# Juvenile chum migration patterns in the lower Columbia River and estuary


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**Columbia River Estuary Workshop 2014**

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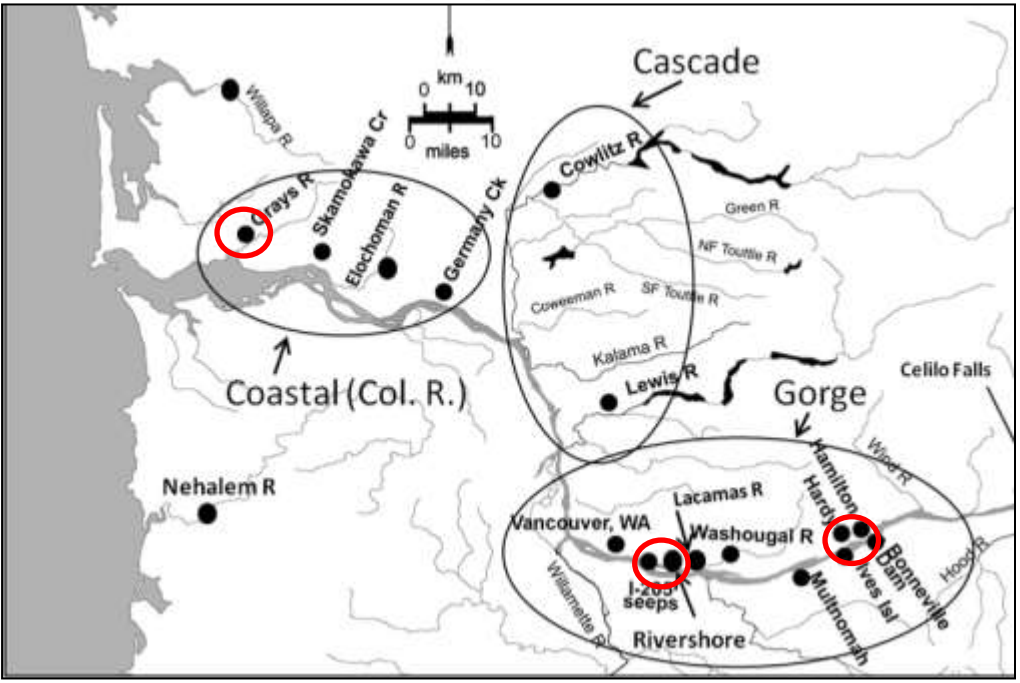
**Thanks to the many NOAA and CE colleagues!**

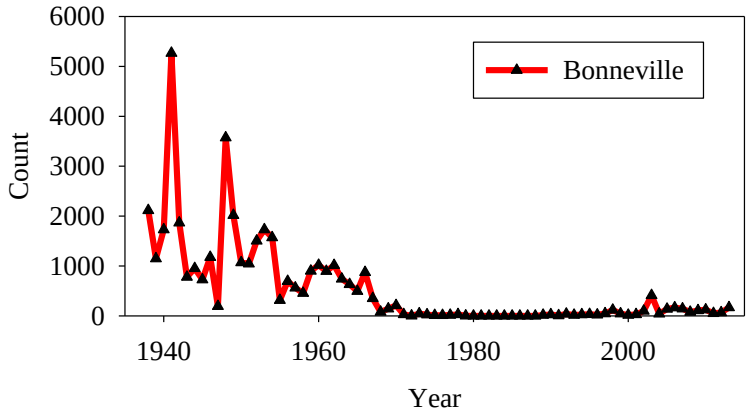
# Collapse of the CR chum

- Historic annual run >1.3 million fish; today < 15 k
- Historic distribution: CR mouth to Walla Walla River
  But concentrated below Celillo Falls (near The Dalles dam)
- Present pattern: limited number of spawning locations on Washington side:
  - ⇨ Grays River
  - ⇨ In main stem CR near I-205 and below Bonneville Dam
  - ⇨ Some returns to Cowlitz & Lewis Rivers and elsewhere
- Functionally extirpated from Oregon side (probably < 1 k / yr).

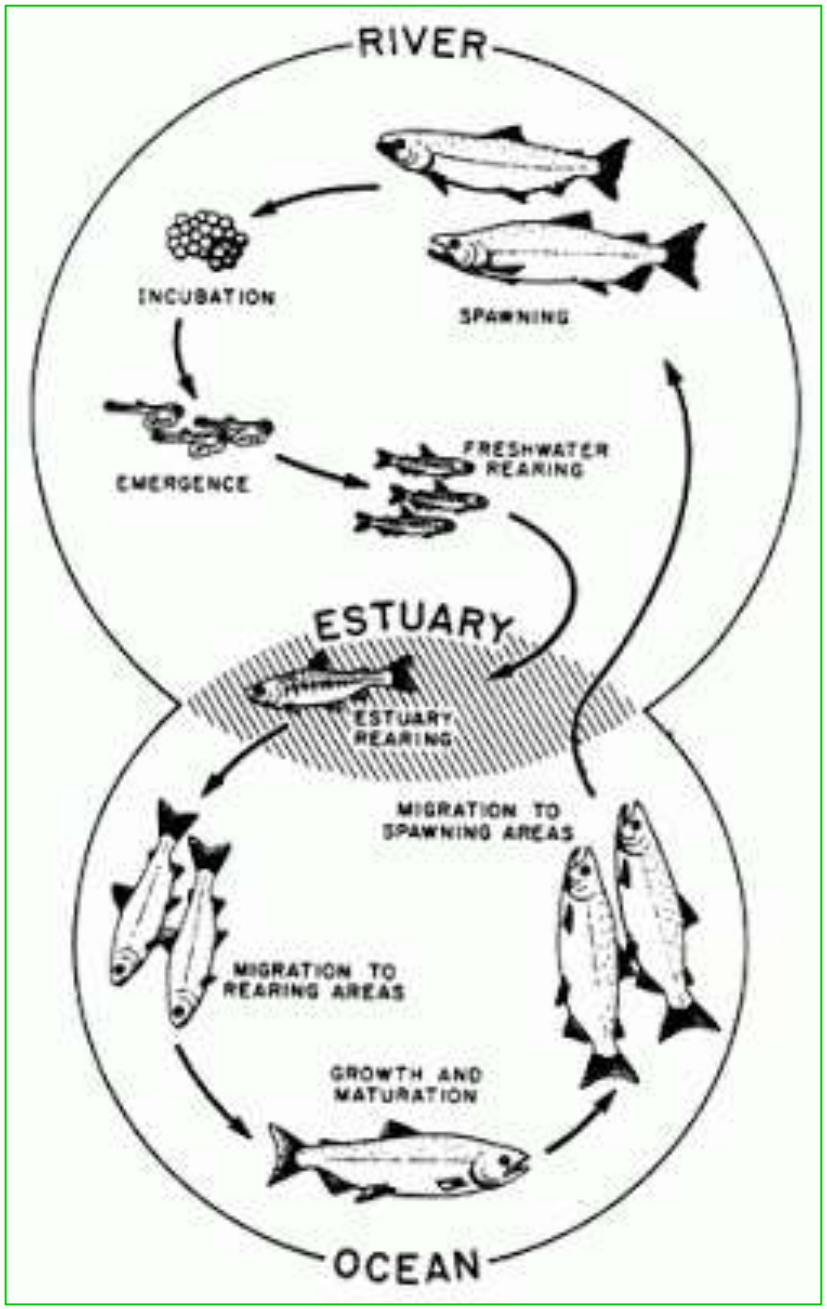


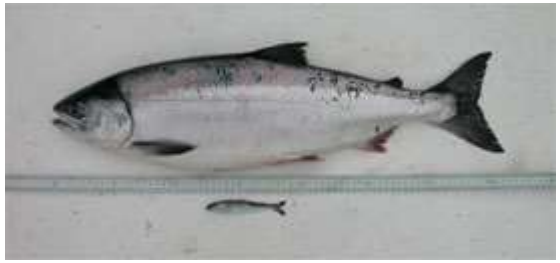

Small, M. P., K. Homel, and C. Bowman. 2013. Genetic assignments of Oregon chum salmon *Oncorhynchus keta* in the Columbia River estuary

- At present, renewed emphasis on chum spawning habitat restoration in both WA and OR

