

NITINAT RIVER HATCHERY



‘Semi-natural’ or Conservation Enhancement Techniques

Nitinat River Hatchery
Coho 2002-2004 Brood Trials

Coho Brood 2002-2004

- Compare traditional +20 g smolt vs a 10 g smolt
- Goal: to produce the most cost effective '**quality**' hatchery smolt (Semi-natural vs Conventional)
- Followed the wild salmon template, monitoring various characteristics.

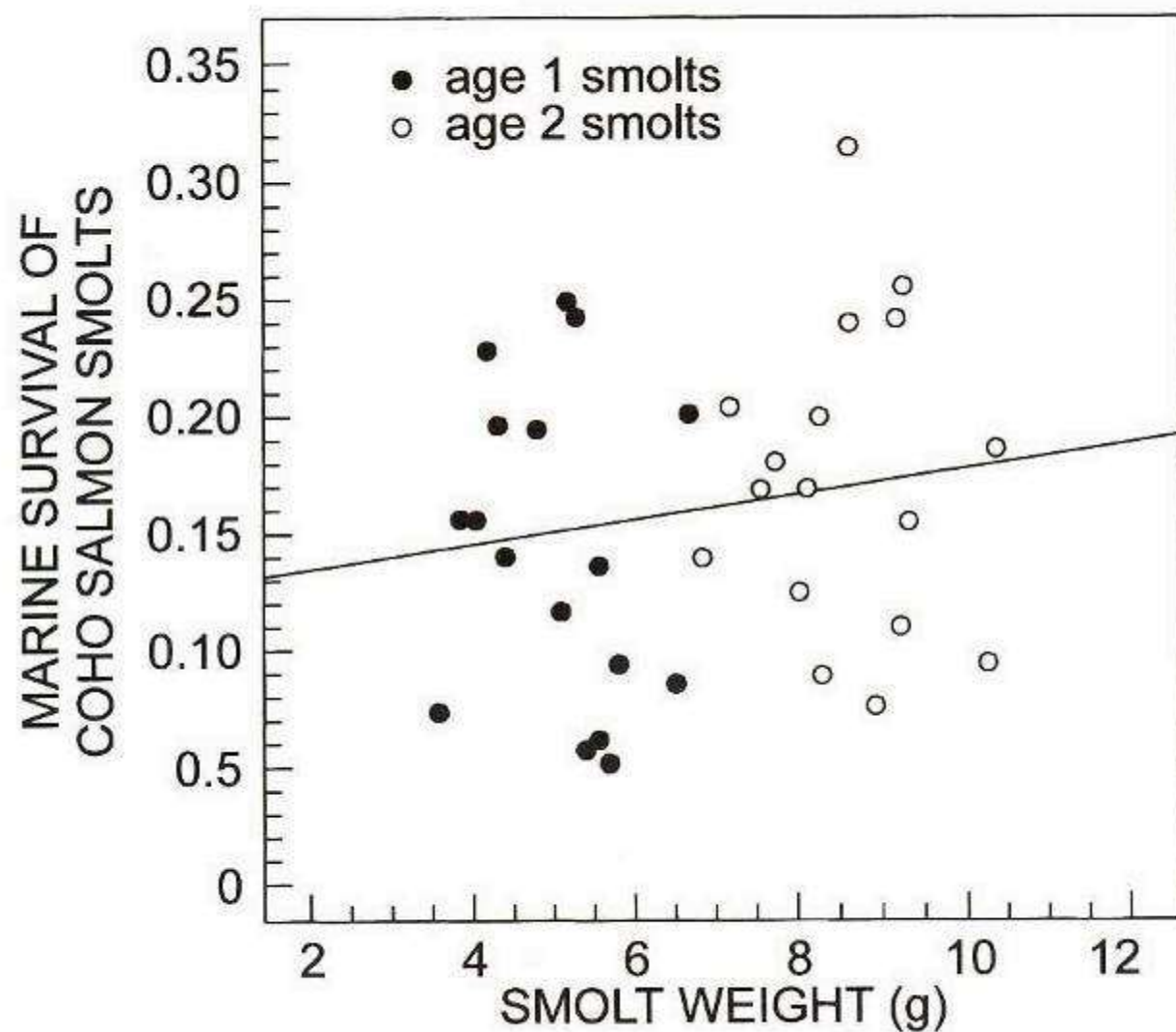


FIGURE 19.7 Marine survival vs. size and freshwater age of coho salmon smolts from Carnation Creek. (Figure adapted from one provided by L. B. Holtby, Fisheries and Oceans Canada.)

