Spawning Biology of the Lake Washington Population of Longfin Smelt

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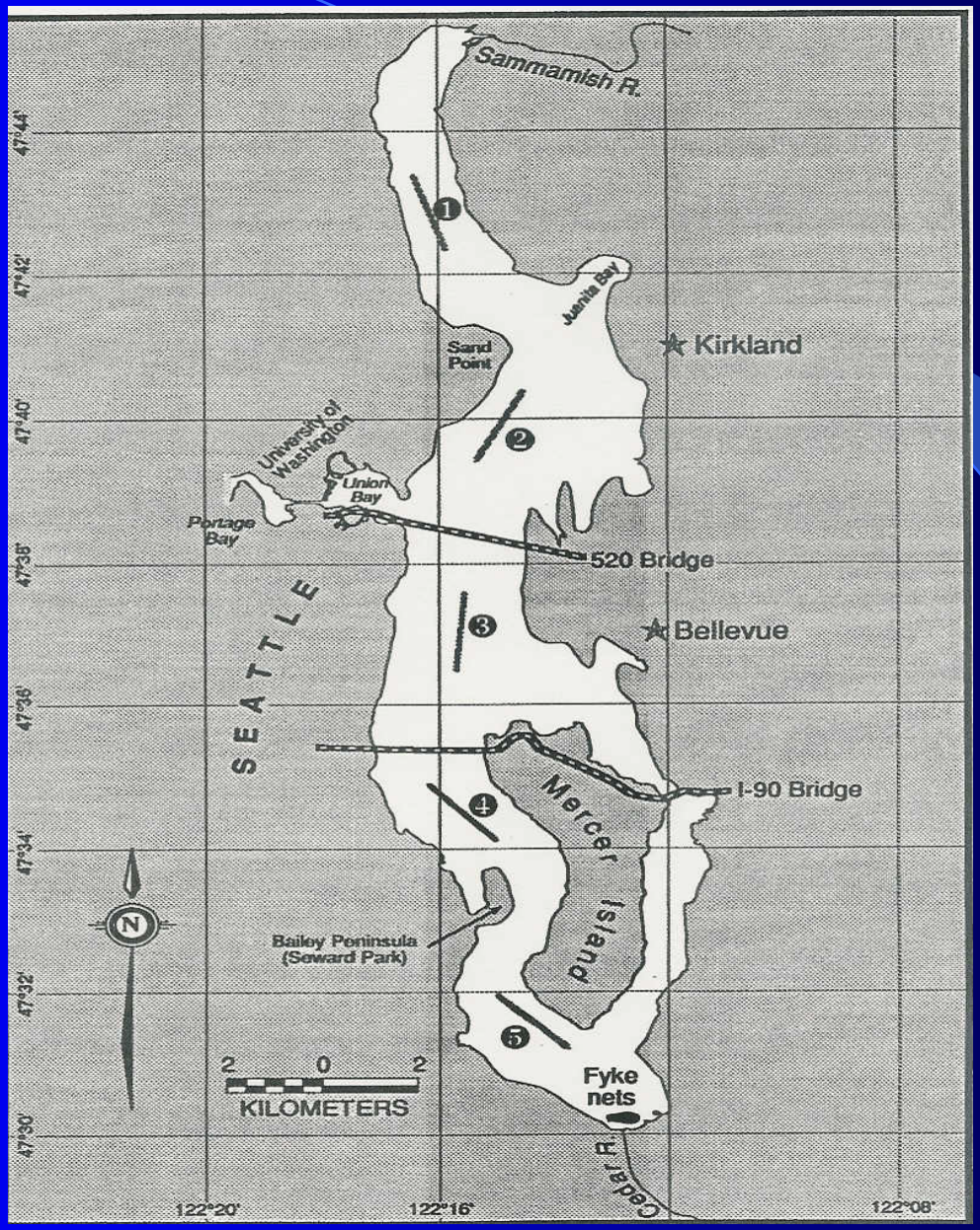
Longfin Smelt (*Spirinchus thaleichthys*)

(from Wydoski & Whitney 1979)

