

Brightwater

T R E A T M E N T S Y S T E M



ACOE Workshop : July 22, 2003
Biological Studies



Initial literature review



- ⌘ Was aquatic vegetation data available?
- ⌘ Was distribution data available for threatened and endangered species?
- ⌘ Was forage fish spawning area data available?

Biological Studies



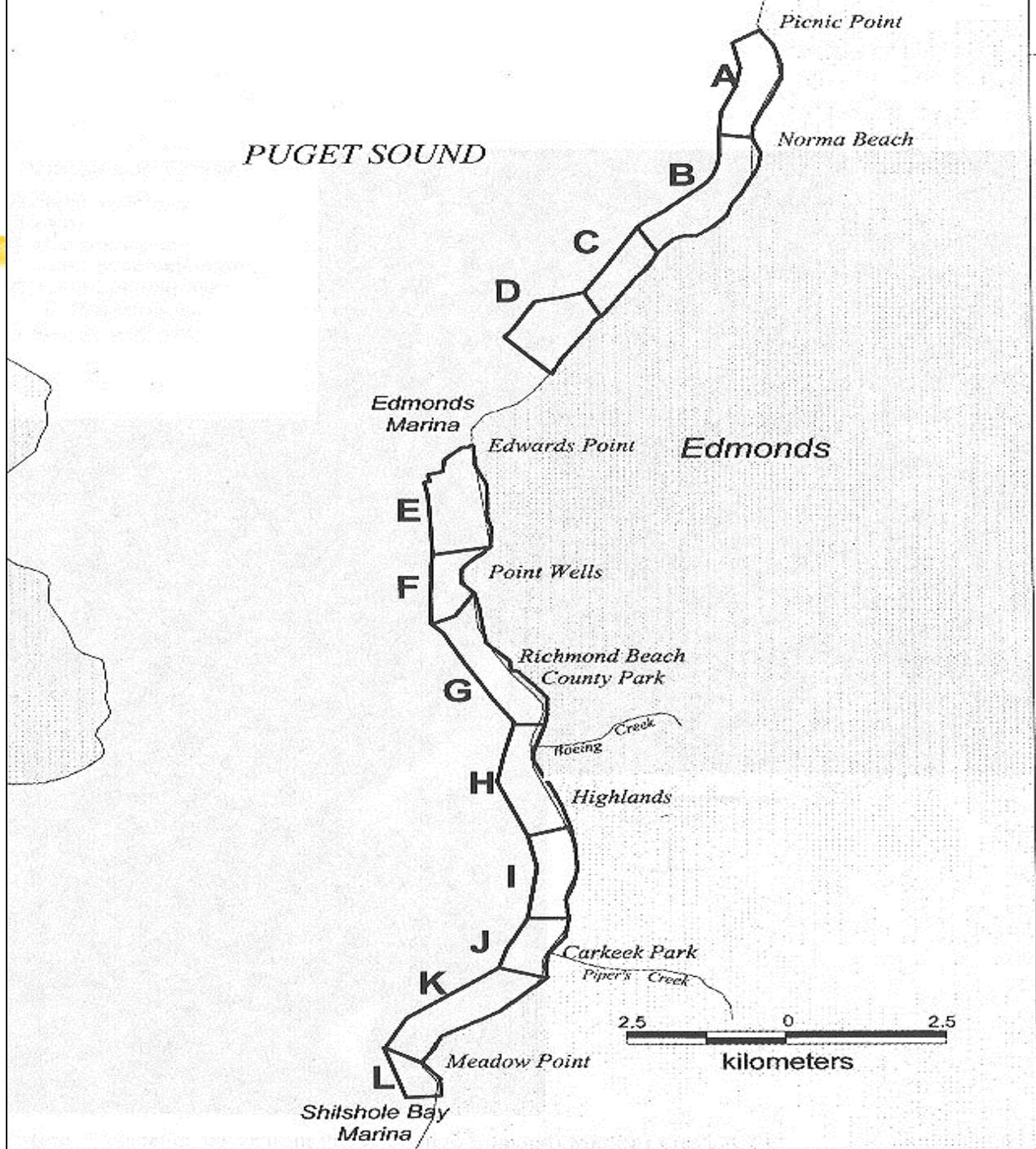
- ⌘ Eelgrass survey
- ⌘ Forage fish spawning surveys
- ⌘ Geoduck distribution & abundance survey
- ⌘ Nearshore beach seining surveys
- ⌘ Benthic infauna at selected locations
- ⌘ Geoduck tissue chemistry & bacterial study

