

Overview of Marine Cage Culture Operations in the U.S.A.

Presented at the
**Workshop for Development of Sustainable
Practices for Marine Cage Culture
Operations in the U.S. Caribbean**
Nov. 2-3, 2010, San Juan, Puerto Rico

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The Aquaculture Imperative



The San Diego Union-Tribune
 Saturday, February 24, 2007

UNION-TRIBUNE EDITORIAL
Hatch fish farming
Aquaculture belongs in U.S. waters

Hardly a month goes by without a health study concluding that Americans should eat more fish. There's just one problem – the world doesn't have nearly enough fish. Wild stocks leveled off years ago, and scientists warn of crashing populations caused by overfishing. Meanwhile, human population growth and rising worldwide wealth are driving sharp increases in demand for seafood.

The answer is aquaculture, a fancy word for seafood farming. The industry is growing rapidly around the world – everywhere but the United States, where environmental opposition and red tape have stymied would-be farmers.

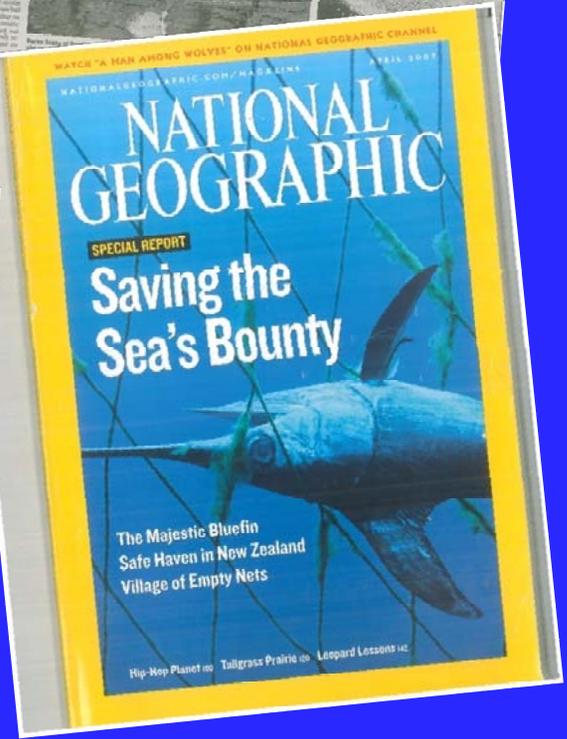
Congress has a perfect opportunity this year to clear away obstacles. The National Marine Fisheries Service, a federal agency, is promoting a bill to create a regulatory system for aquaculture in federal waters, which extend from three to 200 miles offshore. This bill deserves passage.

Aquaculture got a bad rap because of the environmental abuses in other countries. Yet Americans import 70 percent of their seafood each year, with about 40 percent of it farmed. This should be a U.S. industry, under U.S. supervision.

The right way to farm fish is being demonstrated in San Diego at the Hubs-SeaWorld Research Institute. The institute has been raising hatchlings in Carlsbad for years to replenish wild stocks of threatened species. Lately it's been honing commercial-scale technologies at SeaWorld, Santa Catalina and Escondido.

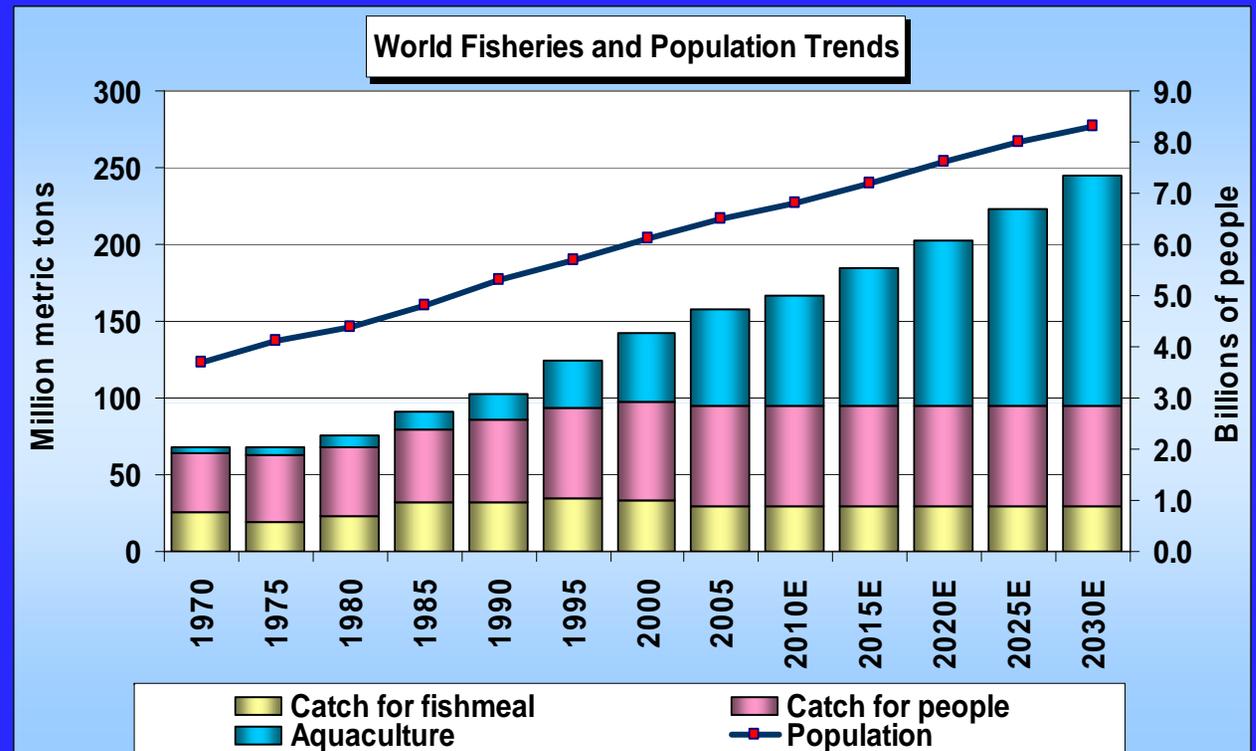
Researchers raise California yellowtail, rockfish, sea bass and other species in deep-water pens. Waste is flushed naturally. Workers monitor health and nutrition to yield food that recently won a sushi competition in Japan.

