Spring Chinook Interactions Indices

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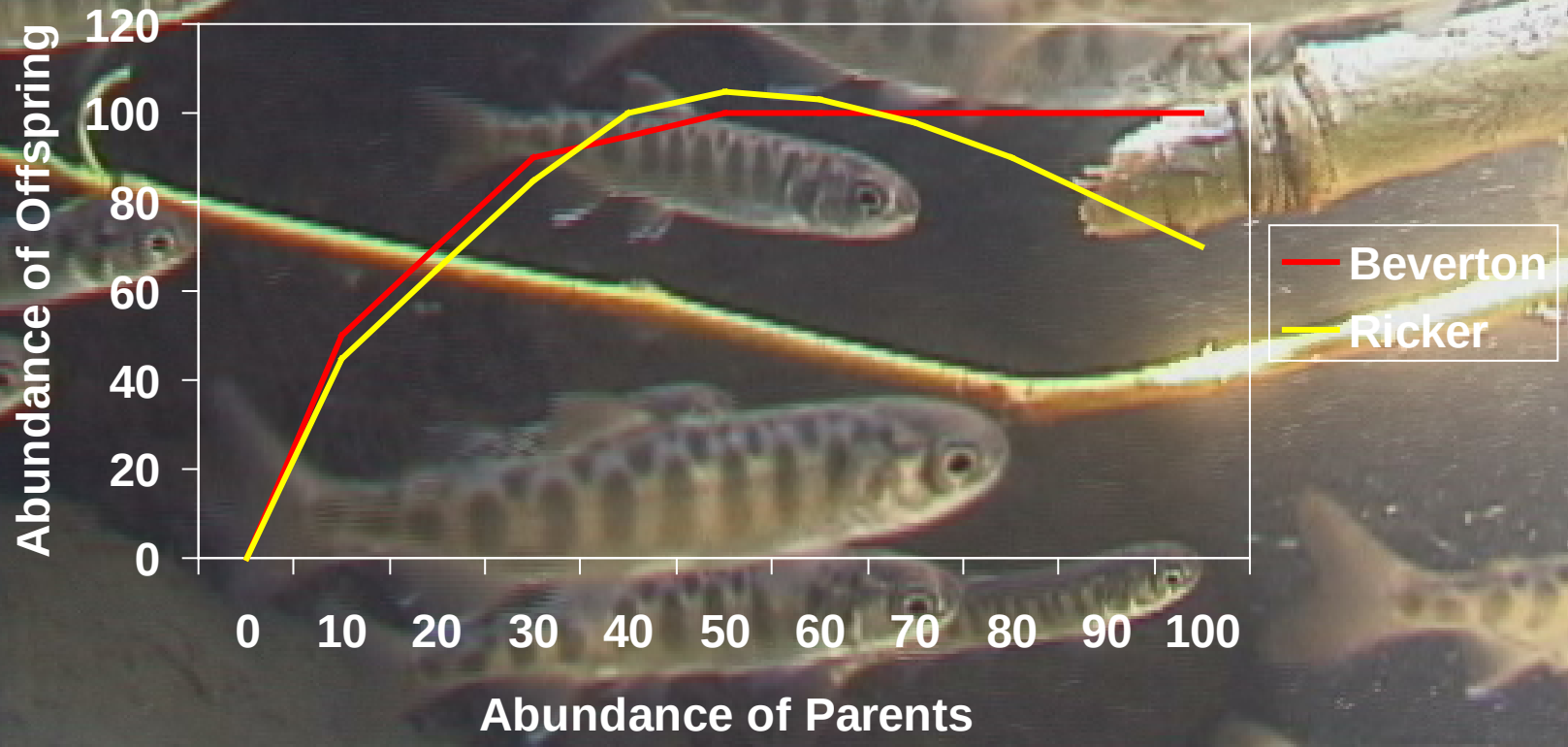
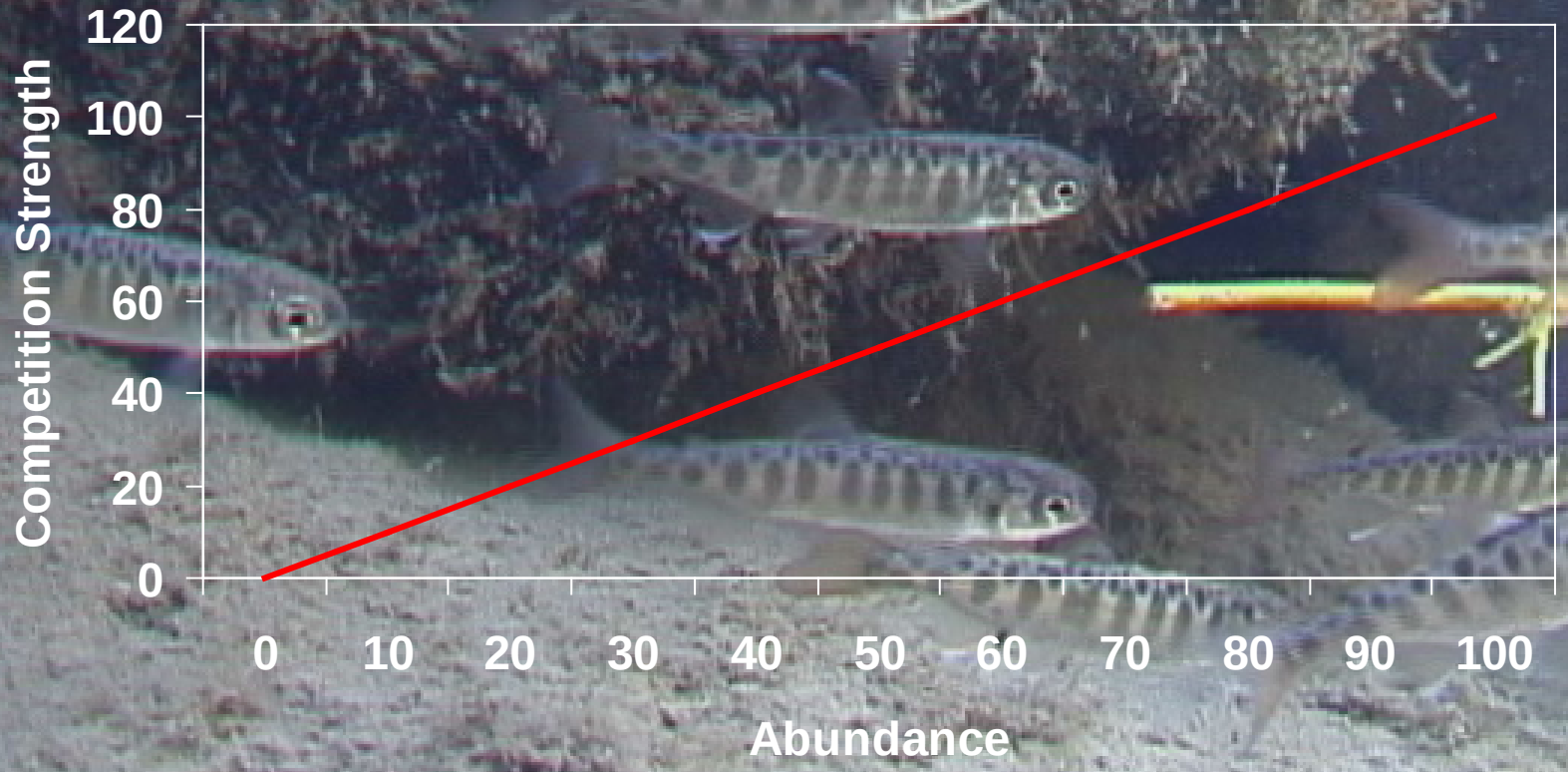
Capacity


Abundance of Offspring
120
100
80
60
40
20
0
0
10
20
30
40
50
60
70
80
90
100
Abundance of Parents
Beverton
Ricker

