

# What do we know about benthic invertebrates?

A photograph of a white lighthouse with a dark lantern room, situated on a grassy cliff overlooking the ocean. The sky is clear and blue. The lighthouse is the central focus of the image.

Review of Prior Work

Razor Clam Management

Razor Clam Life History

How near shore disposal might affect razor clams?

## *Key Points from previous studies*

- 1) This benthic community is characterized by species who have adapted to a high energy environment, including waves, sediment movement, storms, freshwater, strong tides.
- 2) Distribution of benthic species is inherently patchy and variable.
- 3) The members of this community are highly motile rapid burrowers, quick tube builders or rapid colonizers.
- 4) Some effect to the community is expected following disposal, but this will not necessarily have a long-term negative impact. The time frame of recovery is variable depending on project-specific details such as thickness of material disposed, timing, etc.
- 5) More information is needed about similarities between dredge material to be disposed and the natural sediments in the disposal area.

# Dominant Benthic Invertebrates from Inshore Stations 1974-1996

## Nemertea

Nemertea sp

## Polychaeta

Capitellidae sp

*Chaetozone setosa*

*Chaetozone spinosa*

*Eteone* sp

*Magelona sacculata*

*Nephtys californiensis*

*Prionospio lighti*

*Owenia fusiformis*

*Spio filicornis*

*Spiochaetopterus costarum*

*Spiophanes bombyx*

## Mollusca

*Olivella biplicata* - snail

*Olivella pycna* - snail

*Siliqua patula* - razor clam

*Siliqua* spp.

