Rebuilding Fishery Stocks in Korea

: A National Comprehensive Approach

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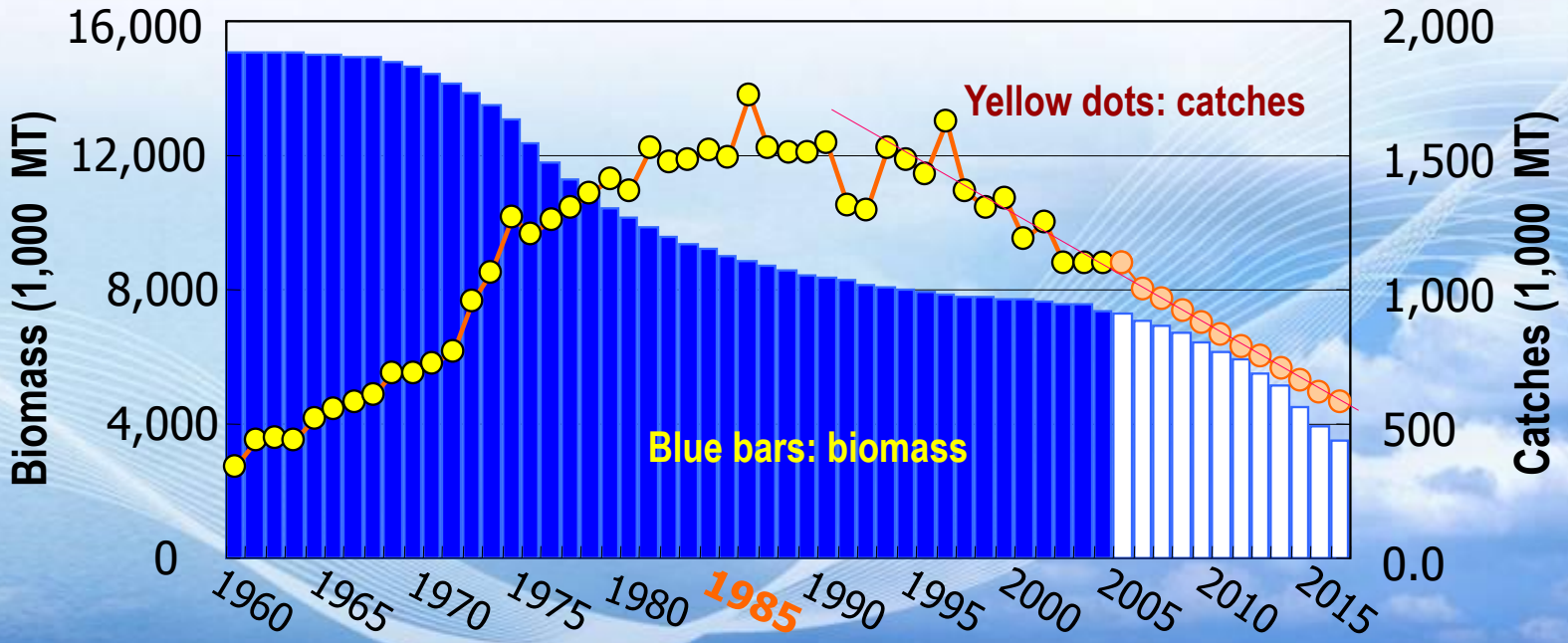
I. Background of Fish Stock Rebuilding Plan(FSRP)

Overcoming Challenges of the Management System

✓ Decline of fish stocks and catch

- Reduction in Stocks (0,000 M/T) : ('80) 1,000 → ('04) 790 → ('15) 390 (expected)
- Reduction in Catch (0,000 M/T) : ('86) 170 → ('04) 108 → ('15) 66 (expected)



Limitations of Fisheries Management System

- Total amount of fishery resources was estimated to have reduced, ***though there are differences in increase and decrease of amount for fish species*** (Healthy stocks and depleted stocks among 119 species)

- Direct and Indirect causes of such reduction may include;

✓ Destruction of habitats by **contamination of marine environment** and **climate changes** and **ecological changes** in fish species

✓ Due to **geographical characteristics of fishing grounds**, an individual nation has limitation in management and recovery of fishery resources

✓ Due to the '**multi-species/multi-fisheries**' characteristics of coastal and offshore fisheries of Korea, there were limitations in establishing policy management measures according to characteristics of each fish species

Need for Species-based Stock Enhancement Programs

- Aimed to increase fish stocks by improving the marine environment, restoring productivity of the natural population of fish

- Need for a role to play in fisheries management as part of an integrating fisheries management strategies