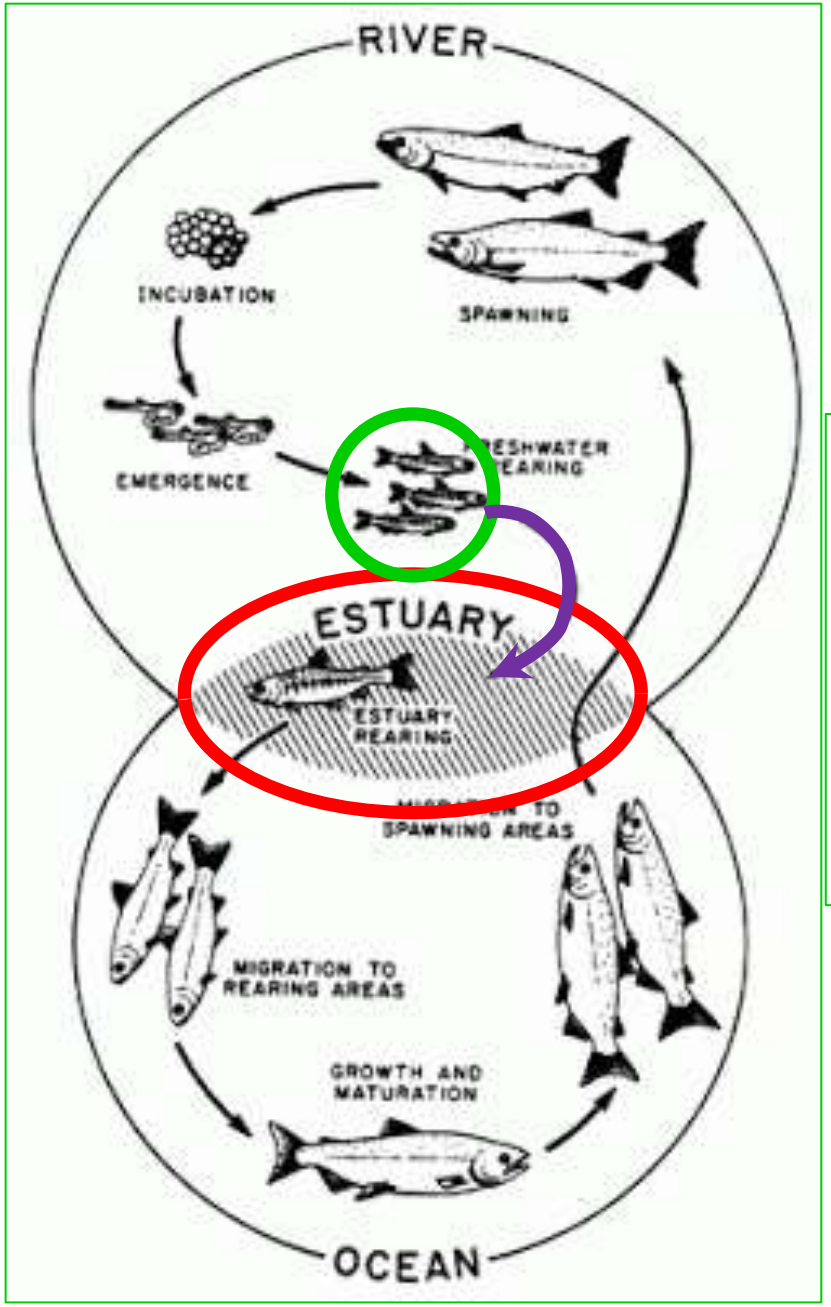


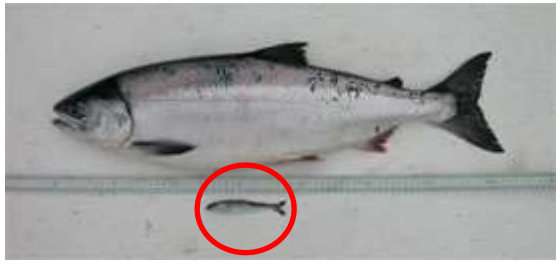
# OUTLINE


RIVER
INCUBATION
SPAWNING
EMERGENCE
FRESHWATER REARING
ESTUARY
ESTUARY REARING
MIGRATION TO SPAWNING AREAS
MIGRATION TO REARING AREAS
GROWTH AND MATURATION
OCEAN



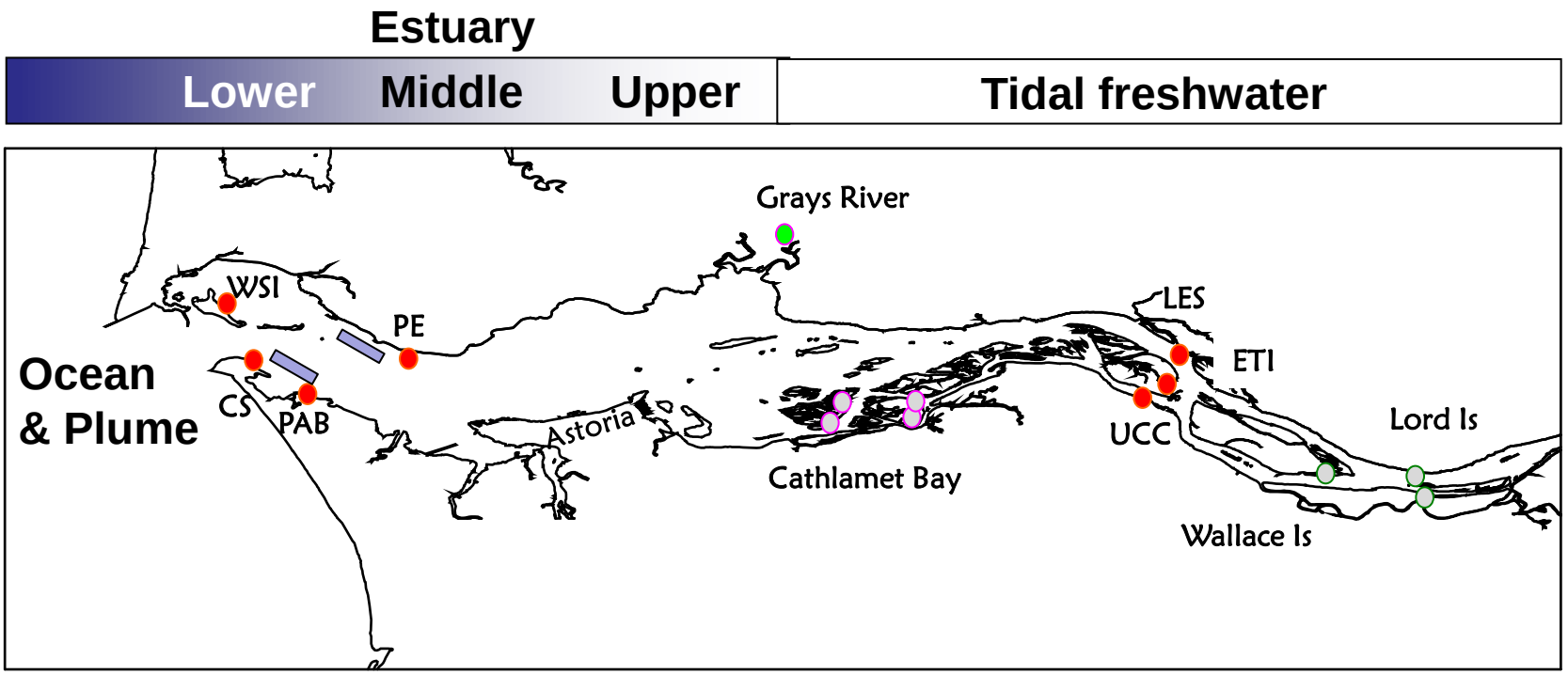
# OUTLINE



1. Population status (compared to other salmonids & fish species)
2. Life history characteristics
3. Migration patterns (timing, size & distribution)
   - ⇨ Main stem estuarine & TFW habitats
   - ⇨ Grays River restoration wetland
   - ⇨ Mark recapture
4. Conclusions

# LCRE sampling sites



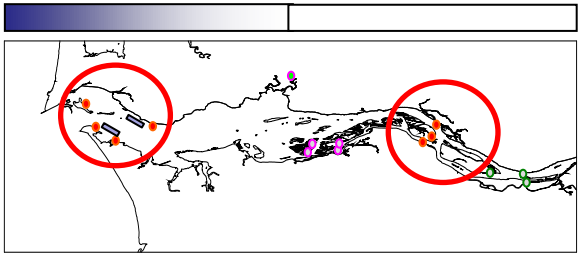

**Studies – Spatial and temporal scales**

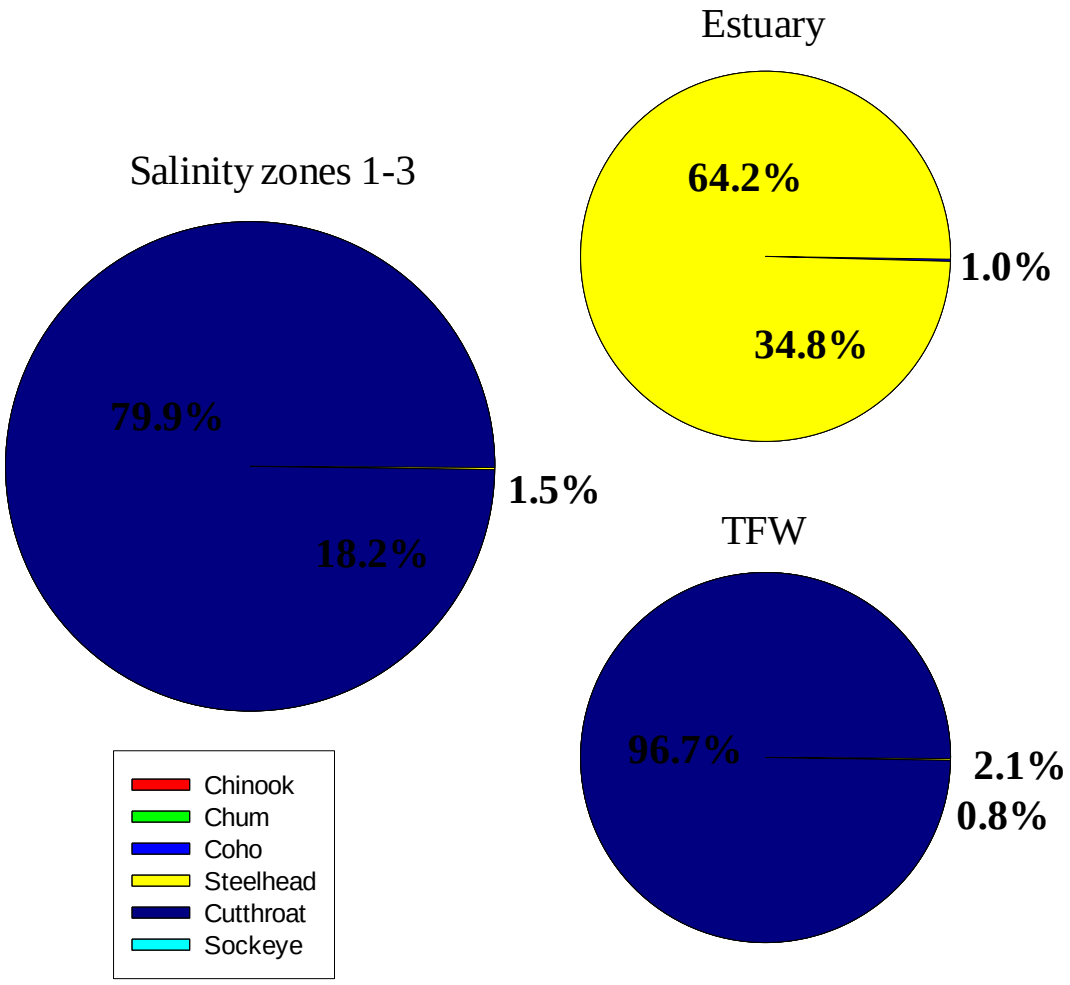
1. **Estuary beach seine &Trap net**
2. **Grays River studies**
3. **Estuary purse seine**
4. **Migration studies**