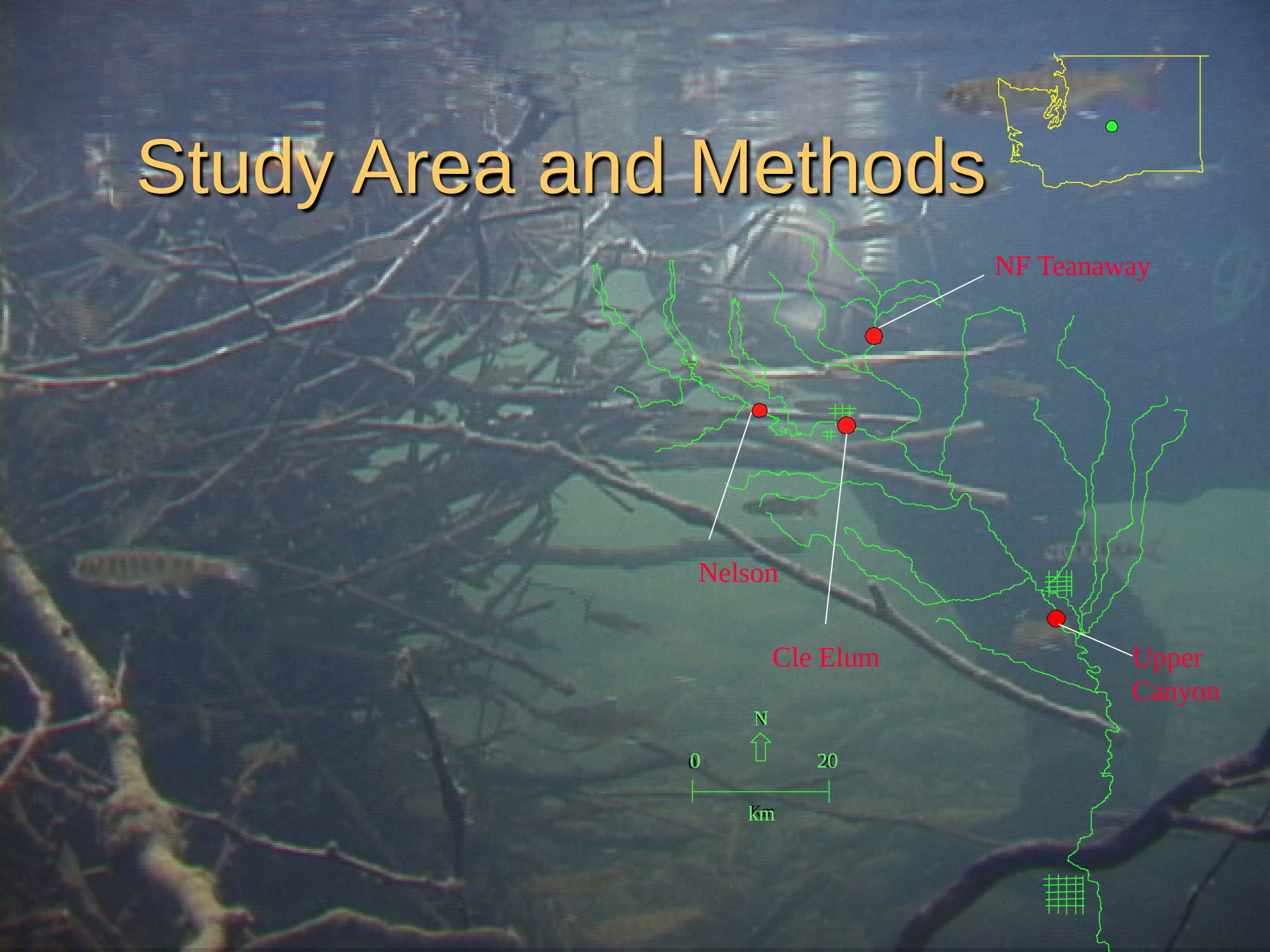
Density Dependence



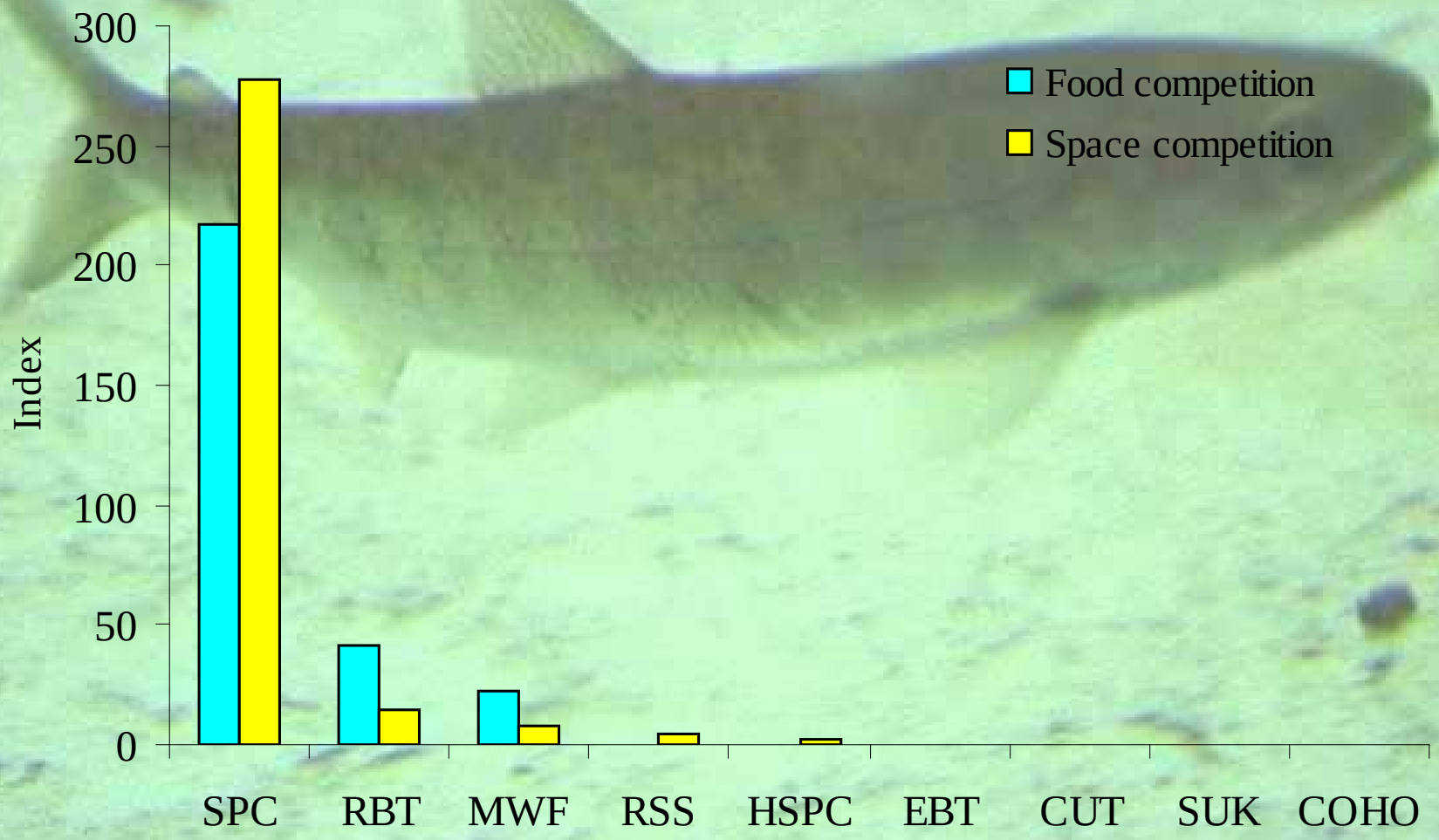
Interactions Indices

- Food competition= Amount of SPC food eaten by ‘competitors’ and food limitation of SPC
- Space competition = Frequency and magnitude of fish in interactions proximity to SPC
- Microhabitat = % of measurements that are outside of the 98% confidence interval when adjusted by fish length
- Evaluations - growth and survival correlations