It's time for environmentalists to embrace responsible aquaculture, and for Congress to release this industry into the wild.



Increasing Global Demand

40 million more tonnes of aquatic food will be required by 2030 to maintain the current per capita" current per capita"
 FAO 2006



Courtesy: Jingjie Cho, NOAA Aquaculture

NOAA Strategic Goal: 1.5 million more tonnes by 2025

At a landed price of \$4/kg this is **\$6 billion** supporting 60,000 seafood industry jobs for a net benefit of \$24 billion to the US economy.



Salmon Farming:

Unfairly used as the poster child for Anti-aquaculture



Why Move to Open Ocean?

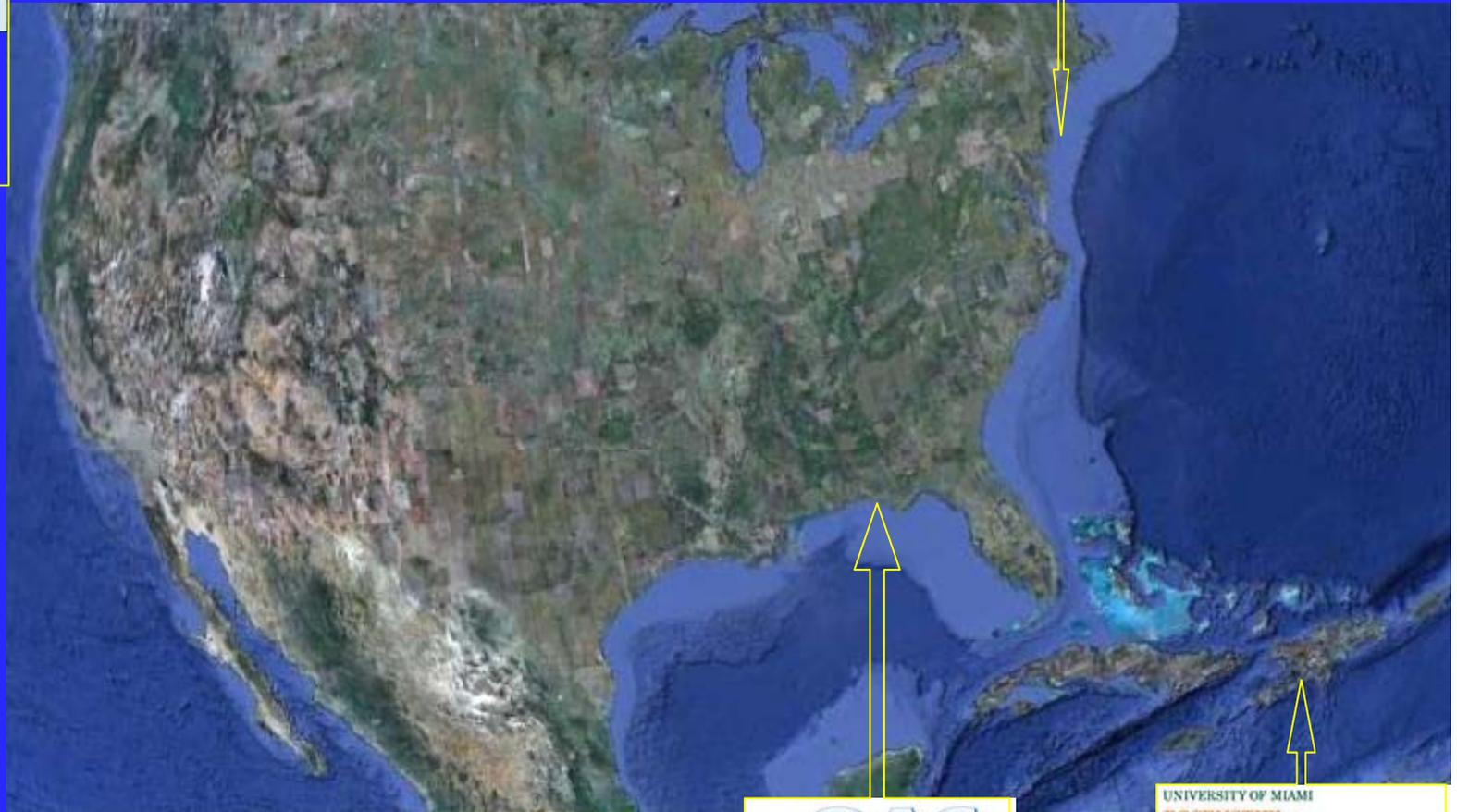
In the coastal zone . . .