**Timeline**

2002-2007: monthly; PAB 2010-pres
2005-2009
2010-2012
2008, 2013

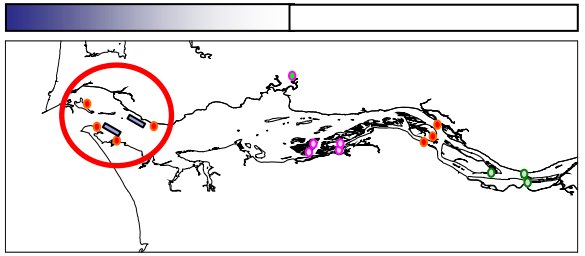
# Salmonid diversity 2002-2007





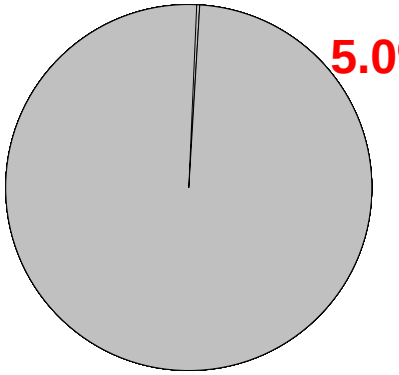

| Species | Estuary | TFW | Total |
|---|---|---|---|
| Chinook | 5445 | 7614 | 13059 |
| **Chum** | **2920** | **63** | **2983** |
| Coho | 85 | 165 | 250 |
| Steelhead | 16 | 17 | 33 |
| Cutthroat | 12 | 12 | 24 |
| Sockeye | 1 | 2 | 3 |
| Total | 8479 | 7873 | 16352 |

