Cooperation of Science & Management for HABS:

Domoic Acid & the Washington Coast Razor Clam Fishery

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Chadsey, M., Trainer, V. & T. Leschine 2012
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Washington razor clam fishery

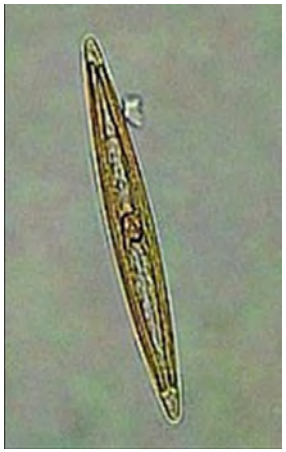
Source: WDFW

Recreational fishery worth upwards of $12 million/year

Source: ORHAB

Tribal commercial harvest estimated at $7 million/year

Tribes use also for subsistence and ceremonial purposes



Pseudo-nitzschia diatom

Domoic acid (DA)

Amnesiac shellfish poisoning (ASP)

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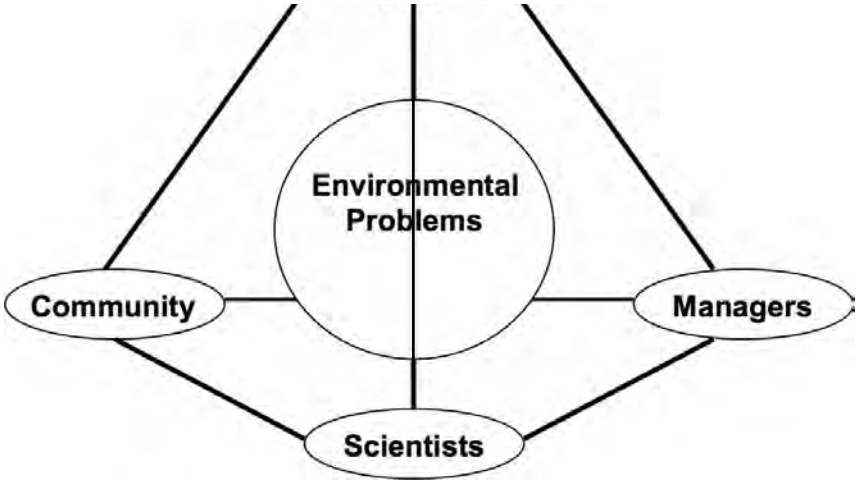
Institutional Analysis

"The role of institutions is an underappreciated aspect of resource management...."

- Imperial and Yandle, "Taking institutions seriously: using the IAD framework to analyze fisheries policy" (2005)

