Understanding Changes in Transitional Areas of the Pacific
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Effects of environmental changes in inshore waters on community structure and population dynamics of exploited marine species

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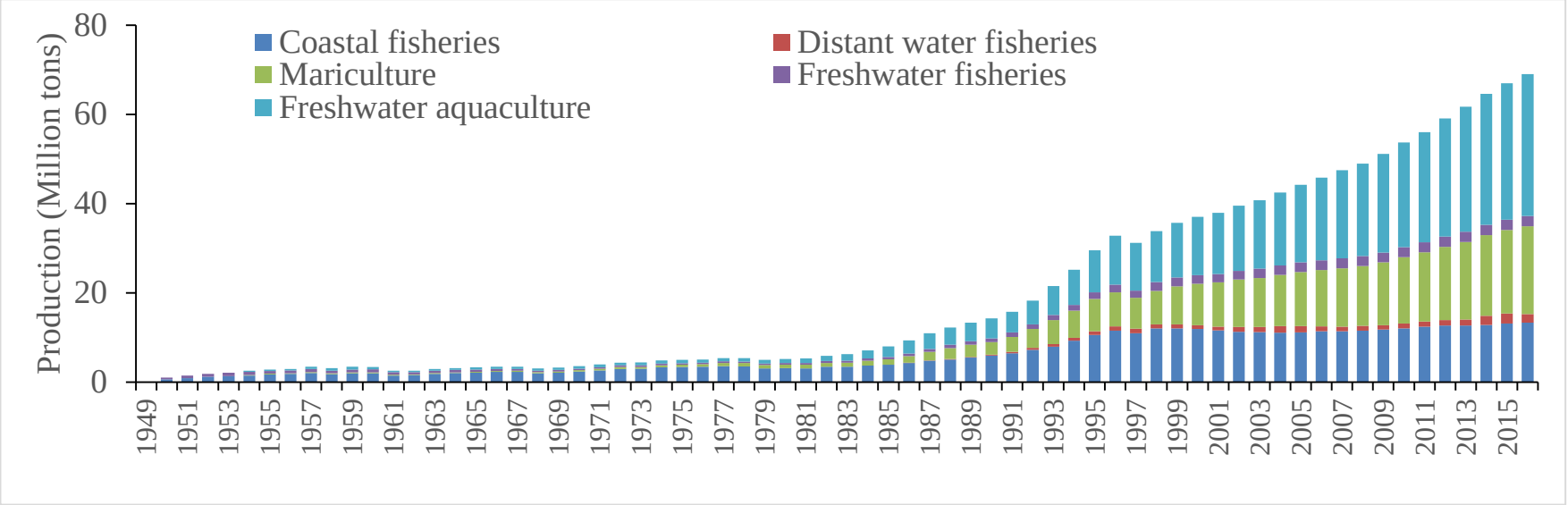
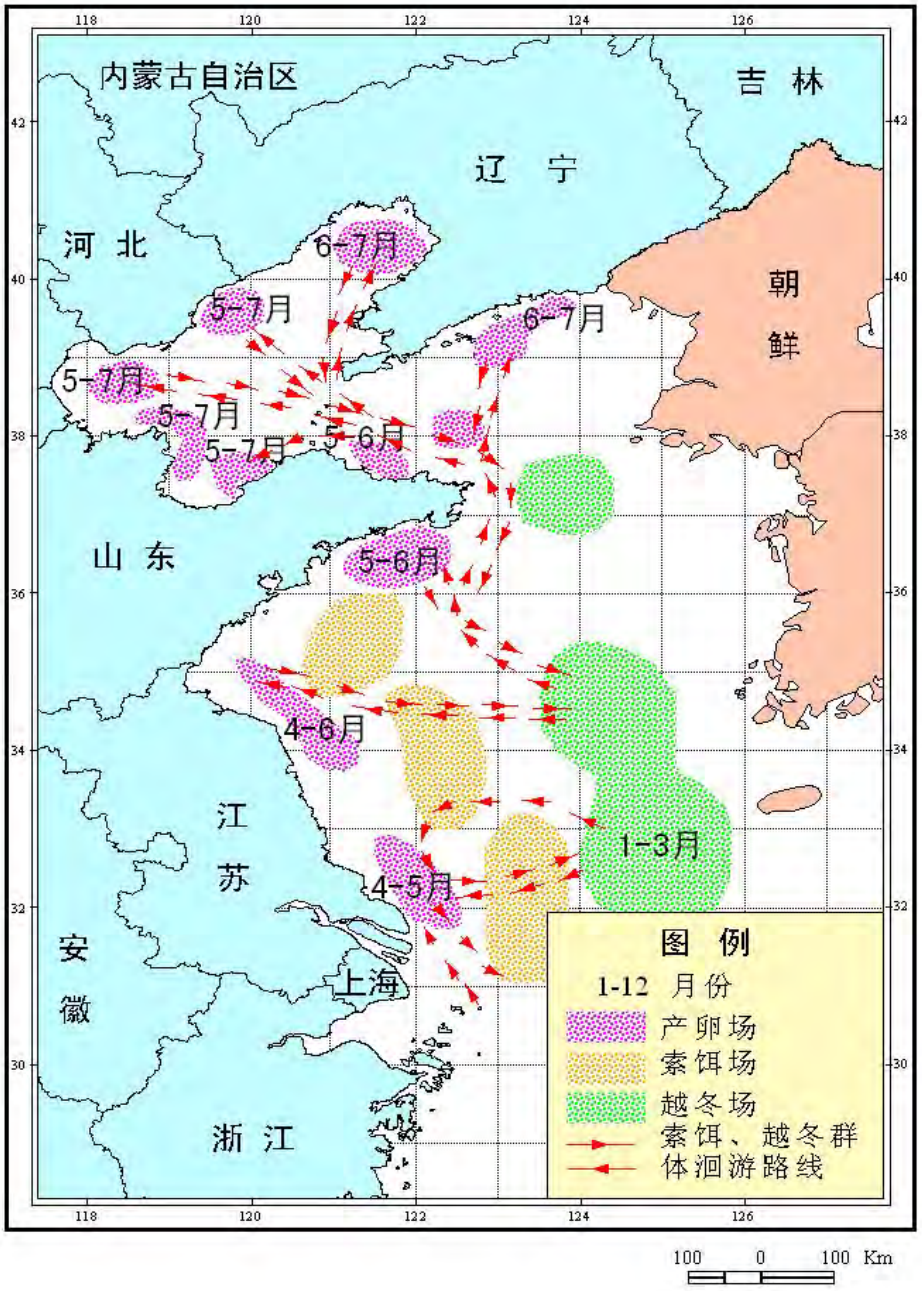
(Marine capture, nearly 90% and all most mariculture from coastal fisheries)