✓ Artificial Reef Program

- Implemented in 1971 to increase fish stocks by installing artificial reefs to create habitats and spawning grounds (installed nationwide in the total area of 202,141ha by 2007)

✓ Marine Seaweed Forest Program

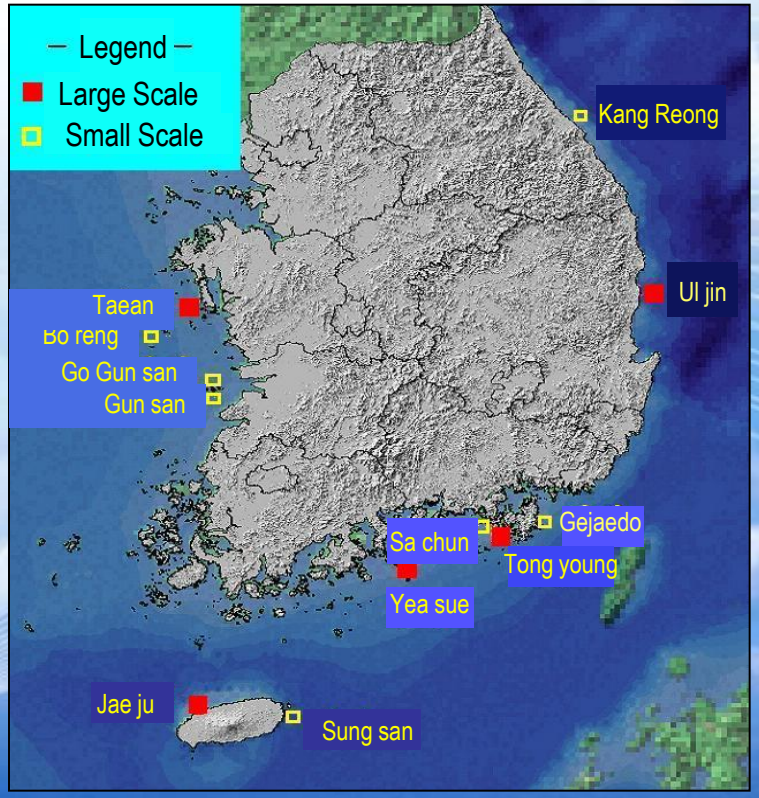
- Implemented in 2002 for installing seaweeds for the recovery ecosystem of fishing grounds
- Playing an important role in spawning, breeding, and feeding grounds for fish, shellfish, etc.
- Planned to spend US$281 million over the next 10 years to grow 35,000ha of seaweed forest

✓ Fry Releasing Program

- Operated since 1976 to enhance the recruitment of insufficient fishery resources
- Total 400 million fish fries were released between 2004 and 2007