ORHAB



Conceptual Framework for Environmental Management

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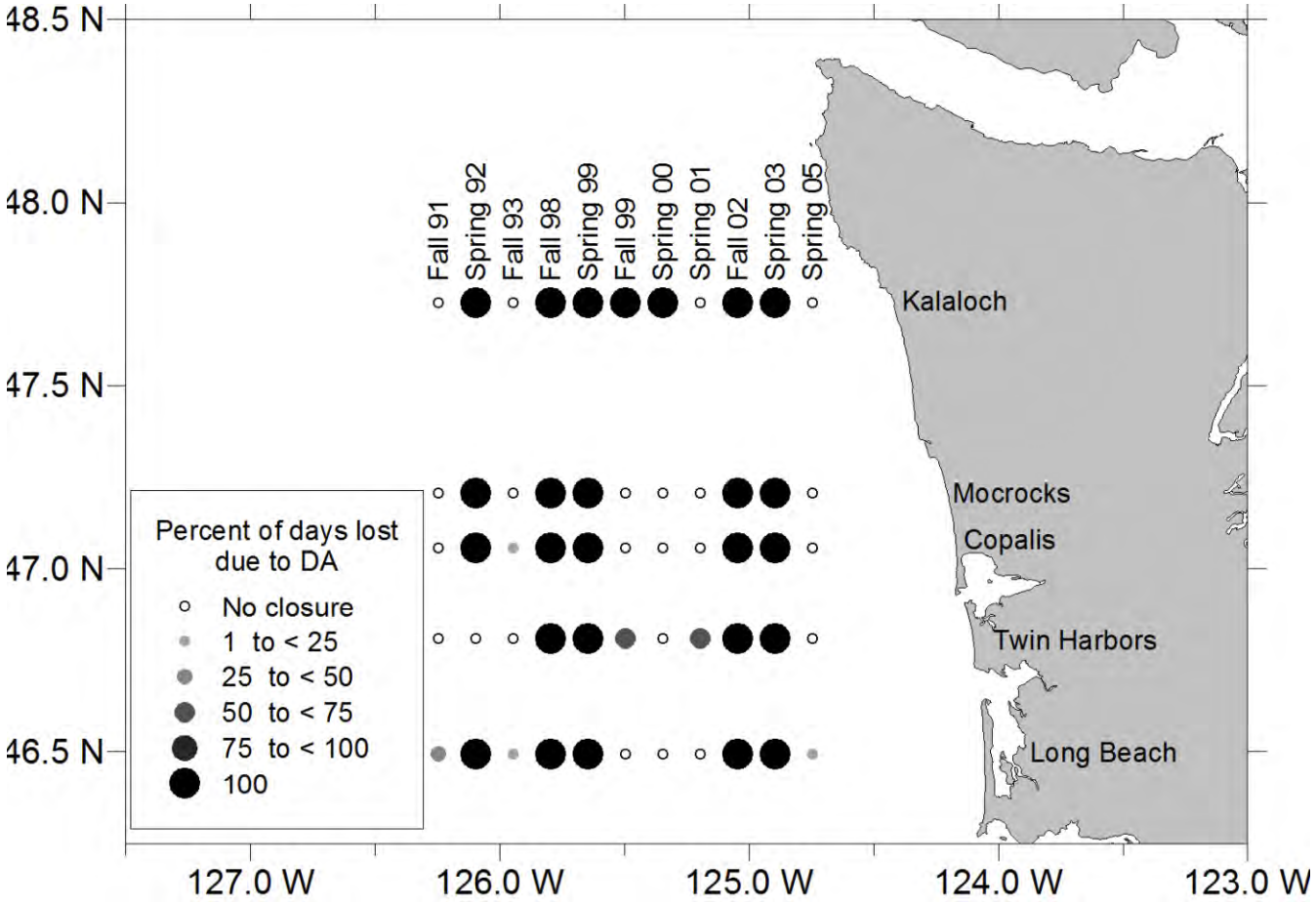
Domoic acid closures of Washington razor clam fishery



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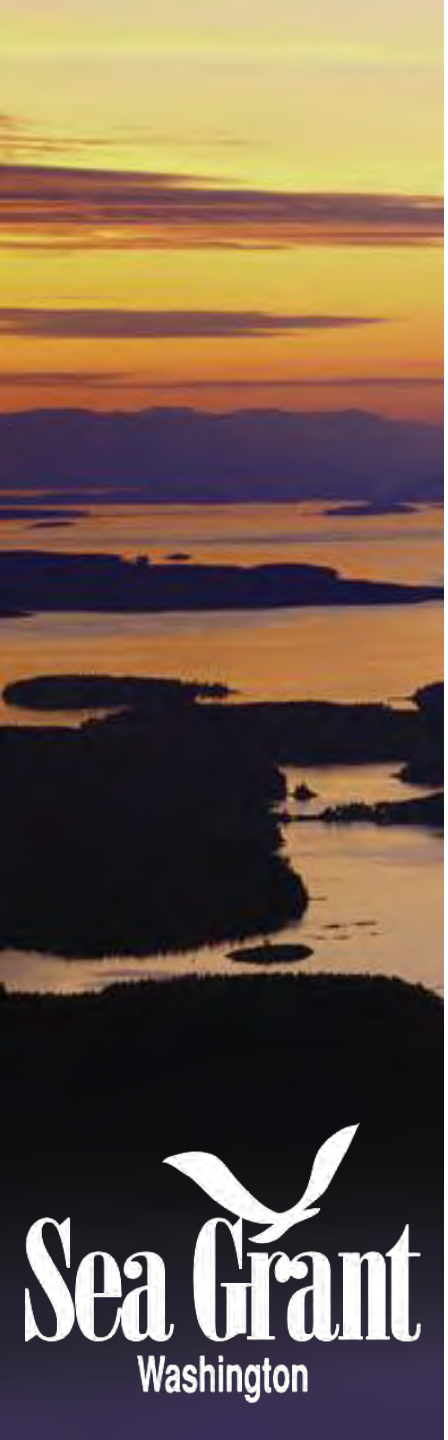