*Spiromoellaria quadrae* - snail

## Crustacea

*Anisogammarus confervicolus* - amphipod

*Archeomysis grebnitzkii* - amphipod

*Diastylopsis dawsoni* – cumacean

*Diastylopsis* spp. - cumacean

*Diastylopsis tenuis* - cumacean

*Eohaustorius sencillus* - amphipod

*Hippomedon denticulatus* - amphipod

***Siliqua patula* - razor clam**

*Mandibulophoxus uncirostratus* - amphipod

Mytilidae - mussels

*Monoculodes spinipes* - amphipod

*Paraphoxus milleri* - amphipod

*Paraphoxus obtusidens* - amphipod

*Paraphoxus obtusidens major* - amphipod

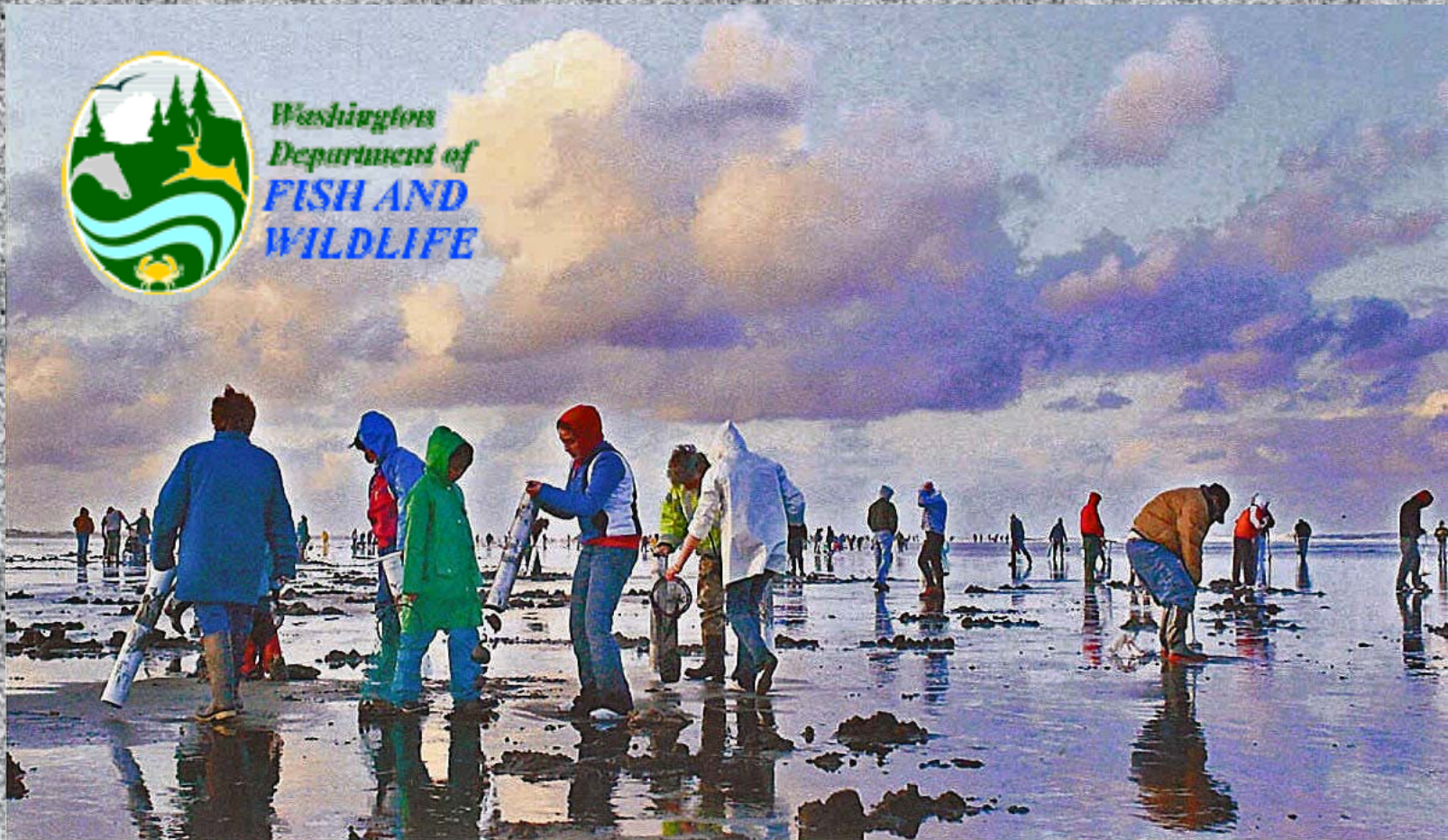
*Photis macinerneyi* - amphipod

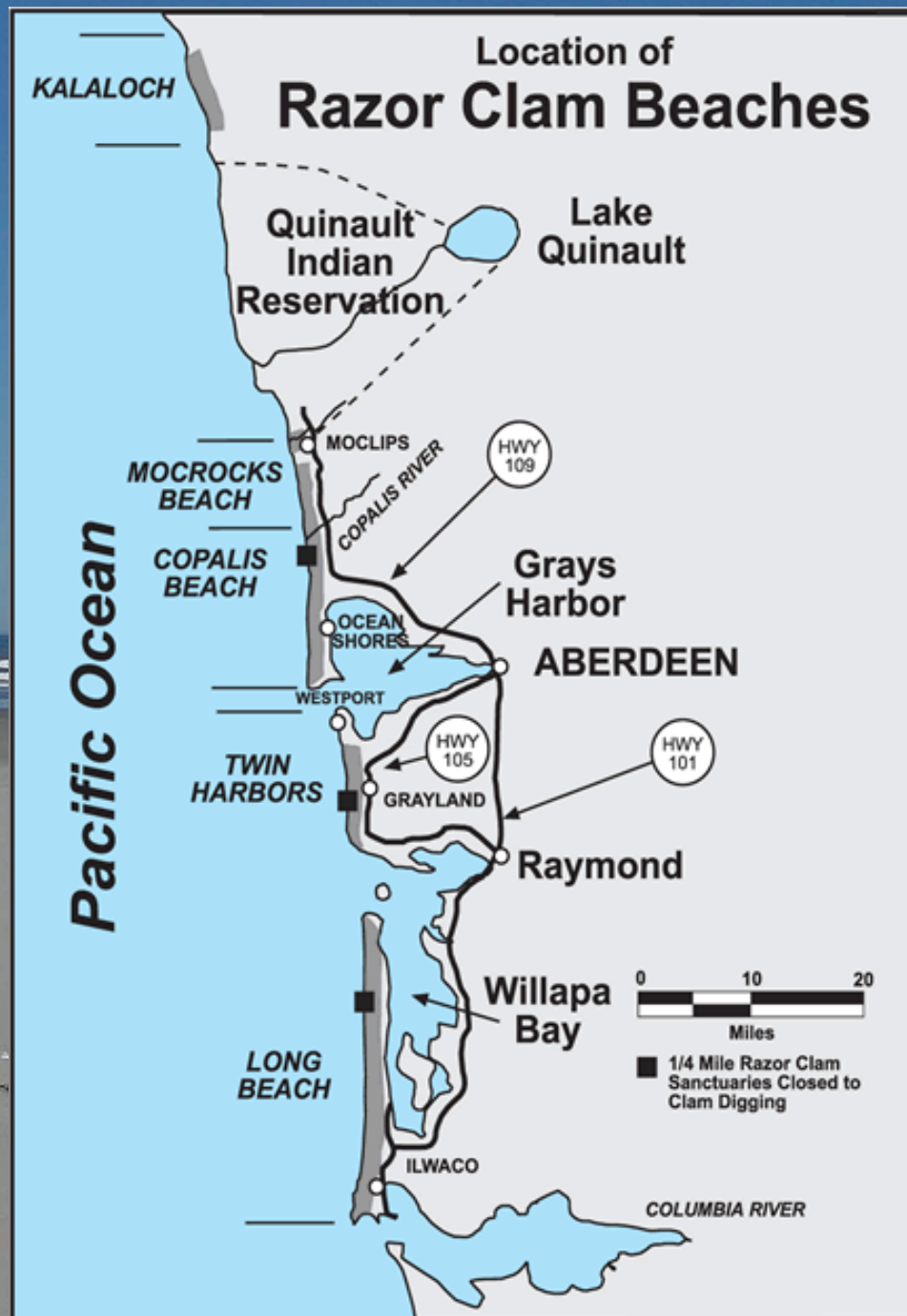
*Rhepoxynius vigitegus* - amphipod

## Echinodermata

*Dendraster excentricus* – sand dollar

# Razor Clam Management in Washington State





FISH AND WILDLIFE COMMISSION  
POLICY DECISION

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<b>POLICY TITLE:</b>	<b>Razor Clam Management</b>	<b>POLICY NUMBER:</b>	<b>POL-C3009</b>
Cancels:		Effective Date	January 4, 1997
		Termination Date	(if applicable):
See Also:		Approved by:	<u>/s/ Lisa Pelly</u> Fish and Wildlife Commission Chair

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The management objectives for the razor clam fishery are:

- Manage the razor clam resource on all coastal beaches for recreational use with a minor separate commercial fishery located only on detached spits of Willapa Bay
- ~~Manage the resource to maintain stable and healthy populations~~
- Maximize recreational opportunity.
- Independently manage the razor clam populations on Kalaloch, Mocrocks, Copalis, Twin Harbors and Long Beach while considering the pertinent ~~interactions of escape, effort, opportunity and tribal allocations~~
- Provide for consistent commercial fishing opportunity that does not conflict with the recreational fishery.



Razor clams are part coastal history and culture

Cook-Off





Many people depend on the social value of the fishery...

