International Symposium for the Convention on Biological Diversity -The role of forest biodiversity in the sustainable use of ecosystem goods and services in agro-forestry, fisheries, and forestry-

2010.4.26 at Waseda University

Forest ecosystem serves to coastal marine biodiversity and productivity

Hiroshi Mukai
Division of Integrated Coastal Management
Field Science Education & Research Center
Kyoto University

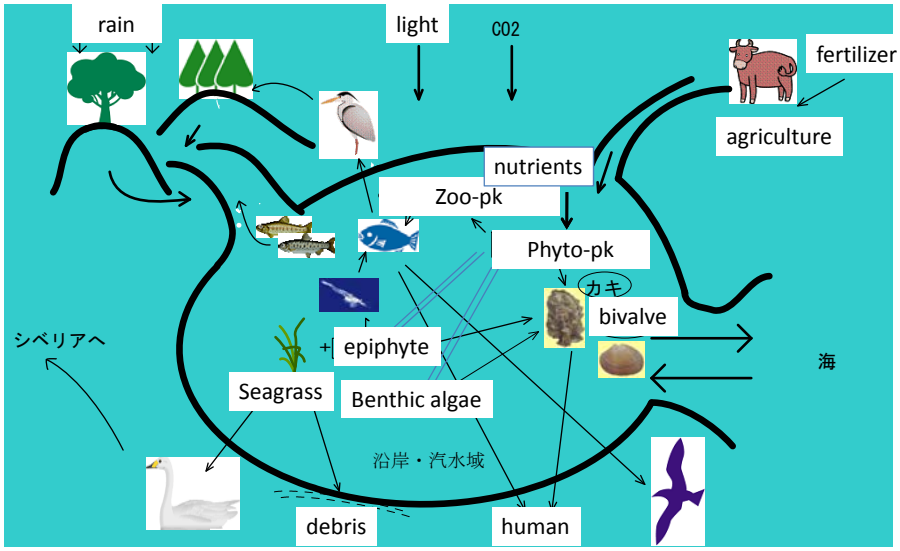
To conserve marine environments, restoration of forests

- Forest restoration by fishermen

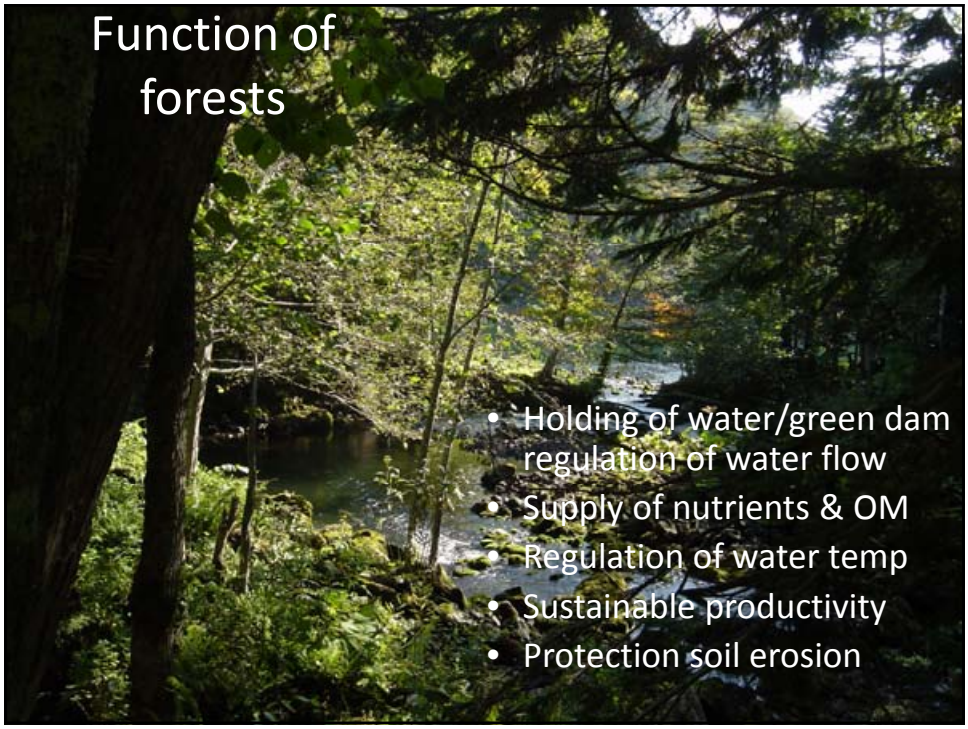
‘Forest is a sweetheart of sea’