ORHAB Objectives

- Focus scientific attention on *Pseudo-nitzschia* bloom dynamics
- Build credibility for future funding
- Assess economic impacts of HABs on state's coastal communities
- *Develop* ***local capacity*** *and* ***affordable tools*** *for DA monitoring*

ORHAB Sampling

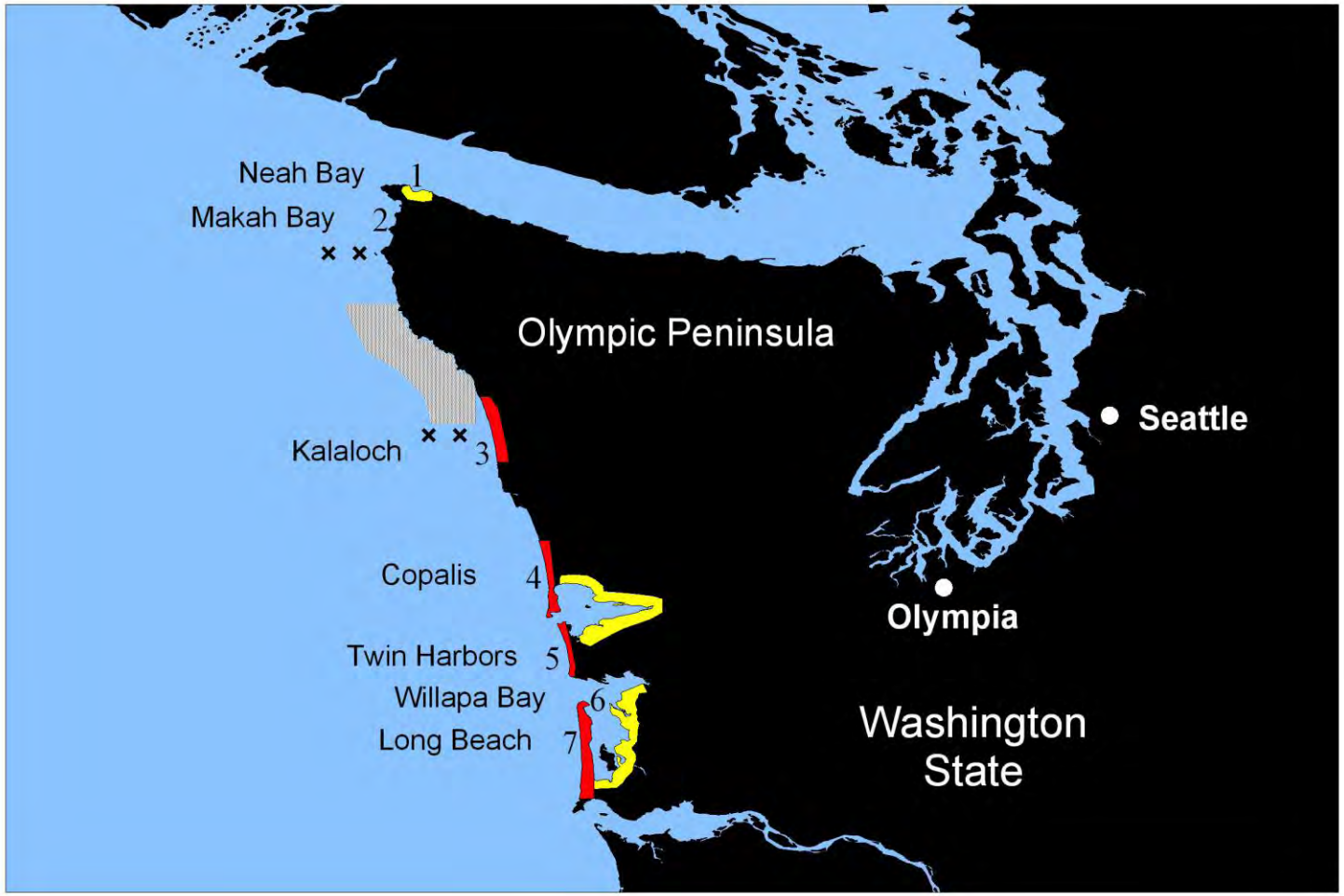

Image: ORHAB Newsletter

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ORHAB Monitoring

Twice weekly seawater samples

WDFW Technician Alan Sarich collecting a plankton sample

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ORHAB Monitoring

Seawater tested for presence of toxin