- Land values make aquaculture economically impractical
- Water quality is often poor
- There are more user conflicts
- Permitting processes are exhaustive and designed to limit growth





Cates International, Inc.



UNIVERSITY OF MIAMI
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SCHOOL of MARINE &
ATMOSPHERIC SCIENCE



Snapperfarm, Inc.

Ocean Farming of Marine Finfish in the Northeast

Univ. of New Hampshire



Photos by University of New Hampshire



Ocean Farming of Marine Finfish in the Southeast

Univ. of
Miami/Snapperfarm



Photo by University of Miami and Snapperfarm, Inc

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Photo by Ocean Farms, Teaball, Inc

Ocean Farming of Marine Finfish in the Hawaii Cates International & Kona Blue



Photo by Kona Blue



Photo by University of Hawaii

Photo by Kona Blue

Ocean Farming of Marine Finfish in Baja California

UABC/CISCESE & 8 Tuna
Farms

Photo by Autonomous University of Baja California



Ocean Farming of Marine Finfish "almost" in California HSWRI



HSWRI Marine Finfish Aquaculture Program

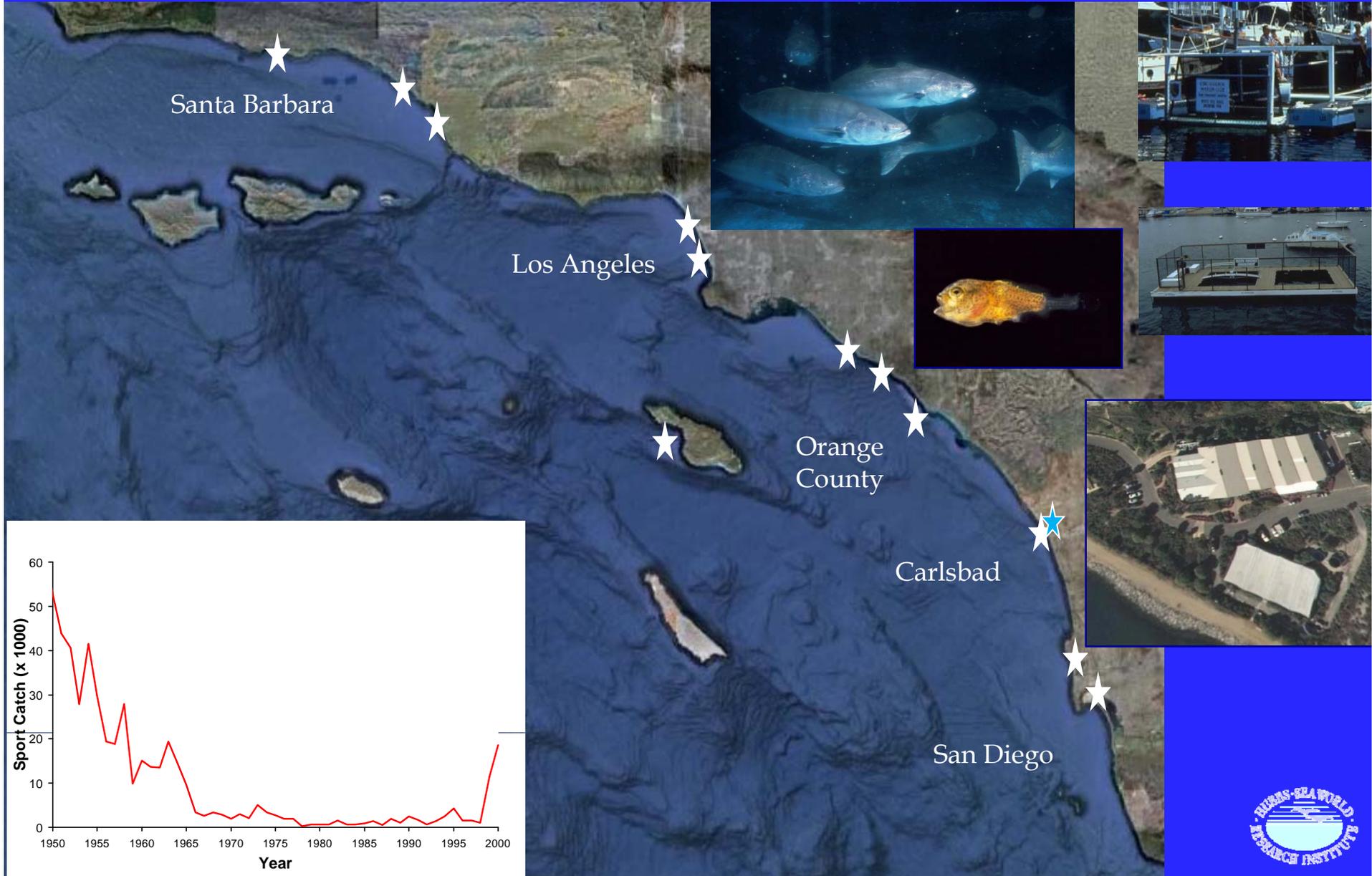


Hatchery Production



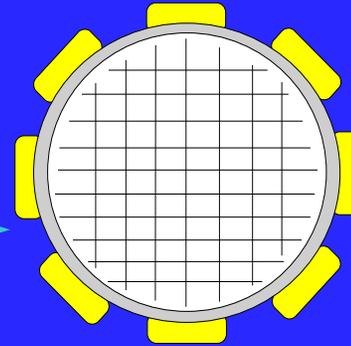
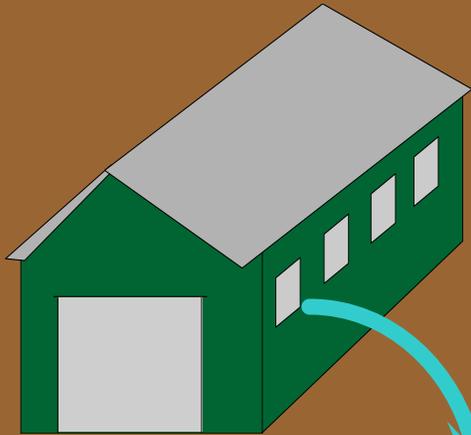


Ocean Resources Enhancement and Hatchery Program

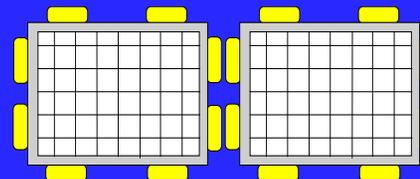


White Seabass Culture Model

Market
(1998-1999)



2000- present
(8-12" fish)



1990-2000
(8" fish)

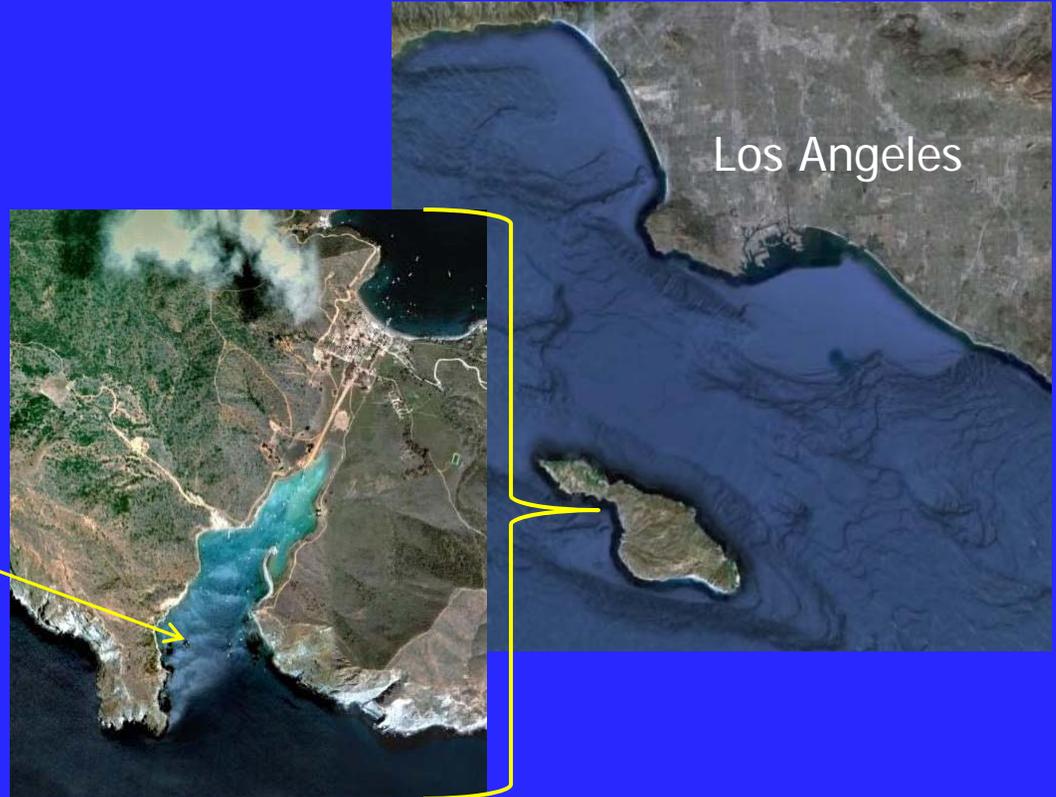
1986
(4" fish)

STOCK ENHANCEMENT



Catalina Island Commercial Demonstration Project

NOAA/Saltonstall Kennedy Funded



Los Angeles

Significant Site Characteristics

- Depth 15-23m
- Located within existing mooring lease area
- Well protected against rough sea conditions from three directions



Results

- Reached marketable size in 18 months
- 97% survival and no disease related mortality
- Zero escapes
- Product quality was deemed "excellent"
- *"...net cages can influence the fish community in a positive way"**

* Oakes and Pondella; 2009; J. World Aquaculture Soc.; Vol. 40, No. 1; pp 1-21



California should lead in Ocean Farming:

- Largest ocean economy in the nation - \$42.9 billion
- Nation's leading agriculture producer - \$32 billion
- With loss of tuna fleet, drastically changed fishing industry
- Over 1,100 miles of coastline
- Excellent climate and ocean conditions, especially in the south
- Enviable array of native species with high market value
- Innovation in all aspects of technology, including hatcheries



Candidate Marine Finfish for California

Category	Common Name	Latin Name	Potential
"Bass"	White seabass	<i>Atractoscion nobilis</i>	Excellent
	Striped bass	<i>Morone saxatilis</i>	Excellent
Tunas and jacks	Bluefin tuna	<i>Thunnus thynnus</i>	Excellent
	Yellowfin tuna	<i>Thunnus albacares</i>	Excellent
	Bigeye tuna	<i>Thunnus obesus</i>	Excellent
	Yellowtail	<i>Seriola lalandi</i>	Excellent
Flatfish	California halibut	<i>Paralichthys californicus</i>	Very good
Groundfish	Sablefish	<i>Anoplopoma fimbria</i>	Excellent
	Cabazon	<i>Scorpaenichthys marmoratus</i>	?
	Lingcod	<i>Ophiodon elongatus</i>	Good
	Rockfishes	<i>Sebastes spp</i>	?
Other	California sheephead	<i>Semicossyphus pulcher</i>	?



Open Ocean Farming Technologies Already Available

- The basic technologies for offshore farming are already in place . . . largely overseas but also embedded in the fishing industry
- Opportunities for innovation exist – especially for submerged and deep water environments



Hatchery

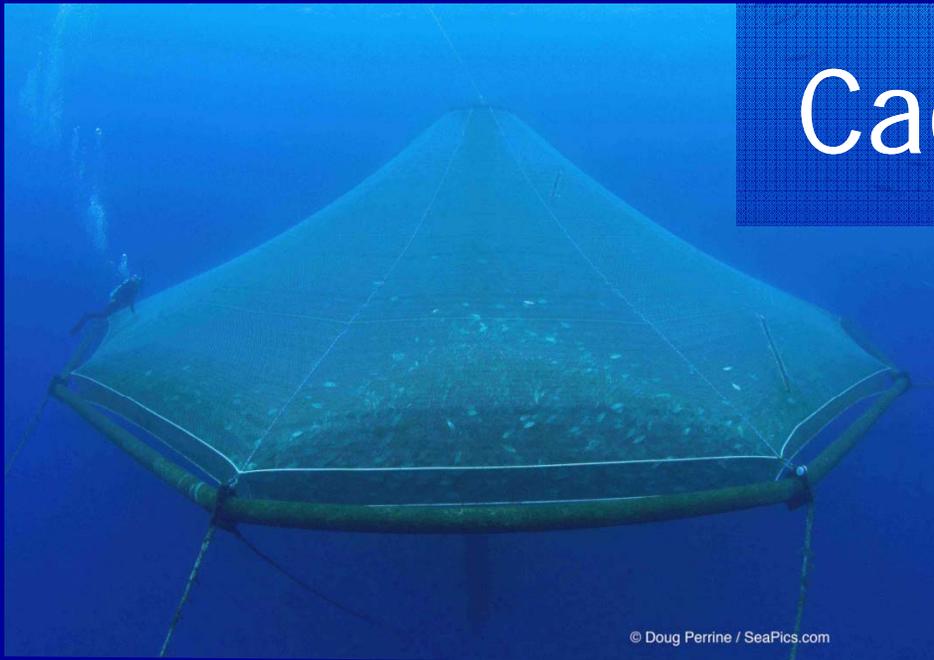


Photo by Kent Seatech



Photo by The Abalone Farm

Cages



© Doug Perrine / SeaPics.com

Photo by Kona Blue

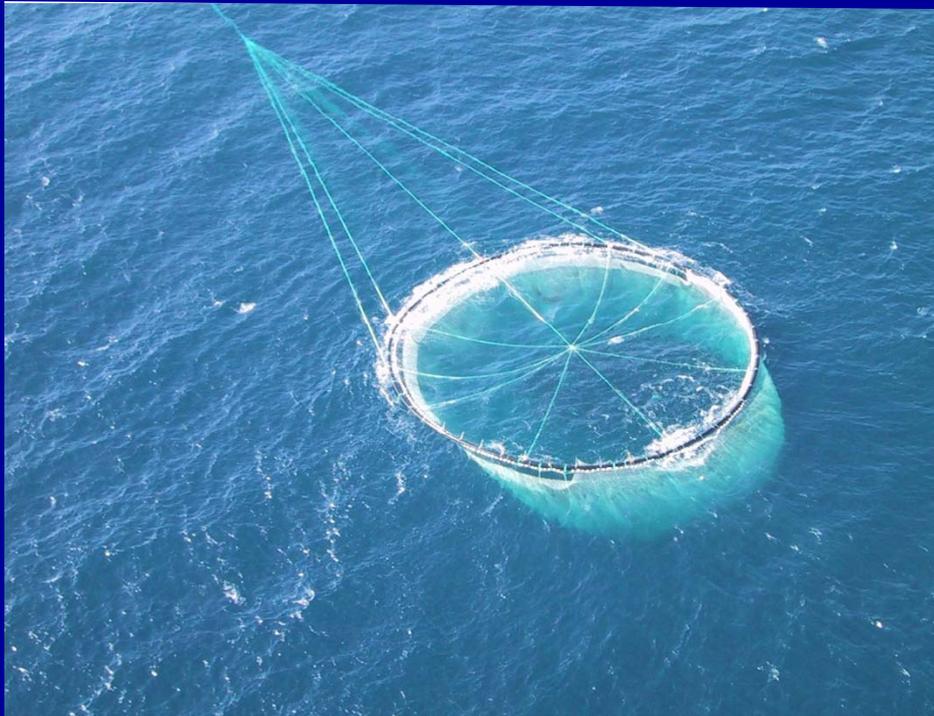


Photo by Ocean Forest Teahouse, Inc.