2016 (Tons)

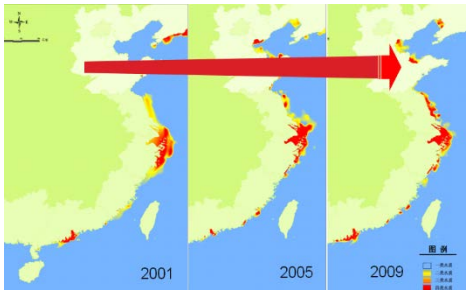
- **Total**：69.0125 million
- **Marine capture**： 15.2692 million (13.2827 million +1.9825 million)
- **Mariculture**：19.6313 million
- **Freshwater culture**：31.7926 million
- **Freshwater capture**：2.3184 million

Data source: China Fishery Statistical Yearbook (1950-2017)



Key habitats of fishery species

Multiple stressors！ ！



Reclamation

Pollution

Others

Fisheries

Climate change

Overfishing

Ecological disasters

Aquaculture；
Runoff；
…..

Conservation of fisheries resources

Stock enhancement，artificial reef,
New aquaculture model….

CCCC-GLOBEC → FUTURE

Changes of Coastal transitional habitats caused by Human activities and climate changes

Coastline, hydrodynamics, nutrients, ….

- **phyto-, Zoo-**
- **Spawning, nursing, feeding grounds;**
- **Physiology, Prey, predation, migration**
- **… …**

Life cycle

Recruitment

Programme: Effects of environmental changes in inshore waters on recruitment processes and population dynamics of exploited marine species

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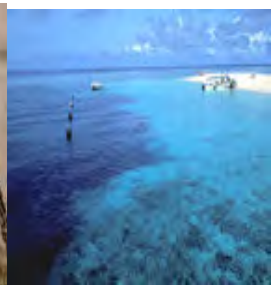
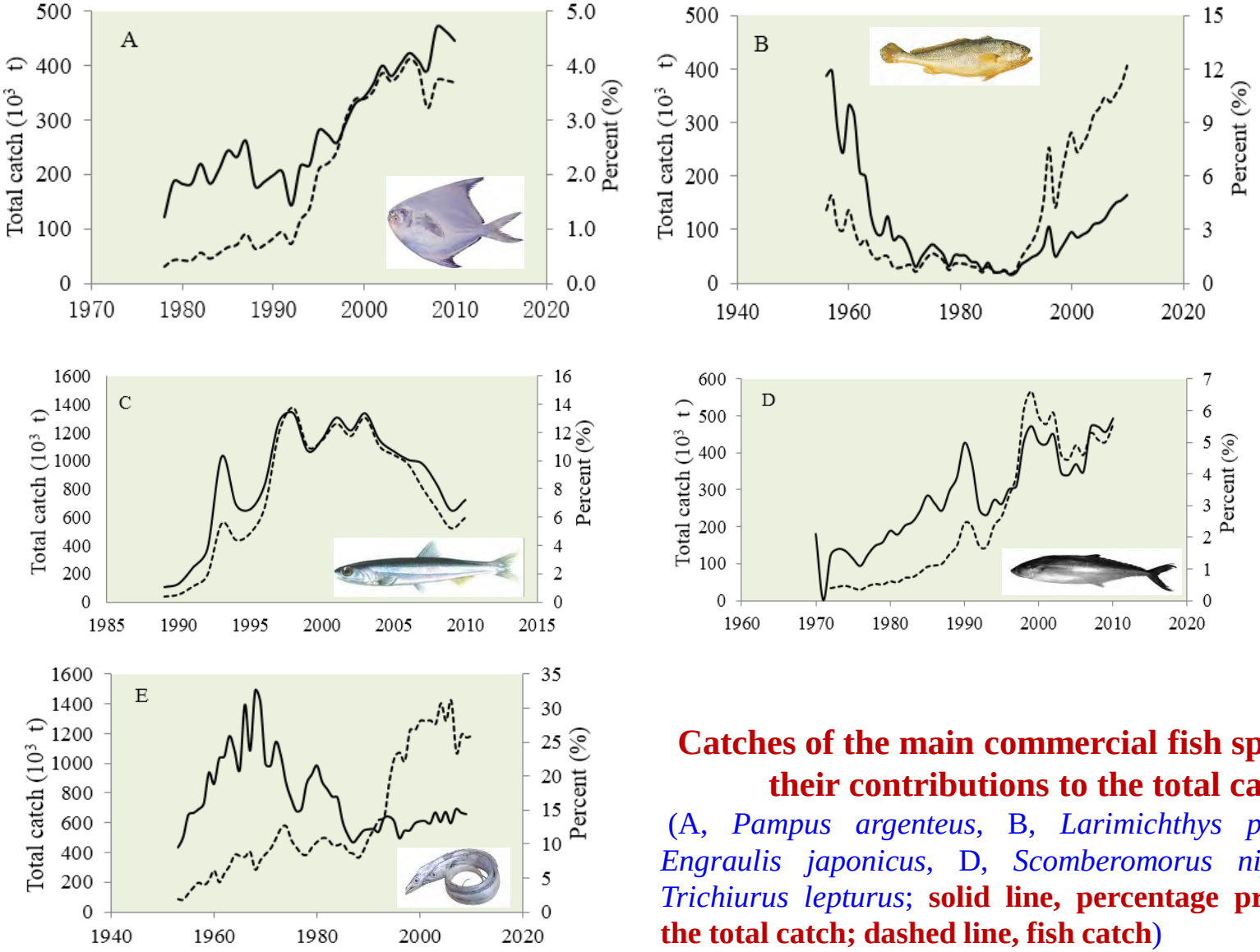
What is the status of community structure and population dynamics of exploited marine species?