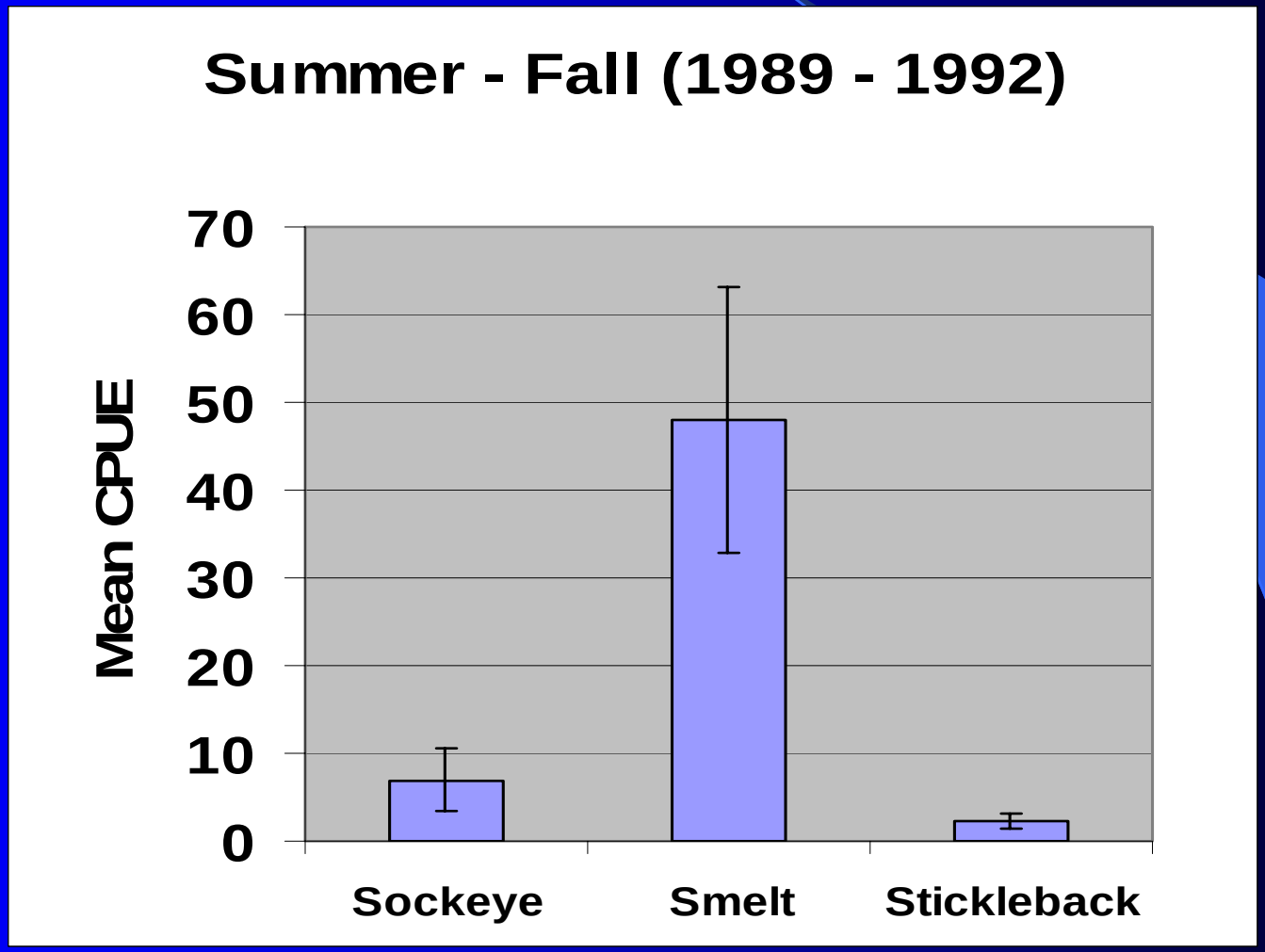
Map of Lake Washington



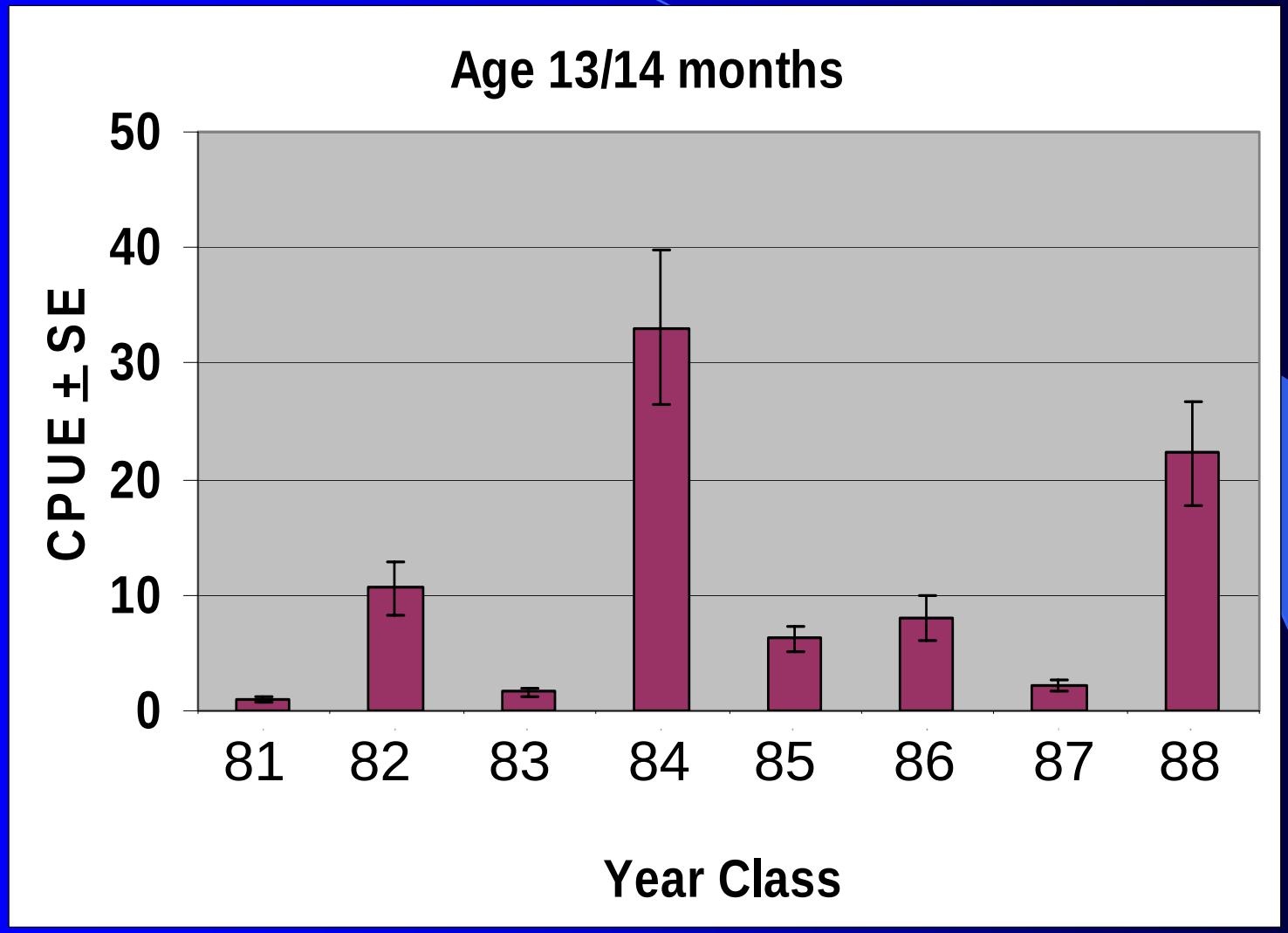
Smelt Population in Lake Washington

- One of a few land-locked populations
- Mature and spawn at age 2
- Die after spawning; very few survive to year 3

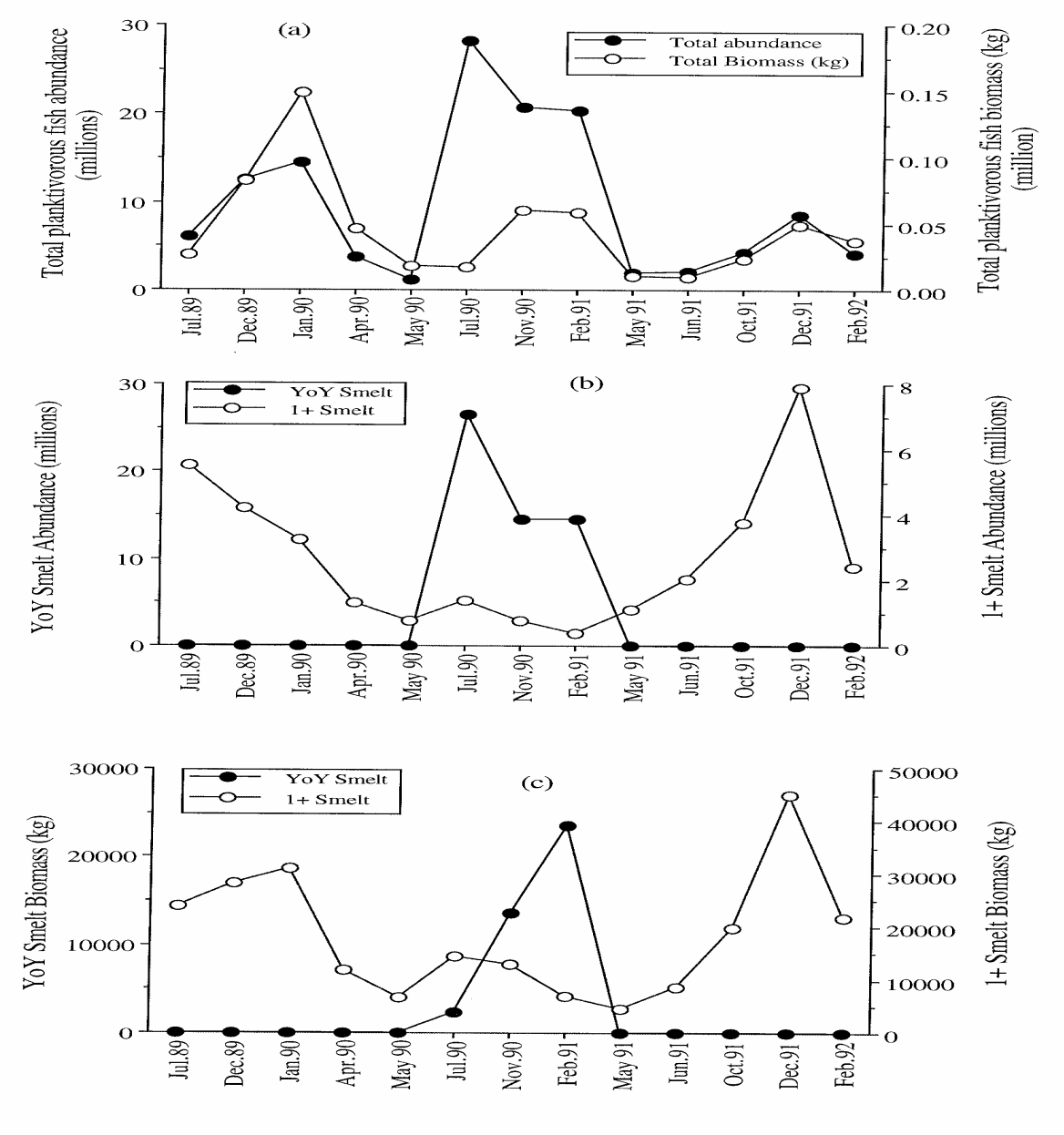
Mean CPUE of Major Planktivorous Fishes in Lake Washington