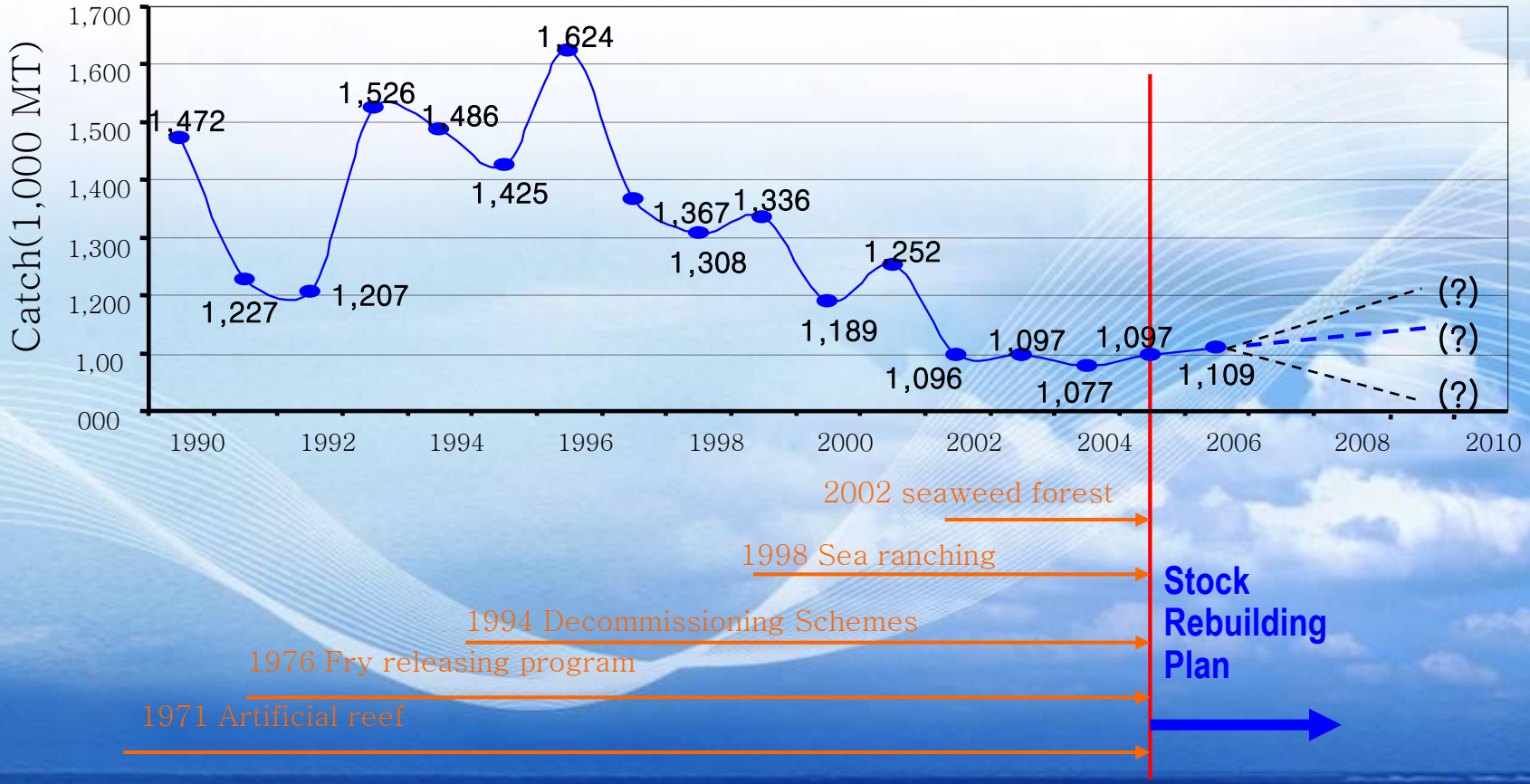
✓ Sea Ranching Program

- Operated since 1998 for providing for sustainable fish stock reproduction in the coastal areas by installing artificial reef and releasing fish fries densely
  - 5 large-scale sea ranching
  - 20 small-scale sea ranching by 2010



Need for the Stock Rebuilding Plan for Sustainable Fisheries

- Steady Reduction in Offshore/Coastal Fish Stocks
- Limitation in Fisheries Management Measures and Policy
- Problems in Marine Ecology Environment (Protection of Habitats)
- Need for the Species based the Stock Enhancement Programs



II. Implementation of Ecosystem-based FSRP

Establishment of Ecosystem-based FSRP

✓ Background

- Overcoming limitations with the conventional management
- Strengthening a need for management of EEZ fish stocks
- Proliferating a community-based management fisheries
- Integrating stock enhancement and management measures

→ Acknowledging the necessity of policies for recovery of Individual species to manage all fish species

→ **FSRP has been established In 2002-2005**

✓ Concept

- **Ecosystem-based FSRP aims to increase the level of fish stock from the current level to a target level within a rebuilding period with efficient fisheries management measures and stock enhancement programs**

✓ FSRP Objectives in Term of Biomass and Catch

- Aimed to enhance the total fish stock to the level of 10 million MT by 2017
- Expected to maintain the stable catch limit of 1.3 million MT annually

✓ Selection of Recovery Target Species

- Using a trend analysis of catch by fish species by Garibaldi and Caddy(2004) and stock assessment method to evaluate the state of fish stocks

① Creation of Sustainable Development Index (SDI):
SDI % =(3-year m-average('01-'04)) / (Max. of last 15 years 3-year m-average('90-'04))

② Selecting target species whose SDI value is less than 30%

③ Selection criteria utilizing resources Information based on SDI

✓ Establishment and Operational Plan by Stage

- Stage 1(2002-2005): Establishment of basic mid and long-term FSRPs and Institutional improvement
- Stage 2(mid-term, 2006-2012): Implementation of FSRPs for 20 species
- Stage 3(2013-2017): Settlement of FSRP-based fisheries management system

Operating System of Ecosystem-based FSRP

✓ MIFAFF (Ministry for Food, Agriculture, Forestry, and Fisheries)

- Selecting target species based on the NFRDI's SDI and stocks reports
- Demand and suggest LFRMC to establish and operate the FSRP
- Administrating FSRP, including Institutional aspects and support activities

✓ NFRDI and Scientific Council(SC)