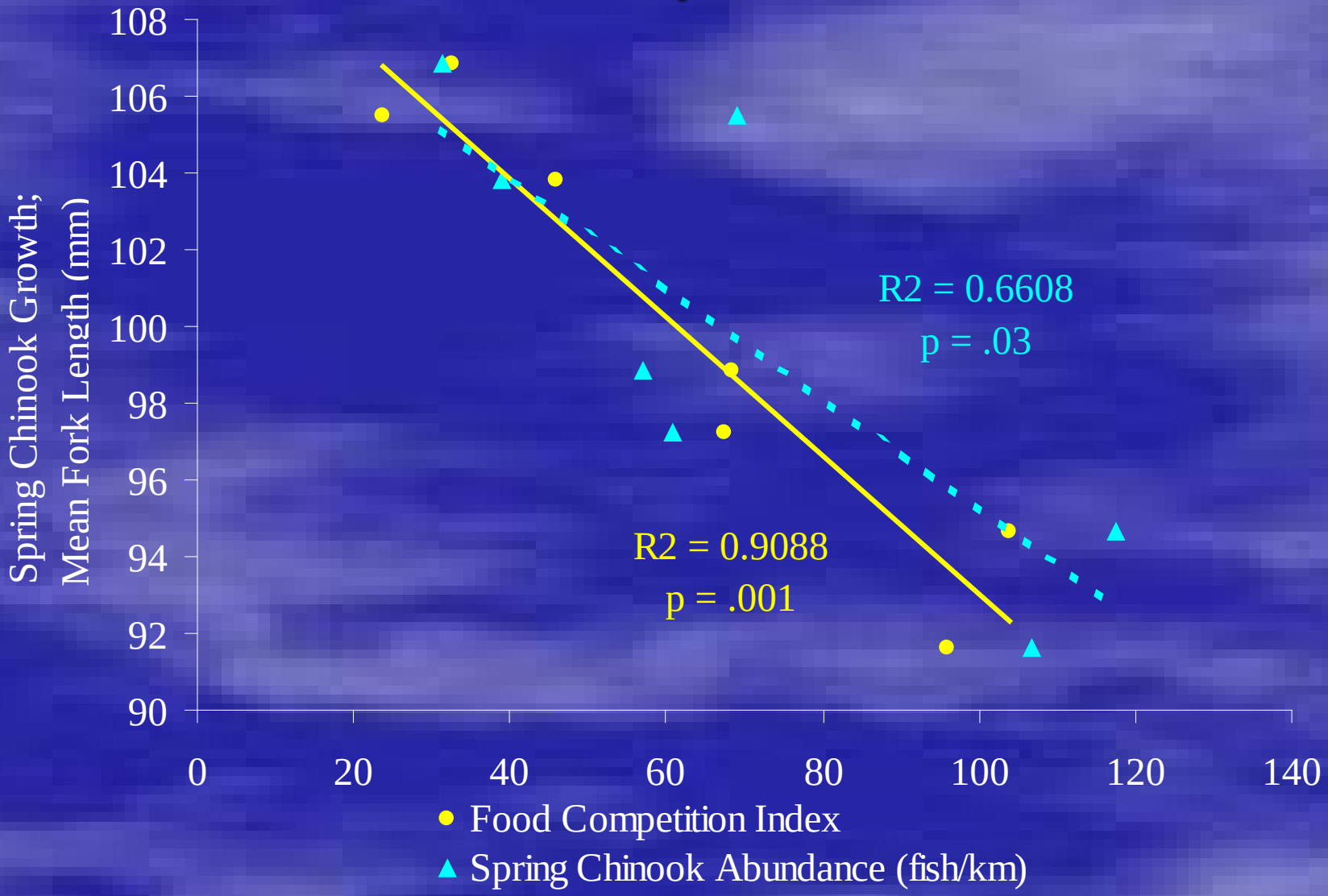
Study Area and Methods



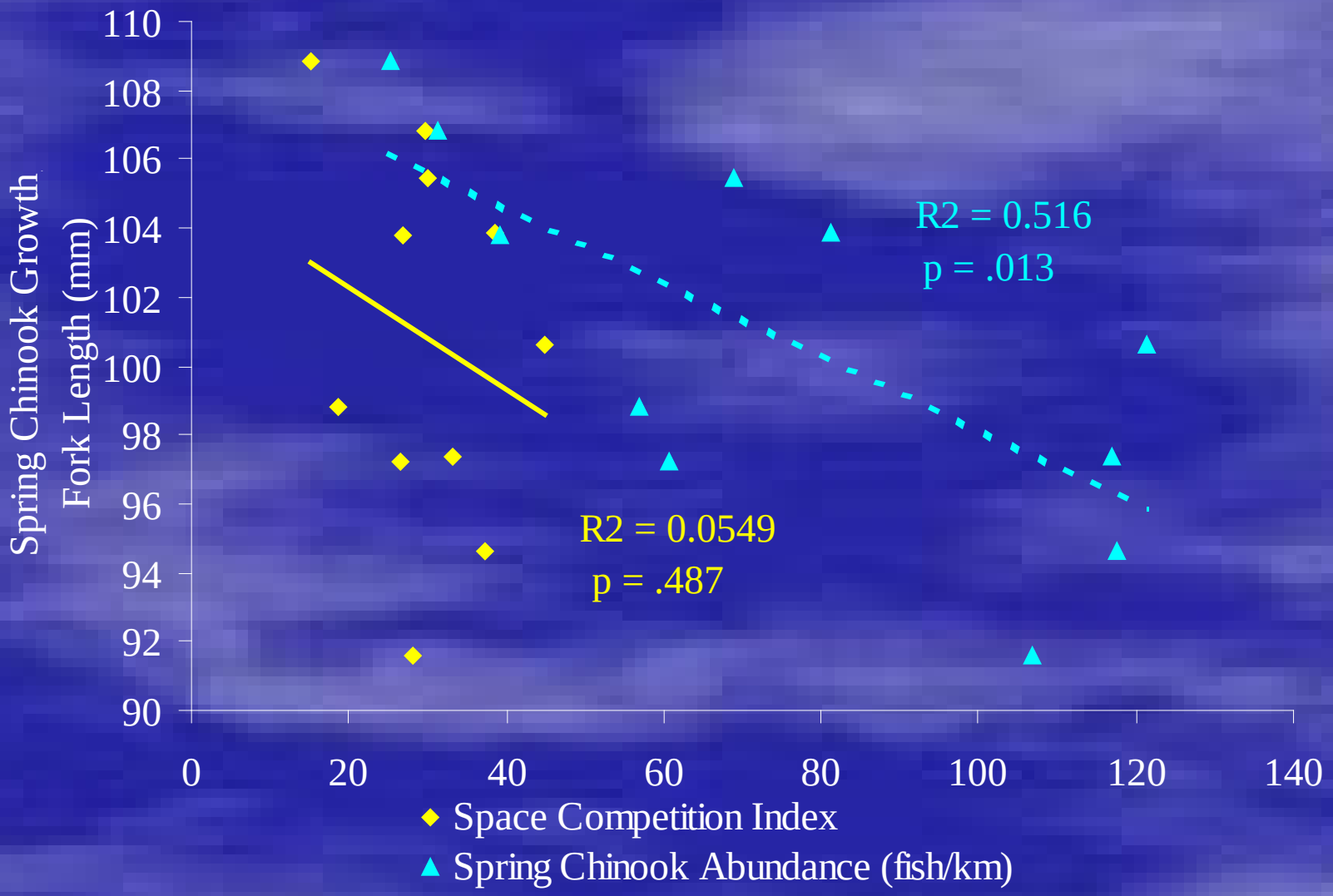
Competition Ranking 98-04



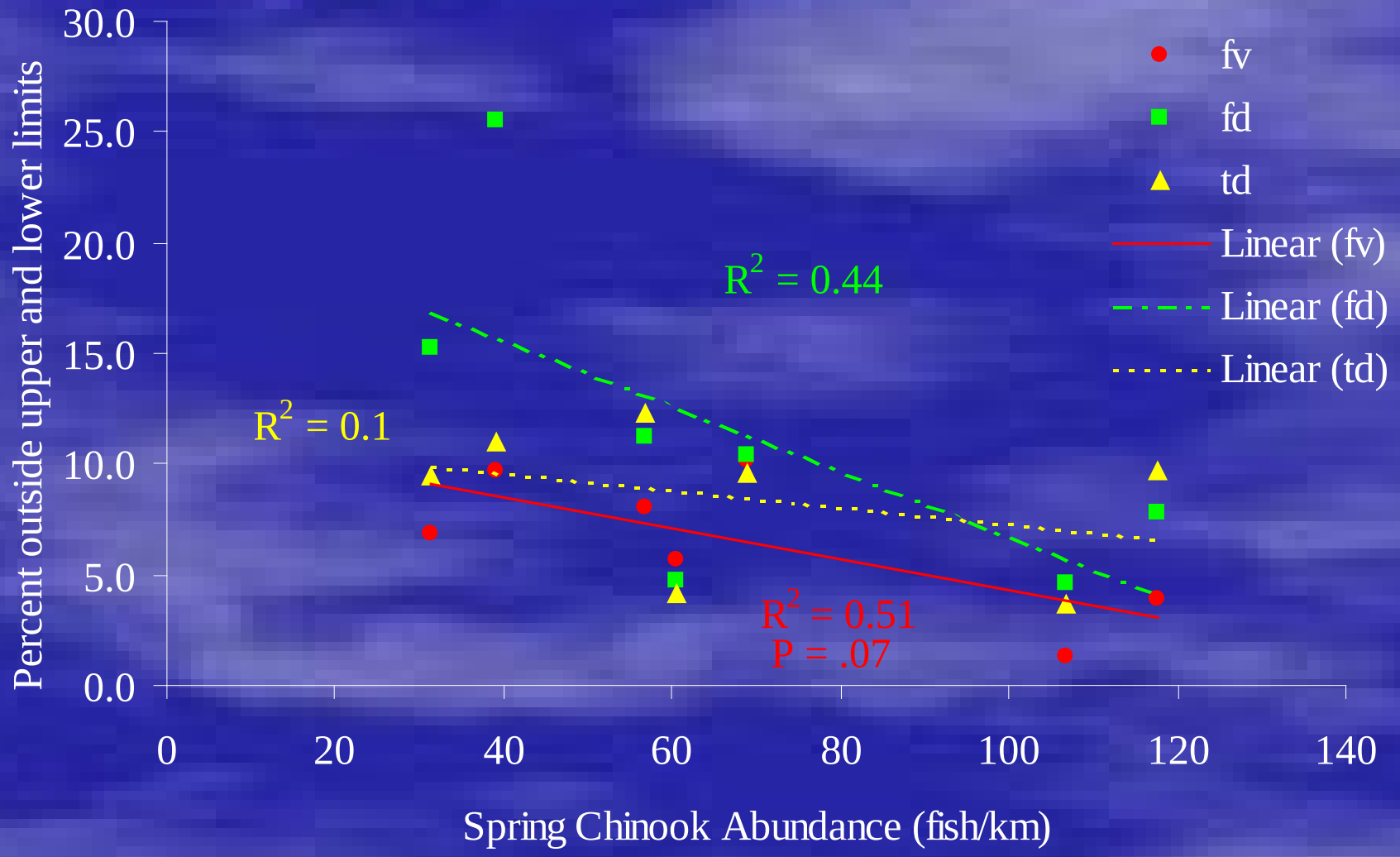
Food Competition Index



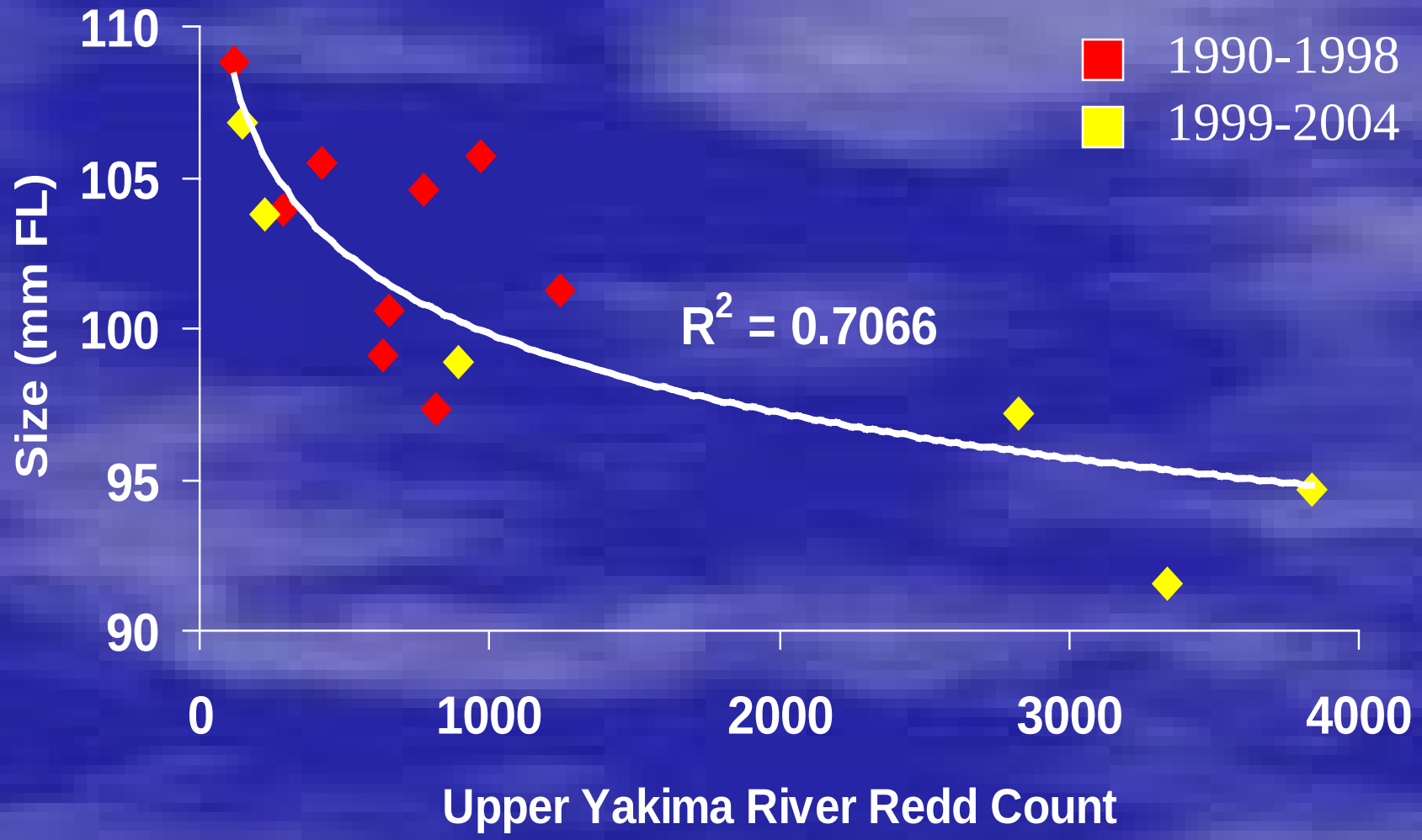
Space Competition Index



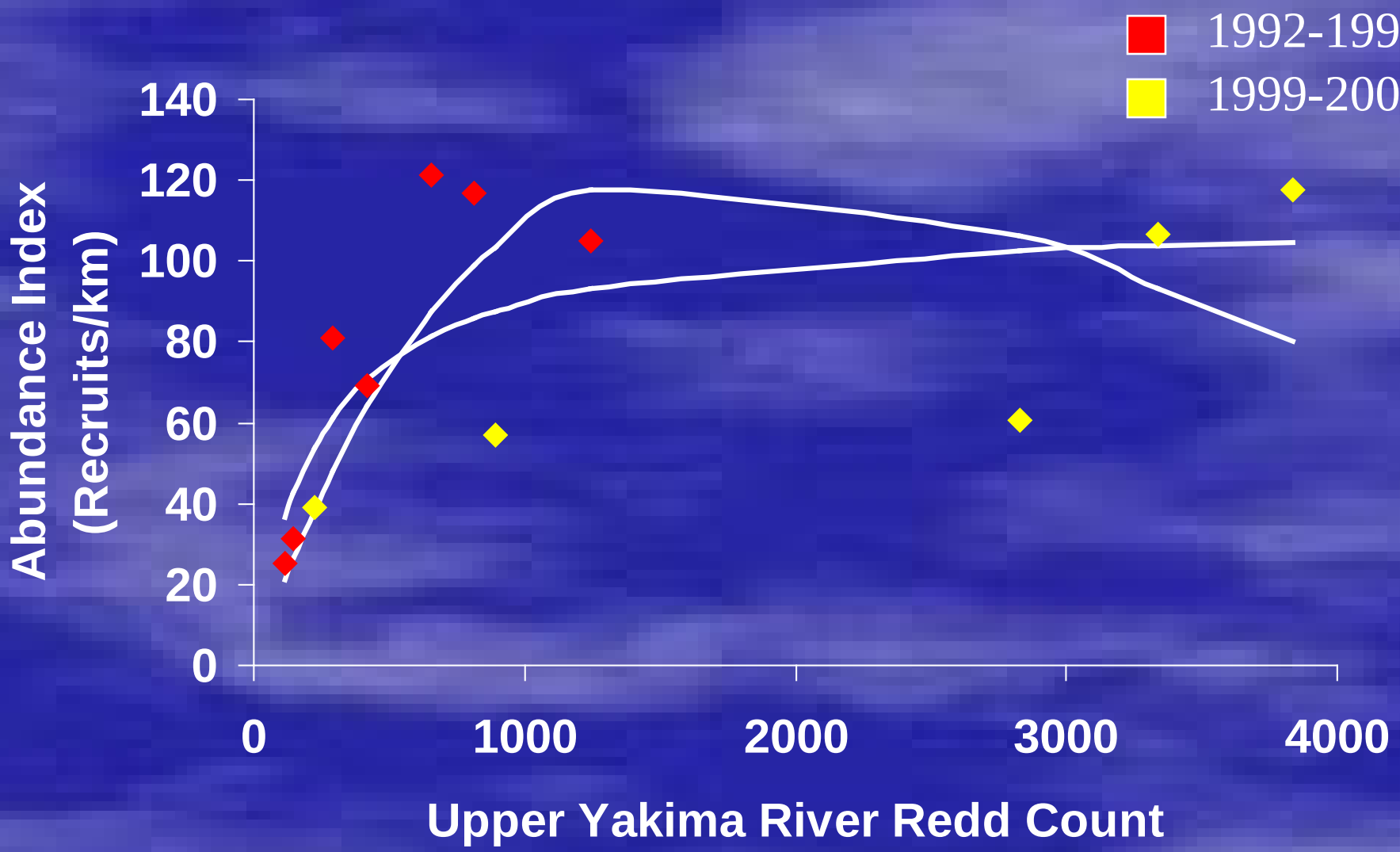
Microhabitat Index



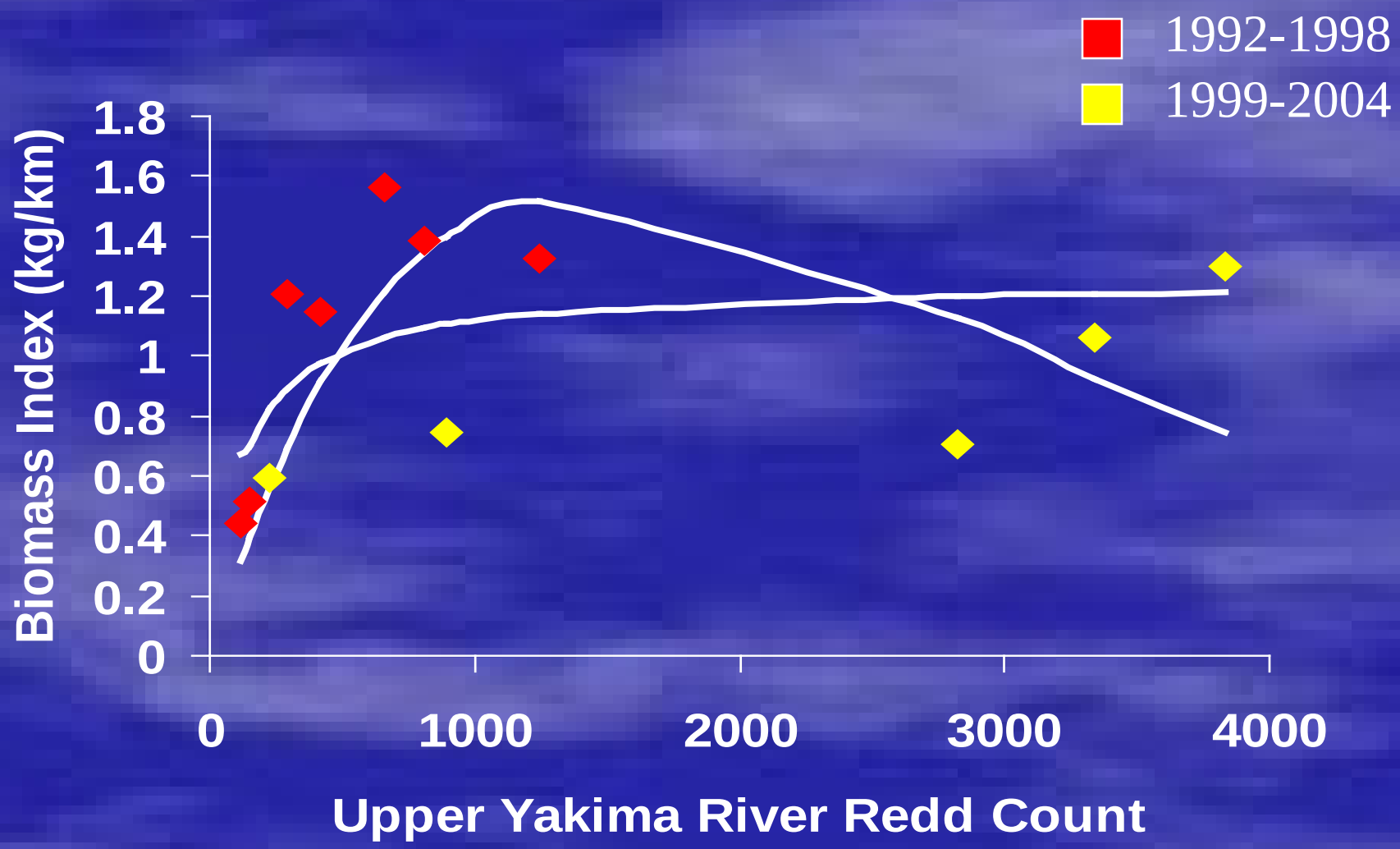
Spawners vs. Size



SPC Abundance Index



SPC Biomass Index



Summary

- Competition indices are highest for SPC
- Food competition index is significantly correlated with growth and survival
- Space and microhabitat indices are not significantly correlated with growth and survival
- Growth decreases with increasing abundance particularly at redd abundance >760
- Abundance and biomass increases with spawner abundance until approx 760-1100 redds

Future Direction

- Focus indices on spring chinook
- Combine/modify territory size models (size, space) and habitat suitability models (microhabitat, food) to determine the number of locations that can support chinook
- Compare predictions to observations at various flows (% K)

Speculations and Applications

- Supplementation is unlikely to produce large increases in abundance without changes to artificial habitat constraints (250 redds/year)
- Artificial constraints on growth and survival could be relaxed with more normative flows
- Water management for juveniles when redds expected to be above about 760 redds (must consider impacts to other species)
- Increase area available for rearing (remove barriers)
- Increase quantity and quality of bank habitat

