

Intensive practical training of women in Integrative Multi-Trophic Aquaculture: Towards a sustained mariculture workforce in Puerto Rico



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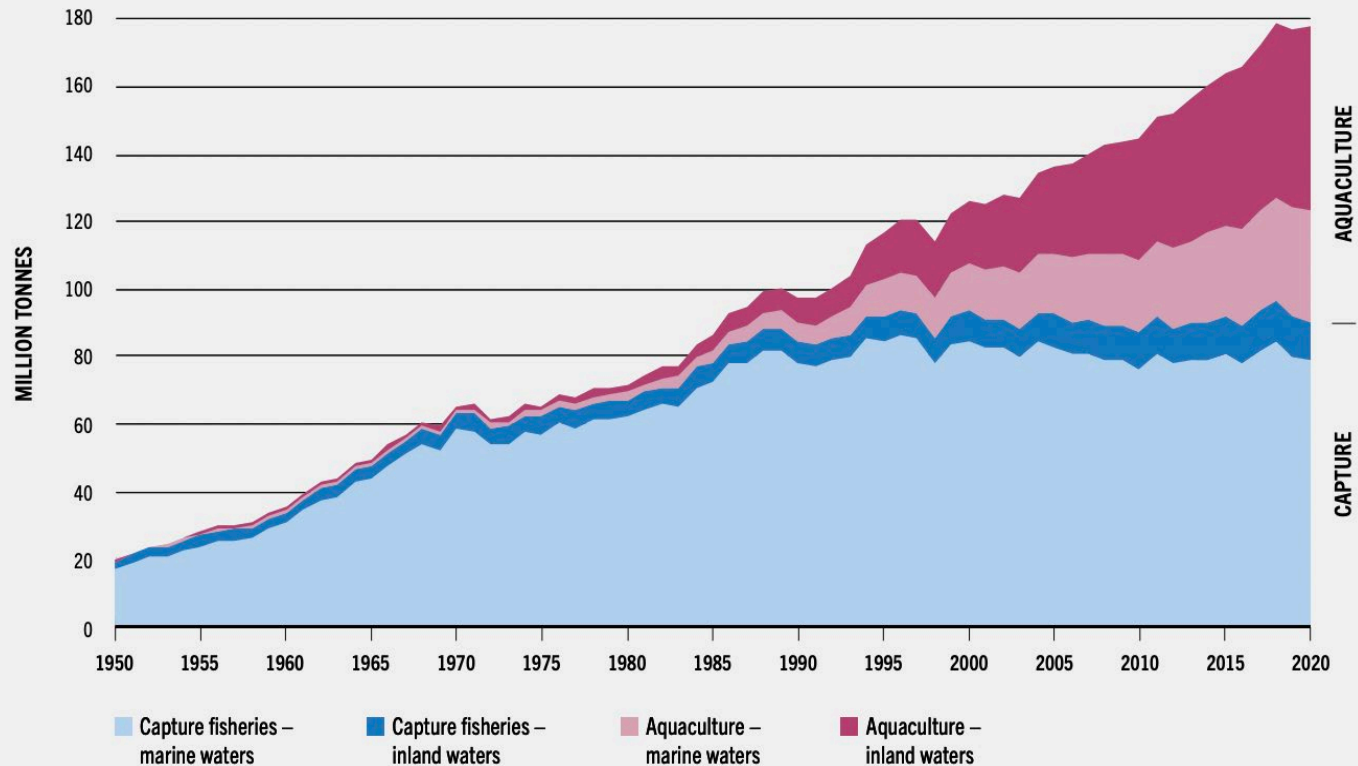


THANK YOU...



Consumption of seafood has increased while marine-capture fisheries production has decreased. The World Bank predicts that aquaculture will be the world's primary source of seafood by 2030.

