

Fisheries and stock enhancement in the Bohai Sea, China

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Outline

1. Current status of fisheries in Bohai Sea
2. Stock enhancement in Bohai Sea
3. Conclusion remark



1. Current status of fisheries in Bohai Sea



1. Current status of fisheries in Bohai Sea

Costal ecosystem under multi-stressors

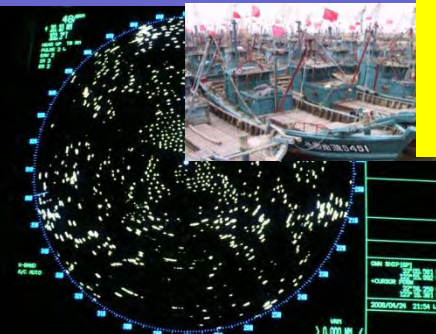
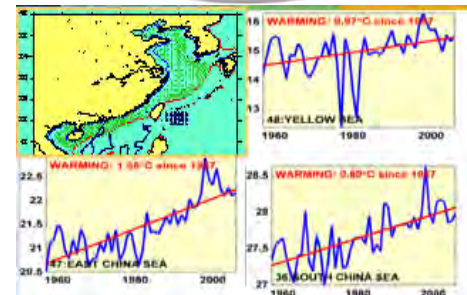
Human activities

Climate change

Changes in habitat, species composition, and distribution

Biological characteristics adaptation of fishery species

**Great decline of fishery resource;
Great degradation of ecosystem**



三峡水利枢纽



丹江口水利枢纽

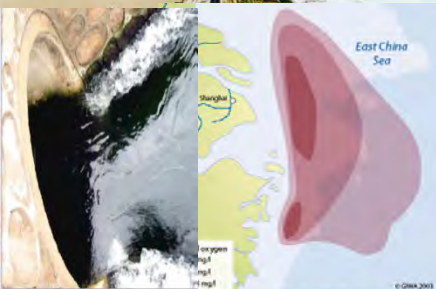
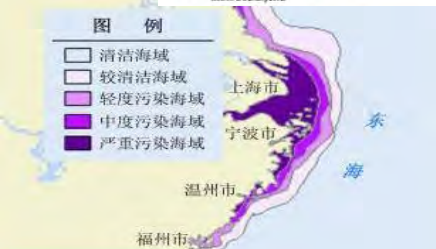
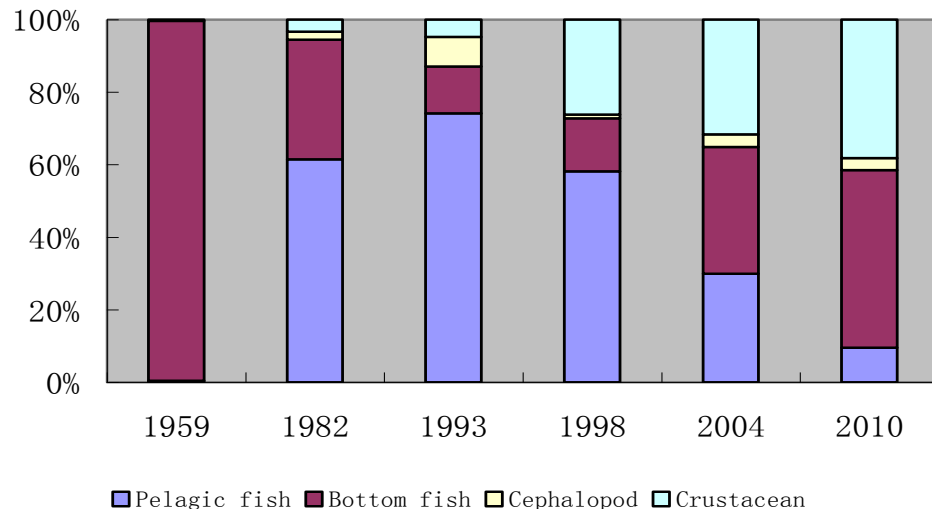
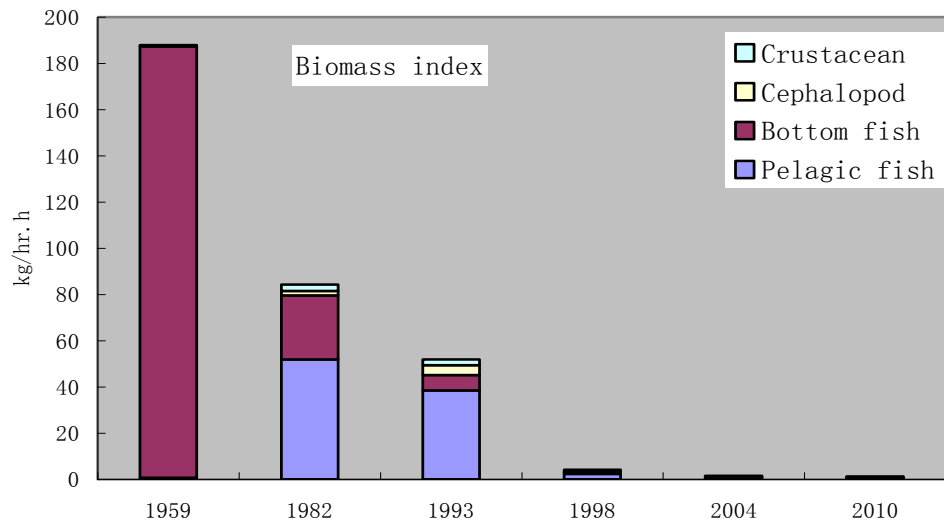


