

Bivalve Culture in Hawaii: Advances and Challenges



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Partners

- PACRC/UHH
- UH-Maui
- Department of Health
- Hawai`i Pacific University
- University of Hawaii Sea Grant College Program
- Center for Tropical and Subtropical Aquaculture
- NOAA
- CTSA Shellfish Working Group
- Aquaculture Development Program
- Kona Bay
- Hawaiian Shellfish LLC
- Goosepoint Oysters
- Kualoa Ranch
- Taylor Shellfish
- Kona Bay Marine Resources
- Hawaiian Learning Center
- Pae Pae `O He`eia
- Hale `O Lono



PACRC Hatchery Staff

Staff

- Maria Haws- Program Director
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- Mychael Moe-Shellfish Technician
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Students

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- Keoni Soares



Context

- Hawai`i is the only coastal State without bivalve growout in open waters
- State shellfish sanitation accomodates only import, not grow-out
- High potential due to:
 - Clean water
 - Large bivalve hatcheries
 - High local demand + 69 million visitor days/year
- New opportunities due Mainland problems
 - Permitting increasingly difficult
 - Diseases
 - Gulf Coast oil spill/red tides
 - NW ocean acidification problems



Efforts to Develop Bivalve Culture

- Shellfish sanitation and growing area classification
- Growout trials in Hawaiian fishponds
- Development of hatchery and culture methods for local species
- Training and extension
- Biological studies
- Cultural studies



PACRC Shellfish Hatchery



PACRC Hatchery Objectives

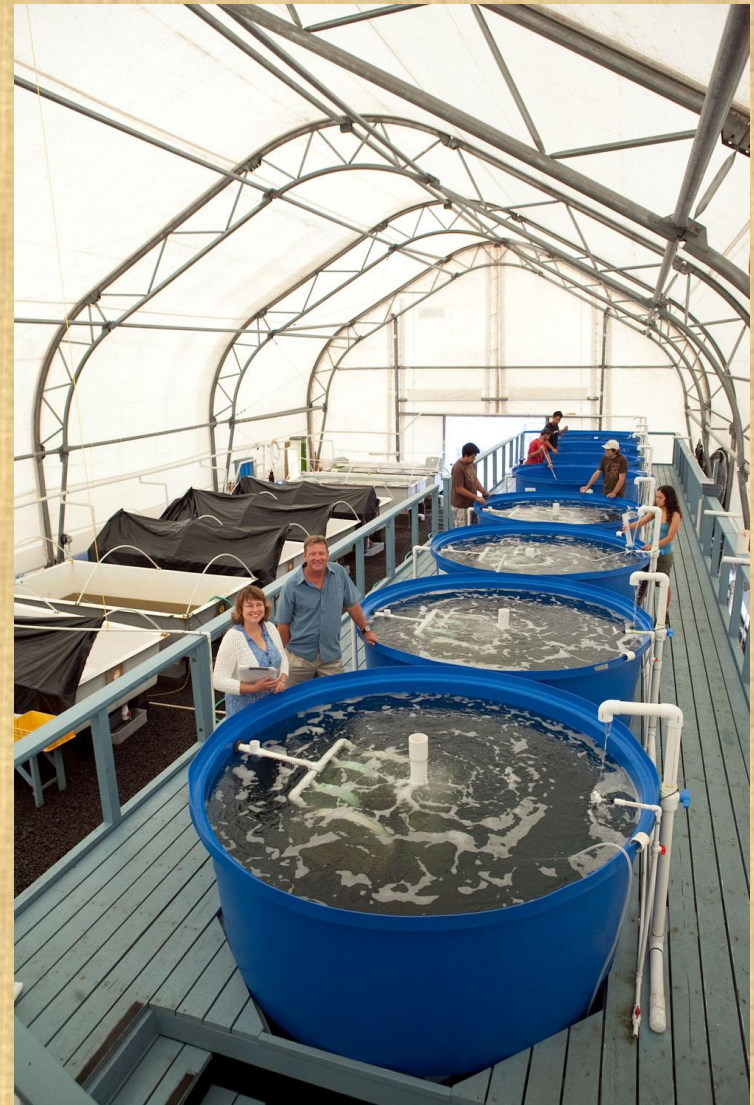
- Demonstration
- Training and education
- Basic biological research
- Applied R&D
- Species