FIGURE 1 WORLD CAPTURE FISHERIES AND AQUACULTURE PRODUCTION

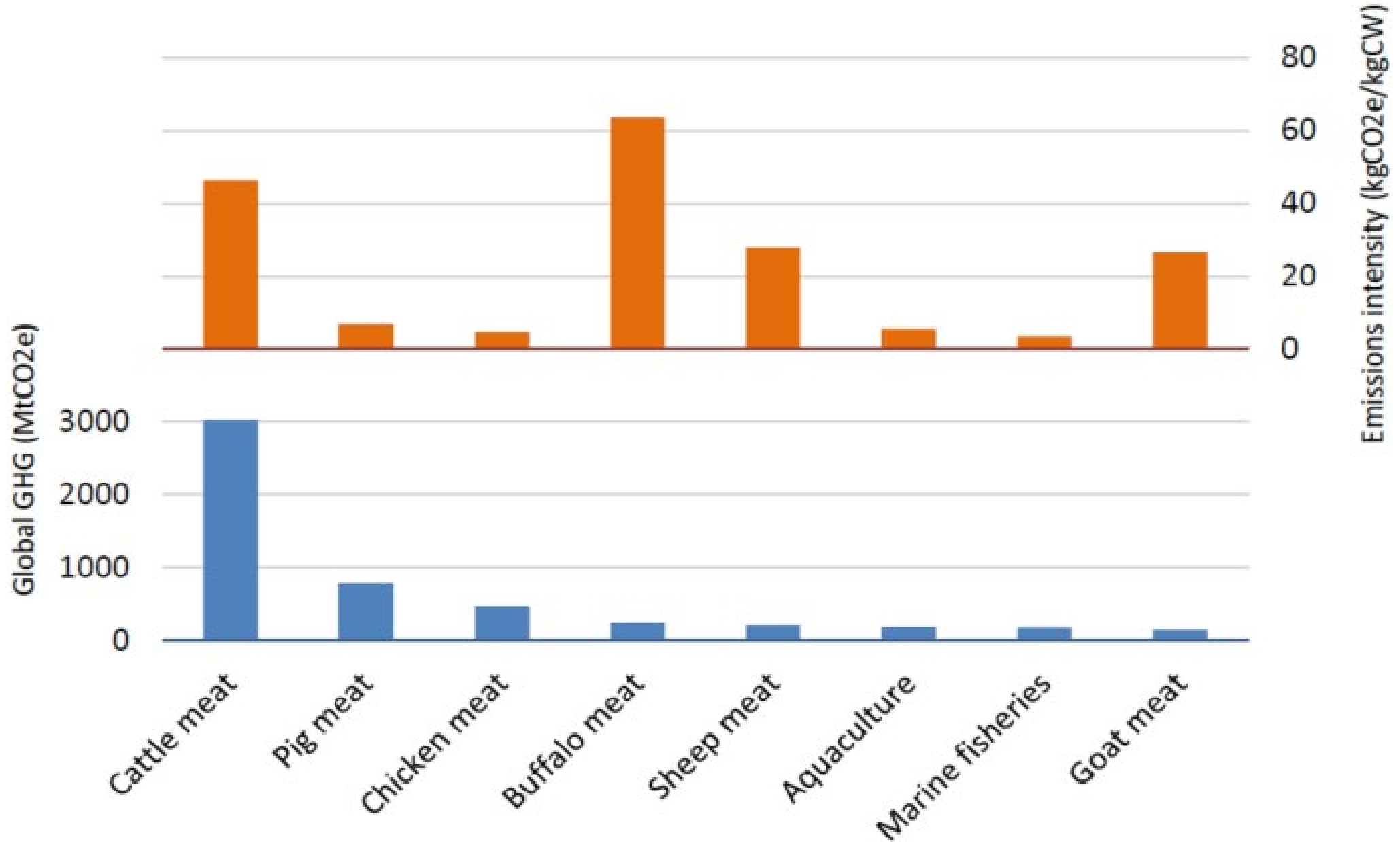


NOTES: Excluding aquatic mammals, crocodiles, alligators, caimans and algae. Data expressed in live weight equivalent.
SOURCE: FAO.

Women's work plays a vital role in aquaculture, with the UN Food and Agriculture Organization reporting that women make up 70% of the aquaculture workforce worldwide.

Women's role in Puerto Rico Aquaculture remains a potential?

Comparative Greenhouse Gas Emissions Among Farmed Food



Currently, aquaculture systems produce only one species or trophic group.



