

DRAFT: NOT FOR DISTRIBUTION
ENDOSYMBIOTIC, COMMENSAL, AND PARASITIC
ORGANISMS ASSOCIATED WITH WILD GEODUCK CLAMS
(*Panopea abrupta*)

Carolyn S. Friedman, Brent Vadopalas

School of Aquatic & Fishery Sciences,
University of Washington
Seattle, WA USA

Paul Frelier

Mariscos Veterinary Services
Three Forks, MT USA

Ralph Elston

AquaTechnics
Sequim, WA USA

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Introduction

- Farmed marine invertebrates are often non-native species
 - Criticism often focuses on the impacts of non-native and potentially invasive species on local species/ecosystems
 - Target and non-target species
 - Including pathogens
- Farming of native species may reduce potential concerns related to exotic species
- However, culturing native species within their natural range ensures that farmed and wild organisms can
 - Interbreed
 - Compete for the same resources
 - Share parasites and diseases

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Introduction 2

- Cultured and wild animals may have disease impacts on one another
- Parasites or disease agents are naturally present in wild populations
 - Prevalence and intensity varies with species, locale, density, environmental conditions.....
- Disease organisms can achieve epidemic status in dense populations
 - High density plantings may facilitate disease transmission both within cultured and between wild and cultured populations
- Successful management or control of a disease agent is facilitated by an understanding of the presence and prevalence of potential pathogens in a population

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We need to collect baseline data on the presence, identity and impact of parasites and diseases commonly encountered in the environment/species in question

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Geoducks

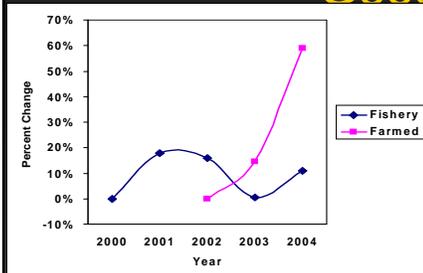


Fig. 1. Percent change in WA geoduck landings vs aquaculture production (Jonathan King, Northern Economics, Anchorage AK, personal communication).



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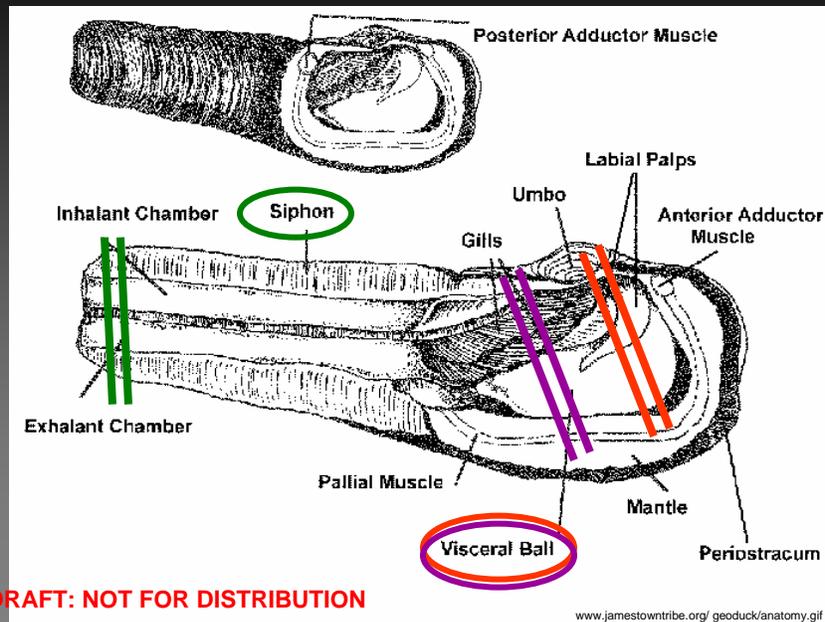
Methods

- Collected wild geoduck clams from three sites in the greater Puget Sound two times during two years
 - May and late September-early October 2007
 - August 2008 and January 2009
 - Freshwater Bay, Thorndyke Bay and Totten Inlet in Washington state