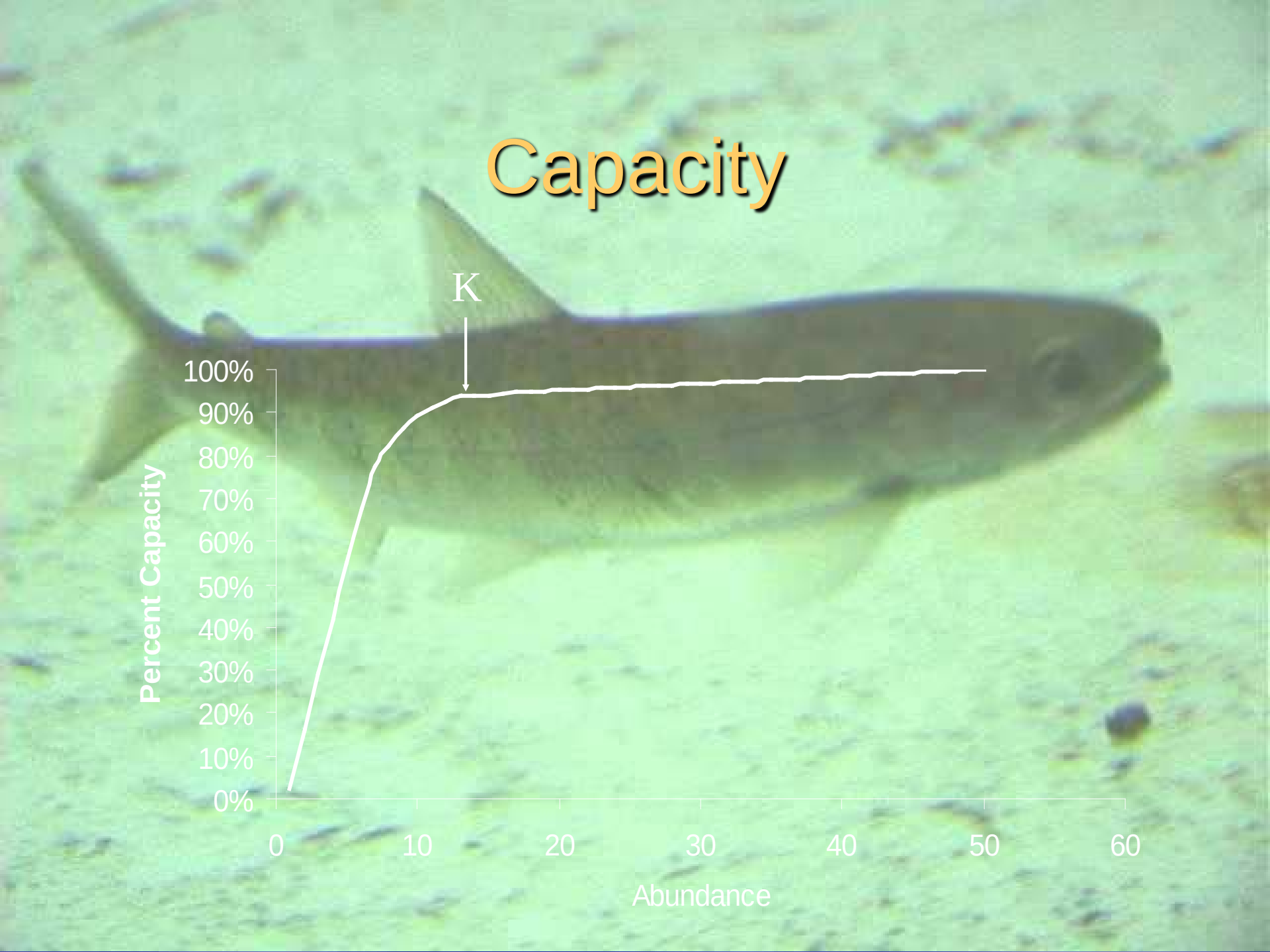

The End



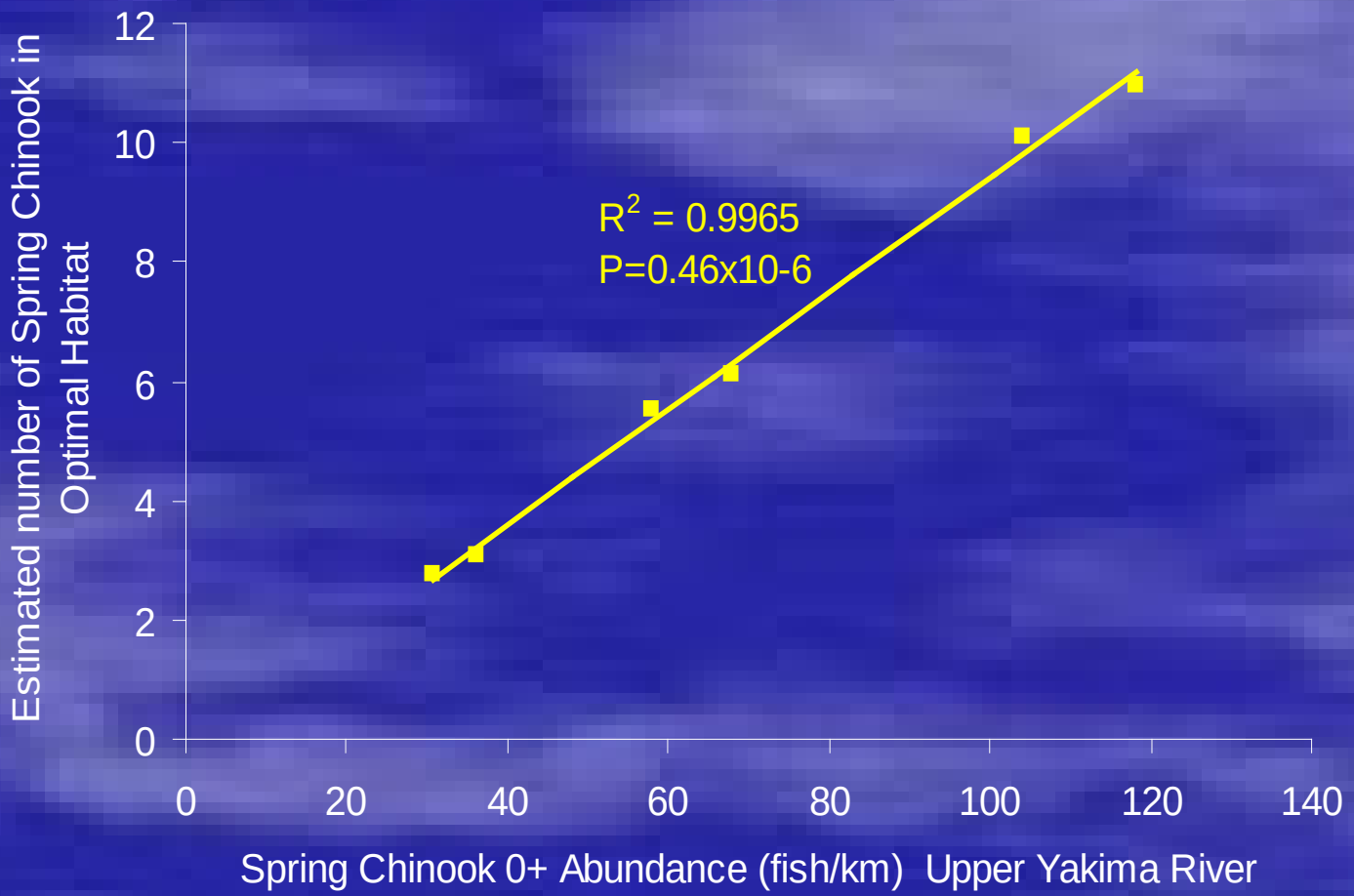




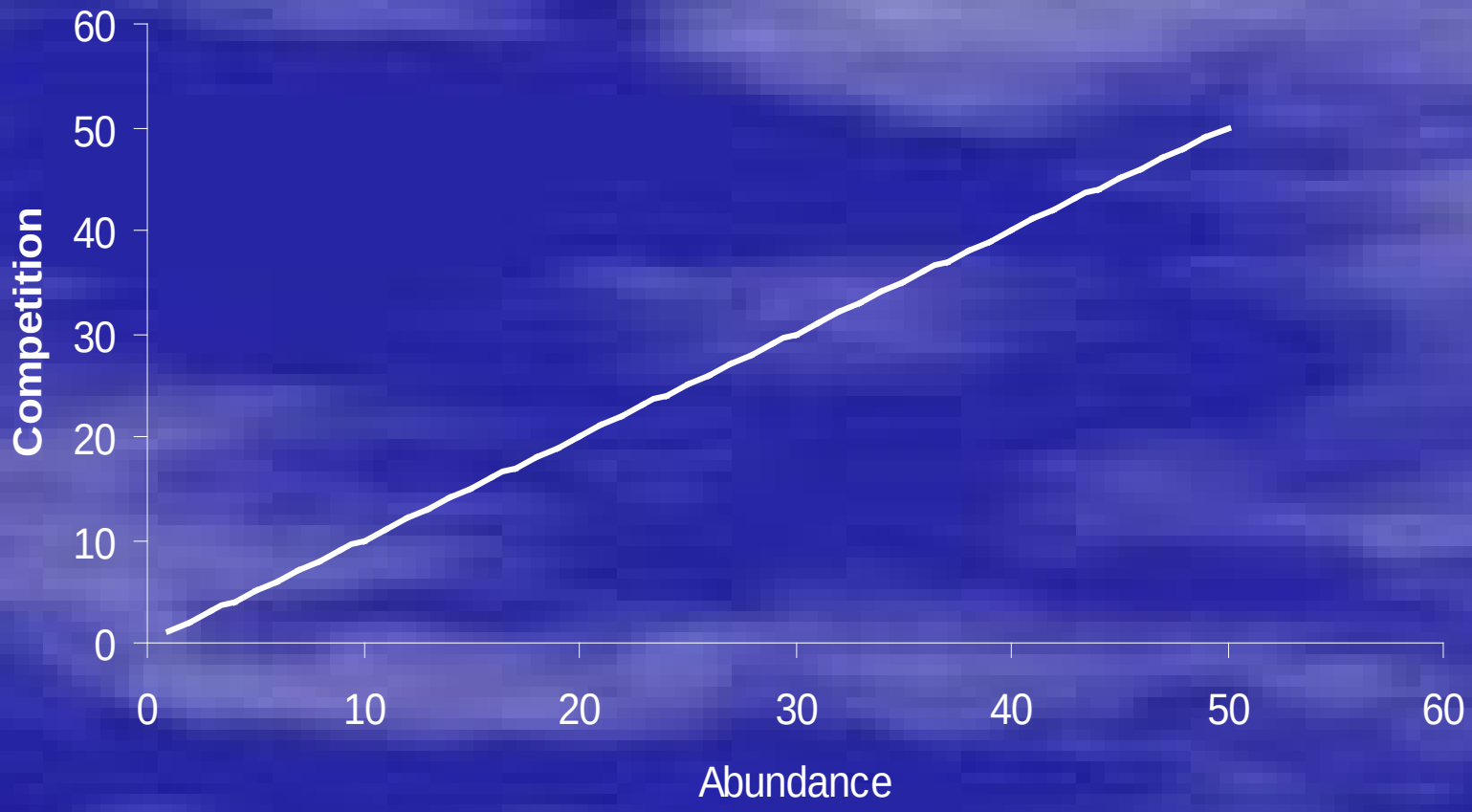

Capacity


K
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent Capacity
0
10
20
30
40
50
60
Abundance

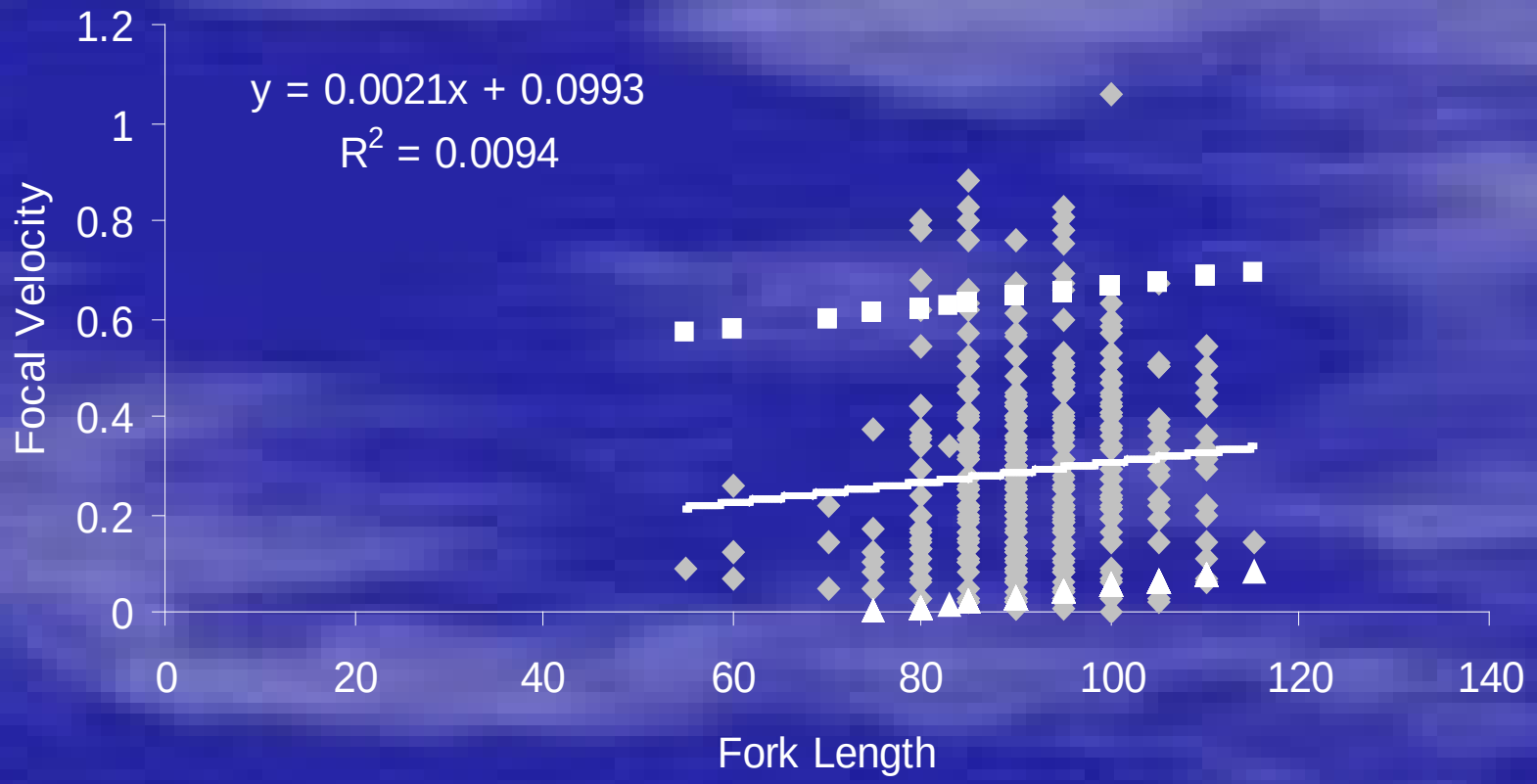
SPC in ‘Optimal Habitat’