Monoculture has several disadvantages:

Selective breeding.

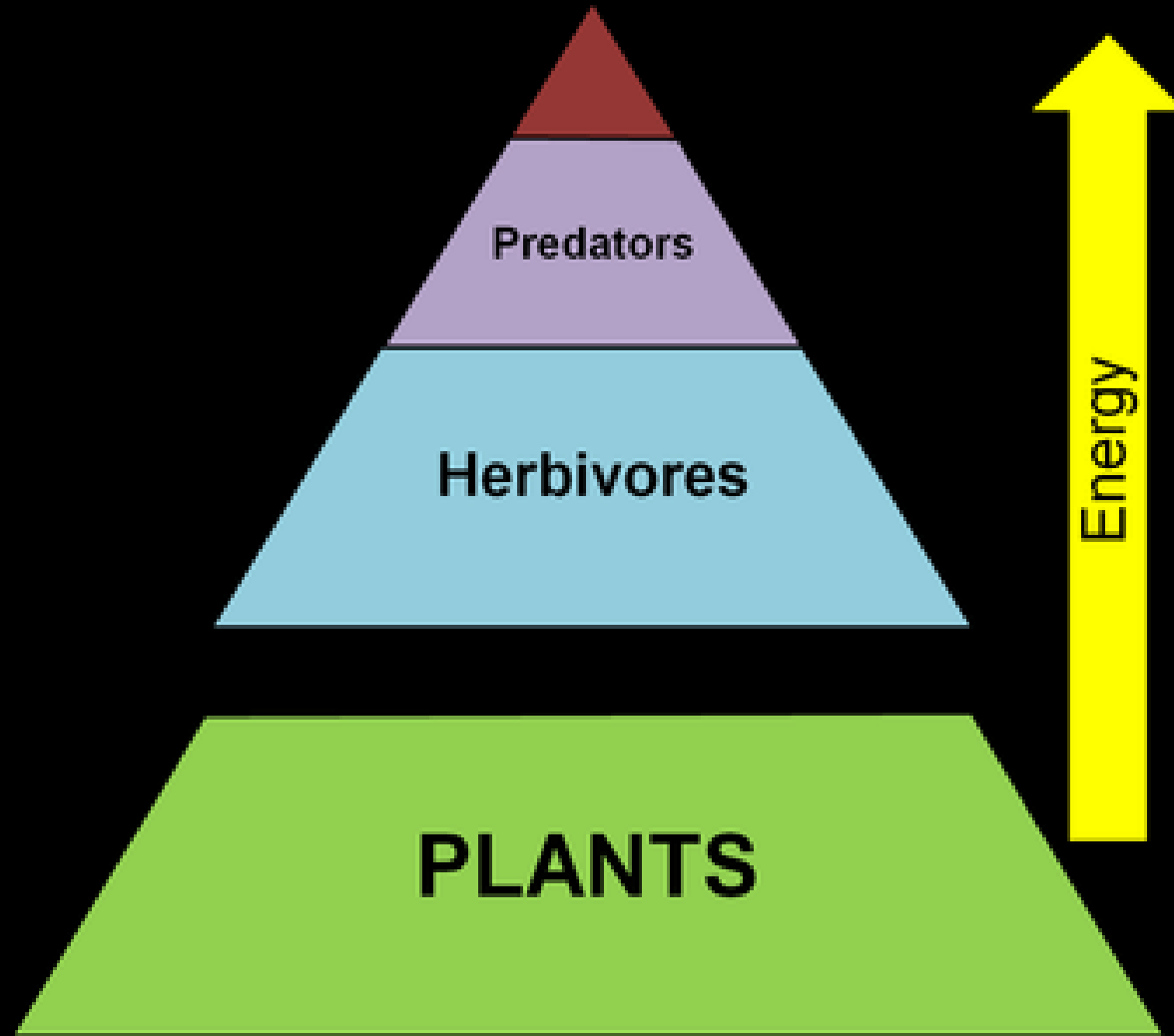
Disease outbreak.

Environmental degradation.