soundwaves.usgs.gov/2005/02/research.html



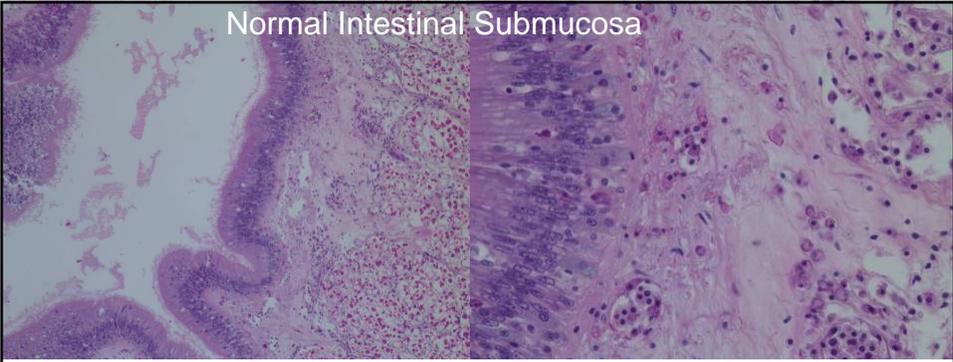
Processing samples: Geoduck Anatomy



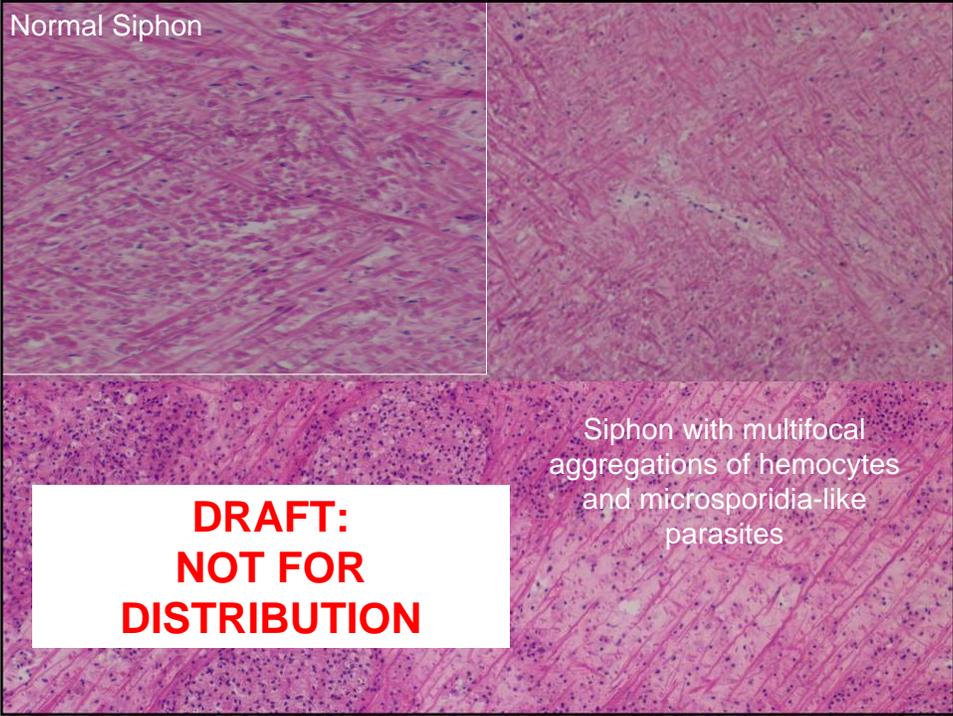
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Preliminary Summary of Geoduck Health from Totten Inlet

- Sexes: 58% Male, 40% female, 2% unknown
- Parasites:
 - **Microsporidia-like**
 - Siphon: 7.5%
 - *Steinhausia*-like in ova 9.8%
 - Intestinal submucosa parasites 30%
 - Gill RLO 6.8%
 - Fungi 1.5%
- Diseases:
 - Siphon hyperkeratosis 17.3%
 - Digestive tubule inflammation 5.3%
 - Clogged gill water tubules 2.2%
 - Occasional warts
 - Siphon discoloration



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H&E

Non-Acid Fast

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PAS +

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Parasite in siphon:
possible
microsporidian but
non-acid fast so
identity based on
morphology alone is
unclear

Intracellular development of *E. bieneusi* and *E. intestinalis* spores.

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*Encephalitozoon intestinalis**

*Development inside parasitophorous vacuole also occurs in *E. hellem* and *E. cuniculi*.