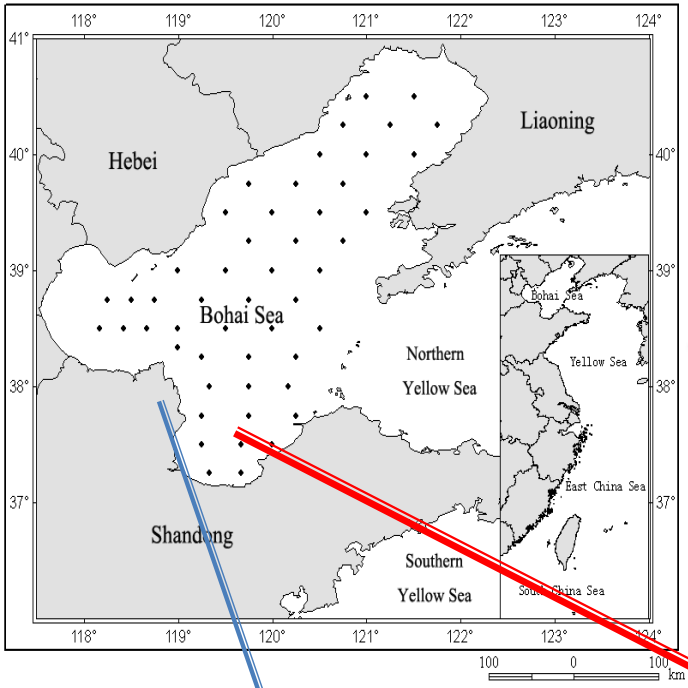


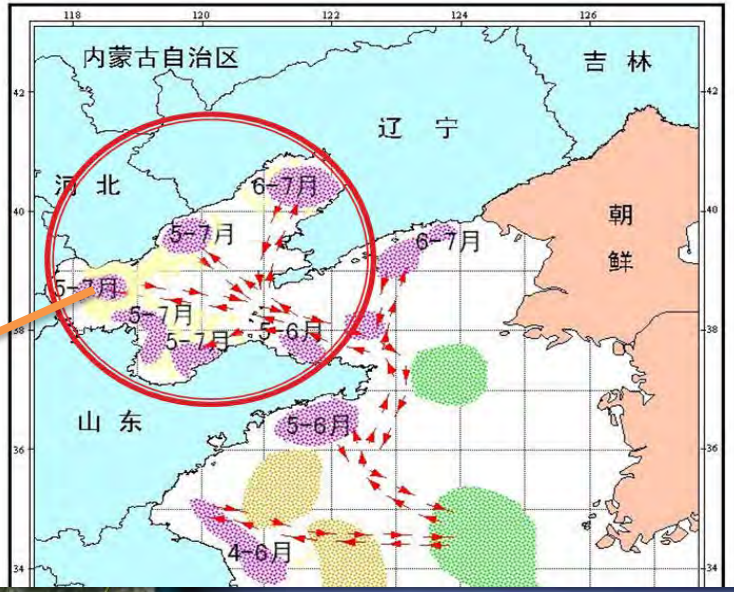
Catches of the main commercial fish species and their contributions to the total catch

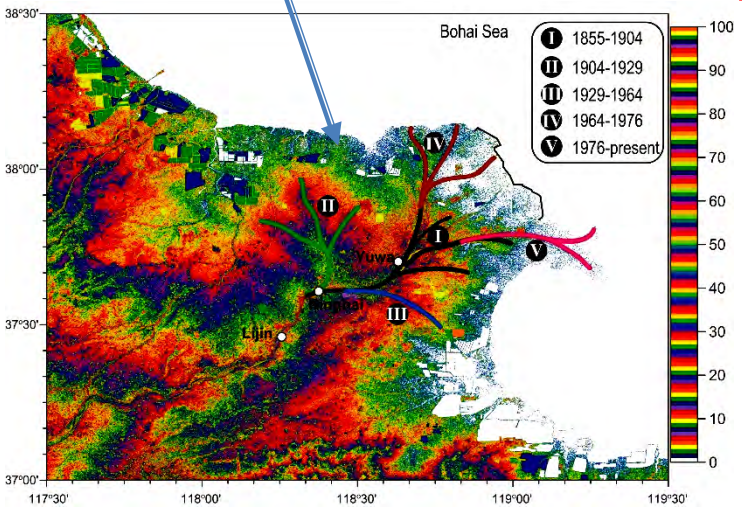
(A, *Pampus argenteus*, B, *Larimichthys polyactis*, C, *Engraulis japonicus*, D, *Scomberomorus niphonius*, E, *Trichiurus lepturus*; **solid line, percentage proportion in the total catch; dashed line, fish catch**)

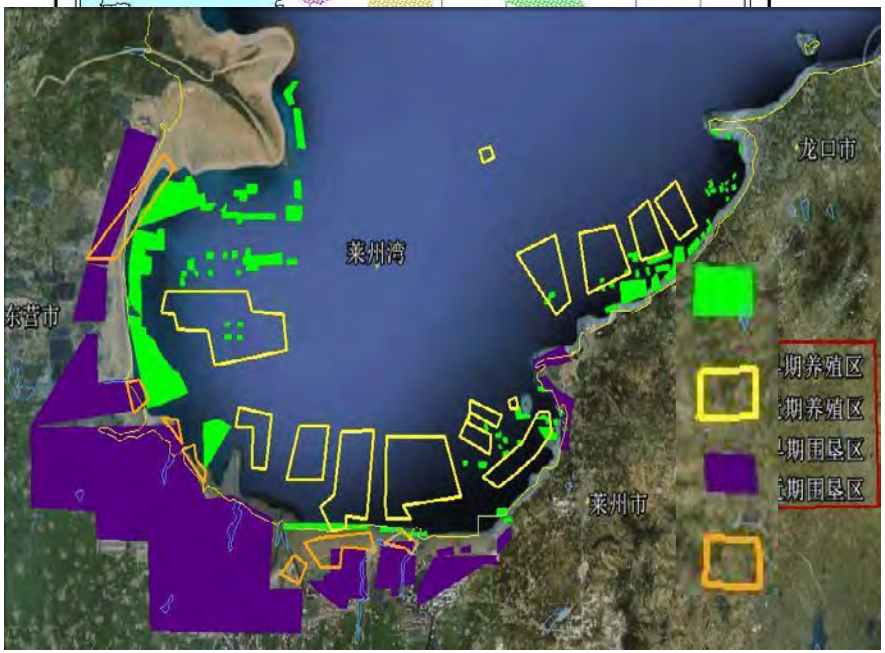
Data source: China Fishery Statistical Yearbook (1950-2017)