Feeds and Feeding



Photos by University of New Hampshire



Photos by Labs, Forster

Fish Transport and Handling



Photo by University of New Hampshire



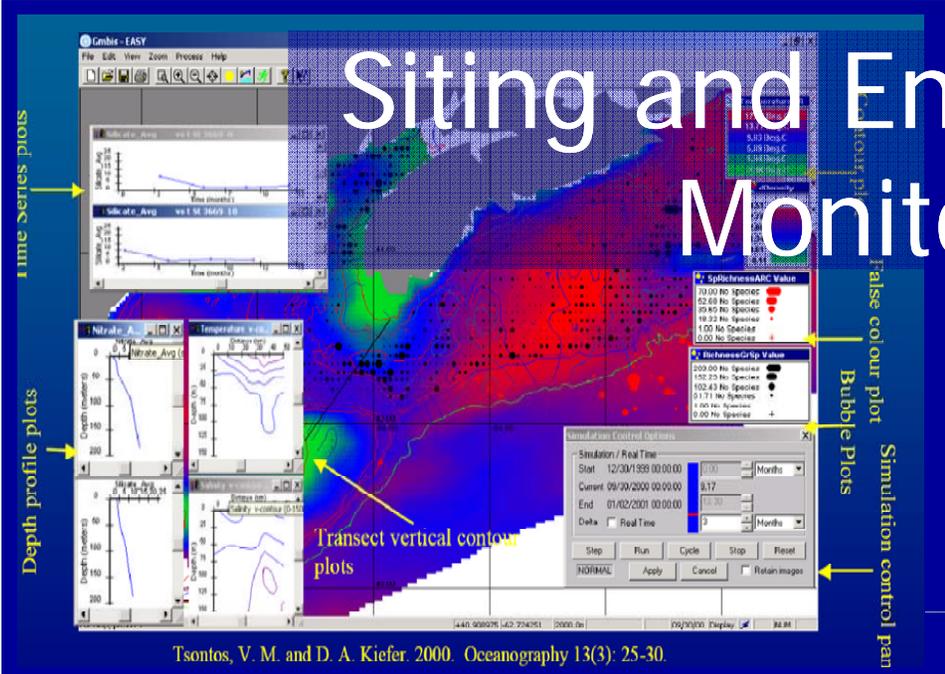
Photo by University of Hawaii and Cates International