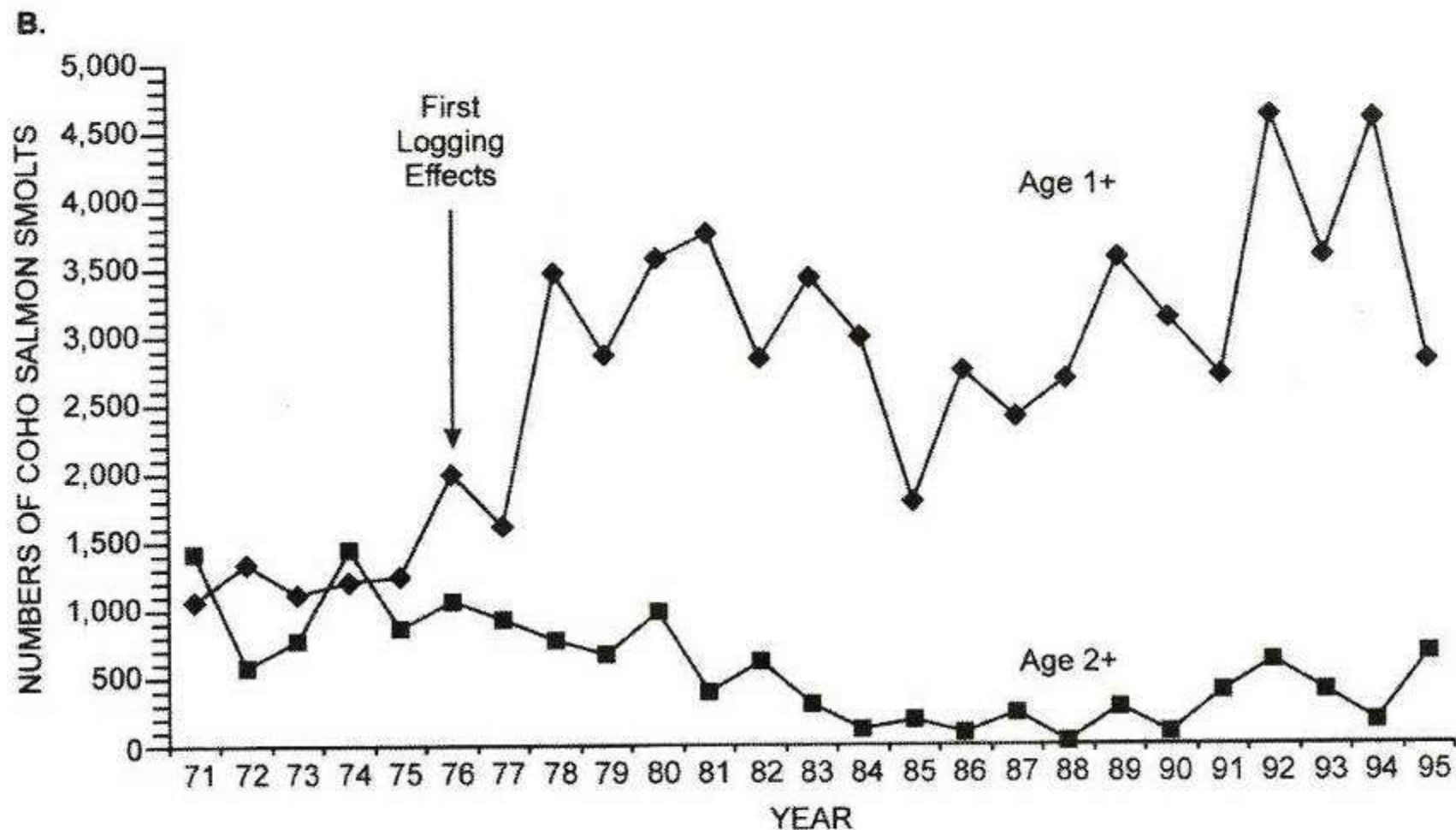


FIGURE 19.5 Total numbers of coho smolts (A) and numbers of age-1 and age-2 smolts (B) migrating seaward from Carnation Creek each spring between 1971 and 1995. Since 1982, >91% of coho smolts have been age-1 fish.