A case study in Bohai Sea

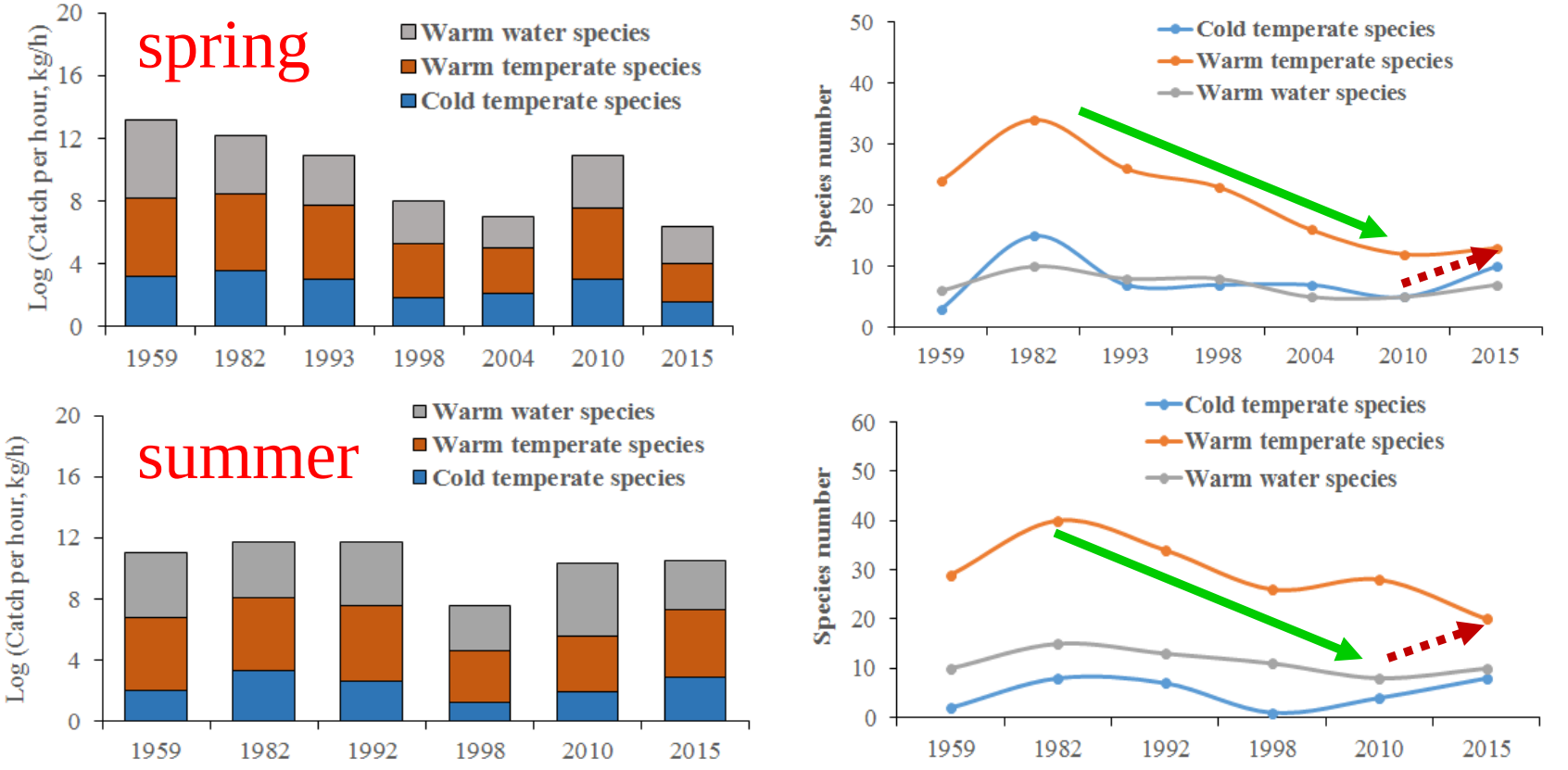






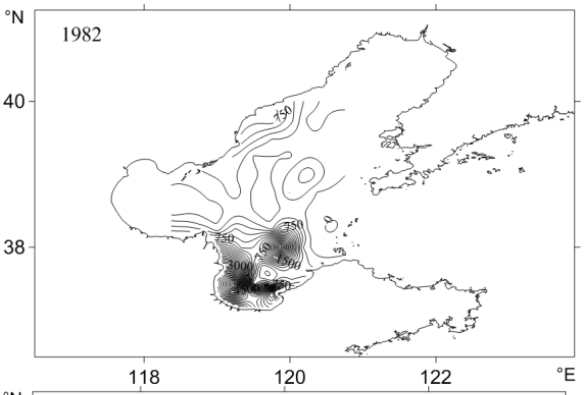


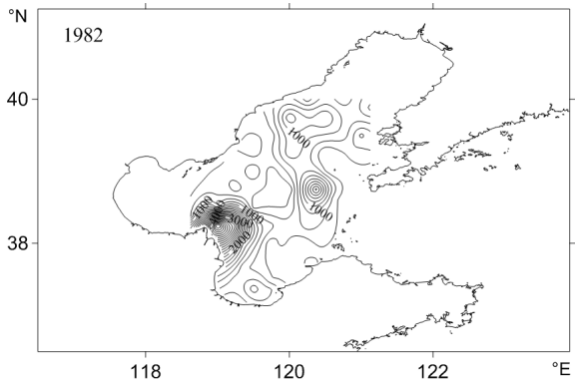
Fish species ecotype and their biomass in the Bohai Sea