Filtering water for domoic acid ELISA assay

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ORHAB Monitoring

Seawater tested for presence of toxin

Doing plankton counts

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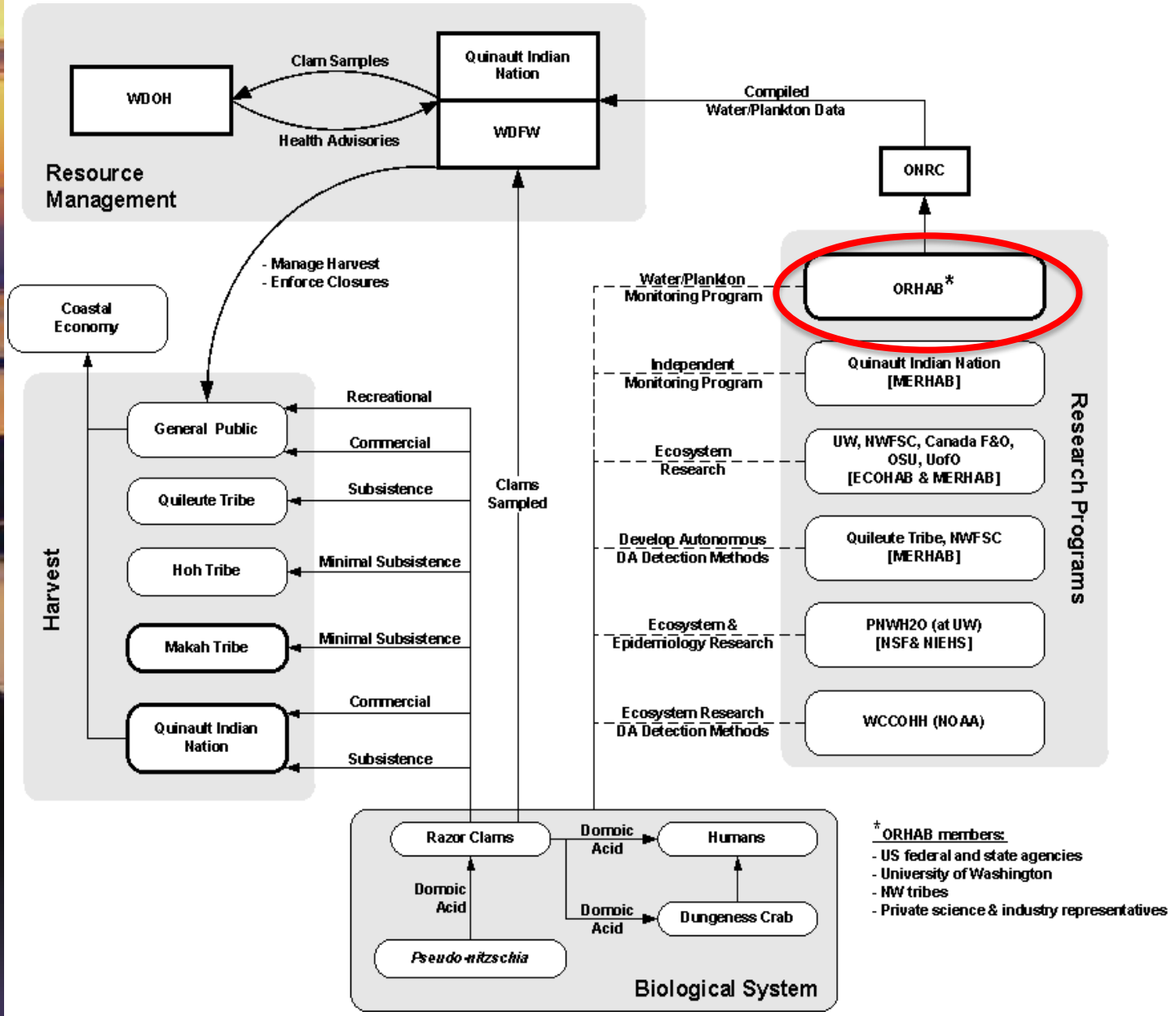
Institutional Map



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Institutional Milestones:

Science and scientists made substantial contributions: Example of "use-inspired basic research"

'99 ORHAB Partership[2] formed

'00 ORHAB funded (MERHAB; 5 yrs)

'99 Quileute tribe requests HAB assistance from the Olympic Natural Resources Center[1] (ONRC) in Forks, WA

