

# Assessment of the Japanese sardine (*Sardinops melanostictus*) stock in the northwestern Pacific for Japanese management system

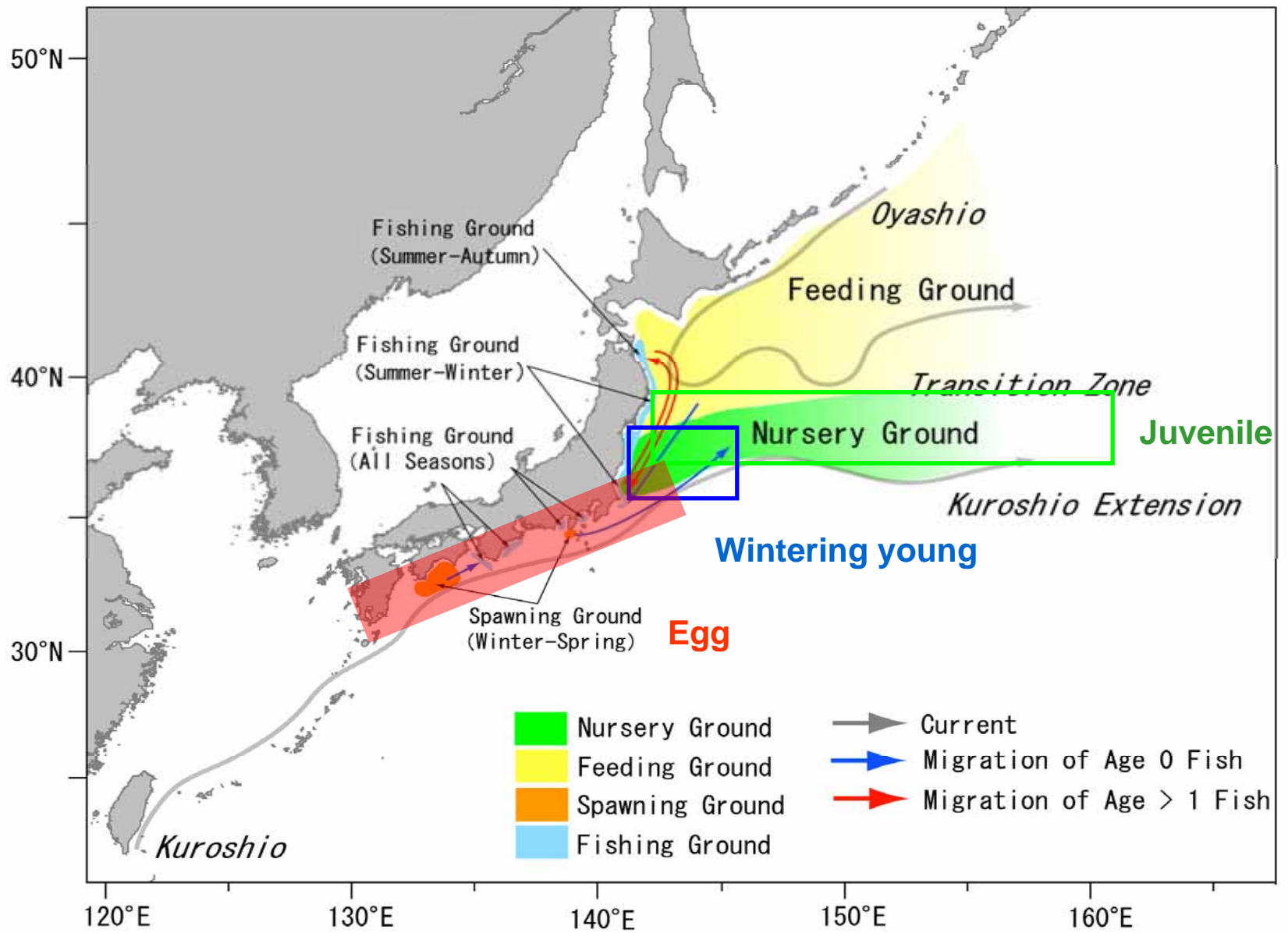
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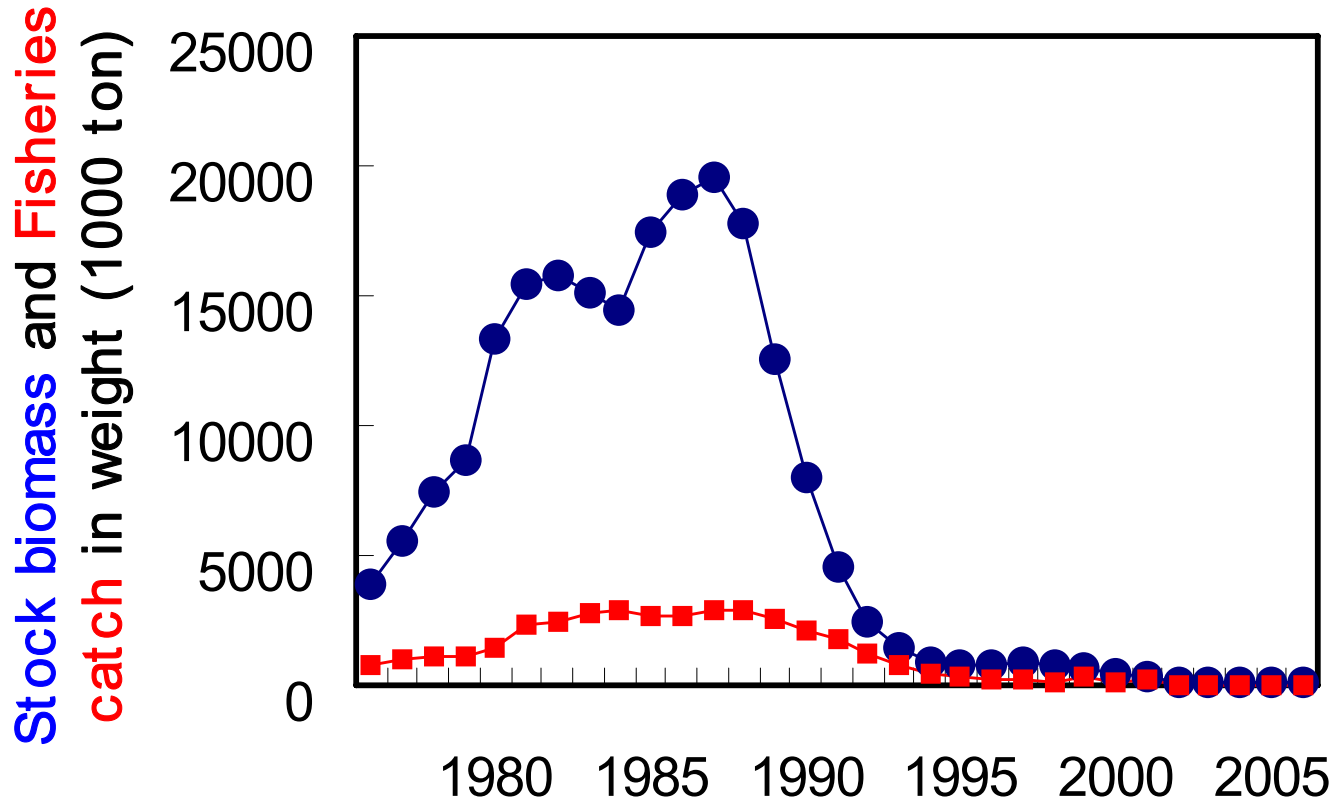