Quality Smolt Measurement

**Traditionally, quality measured by size and release time.*

Quality should be measured by looking at additional characteristics:

- **Morphological** - ***forms*** of an organism – size & shape
- **Physiological** - ***functions*** of organism - health & smolting systems
- **Behavioral** - condition smolts before release may help avoid predation and improve hunting skills, improve migratory behavior
- **Genetic** - Phenotype characteristics (**survival, growth, migration, reproduction**) are determined by:
 - Genotype and Environment (physical territory, chemical, biological)

Smaller Smolts

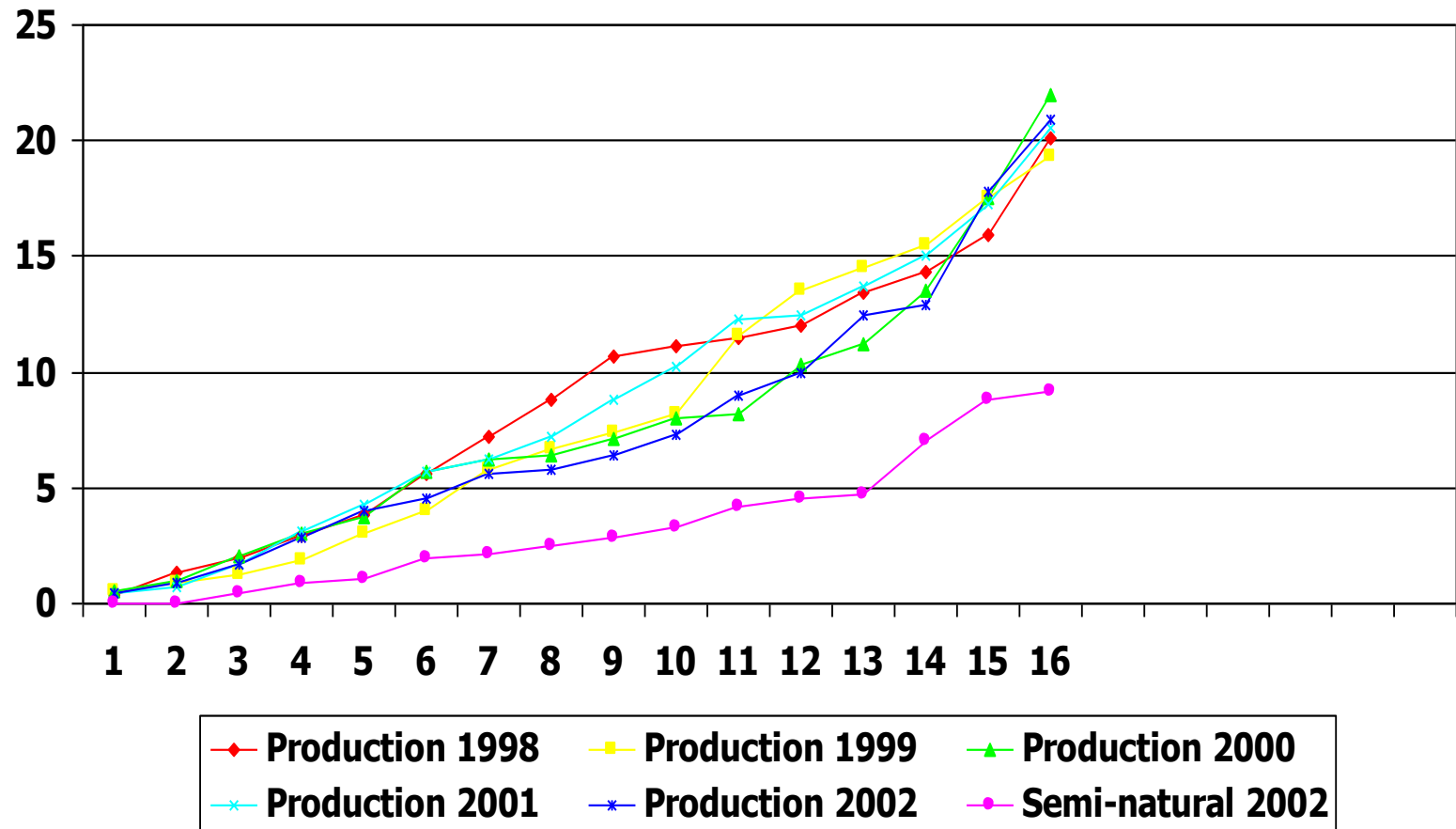
Smaller but well smolted smolts could have:

- Increase stamina and quicker migration
- Less competition with wild smolts in river and estuary
- Better early marine survival

Also, smaller smolts should have:

- Better in-hatchery survivals
- Less returns as jacks
- Lower feed cost
- Lower water pumping cost

Nitinat Coho Smolt Growth



Traditional Rearing

- Pond density 14 kg/m³
- 20g smolt @ release
- Unmodified incubation & rearing environment
- No conditioning at release