Eelgrass survey



- ⌘ Conducted in fall 1999
- ⌘ Used side scan sonar and underwater videography
- ⌘ 28 kilometers of shoreline surveyed from Shilshole to Picnic Point
- ⌘ Depths surveyed ranged between +1 to -30 meters MLLW

Eelgrass survey area

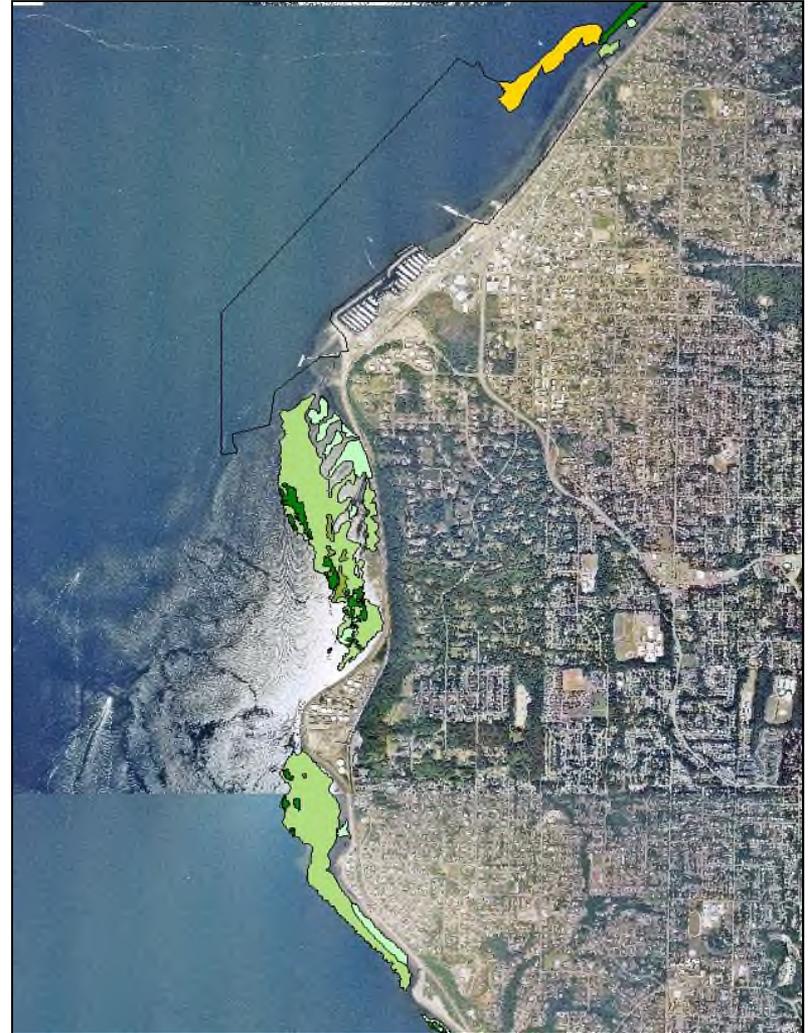
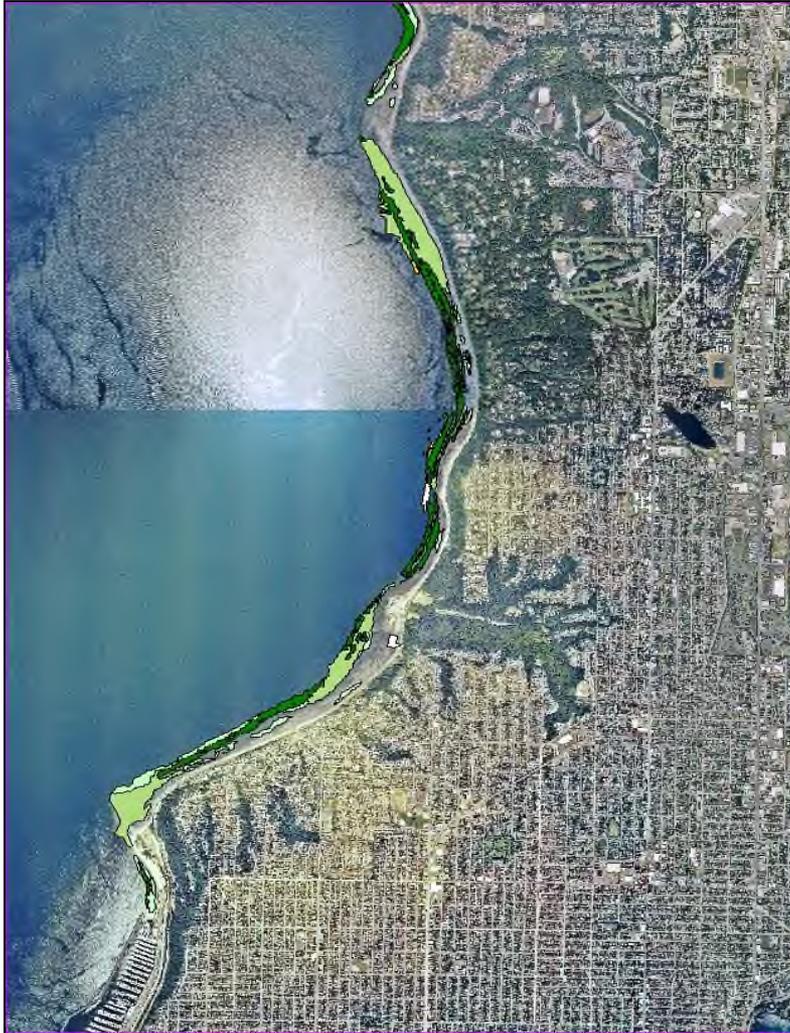


