SATOH UMI MOVEMENT IN INDONESIA

Suhendar I Sachoemar$^1$ and Tetsuo Yanagi$^2$

1. Agency for the Assessment and Application of Technology (BPPT), Indonesia
2. Research Institute for Applied Mechanics (RIAM), Kyushu University, Japan
### Area Statistics

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine area</td>
<td>2,915,000 km²</td>
</tr>
<tr>
<td>Shelf area</td>
<td>1,847,700 km²</td>
</tr>
<tr>
<td>Coastline</td>
<td>95,181 km</td>
</tr>
<tr>
<td>Land area</td>
<td>1,826,440 km²</td>
</tr>
<tr>
<td>Reef area</td>
<td>51,020 km²</td>
</tr>
<tr>
<td>Mangrove area</td>
<td>42,550 km²</td>
</tr>
<tr>
<td>Reefs At Risk</td>
<td>82 %</td>
</tr>
</tbody>
</table>

### Socioeconomic Statistics

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>250,000,000 (BKKBN, 2013)</td>
</tr>
<tr>
<td>Coastal Population</td>
<td>96 %</td>
</tr>
<tr>
<td>GDP/Capita</td>
<td>3,200,5181 US$ /capita</td>
</tr>
<tr>
<td>Fish consumption</td>
<td>31.64 Kg /capita (Ditjen P2HP, 2011 )</td>
</tr>
</tbody>
</table>


- Indonesia, the world’s largest archipelago: 18,000 islands, 17,000 islands with 6000 inhabitants
- Covering both the Indian and Pacific Oceans, Andaman, Java, South China, Sulawesi, Banda and Arafura Seas
- Ornamental Fish: 253 species
- Coral: 400 species (57% of the world)
Space Utilization of Fisheries, Coastal and Marine Resources

Marine Resources

Sport and Commercial Fishing

- Marine Fisheries Resources
  - Pelagic Fish (Tuna, Skipjack, etc)
  - Demersal Fish: Shrimp, Sea bream, etc.
  - Coral Fish: Grouper, etc

Commercial and Tourism Aquaculture

Coastal Resources

Coastal Fisheries Resources

- Breackishwater: Shrimp, Tilapia, Milk Fish, Seaweed
- Swamp area: Snakhead, Sand gobi

Breackishwater Aquaculture and Fishing

- Carp, Tilapia, Gourame, Cat fish

Freshwater Resources
Pond, Lake, Reservoir

Breackishwater Aquaculture and Swamp
GLOBAL AND NATIONAL ISSUES

Rapid Industrial Growth

Global Warming

Climate Change

Excessive of Natural Resources Exploration

Environmental Degradation

Declining Carrying Capacity and Production

Population Growth

Food demand increment

Food Shortage

Adaptive Technology for Climate Change and the Environment

Improvement of Production and Food Sufficiency
The Environment Impact

Source
- Industrial Pollution
- Intensive Fish Culture
- Harbour
- Mining and Coastal Erosion

Effect
- Red Tide
- Oil spill
- Turbidity and Sedimentation

Impact
- Fish Mass Mortality
- Coral Reef Destruction
- Mangrove Degradation
- Coastal Healthy Damage
## Status Marine Fisheries Resources

<table>
<thead>
<tr>
<th>No.</th>
<th>Fisheries Resources Catagories</th>
<th>REGION OF MARINE FISHERIES RESOURCES MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Malacca Strait</td>
</tr>
<tr>
<td>1.</td>
<td>Large Pelagic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potency</td>
<td>27.7</td>
</tr>
<tr>
<td></td>
<td>TAC</td>
<td>22.1</td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>36.2</td>
</tr>
<tr>
<td></td>
<td>Utilization</td>
<td>OE</td>
</tr>
<tr>
<td>2.</td>
<td>Small Pelagic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potency</td>
<td>147.3</td>
</tr>
<tr>
<td></td>
<td>TAC</td>
<td>117.8</td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>132.7</td>
</tr>
<tr>
<td></td>
<td>Utilization</td>
<td>OE</td>
</tr>
<tr>
<td>3.</td>
<td>Demersal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potency</td>
<td>82.4</td>
</tr>
<tr>
<td></td>
<td>TAC</td>
<td>66.9</td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>146.3</td>
</tr>
<tr>
<td></td>
<td>Utilization</td>
<td>OE</td>
</tr>
<tr>
<td>5.</td>
<td>Reef Fish</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potency</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>TAC</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>21.5</td>
</tr>
<tr>
<td></td>
<td>Utilization</td>
<td>OE</td>
</tr>
</tbody>
</table>