# Fish community at estuarine beach seine sites 2002-2007

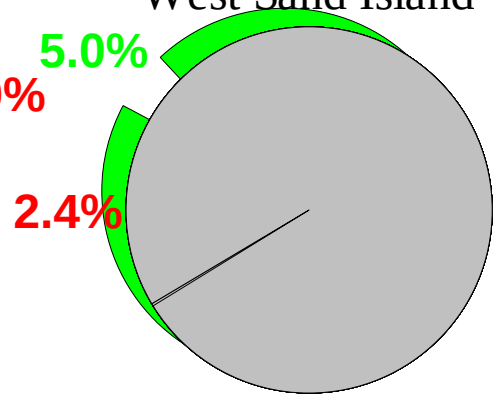


River Mouth

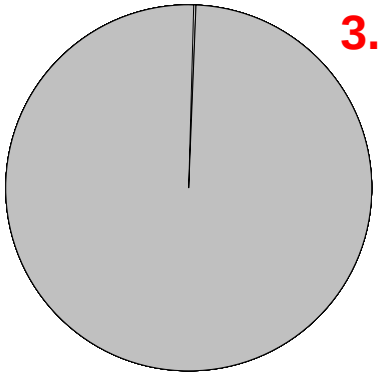
Clatsop Spit



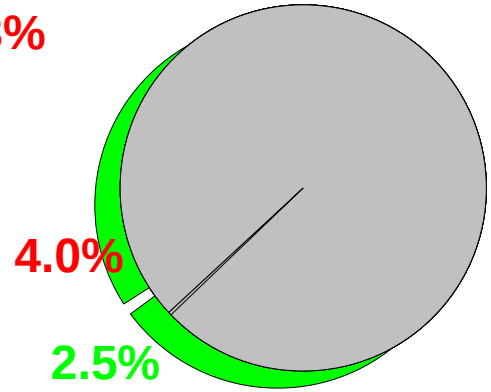
West Sand Island




Pt. Adams Beach




Pt. Elice

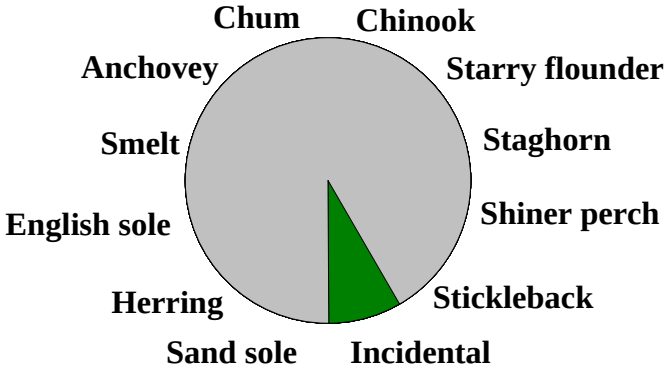



**Oregon**

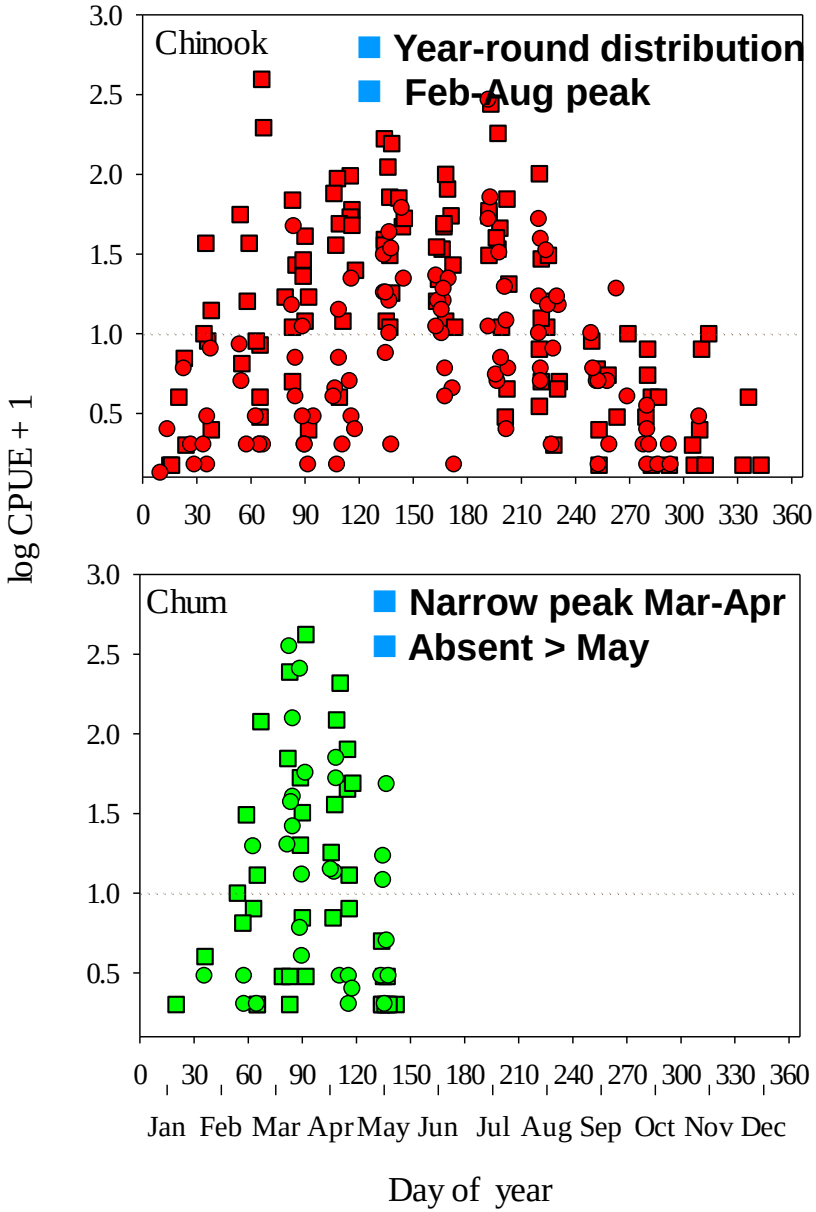
**<1%**

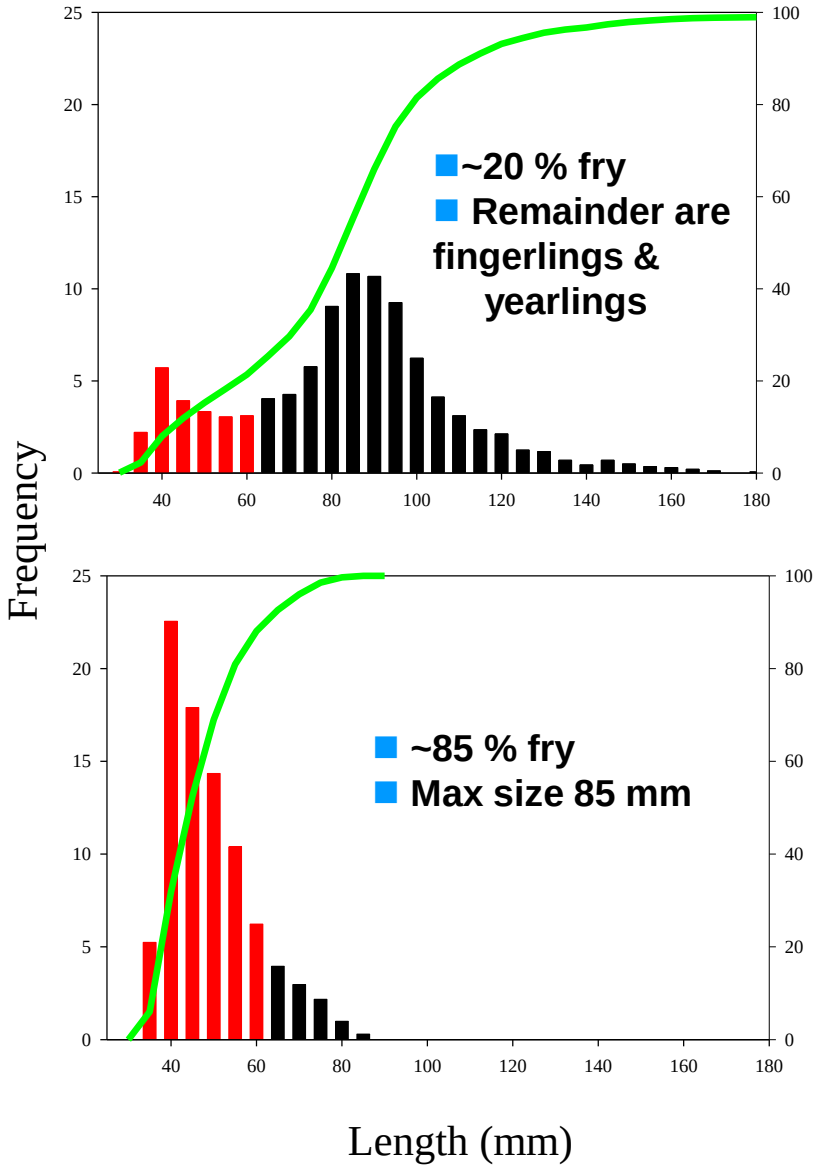
**Washington**

- **Spatial variation along salinity gradient**
- **Chum Salmon <1-5% of catch**
- **Chum more abundant on Washington side**

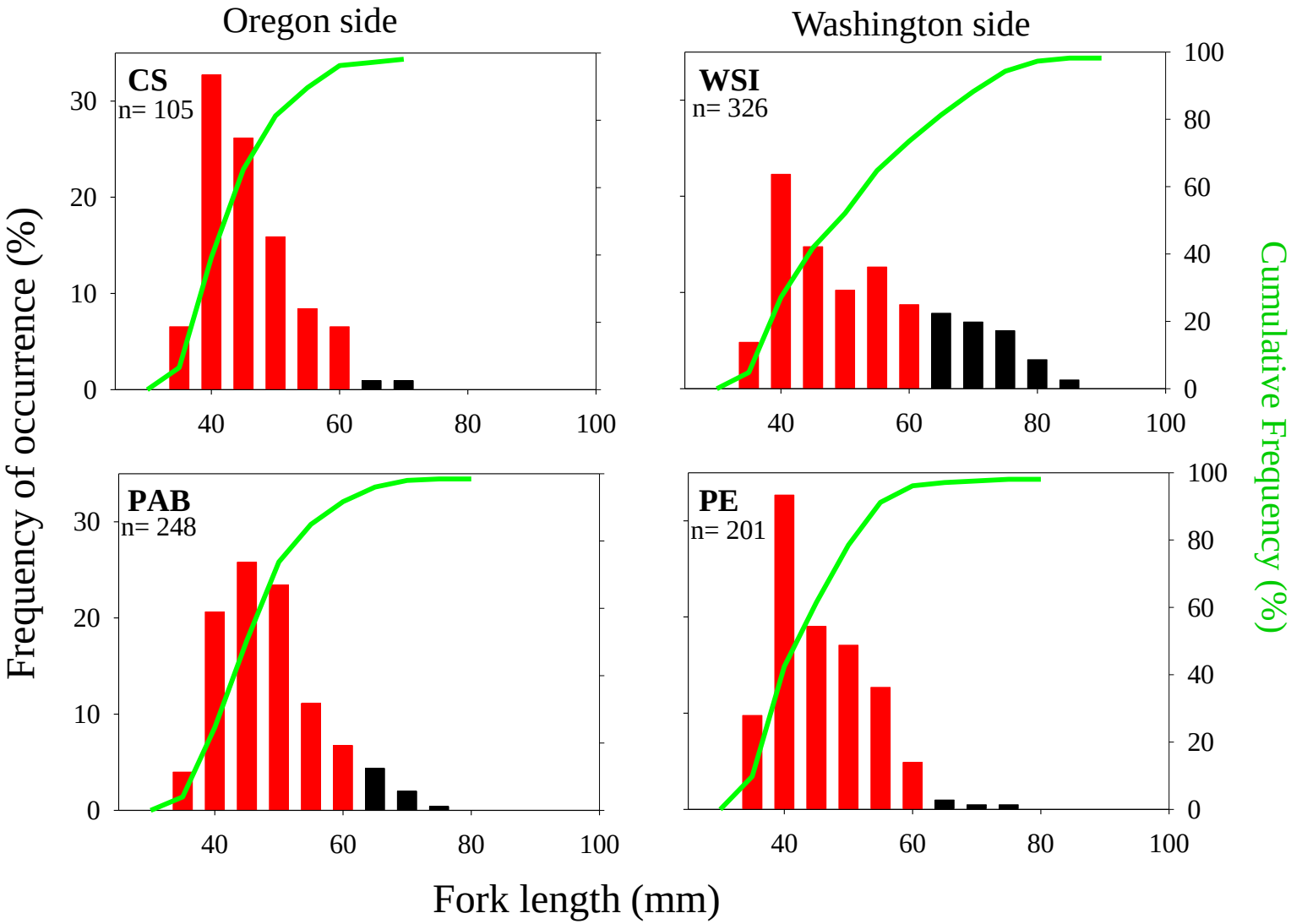


# Abundance and size-frequency 2002-2007

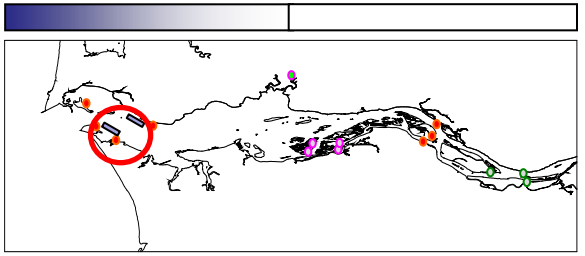


# Spatial variation of chum size-frequency

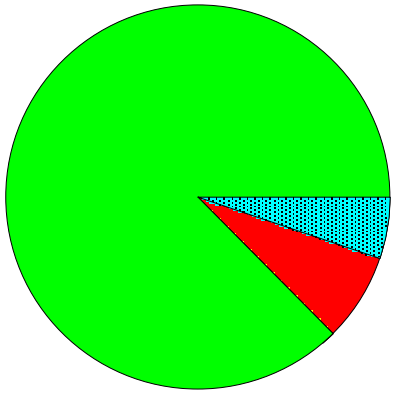


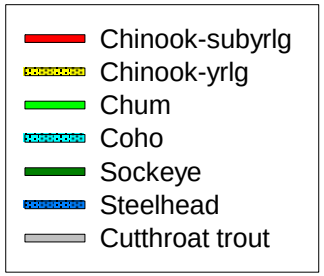
# Main channel vs shallow water salmon species 2010-2012