Figure 11 Hypoxy areas in the East China Sea. Source: Li, Zhong 2012

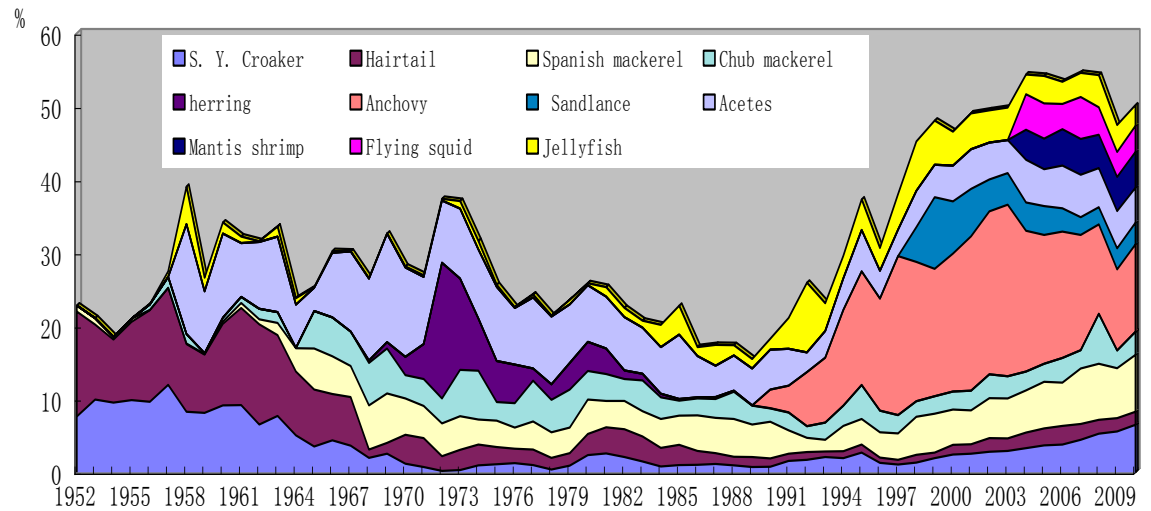
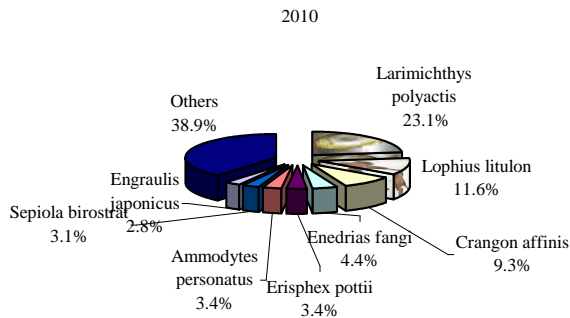
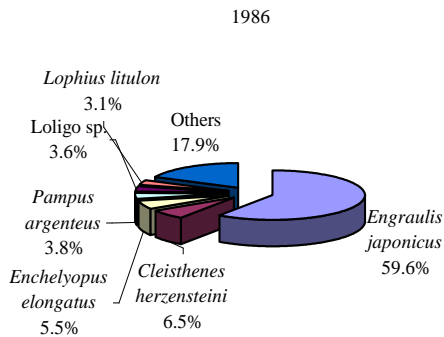
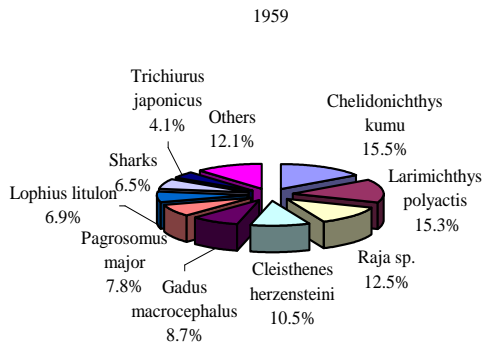


1. Current status of fisheries in Bohai Sea



- The abundances of many economically important species have been depleted.
- Early maturity and reduced spawning ground have been observed in some species.

1. Current status of fisheries in Bohai Sea



Large-sized demersal species have been replaced by the low-valued and small-sized pelagic fish;

Community structure changed considerably, rapid species shift, lower trophic level, simpler food web.

To rebuild or restock depleted fishery stocks is needed

2. Stock enhancement in Bohai Sea

Current status of stock enhancement in China

- Since the 1980s, sea ranching and stock enhancement have been regarded as the important measures to rebuild the depleted stocks.
- It developed very fast in recent years.