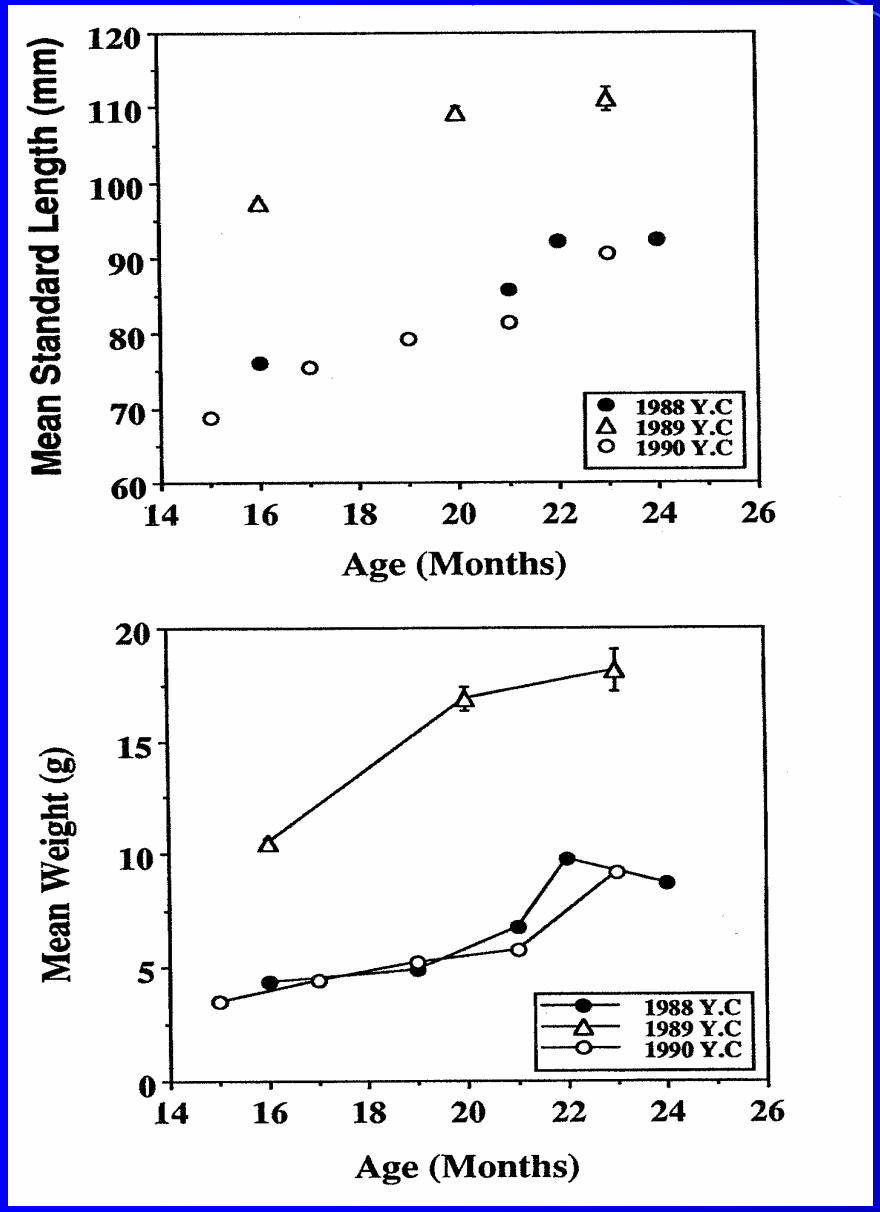
Cyclic Pattern in the Abundance of Longfin Smelt (Data from WDF)