- *Crassostrea gigas* (Pacific Oyster)- 2N and 3N
- *Dendostrea sandvicensis* (Hawaiian Oyster)
- *Pinctada margaritifera* (Black-lip Pearl Oyster)
- *Tellina palatum* (Hawaiian Clam)

Pacific Oyster production at PACRC

- **2009:** 400 million eyed-larvae
- **2010:** 700 million eyed-larvae
- **2011:** 780 million eyed-larvae & 4 million spat (2-4 mm)



Hawaiian Oyster

Dendrostrea sandvicensis

Characteristics:

- Native species, but increasingly rare
- Related to *Ostrea edulis*
- Small (~6 cm), but succulent
- Sweet, nutty flavor
- Potential as half-shell product
- Larval brooder



Hawaiian Oyster-Progress

- Hatchery methods developed- >150,000 produced
- Production of F₂ and F₃ generations
- Beginning selective breeding program
- Grow-out trials in Hawaiian fishponds
- M.S. Thesis-seasonality of reproduction and condition index
- M.S. Thesis-Environmental tolerances (salinity and temp.)



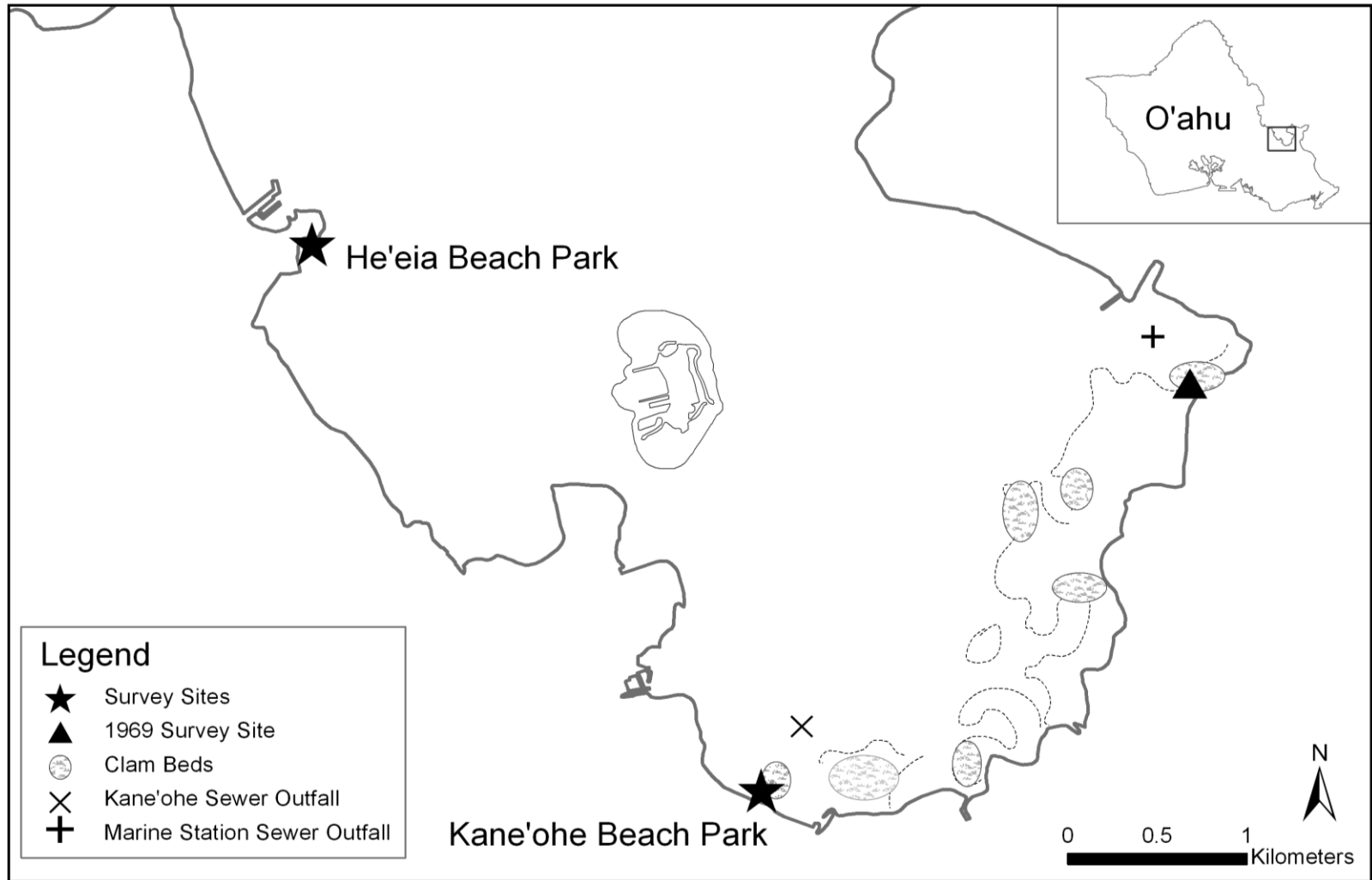
Hawaiian Clam- *Tellina palatum*

- One of the few species still easily found in intertidal zone
- Good flavor quality
- Maximum size found: ~10 cm
- Successfully spawned but not reared to metamorphosis
- Work continues
- Focus of ecological studies on `Oahu

Tellina palatum

- Comparative study of *T. palatum* and Manila clam populations at He`eia and Kaneohe State Beach Park