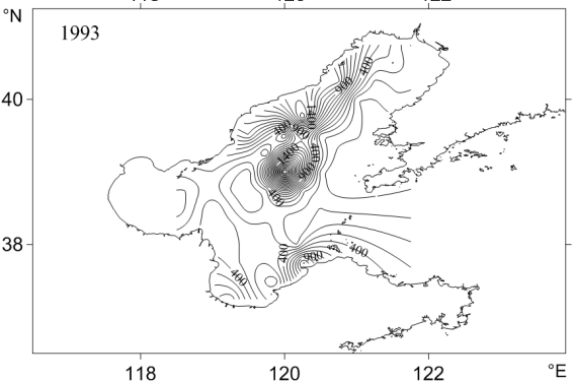


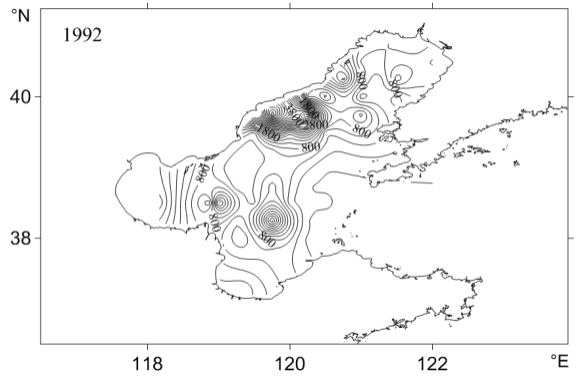
- Fish species and biomass were composed by warm temperate species and warm water species;
- Since 1982, species number decreased both in warm temperate species and warm water species;
- After 2010, all kinds of fish ecotypes slightly increased.

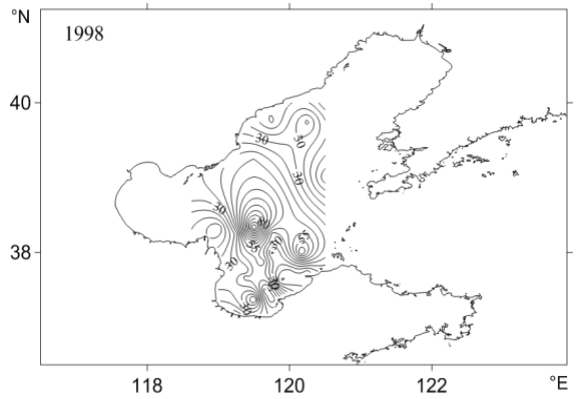
Shan et al, 2016, Marine and Coastal Fisheries