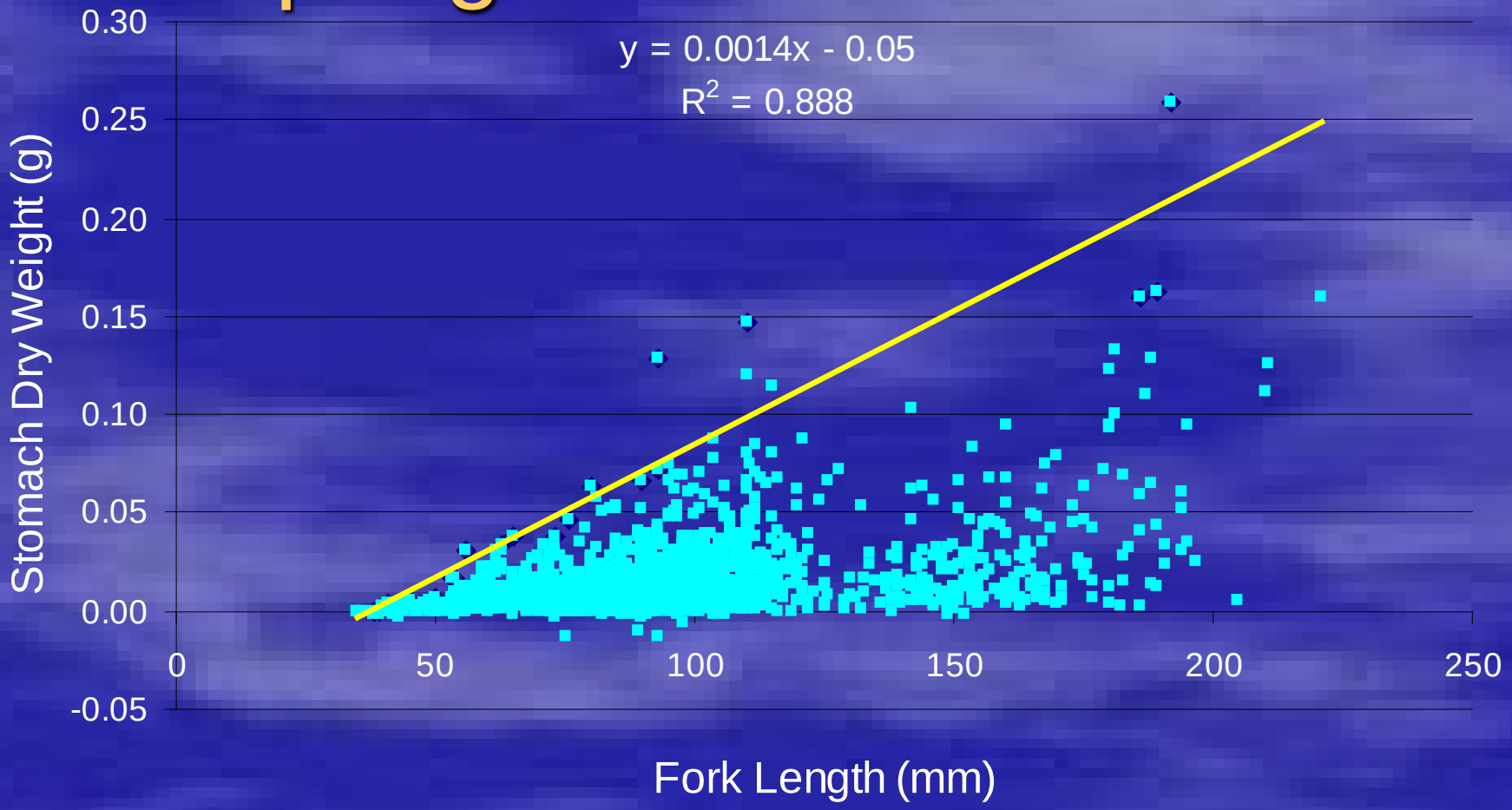
Density Dependence



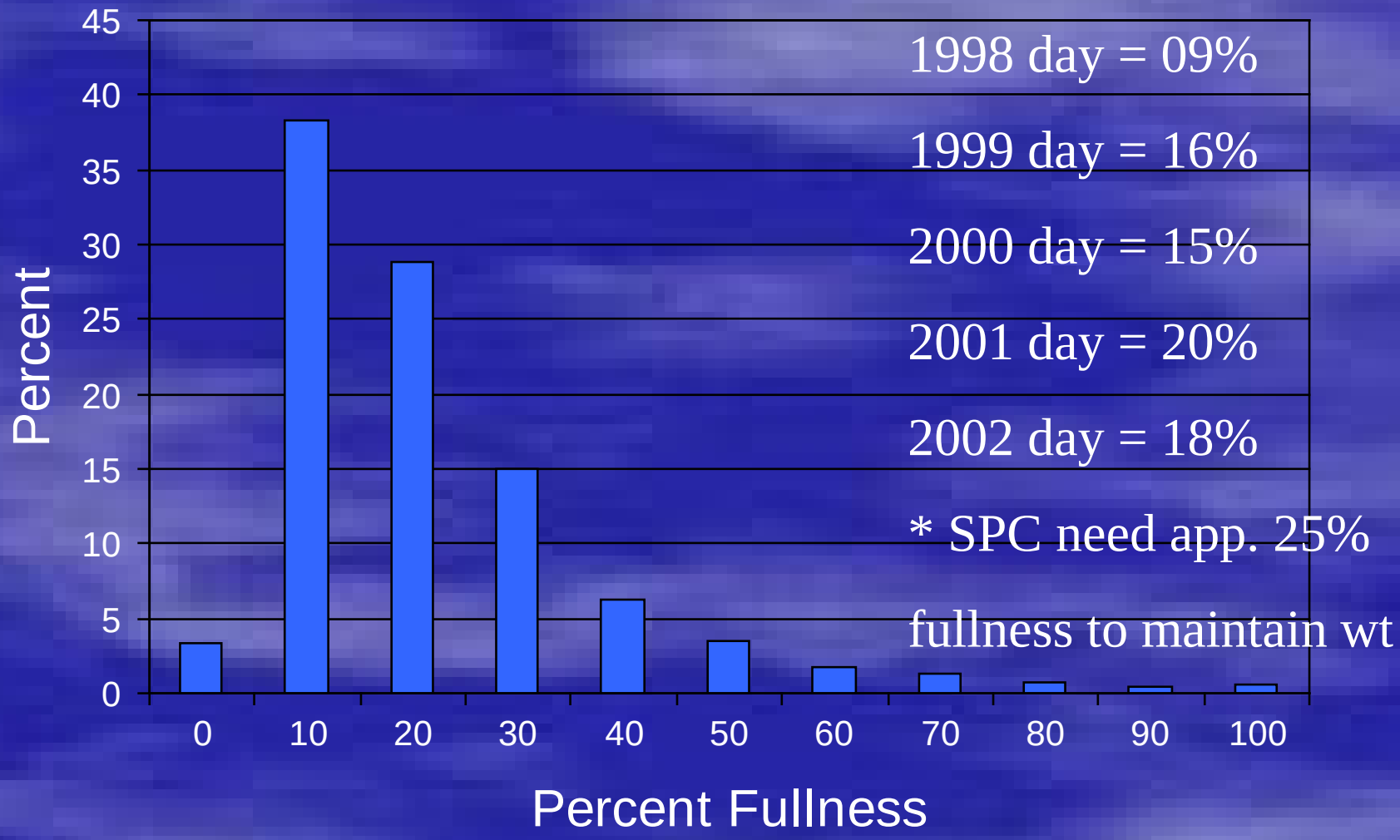
Percent Outside 98



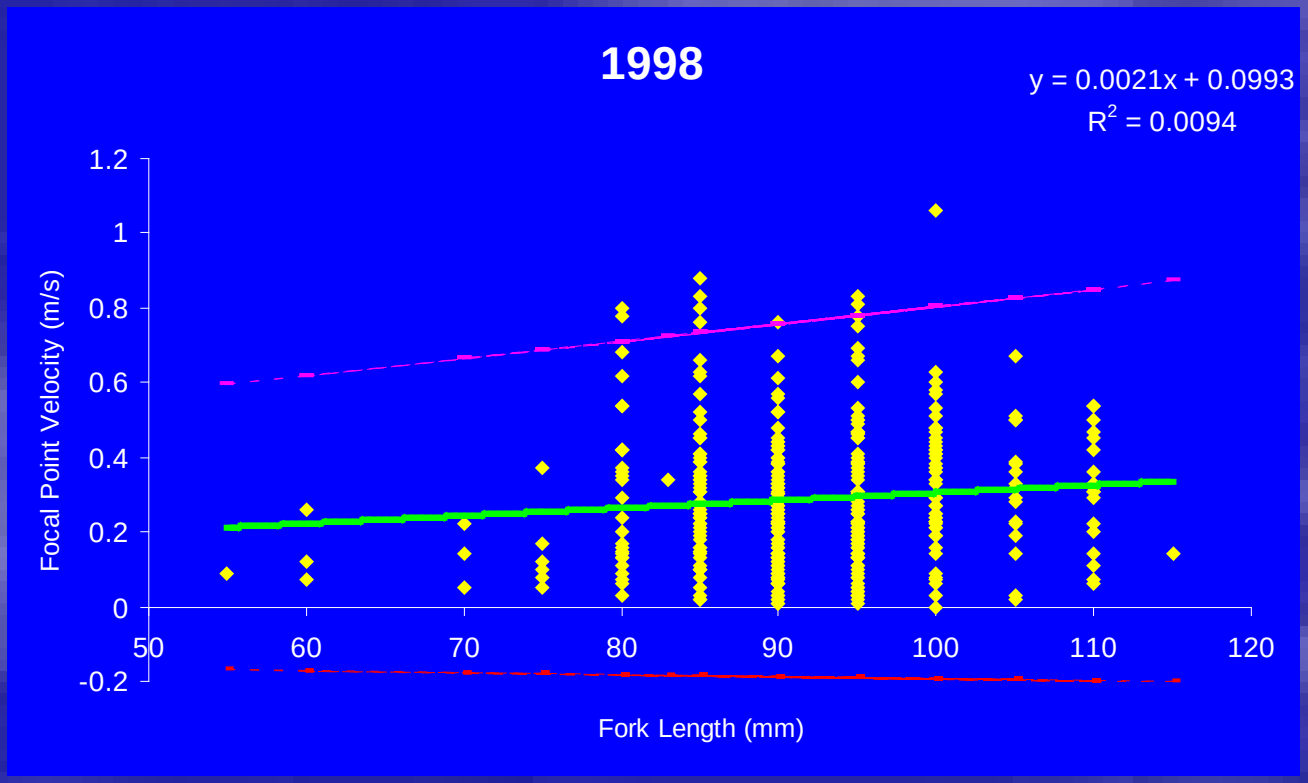
Maximum Stomach Weight Spring Chinook Salmon



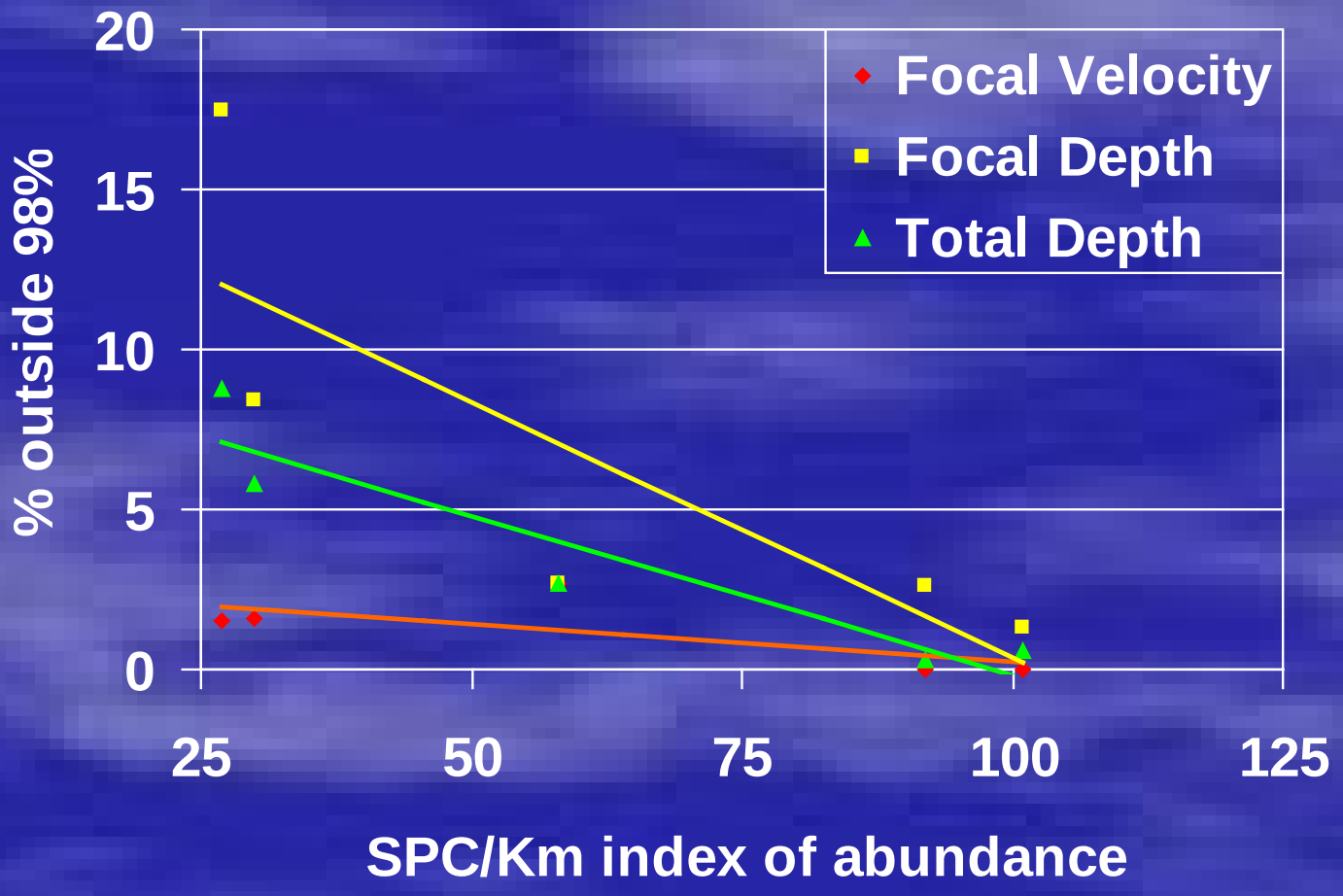
Stomach Fullness of SPC n=2130, 24 hr, 97-02