Semi-natural Rearing

- Incubation chillers 3.5C
 - Bulk box incubate in plastic substrate
 - Pond densities 6kg/m³
 - Environmental enrichment
 - 10 g @ release (volitional)
 - Live feed added to diet (bug light & krill)
 - Predator conditioning





Steelhead smolt –
predator trainer

Krill (prey
introduction/experience)



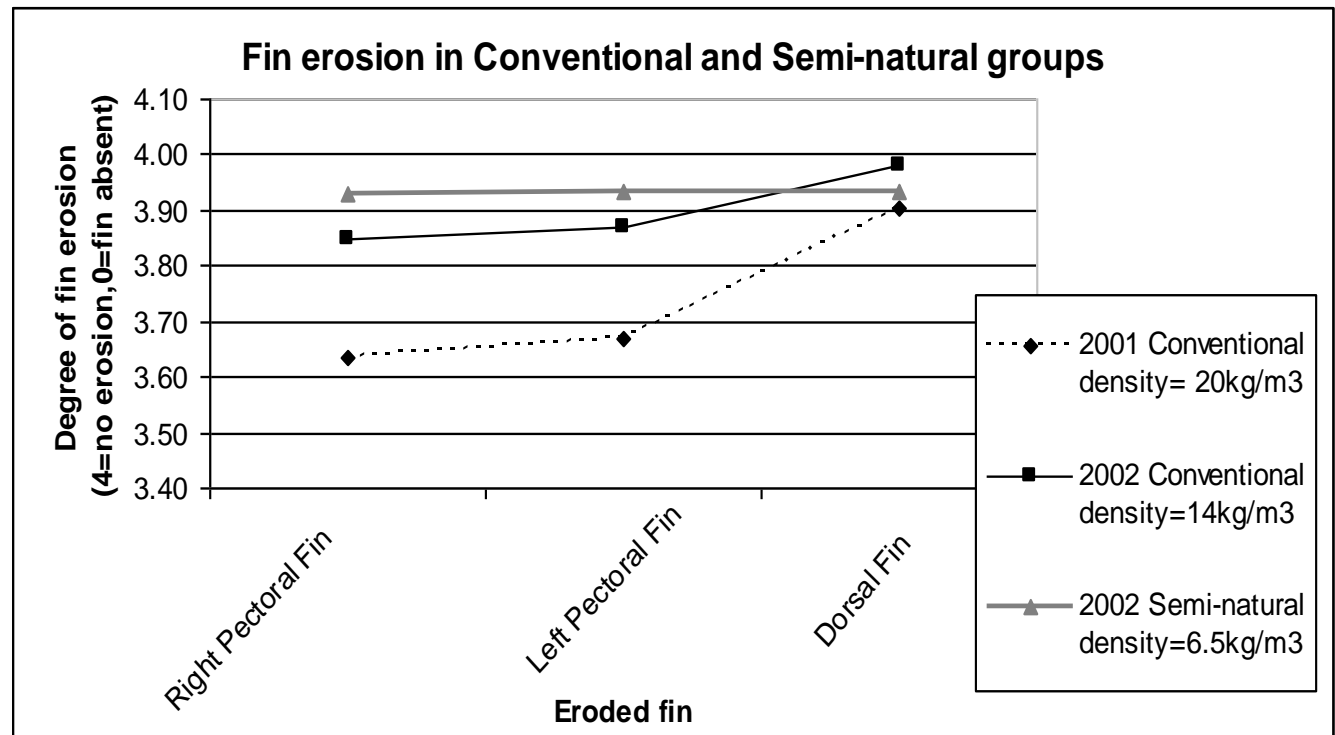
Experimental Expectations

The Semi-natural group would see:

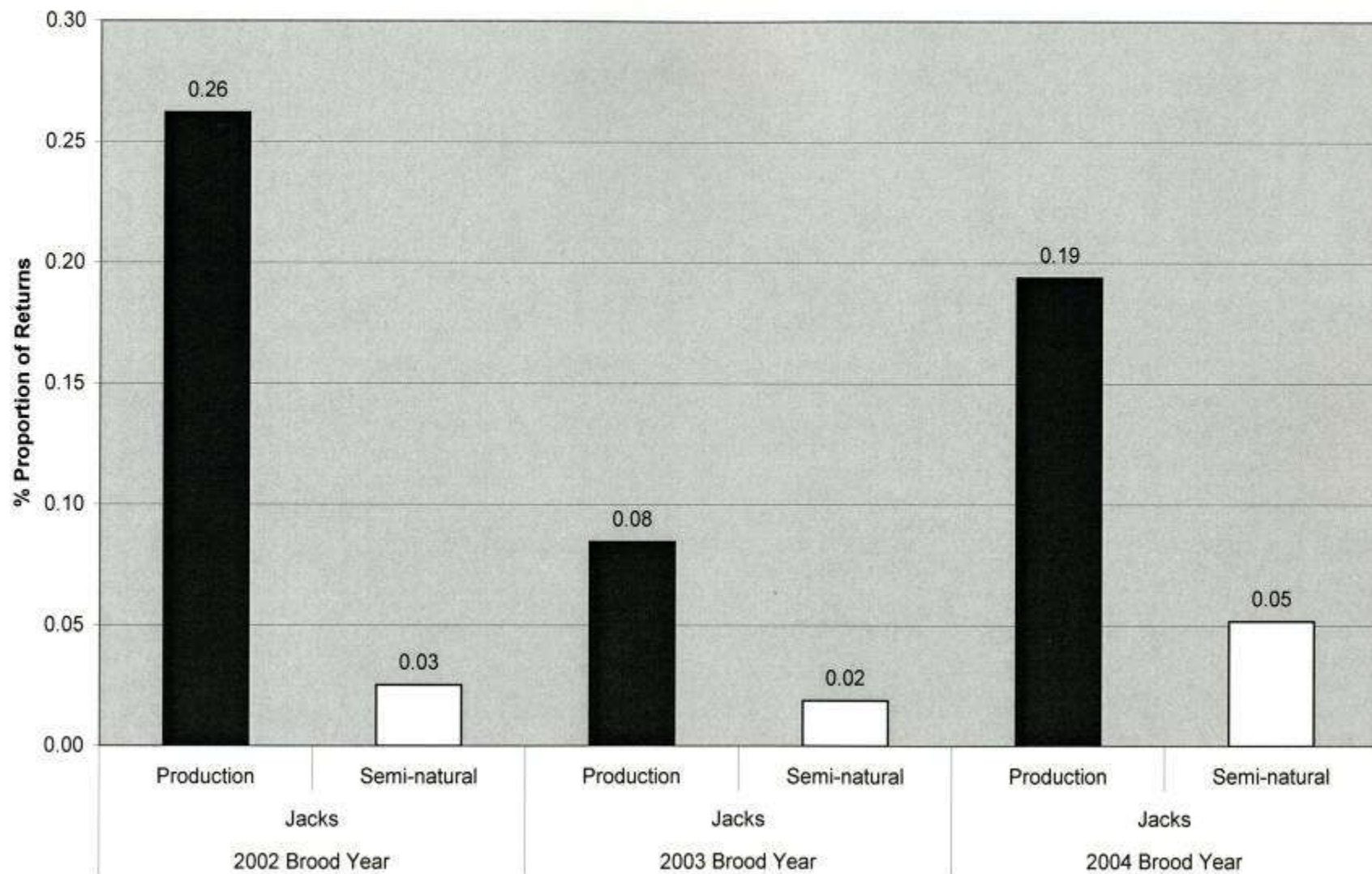
- 1) Less fin erosion in fry
- 2) Fewer jacks returning
- 3) Similar or higher adult return
- 4) Larger adults, similar to the wild population
- 5) Better benefit:cost