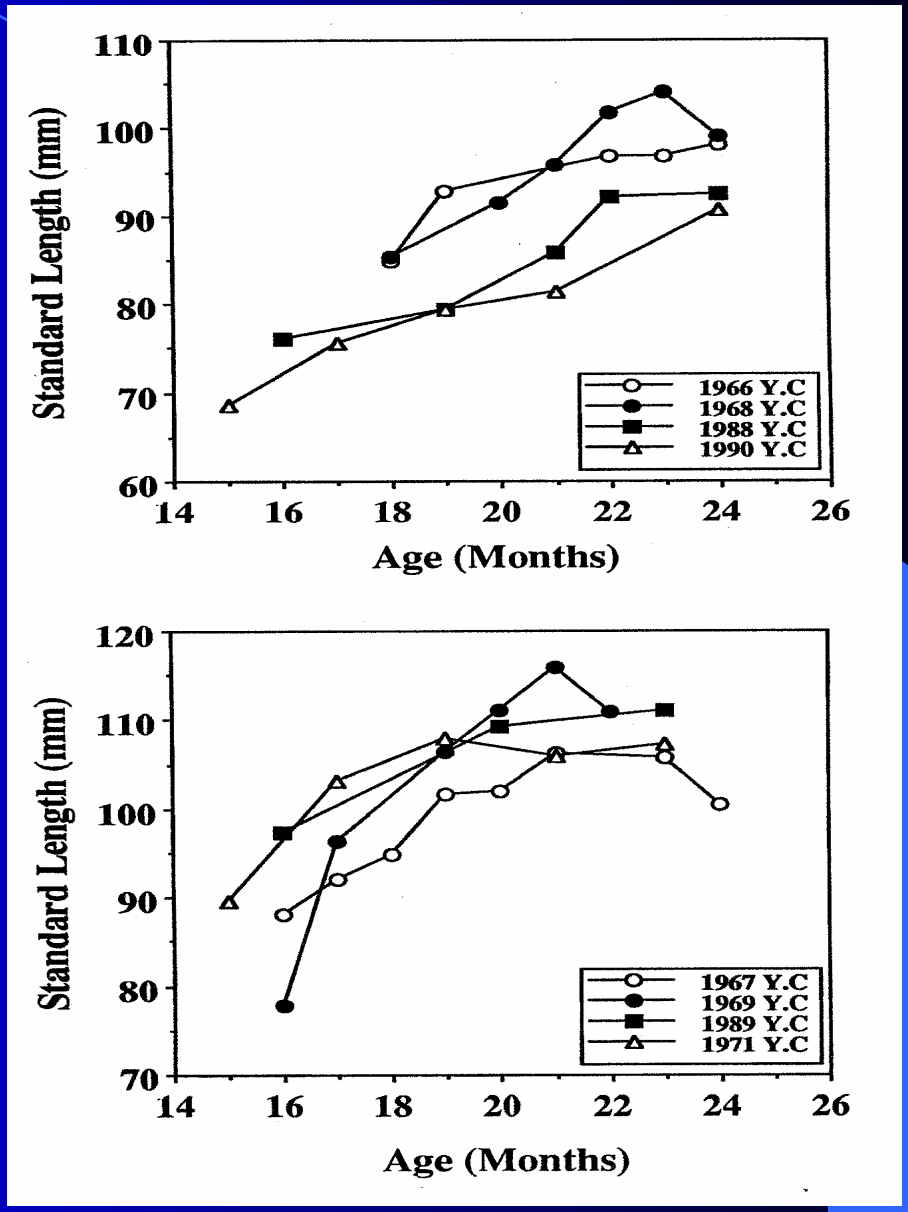


Cyclic Variation in the Abundance of Longfin Smelt *(Chigbu 2000)*

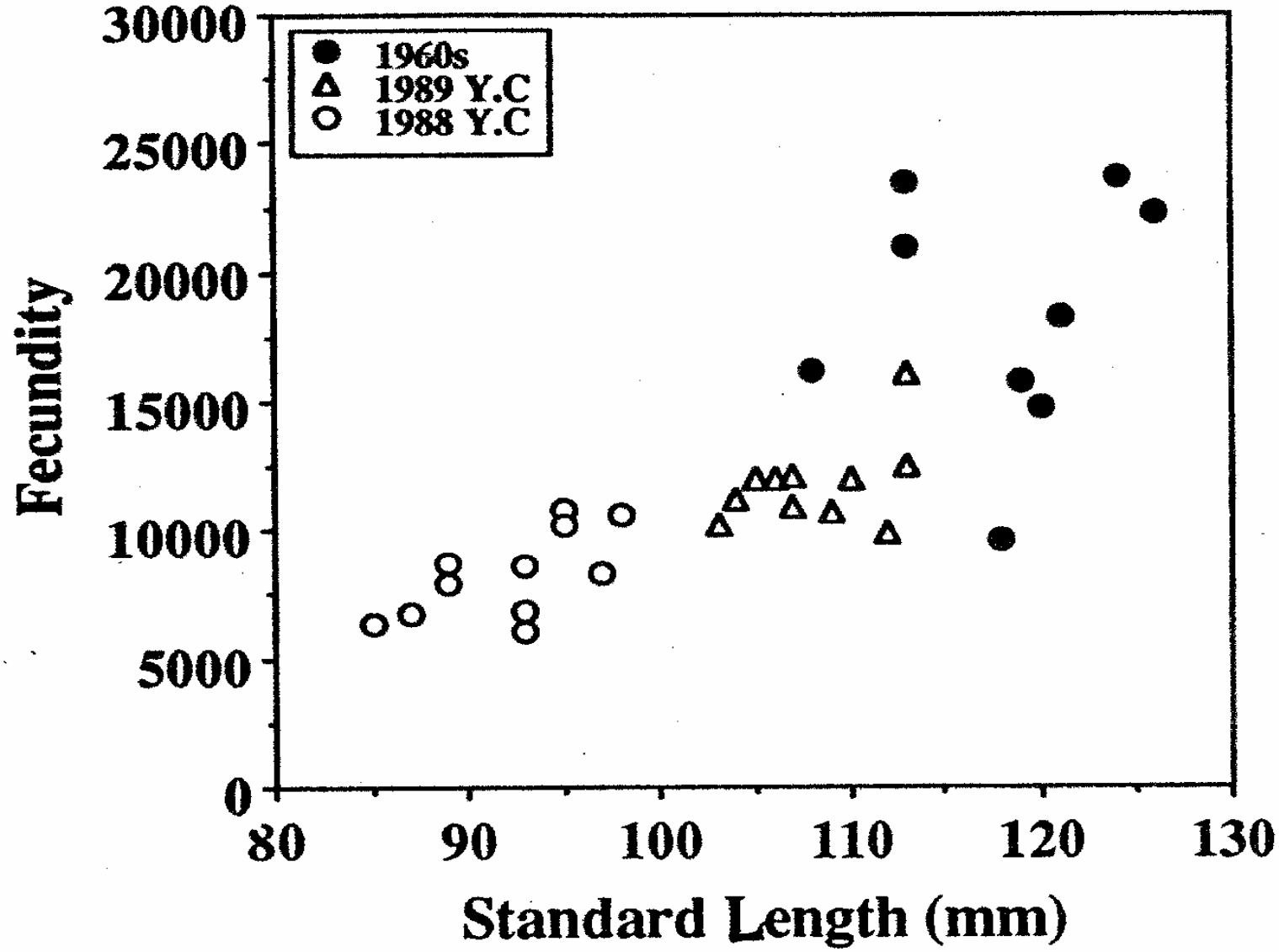


Influence of Cyclic Variation in the Abundance of Longfin Smelt on growth *(Chigbu & Sibley 1994)*





Influence of Variations in the Abundance of Longfin Smelt on fecundity *(Chigbu & Sibley 1994)*

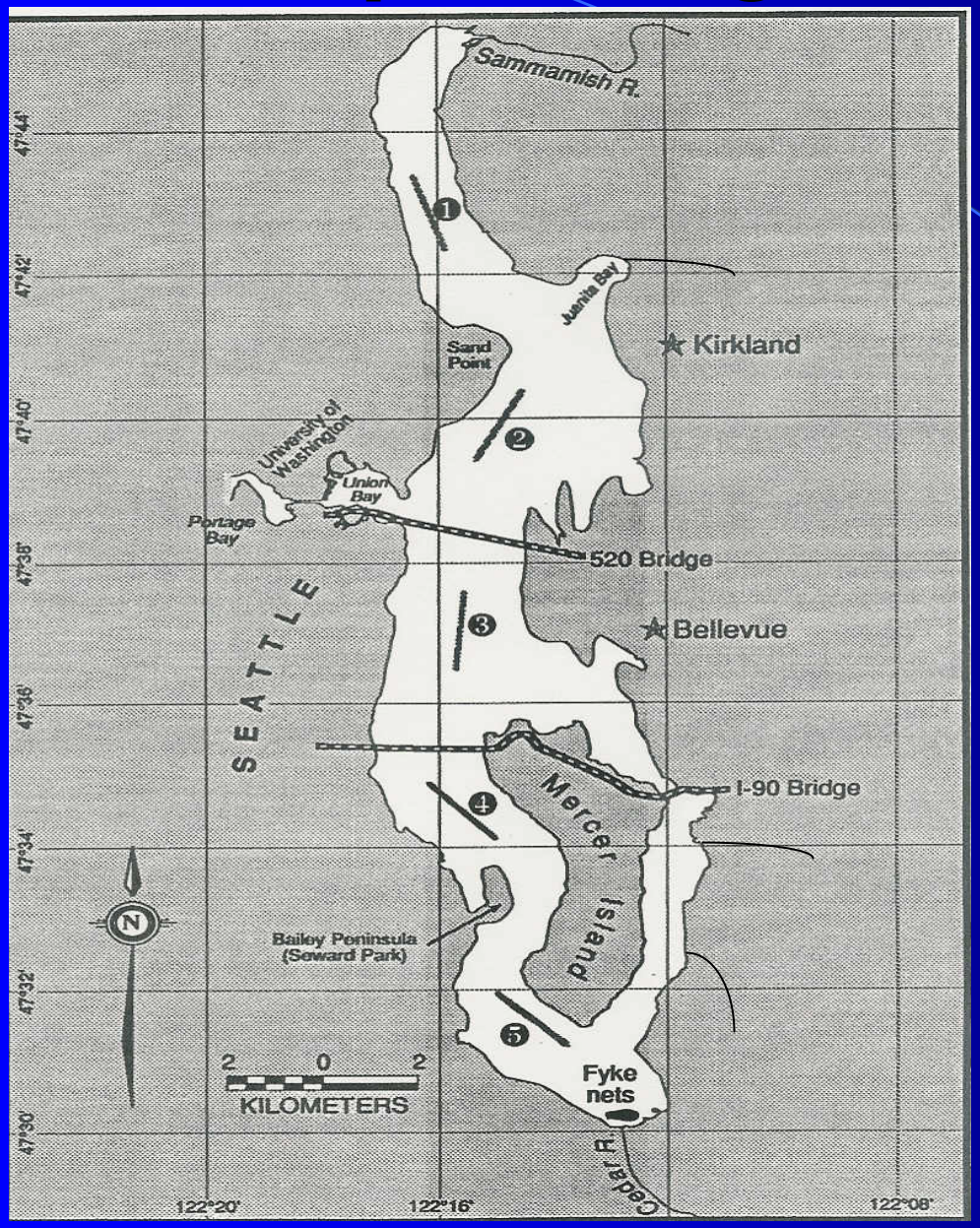


Fecundity of Landlocked Smelt Populations*

Species	Locality	Size of Fish (mm)	Age at 1st Maturity	Fecundity (Eggs/Fish) (1000)	Source
Osmerus eperlanus	Rjgrod Lake	74–101	1 – 2	4.1–9.0	Czeczuga 1959
O. eperlanus	Syam Ozera	108–157	2	7.5–20.0	Sterligova 1979
O. mordax	Lake Superior	185–224	3	22.3–40.9	Bailey 1964
O. mordax	Lake Erie	97–132	-	5.5–5.3	Nsembukya-Katuramu et al. 1981
Spirinchus thaleichthys	Harrison Lake	46–61	2	0.5–2.4	Dryfoos 1965
S. thaleichthys	Lake Washington	108-126	2	16.2–22.2	Dryfoos 1965