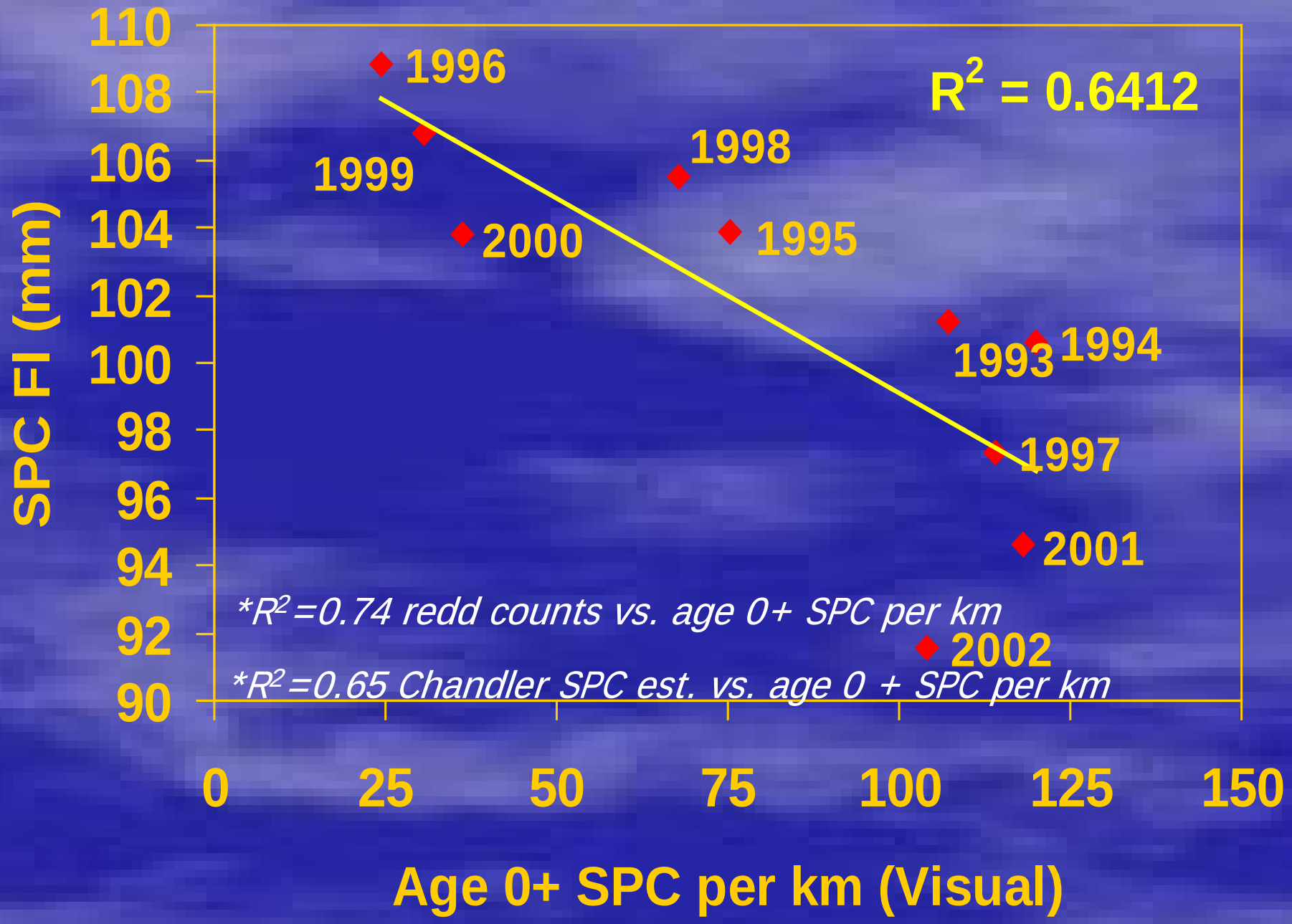


SPC length vs. Focal Velocity and 98% confidence limit

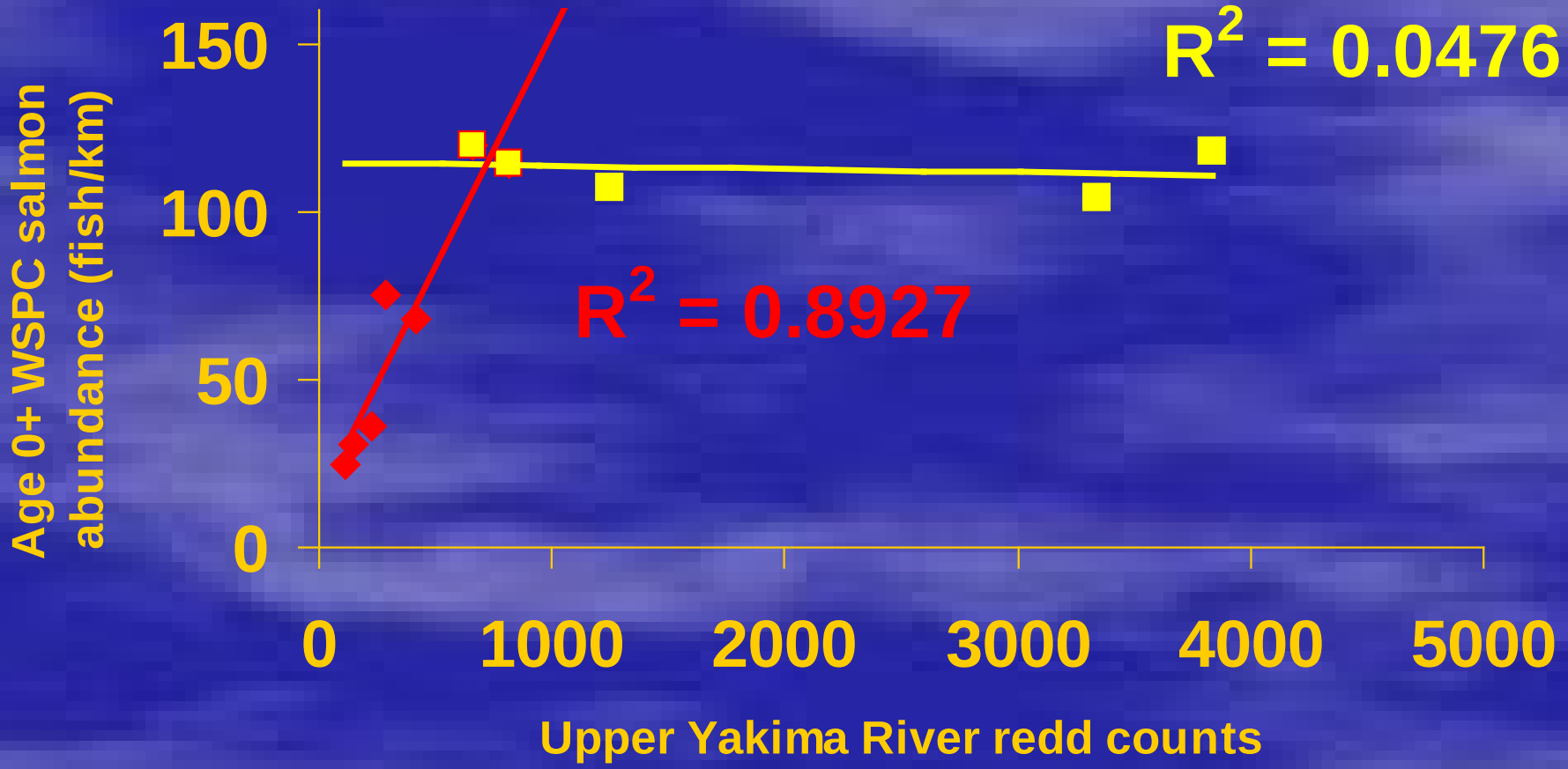


Microhabitat (1998-2002)

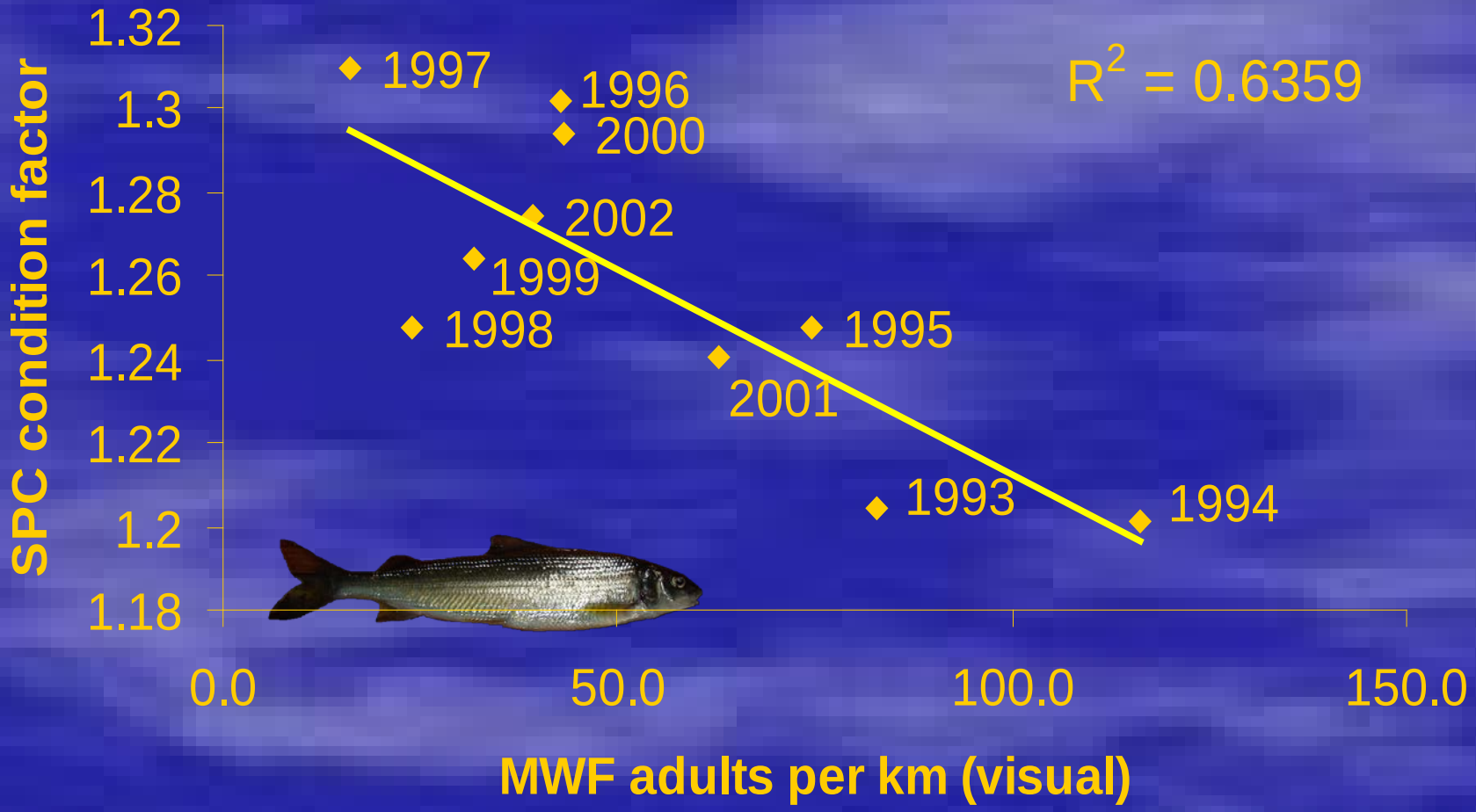



SPC FI (mm)
110
108
106
104
102
100
98
96
94
92
90
1996
1999
2000
1998
1995
1993
1994
1997
2001
2002
R^2 = 0.6412
*R^2 =0.74 redd counts vs. age 0+ SPC per km
*R^2 =0.65 Chandler SPC est. vs. age 0 + SPC per km
0
25
50
75
100
125
150
Age 0+ SPC per km (Visual)