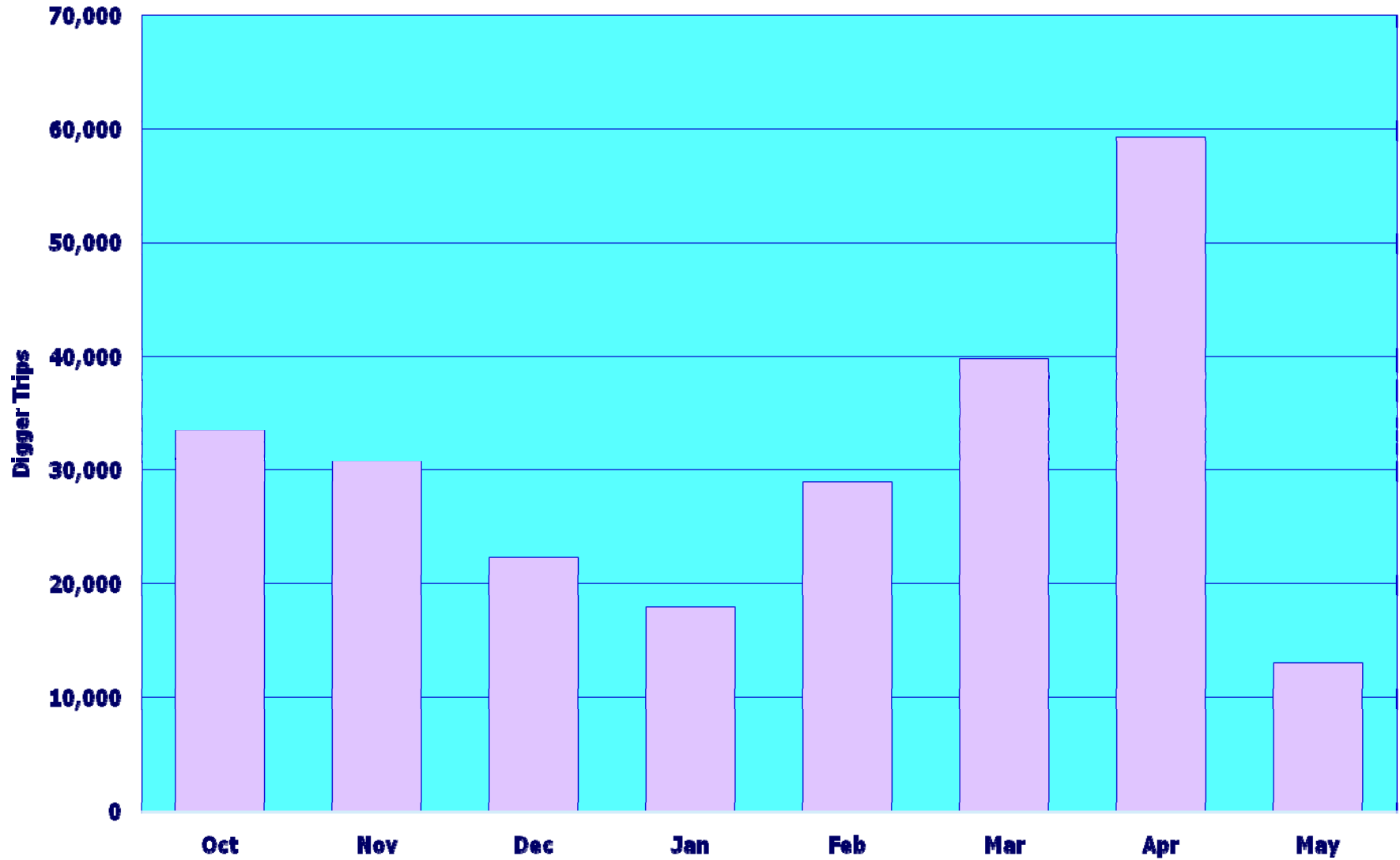




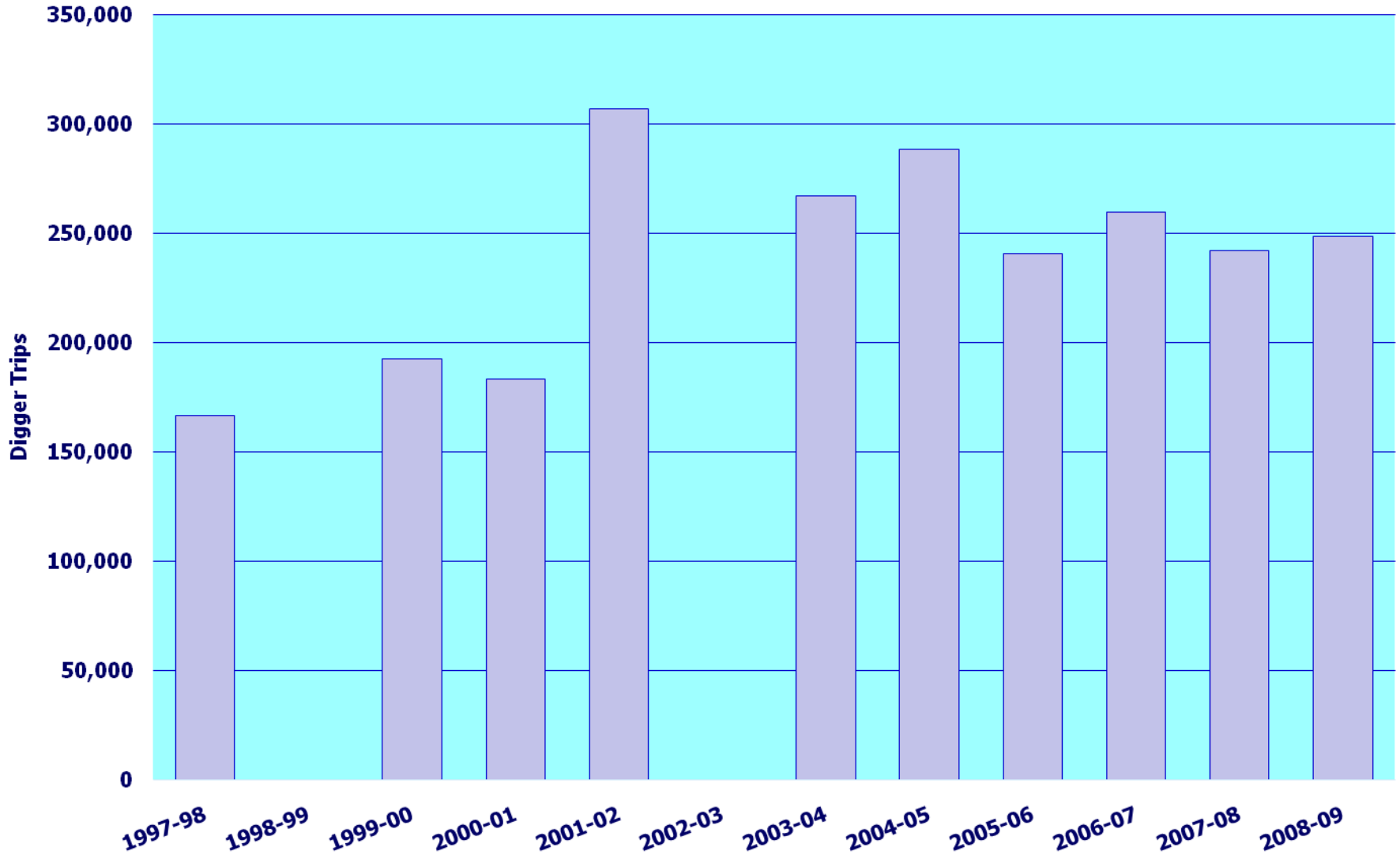
Clam seasons are very important to the many businesses depend on the income generated by thousands of visitors.



# Washington Recreational Razor Clam Average Effort By Month 1997 through 2009



# Washington Recreational Razor Clam Average Effort By Season 1997 through 2009



# 2008-2009 Fishery Review

3.2 million clams

\$12.2 million  
to local  
economies.

249,000 digger trips

Average of 12.9 clams per digger trip



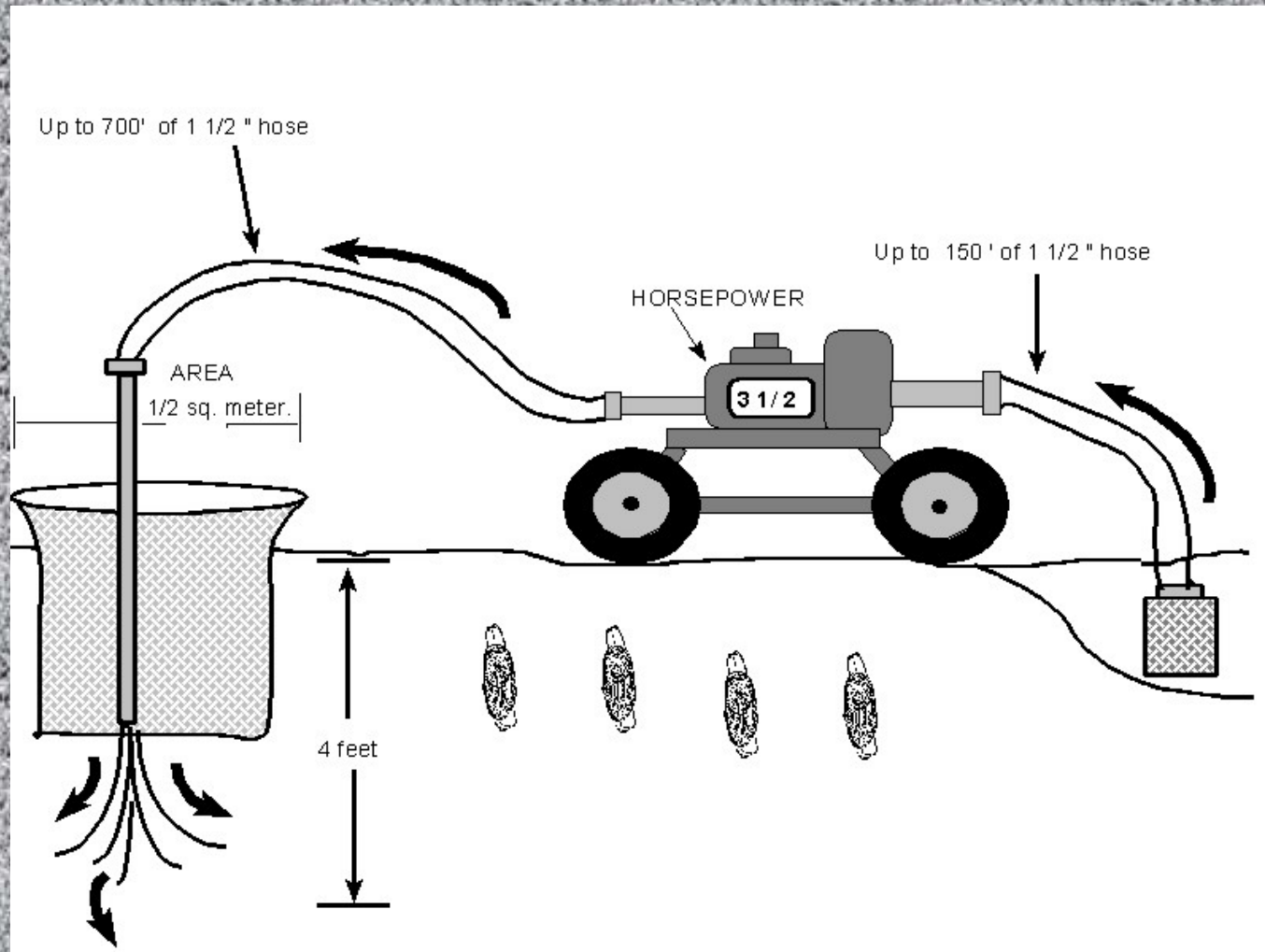
# Reaching Our Goal



# WDFW Annual Management Cycle:

- **May through September** – complete coast wide stock assessment / develop TAC by beach.
- **August** – Negotiate Fishery Management Plans for U&A beaches with tribal governments.
- **September** - Hold a series of 5 public meetings.
- **Early October** - Make season decision / announce season.
- **October through April** – Monitor harvest / manage to TAC / collect needed bio-toxin samples.

# Annual Coast-wide Stock Assessment



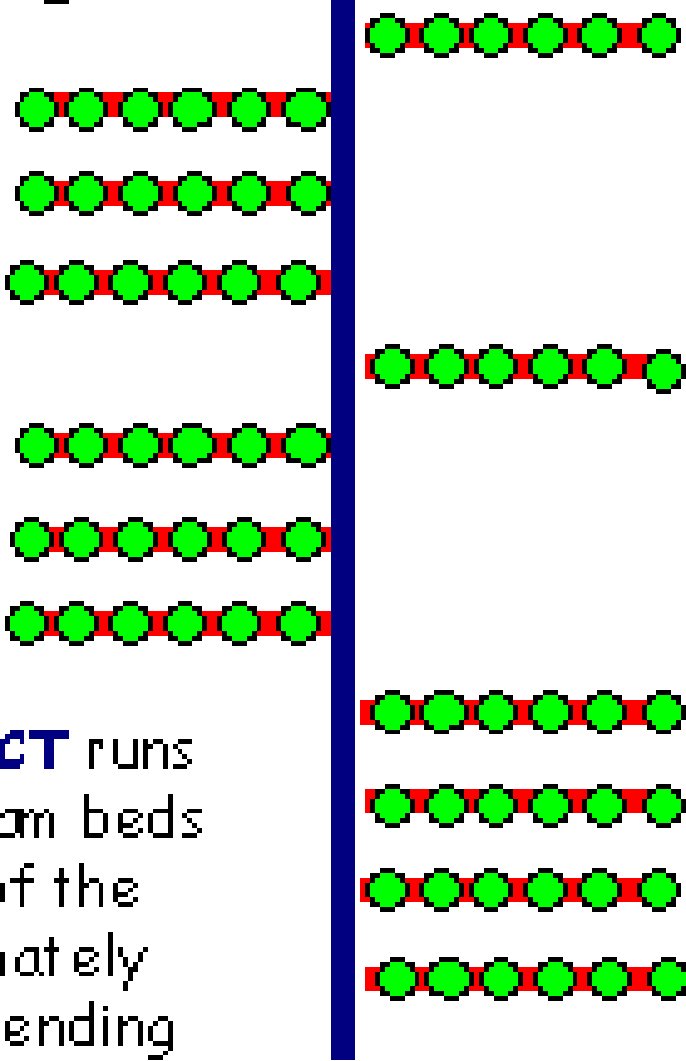
Starting in May and ending in September  
WDFW and tribal co-managers survey a total

...total of 58 miles of  
Razor Clam habitat...

from the sound end of the  
Long Beach Peninsula (Beard's Hollow) to  
the north end of Kalaloch.





