NEW DIRECTIONS IN SUSTAINABLE MARICULTURE AND FISHERIES HABITAT RESTORATION
UNITED NATIONS COMMISSION ON SUSTAINABLE DEVELOPMENT
PARTNERSHIP IN NEW TECHNOLOGIES FOR SMALL ISLAND DEVELOPING STATES
May 13 2008
Tom Goreau
President, Global Coral Reef Alliance

GLOBAL FISHERIES CRISIS

- Almost all fisheries are overexploited and crashing
- This applies to both shallow and deep water fisheries
- As a result aquaculture production is rapidly increasing, and is already surpassing wild capture fisheries
PROBLEMS OF CONVENTIONAL MARICULTURE

• Monocultures, usually of a single clone
• Escapees contaminate and erode genetic diversity of wild populations
• Dense populations promote disease and parasites
• When one gets sick, all die
• Diseases and parasites infect wild populations
• Feedlot operations, intensively fed, antibiotic use
• Cause intense pollution of surrounding habitats from rotting food and excrement

UNSUSTAINABLE MARICULTURE

• Impoverishes biodiversity
• Promotes disease, parasites, and pollution
• Relies on heavy external food additions
• Energy intensive
• Damages surrounding habitats
• Mangrove destruction
• Often capital intensive
• Food for export not local consumption
EXAMPLES

- Salmon in Norway, Scotland, British Columbia, Nova Scotia, Alaska
- Shrimp in Southeast Asia and Latin America
- Feedlot fish ranching of tuna and cobia
- Exotic oyster introductions

ALGAE: EUCHEUMA

- Most widespread in Indonesia and Philippines
- Problems with exotic species invasiveness, monoculture
- Intrinsically low value
- Processing not done locally
- Overproduction has caused price collapse
ALGAE: GRACILARIA

- Range of agar products from low to high value, many diverse species
- Carrageenan cannot substitute for high value Agar uses
- Can be processed locally
- Wide range of genetic diversity for growth, agar gel strength, nutrient response, and herbivore resistance that can be selected with more research
- Habitat for juvenile lobsters and conch

HOLOTHURIANS, SEA CUCUMBERS, TREPANG, BECHE DE LA MER

- Many species
- High value, high demand
- Pharmaceutical uses
- Wild harvest, overexploitation worldwide
- Can be propagated
- Pacific Aquaculture Cooperatives in Republic of the Marshall Islands, Solomon Islands, possible expansion to other areas
- Whole atoll farming with local partnership
MARINE PROTECTED AREAS VERSUS HABITAT RESTORATION

- MPAs work only where overfishing is the prime cause of fisheries decline, and where prime habitat can be protected
- Don’t work where habitat quality is degraded, as in almost all reefs
- Only habitat restoration will work in degraded areas
- Habitat restoration requires a framework of bottom-up community-based management to work

CUBA LOBSTER CASITAS

- Create habitat for lobster, especially in seagrass habitats where lobster have no place to hide from predators
- Have greatly increased standing stocks, sustainable production and exports
- Require cooperative management to succeed
FISH AGGREGATION DEVICES

• Based on natural aggregation of tuna under floating logs
• Made from Bamboo and coconut palm fronds
• Greatly increase pelagic fish catches
• Long artisanal tradition in Philippines and now being widely applied in Indonesia, Pacific and Caribbean
• Sometimes blamed for depleting reef fish, but this is exaggerated, creates new habitat
• Can be overharvested, need management
• Rock piles, Indonesia, Philippines, Palau

JUVENILE FISH HABITAT

• Most reef fish and lobster juveniles prefer shallow areas, mangroves, or algae mariculture
• Usually thought that shallow water, distance from reef, or structural complexity is key
• Experiments by Ivan Nagelkerken with artificial mangrove roots show highest juvenile fish recruitment in reef slope habitats
• Therefore increasing structural complexity is the most important factor
BIOROCK FISHERIES HABITAT RESTORATION

• Greatly enhances coral growth and survival from environmental stress
• Speeds up growth of all attached organisms
• Greatly increases recruitment of attached and free swimming organisms, such as fishes, both adult and juvenile
• Promotes highly diverse ecosystem
• No external food inputs
• Can be built in any size or shape

BIOROCK IN FISHERIES MANAGEMENT

• Fishermen can restore habitat quality and greatly increase sustainable harvestable standing stocks of fish, lobsters, oysters, and many other reef organisms
• Floating reefs can be built to increase pelagic fish catches
• Require management
• Require large scale investment in fishermen’s knowledge and microloans
ENHANCING RECRUITMENT AND HABitat

- Release of juvenile groupers into Biorock habitat by the Gondol Research Institute for Mariculture, Gerokgak, Bali
- Capture of pre-metamorphosis juvenile fish, coral, and invertebrates and transfer to Biorock habitat can greatly reduce juvenile mortality and increase standing stocks

FUTURE FISHERIES

- FARMING, NOT HUNTING
- LARGE-SCALE RESTORATION OF DEGRADED HABITAT
- FLOATING REEFS TO EXPAND PRODUCTION TO SHELF WATERS AND OPEN OCEAN
- INVESTMENT IN ARTISANAL COMMUNITY-BASED FISHERIES MANAGEMENT RATHER THAN SUBSIDIZING INDUSTRIAL FLEETS TO INCREASE OVEREXPLOITATION
- CHANGES IN POLICIES AND FUNDING
- NEED TO LINK TO CLIMATE CHANGE
Geotherapy: Restorative solutions utilizing existing technologies in new and innovative ways that harmonize with nature.

SUSTAINABLE FLOATING ISLANDS

What does a healthy future look like?

SUSTAINABLE DESIGNS FOR TROPICAL ISLANDS:
- Self-repairing reefs which offer shore protection
- Reef restoration which enhances biodiversity
- Mariculture
- Maritime agriculture for food and fuel (seaweed)
- Carbon sequestration
- Eco-tourism
- Water desalination
- Renewable energy sources:
  - Solar
  - Algae-lipid biofuel
  - Tidal
  - Wind
  - Wave
  - Hydrogen

To see more of the artist’s work go to www.alexmcrae.com

Copyright 2008

ARTIST CONCEPT BY: Alex McRae

Geotherapy: Restorative solutions utilizing existing technologies in new and innovative ways that harmonize with nature.

SUSTAINABLE FLOATING ISLANDS

What could our future look like?

SUSTAINABLE DESIGNS FOR TROPICAL ISLANDS:
- Self-repairing reefs which offer shore protection
- Reef restoration which enhances biodiversity
- Mariculture
- Maritime agriculture for food and fuel (seaweed)
- Carbon sequestration
- Eco-tourism
- Renewable energy sources:
  - Solar
  - Algae-lipid biofuel
  - Tidal
  - Wind
  - Wave
  - Hydrogen

To see more of the artist’s work go to www.alexmcrae.com

Copyright 2008