The 3rd International Symposium on Food and Environment in Asia

Graduate School of Biosphere Science, Hiroshima University

December 20, 2010

Aim of the Symposium

In Korean coastal and offshore fisheries, reaching the record high in the mid 1980s at 1,700 thousand MT, the fishery production has decreased to 1,080 thousand MT by 2004, but increased to 1,100 thousand MT in 2005. The trend continued in 2008 and the production increased to 1,285 thousand MT and the production in 2009 totaled at 1,227 thousand MT. The major species in coastal and offshore fisheries were anchovy, squid, mackerel and hairtail.

To address such catch reduction and unstable, the Korean government has begun to genuinely acknowledge the necessity to enhance fisheries productivity through the environmentally friendly fishery policies. The primary objective of the fishery policies is to improve both fishermen's and consumers' welfare by protecting and recovering fishery resources. For fishermen, the government focuses on the following: *a*) facilitation of the fishing fleet buy-back program; *b*) promotion of efforts to foster culture-based fisheries and fishery resources; *c*) expansion of applicable species for the TAC system and Fish Stock Recovery Program; *d*) amendment of fishery-related institutional regimes to harmonize with the fishermen-oriented CBFM; *e*) strengthening law enforcement activities to eliminate illegal fishing activities.

As part of the fishery policies efforts to promote sustainable and responsible fisheries development and ecosystem-based aquaculture management, the Korean government is taking measures to encourage environment-friendly offshore aquaculture over coastal aquaculture.

The area for aquaculture in 2009 was 138,867 hectares, an increase of 3,784 ha (2.8%) from 136,083 ha in 2008. Aquaculture production in 2009 was 1,313,000 MT (KRW 1,846,300 million), a 5% decrease from 1,382,000 MT (KRW 1,522,500 million) in 2008. The number of aquaculture households in 2009 was 22,592, a 2.2% increase from 22,101 in 2008. The major species in aquaculture are flatfish, jacopever, oyster, short-necked clam, sea mussel, laver, and brown seaweed.

In 2009, 「The Plans to Promote Eco-Friendly and High Valued Added Offshore Fisheries」 was drawn, which aims to establish 6 places of offshore aqua farms (4 blue fin tuna farms, 2 for other species) and to lay the R&D foundation for the ‘complete tuna farming’, which encompasses the entire life cycle of tuna.

To assess the environmental impacts on fisheries and the environmental capacity for sustainable fisheries, various factors such as water quality, sediments, distribution of benthos, and the status of the use of fishing grounds are being studied in earnest.

The Korean government has also been operating an effective system to provide early warning forecasts for red tides to mitigate the damages they cause to coastal and offshore fisheries and aquaculture.

In addition, 206,500 hectares of artificial reef was formed by 2009 as a result of artificial reef project to restore fishery resources in an environment-friendly manner. Another project, the quality seedling/releasing project which has been implemented since 1986 and a total of 1,150 million seedlings for flatfish, jacopever and abalone were released by 2009. Korea is also planning to foster sea-ranches that are in customized for environment of each sea area by investing 158.9 billion until 2010.

"The Fisheries Resources Development Agency", which is scheduled to be founded in January 2011, will enable the efficient implementation of stock enhancement programs such as artificial reef, seaweeds forest, marine ranches and fish seed release. So far, the government has designated and is managing 2,979(measured by sea levels)㎢ in 10 bays (including 21 of cities and districts) as the 「Fisheries Resources Protective Areas」 in order to conserve coastal ecosystems, spawning areas and habitats..

The Korean government is also making efforts to preemptively deal with the impact of climate change on the fisheries sector. This sector is going through environment-induced challenges such as changing distribution and abundance of major species, the appearance of sub-tropical species and toxic jellyfish. In response, the government has taken climate change into serious consideration in terms of fisheries management which is well reflected in the Comprehensive Marine and Fisheries Strategies for Climate Change (2007) and the National Action Plan to Adapt to Climate Change (2009).

Climate change is an inevitable challenge for Korean capture fisheries and aquaculture production. In this regard, the Korean government has established national policies and strategies under the “Green Growth” framework, which is one of the top priorities of the country. Such plans are expected to contribute to more sustainable and flexible fisheries policy in Korea as well as ensure a stable supply of fish and seafood, particularly given that fisheries are one of the main contributors to the food industry in Korea and a major source of protein for the population.

