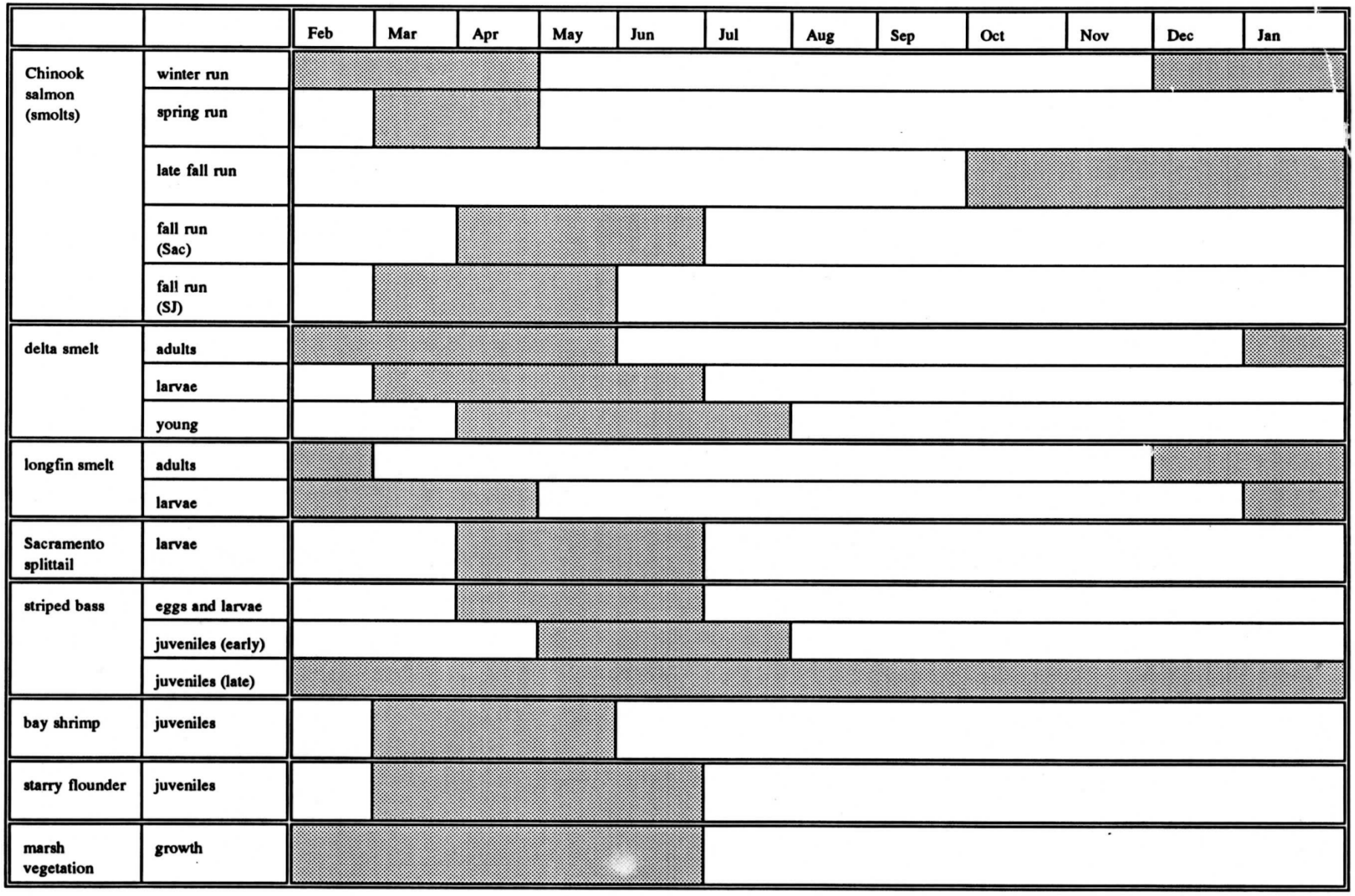
Source:
Kimmerer 2002MEPS





Kimmerer et al.
Estuaries and Coasts 2009

SPECIES NEEDS IN THE BAY/DELTA



Cumulative Reservoir Capacity

Central Valley Basin