*Modified from Nellbring 1989

Spawning Location

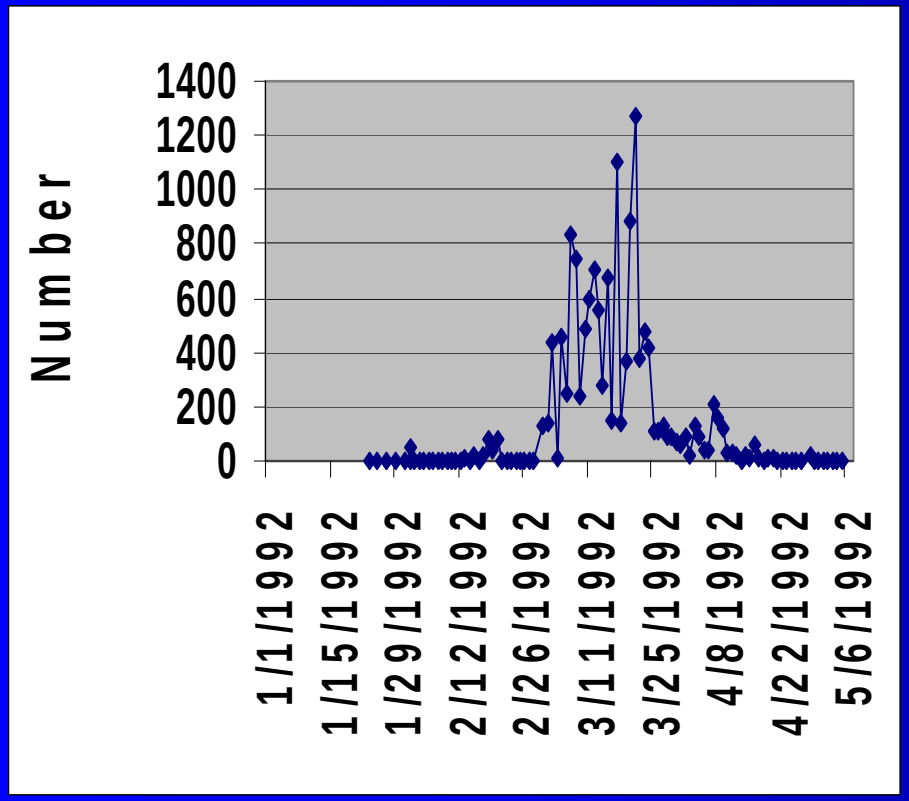


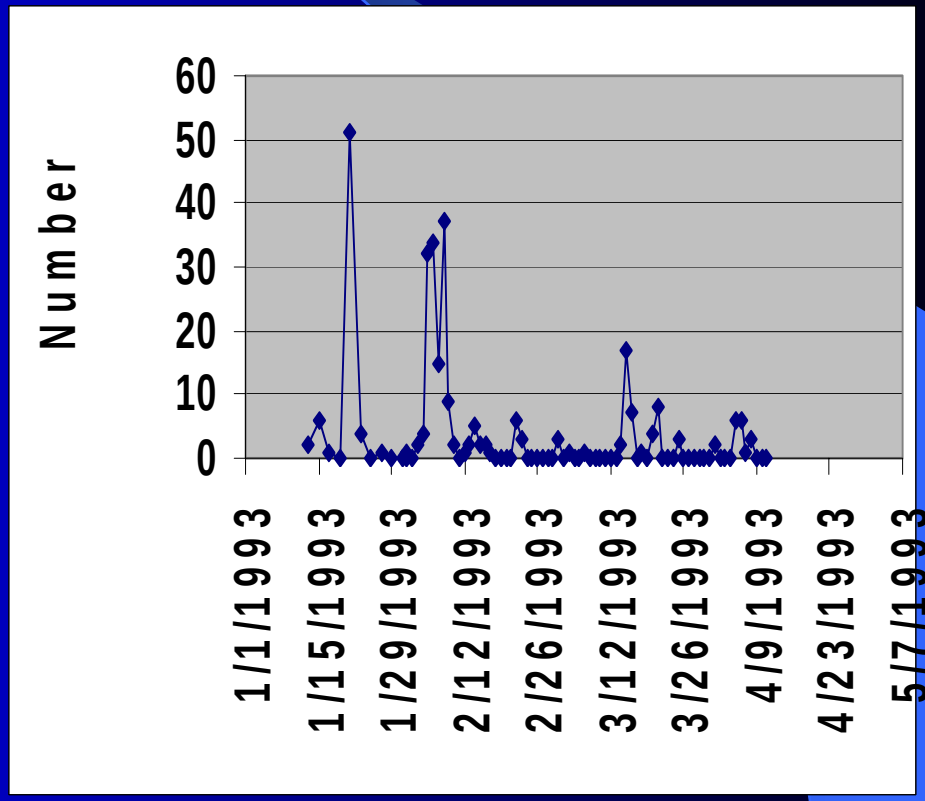
-May Creek
-Coal Creek
-Juanita Creek
-Cedar River

Timing of Spawning (Moulton 1974)

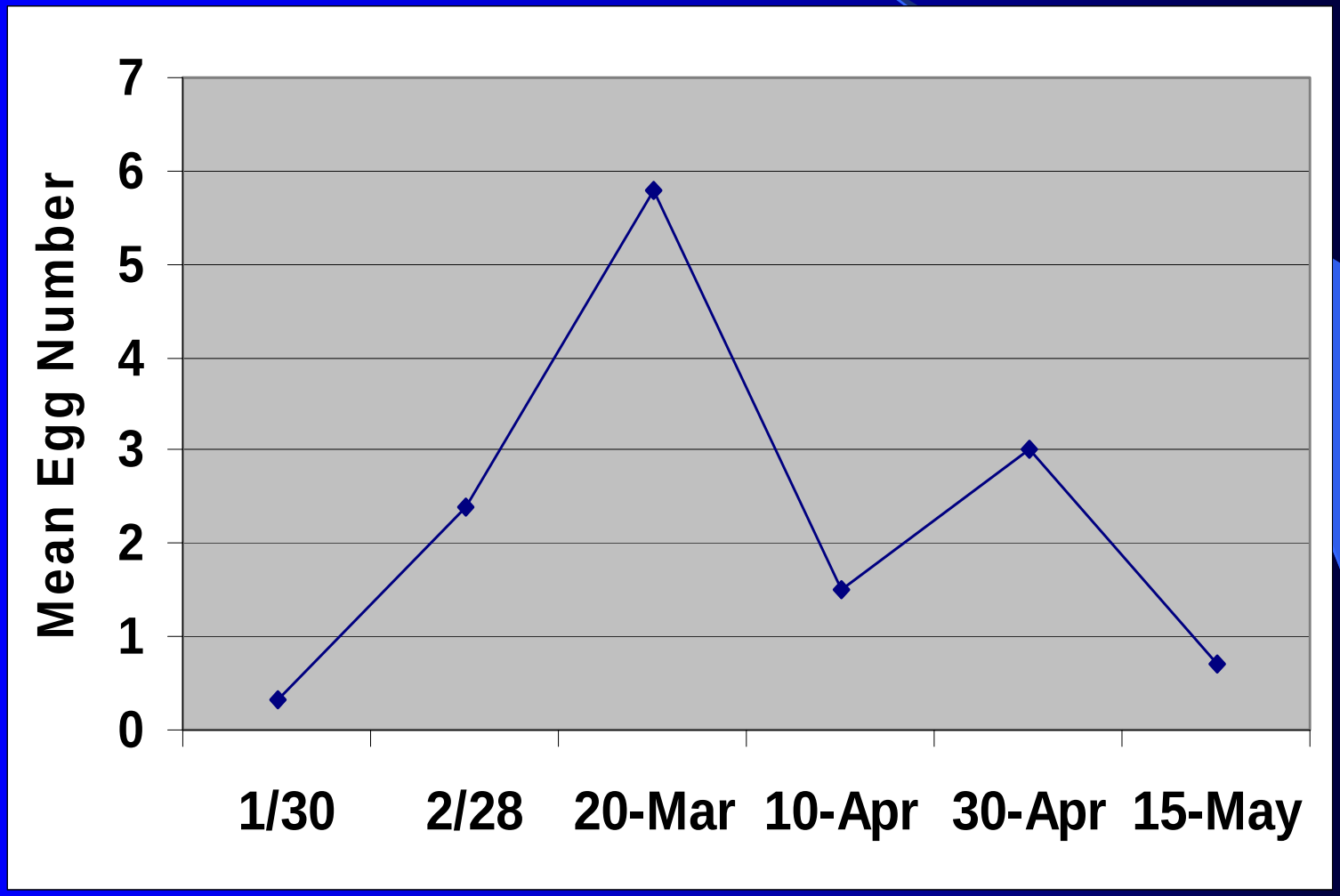
- **Months:**
  - **Peak spawning in mid-February (From early Feb. to late March) ------- Odd year (1971)**
  - **Peak spawning in mid-March (From late Feb. to mid-April) ------- Even year (1970)**

Timing of Spawning in the Cedar River
(Data from WDF)