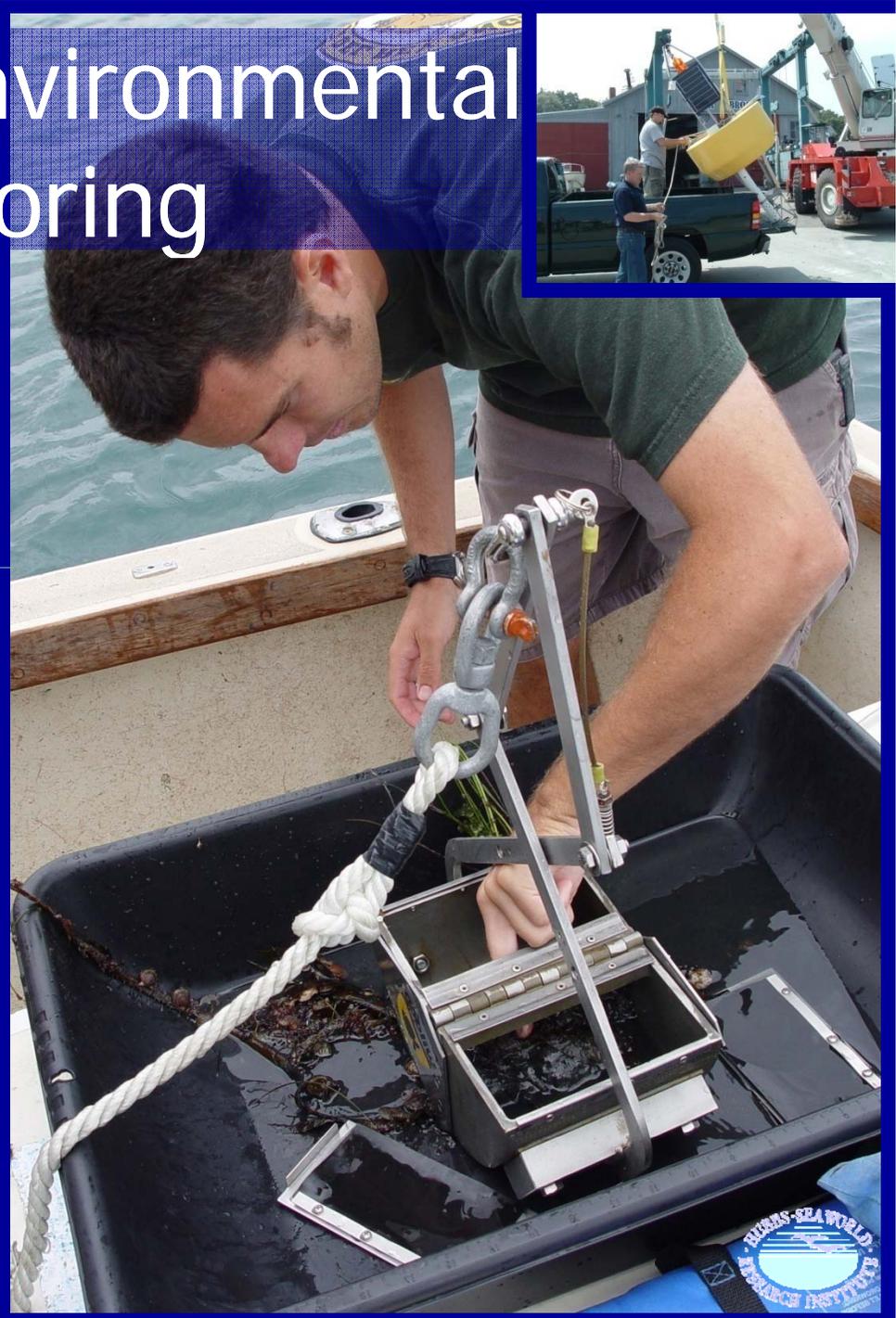
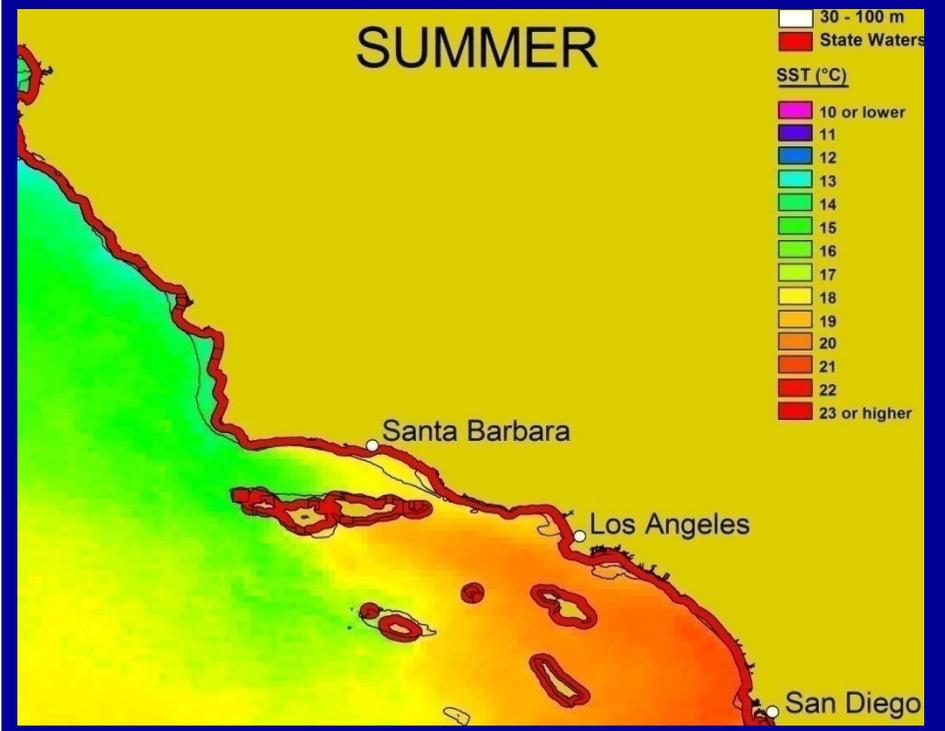
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