*Sardinops melanostictus*

- (1) *Current stock status*
- (2) *ABC(acceptable biological catch) setting*
- (3) *Suggestion for the stock recovery measure that promote sustainable fishery*



## Stock biomass (VPA) and Fisheries catch



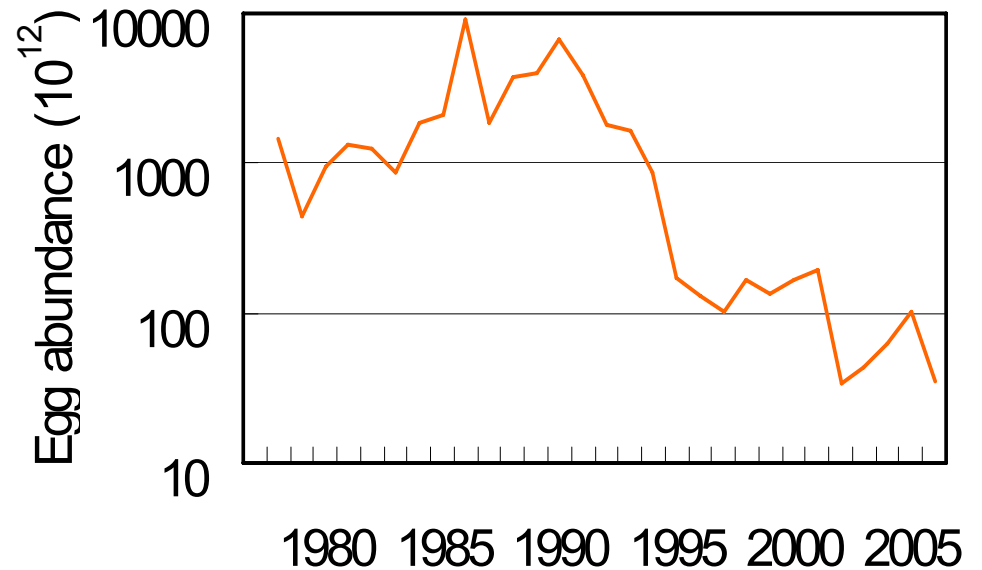
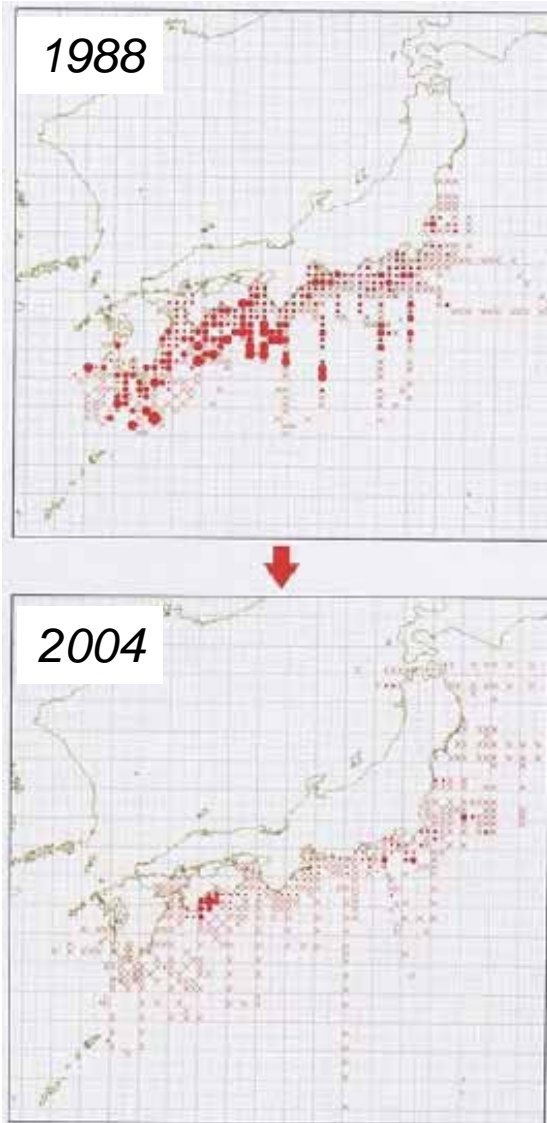
*Stock abundance decreased from ca. 14-19 million ton during 1980's to less than 1 million ton in late 1990's.*