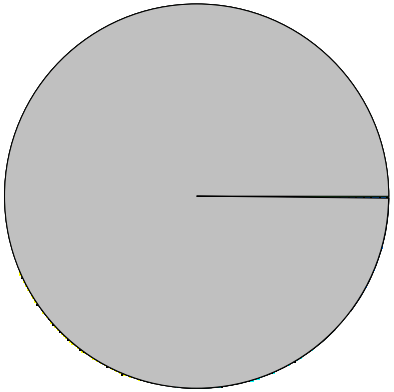
## Salmonid species distribution

Shoreline

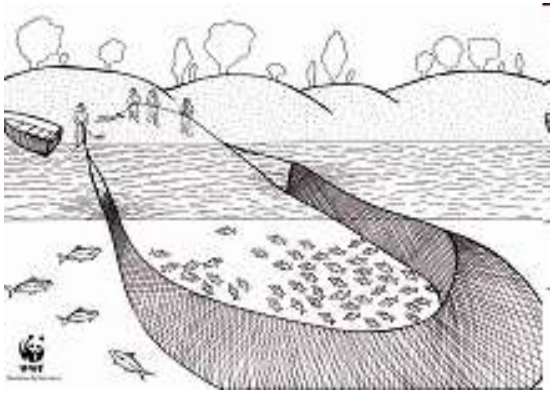




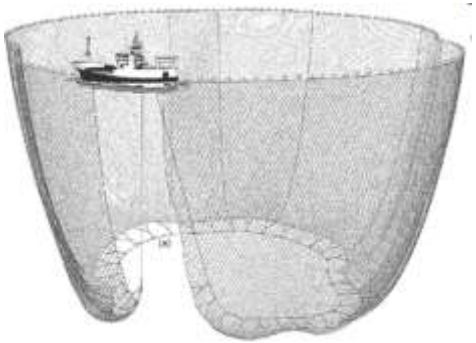

Channel



stipple indicates yearling life-histrory



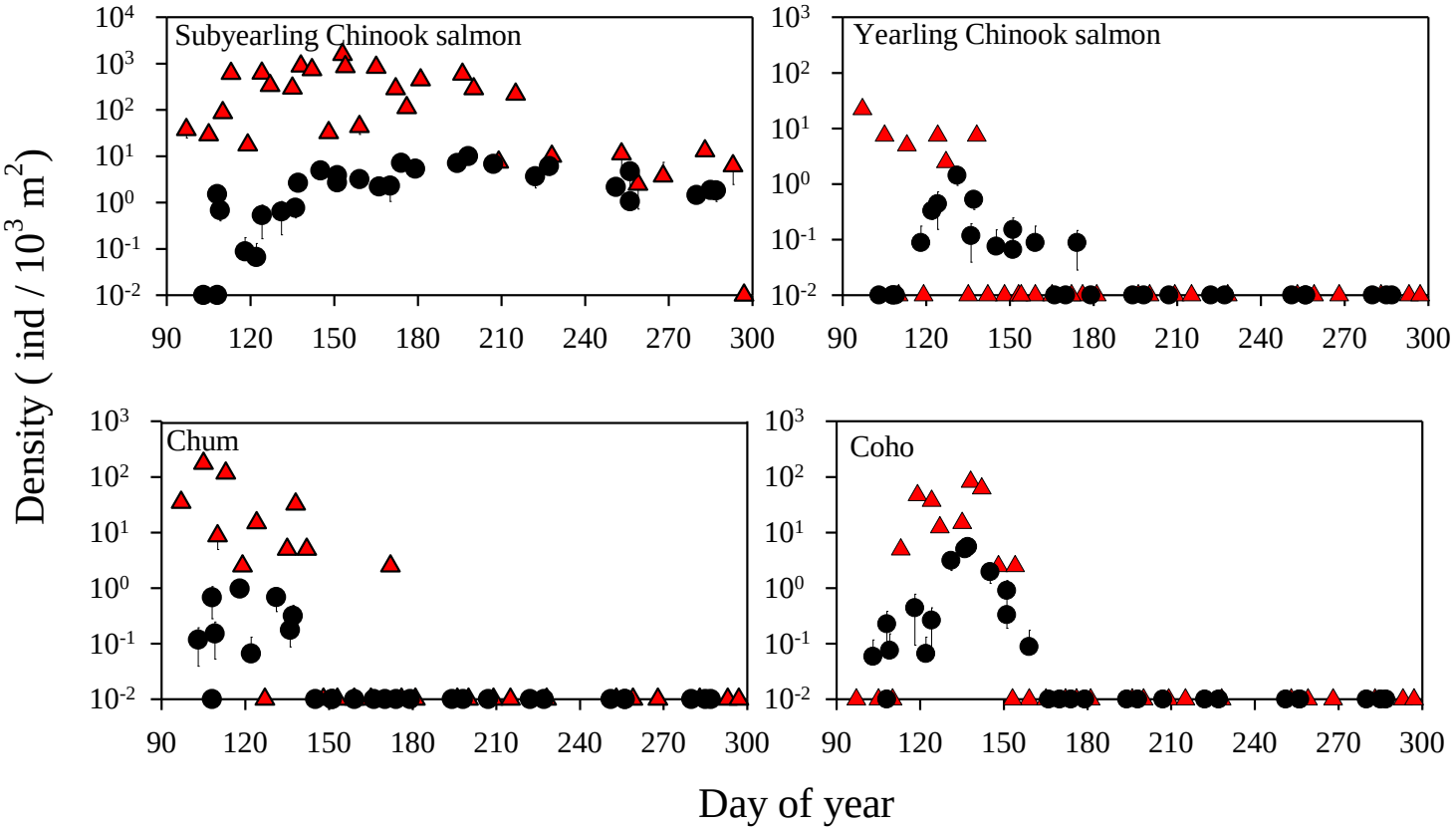
Area ~ 400 $m^2$

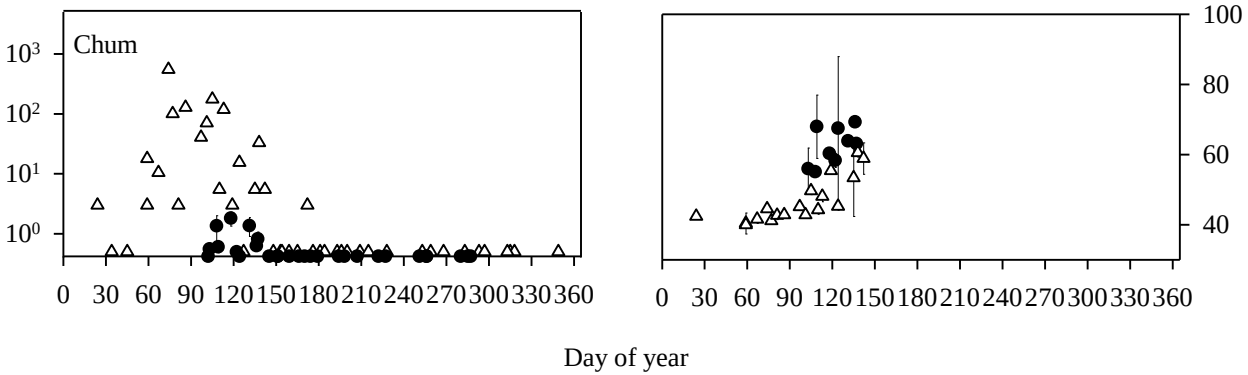


Area ~ 1850 $m^2$

G.C. Roegner[1], L.A. Weitkamp[2], D.J. Teel[3]. In Prep. Fine-scale variation in habitat use by juvenile salmonids in the Columbia River estuary.