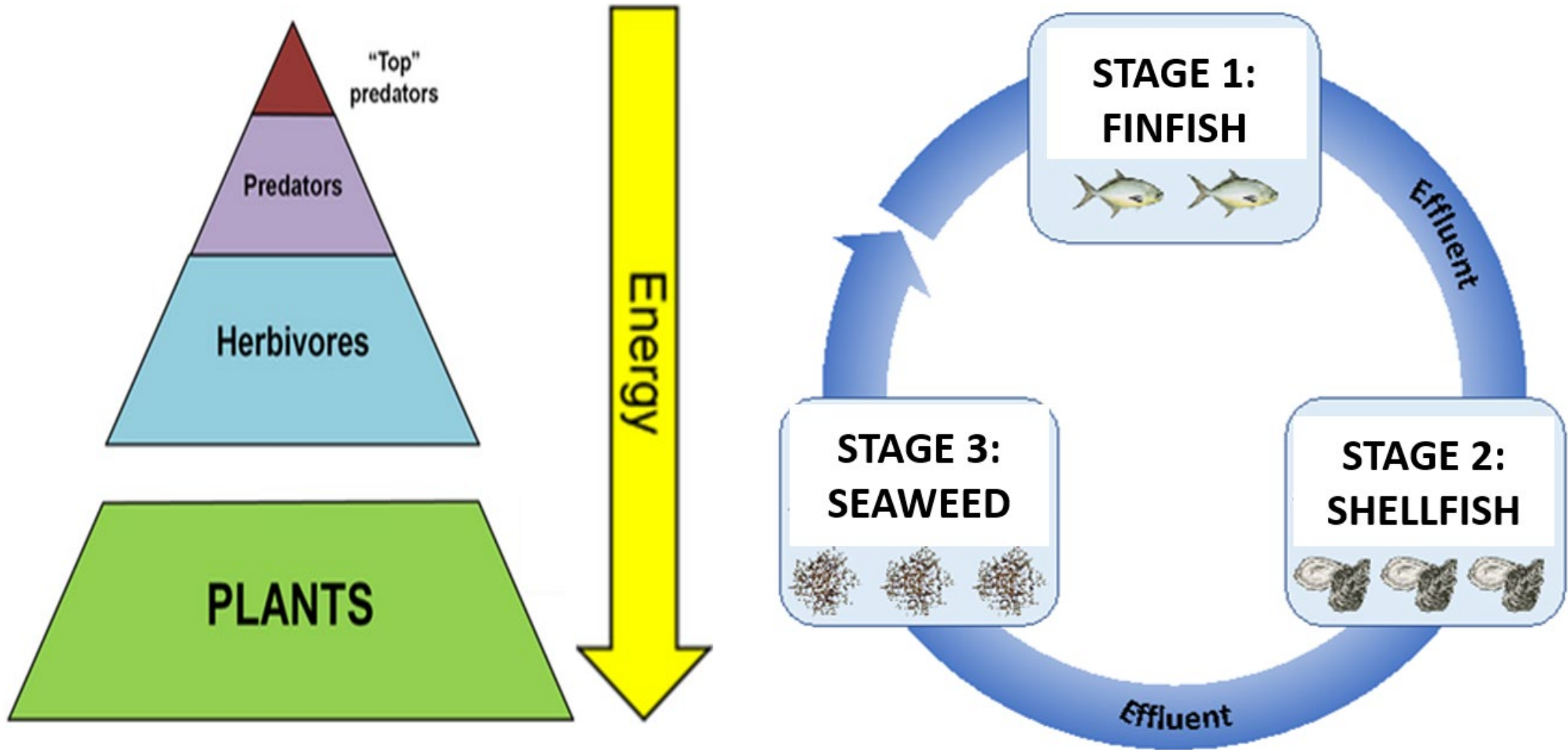
Alternative to Monoculture?
Integrated Multi-Trophic Aquaculture

IMTA

Recall the flow of energy in a simple food chain?



The Conceptual Framework of the IMTA Technology is an Inverted Food Chain!