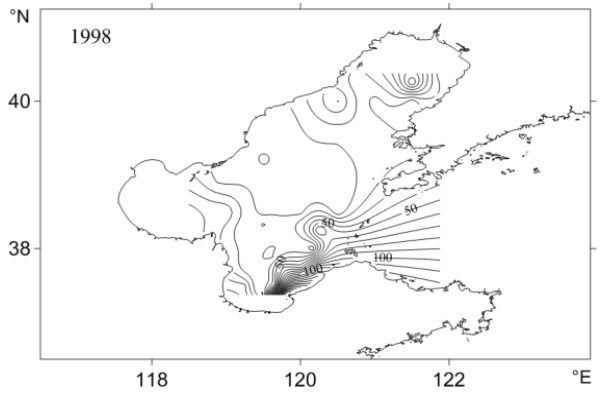








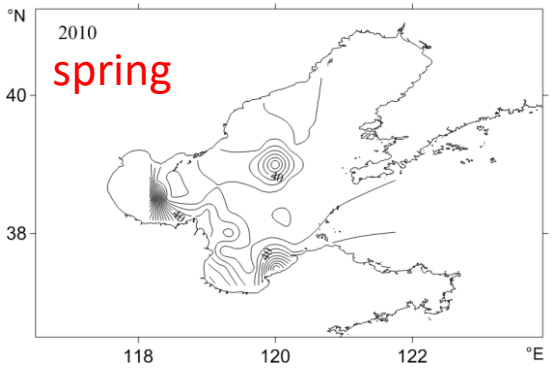


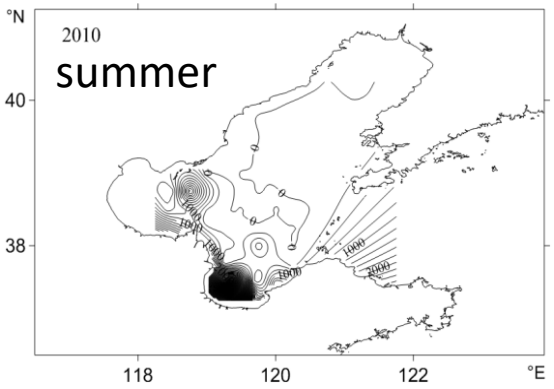


spring

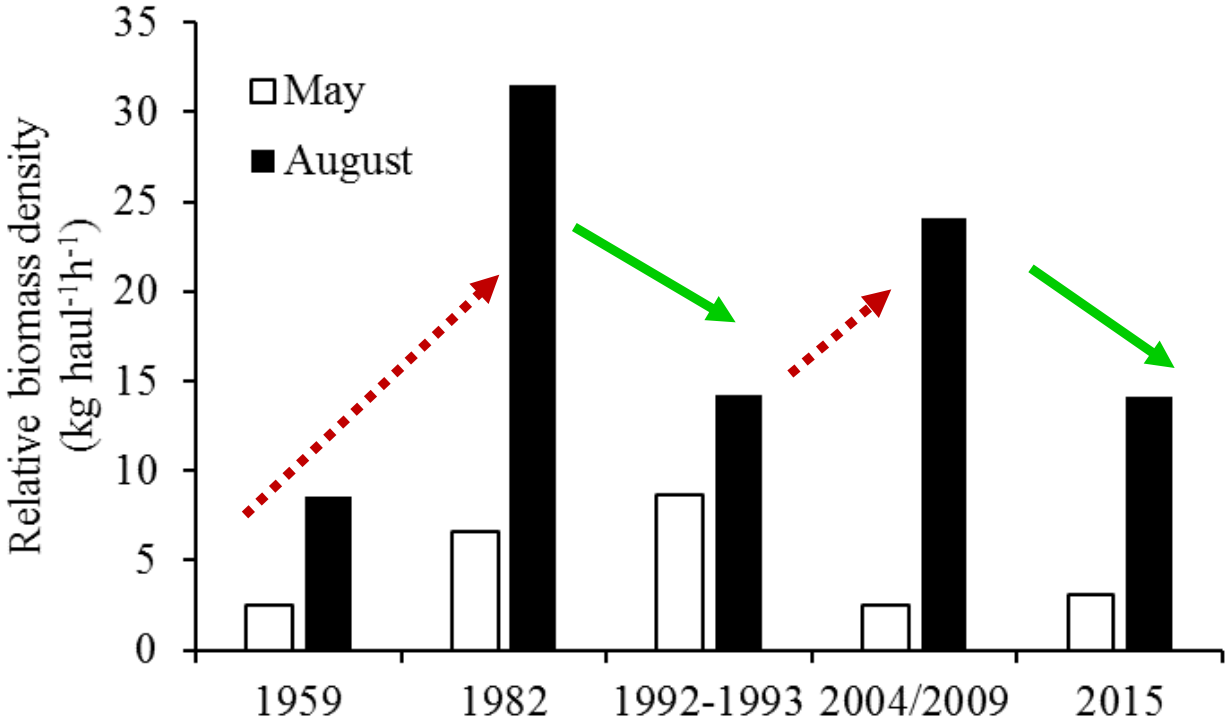
summer

Fish biomass distribution in the Bohai Sea (kg/km^2)



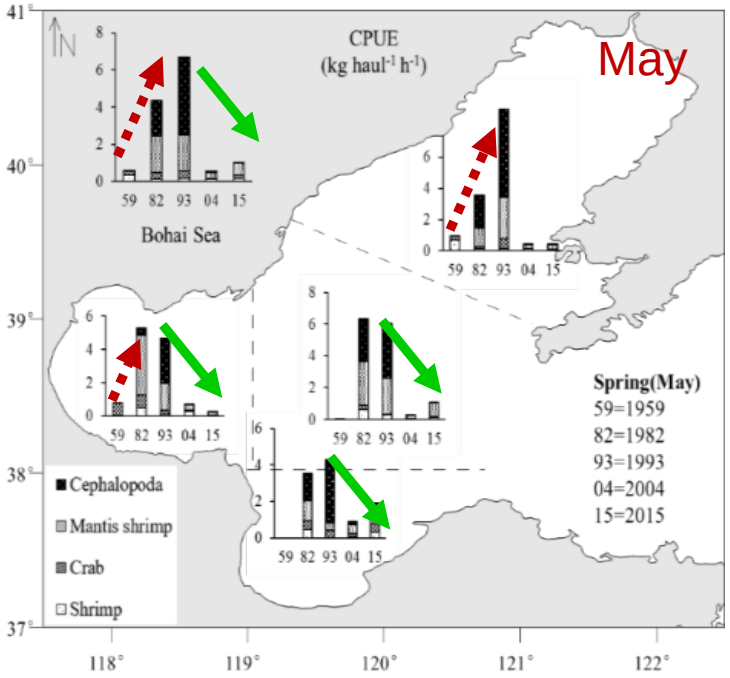


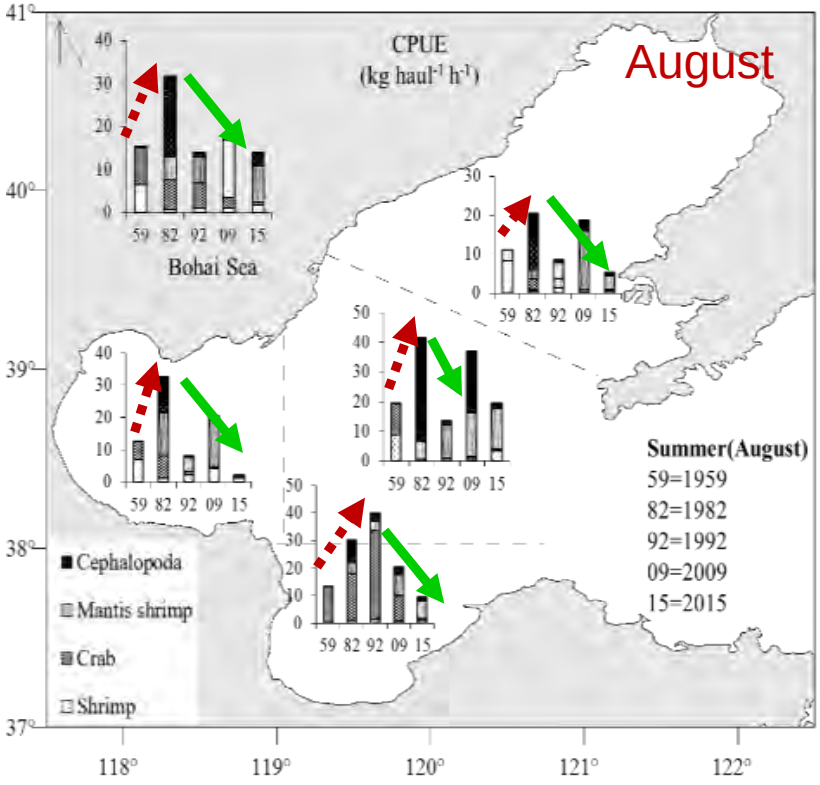
Shan et al, 2016, Marine and Coastal Fisheries