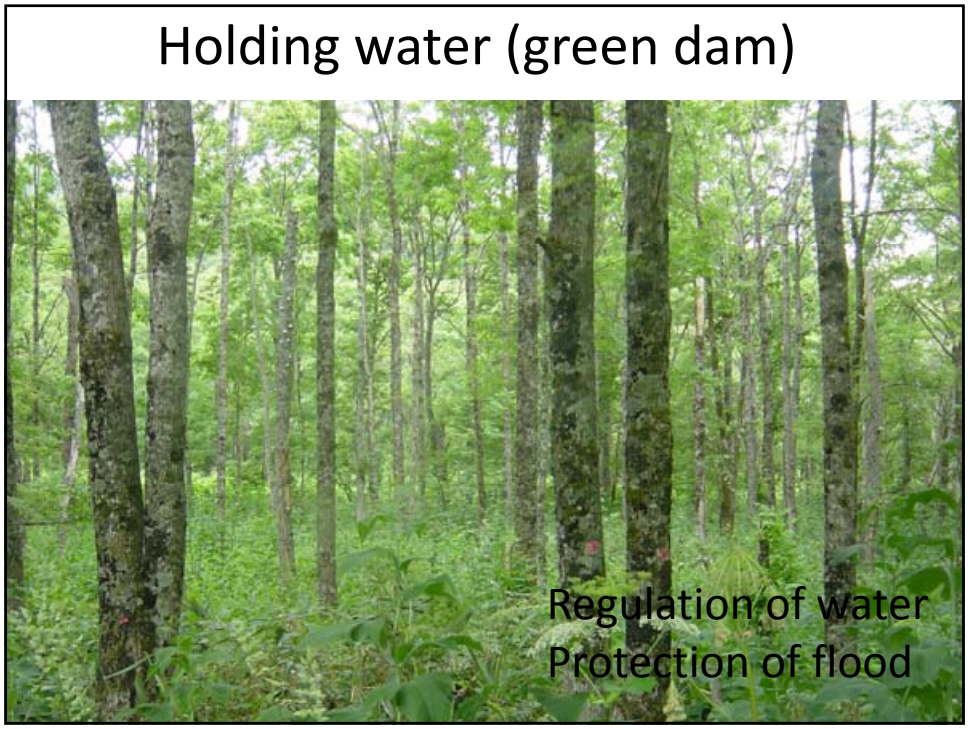
Material flow and sediment flow
Inter-ecosystem interaction between terrestrial and coastal marine ecosystems

Coastal marine ecosystem

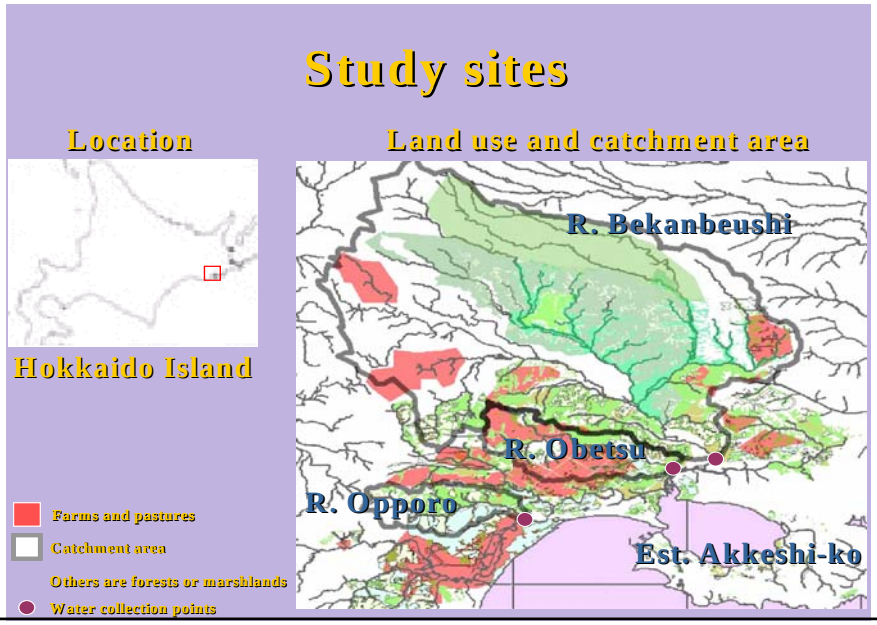


- Importance of Allocthonous inputs in coastal marine ecosystems


Function of forests
• Holding of water/green dam regulation of water flow
• Supply of nutrients & OM
• Regulation of water temp
• Sustainable productivity
• Protection soil erosion