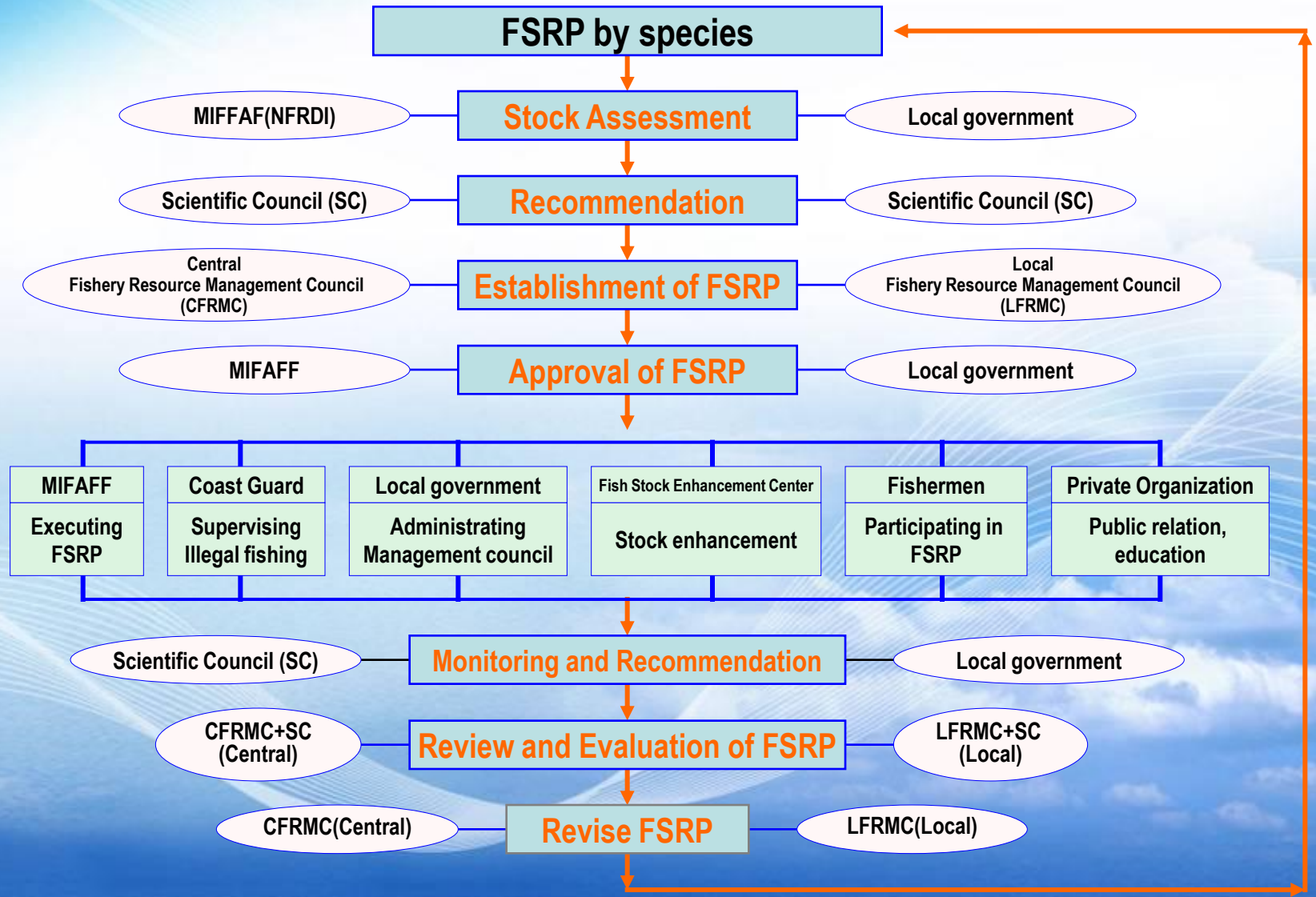
- Reporting SDI and stock assessment and submitting the recommendations
- Reviewing and establishing the recommendations in the central and local SC
- Fish Stock Enhancement Center supports SC to submit recommendations

✓ Local Fishery Resource Management Council(LFRMC)

- Composed of local government, fishery cooperatives, fishermen, and experts
- Establishing and operating FSRP based on SC's recommendations
- Developing stock rebuilding measures and gathering fishermen opinion