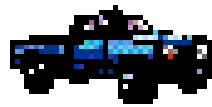


Six **SAMPLE**  
**PLOTS** are  
pumped at each  
elevation.  
● = Plot

**ELEVATIONS**  
are randomly  
chosen to run  
north or south  
of the transect  
at 50 foot  
intervals.

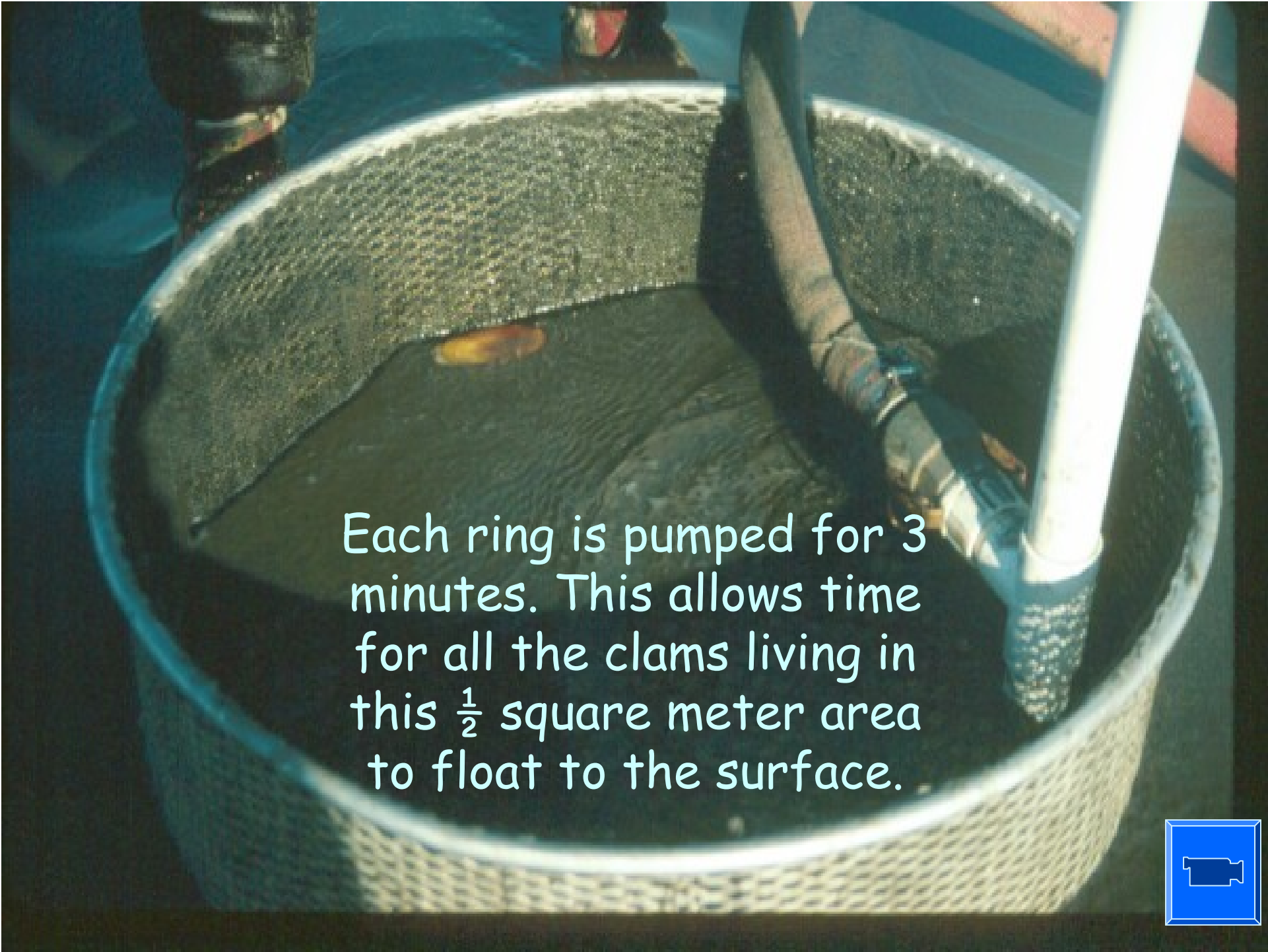
Each **TRANSECT** runs  
from top of clam beds  
to the edge of the  
surf, approximately  
600 feet (depending  
on the location).

**UPLAND DRIVING AREA**





Water is pumped up the beach  
and used to liquefy the sand  
within a  $\frac{1}{2}$  square meter  
aluminum ring.



Each ring is pumped for 3 minutes. This allows time for all the clams living in this  $\frac{1}{2}$  square meter area to float to the surface.





Each clam is recorded, measured and returned to the beach.



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# Development of Total Allowable Catch (TAC) by beach.



**LONG BEACH RAZOR CLAM POPULATION AND HARVEST DATA**

YEAR	POPULATION (clams)		TAC (clams)	HARVEST	% of TAC harvested
	RECRUITS	PRE-RECRUITS	Harvest rate @ 25.4% of recruits	TOTAL (clams)	
1997-98	2,119,325	3,831,718	538,309	495,615	92.1%
1998-99	2,422,618	2,645,228	615,345	0	0.0%
1999-00	4,090,683	5,582,944	1,039,033	1,194,779	115.0%
2000-01	4,472,665	961,200	1,136,057	1,098,115	96.7%
2001-02	7,959,677	16,525,001	2,021,758	1,865,729	92.3%
2002-03	11,729,090	39,094,638	2,979,189	0	0.0%
			Harvest rate @ 30% of recruits		
2003-04	4,424,363	21,160,972	1,327,309	1,290,978	97.3%
2004-05	6,265,021	24,964,188	1,879,506	1,696,283	90.3%
2005-06	4,464,062	18,349,025	1,339,219	1,378,575	102.9%
2006-07	6,093,834	4,380,820	1,828,150	1,751,151	95.8%
2007-08	4,151,123	444,971	1,245,337	1,227,519	98.6%
2008-09	3,509,940	5,894,291	1,052,982		0.0%
<b>AVERAGE</b>	<b>5,141,867</b>	<b>11,986,250</b>		<b>1,333,194</b>	

**COPALIS RAZOR CLAM POPULATION AND HARVEST DATA**

YEAR	POPULATION (clams)		TAC (clams)	State's Share	State's
	RECRUITS	PRE-RECRUITS	Harvest Rate @ 25.4% of recruits	(50% w/ adjustments)	HARVEST (clams) TOTAL
1997-98	1,180,874	3,768,905	299,942	149,971	146,886
1998-99	3,013,553	1,777,219	765,442	382,721	0
1999-00	2,954,952	2,034,445	750,558	375,279	365,191
2000-01	3,236,440	9,540,718	822,056	411,028	381,369
2001-02	8,122,270	17,488,883	2,063,057	1,364,528	1,270,953
2002-03	7,090,319	3,282,696	1,800,941	900,471	0
			Harvest rate @ 30% of recruits		
2003-04	2,841,229	11,727,251	852,369	426,184	462,520
2004-05	7,105,212	8,852,948	2,131,564	1,245,782	1,239,173
2005-06	4,953,508	4,799,194	1,486,052	743,026	817,228
2006-07	2,838,707	3,146,425	851,612	425,806	466,620
2007-08	4,751,308	6,567,921	1,425,392	712,696	636,376
2008-09	6,453,563	9,953,166	1,936,069	968,034	
<b>AVERAGE</b>	<b>4,371,670</b>	<b>6,635,146</b>			<b>642,924</b>



# How many days can we dig?

1. Stock assessment (total clams / average size)
2. TAC (total allowable catch) =  
total clams 3 inches or greater  $\times$  30.0%
3. Number of days = TAC / expected daily harvest

## NEWS RELEASE

### Public meetings scheduled on razor clam season

OLYMPIA – The Washington Department of Fish and Wildlife (WDFW) will seek recommendations on the fall razor clam season at a series of five public meetings in western Washington this month...