# Egg abundance

## Egg abundance survey

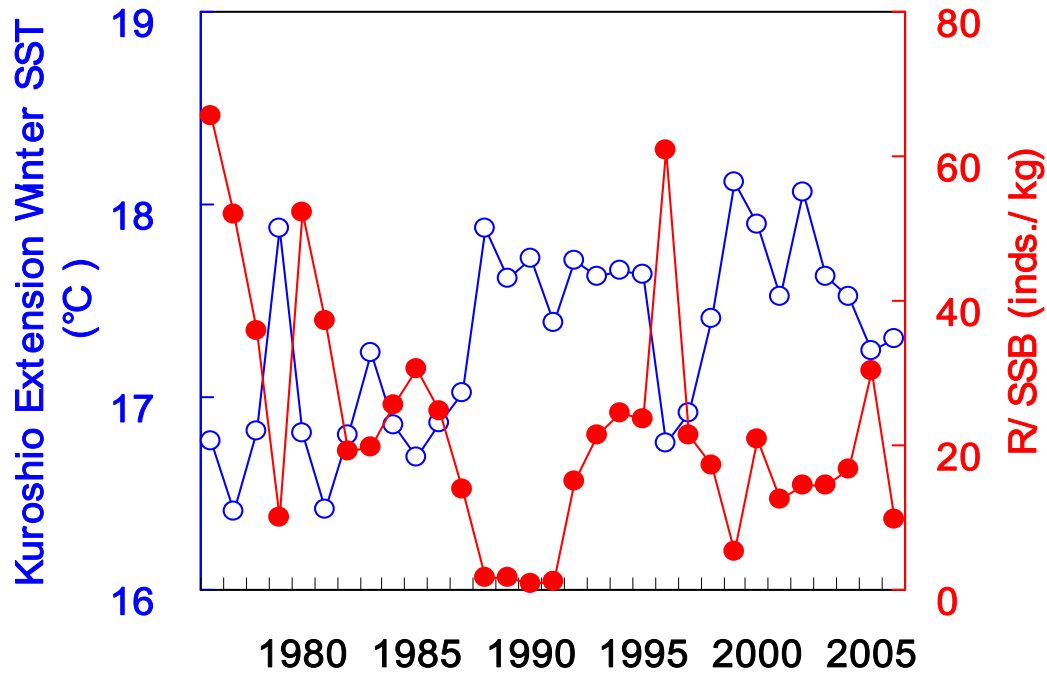
Vertical towing from 150m depth (or near bottom) to the sea surface  
Long Norpac net (0.335mm mesh size and 45cm mouth diameter) .