Results

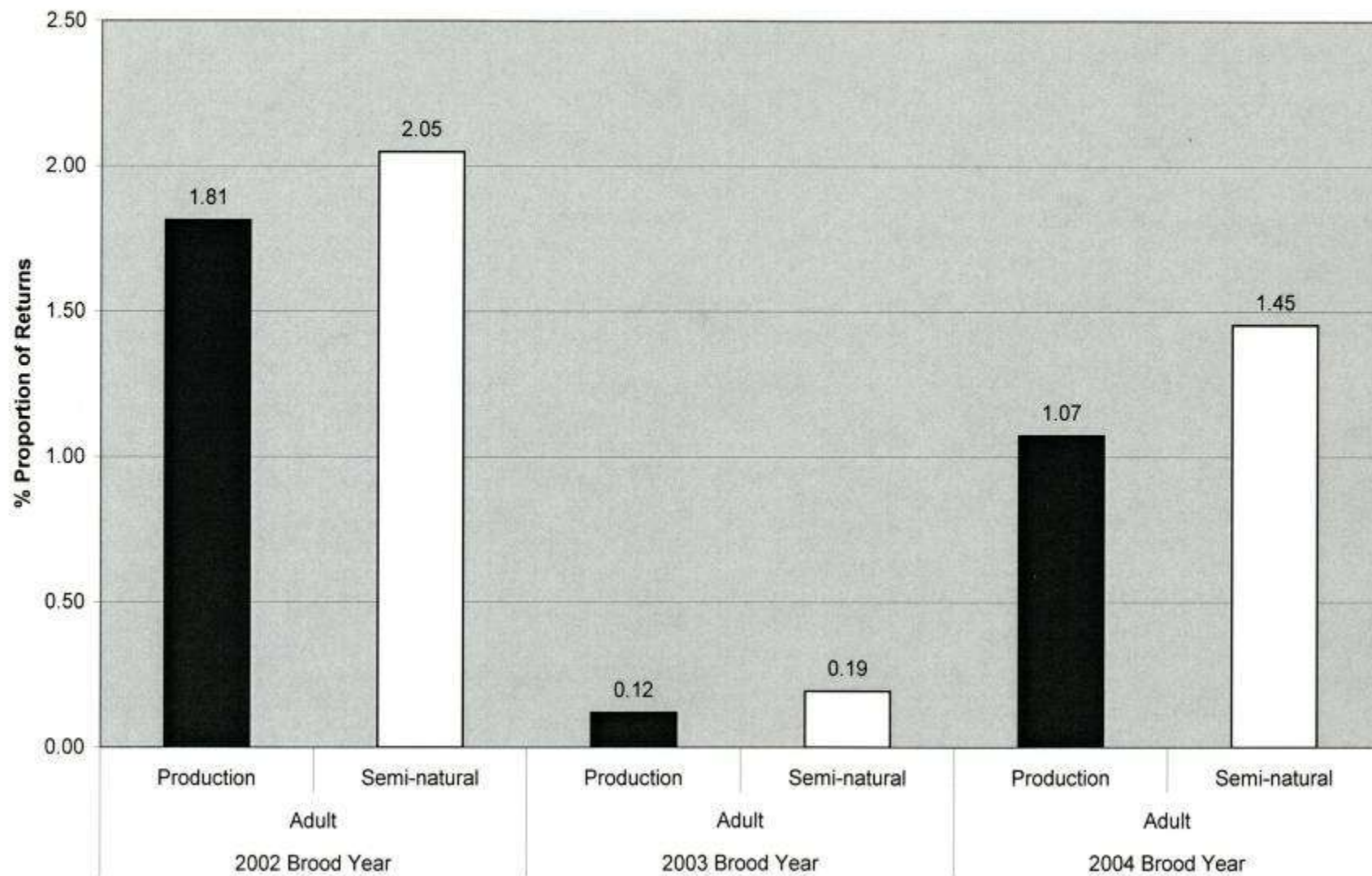
Fin Erosion:



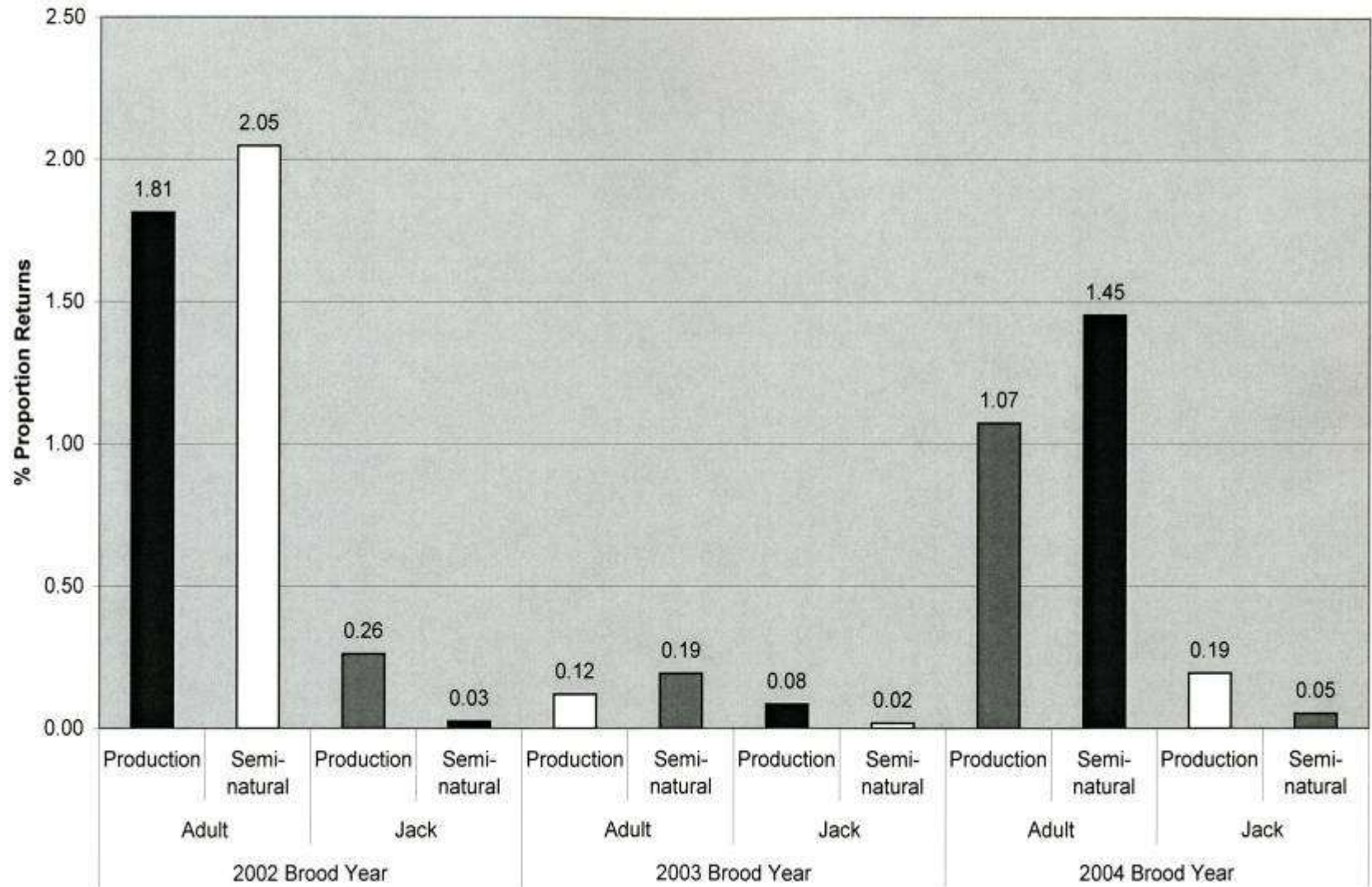
% Proportion of Coho Returns for 2002, 2003, 2004 Brood Year (Jacks Only)