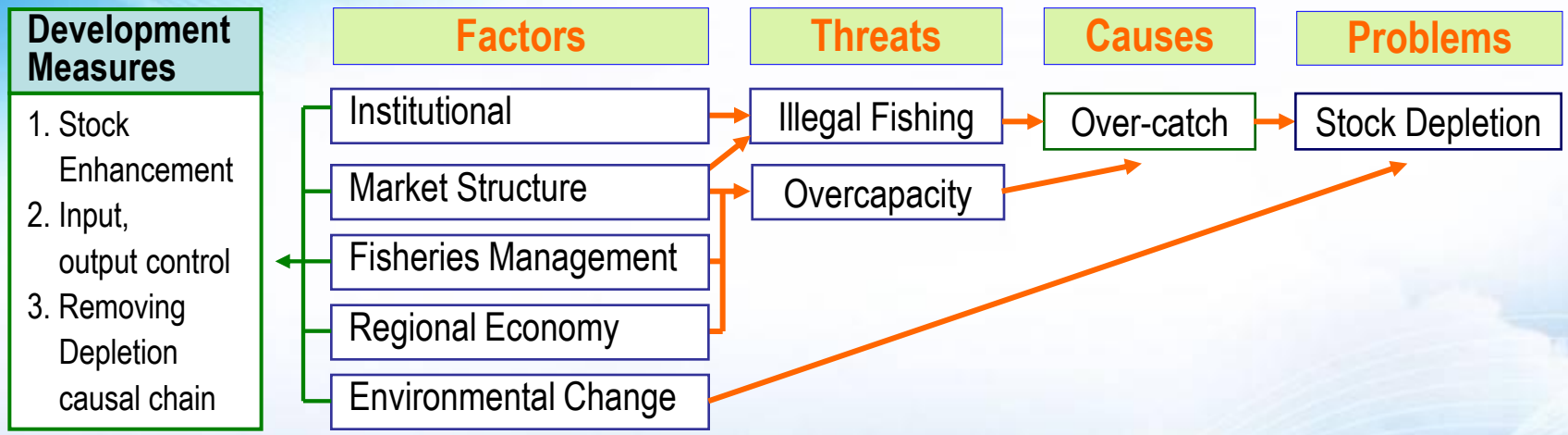
NFRDI : National Fisheries Research & Development Institute

✓ Management and Operation System of Ecosystem-based FSRP



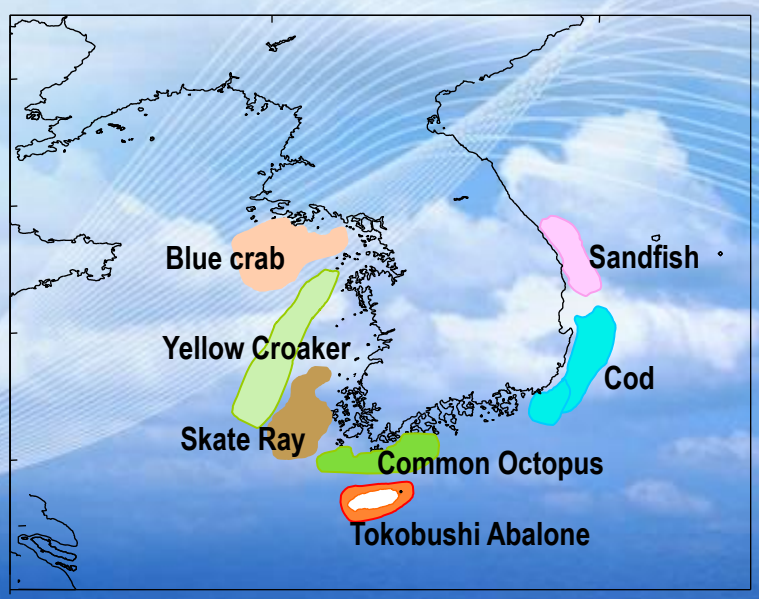
NFRDI : National Fisheries Research & Development Institute

✓ CCA Diagnosis of Stock Reduction and Rebuilding Measures



✓ FSRPs in the Nation-wide Sea Areas

- 7 FSRPs have been operated in the nation-wide sea areas of Korea by 2006-2007
- 4 FSRPs have been operated in 2008-2009
- 9 FSRPs will be operated in 2010-2012
- FSRPs will be operated in 2013-2017



* CCA(Causal Chain Analysis)

Characteristics of Korean Ecosystem-based FSRP

✓ Multi-species-fisheries and Stock Enhancement Programs

- Based on the conventional management measures and stock enhancement programs, it emphasized the management of individual species