## Egg abundance (October-September, 1978-2006)

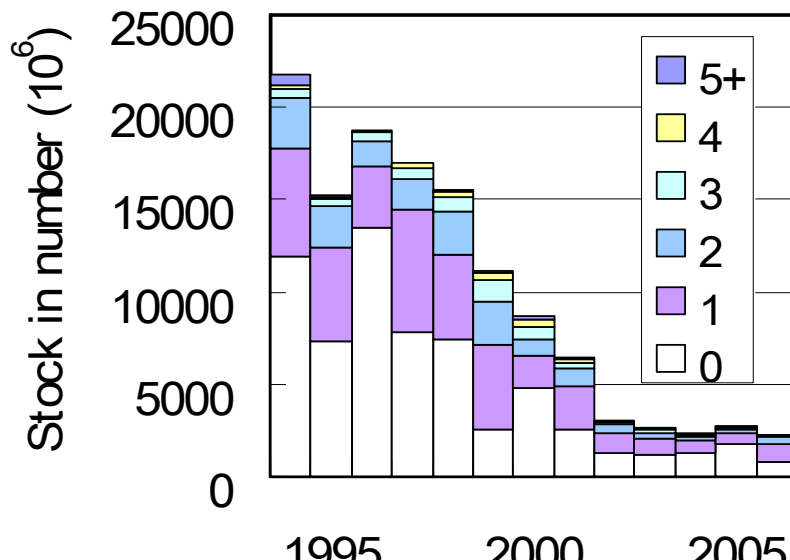


## (2) ABC setting

## R/SSB · Age composition

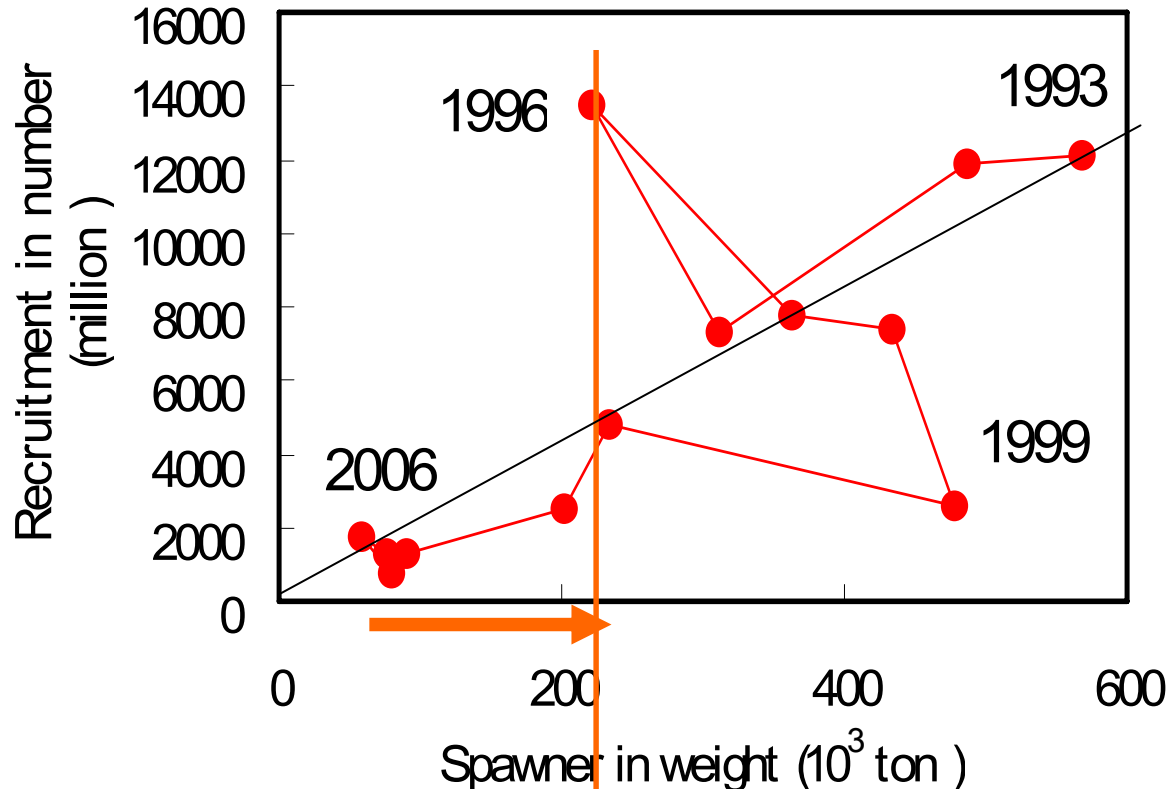


*From the historical perspective, the current stock status would not be in the conditions for rapid stock recovery.*



*SSB and diversity in age composition is also the important step for sustainable fishery*

## SSB for preferable recruitment

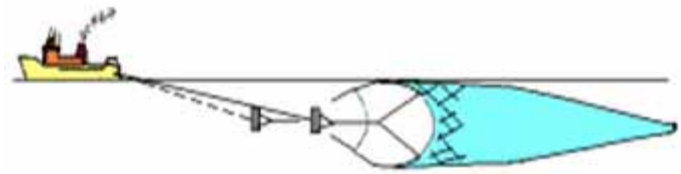


*.Minimum spawning stock biomass at which good recruitments were produced in the past are defined as the limit biomass (B<sub>limit</sub>).*

*B<sub>limit</sub> for Japanese sardine ( low stock level) = SSB<sub>1996</sub>(220000ton)*

*ABC for Japanese sardine = Catch limit corresponding to the fishing mortality preventing the total biomass from decreasing, and rebuilding the spawning biomass*

# Surface-midwater Trawl Survey



## Juvenile



### **Hokuho-maru**

Survey period: May-Jun. 1996-  
3 stations during a night  
Sub-surface trawl  
Net opening: 25 x 25 m  
Mesh aperture (cod end): 10 mm  
Towing duration: 30 min.  
Towing speed: 3.5 knot

## Wintering young

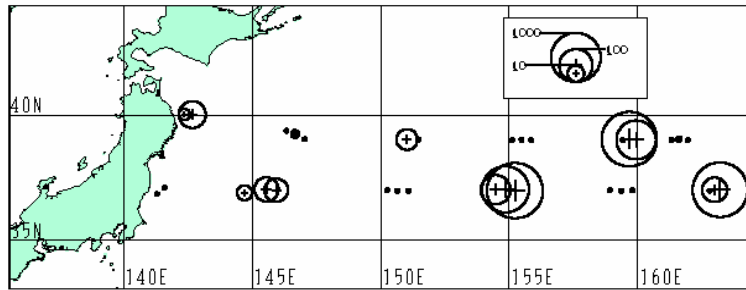


### **R/V Shunyo-maru**

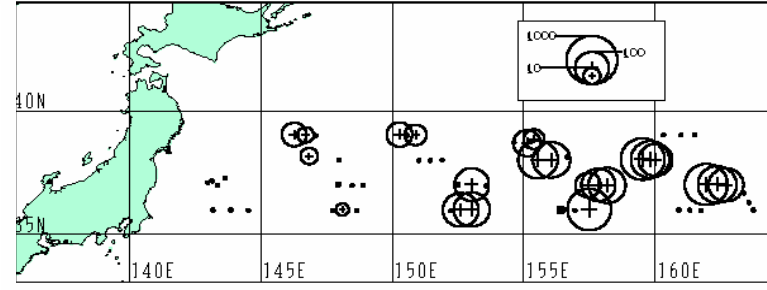
Survey period: Jan-Feb. 2002-  
3 stations during a day  
Surface-midwater trawl  
Net opening: 40 x 40 m  
Mesh aperture (cod end): 17 mm  
Towing duration: 60 min.  
Towing speed: 5 knot