- Drastic declines since 1960's for Manila clams from +200/m² to <1/m²
- Increases in *T. palatum* from 2/m² to 8/m²
- *A priori* hypothesis that water quality or habitat degradation was responsible not supported

Old Manila clam beds (1969)



up to 22,000 m³/day sewage discharge per day

Growout trials in fish ponds



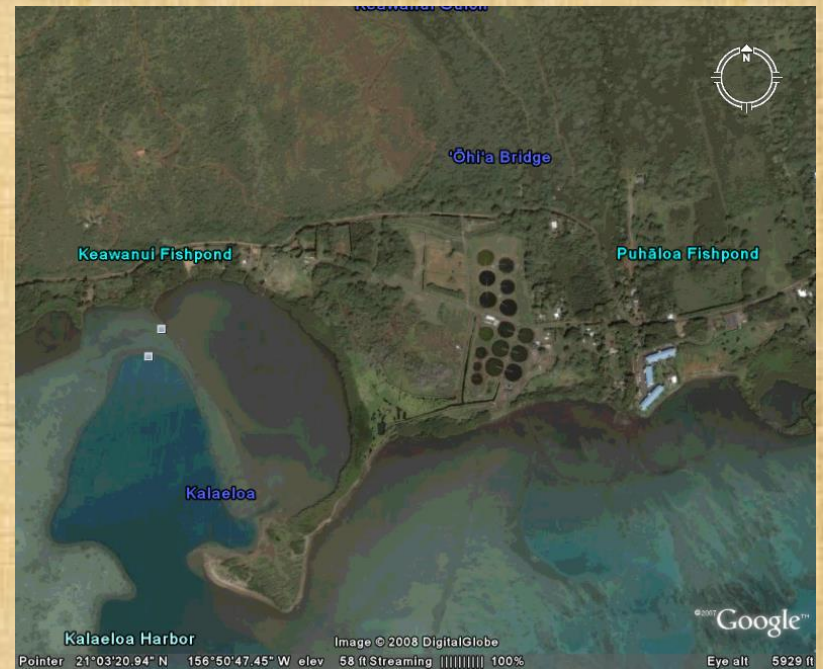


KANEOHE BAY, OAHU



Pa 'i ki'i 'ia na USGS

Keawanui pond and shrimp farm



Grow out trials

2008-2010:

C. gigas trials in He`eia & Keawanui (2N),
Moli`i (3N)

Manila Clam trials-
He`eia and Keawanui



Triploid Oyster Growout at Moli`i



Grow out trials

2010:

- Repeated *C. gigas* diploid trials in He`eia at new sites
- First Hawaiian Oyster growout in He`eia
- Finished 2N and 3 N *C. gigas* comparisons in 4 ponds (He`eia, Hale `O Lono, Moli`i and Keawanui)



Special thanks to Taylor Shellfish for the triploid oyster spat

Take home message

- Hawaiian fish ponds can produce market size (3-4") Pacific Oysters in 5-6 months
- Obtaining same size takes 2-3 years in Pacific NW



Shellfish Sanitation

Interstate Shellfish Sanitation Conference (ISSC): formed in 1982 to foster and promote shellfish sanitation through the cooperation of state and federal control agencies, the shellfish industry, and the academic community.