✓ Durability of Fisheries with Stock Enhancement Supports

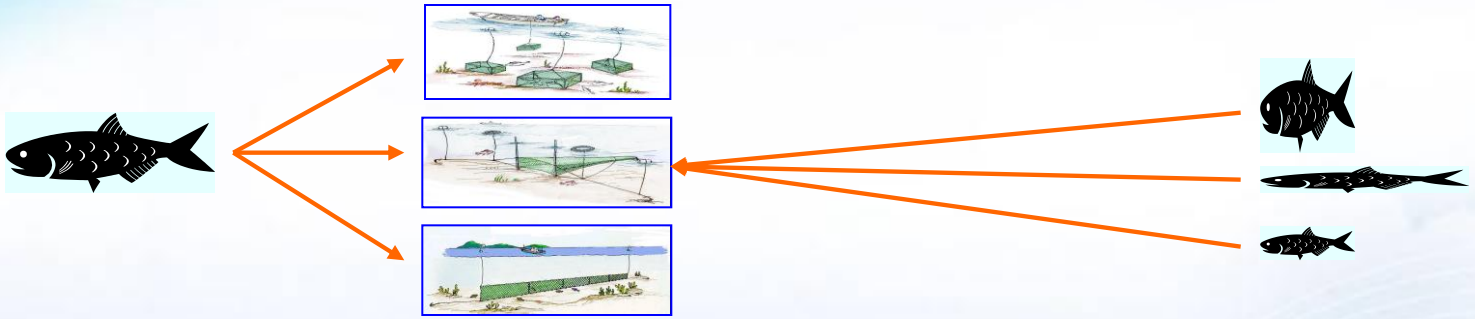
- By using direct measures and stock enhancement programs together, it allows effectively and quick recovery of fish stock while maintaining fishing activities

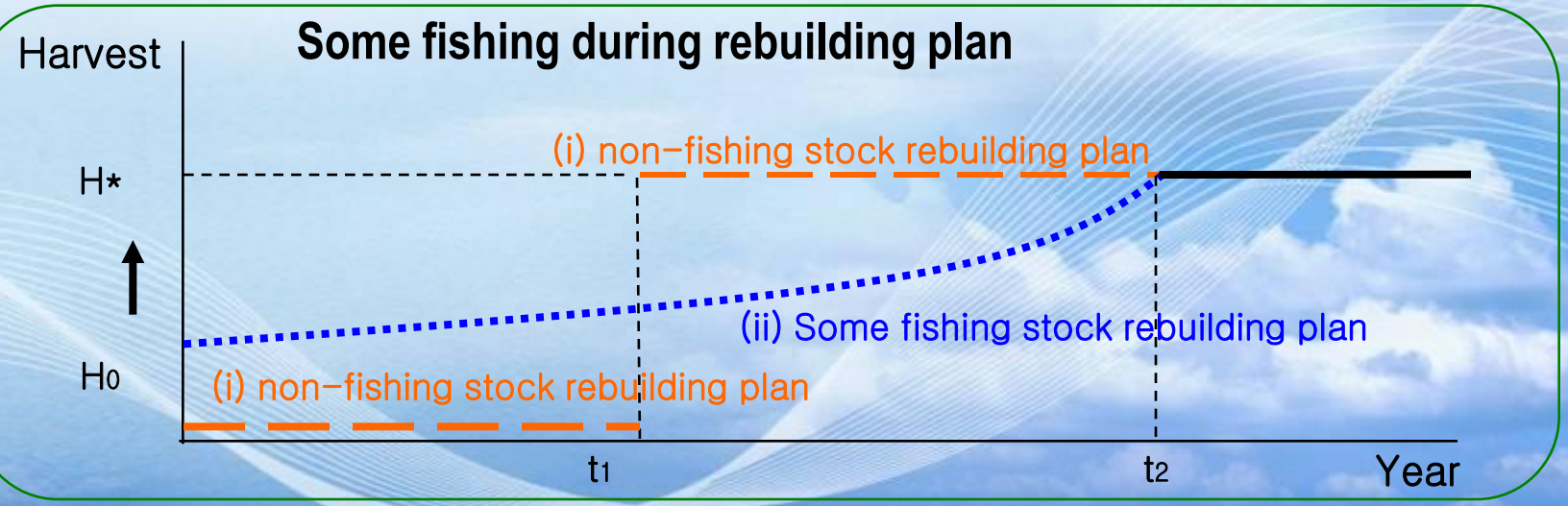
✓ FSRP + Community-based Fisheries Management

- FSRP premises voluntary participation of fishermen by connecting with a community-based fisheries management

- The efficacy of FSRP can be maximized through voluntary acceptance of restrictions for resource recovery and self control on unlawful fishing activities