# Geographical distribution and abundance of sardine juveniles

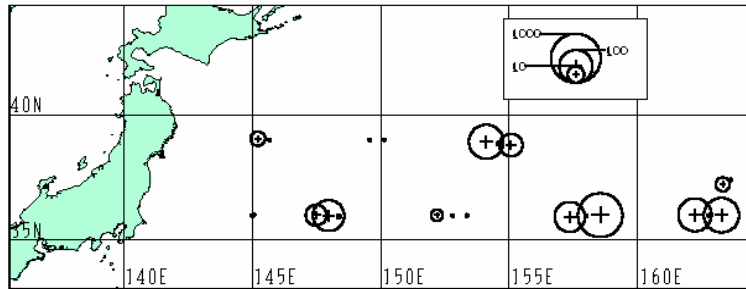
Circle size = No./net haul



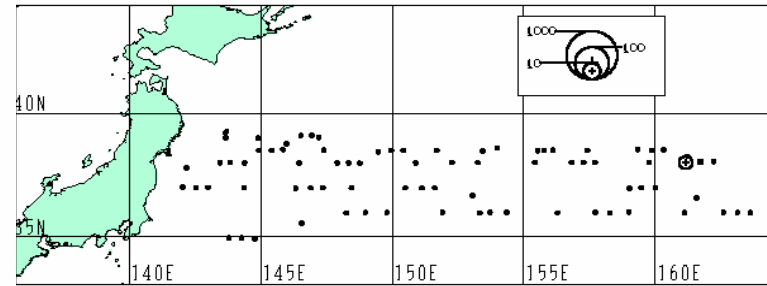
1996



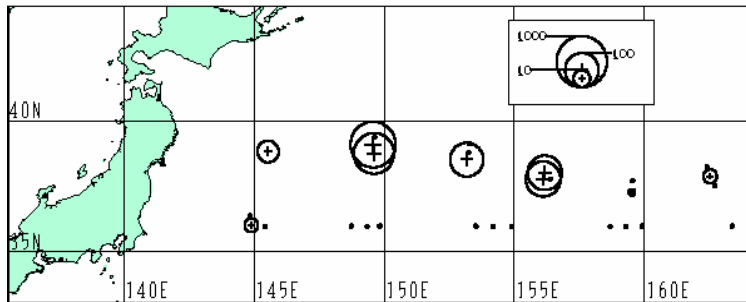
2000



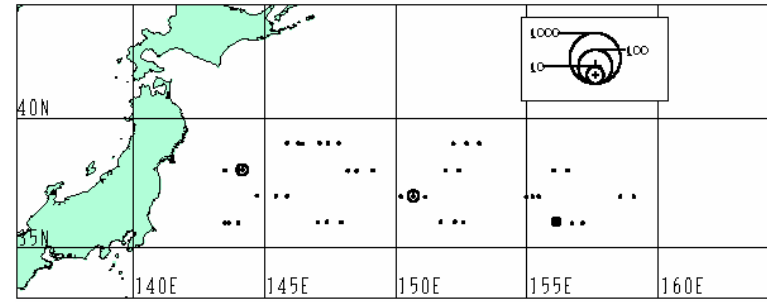
1997



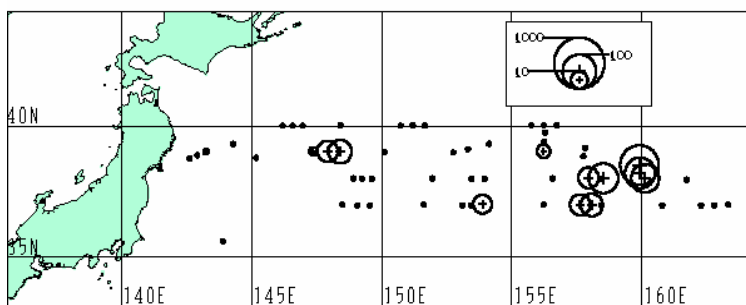
2001