Holding water (green dam)
Regulation of water
Protection of flood

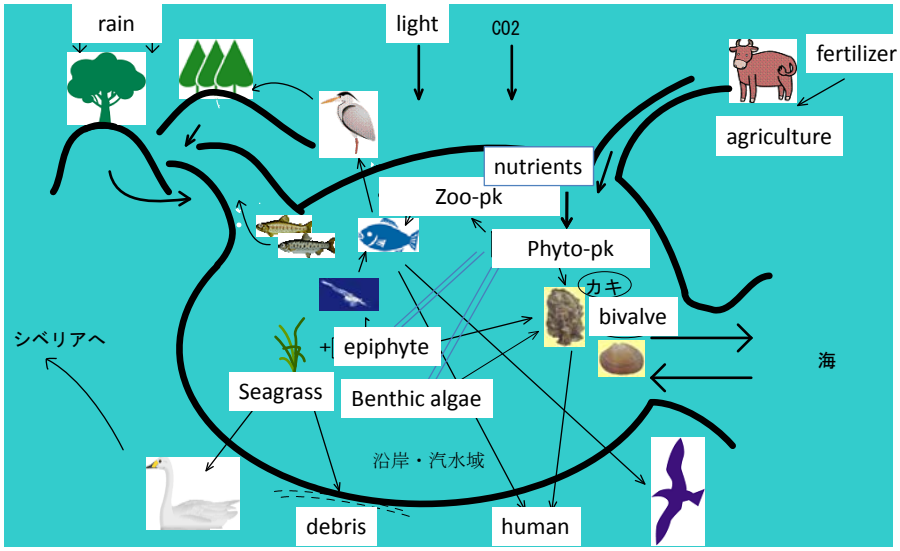
Regulation of water runoff



Water regulation of forest in rainfall

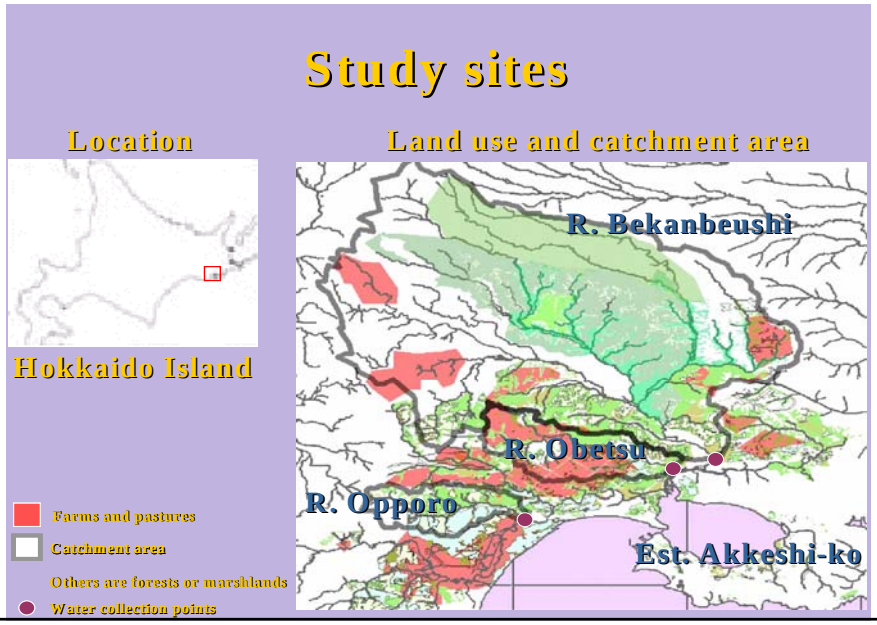
	R. Obetsu	R. Bekanbeusi
Watershed area	38.7 km2	379.0 km2
Farm ratio	65.7 %	7.6 %
Precipitation volume in watershed	2,530,000 ton	24,830,000 ton
Runoff ratio within 72 hours	66.0 %	12.8 %