- Long Beach
- Westport
- Ocean Shores
- Forks
- Tacoma



During daylight tides (at the peak of the effort)  
the number of diggers are counted and...

...diggers  
are  
surveyed  
to  
determine  
the  
number of  
clams per  
digger...



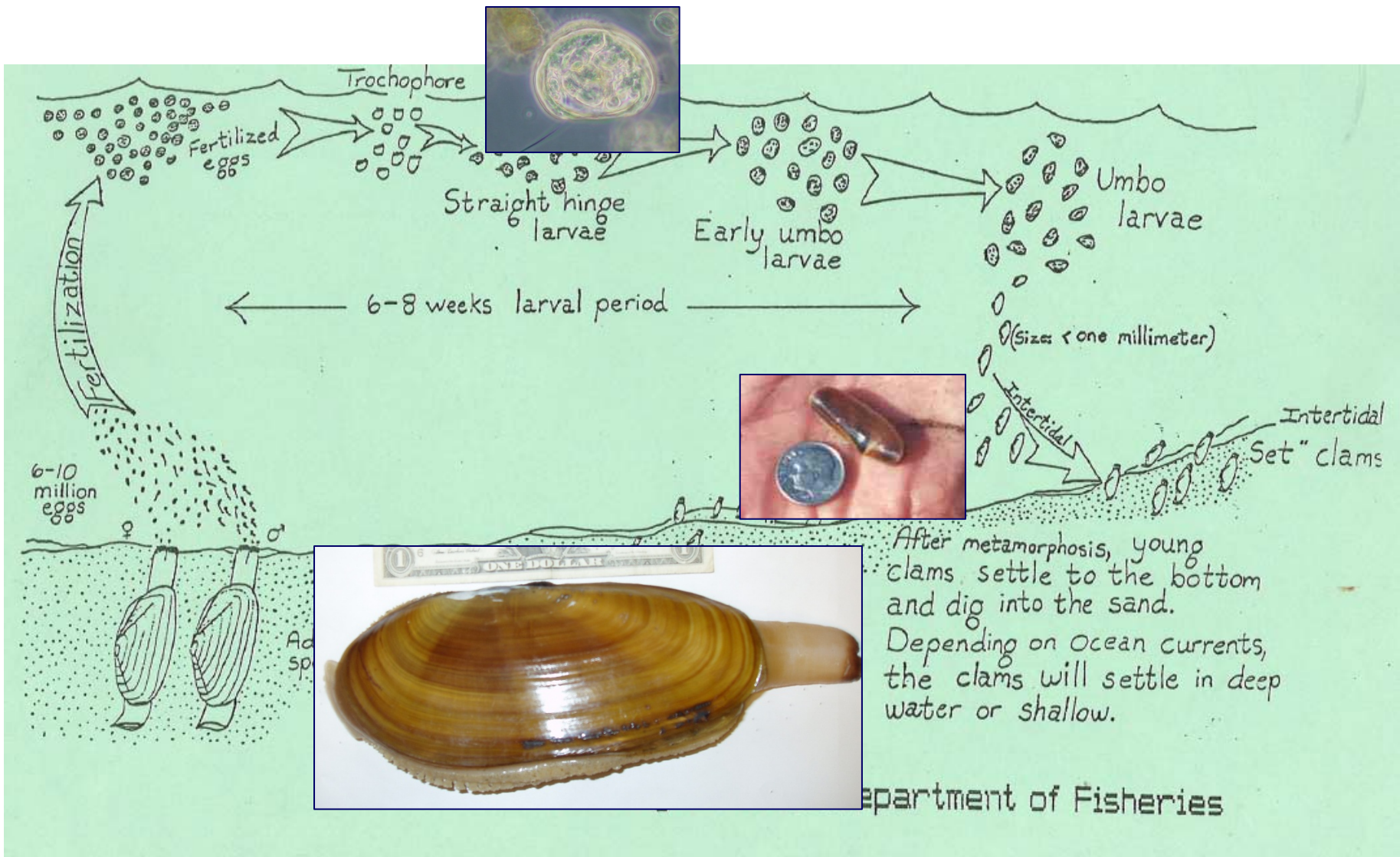
To determine effort, during night tides...

...lanterns are counted and diggers are additionally surveyed to determine the number of diggers per lantern...