Research and development will be strengthened to increase the country’s adaptive capacity to the effects of climate change, while maximizing new opportunities for growth. In addition, expanding the community-based fisheries management system will provide important non-scientific knowledge for making policies and plans more relevant and enabling policy reform while contributing to climate change adaptation.

The rapidly increasing human population in tropical Southeast and South Asia is exerting tremendous pressure upon land and food resources. Land-based agricultural resources have been exploited at an ever-increasing pace since historical times. Lately, the utilization of aquatic food resources has increased as a result of the development of modern aquacultural technology. For many coastal communities in Asia, marine food resources often serve as their only cheap protein source and serve as a foundation of an affordable food supply chain. However, due to rapid environmental degradation due to anthropogenic impacts and imminent climate change, the continued well being of the marine environment is at great risk and the quality of food resources could be compromised, thereby raising important issues of food safety and security.

The first part of this paper deals with an overview of marine food production activities in Southeast Asia focusing on the seaweed culture industries of the Philippines and neighboring countries. The mass cultivation of economically-important seaweed species for the global carrageenan and agar industries faces a number of critical environmental, epidemiological, socio-economic and geopolitical issues and challenges. However, it has been and still is generally perceived as an environmentally-friendly and energetically efficient food production technology since its biomass-based output occupies the base of the biological food chain.

Many aquaculture activities in Asian waters and estuaries require habitat modification that contributes to destruction and degradation of formerly pristine environments. These detrimental effects have long-term impacts on the environment that are only beginning to be felt. Little is known about their impact on food safety and food production patterns. Imminent climate change effects like temperature and precipitation changes, increased frequency of extreme weather events, ocean acidification and the like, together with anthropogenic impacts from industrialization and agriculture will likely affect the food supply chain by increasing food safety hazards at various stages.

The presentation will highlight some well-known environmentally-friendly technologies that will serve the dual purpose of food production and environmental preservation. For these technologies to be practical for adoption in Asian coastal communities, they must be relatively low cost and easy technology. One example is the integrated multi-trophic aquaculture (IMTA) which promotes polyculture of aquatic species for greater economic output and fulfilling certain environmental remediation functions at the same time. Algal biofilters and scrubbers that have been tested successfully in industrialized countries can be good candidates to fulfill these dual roles as well.

はじめに

材料と方法

結果と考察

Table 1. Ingredient and nutrient composition of diets

	IS+CS		CS	
	kg/head/day	% of DM	kg/head/day	% of DM
Ingredient				
IS	3.10	14.8	0.0	0.0
CS	2.93	14.0	5.87	27.4
Concentrate-1	10.2	48.6	10.7	49.8
Concentrate-2	0.21	1.0	0.38	1.8
Oats hay	1.79	8.6	1.79	8.4
Alfalfa hay	0.89	4.3	0.89	4.2
Beat pulp	1.82	8.7	1.82	8.5
Total	20.9	100.0	21.4	100.0
Nutrient composition				
CP	2.88	13.8	2.80	13.1
NDF	7.77	37.2	7.93	37.0

Table 2. The amount of DM intake and milk production

	IS+CS		CS		P
	Mean	SE	Mean	SE	
Intake (kgDM/head/day)	20.7	0.32	20.9	0.09	0.21
Milk yield (kg/head/day)	25.9	2.85	25.7	2.37	0.84
Milk composition					
Fat (%)	4.33	0.26	3.74	0.28	0.07
Protein (%)	3.74	0.14	3.75	0.16	0.86
Lactose (%)	4.24	0.07	4.21	0.10	0.61
MUN (mg/dl)	10.1	1.01	8.8	0.67	0.101

Table 3. The time proportion of of eating and ruminating hehavior during the time periods of 10-15, 17-22 and 22-7

	Time periods	IS+CS		CS		P
		Mean	SE	Mean	SE	
Proportion of eating time	10-15	0.62	0.029	0.52	0.020	0.03
	17-22	0.41	0.023	0.41	0.029	0.94
	22-7	0.08	0.011	0.11	0.033	0.29
Proportion of ruminating time	10-15	0.16	0.020	0.19	0.027	0.41
	17-22	0.33	0.023	0.26	0.017	0.101
	22-7	0.51	0.023	0.48	0.027	0.53