Information collected



- ⌘ Submerged aquatic vegetation (SAV) type
- ⌘ SAV density estimates
- ⌘ Fish & macroinvertebrate presence
- ⌘ Substrate type

Overall SAV patterns



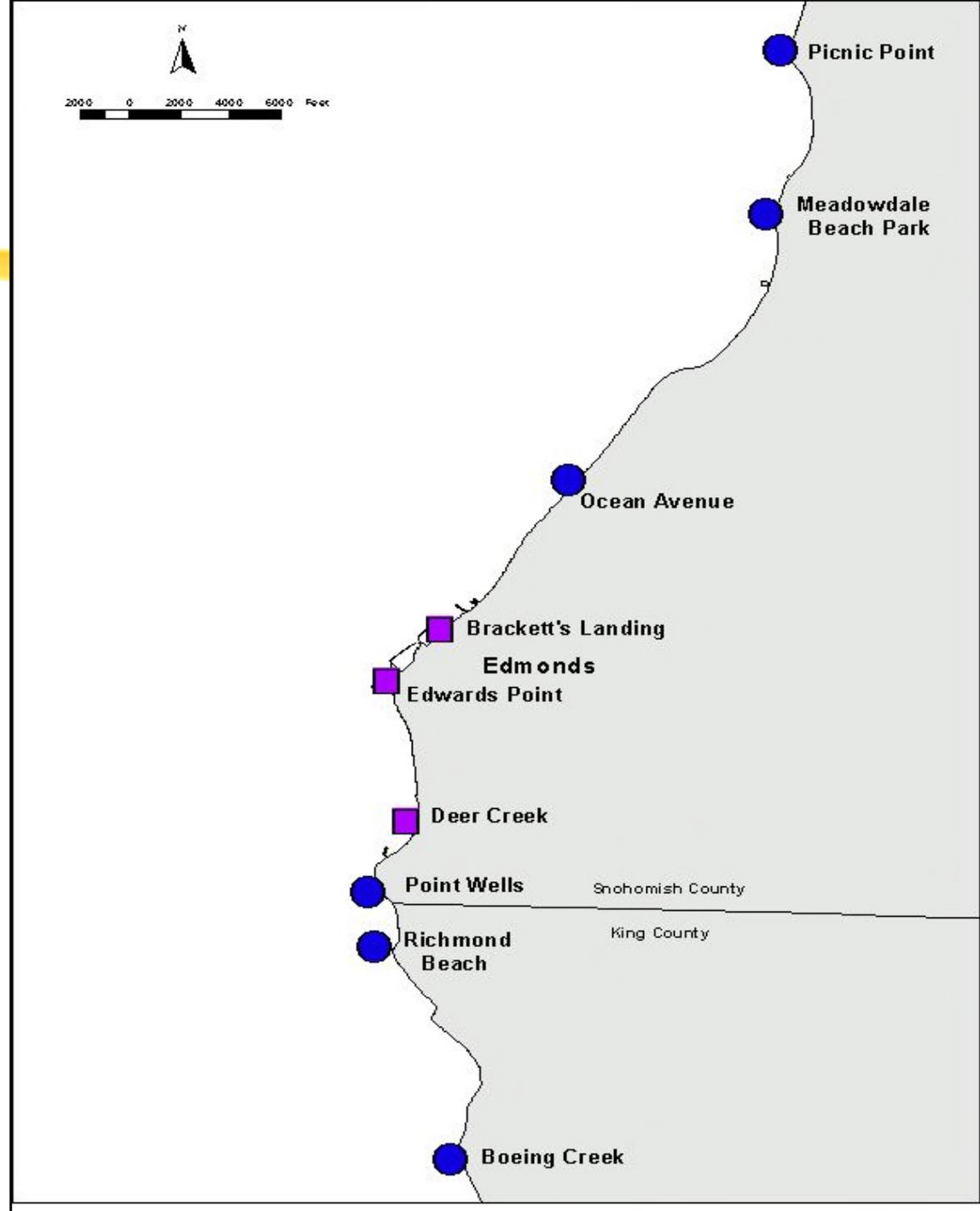
Forage fish spawning area surveys



- ⌘ Surf smelt & sand lance
- ⌘ Conducted November 2000 - February 2001 at 6 sites
- ⌘ Conducted November 2001 - February 2002 at 3 sites
- ⌘ WDFW protocols followed

Forage fish

sampling sites



Forage fish egg sampling



Sand lance eggs



Forage fish survey results

Site	Date Sampled	Documented Spawning Habitat (minimum of two eggs)	
		Sand Lance	Surf Smelt
Picnic Point	Nov. '00 - Feb. '01	●	●
Meadowdale Beach Park	Nov. '00 - Feb. '01		
Ocean Avenue	Nov. '00 - Feb. '01	●	
Brackett's Landing	Nov. '01 - Feb. '02	●	
Edwards Point	Nov. '01 - Feb. '02		●
Deer Creek	Nov. '01 - Feb. '02	●	●
Point Wells	Nov. '00 - Feb. '01	●	●
Richmond Beach County Park	Nov. '00 - Feb. '01		
Boeing Creek	Nov. '00 - Feb. '01		

Geoduck distribution survey

- ⌘ WDFW guidelines
- ⌘ April 8-May 10, 2002
- ⌘ 11.3 Km shoreline surveyed from 1.2 to 21.3 m (-4 to -70 ft) MLLW



Geoduck information collected



- ⌘ Distribution & abundance
- ⌘ Biomass
- ⌘ Length
- ⌘ Age (subset)
- ⌘ Distribution of other biota
- ⌘ Photographs for grading assessment
- ⌘ Chemical & bacterial tissue concentrations

Geoduck survey area



Results



- ⌘ Average density 0.84 geoducks/m²
- ⌘ Density increases with depth
- ⌘ Biomass decreases with depth
- ⌘ Average weight 1.1 kg (2.3 lbs)