The National Shellfish Sanitation Program (NSSP): the federal/state cooperative program recognized by the U. S. Food and Drug Administration (FDA) and the Interstate Shellfish Sanitation Conference (ISSC) for the sanitary control of shellfish produced and sold for human consumption. The purpose of the NSSP is to promote and improve the sanitation of shellfish (oysters, clams, mussels and scallops) moving in interstate commerce through federal/state cooperation and uniformity of State shellfish programs.

Participants in the NSSP include agencies from shellfish producing and non-producing States, FDA, EPA, NOAA, and the shellfish industry. Under international agreements with FDA, foreign governments also participate in the NSSP. Other components of the NSSP include program guidelines, State growing area classification and dealer certification programs, and FDA evaluation of State program elements.

Shellfish Sanitation

Formal procedures for state representatives to review shellfish sanitation issues and develop regulatory guidelines published in revisions of the **NSSP Model Ordinance**.

<http://www.issc.org/nssptoc.aspx>

Hawai'i is an importing State only. State does not fund the classification of shellfish growing areas.

Classification of shellfish growing areas, which depends a shoreline survey and regular water quality sampling

Classifications:

- Approved
- Conditionally approved
- Restricted
- Conditionally restricted
- Prohibited

Water quality sampling

Fecal coliform

- Thanks to Dr. Paul Bienfang
- Funded by NOAA Hawaii Sustainable Seafood Grant

- He`eia: two post-rain samples
- Moli`i: two post-rain samples
- Keawanui: one “dry” sample

- Results were generally good, even after heavy rains
- Most areas within the ponds could be classified as conditionally approved or approved

Progress with Shellfish Sanitation

- Shellfish Working Group was assured by DOH that classification of growing areas would be done
- Fund-raising (new grants from NOAA Seafood Program & Sea Grant)
- Impending visit by FDA laboratory specialist to certify laboratory (Nov. 28)
- Followed by training for DOH in shoreline surveys and water quality monitoring design (Nov. 28)
- Three DOH labs to be certified (Kauai, Hilo and `Oahu)

Next Steps

- Classification of growing areas (at least 7 sites requesting)
- Up to one year of monthly water quality sampling
- Producer training in all aspects of shellfish sanitation, from pond to table



Next Steps

- Continue development of local species
- Development of appropriate culture systems for Hawaiian fishponds
- Which *C. gigas* strain performs best in Hawaii (including naturalized strain)?
- Will better predator exclusion improve clam performance?
- Test Kumamoto oysters (*C. sikamea*) in ponds
- Track condition index



SHELLFISH SHOW PROMISE

The state's rich resources mean the industry could take off once facilities are certified for safety

By Kristen Consillio
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Bruce Anderson has raised tens of thousands of oysters over the past two years at the 800-year-old Moli fishpond nestled at the base of Kualoa Ranch.

The former state Health Department director and his wife, Debbie, have spent many weekends sorting and scrubbing oysters that grow in the nutrient-rich ancient Hawaiian fishpond owned by Kualoa.

The ranch and operators of at least three other fishponds have begun to raise Pacific oysters in hopes they will someday be able to sell them in Hawaii and ship them to other states.