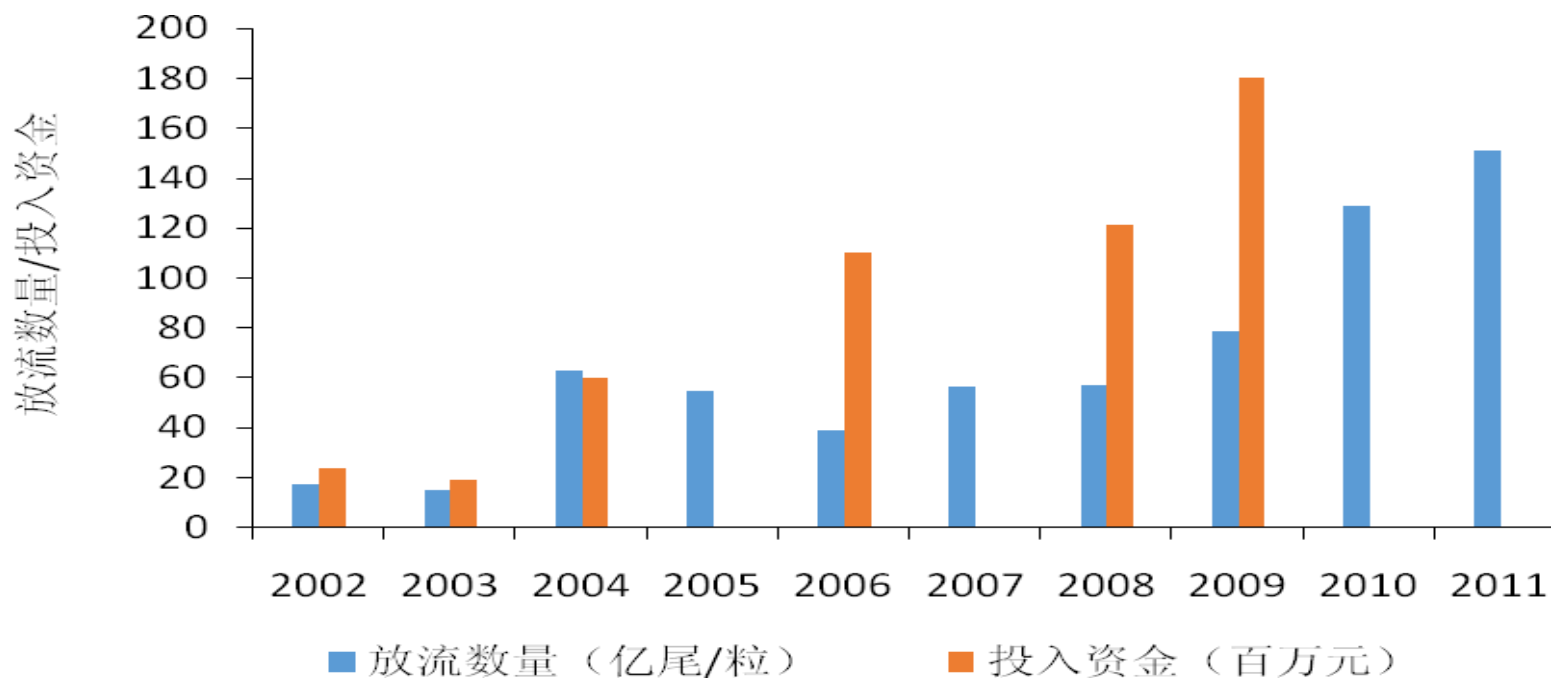
2. Stock enhancement in Bohai Sea

Current status of stock enhancement in China

- **The main species were high-valued species, particularly fleshy prawn in the Bohai Sea, and Yellow Sea;**
- **Other hatchery juveniles, such as red seabream, large yellow croaker, flounders and mullet, tonguefish, shellfish, abalone and jellyfish etc;**

2. Stock enhancement in Bohai Sea

Current status of stock enhancement in China



China coastal waters

Species enhanced in the Bohai Sea

Main species:

- **Chinese shrimp** *Fenneropenaeus chinensis*
- **Blue crab** *Portunus trituberculatus*
- **Flounder** *Paralichthys olivaceus*
- **Jellyfish** *Rhopilema esculenta*

Others:

- **Mullet** *Liza haematocheila*
- **Red sea bream** *Pagrosomus major*
- **Black porgy** *Sparus macrocephalus*



Location of releasing



Size of releasing

Chinese shrimp:

Two sizes of fry were released after quarantine inspection

- Ca. 1.2 cm (lower cost + higher mortality)---Hebei Prov.
- Ca. 2.5 cm (higher cost + lower mortality)---Shandong prov.

Juvenile blue crab—stage II (6-8 mm) ;

Jellyfish— diameter 2-3cm;

Flounder —length 5-8cm;

Time of releasing

- **Chinese shrimp:** Mid-May-Mid-June;
- **Blue crab:** late June;
- **Jellyfish:** late may – Mid-June;
- **Flounder:** June – July.

Water temperature >15° C.

