

Possible New Management Measures
for Stock Rebuilding of Blue crab,
Portunus trituberlatus (Miers),
in Western Korean Waters

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Background

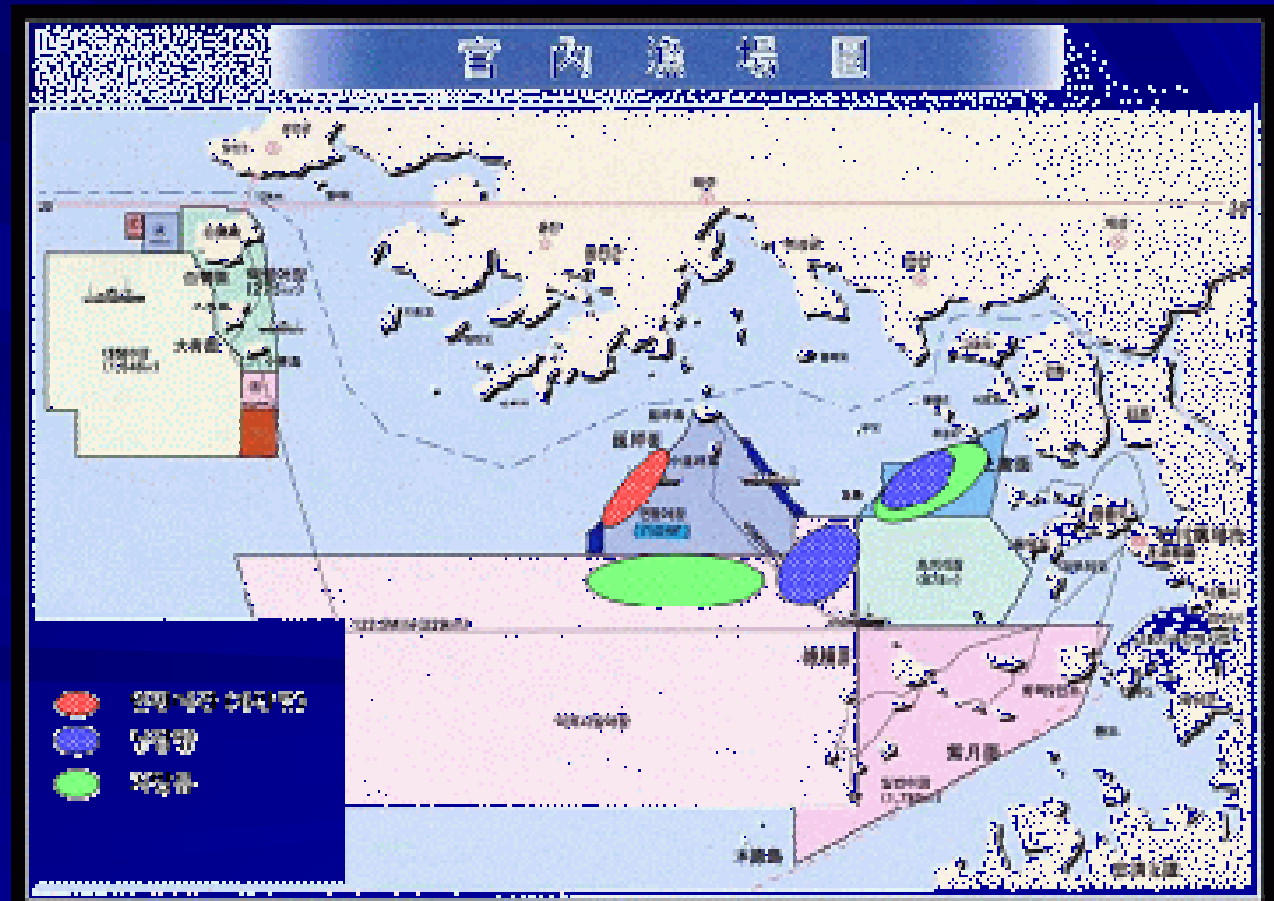
- Landings of blue crab have declined about 75% over the past 5 years; Abundance is decreasing
- A closed fishing season and minimum size limits are being used in management
- An ecosystem-based benefit from improved crab management is anticipated