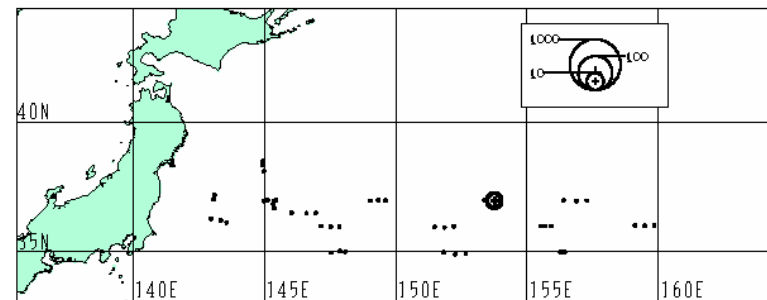
1998



2002

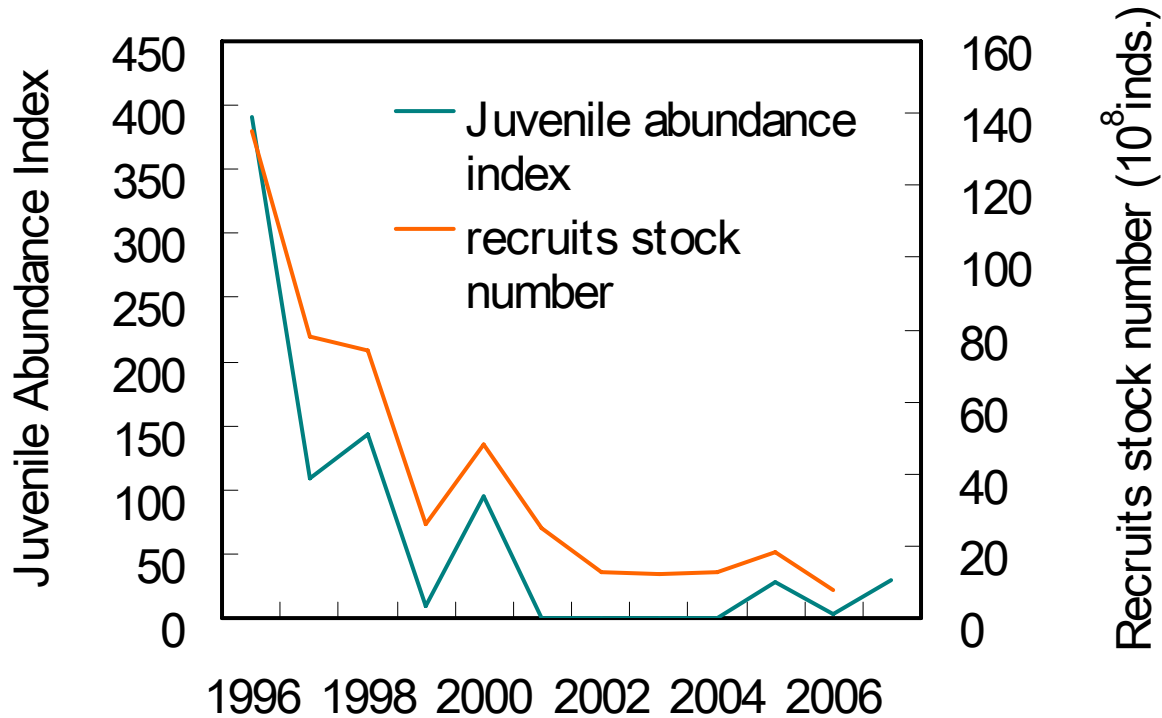


1999



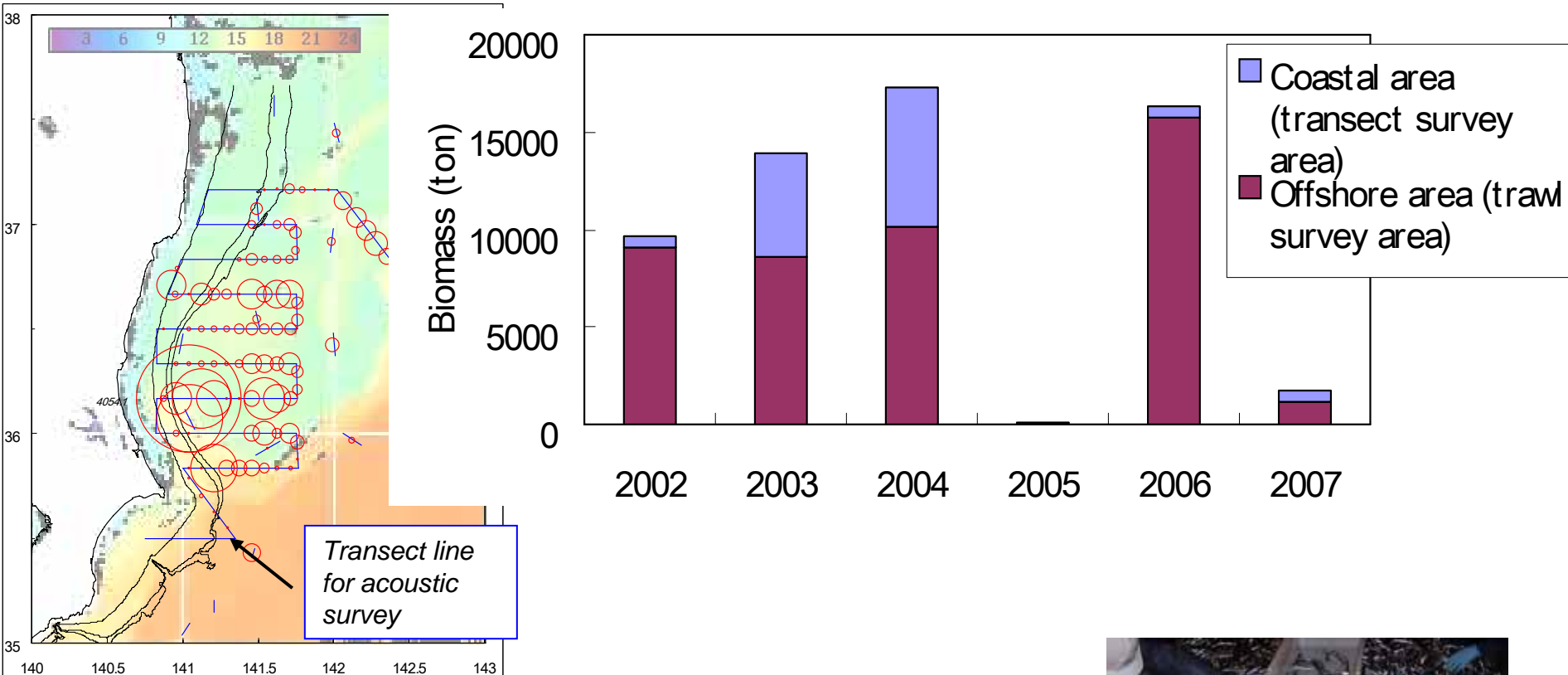
2003





*Juvenile abundance index (standardized juvenile catch numbers by May SST in KOTZ and tow numbers) fairly agreed with recruitment numbers estimated from cohort analysis*