Nutrient supply in coastal ecosystem

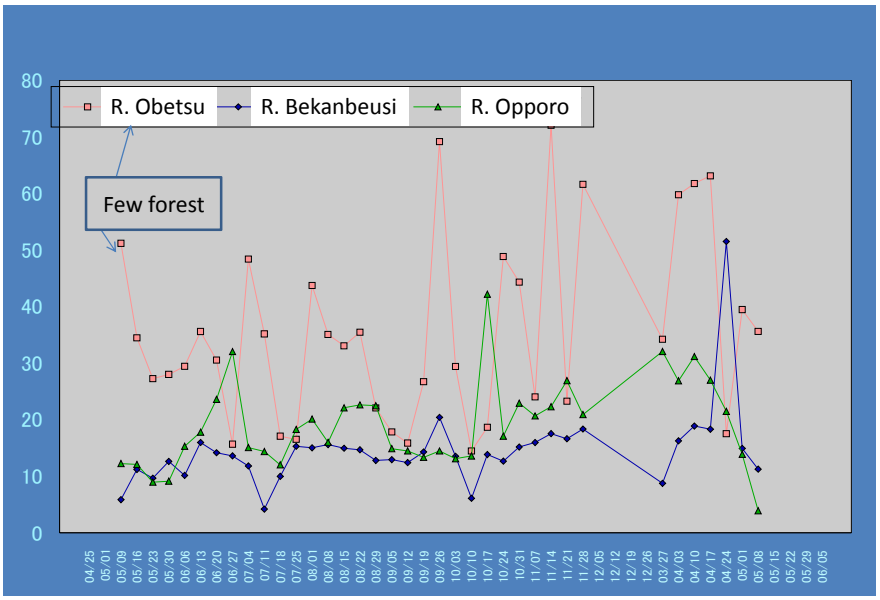


- Importance of Allocthonous inputs in coastal marine ecosystems

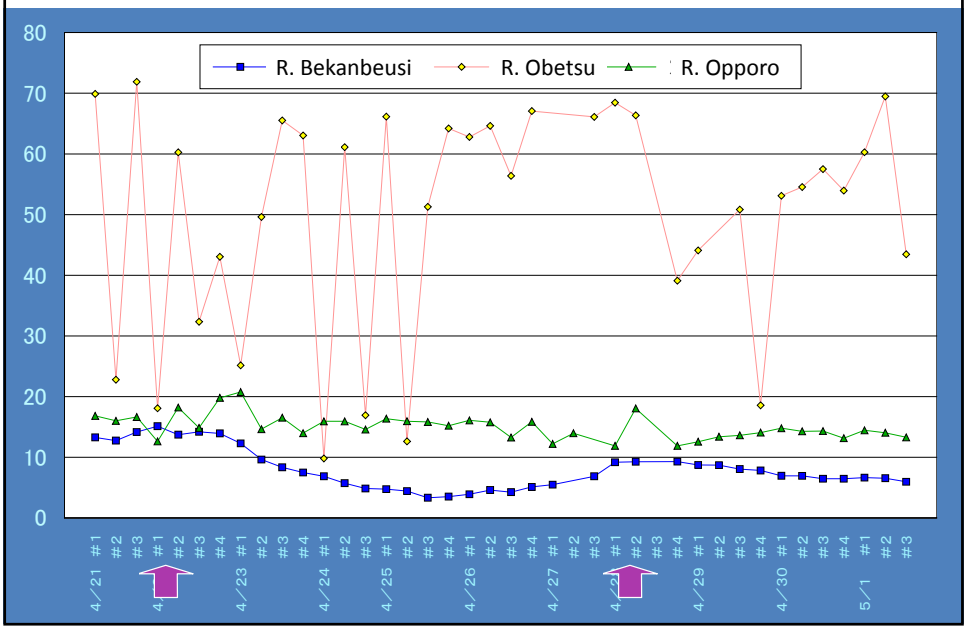
Transportation of nutrients & OM



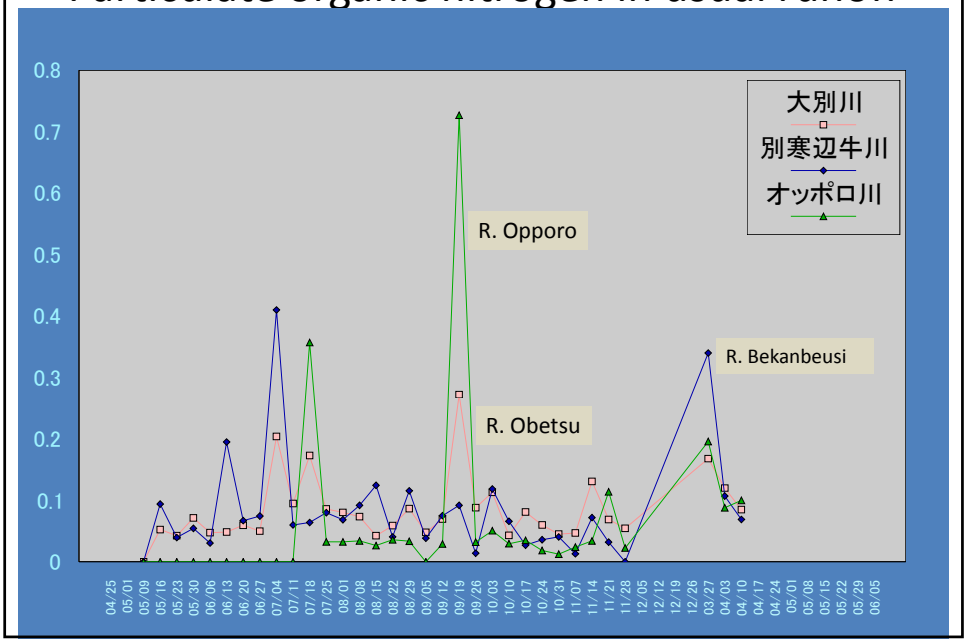