Materials and methods

- Management scenario evaluations
 - Reduce estimated ghost fishing impacts (eg; Removing lost and derelict fishing gears)
 - Lengthen the closed season to reduce fishing mortality for adult female crab or molted crab
 - Protect brooding crabs from fishing
 - Extend the legal minimum limit size based on stochastic fisheries data and species' biological characteristics

Removing lost and derelict fishing gears

- To improve ocean habitat
- Reduce ghost fishing rate from an estimated 14% (7~30% range)



Predicted yield loss from ghost fishing

Year	Catch (t)	Loss (t)
'00~'01 mean	12,133	1,699
'02	16,182	2,265
'05~'06 mean	1,788	250

Lengthen the closed season in September for molting

- Reduce fishing mortality by not catching crabs with soft shells during the molting season
 - Expect an increase in spawning stock size
 - 90% of the total crab catch from 1~20 Sept is softshell.
- Molting season: Jul. ~ Sept.
(mainly early Aug. ~ mid Sept.)
- Current closed season: 1 Jul.~31 Aug.
- Suggested closed season: 1 Jul.~20 Sept., extend by 20 days

Expected catch increase by lengthening the closed season for molting crabs

Year	Catch (t)	Molting crab catch (t)	Expected hard shell catch increase (t)
2004	473	426	553
2005	554	499	649
2006	772	695	904

¹ applied gain weight rate 150% per molt (molting crab catch x 1.3)

Extend the closed season in June for spawning

- Expected benefits

- A. increase crab spawning biomass

- B. increase crab recruitment

- Closed season

- ▷ Spawning season: May ~ Sept. (mainly: June ~ Jul.)

- ▷ Present closed season: 1 Jul.~31 Aug.

- ▷ Extend closed season: 10 Jun.~31 Aug. by 20 days

A. Increase in spawning biomass

Catch of female crabs from 10 Jun.~30 Jun.

Year	Catch (t)		Ind. weight (g)		Number of individual (x1,000)		
	Large	Medium	Large	Medium	Large ¹	Medium ²	Sum
'00~'01 mean	626	159			1,898	692	2,590
'03	674	168	330	230	2,043	731	2,774
'05~'06 mean	76	4			18	18	249

B. Increase crab recruitment

Year	Recruited number ¹ (x1000)	Mean ind. weight (g)	Recruitment (t)
			Estimated ²
'00~'01 mean	10,358		2,383
'03	11,097	230	2,552
'05~'06 mean	997		229

¹ sum of catch number of female in previous table x N_t ; $N_t = N_0 \exp(-Zt)$
here, hatching number $N_0 = 1,500,000$ individuals, survival rate $S = 0.45$,
total mortality $Z = -\ln S = 0.8$, molting times $t = 16$