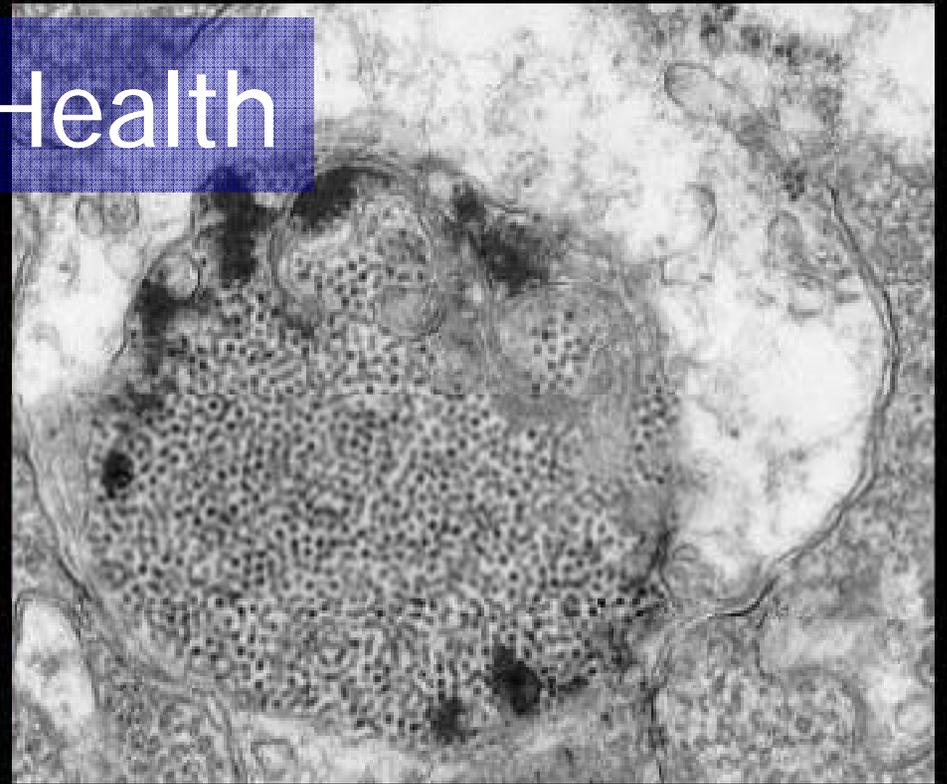
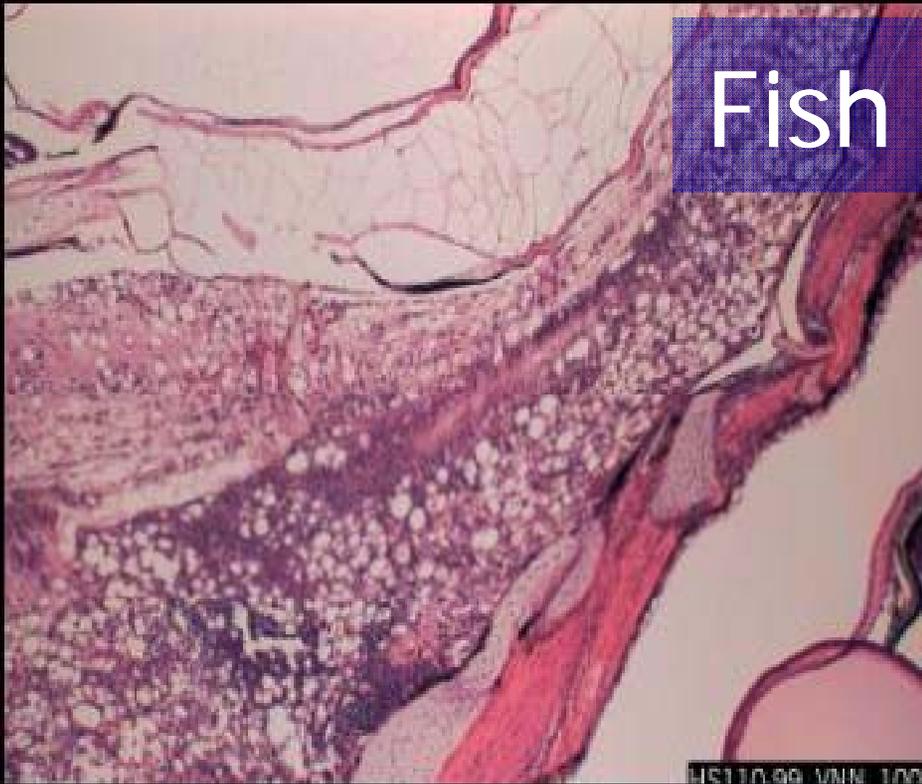
Siting and Environmental Monitoring