Nitrate & nitrite conc at usual runoff



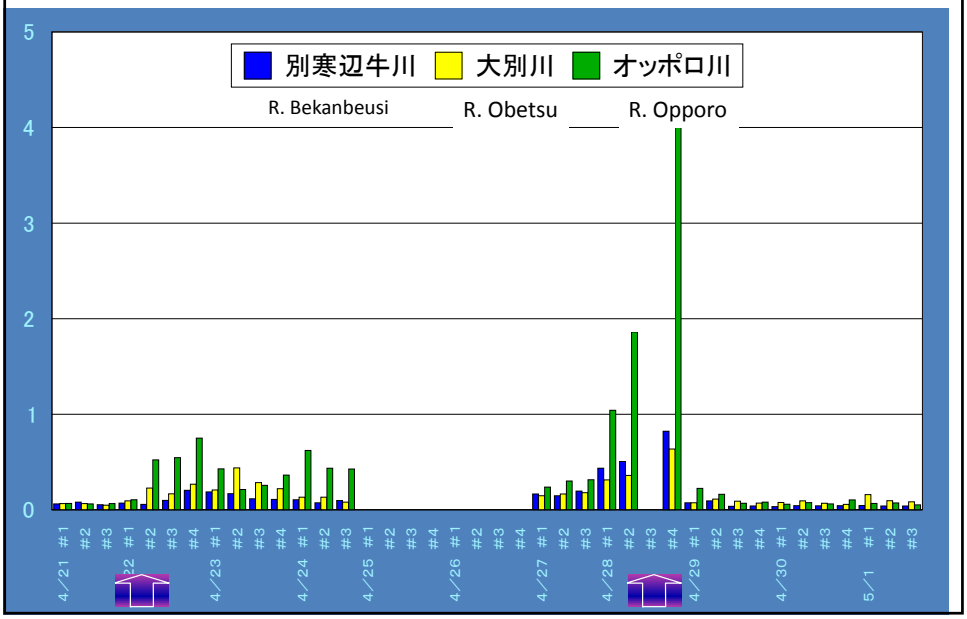
Nitrate & nitrite conc at sporadic runoff (heavy rain)



Particulate organic nitrogen in usual runoff



PON at sporadic runoff (heavy rain)