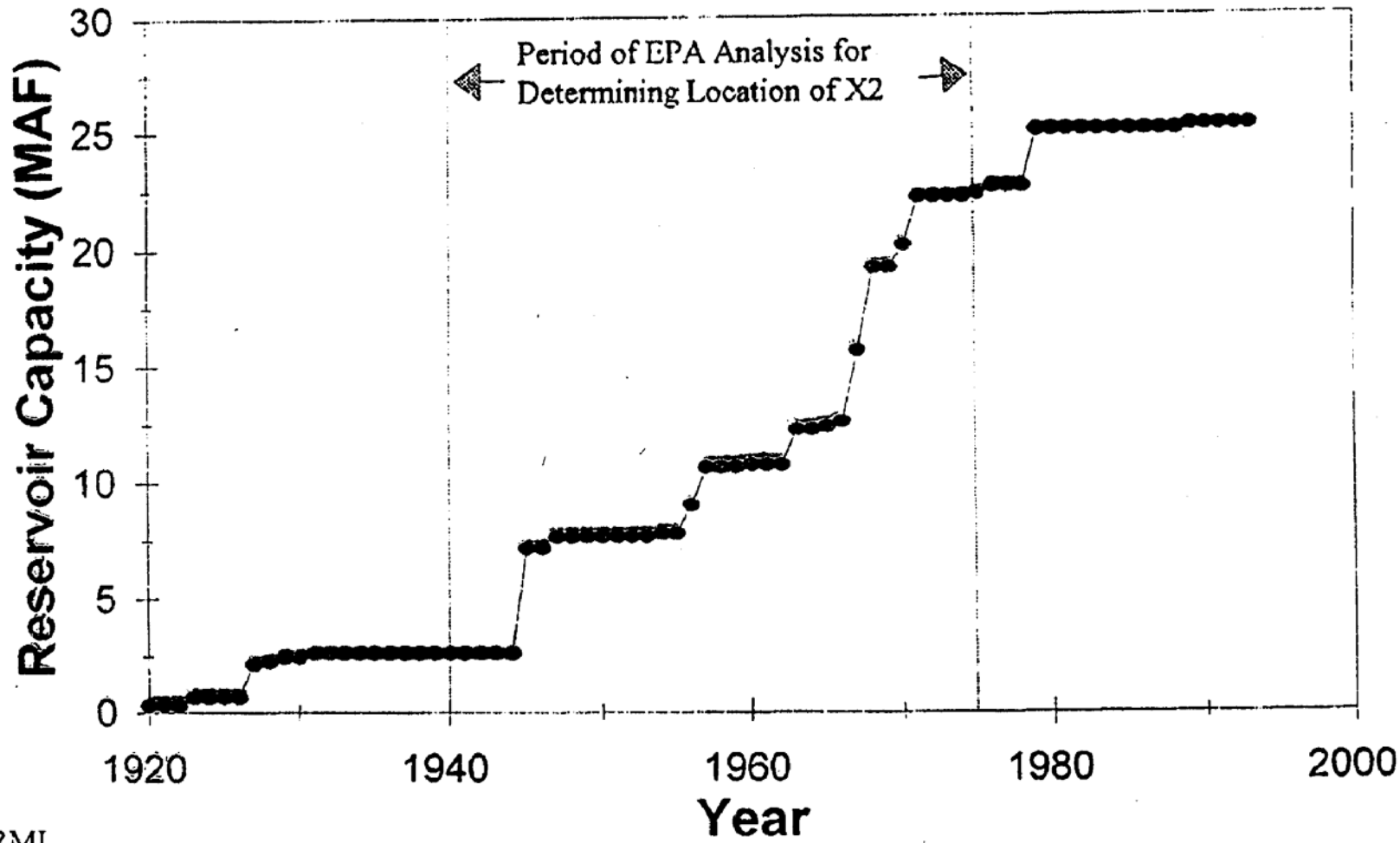


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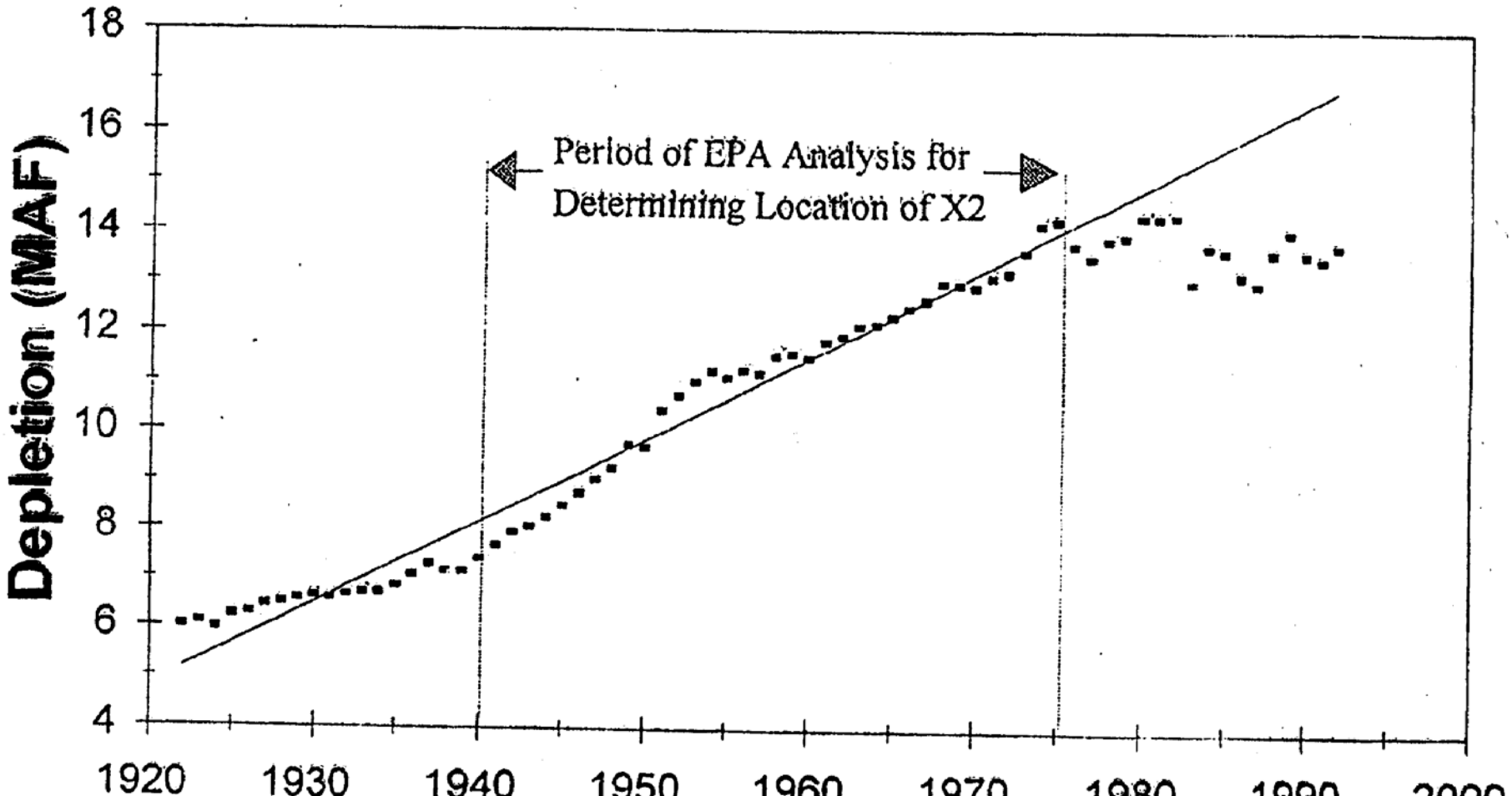
Figure 1

Historic Central Valley Depletions

1922 - 1992



Mean Feb-Jun X2 positions

	Critical	Dry	Below Normal	Above Normal	Wet
1930-39	74	66	57		48
1940-49		68	68	54	52
1950-59		72	69	62	54
1960-75		72	71	62	59
1976-80	86	77	69	59	57