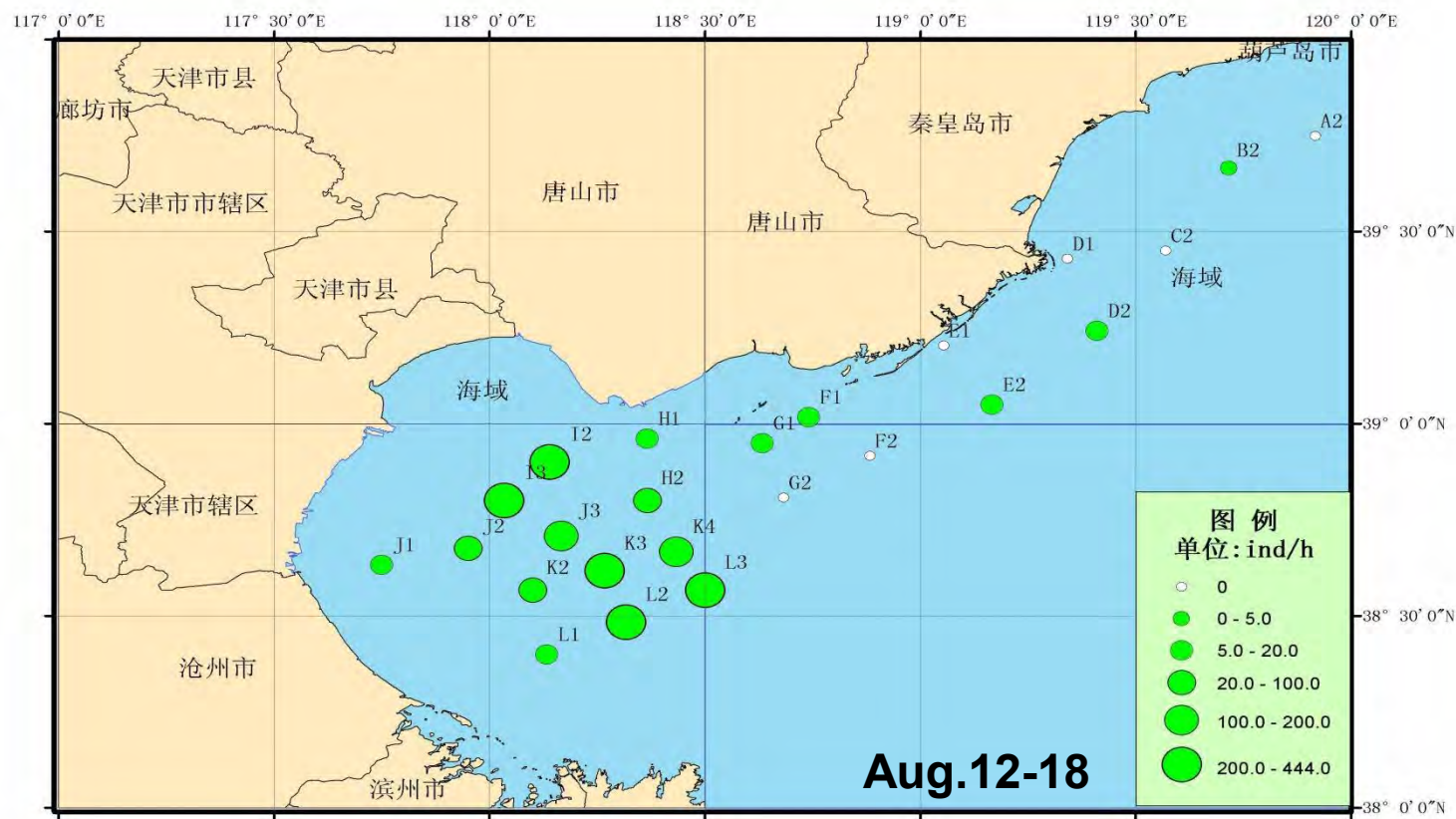
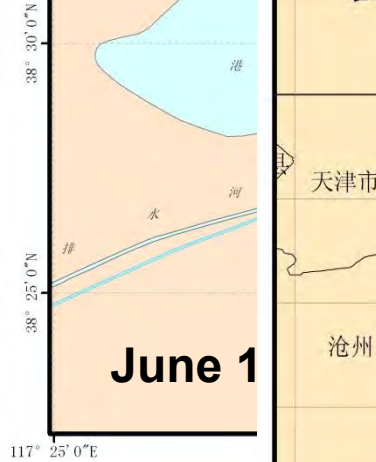
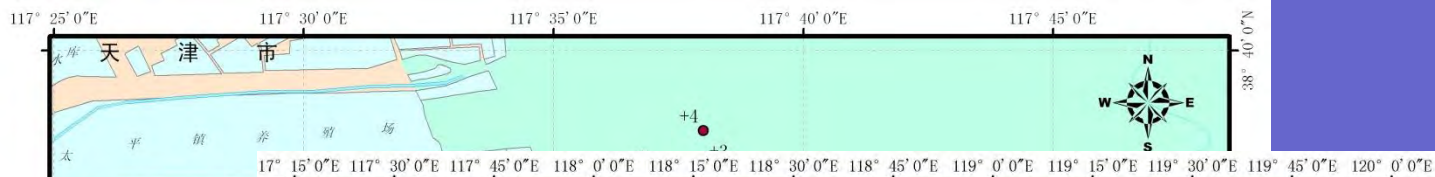