'02 NWFSC ECOHAB-PNW[3] funded (5 yrs)

'03 WA state approves shellfish license fee to fund ORHAB monitoring program after federal funding ends in 2005

'04 Quileute tribe funded for coast-based monitoring (MERHAB[5]; 3 yrs)

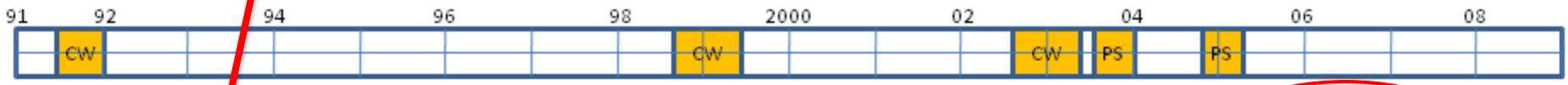
'04 NOAA West Coast Center for Oceans & Human Health[4] (WCCOHH) established at NWFSC

'05 QIN funded for coast-based HAB monitoring (MERHAB[5]; 3 yrs)

'05 Puget Sound HAB monitoring program initiated by WCCOHH

'07 MOCHA[6], an Oregon HAB monitoring program, modeled after ORHAB, is funded (MERHAB; 5 yrs)

'08 WCCOHH funds expansion of Puget Sound HAB monitoring program into volunteer-based SoundToxins[7]



Technology & Policy Milestones:

1991 (following first closure of WA razor clam fishery due to DA)
- Quileute tribe begins monitoring phytoplankton and clam tissue
- WDFW, WDOH partner to establish state monitoring program for DA
- WDOH sets DA action level in clam tissue at 15ppm

'00 Quileute tribe initiates independent coast-based DA monitoring program

'99 ORHAB Monitoring Program put in place:
- Biweekly phytoplankton counts; bimonthly analysis of clam tissue to monitor DA levels
- Threshold *Pseudo-nitzschia* levels trigger further on-site testing of DA levels in seawater
- Clams sampled twice prior to every 'opener' to determine safety; HPLC analysis of DA levels conducted by WDOH.

'00 WDOH raises DA action level in clam tissue to 20ppm[8]

'04 NOS, Mercury Science, & NWFSC collaborate to develop DA ELISA[9]

'05 NWFSC & Jamestown S'Klallam tribe initiate DA monitoring in Puget Sound

'06 ORHAB partners begin validating the DA ELISA at coastal labs

'07 NOS & NWFSC funded to develop simple, inexpensive, DA 'SPOT' Detection assay for onsite DA monitoring[10]

'08 ORHAB partners begin field testing the DA 'SPOT' Detection assay at coastal sampling sites

Scientific Milestones:

Environmental conditions associated with DA in razor clams on the WA coast [Adams et al 2000]

- Juan de Fuca eddy *Pseudo-nitzschia* species & DA levels characterized
- Model proposed for shoreward advection of *Pseudo-nitzschia* [Trainer et al. 2002]

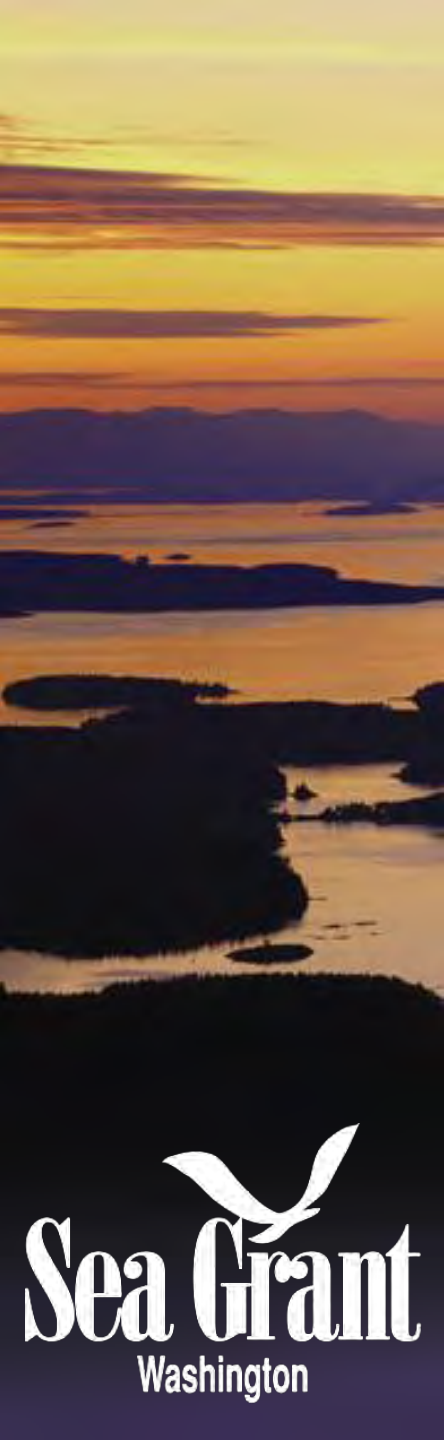
Transport models to explain spatial and temporal distribution of HAB events on WA coast [MacFadyen et al. 2005; Hickey et al. 2005]