Nearshore beach seining



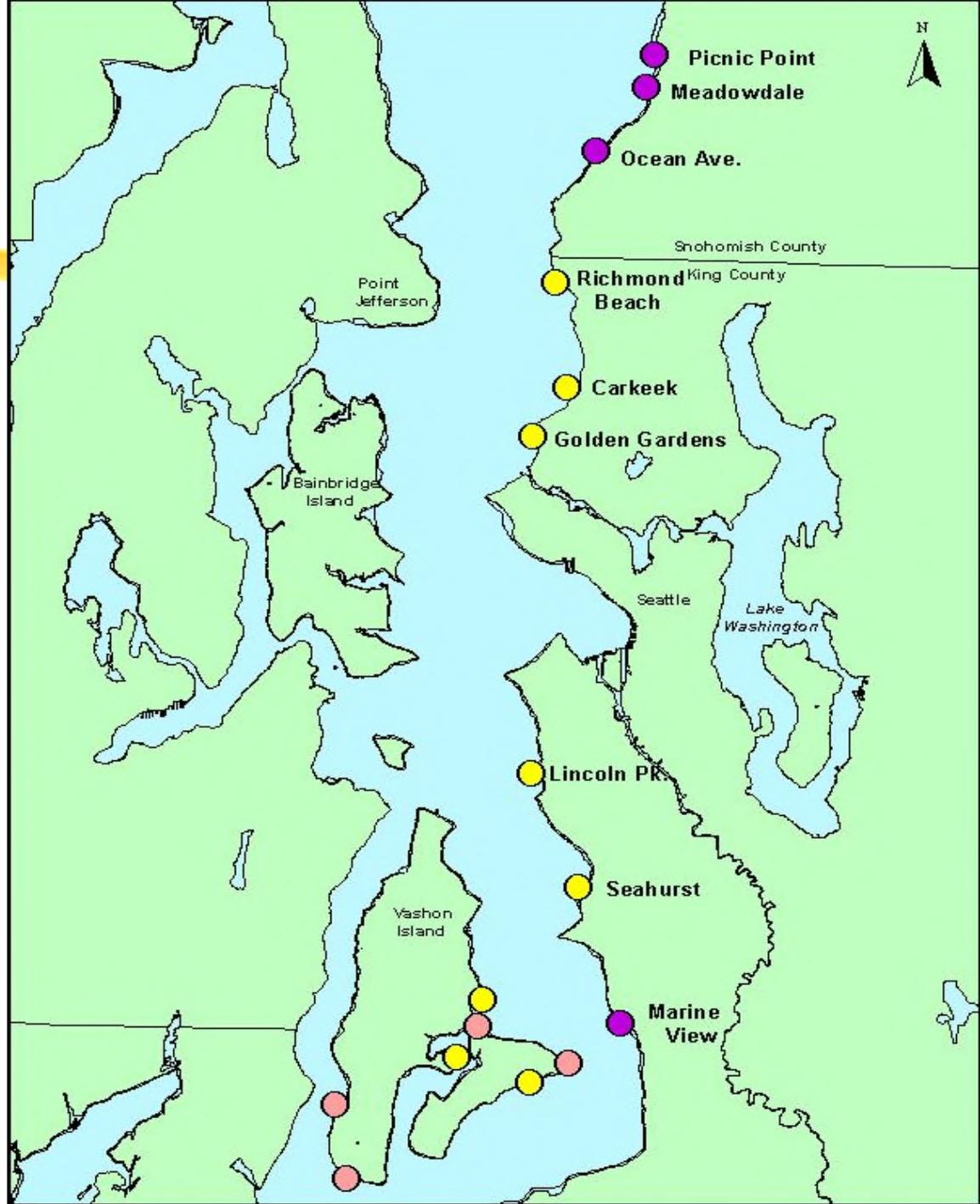
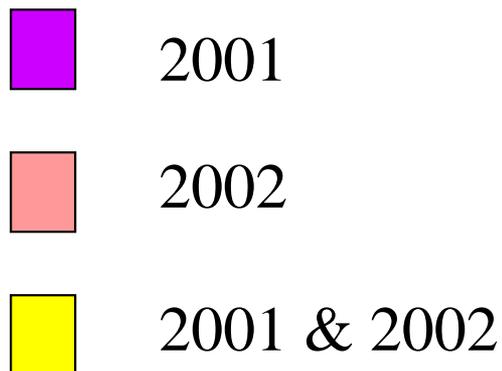
- ⌘ Conducted May- October in 2001 & 2002 at 16 sites (8 overlapping between years)
- ⌘ Primary purpose to determine timing, distribution, & species composition of nearshore marine fishes, particularly juvenile salmonids
- ⌘ Learn more about habitat utilization

Information collected



- ⌘ Species, count, length data for all species
- ⌘ Water temperature, substrate, vegetation
- ⌘ Clipped/unclipped fin for chinook & coho
- ⌘ Coded-wire tag presence for chinook
- ⌘ Sub-sample of chinook, chum, coho collected for dietary analysis