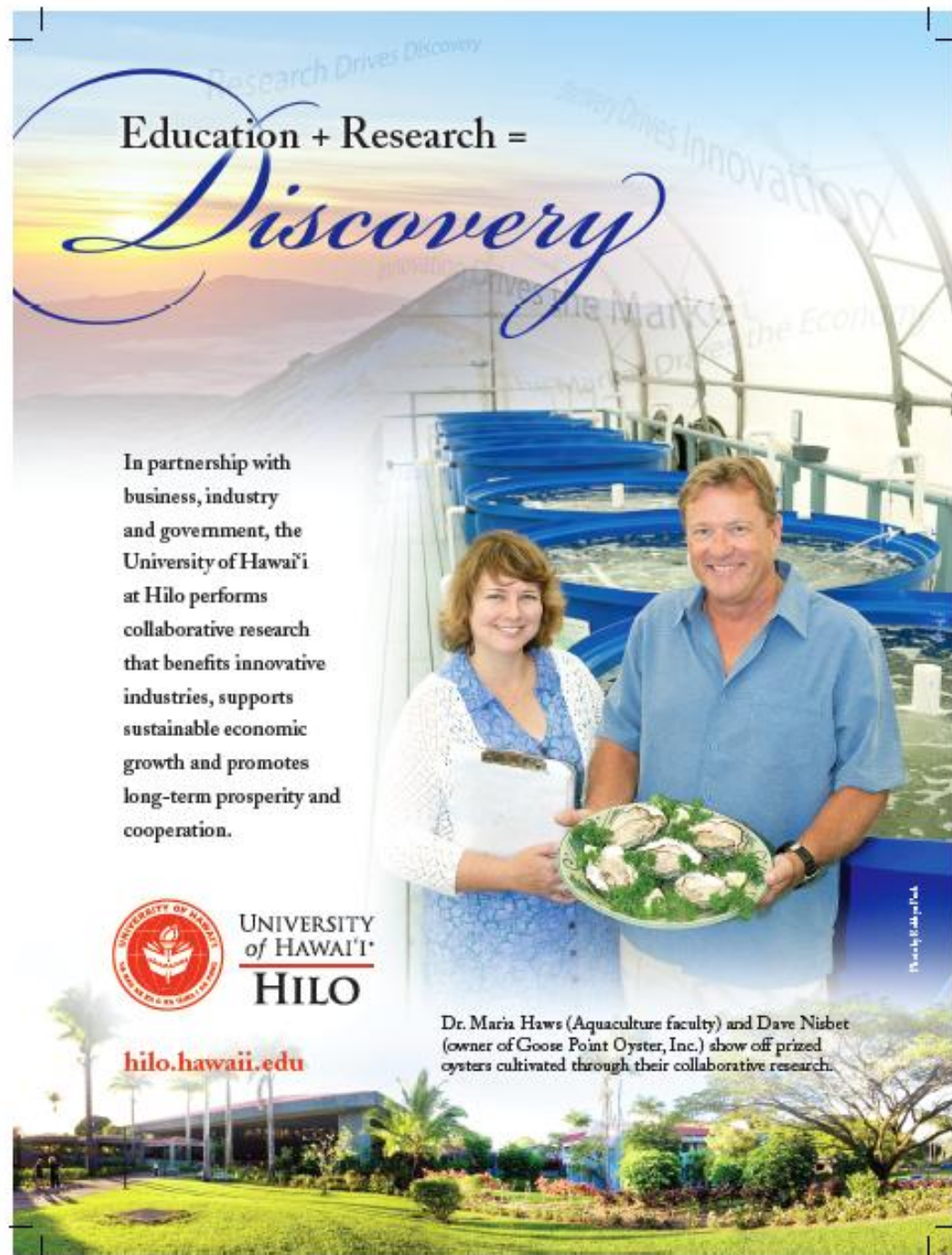
It's a business with great potential for Hawaii.

Washington state's oyster industry generates \$200 million a year. Hawaii, so far, generates zero.

The problem has been government bureaucracy.




UHH's contribution to APEC magazine



Research Drives Discovery
Research Drives Innovation
Research Drives the Market
Research Drives the Economy

Education + Research =
Discovery

In partnership with business, industry and government, the University of Hawai'i at Hilo performs collaborative research that benefits innovative industries, supports sustainable economic growth and promotes long-term prosperity and cooperation.

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hilo.hawaii.edu

Dr. Maria Haws (Aquaculture faculty) and Dave Nisbet (owner of Goose Point Oyster, Inc.) show off prized oysters cultivated through their collaborative research.

Photo: [unreadable]

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- NOAA
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- PIPES internship program
- Goosepoint Oyster and Hawaiian Shellfish LLC



*High School Students
Keawanui, Moloka`i*