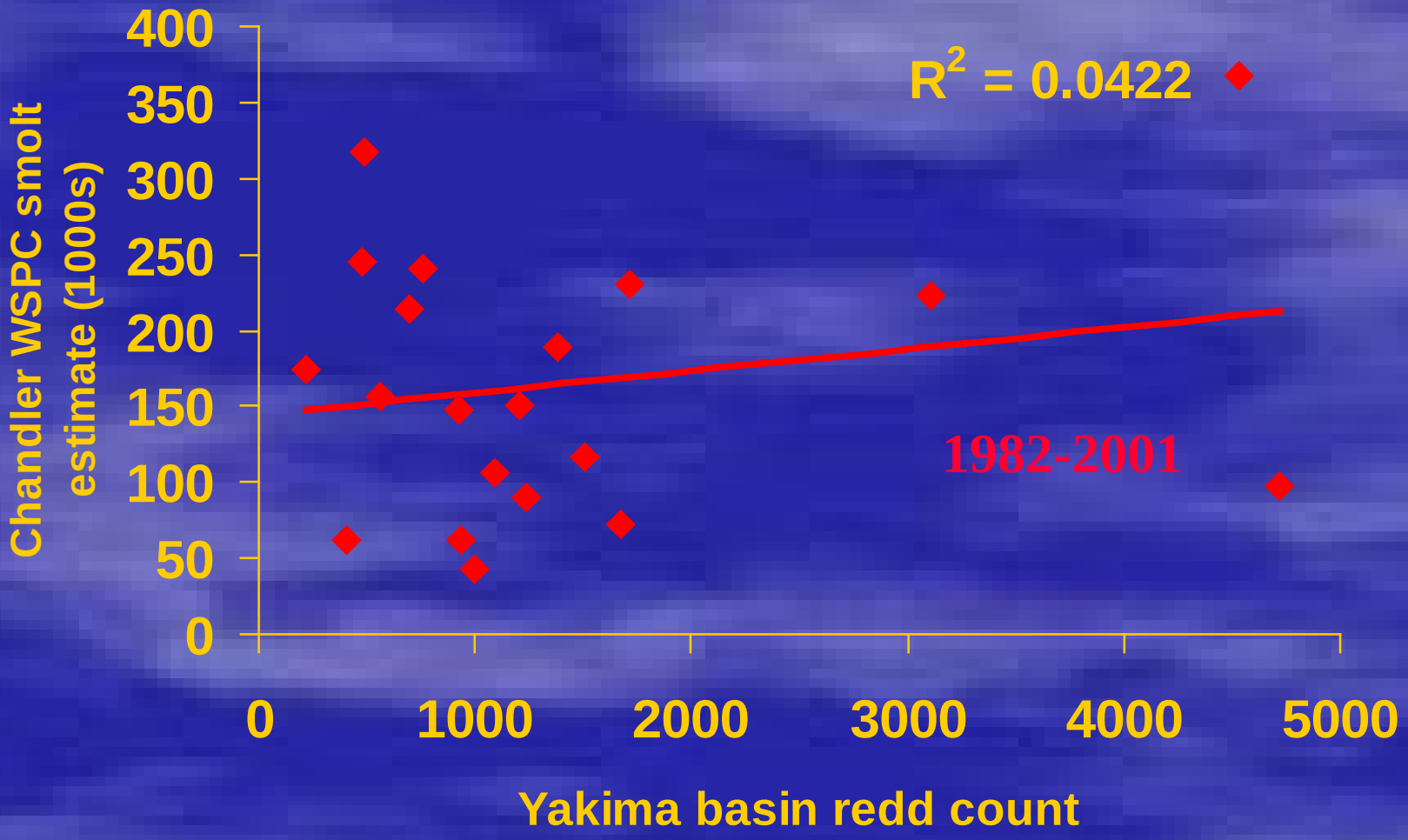
Density Dependent Survival?



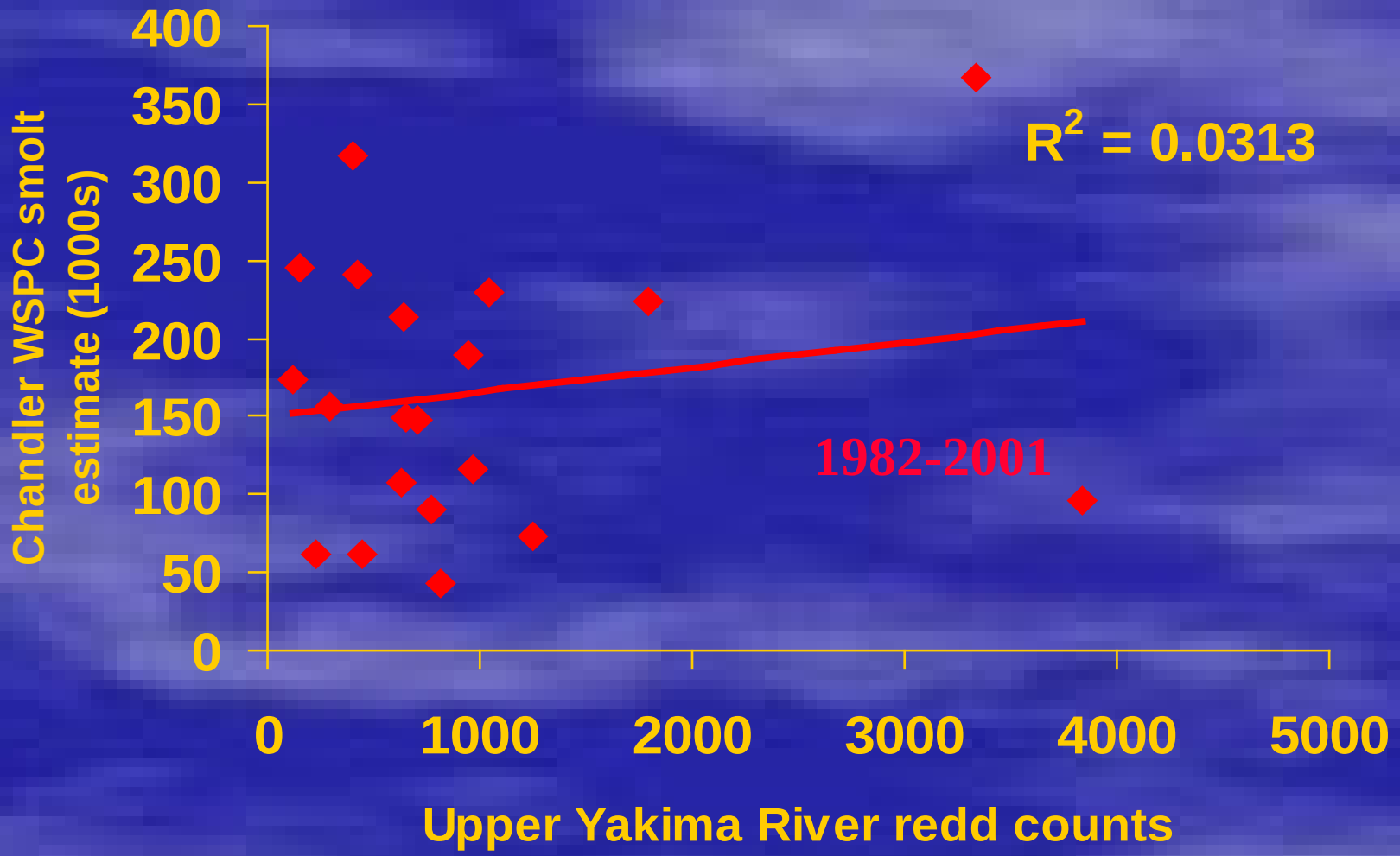
MWF abundance vs target condition



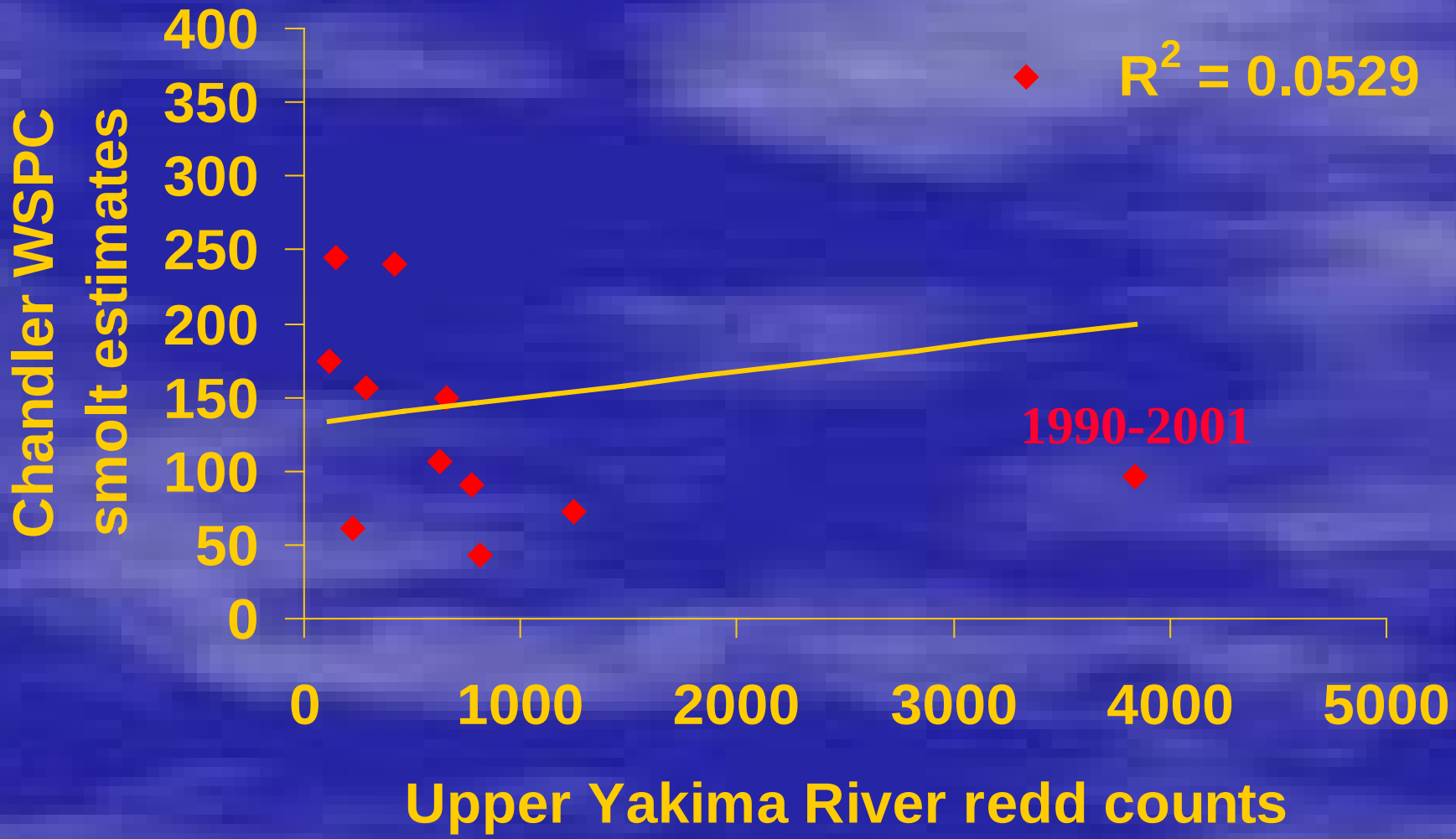
Yakima Basin redd count vs Chandler estimate



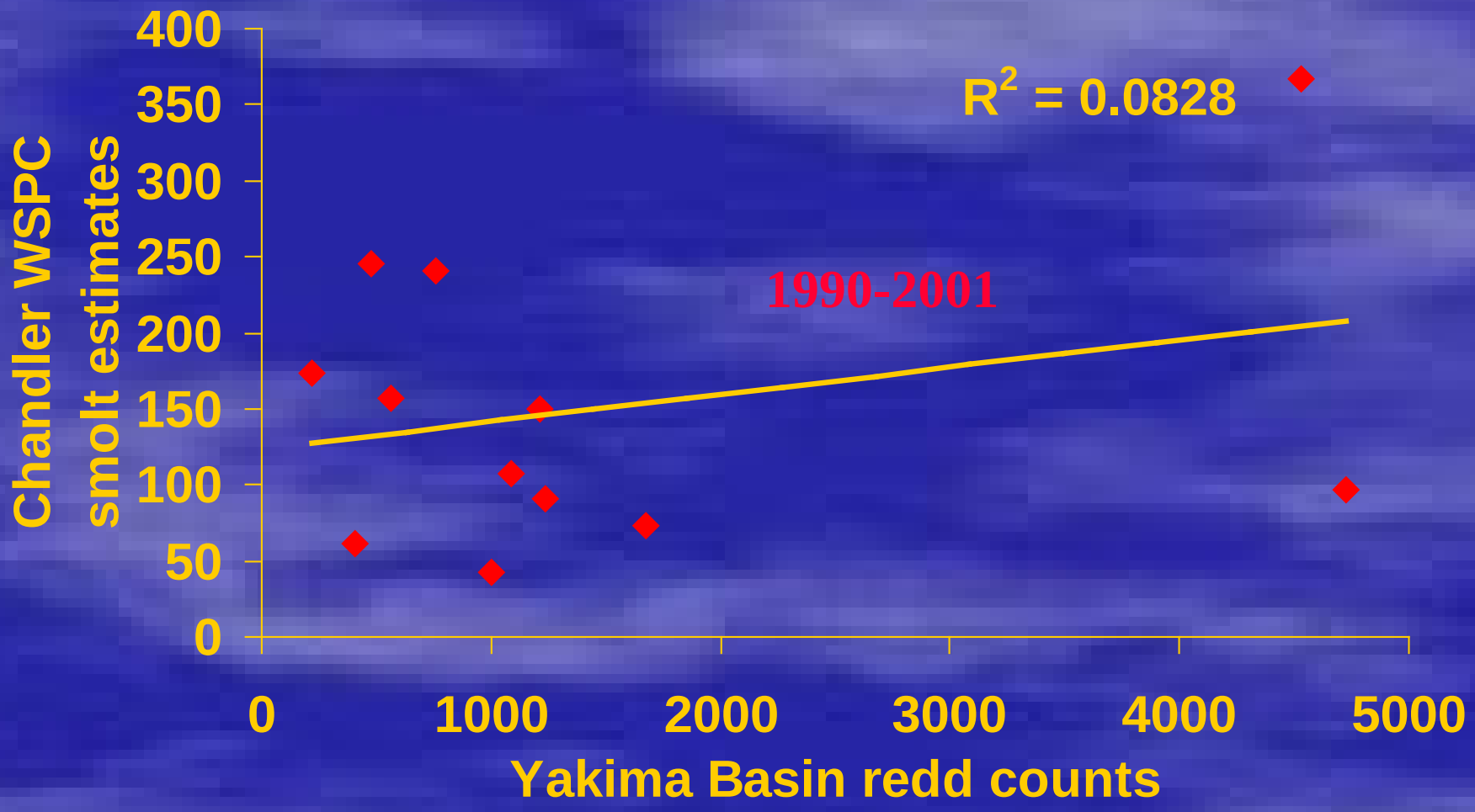
Upper Yakima River redd counts vs Chandler estimate