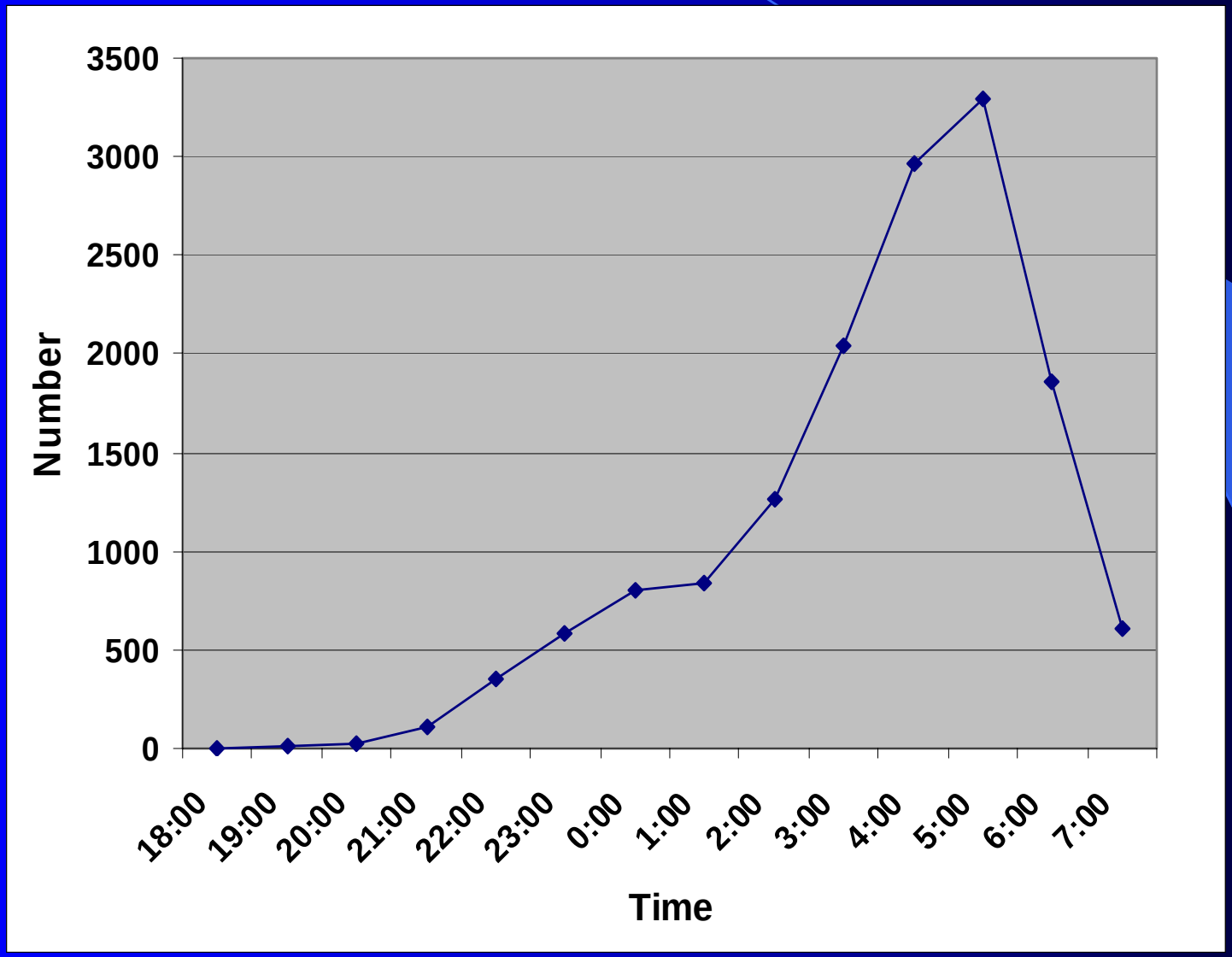
Spawning in Juanita Creek
Jan. – May 1996



Timing of Spawning contd.
(Moulton 1974)

- Spawning occurs at night
- Greatest catch between 1800 and 2100 hr
- Catches for males: 1800 – 2400 hr
- Catches for females: 2100 – 0300 hr
  - i.e. Males precede females into the river

Number of Adult Smelt Captured at the Cedar River Sockeye Salmon Fry Trap (Jan.- May 1994) (Data from WDF)



Sex Ratios During Spawning Run

- During peak spawning period: 53.3% (males), 46.7% females
- After peak spawning period (78.8% male, 21.2% female)
- Females leave the river after spawning
- Males do not leave the river until dawn

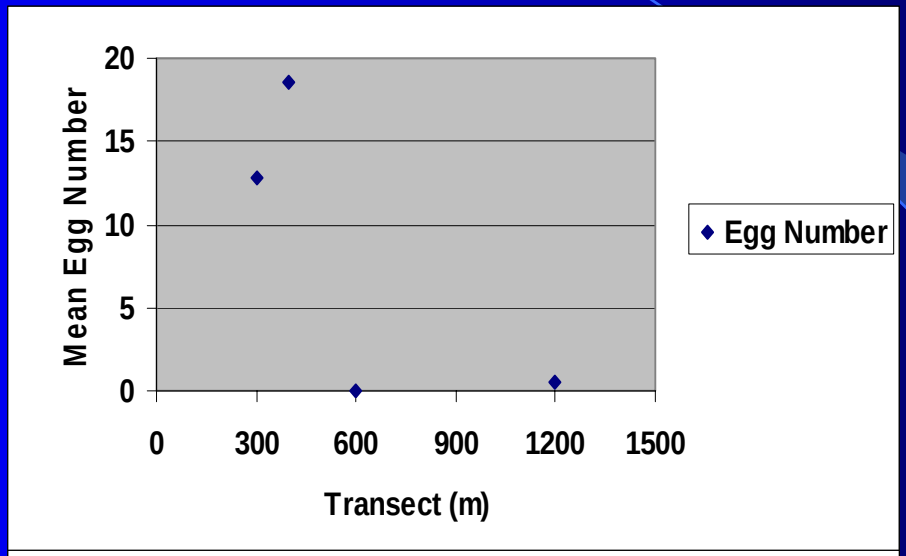
Temperature During Spawning Run

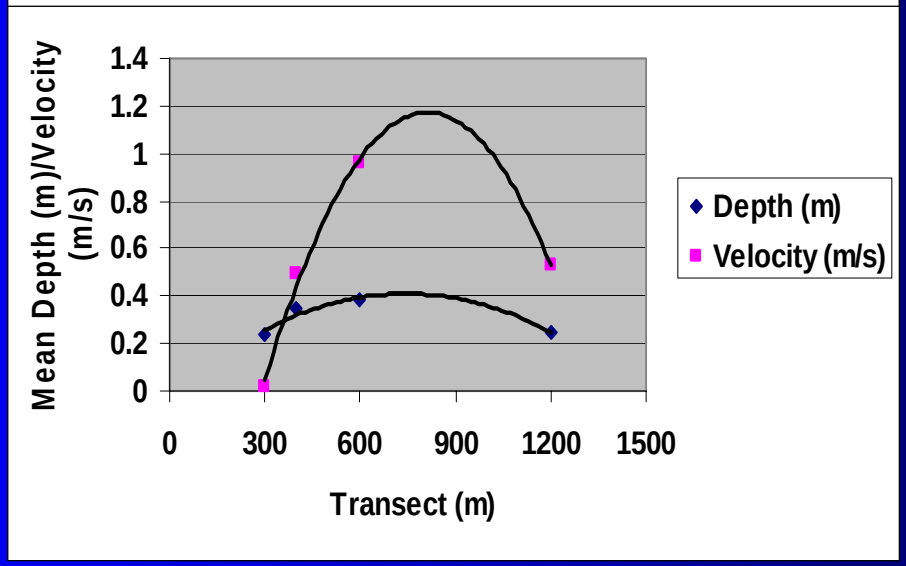
- 5.6 to 6.7^{o}C

Average Size of Longfin Smelt During Spawning Run

- Average sizes of males & ripe females decreased as the run progressed
- Larger smelt of each year class matured and spawned earlier than the smallest fish