Nearshore beach seining survey sites



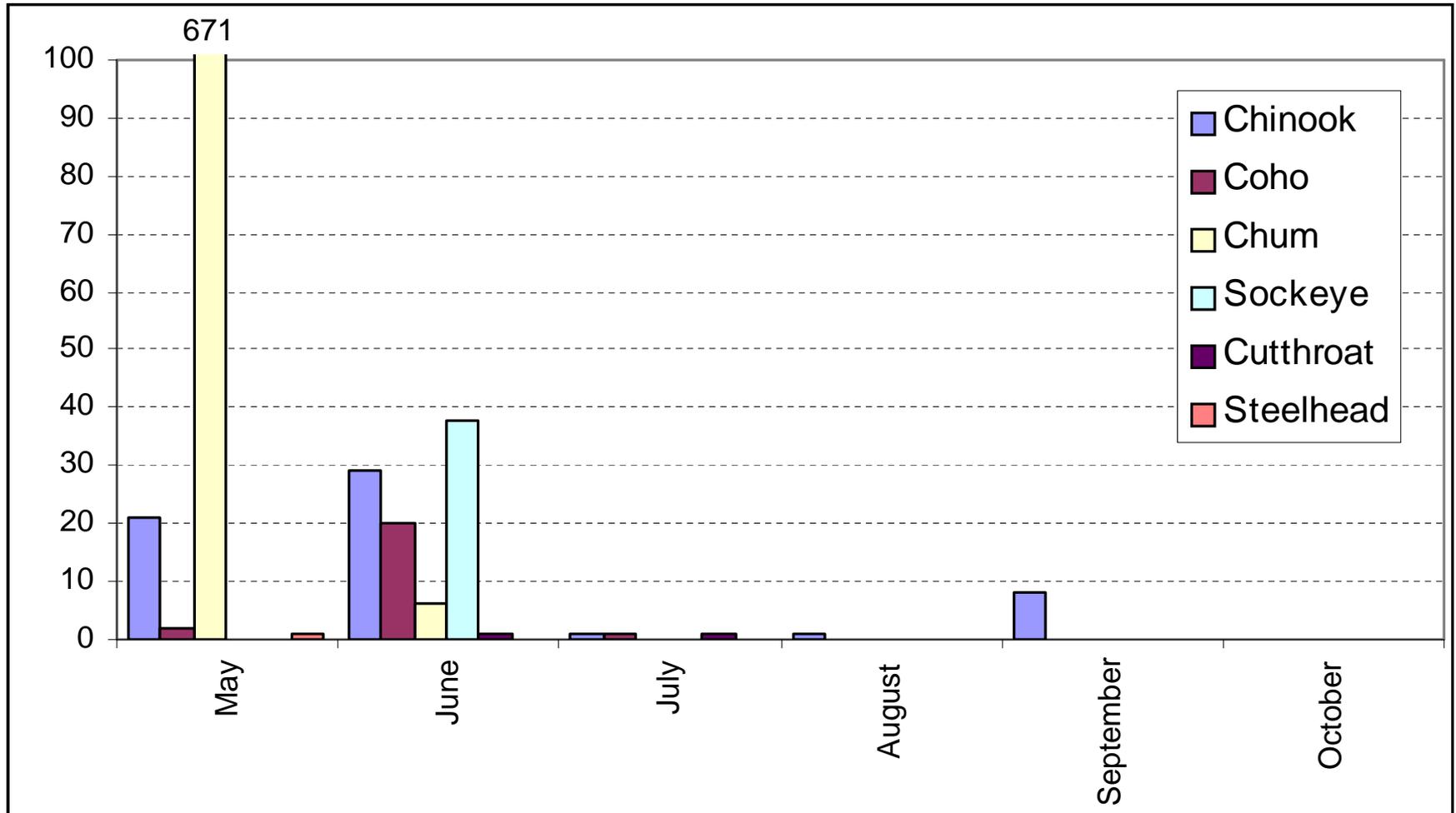
Seining sampling effort

	2001	2002
# of Sets	278	203
# of Sample sites	12	12
# of Fish species	43	42
# of Fish caught	46,097	25,220
# of Salmonids	4,258	3,590

2001 Nearshore beach seining results

	Picnic Point	North Edmonds	Richmond Beach	Total
Perch	2,854	5,309	1,335	9,498
Salmon	164	232	798	1,194
Flatfish	490	542	155	1,187
Sculpin	84	168	52	304
Gunnels	13	161	12	186
Tubefish	5	16	57	78
Forage fish	1	47	8	56
Others	4	10	3	17

Salmonids at Richmond Beach in 2001



Next Steps



- ⌘ Eelgrass survey in 2003--shoot density
- ⌘ Intertidal biota survey in 2004 once outfall alignment selected

Zone Summary

	Zone 7S	Zone 6
Fish		
juvenile salmonids	chm,cho.chnk,sky,sti,cut	chm, chnk, pink
perch & flatfish	yes	yes
smelt & herring	yes	sand lance only
others	yes	yes
Macroinvertebrates		
typical cast of characters	yes	yes
Marine Mammals		
cetaceans	yes	yes
pinnipeds	yes	yes
Marine Birds		
alcids	yes	yes
gulls	yes	yes
anatids	yes	yes
Vegetation		
eelgrass in zone	moderate to dense	sparse to none
eelgrass along alignment	?	?
kelp	yes, 3 patches	no
other	yes	yes
FF Spawning Habitat	sand lance, smelt	smelt
Commercial/Tribal Fishing	yes	yes
Benthic Infauna	typical	typical