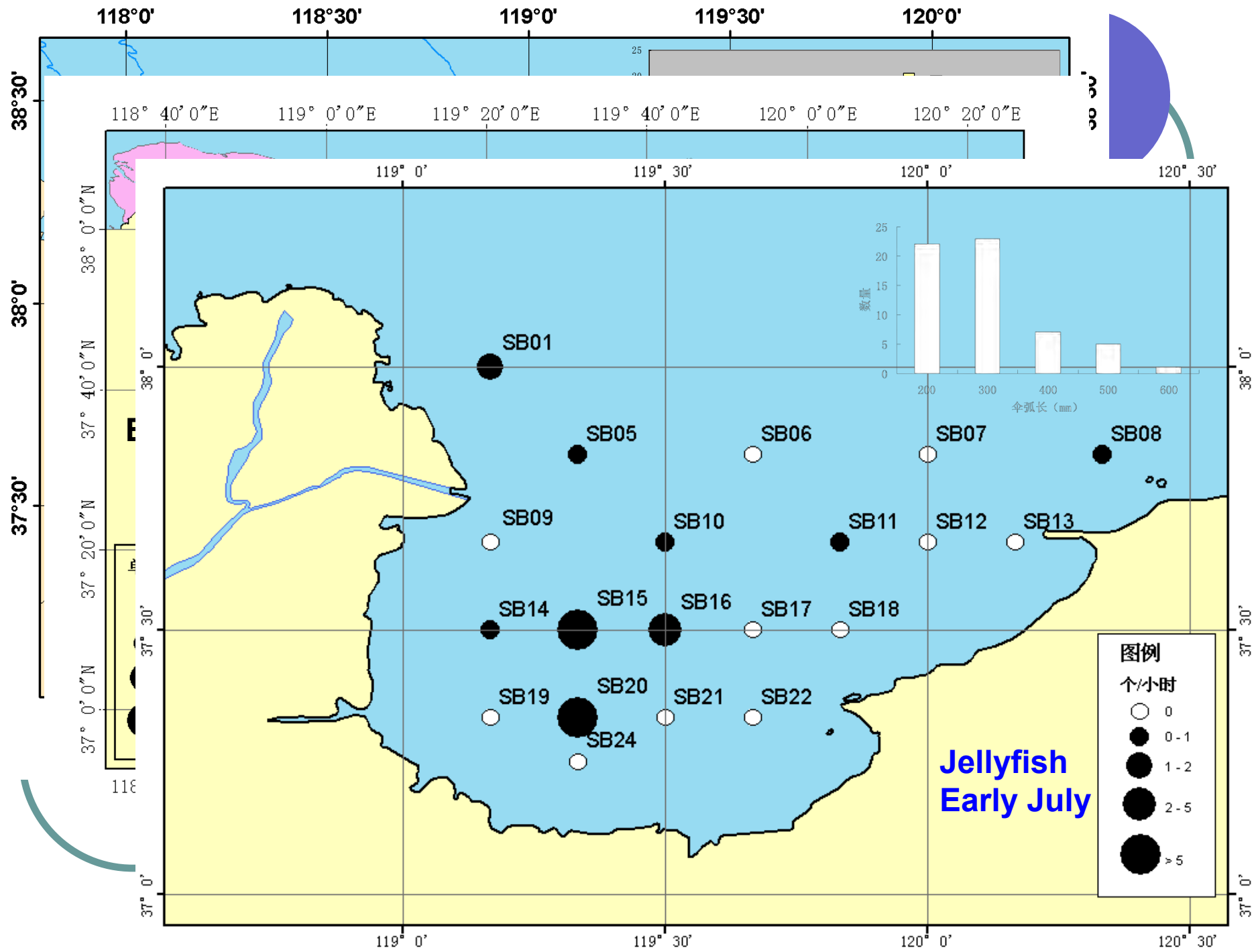
Evaluations



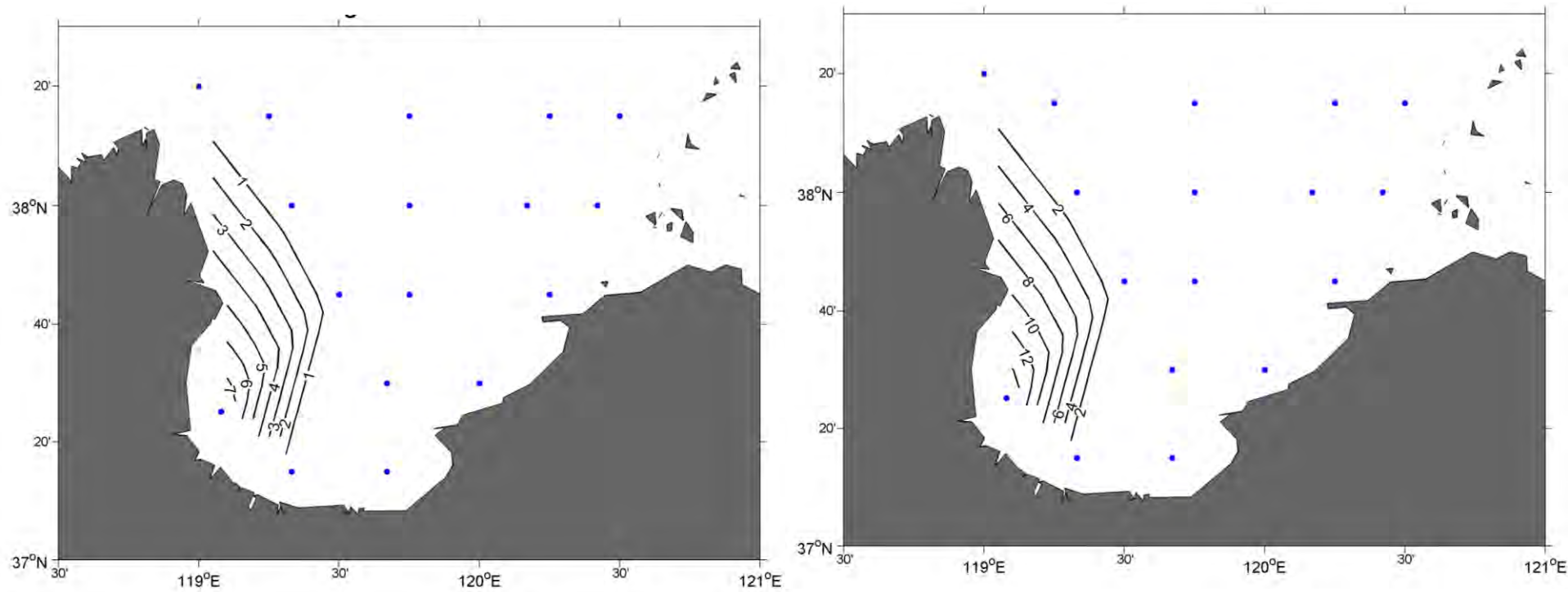
Tracking Surveys



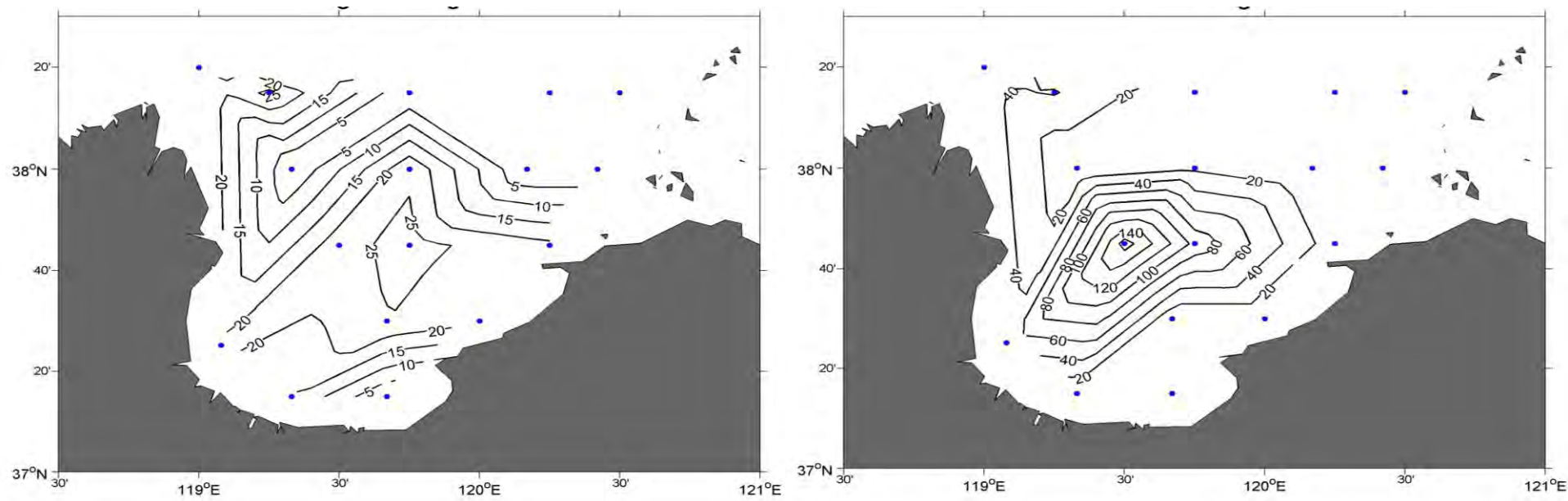