Conceptual framework of the IMTA technology. High-protein organic waste and uneaten fish-food accumulated in the finfish culture Stage 1 tanks flow, as effluent, into the Stage 2 tanks and become food for the organic extractors (shellfish) being cultured, and then the wastes of these organisms, flow into the Stage 3 tanks where inorganic wastes are used as fertilizers for food production by the inorganic extractors (seaweeds and aquatic plants) being cultured in these tanks. (Diagram modified from Turingan et al. 2023)

Integrated Multi-Trophic Aquaculture

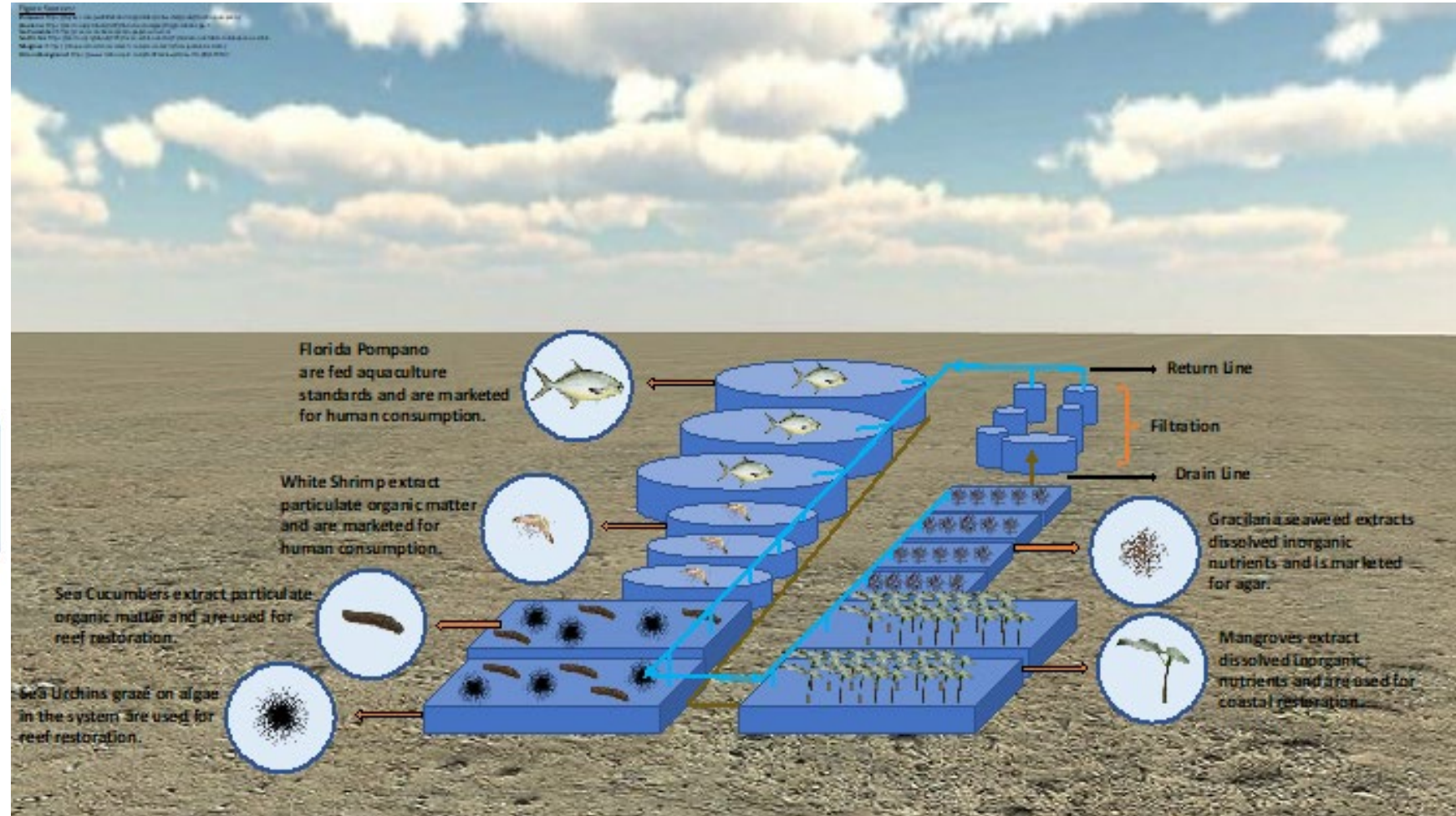
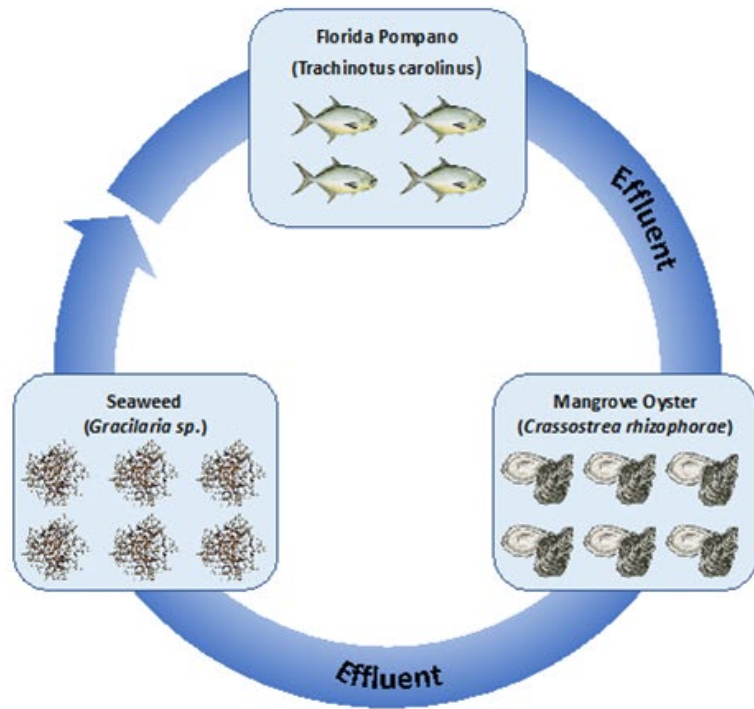
Advantages:

1. Environmental Remediation
2. Economic Stability
 1. Improved Output (Long-term)
 2. Lower Cost (Long-term)
 3. Product Diversification
 4. Risk Reduction
3. Social Acceptability

Disadvantages:

1. Larger Aquaculture
 1. Increased Cost (Short-term)
2. Setup Diversification
 1. Increased Cost (Short-term)
3. Competition
 1. Potentially Reduced Output (Short-term)

The IMTA System in Puerto Rico



The Pilot IMTA facilities at the Department of Marine Sciences began construction during the early months of 2022



Teamwork during the Covid Watch period and after several modification to the initial plan, the system became the first pilot Integrated Multitrophic RAS facility in in Puerto Rico by the end of the year. With a minimal capital investment for the grow-out of marine species, the system goal is to help develop skills, knowledge and renewed interest regarding best-mariculture practices.

<https://youtu.be/-cvKhDNOL-E>

Community-based Hands-on Training

- Interamerican University Professors Maria Barberena, Natasha de Leon
SEAS Fellows: Stephanie Lopez and Miriam Villafañe + 19 students
- 41 students and 45 teachers and administrators from La Parguera Public School. This school is developing curricula with emphasis in marine science topics
- 15 staff members of the Instituto Nueva Escuela (INE, <https://www.inepr.org>), a Montessori public school institute that run schools in 27/78 municipalities in Puerto Rico.
- 15 Visitors from INE and Para La Naturaleza (<https://www.paralanaturaleza.org/>)
- 18 young participants of Taller Ecologico summer experiences (<https://www.tallerecologicopr.com/home-copy>)
- Sight visit of Puerto Rico Department and Environmental Resources agency Secretary, subsecretary and staff.



Omar talks about the water circulation at the IMTA



Otero illustrates how mangroves are integrated into the IMTA

PR Local Partners: Fishing and Women's Associations

¡ATENCIÓN PESCADOR COMERCIAL!

Inicia el Programa de Educación para Pescadores Comerciales (PEPCO) del Departamento de Recursos Naturales y Ambientales de manera virtual.