% Proportion of Coho Returns for 2002, 2003, 2004 Brood Years (Adults Only)

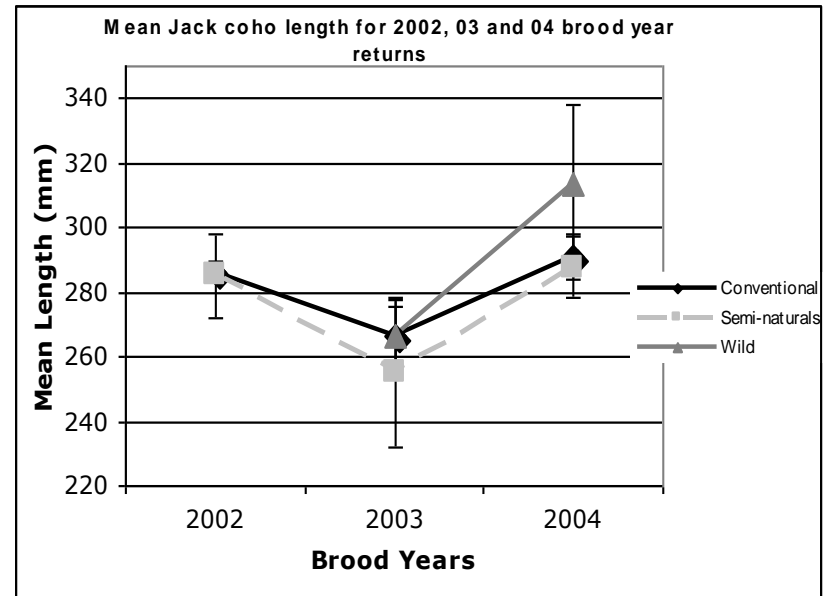
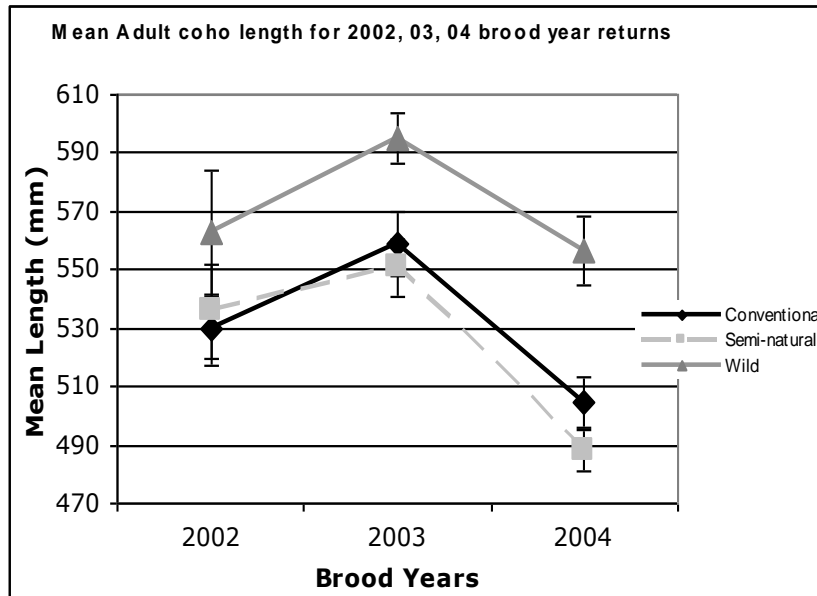