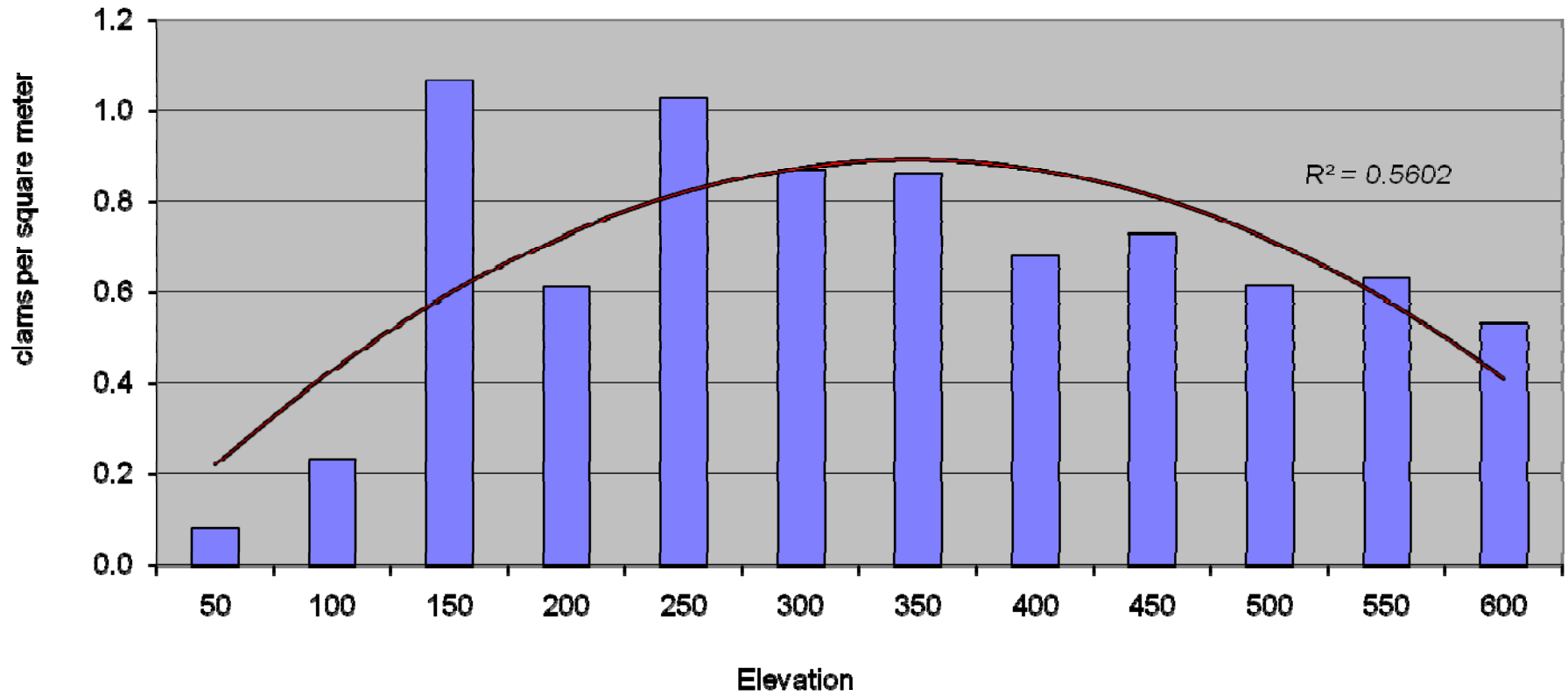


# Razor Clam Life History

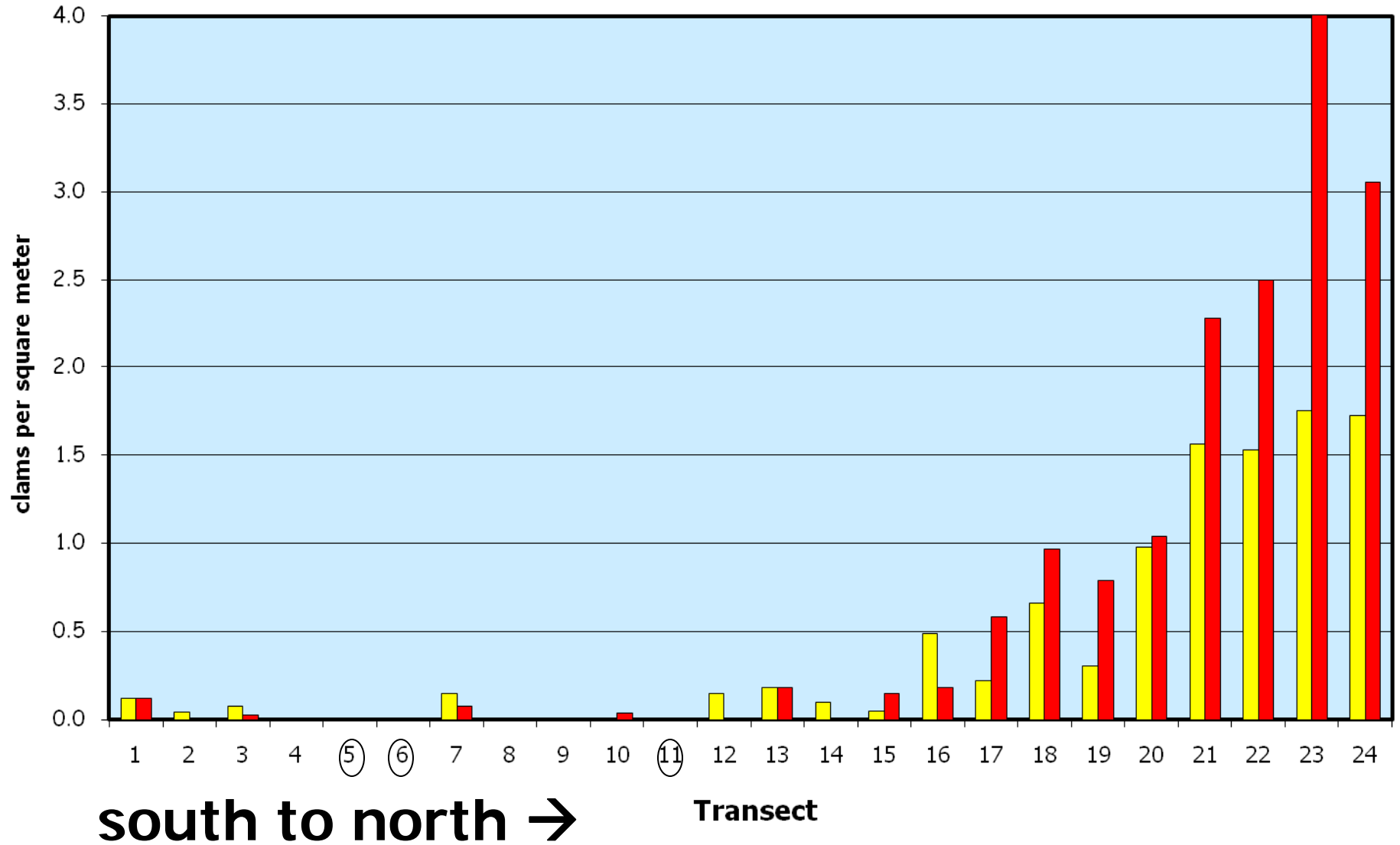
- Most razor clams spawn in the late spring, however spawning can and often does occur at other times during the year.
- Individual razor clams are either male or female, with the sex ration about 1:1.
- Eggs and sperm are broadcast into the water column were fertilization occurs.
- The larval period (*trochophore to veliger to umbo stages*) lasts 6 to 8 weeks.
- As metamorphosis ends, the shell forms and a distinct foot is evident and the clams begin to settle to the bottom.
- At about 10 weeks the clams have reached about 5 mm and can begin to hold themselves moved about by currents and shifting sand.
- As razor clam grow and mature - they remain in one place.
- Young clams grow rapidly – reaching 4 inches in shell length in between 15-18 months.
- Most razor clams spawn for the first time by the time they reach 4 inches.
- The largest razor clam on record in Washington is 178 mm (7 inches).
- Maximum natural life span for Washington razor clams is between 5 to 6 years.



Long Beach Razor Clam Recruits  
Distribution Averaged Across Elevations  
2000-2008



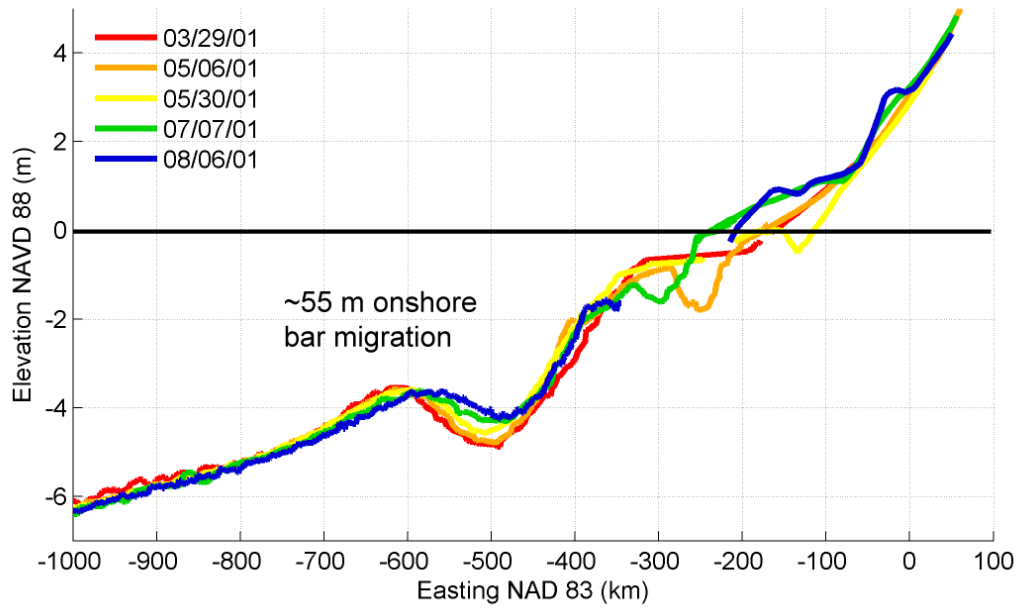
# Long Beach Razor Clam Population Recruit / Pre-recruit Distribution - 2008