<http://www.dpd.cdc.gov/DPDX/images/ParasiteImages/M-R/Microsporidiosis>

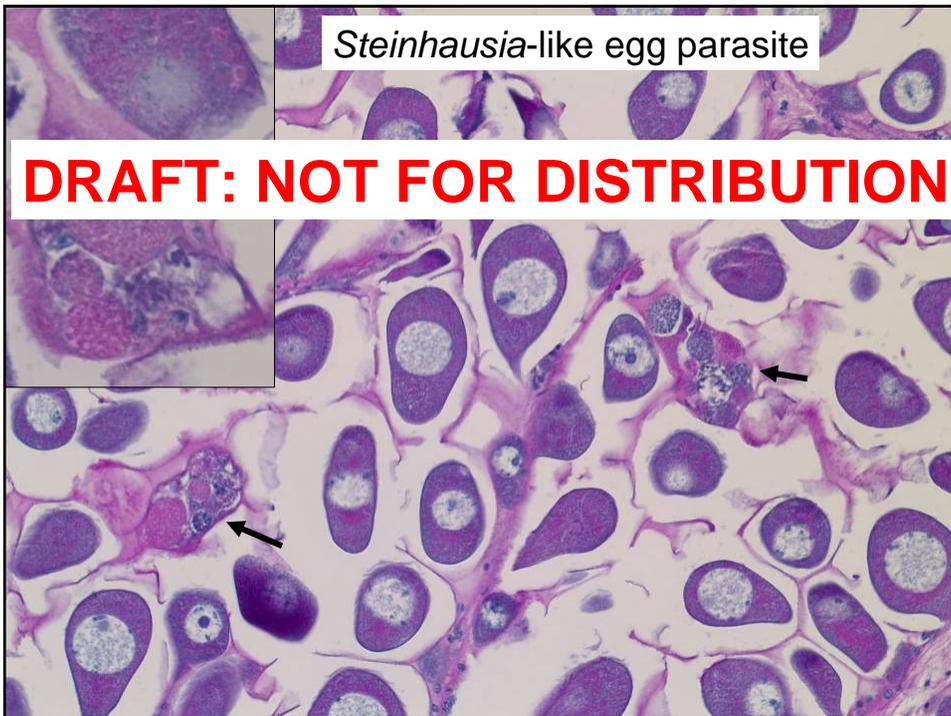
Gill RLOs

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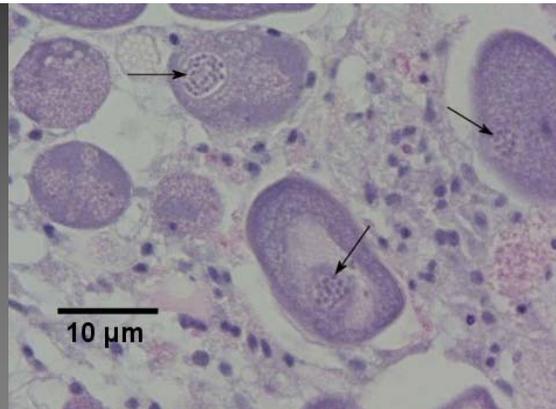
Steinhausia-like egg parasite

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Steinhausia mytilovum

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Bower, S. 2009. Image provided by J. B. Jones, Department of Fisheries, Government of Western Australia, bjones@agirc.wa.gov.au

Steinhausia-like parasite

- Of slides examined to date:
- 30% Only seen in geoducks from Totten Inlet
- None from Thorndyke Bay
- None from Freshwater Bay
- Low intensity infections (scale = 1)
- Lacked a host response

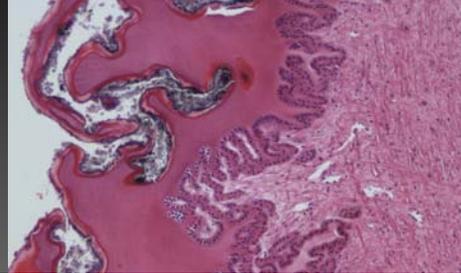


Figure 4. Microsporidian-like parasites within geoduck egg (arrows).

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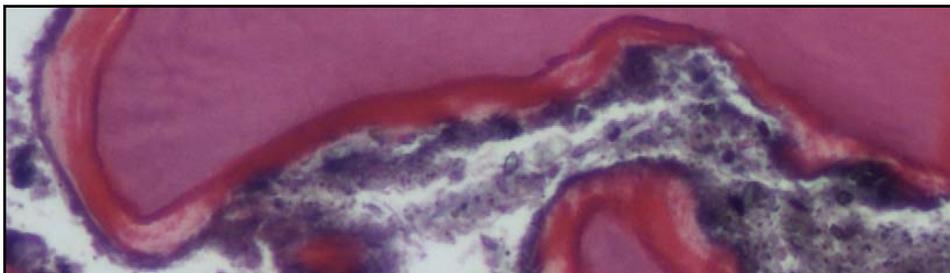
Mantle Abnormalities

- Hyperkeratosis and epithelial discoloration

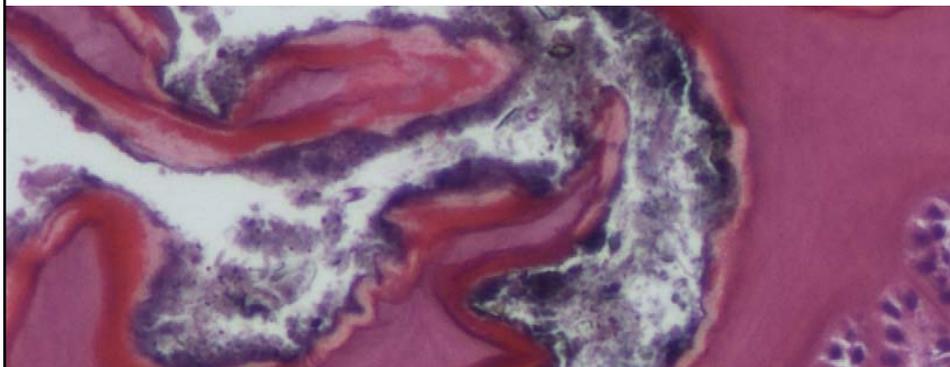


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- Warts on siphon epithelium seen periodically



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