**Sources:** Directorate General of Capture Fisheries, MMAF (2005)

**Note:** Potency, TAC and Production in 10 ton/year

OE = Over Exploited, UE = Under Exploited, FE = Fully exploited

TAC = Total Allowable Catch
The Degradation of Mangrove Forest in Indonesia

Impact of:
Land conversion into brackiswater pond, housing, industrial estate, firewood, sand mining, etc.

- Indonesia
  Year 1982: 5,209,543 ha → Year 1992: 2,496,185 ha (52.08% loss)

- Java
  Year 1985: loss 70%

- Sulawesi:
  Year 1965: 110,000 ha → Year 1985: 30,000 ha (72.7% loss)

Negative Impact on:
Fisheries Resources Restocking,
Diversity Degradation
Environmental Degradation
Erosion, Pollution,
MANGROVE ROLE ON THE ENHANCEMENT OF FISHERIES RESOURCES

Life Cycle of Penaeid Shrimp

Mangroves → Postlarva → Estuary → Beach → Ocean

- Mysis
- Zoea
- Nauplius
- Adult
- Eggs

Not to Scale
Creating new strain of fish adaptive to the environment change: Saline Tilapia

Application Technology of the “INTEGRATED MULTI-TROPHIC AQUACULTURE (IMTA)”

Enrichment biodiversity (product diversification)

Mangrove reforestation

Coastal Restoration

Dissemination and publication

Productivity of the brackishwater → LOW (Decrease)


Indonesian Brackish Water Pond Area: 1,2 Million Ha, but the utilization level only: 37.5%
# Impact of the Illegal and Destructive Fishing on Coral Reef

<table>
<thead>
<tr>
<th></th>
<th>P3O LIPI</th>
<th>Coremap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>6.48 %</td>
<td>6.10 %</td>
</tr>
<tr>
<td>Good</td>
<td>22.53 %</td>
<td>22.68 %</td>
</tr>
<tr>
<td>Pair</td>
<td>28.39 %</td>
<td>31.46 %</td>
</tr>
<tr>
<td>Poor</td>
<td>42.59 %</td>
<td>39.76 %</td>
</tr>
</tbody>
</table>

## Cyanide

![Cyanide Image]

## Bombing

![Bombing Image]

## Live Reef Fish Trade Expansion

![Map with Fishing Areas]

## Destructive and Over Fishing

![Map Showing Fishing Impact]

### Level
- Low
- Pair
- High

**Burke at al, 2002**
Technology and Fisheries Product
Adaptive to the environment and climate change, global warming

Inovative → Creative → Productive

Fisheries, coastal and marine resources
Model of sustainable management and utilization model

Society
Concept of Sustainable Natural Resources Management in the Coastal Marine Areas

**Sato Umi**
- Harmonization Nature and Human with mutualism symbiosis spirit
- Stabilization of the environment and the availability of the natural resources
- Encouraging high productivities and biodiversity ecosystems
- Sustainable utilization of the natural resources in the coastal area.
- Stabilization and sustainability of the human welfare

**Gempita-SPL/SFiCom-Gapura**
Sustainable Utilization of Fisheries, Coastal and Marine Resources for the Society- Movement Action Program for Northern Coastal Area of West Java
- Coastal environment and natural resources degraded due to the rapid deforestation of mangrove and high exploitation of the land utilization by intensified shrimp culture.
- Low productivity and biodiversity
- Decreasing of the land carrying capacities and multi variance of fish diseases
- Human poorness and limited field work
Local Wisdom: The dynamic source of knowledge organized, developed and forwarded by a certain population that is integrated with their understanding of the natural and cultural surroundings.


International Regulation:
- Convention for the Preservation and Protection of Fur Seals 1911
- Convention for the Preservation and Protection of the Halibut Fishing of the Northern Pacific 1923
- Convention for the Regulation of Whaling 1931.
- FAO 1995: Code of Conduct for Responsible Fisheries (CCRF)
- International Plan of Action (IPOA) dan Illegal Unreported Unregulated (IUU) fishing.