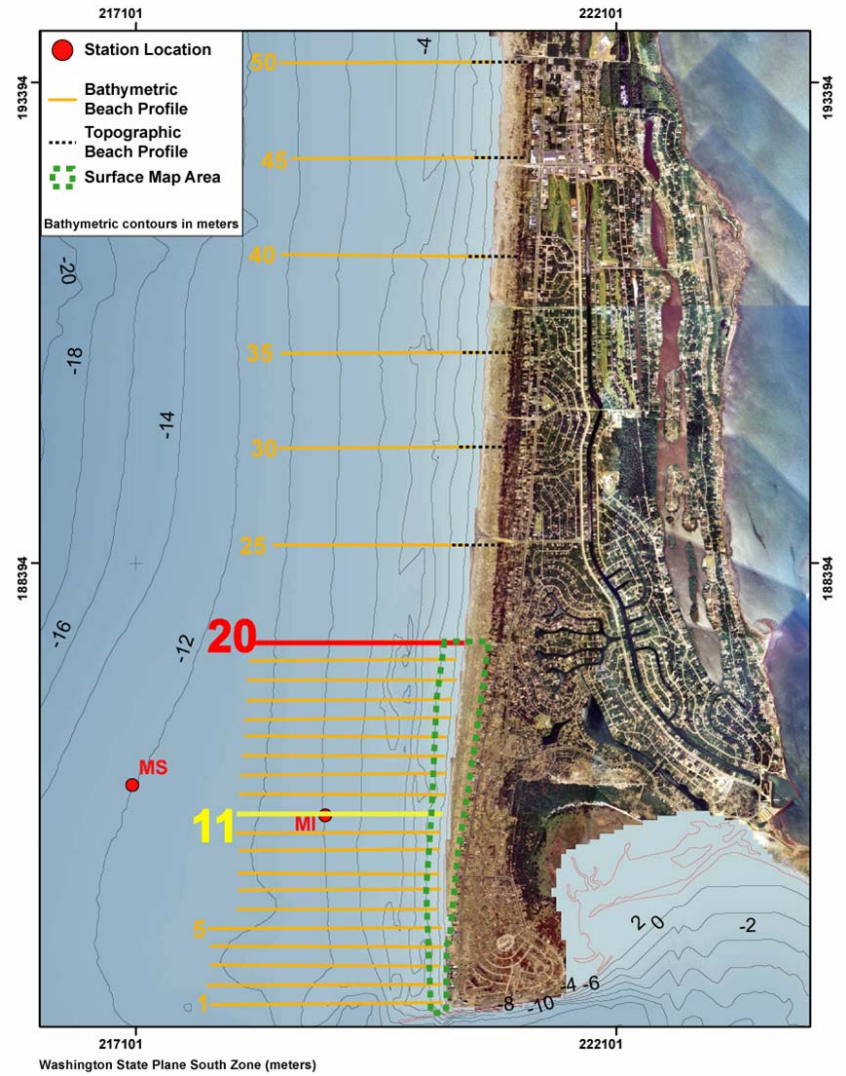
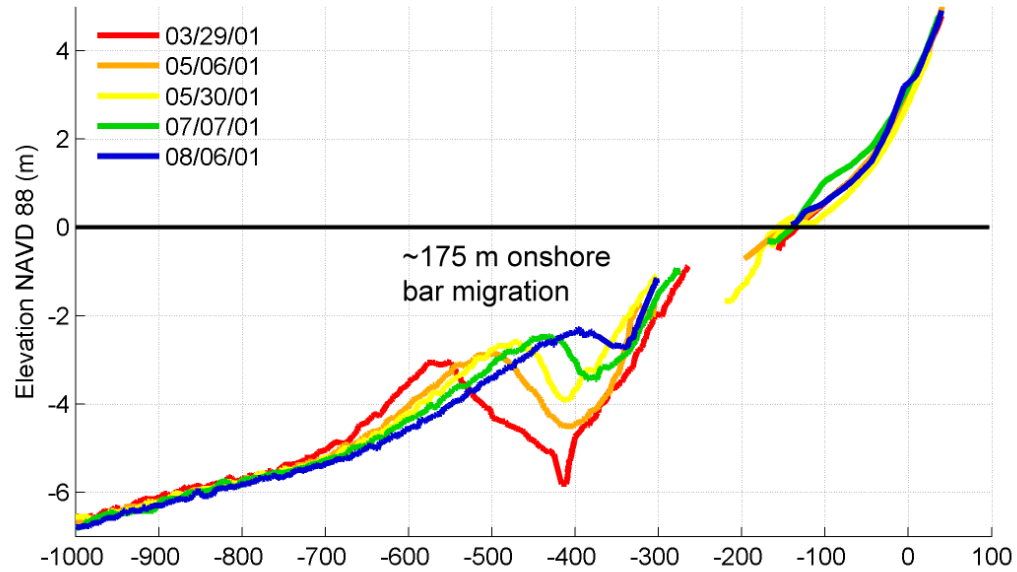