The relative biomass density of commercial **invertebrate species** in Bohai Sea during 1959-2015

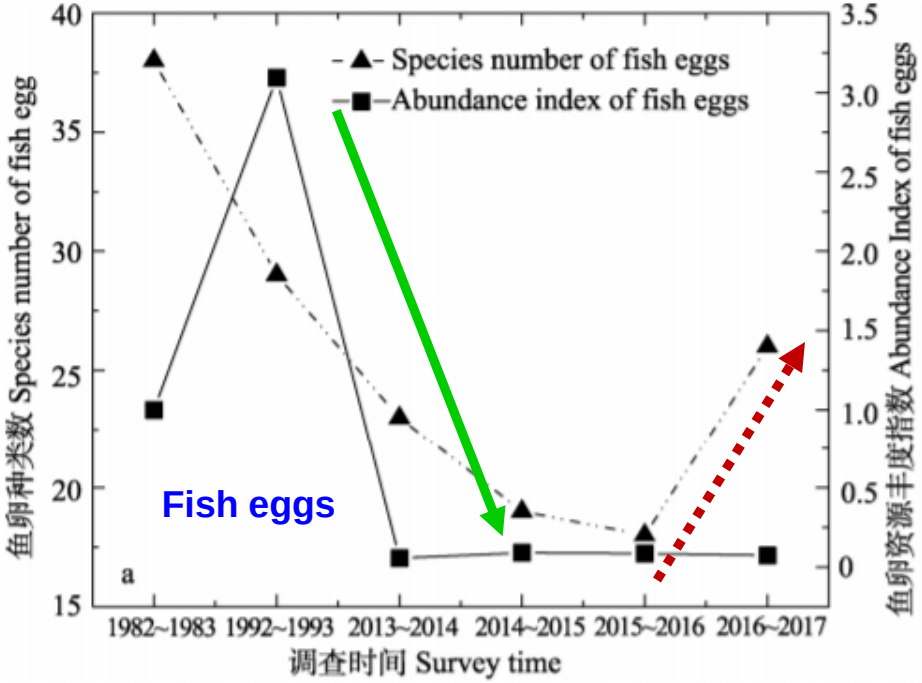
Wu et al, 2017

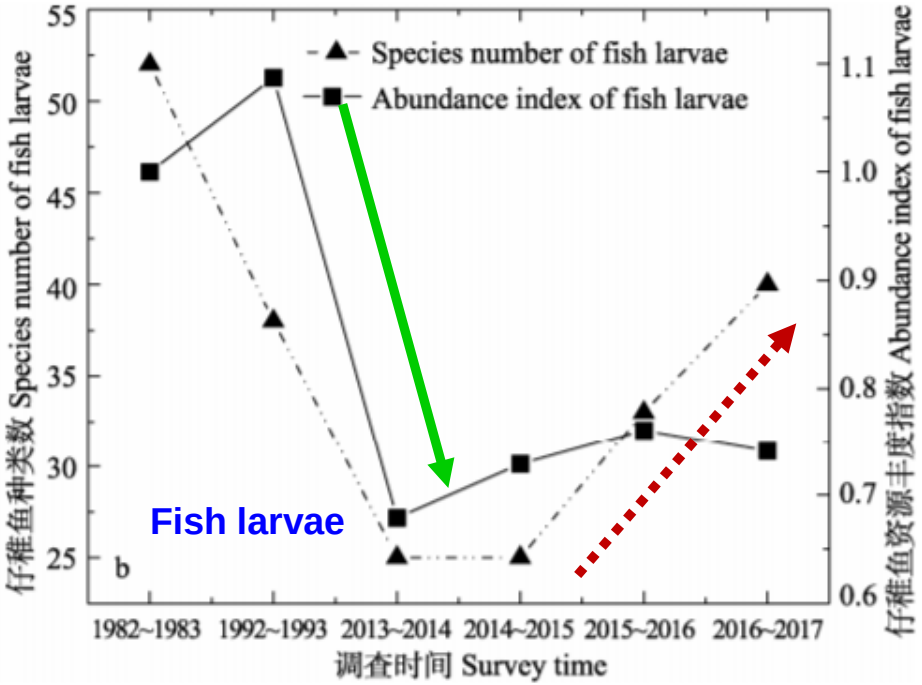