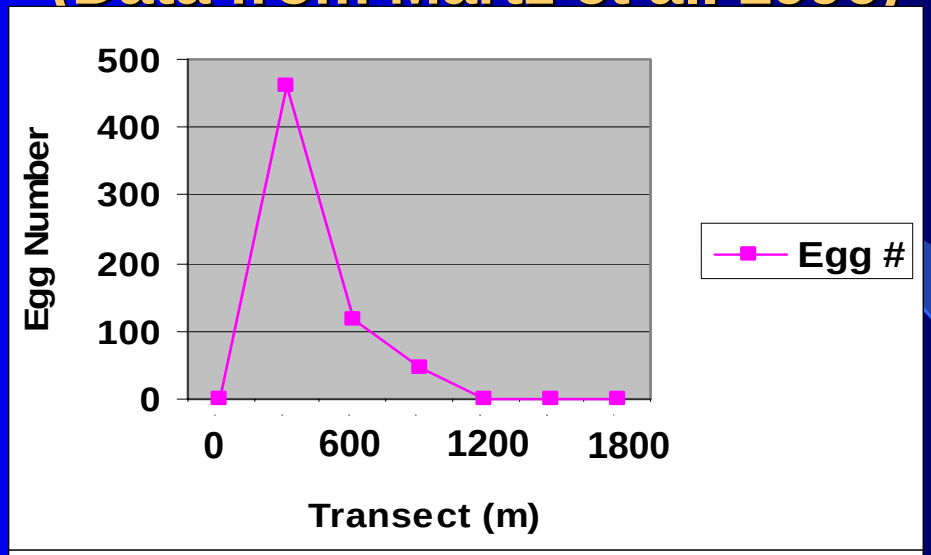
Egg Distributions in Cedar River (March 7, 1995)
(Data from Sibley & Brocksmith 1996)

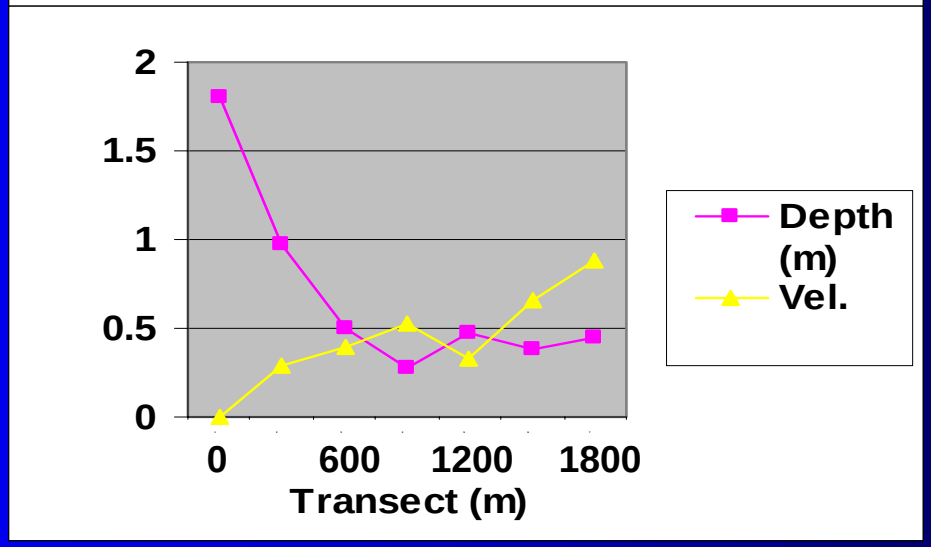




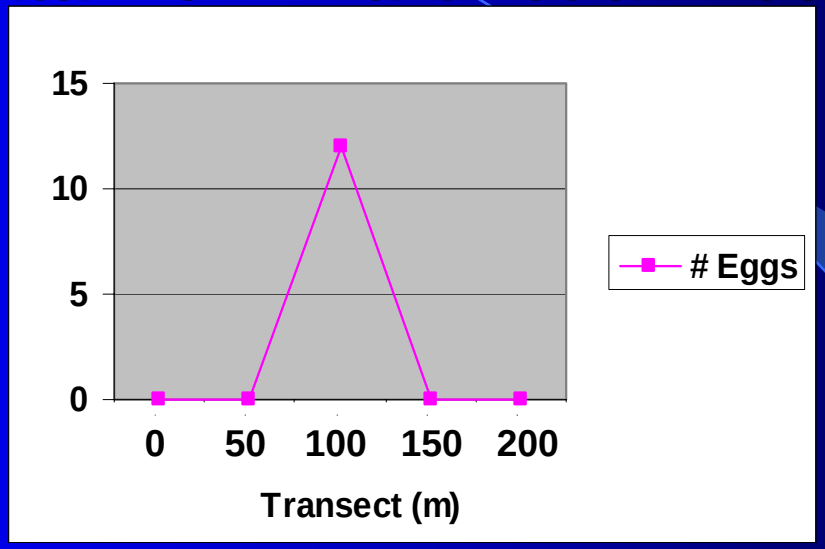
Egg Distributions in Cedar River (April 10/11, 1996)

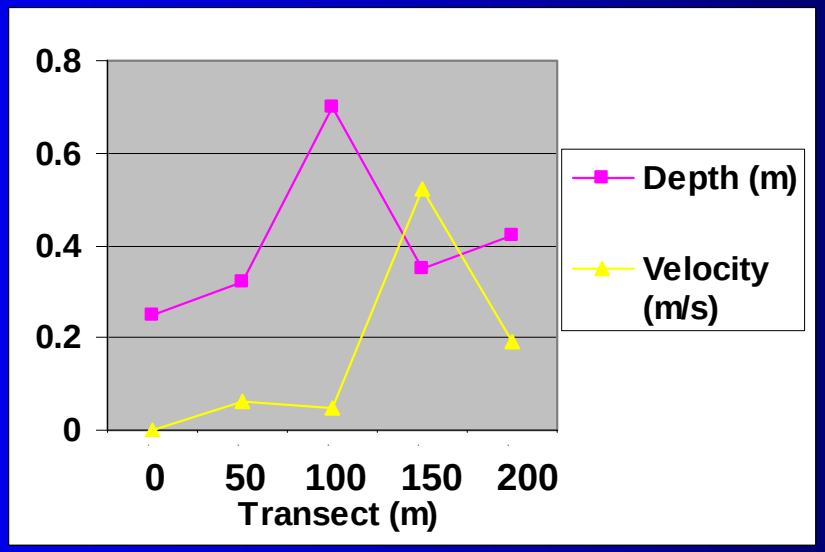
(Data from Martz et al. 1996)