Nitrogen accumulation in the watershed in 2000

Watershed	Area (km2)	N-input	N-output	Output in %
R. Bekanbeusi	379	227.4 ton	43.1 ton	19
R. Obetsu	39	23.2 ton	6.1 ton	26
R. Opporo	29	17.9 ton	2.6 ton	15
Whole river	447	268.1 ton	51.8 ton	19

- N-Input is assumed as 6kg/ha/yr

Function of river and plain (wetland)

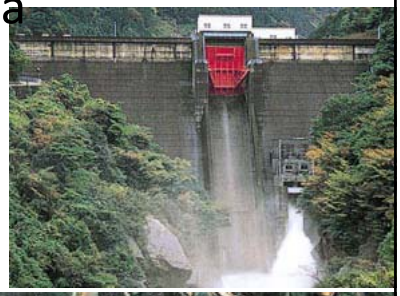
- Buffer of water balance
- Transportation of nutrients & OM and biological processes in river
- Ecosystem of river
- Function of plain (wetland) and paddy field

Function of plain (wetland) as a buffer

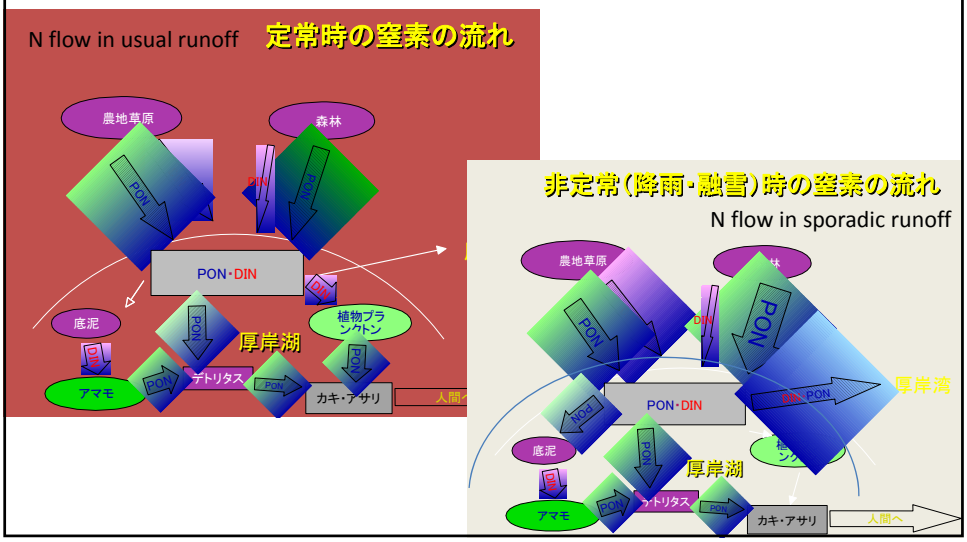
- Lost function

Human impacts on connectivity of land and sea

- Lost of wetland or paddy field
- cutoff of connectivity in river ecosystem by dam



Difference of marine response between usual and sporadic runoff



Regulation function of water temperature

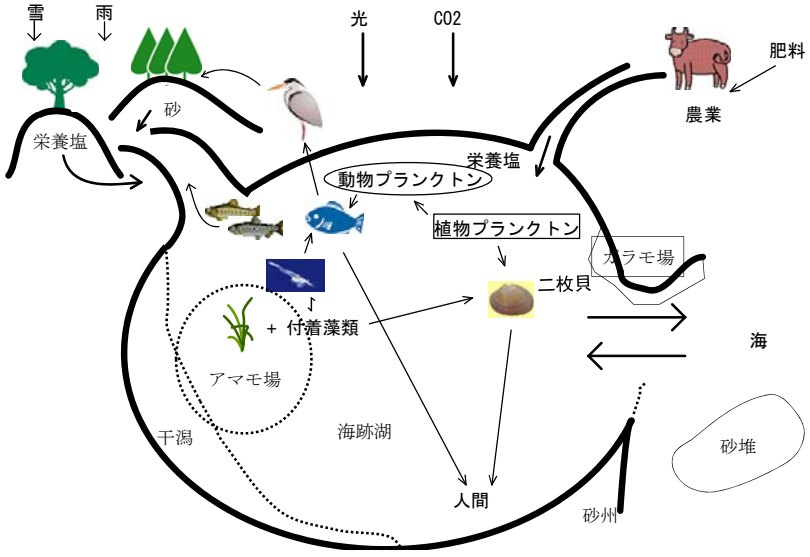
- Mass mortality of coastal oyster population（Inukai,1938）