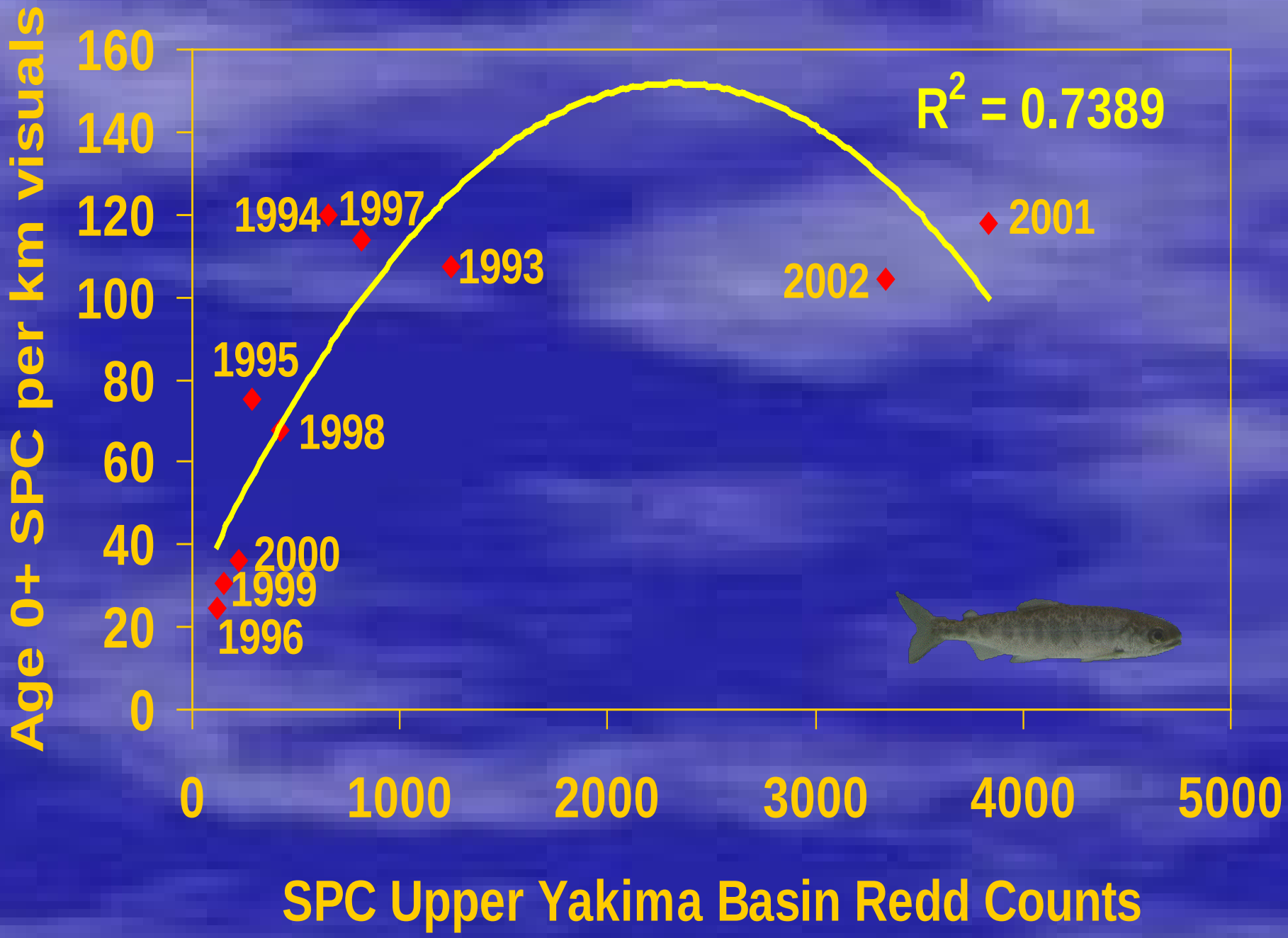


Upper Yakima River redd counts vs Chandler estimate

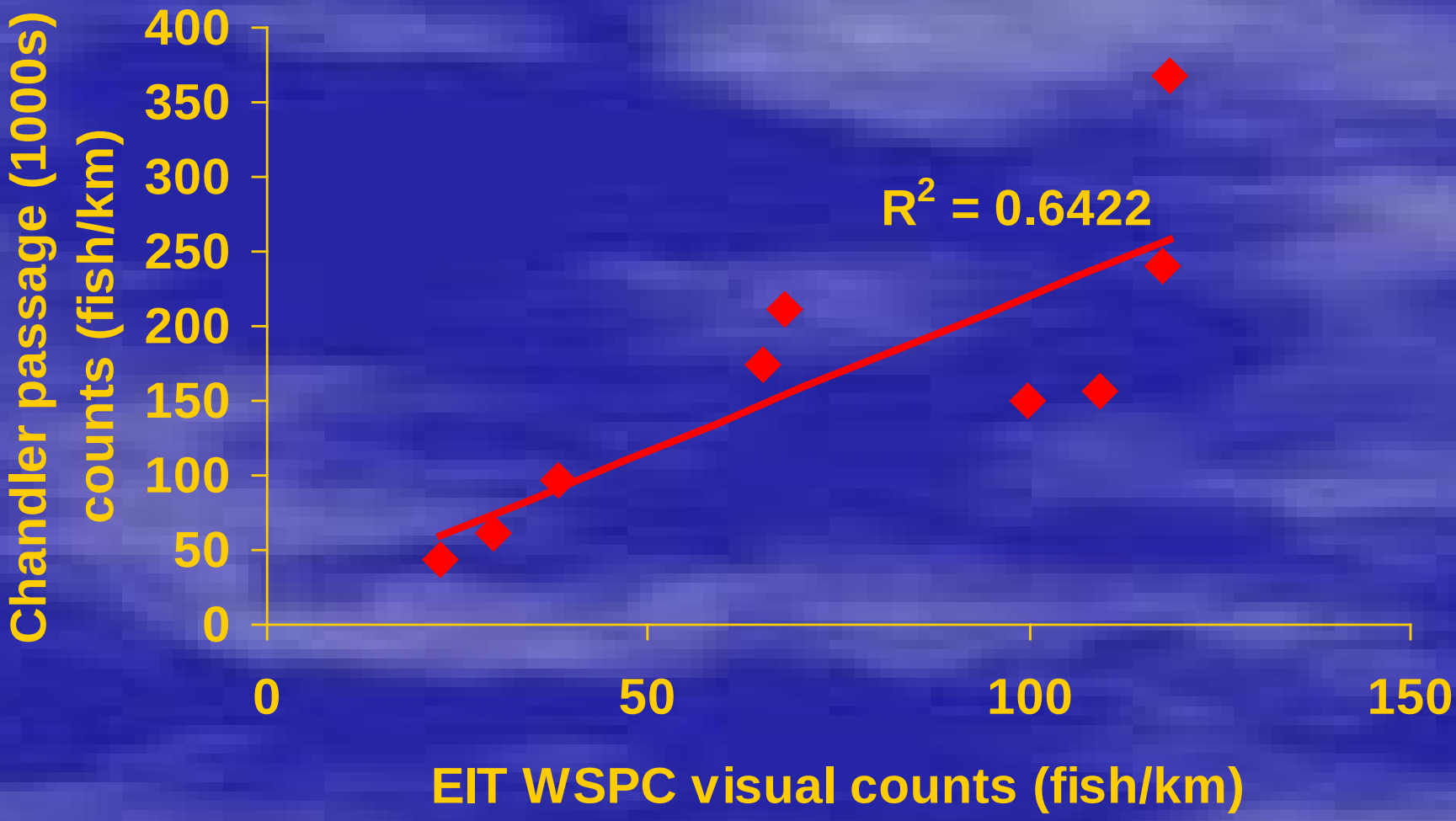


Yakima Basin redd counts vs Chandler WSPC smolts

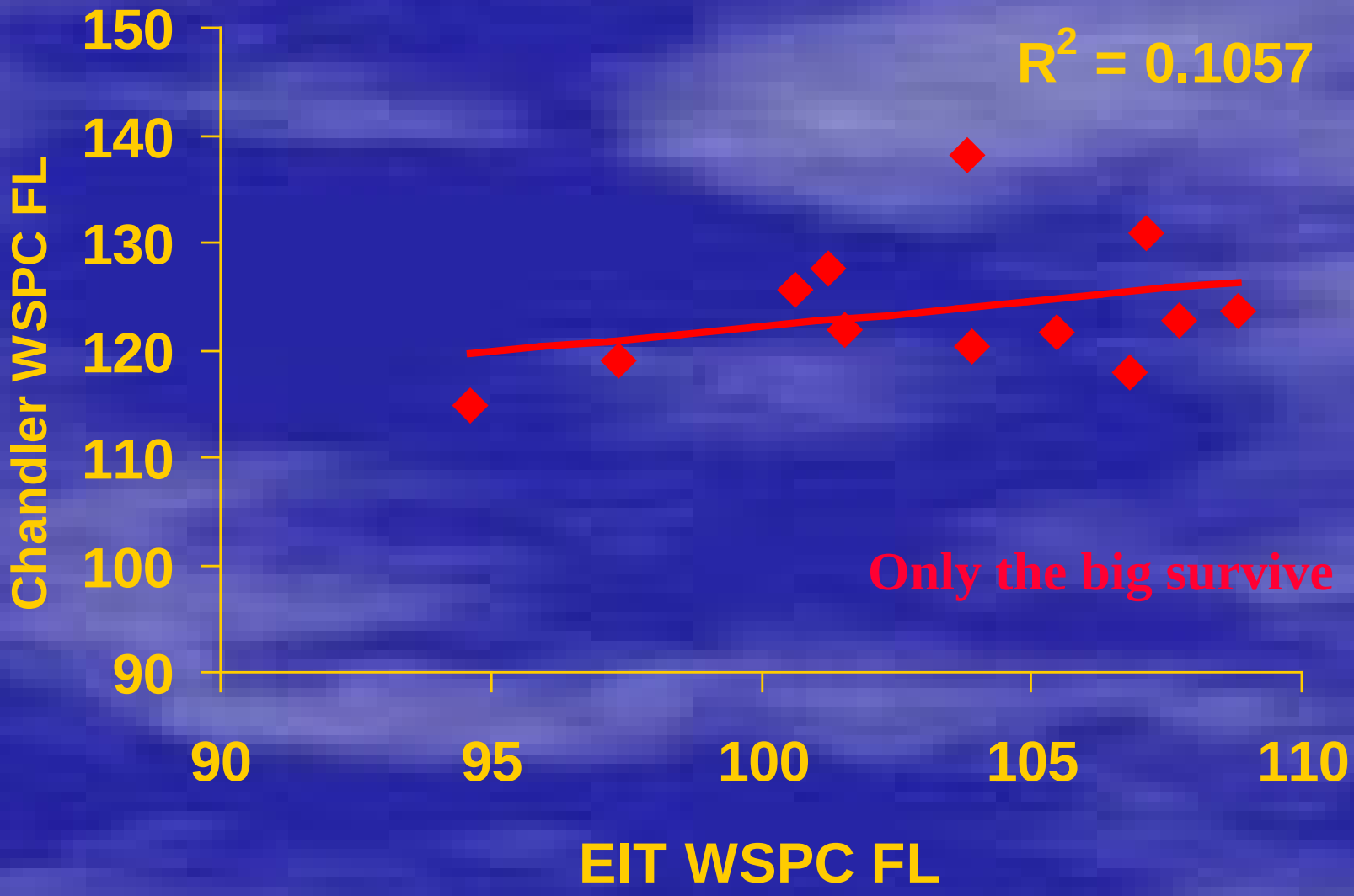



Age 0+ SPC per km visuals
160
140
120
100
80
60
40
20
0
R^2 = 0.7389
1994
1997
1993
2001
2002
1995
1998
2000
1999
1996
0
1000
2000
3000
4000
5000
SPC Upper Yakima Basin Redd Counts

Chandler WSPC estimates vs EIT WSPC visual counts



WSPC FL at Chandler vs EIT



2001 Average SPC 8/1 to 10/28