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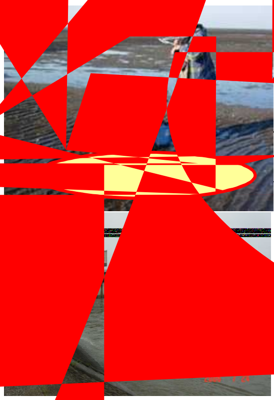

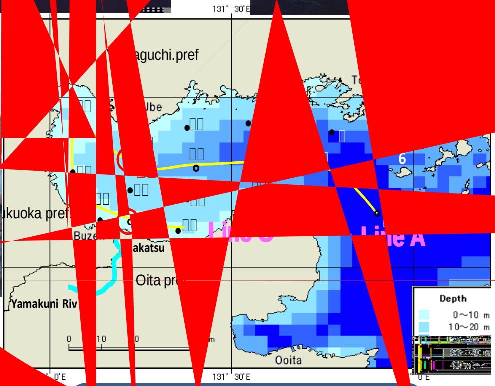
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DNA

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Ebp2 Rrs1

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(Horigome *et al*.

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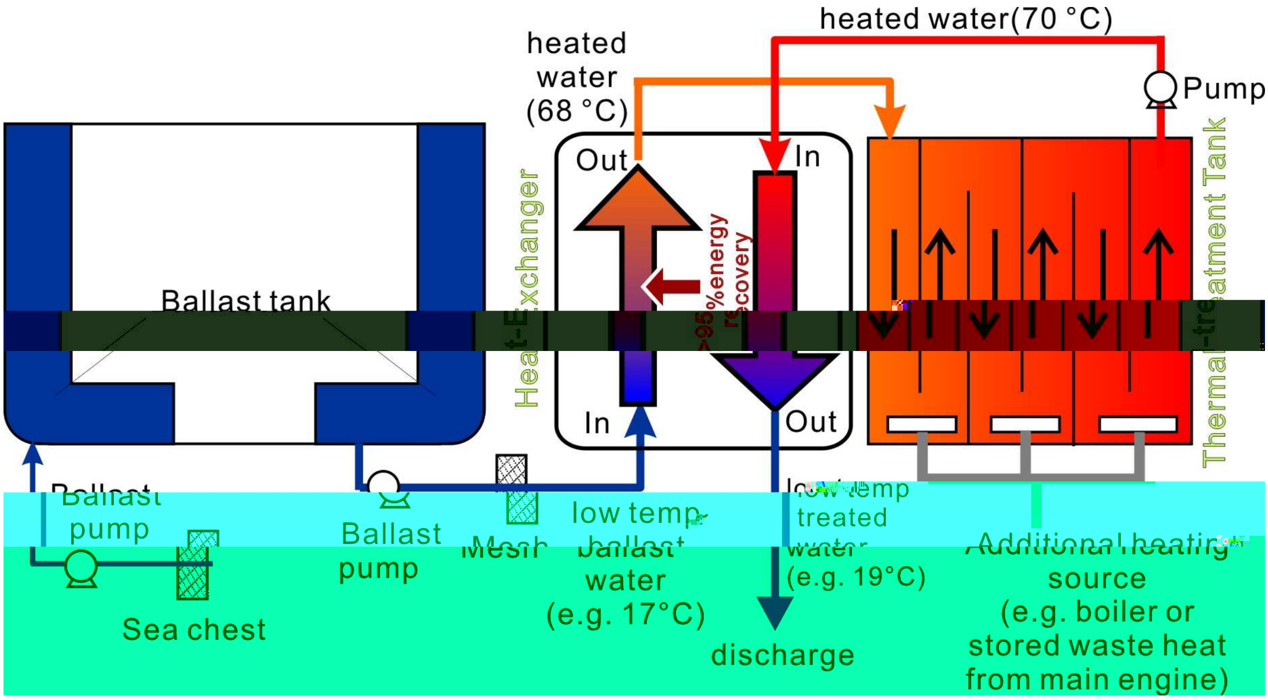
DNA

Ebp2

Ebp2 **Rrs1**


heated water(70 °C)
heated water (68 °C)
Pump
Out
In
Heat-Exchanger
>95%energy recovery
Thermal-treatment Tank
Ballast tank
In
Out
Ballast pump
Ballast pump
Mesh
low temp ballast water (e.g. 17°C)
low temp treated water (e.g. 19°C)
discharge
Sea chest
Additional heating source (e.g. boiler or stored waste heat from main engine)