

# AQUACULTURE IN THE 21<sup>ST</sup> CENTURY

## WHAT IS CART?



The Conservation Aquaculture Research Team (CART) is a diverse group of scientists and practitioners who have teamed up to address the most pressing questions about how we get food from the oceans. In particular we focus on ocean aquaculture (aquatic farming), its role in feeding the planet, and the potential and constraints to sustainable production. Founded at the National Center for Ecological Analysis & Synthesis, a world-renowned environmental science 'think and do-tank' based at UC Santa Barbara, CART uses the scientific tools of synthesis and analysis to tackle key questions within four broad categories relevant to industry, policy, and conservation.

## TOPIC #1: OFFSHORE AQUACULTURE

Offshore aquaculture is the most nascent form of aquatic farming in the world, with the technology and implementation just now coming online. A number of countries, including Norway, Mexico, Indonesia, and the United States, are actively planning to expand efforts. However, research is limited on the potential impacts of offshore farming and opportunities for sustainable growth. Numerous unknowns remain across systems and species, and the impact on human communities.

### EXAMPLE RESEARCH TOPICS

- What are the economic, governance and cultural constraints to growth in offshore aquaculture?
- Where is the potential greatest for offshore aquaculture in the United States?

## TOPIC #2: AQUACULTURE, SUSTAINABILITY AND GLOBAL FOOD SYSTEMS

Where and how we produce food has tremendous impact on the planet. Nearly 40% of useable land on the planet has been developed for agriculture and livestock production, requiring 70% of all freshwater resources. All but a small portion of the world's wild fish stocks are being exploited. All too often the sustainability of food is assessed in isolation, one food system at a time, and aquaculture is rarely considered. When we put aquaculture on the same proverbial table as all other food systems, how does it perform?

### EXAMPLE RESEARCH TOPICS

- What is the environmental impact of different food systems? How does aquaculture compare?
- What are the conservation implications of a growing human population and its increasing demand for protein?
- How can we better align how we produce (sea) food while minimizing impacts on the planet?
- What are the nutritional and/or conservation trade-offs and limitations of a pescetarian world?



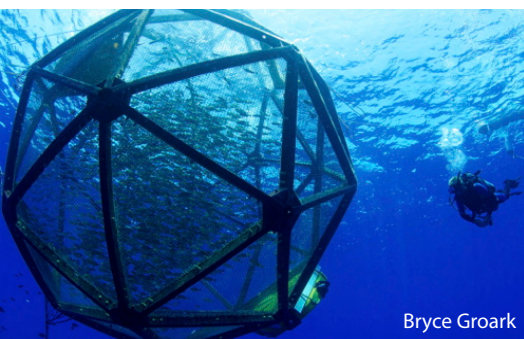


## TOPIC #3: AQUACULTURE AND FISHERIES

Although aquaculture dates back thousands of years, it has only recently become a major player in the global food system. Typically perceived at odds with wild-caught fisheries, there is very little scientific evaluation and understanding of how aquaculture can and does interact with fisheries. We need to know when aquaculture (and what kind of aquaculture) has a positive or negative effect on local and/or global seafood markets.

### EXAMPLE RESEARCH TOPICS

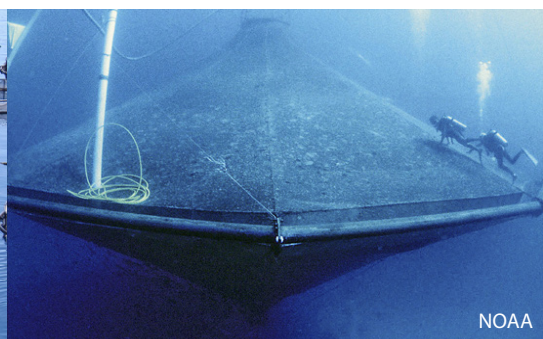
- How does aquaculture interact with wild fisheries? How will they compete for resources and markets, and where and how can they complement each other?
- With ecological limits on fisheries when and where can a species or community benefit from aquaculture?



Bryce Groark



NOAA



NOAA

## TOPIC #4: AQUACULTURE AND CLIMATE CHANGE

Climate change will have dramatic and variable impacts across our planet, and in turn our food systems. With oceans absorbing the majority of heat and carbon dioxide, marine species face many of the biggest changes. Although huge strides have been made understanding how fisheries will respond to climate change, comparatively little research has been done regarding aquaculture. This knowledge deficit has gone relatively unnoticed, but threatens local to global food security.

### EXAMPLE RESEARCH TOPICS

- How will climate change affect where and which species can be farmed? Can we anticipate these changes and optimize policy and investment decisions accordingly?
- Are salmon hatcheries & shellfish aquaculture in Alaska ready for climate change? This important question has not been researched extensively.
- How much can algae and shellfish aquaculture offset climate change? Where are the best places for this?

## SUPPORT OUR WORK

**POSTDOCTORAL FELLOW:** Postdocs provide the engine of scientific discovery for CART. Investing in this early career stage can catalyze research productivity while helping launch the careers of talented, diverse young scientists.

**RESEARCH ANALYST:** Analysts provide key support to research initiatives that are data and computationally large. Investing in our research team helps accelerate the pace and scope of work that can be done by our postdocs and leadership team.

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