% Proportion of Coho Returns for 2002, 2003, 2004 Brood Years



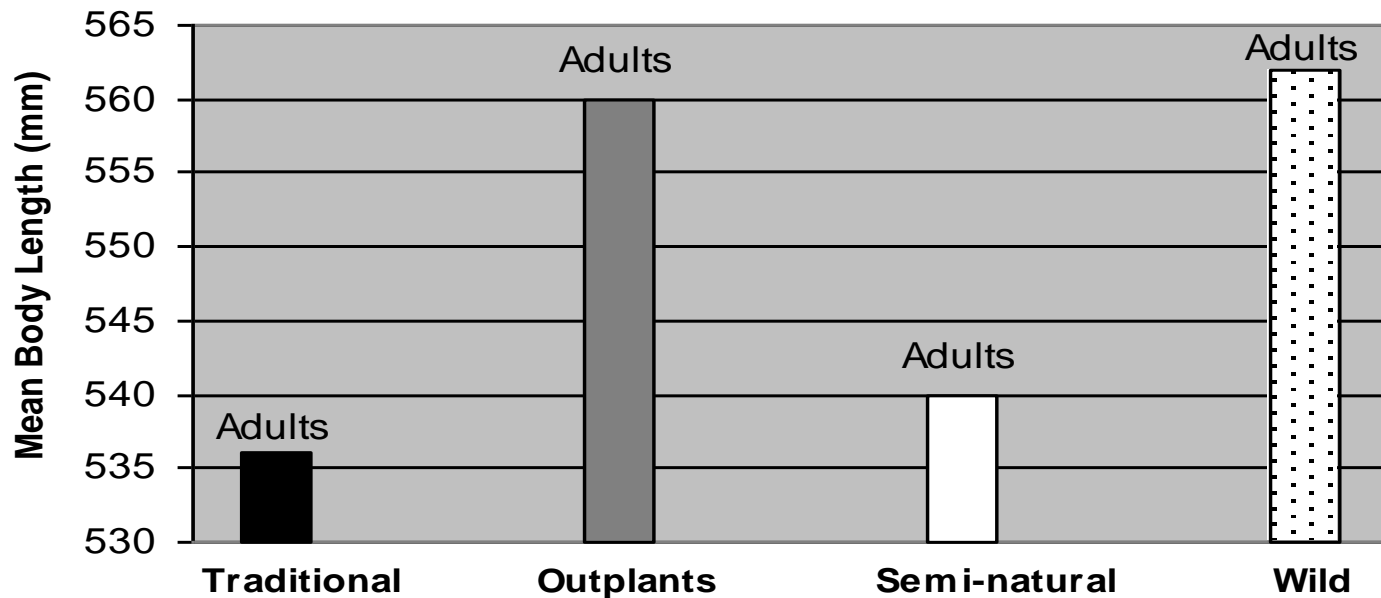
Results

Length of returning adults:



Lengths of adults are different

The Mean Body Length of Adult Coho Sampled From Nitinat Lake, River and Hatchery Swim-ins



Experimental Results

The Semi-natural group results:

- 1) Less fin erosion in fry ✓
- 2) Fewer jacks returning ✓
- 3) Similar or higher adult return ✓
- 4) Larger adults, similar to wild population ✗
- 5) 2 times better benefit:cost ✓

Coho Conservation Hatchery

Practical Methods

- Delay egg/alevin development and ponding date 6-8 weeks, fry experience a natural photoperiod
- Lower rearing densities, optimize water quality
- Yearlings need minimal growth in winter, maximize growth 4-6 weeks before release
- Condition smolts prior to release: exercise, natural prey and predator exposure
- Monitor the natural population & environments to ensure optimal 'wild' or natural production

+20 pound Wild Coho