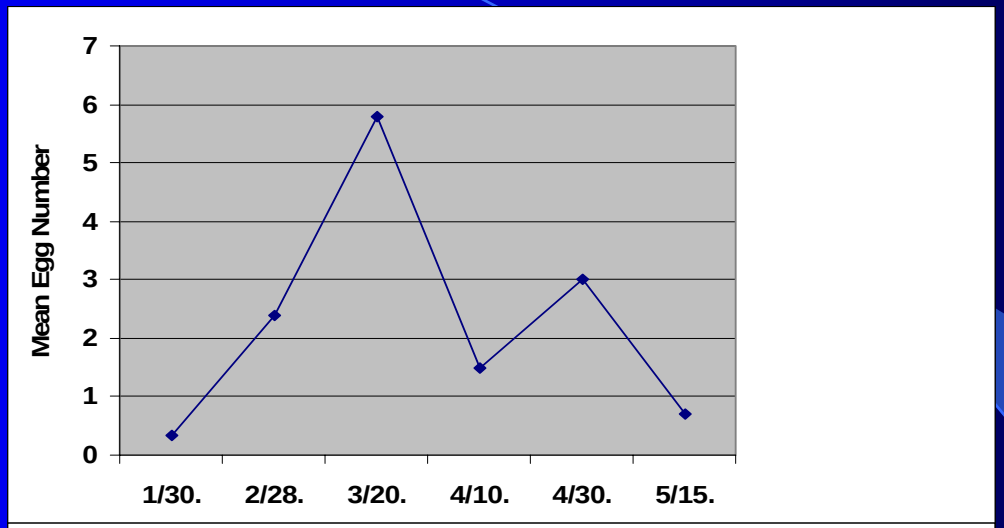


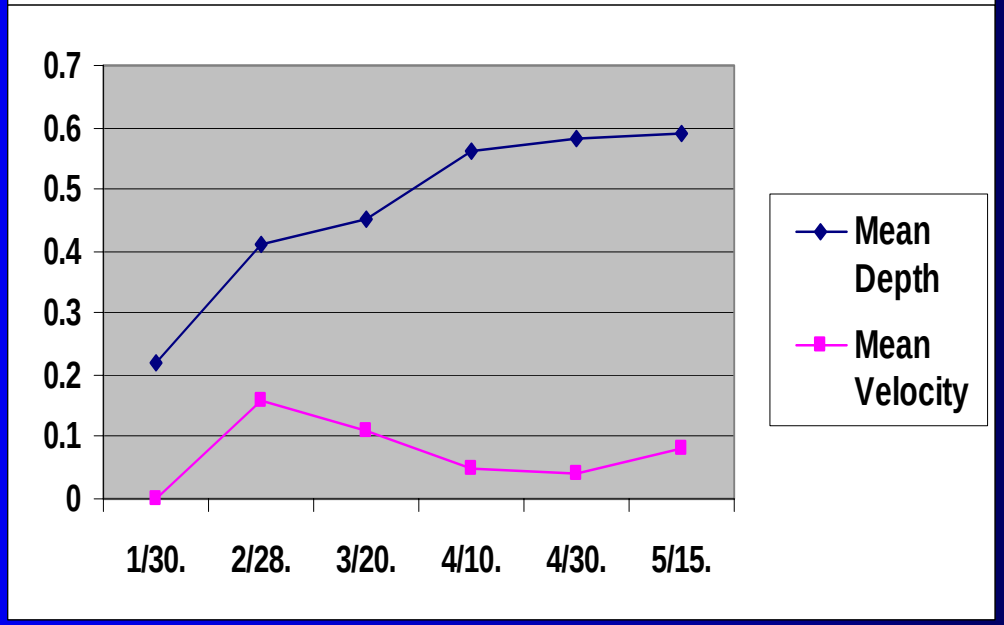
Egg Distributions in Juanita Creek (Feb. 28, 1996) (Data from Martz et al. 1996)





Egg Distributions in Relation to Environmental Factors in Juanita Creek





Spearmans Rank Correlations of Variables in Cedar River

	Rs	p-value	n
Egg # vs Depth (m)	0.33	0.003	78
Egg # vs Velocity (m/s)	-0.55	0.0001	75
Egg # vs Transect (m)	-0.66	0.0001	78

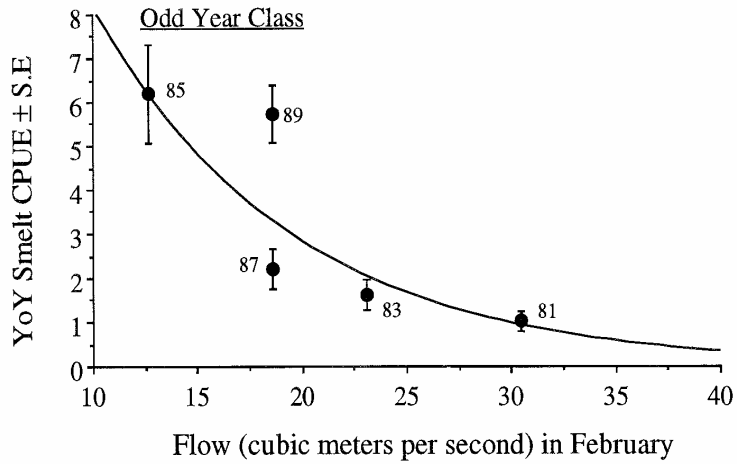
Lab Expt on Spawning Substrate Preference

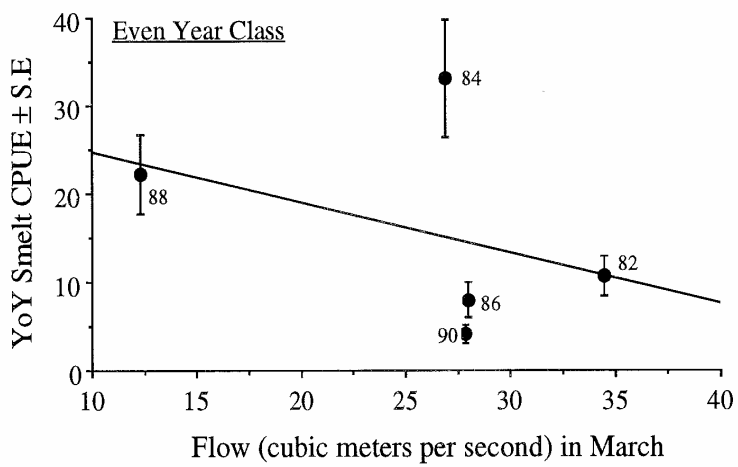
- Martz et al. 1996
  - ~94% of eggs were on sandy substrate
  - ~6% of eggs were on substrate consisting of gravel

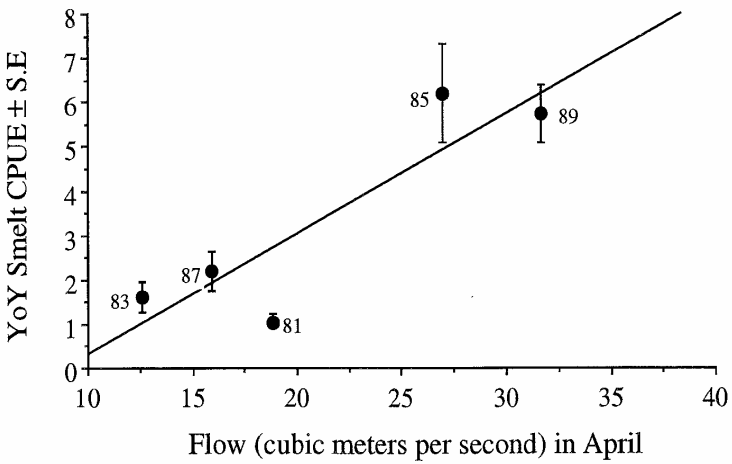
Longfin Smelt Egg Development Time

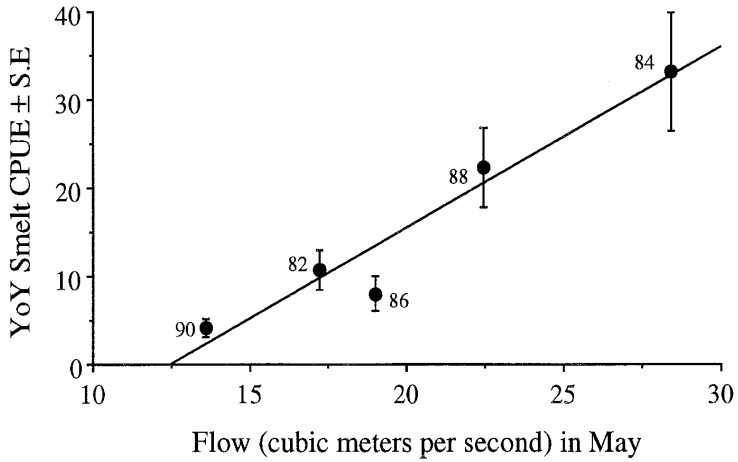
	Temperature (°C)	Days	Source
1.	7.0	40	Dryfoos 1965
2.	8.0 – 9.5	29	Sibley & Brocksmith 1996
3.	9.6 – 10.6	25	Moulton 1970

Longfin Smelt Recruitment & Cedar River Flow *(Chigbu 2000)*









Conclusion

- Longfin smelt spawn mainly in the Cedar River
- Peak spawning for even YC fish occurs in mid-March; for odd YC fish, it is mid-Feb.
- Highest # of eggs occurred at sites with relatively low velocities (0.28 to 0.54m/s)
- In creeks, eggs were found < 200m from the mouth.
- In Cedar River, eggs occurred < 1200m from the river mouth
- Eggs were collected from a variety of substrates, but mostly at sites with some sand
- Lab. experiment suggests that smelt prefers sandy substrate to gravel for spawning

Thank You!