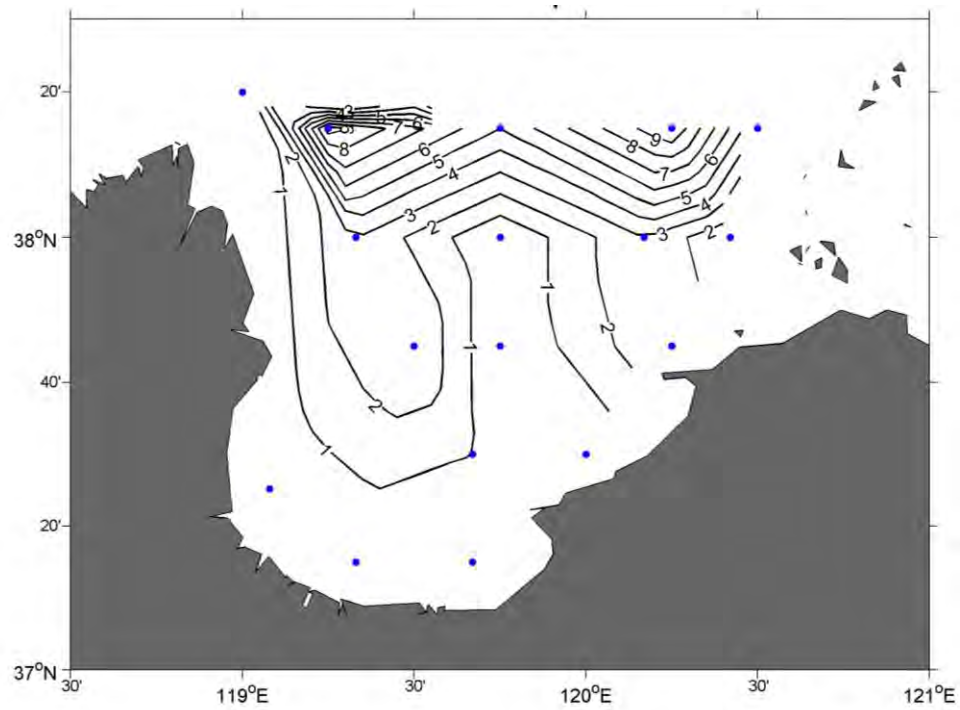
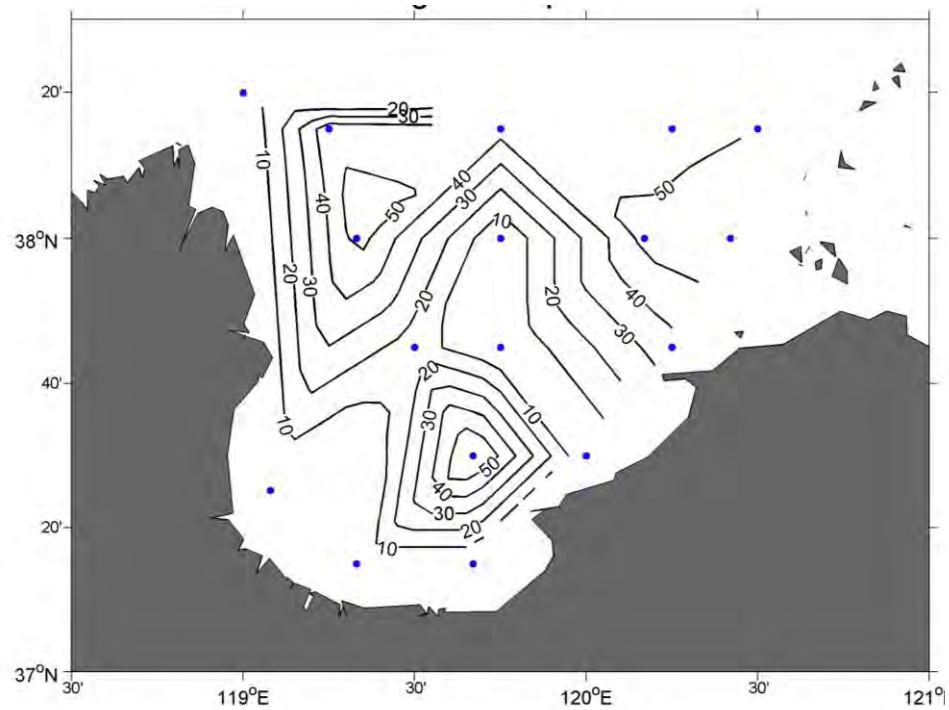
Recapture of Chinese shrimp in July, 2011