# Young (age-1) density survey in wintering area



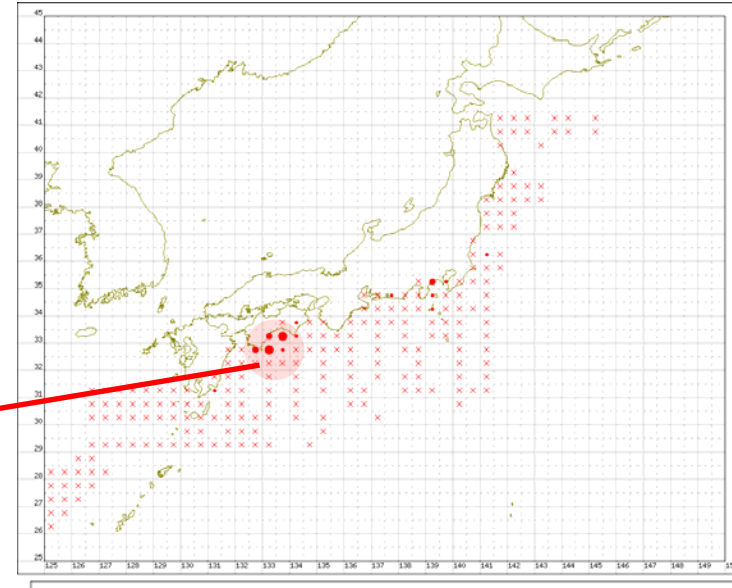
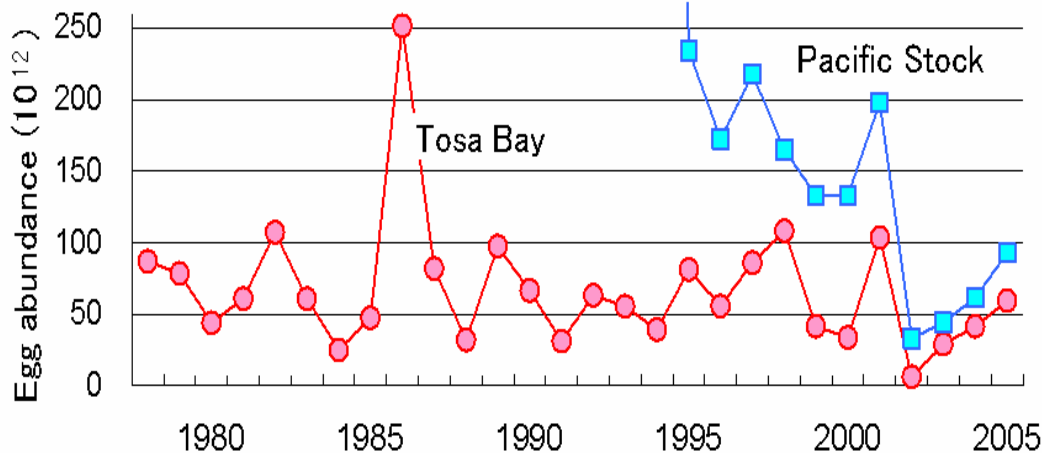
*High density of young was associated to intrusion from Kuroshio-extension.*

*Surface-midwater trawl survey data is essential for the stock assessment in the years of poor recruitment.*