5 Talleres vía 

Desde las 5:00pm ¿Cuándo?

miércoles, 17, de febrero de 2021
 miércoles, 24 de febrero de 2021
 miércoles, 3 de marzo de 2021
 miércoles, 10 de marzo de 2021
 miércoles, 17 de marzo de 2021

Aprenderás sobre:

Procedimiento de licencias y permisos de pesca comercial; Estadísticas pesqueras comerciales y manejo pesquero; Desembarcos comerciales en PR; Reglamento de Pesca de PR; Vedas, Permisos; entre otros temas de interés.



¡Regístrate Hoy!

Accede al enlace para registro Zoom ID: 810 8572 3017 o comunícate con Wilson G. Santiago al (787) 344-0956



AVISO DE VEDA



Carrucho

(*Strombus gigas*)

Del 1 de agosto al 31 de octubre su captura está prohibida.

- Todos los pescadores y distribuidores tienen 7 días desde el inicio de la veda para deshacerse de su inventario.
- Reporta cualquier actividad ilegal al Cuerpo de Vigilantes (787) 724-5700.



Asociación de Pescadores Playita les desea un Feliz Día de Acción de Gracias



PROHIBIDO
DAÑAR O EXTRAER CORALES

PROHIBITED
DAMAGE OR REMOVE CORALS

No extraigas ni compres corales, ni organismos asociados a los arrecifes de coral, tales como las anémonas, erizos, estrellas de mar, pepinos de mar y caracoles. La Ley 147 de 1999 lo prohíbe y establece multas administrativas que pueden fluctuar entre \$500 a \$10,000 por infracción.

Do not remove or buy corals, nor associated organisms, such as anemones, urchins, sea stars, sea cucumbers, and snails. It is prohibited under Law 147 of 1999, which establishes penalties ranging from \$500 to \$10,000 for each violation.



¡Se mira, pero no se toca!

SI VES ALGUNA VIOLACIÓN, DENÚNCIALA al Cuerpo de Vigilantes, al 787-724-5700.



November 4, 2023, Workshop

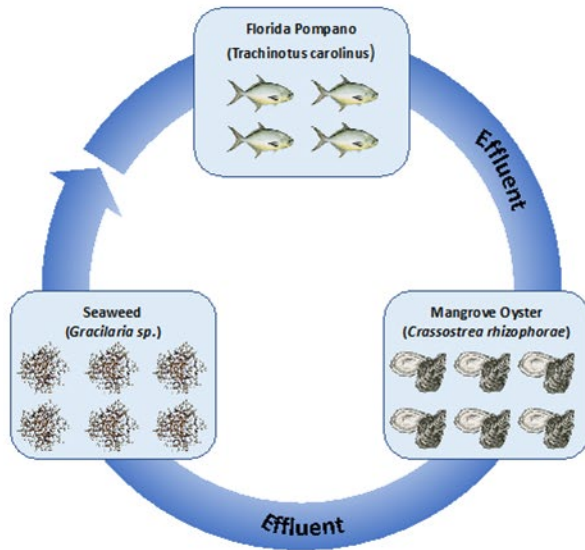
Purpose

- Guide and offer basic knowledge related to IMTA-RAS and its different operational aspects while creating
- awareness of its potential for mariculture within the context of island economy, access to alternative sources of food, and environmental conservation.
- 20+ participants, **mostly women**, teachers from public schools from several municipalities of Puerto Rico will participate in order to help integrate multitrophic aquaculture topics into their curriculum.
- The fishers association of La Parguera have been invited with the to help evaluate the possibility for the adoption of IMTA into their practices.



Stars indicate the origin of workshop participants

Ultimate Goal: **Development of education and outreach tools, strategies or initiatives aimed at improving participation of women in marine aquaculture in the Puerto Rico.**



Project goal helps address national and global fisheries and aquaculture goals.



“The Strategic Plan articulates a vision for an industry that supports jobs, expands access to nutritious domestic seafood, and reinforces healthy coastal and ocean ecosystems in a changing environment. This is supported by the Program’s mission of providing science, services, and policies that create conditions for opportunity and growth of sustainable U.S. aquaculture.”



**Food and Agriculture
Organization of the
United Nations**

**Promoting gender equality and women’s
empowerment in fisheries and aquaculture**