✓ Mixed Species – multi-species/multi-fisheries-durability of fisheries

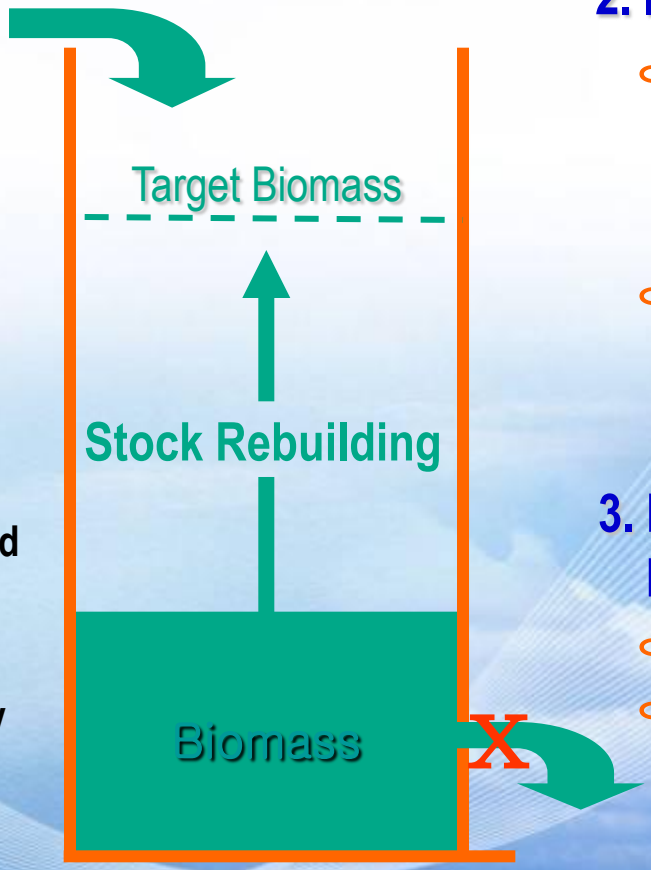




✓ Stock Enhancement Ecosystem-based FSRP

1. Stock Enhancement

- Fostering Resources
  - Artificial reefs
  - Seaweeds forest
  - Fry releasing
  - Marine ranching
- Restoring Productivity
  - Cleaning fish farm areas and fishing grounds
  - Collecting abandoned nets
  - Protecting habitats, nursery spawning areas



2. Input, Output Control

- Fishing Efforts Controls
  - limiting fishing boat and gear
  - limiting mesh size and fishing season
- Allowable Catches
  - post-harvest management
  - landing observer

3. Removing Depletion Causal Chain

- Adjustment Policies
- Unlawful Gear & Methods
  - destructive G/M
  - unlawful fishing activities

III. Biological and Economic Effectiveness of FSRP

- **Based on the Results of only 7 FSRPs by 2007**

Unit: M/T, US$ million

Species	2004 Catch	2007 Catch	2012 Target Catch	Recovered Volume	Price (US$/Kg)	Increase Revenue
Sandfish	2,472	3,767	4,000	1,528	2.24	3.4
Blue Crab	2,683	13,606	14,000	11,317	7.98	90.3
Octopus	7,023	6,625	11,000	3,977	11.82	47.0
Tokobushi Abalone	19	62	200	181	24.57	4.4
Skate Ray	259	375	500	241	11.67	2.8
Cod	2,641	7,533	8,000	5,359	2.69	14.4
Yellow Croaker	17,570	34,221	35,000	17,430	3.34	58.2
Total	**32,667**	66,189	**72,700**	**40,033**		**220.5**

- Though such increase in the catch can not directly be stated as a result of performing FSRP, it probably has resulted from control of fishing effort under the plan, protection of spawning grounds and active stock enhancement programs

Case : Blue Crab Ecosystem-based FSRP

- Selected as the target species of FSRP for the West Sea region of Korea in 2006
- Applied various management measures for FSRP
  - ✓ Fishing prohibition period for protection of small sized crabs
  - ✓ Modification of length of mesh size, protection of spawning grounds
  - ✓ The government and local entities monitor unlawful fishing
  - ✓ Fry releasing program (909,000 crabs were released during 2006-2007)
  - ✓ Active and voluntary participation of fishermen