Environmental factors contributing to 2005 *Pseudo-nitzschia* blooms in Puget Sound [Trainer et al. 2007]

DA production by *Pseudo-nitzschia* linked to iron stress [Wells et al. 2005]

Further evidence for the role of Fe-limitation in controlling DA levels in 2004 *Pseudo-nitzschia* bloom [Trainer et al. 2009b]

Predictive model linking HAB events to California Current upwelling index [MacFadyen et al. 2008]



ORHAB Outcomes

	Before ORHAB	*After* ORHAB
Sample Collection & Monitoring	State & federal agencies; remote	Multiple *local* partners, including coastal tribes
Timing	Concentrated around 'openers'	Continuous; 2x week
Turnaround	7-10 days	Rapid; forecasting ability
Threshold for closure	15 ppm DA	20 ppm DA
Funding	Unstable	Managed to maximize benefit to coastal communities and tribes
Harvest	Emergency closures	Managed to maximize benefit to coastal communities & tribes
Knowledge	Poorly understood	Technical and basic science advances

It’s been awhile….

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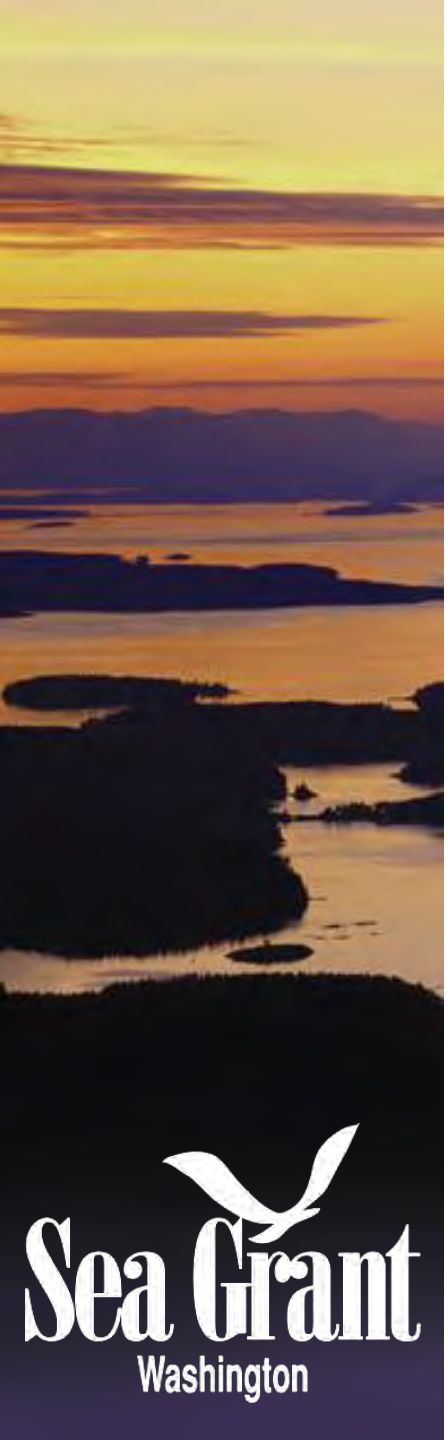

ORHAB today….

Good news:

- Successful transition to permanent state funding
- Partnership still strong; participation *increasing*
- Streamlined (3 paid technicians; WDFW, UW & QIN)

Not so good….

- Transition to state-funding in 2003→Reduced budget
- Concerns about sustainability given increasing costs
- Loss of basic science research funding

Acknowledgements

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