# Catch standardized by area

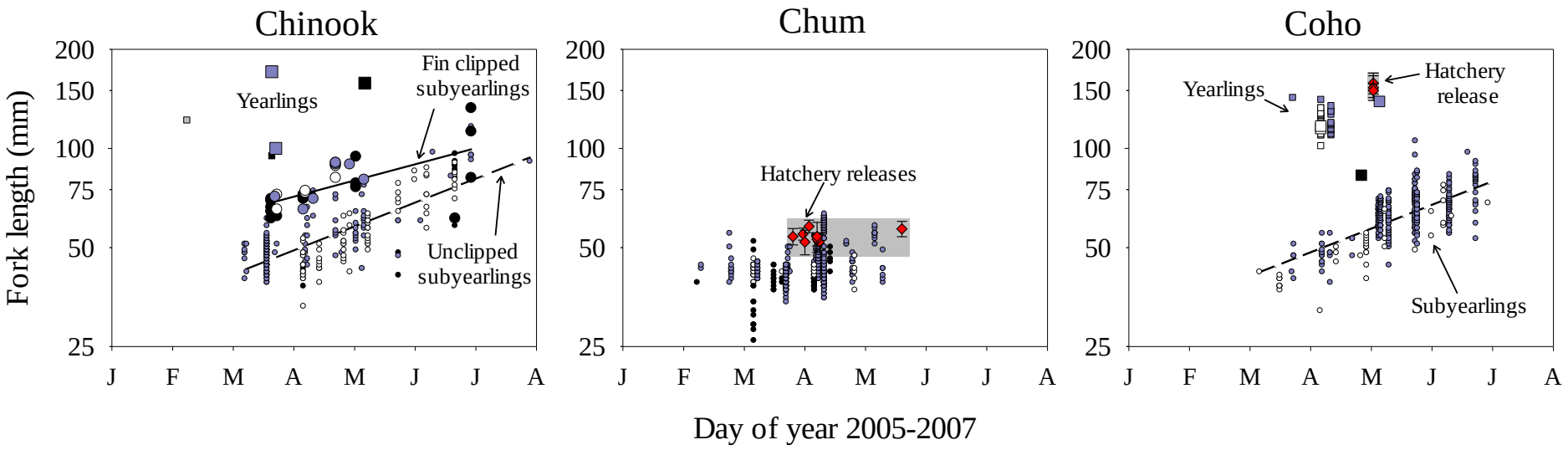



- Densities higher in shallow water
- Salmon larger in channel

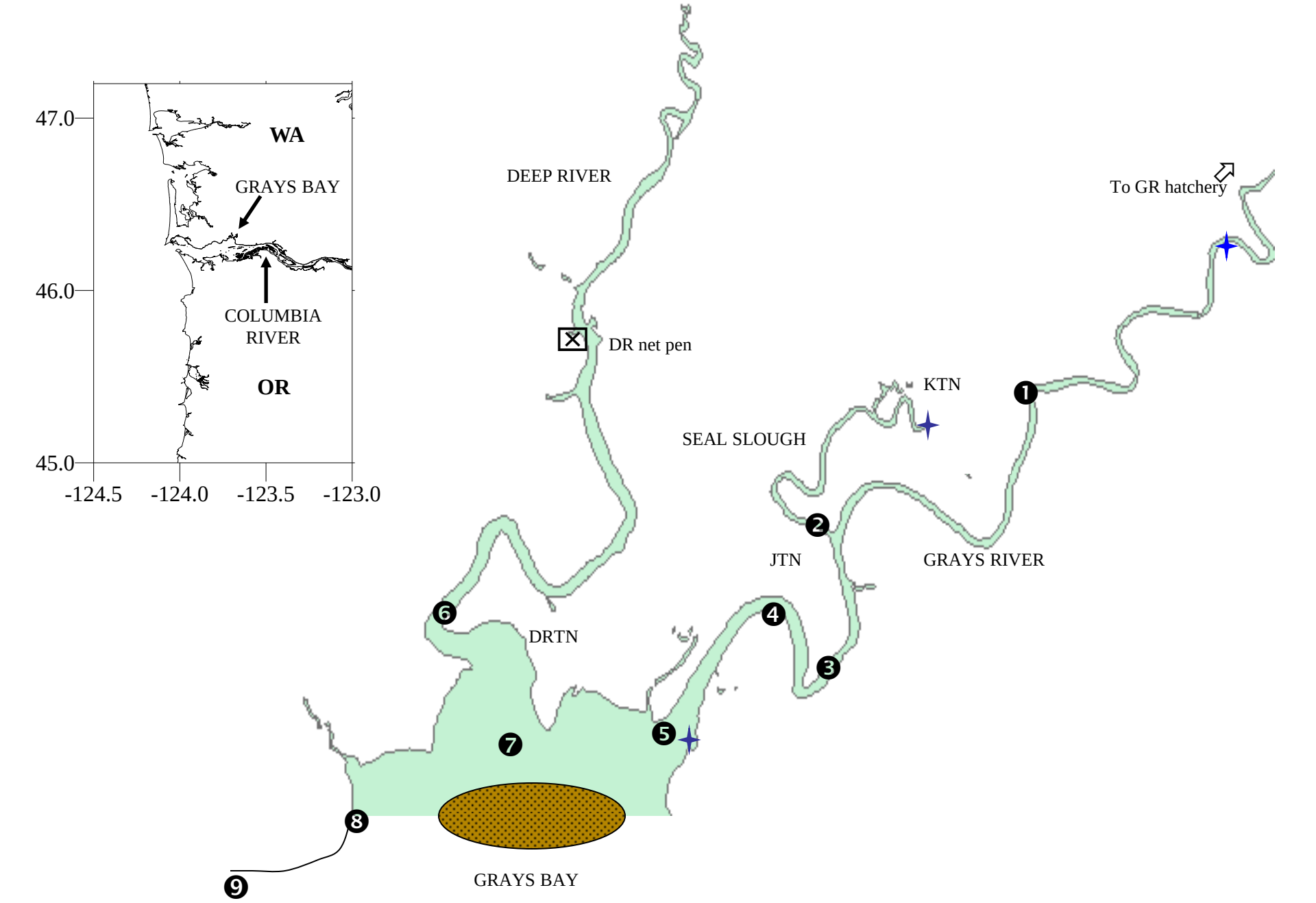
# Migration patterns of chum salmon in restored marsh habitat

# Variation in life histories and migration patterns 2006-2009

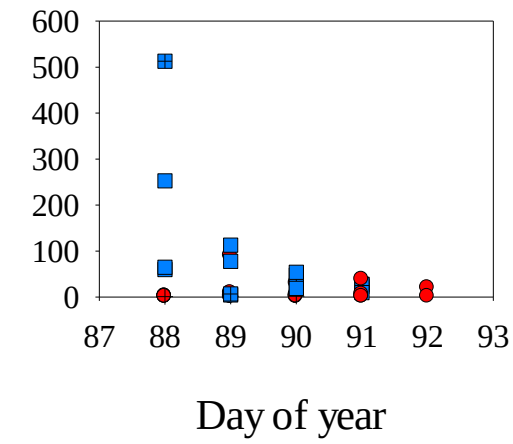



| | Chinook | | | Chum | | | Coho | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | First | Last | Length | First | Last | Length | First | Last | Length |
| 2006* | 67 | 168 | 101 | 39 | 111 | 72 | 82 | 111 | 29 |
| 2007 | 53 | 100 | 47 | 53 | 129 | 76 | 53 | 172 | 119 |
| 2008 | 62 | 162 | 100 | 46 | 120 | 74 | 62 | 176 | 114 |
| 2009 | 64 | 147 | 85 | 48 | 125 | 77 | 98 | 173 | 75 |
| mean | 61.5 | 144.3 | 83.3 | 46.5 | 121.3 | 74.8 | 73.8 | 158.0 | 84.3 |
| sd | 6.0 | 30.8 | 25.3 | 5.8 | 7.8 | 2.2 | 20.2 | 31.4 | 41.8 |