Mean Feb-Jun Number of Days at Chipps

	Critical	Dry	Below Normal	Above Normal	Wet
1930-39	108	133	150		150
1940-49		131	148	151	150
1950-59		129	126	145	151
1960-75		96	99	131	145
1976-80	7	45	117	147	129

Predicted percent days < 2 ppt showing effects of year and flow

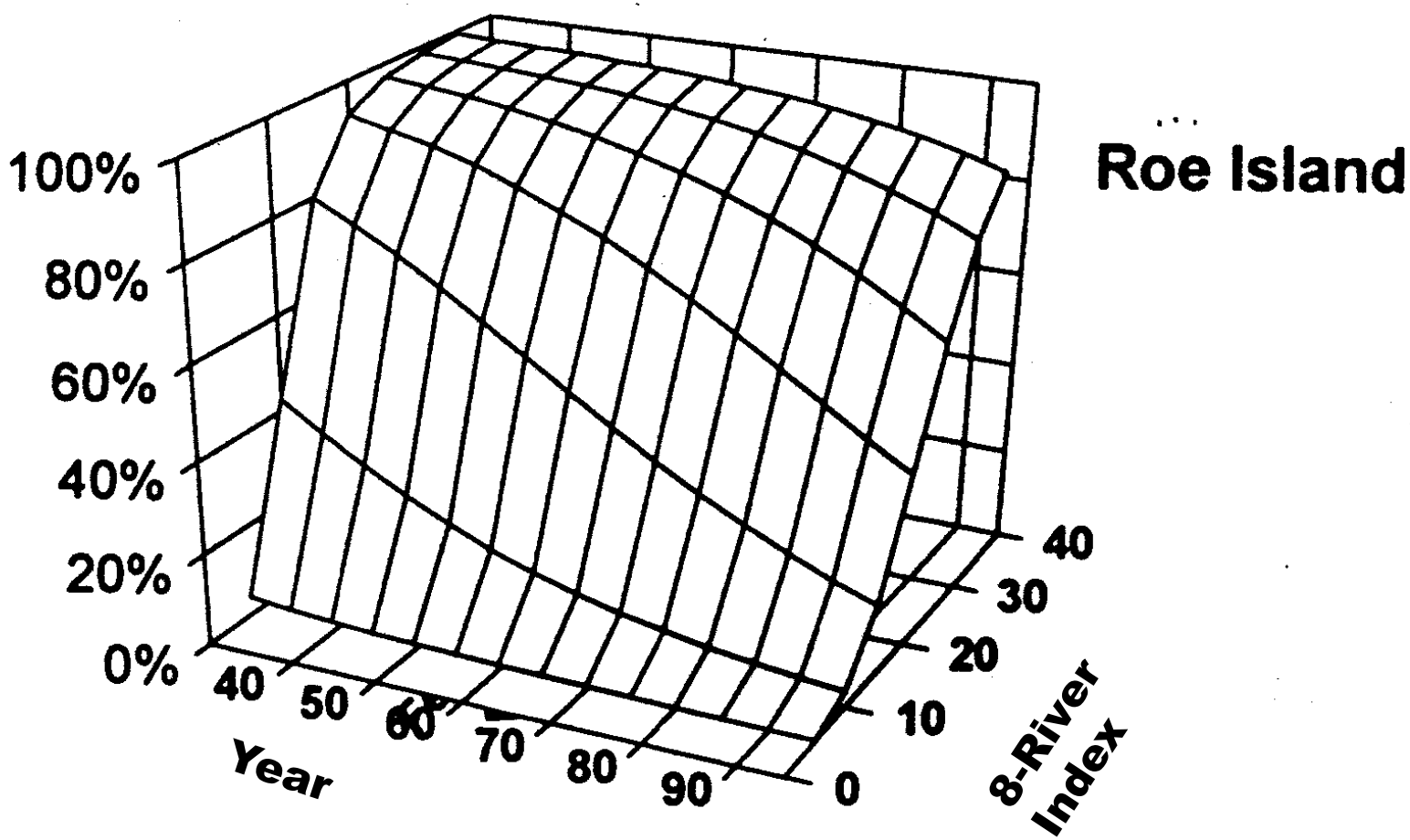
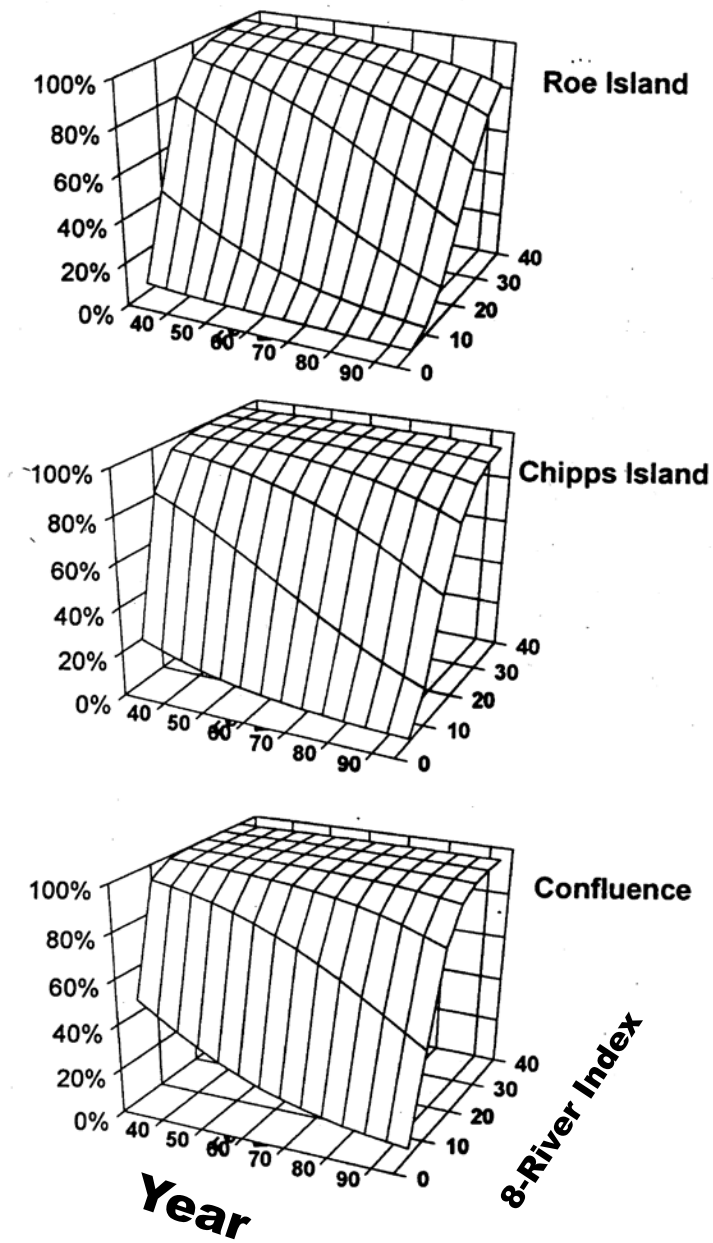


Figure 3. Predicted percent days < 2 ppt showing effects of year and flow



Days West of Chipps Island Feb-Jun

	Critical	Dry	Below Normal	Above Normal	Wet
60’s		98	112		150
70’s	0	67	150	124	148
80’s	33	54		104	148
90’s	27			150	145
2000’s	58	82	128	146	150

Days West of Chipps Island Feb-Jun

	Critical	Dry	Below Normal	Above Normal	Wet
30’s	108	135	150		150
40’s		131	148	151	150
50’s		129	126	145	151
60’s		98	112		150
70’s	0	67	150	124	148
80’s	33	54		104	148
90’s	27			150	145
2000’s	58	82	128	146	150

Days West of Chipps Island July-January

	Critical	Dry	Below Normal	Above Normal	Wet
60's		64	90		131
70's	58	123	200	55	93
80's	5	55		137	110
90's	0			65	88
2000's	10	31	21	10	79