### (3) Suggestion for the stock recovery measure that promote sustainable fishery

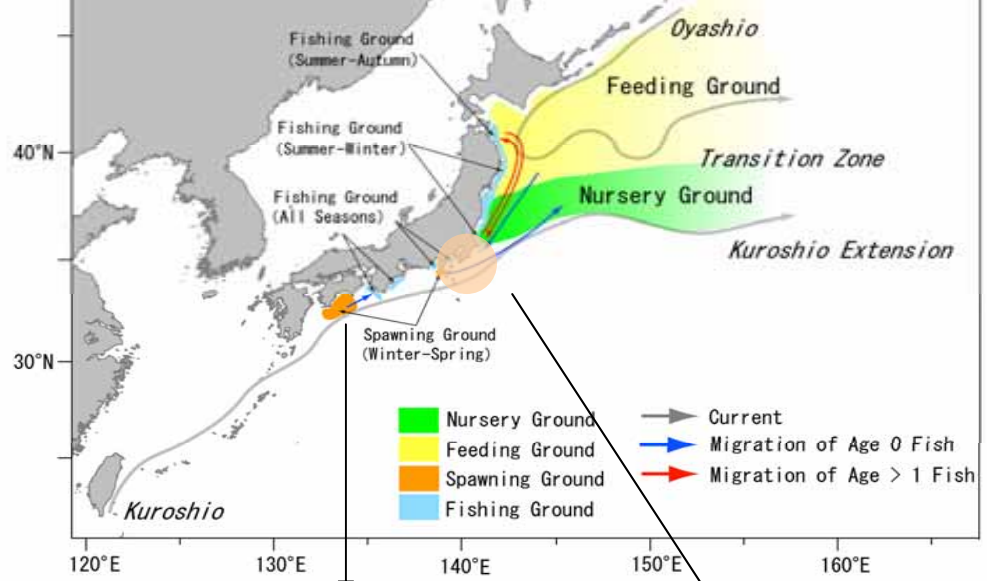
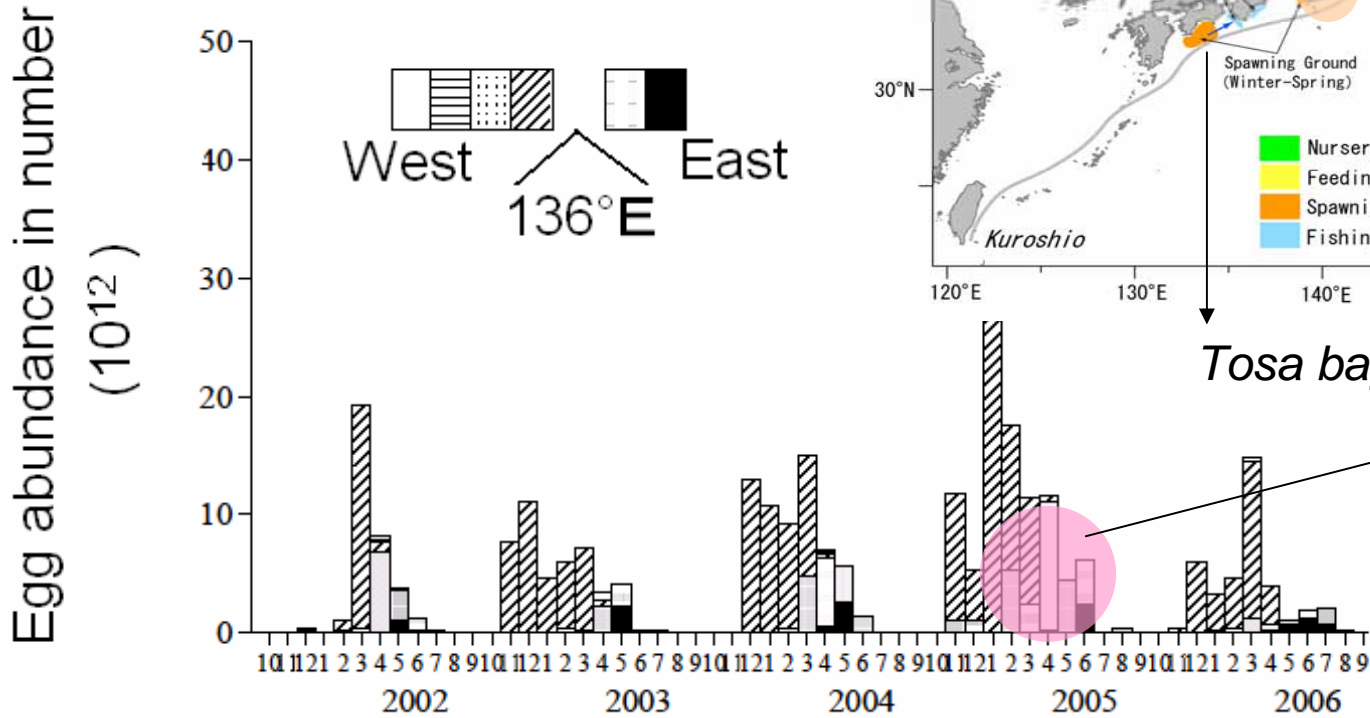
#### Preservation of habitat (spawning area)



*Tosa Bay is one of the spawning areas for Japanese sardine and plays an important role as protected area, because large scale purse seine fisheries are prohibited in Tosa Bay. →Ishida et al . S4-4190*

*The reduction in spawning ground in time and space in recent years also indicates the reduction of biological diversity of sardine stock*

Preservation of biodiversity  
(spawning area)



Tosa bay Boso

Egg abundance >20\*10<sup>12</sup> around Boso region is needed for the favorable recruitment (Kuroda 2004)

Spawning Biomass + Spawning Location (Diversity) → stock rebuilding

# Summary

*The stock size of Japanese sardine in the northwestern Pacific has shown a continuous decrease from 1987 to 2003 and the stock biomass estimate for 2003 was about 130 thousand tons.*

*From the historical perspective, the current stock status would not be in the conditions for rapid stock recovery.*

*The acceptable biological catch (ABC), that is the biological criterion for the TAC, is set to rebuild the SSB to the level of minimum SSB at which good recruitments were produced in the past.*

*Preserving habitat and biodiversity is also the important step for sustainable fishery*