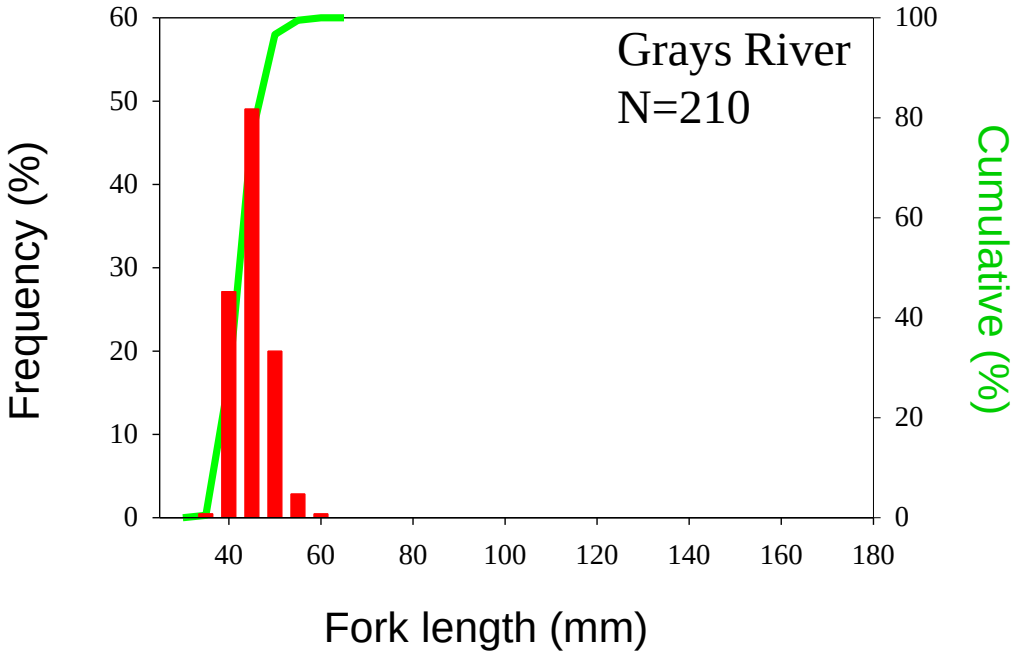
# Chum migration Grays Bay 2008

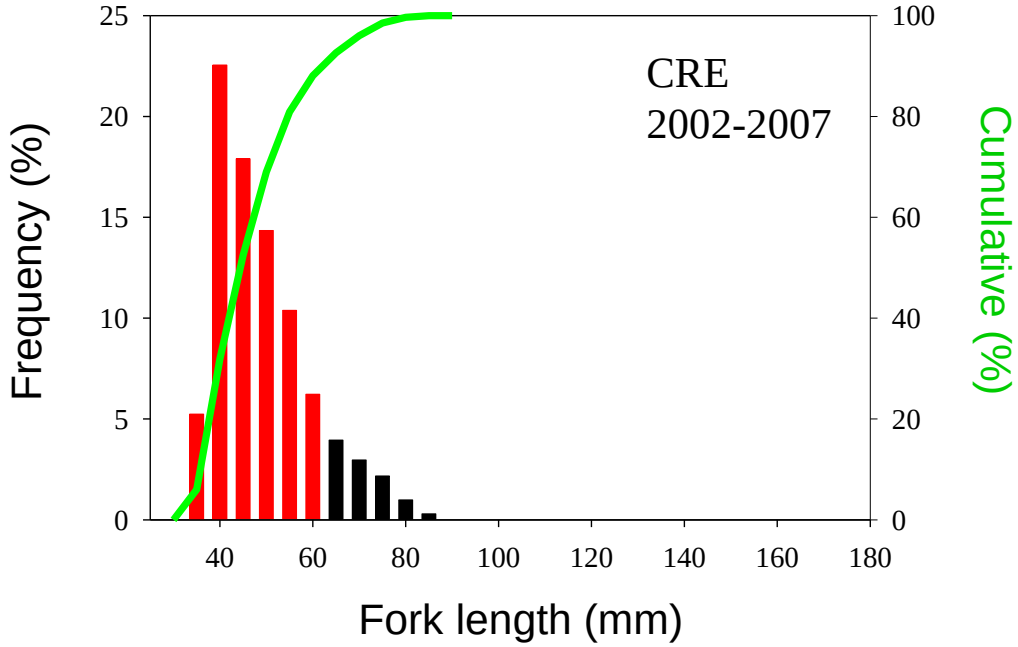


# Chum distribution 2008



# Size frequency comparison

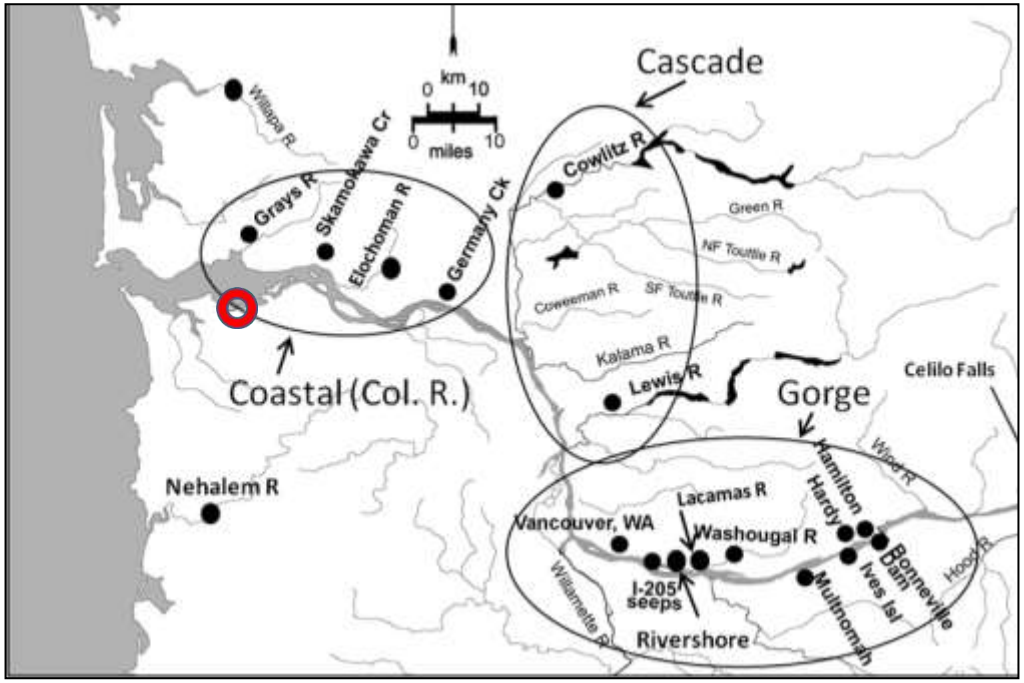


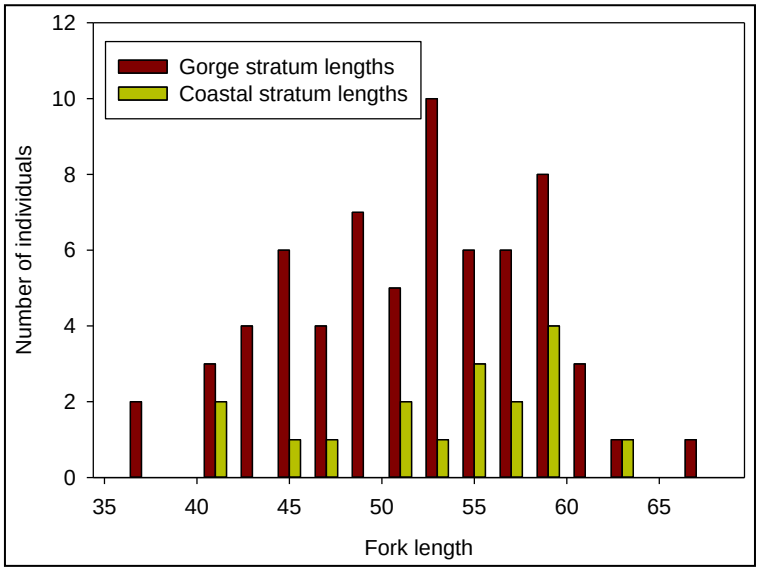
# Tagged chum release study

Location of chum fry 2 days after release

# Genetic assignment of non-tagged chum




| Stratum | # |
|---|---|
| Gorge | 66 |
| Cascade | 0 |
| Coastal | 16 |
| Pacific Coast | 1 |
| Unassigned | 6 |

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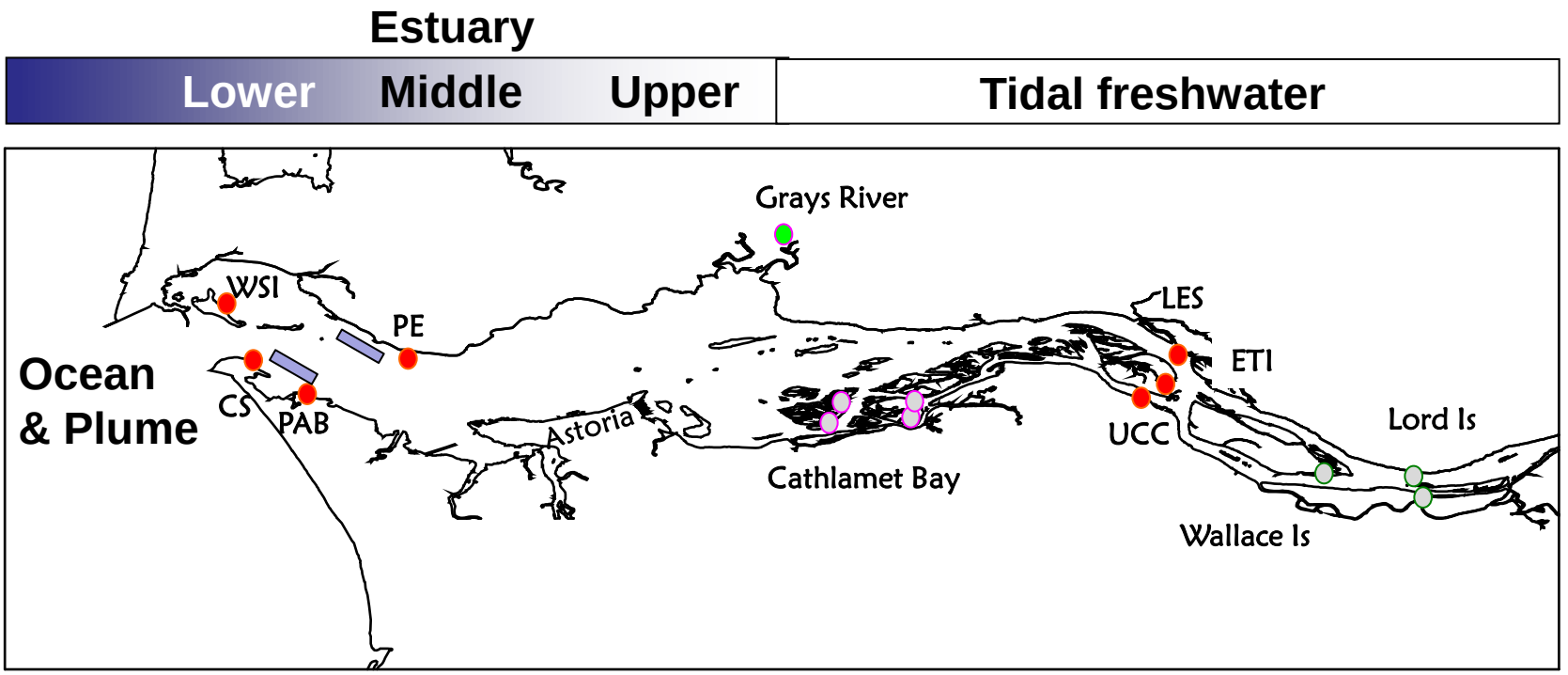
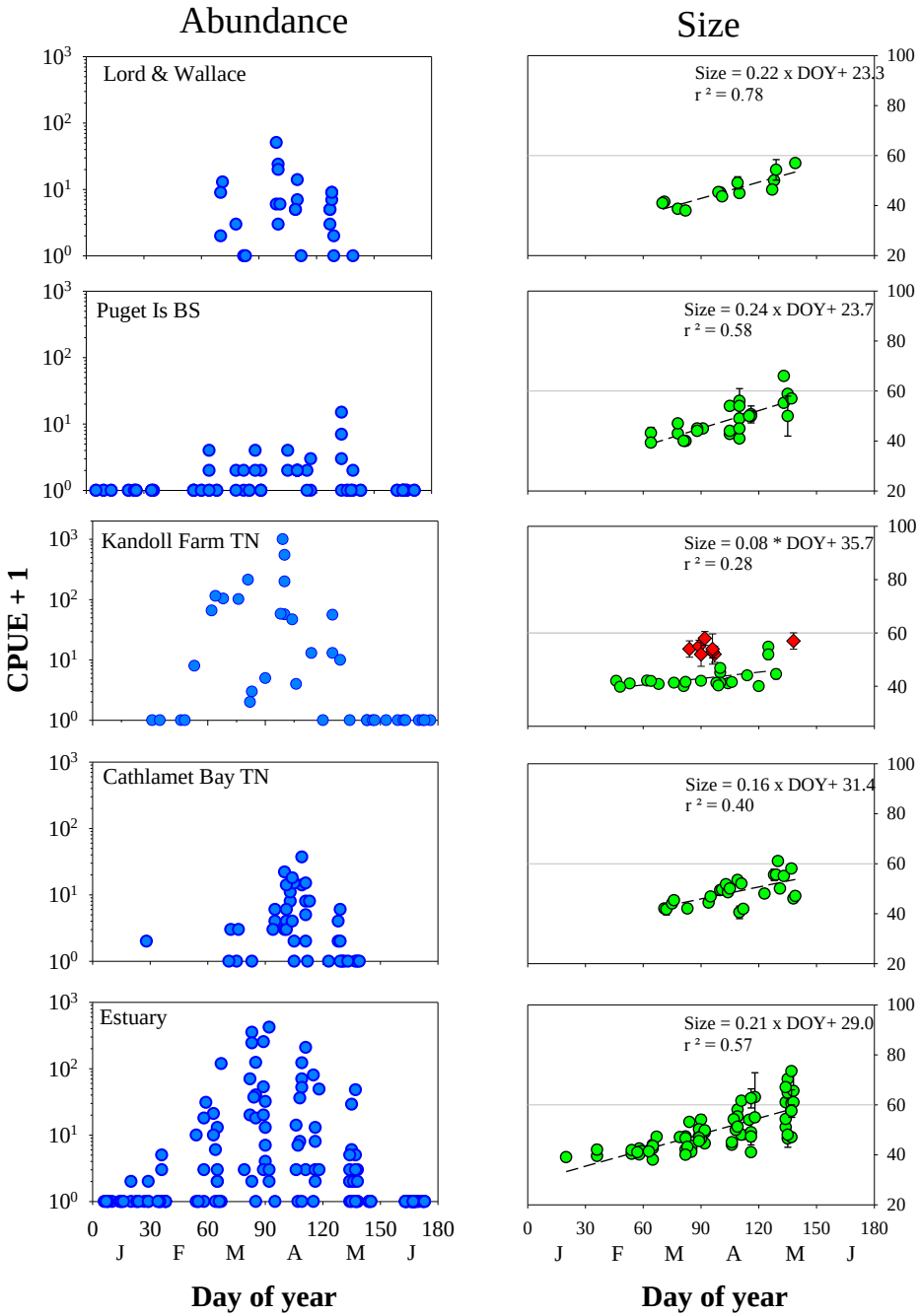
# LCRE sampling sites