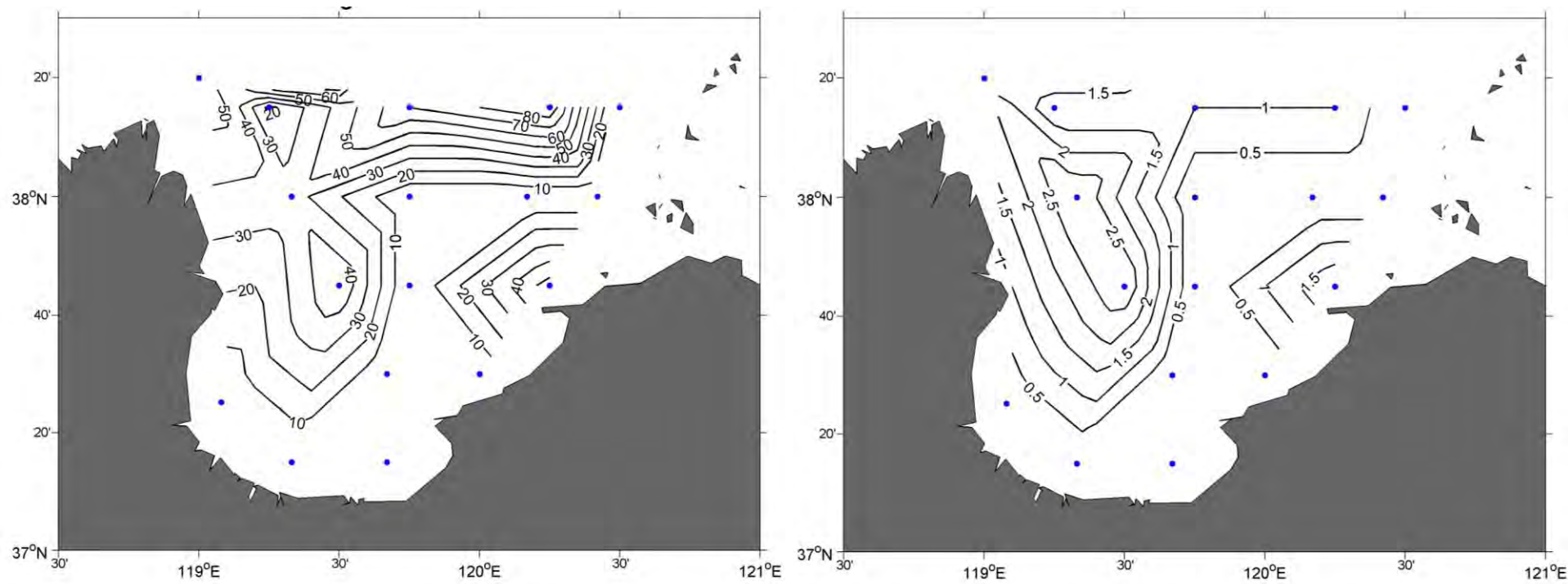
Recapture of Chinese shrimp in Aug., 2011