Tsontos, V. M. and D. A. Kiefer. 2000. Oceanography 13(3): 25-30.



Fish Health



- Diagnostic tools – e.g., PCR, ELISA
- Treatment options – e.g., vaccine development

Ocean Farming Summary

- The technology for ocean farming exists
- Ocean farming in the United States is relatively new
- Existing projects have been monitored extensively and have shown that large volumes of high quality product can be raised in an environmentally sustainable manner
- This includes nearly 10 years of cage farming white seabass in California



Photo by University of Miami and Snapperfarm, Inc.

USA Situational Summary

- Ocean farming is needed to meet demand and reduce pressure on fisheries
- Ocean farming is here and is expanding whether the USA embraces it or not
- USA is a leader in agriculture production, technology development and environmental stewardship
- We have a great opportunity



What is Needed

- Follow the GoM PEIS model
- Commercial demonstration farms that are allowed to work
 - Permitted for a minimum of 1,000 tons annual production of economically and ecologically appropriate species
 - NOAA regional offices working to coordinate biological reviews of permits for NEPA certification
 - Rigorous environmental assessment with pre-determined monitoring variables and evaluation parameters



Gulf of Mexico Management Plan EIS

- Extremely thorough and well done PEIS
- Addressed every major concern
- Reasonable adaptive management strategies
- Should be used as a reference resource
- Consistent with HR 4363 but denounced by Bill's author



Questions?



THE FUTURE
OF FISHING

"With earth's burgeoning human population to feed, we must turn to the sea with new understanding and new technology. We need to farm it as we farm the land."

Capt. Jacques Yves Cousteau, 1975

"As wild fish stocks decline, it is important to be able to have more aquaculture."

Honorable Gary Locke, Secretary of Commerce



Thank You!