National Regulation:
Law no. 32 of 2009: Environmental Protection and Management
DISTRIBUTION OF INDONESIAN ETHNICS

Indonesian Ethnics: 1128 (183,875 million, 300 groups)

(Source: BPS 2010)
Human interaction can increase and decrease productivity and bio-diversity.

Sato-umi is to improve productivity and bio-diversity.
Sato Umi Dissemination Strategy

Problem Identification and Inventarization

Sustainable Utilization Concept Implementation and Socialization

Research Agenda International, National, Regional, Local

Workshop/Seminar/Symposium

Workshop/Training

Working Group NS, SS, ES, CB, Inst, etc

Innovation Technology Application

Demonstration Plot
DEMONSTRATION PLOT
INTEGRATED MULTI-TROPICAQUACULTURE (IMTA) : Bio-recycling-System
BIORECYCLING SYSTEM ON THE INTEGRATED MULTITROPIC AQUACULTURE TECHNOLOGY (IMTA)

IMTA-ZERO WASTE SYSTEM

Future Aqua Farms
### PHYSICAL-CHEMICAL Water Quality Profile of the Treated Breackishwater Pond

#### Physical

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Temp (°C)</th>
<th>Salinity (ppt)</th>
<th>pH</th>
<th>DO (ppm)</th>
<th>Turbidity (NTU)</th>
<th>TSS (mg/l)</th>
<th>BOD$_5$ (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-1</td>
<td>30.81</td>
<td>24.94</td>
<td>7.92</td>
<td>6.02</td>
<td>121.83</td>
<td>36.5</td>
<td>1.66</td>
</tr>
<tr>
<td>P-2</td>
<td>30.77</td>
<td>23.11</td>
<td>7.87</td>
<td>6.16</td>
<td>127.46</td>
<td>22.33</td>
<td>0.71</td>
</tr>
<tr>
<td>P-3</td>
<td>30.92</td>
<td>22.48</td>
<td>7.90</td>
<td>6.43</td>
<td>157.08</td>
<td>22.83</td>
<td>0.24</td>
</tr>
<tr>
<td>P-4</td>
<td>30.94</td>
<td>22.91</td>
<td>7.91</td>
<td>6.47</td>
<td>177.67</td>
<td>18</td>
<td>1.18</td>
</tr>
</tbody>
</table>

#### Chemical

<table>
<thead>
<tr>
<th>Treatment</th>
<th>DIN (ppm)</th>
<th>DIP (ppm)</th>
<th>Sulfide (ppm)</th>
<th>Iron (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1.3</td>
<td>1.081</td>
<td>0.33</td>
<td>0.03</td>
<td>0.12</td>
</tr>
<tr>
<td>P2.3</td>
<td>2.154</td>
<td>0.21</td>
<td>0.03</td>
<td>0.21</td>
</tr>
<tr>
<td>P3.3</td>
<td>2.086</td>
<td>0.74</td>
<td>0.03</td>
<td>0.53</td>
</tr>
<tr>
<td>P4.3</td>
<td>1.207</td>
<td>0.15</td>
<td>0.02</td>
<td>0.39</td>
</tr>
</tbody>
</table>
Total Biomass of the Treated Farm in Brackishwater Pond

Biomass (kg)

- Green Muscle
- Gracillaria
- Fish
- Prawn

P-1  P-2  P-3  P-4

Treatment Pond
Diversity Product of GAPURA

Bio recycle System and Zero Emmiton

Production Technology of Saline Tilapia (Breeding and Genetic Improvement)

Softcell Crab

Sea Weed/Gracilaria

Green Muscle

Black Tiger Shrimp

Benih ikan Nila

Penulisan Benur Uudang

Penanaman Rumput Laut

Kolam udang, ikan nile, dan rumput laut

Kolam udang
DEMONSTRATION PLOT

Sylvo Fishery and IMTA Karawang
DEMONSTRATION PLOT

Sylvo Fishery and IMTA-Pekalongan
DEMONSTRATION PLOT

Bantaeng
Dissemination Activity
Dissemination Activity
Field Trip
1. Karawang
2. Pekalongan
3. Anambas
4. Bantaeng
5. Tual
Thank You