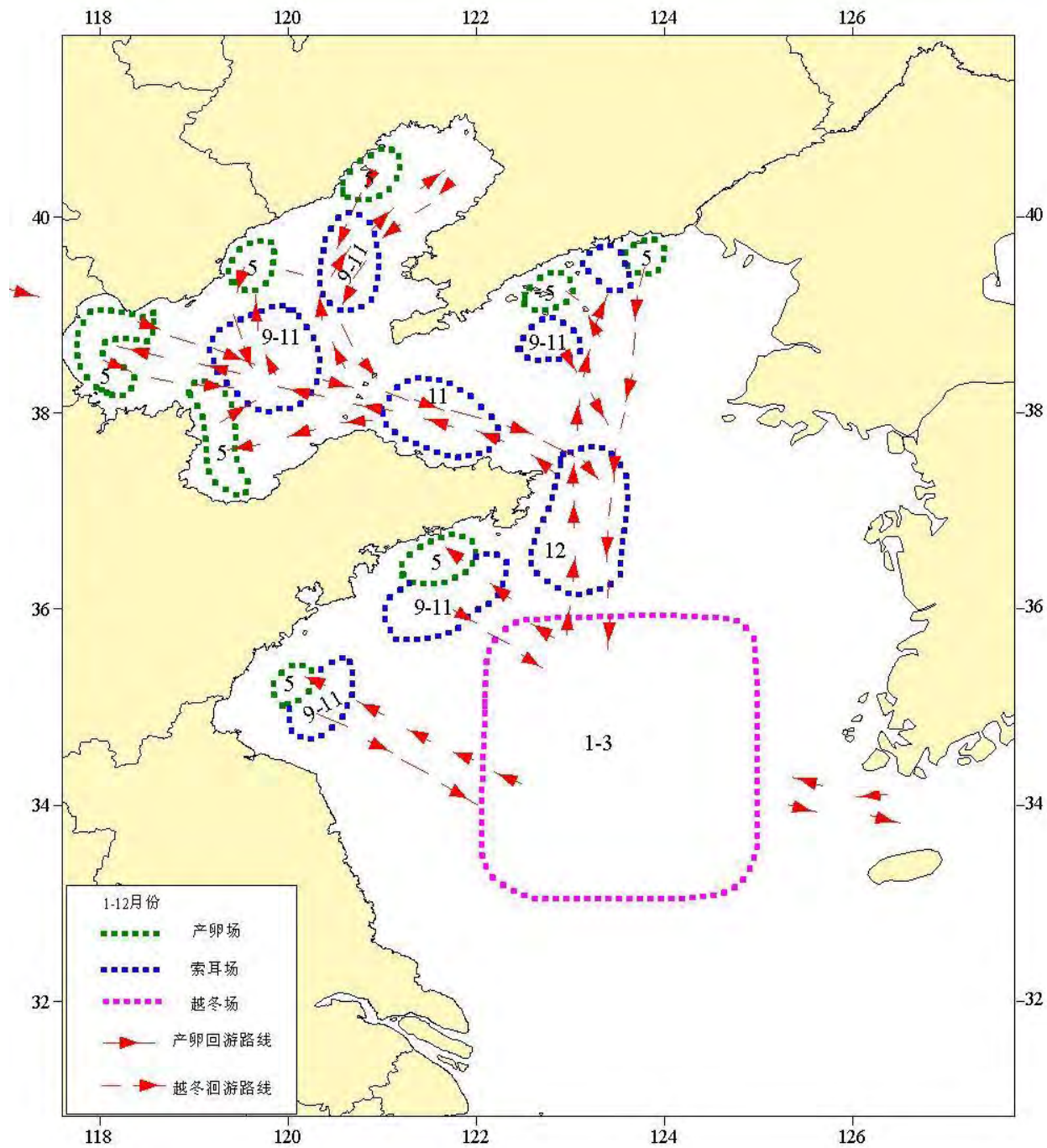


Recapture of Chinese shrimp in Sep, 2011



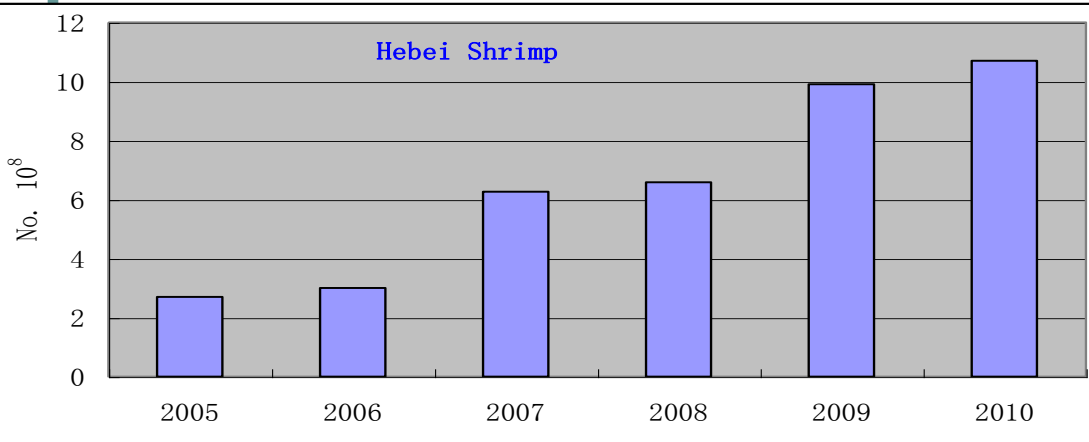
Recapture of Chinese shrimp in Oct, 2011





No. of released and catch

- 2009, 2.03 billion fry, catch, 2377 t
- 2010, 3.16 billion fry, catch, 5270.7 t



Conclusion Remarks

- The possibility of degeneration of genetic diversity in released species should be considered;
- The tagging techniques (invertebrates);
- The effects of released species on the ecosystem.

Important: Overfishing control !

- Restocking of depleted fishery stocks need more input by both manpower and financing
- Ecosystem based management is required.

Thank You