² recruited number x means individual weight

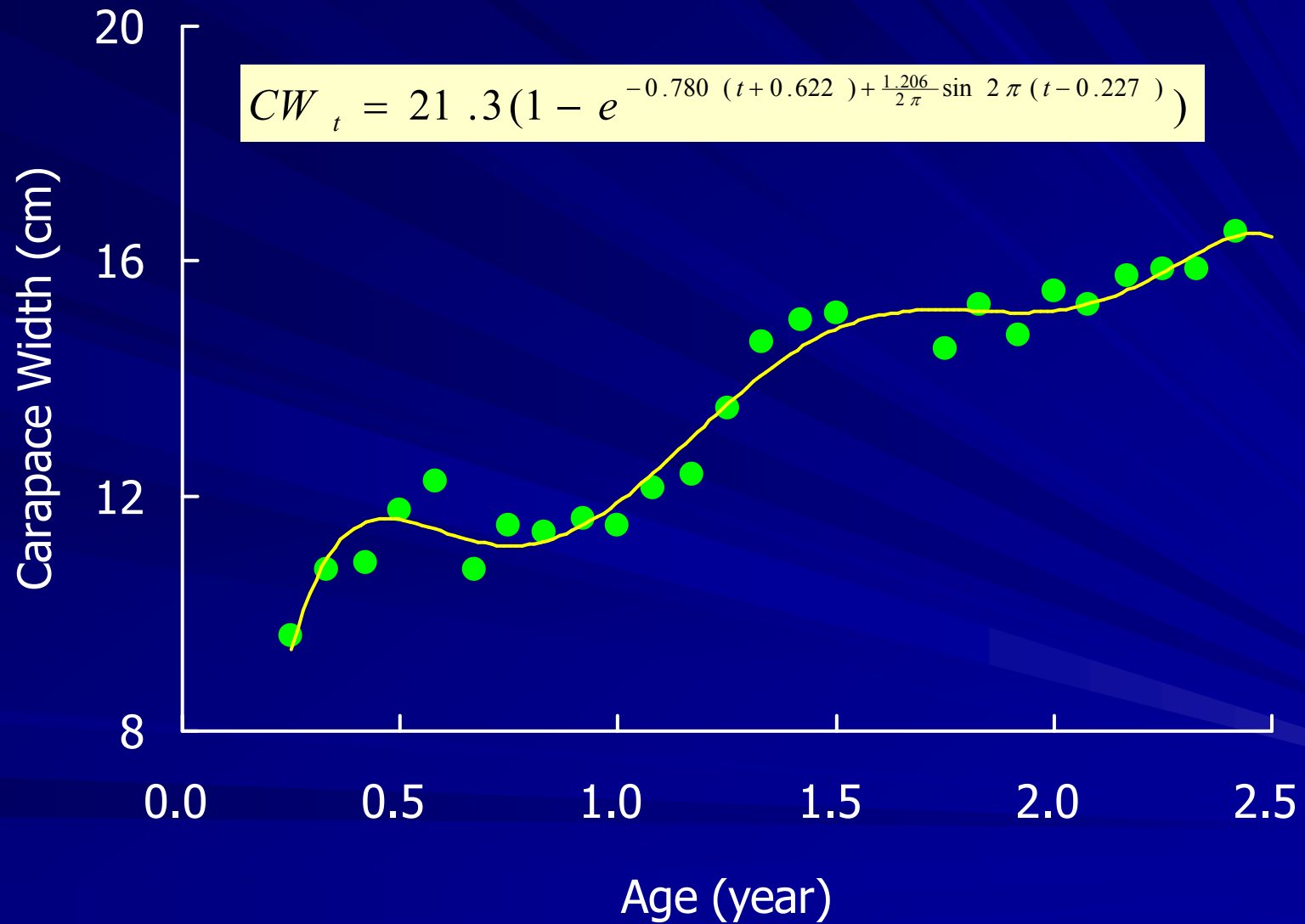
B. Protecting individual growth

Expected catch increasing by individual growth

Year	Catch (mt)	Ind. growth weight ratio per molting (%)	Survival rate	Expected increasing catch (mt) ¹
'00~'01 mean	1,362			272
'03	1,461	150	0.45	293
'05~'06 mean	140			28

¹ catch x individual growth weight ratio per 1 molting x survival rate – catch

Growth pattern of blue crab



Increase the legal minimum size limit (MSL)

- Increase MSL: 5 cm → 6.4 cm (in CL)
- Fishing season for small crabs:
 - Late Oct. ~ late Mar.
 - Most small crab caught: late Oct. ~ mid Dec.
- Main gear to catch small crabs: small stow net
- Catch ratio of small crabs to total catch: 20%

Expected catch Increase by Increasing MSL

Year	Total catch (t)	Estimated past small crab catch ¹ (t)	Predicted Expected increase
'02 Autumn~'03 Spring	16,976	3,395	5,093
'03 Autumn~'04 Spring	2,471	594	891
'04 Autumn~'05 Spring	1,163	233	350
'05 Autumn~'06 Spring	1,984	397	596

¹ 20% of total catch

² estimated small crab catch x individual growth weight ratio
per molt x survival rate

Other management implications

- Provision of compensation for potential short-term landing losses by paying them for ocean cleaning
- Encouraging fisher's voluntary participation for the stock rebuilding program
 - Set up on-going education systems
 - Provide grant incentives for voluntary participation by fishers
 - Strict prohibition of illegal fishing

Future work

- Monitor fishers' compliance
- Effects of fishers' compliance should be communicated back to the fishers
- Surveys to evaluate MPA establishment on spawning, nursery and wintering grounds should be carried out.

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