1. Protection of rise of land temperature by green cover= stabilizer
2. Cutoff of light and heat to river water by riparian forest
3. Stability of water temperature is important for anadromous fish
4. High water temperature causes of water pollution

Flow of sand

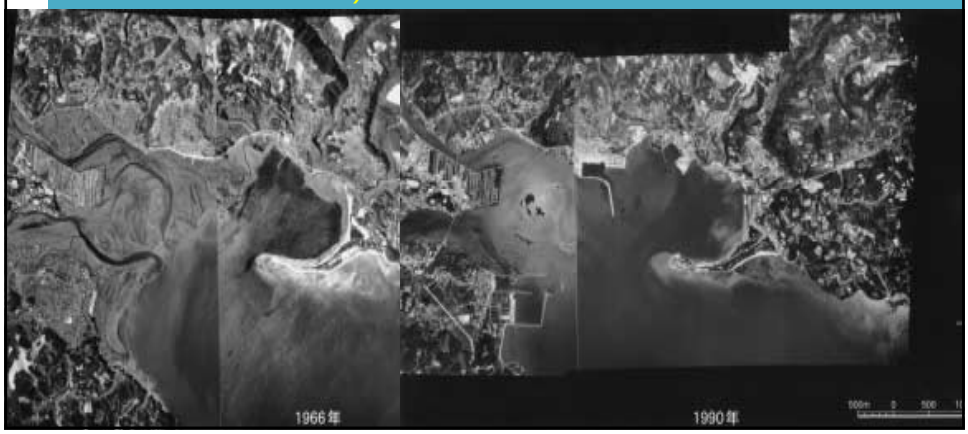
Connection among forest, river, and sea
From upper to lower, and to sea,
Sand-dynamics =create sand, transport sand, accumulate sand, and transport sand again
・Habitat diversity created by sand flow
《river mouth sandy flats, tidal flats, lagoon flats, sandy beach, sand spill, sand bank》

Habitat diversity in estuary and coastal marine ecosystem



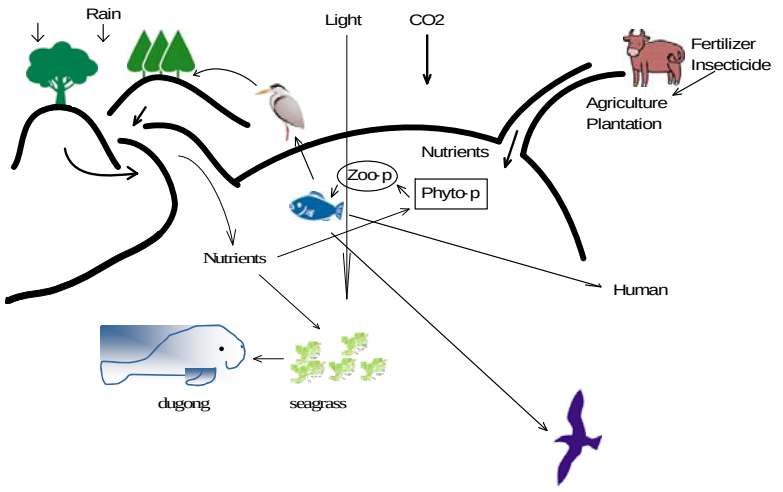
Habitat diversity by sand dynamics

Diversified habitats have been lost by coastal artificial and cemented beach, and proceed to uniformity of habitat（Seino、2001）



For conservation of dugong

- Allochthonous input
- Water quality and light
- Importance of forest for dugong & marine diversity



What happened in forest？

Deforestration &
Plantation

Forest disappears！It changes to farm!

Large scale plantation

集約農業＝農薬・人工肥料の使用

Coconut plantation

Coconut

Banana Plantation

Plantation is not forests,
it is farm

Oil Palm plantation
アブラヤシ

Rubber plantation
ゴム林

Fish pond & shrimp pond

Disappear of mangrove swamp

Bangkok 近郊の海岸地帯


For coastal marine biodiversity and productivity, conserve forests
Thank you