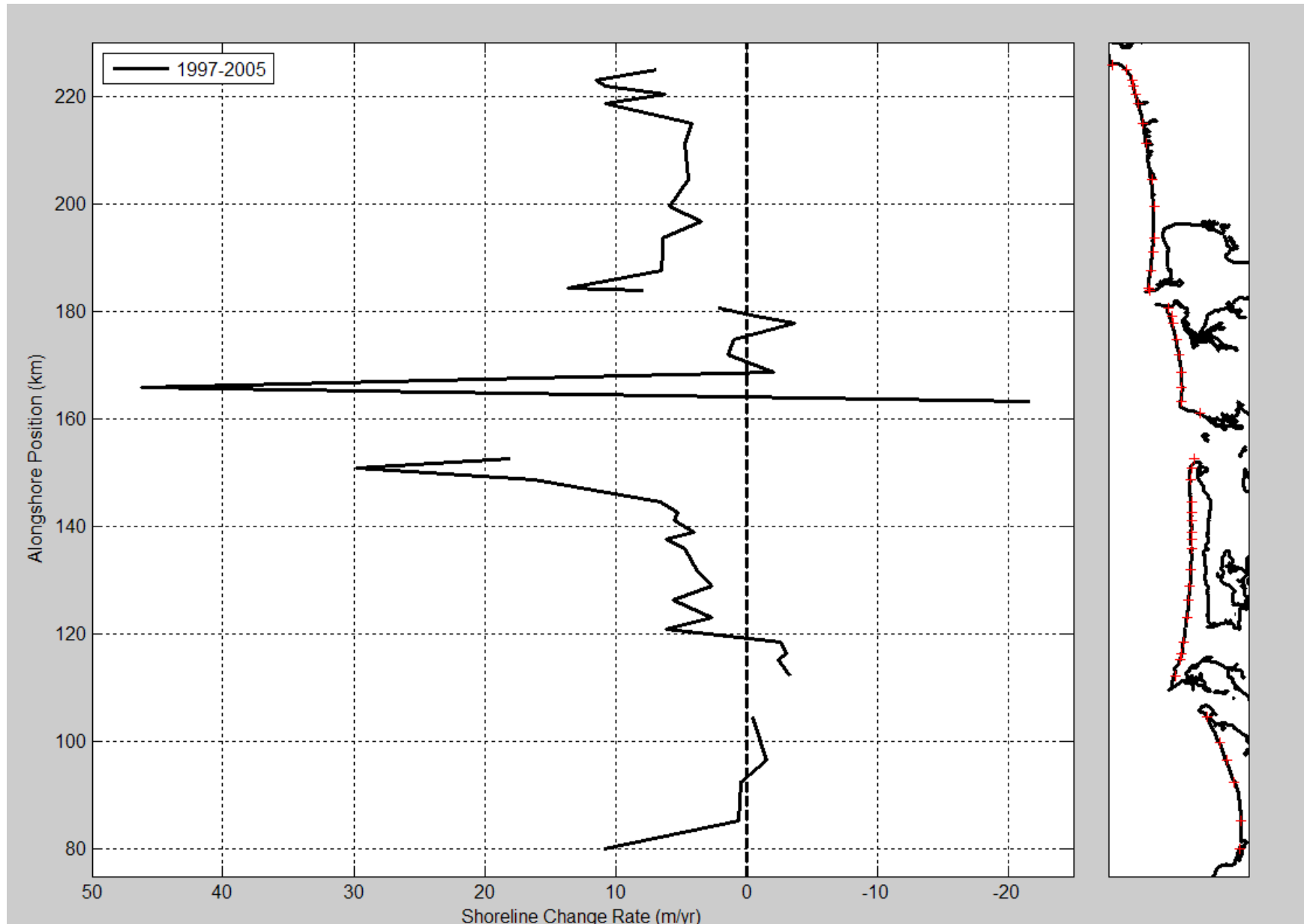
Profile 20



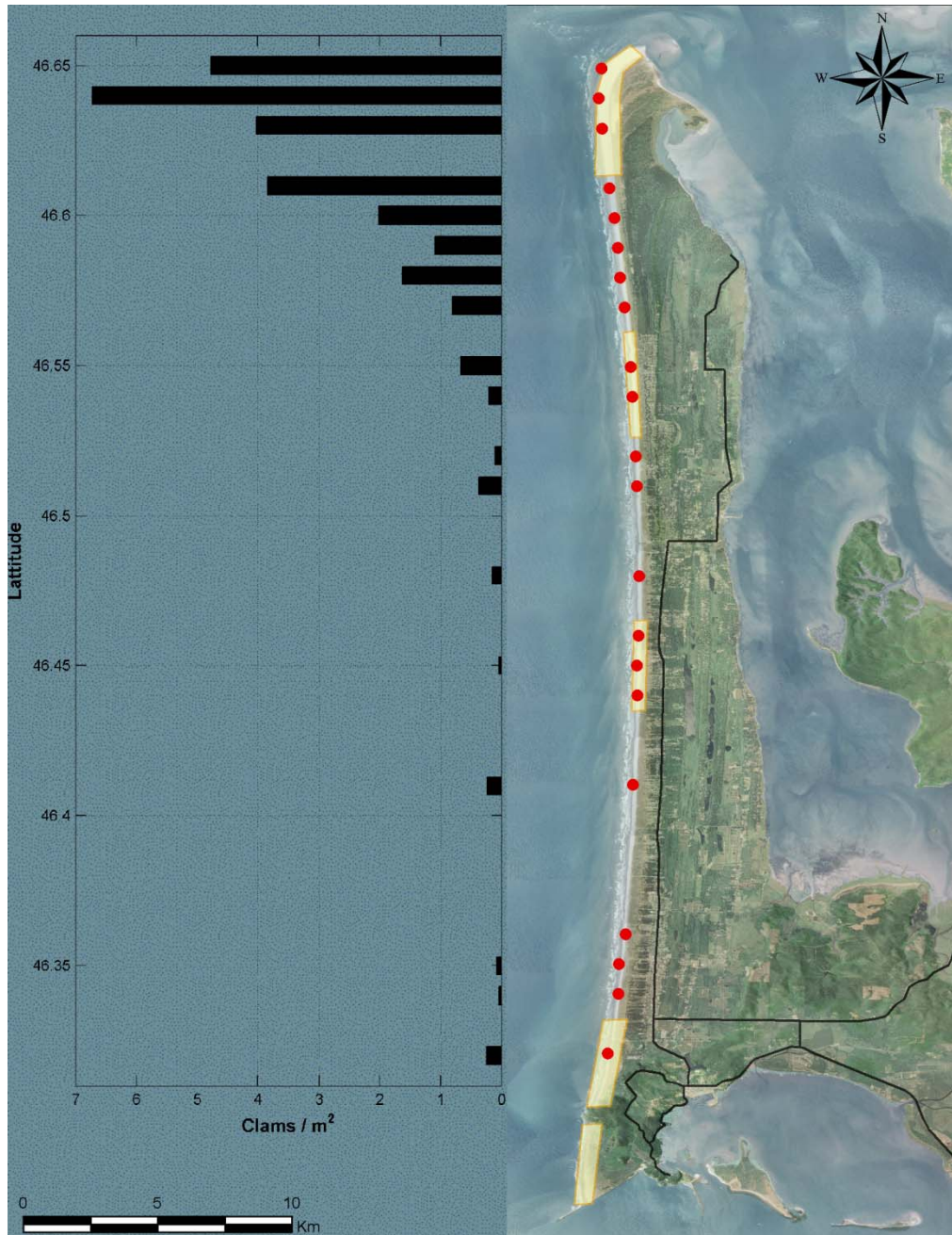
Profile 11



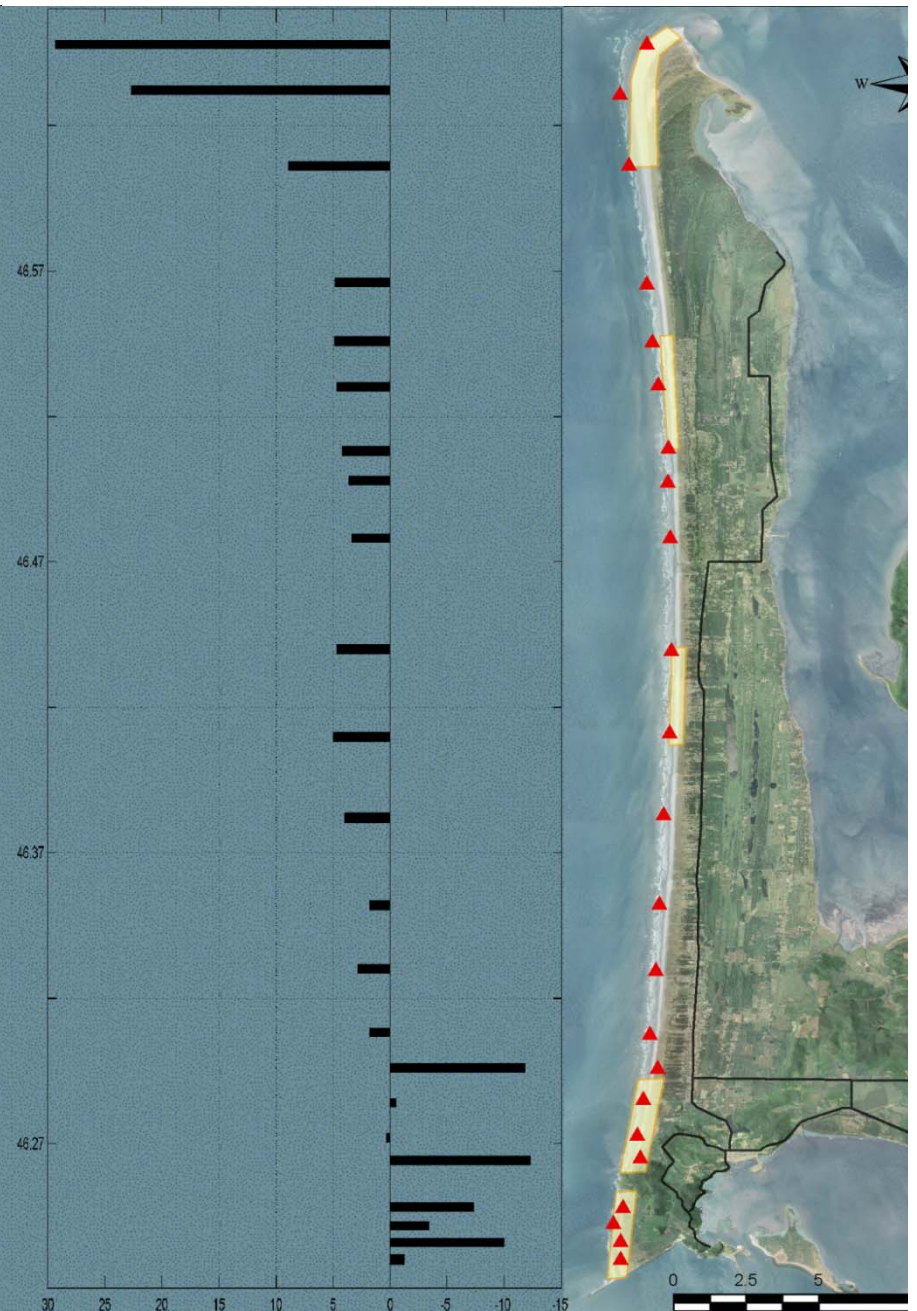
# Beach Profile Change (1997-2005)



## Razor Clam Population Density



## Shoreline Change Rates



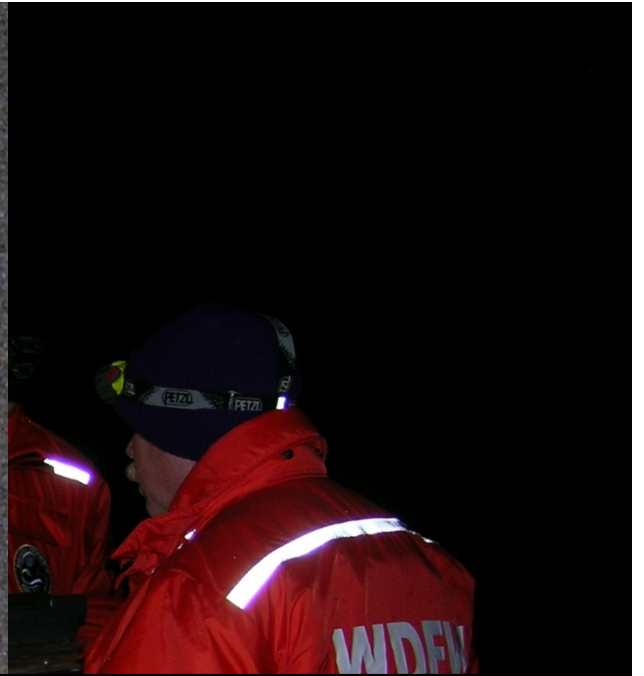


**WDFW's goal is to provide maximum harvest opportunities that are safe and enjoyable experiences, while still maintaining healthy populations.**





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### CANBY