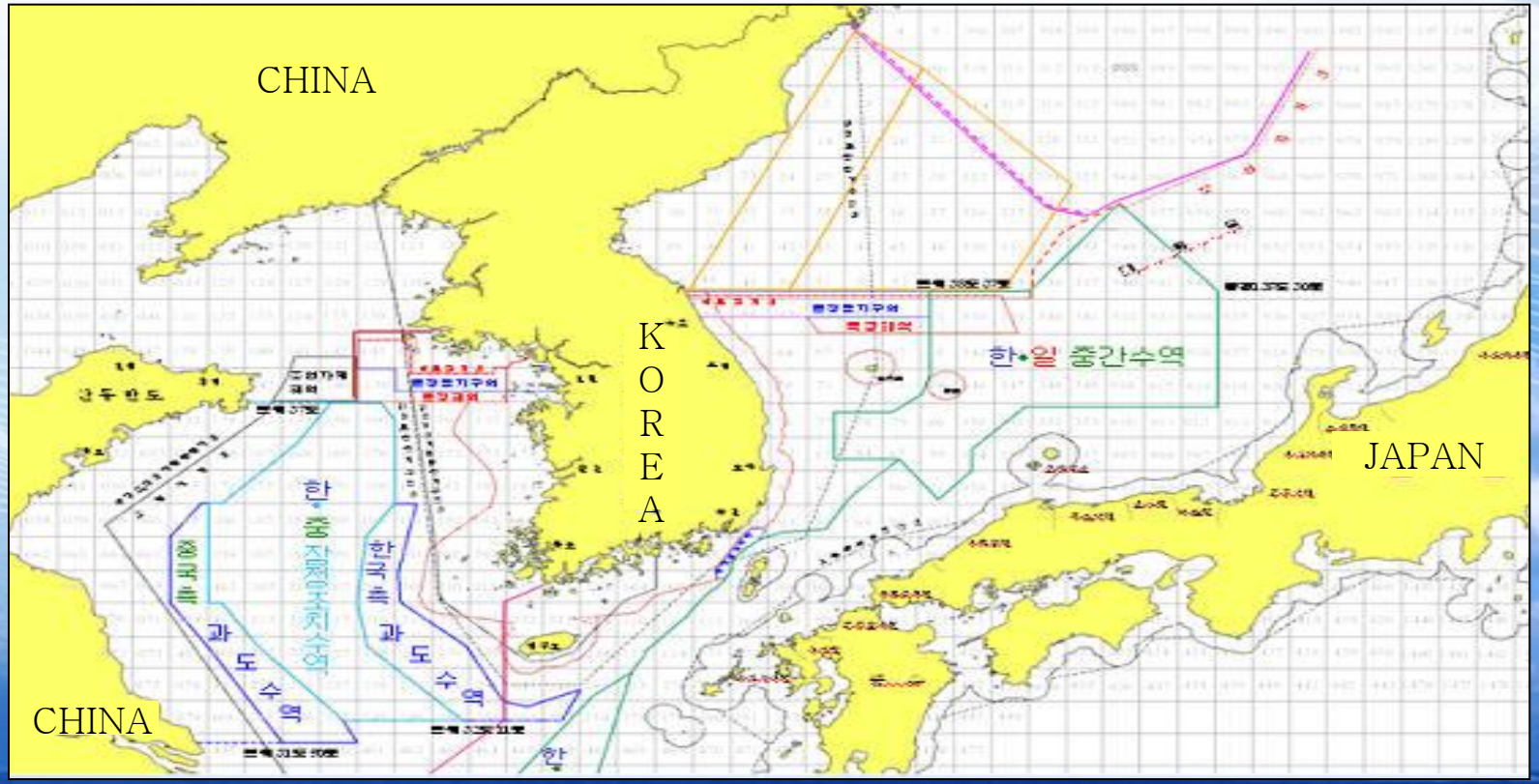
- Catch : 2,700MT in 2004
→ 6,900MT in 2006
→ 13,600MT in 2007

IV. Some Challenges and Conclusion

- **Diverse Data on the Causes of Stock Reduction**
  - The lack of available data brings limitation in establishment of FSRP
  - Need to more comprehensively examine many causes of stock reduction
- **Selecting Properly Functioning Measures**
  - With effective direct restrictions on fishing, measures that improve marine environment and reduce contamination of fishing grounds must be accompanied
  - Reducing negative policies including reclamation projects, ocean bottom sand gathering business, and waster disposal in the seas
- **Strengthening Voluntary Participation of Fishermen**
  - Combining FSRPs with a community-based fisheries management
  - Proper measures to support through stabilization of fishing business during the recovery period must be considered in order to induce active participation

A Joint Regional Fisheries Management System

- Operation of FSRP only by Korea can not obtain complete efficacy in fish stock recovery be accompanied
- A joint fisheries management system must be established to mutual cooperate on large marine ecosystem-based FSRP between adjacent nations



Sea ranching in Tong-young