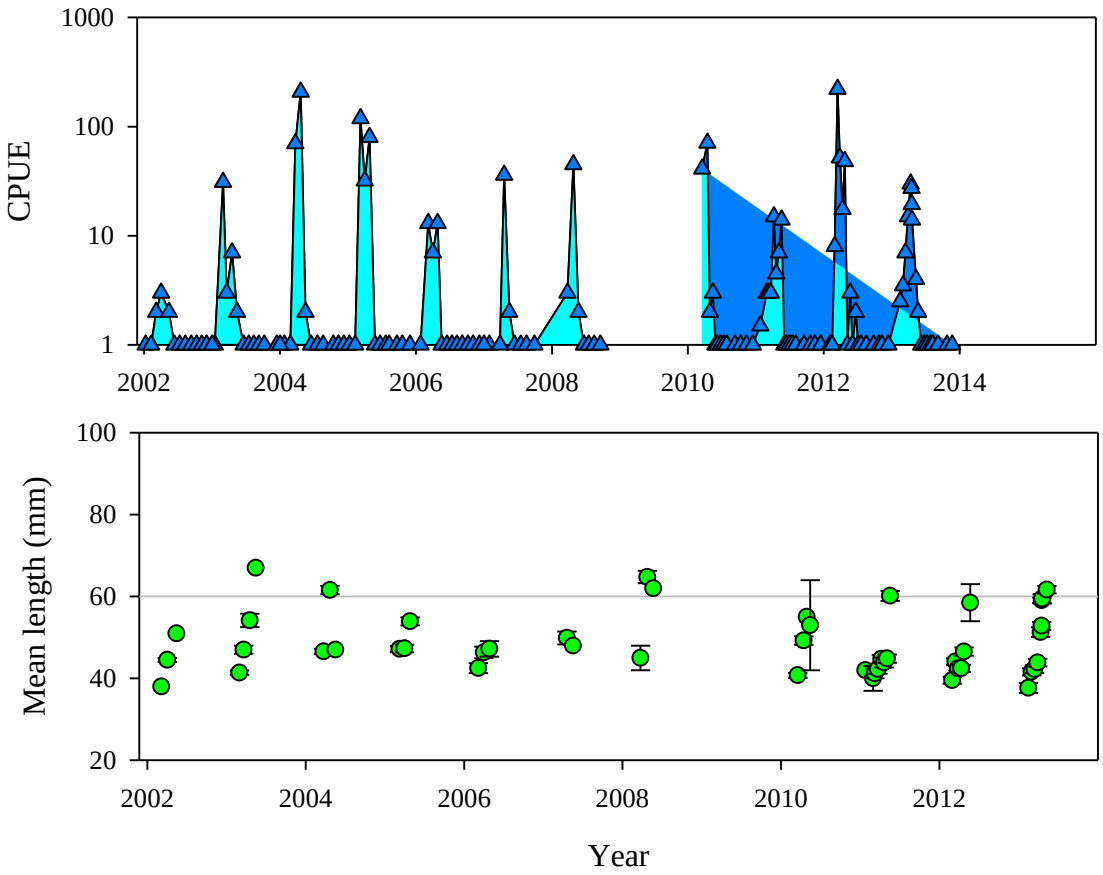


# Abundance and size in reaches A-C




- Consistent end to the migration, but earliest abundance in the estuary
- Highest abundance in estuary & Grays Bay, < 100 fish /haul elsewhere
- Positive size x time slopes at all stations except GB. Growth
- Largest size and highest size range in estuary. Accumulation?

# PAB time series



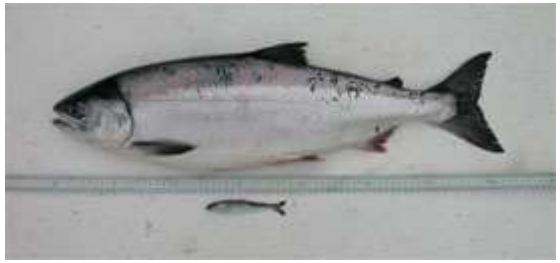

- Interannual variation in both abundance and maximum size

## Summary

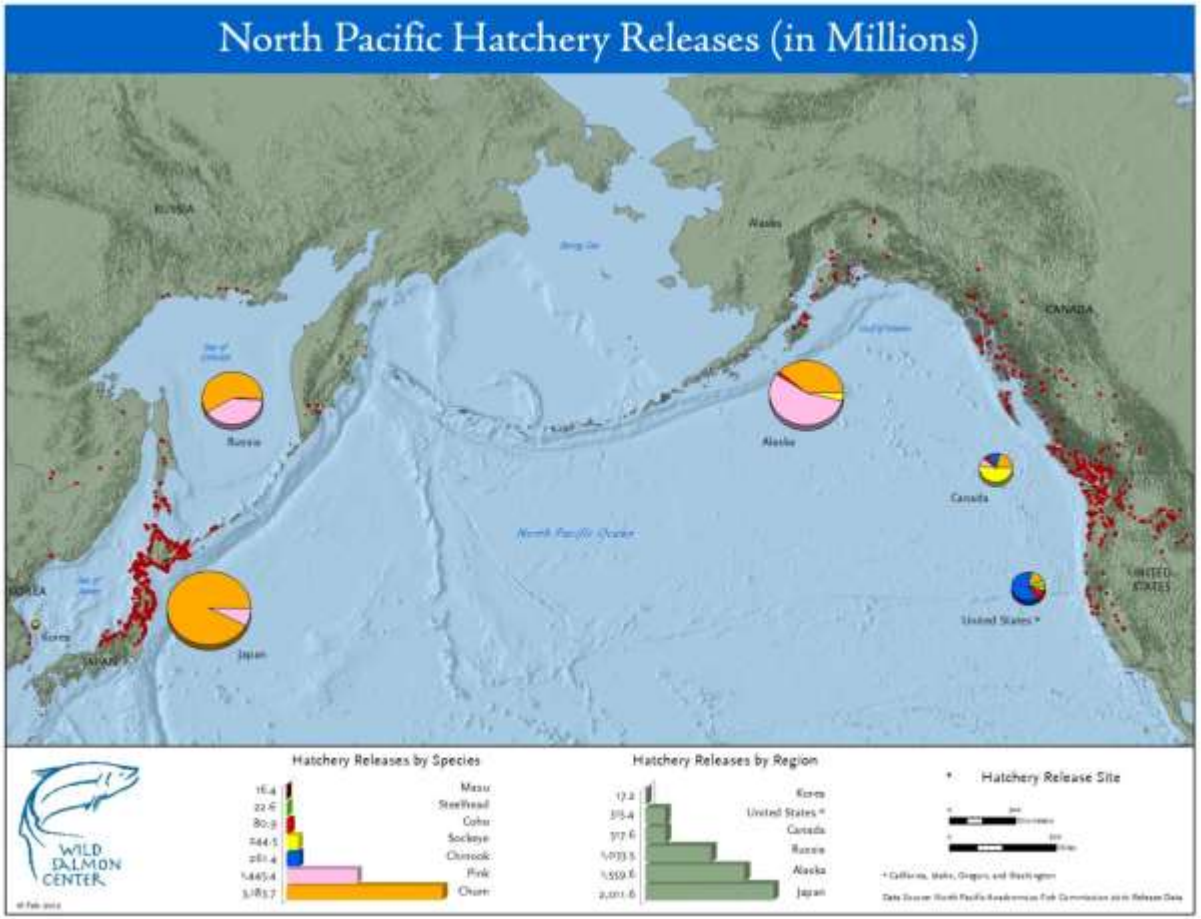
- Juvenile chum salmon are mostly fry migrants
- They peak in April – May and are gone by June
- Concentrated in shallow water
- Higher numbers in the estuary than tidal freshwater zones
- …and on the Washington side
- Migration from natal streams can be rapid
- ...but larger chum found the estuary, indicating residency and growth. Osmotic issue?
- Chum genetics indicates upstream strata represented in Cathlamet Bay

## Restoration recommendations

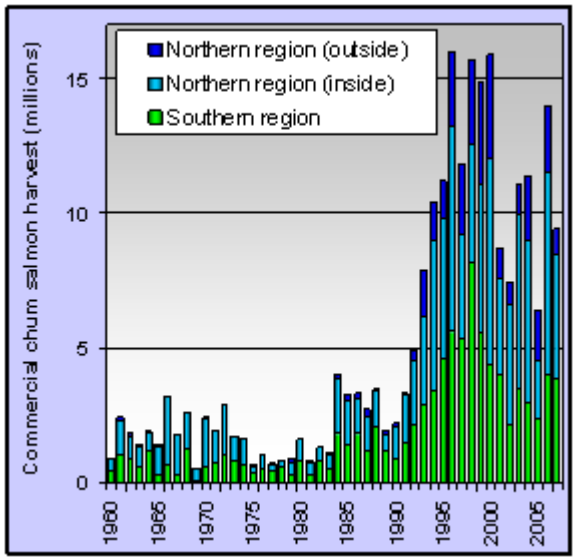
- Maintain shallow water habitat tgo aid outmigration
- RESTORE SPAWNING HABITAT!
- Especially in historically important areas like Youngs Bay



# What is the rest of the chum world doing?




www.stateofthesalmon.org




http://www.afsc.noaa.gov/ABL/MSI/msi_me_csrd.htm

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**Regular Price: $210.00**

**Special Price: $175.00/kg**

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