The commercial invertebrate species biomass and its composition

Wu et al, 2017





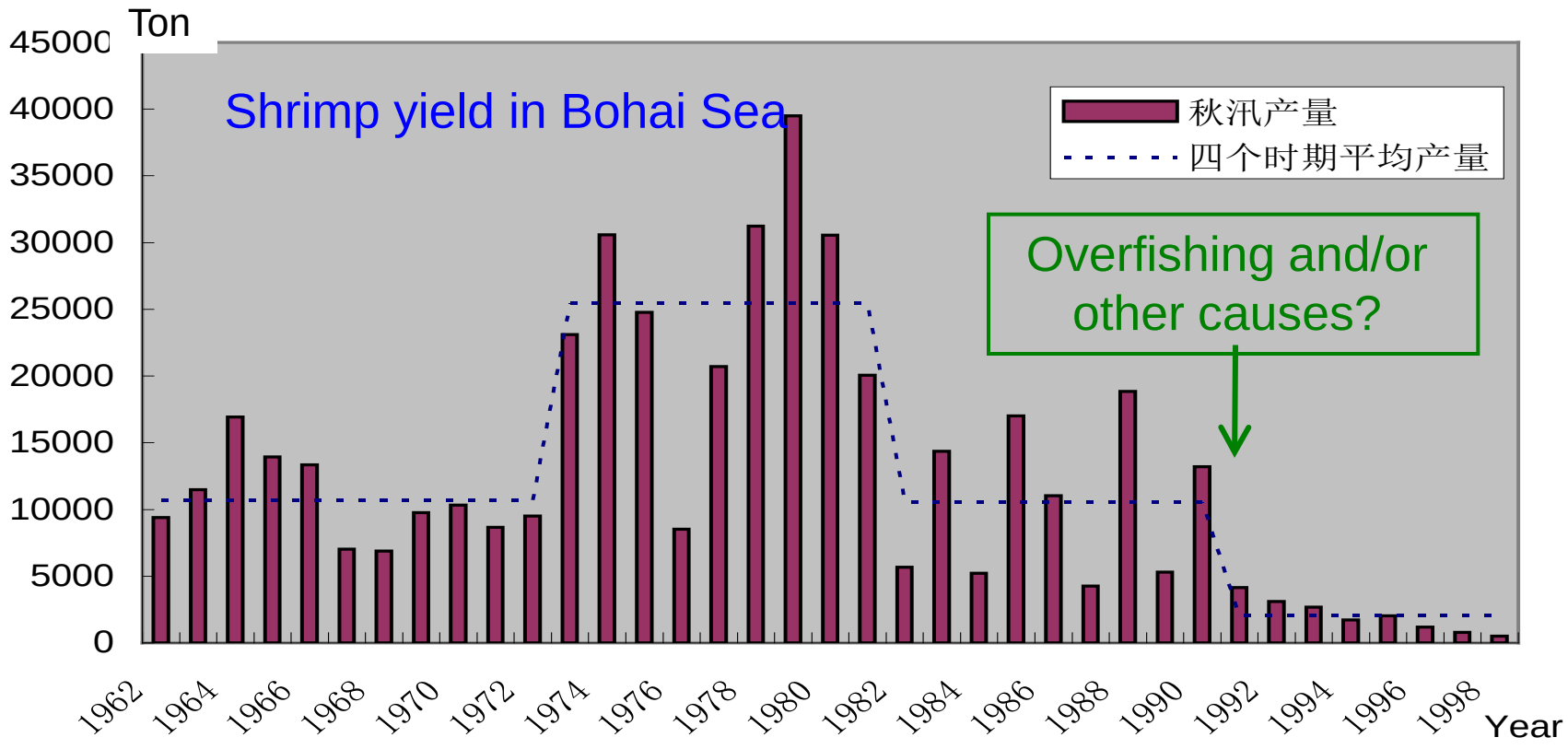
Abundance Index and species number of **fish eggs (a) and larvae (b)**

Bian et al, 2017

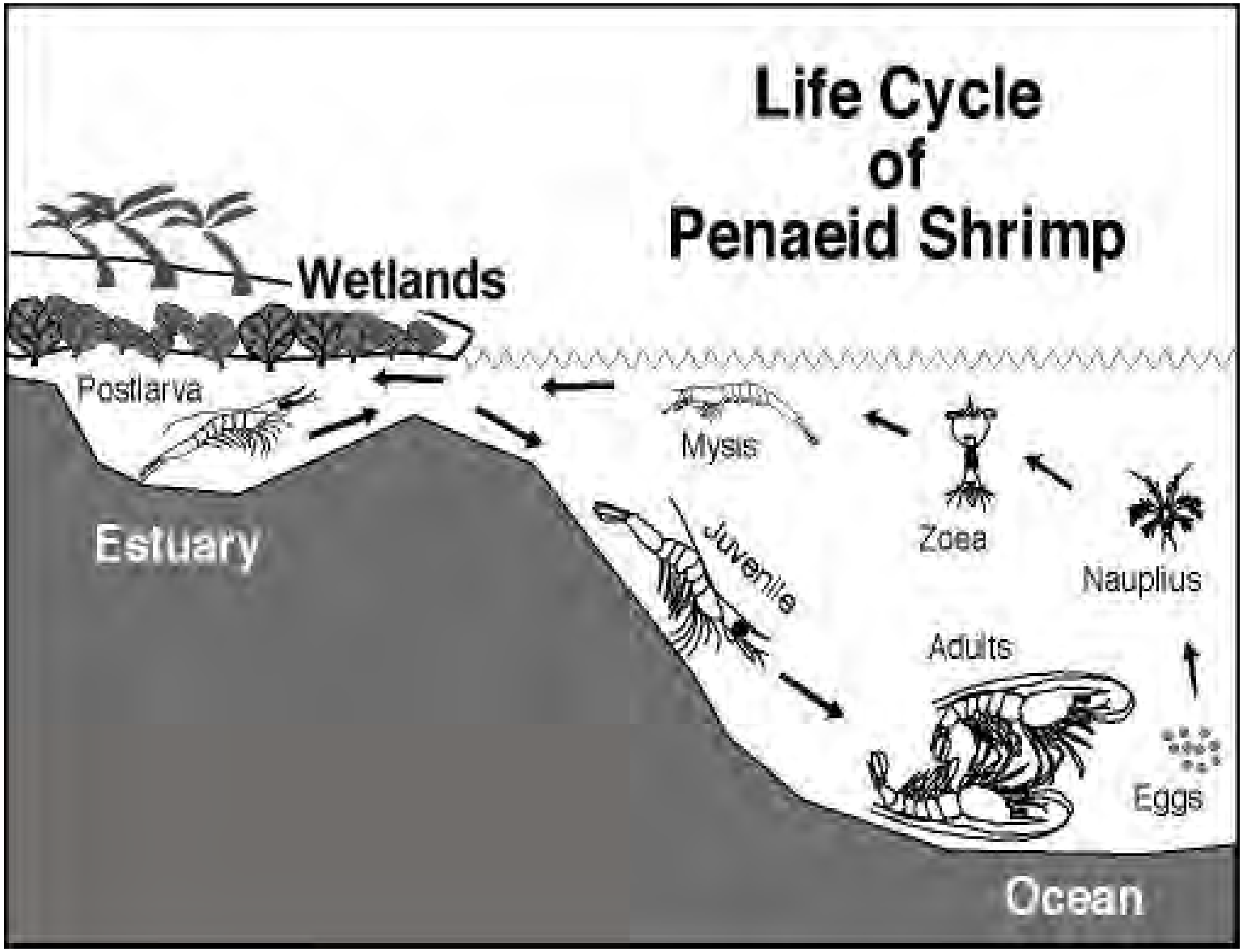
Ecosystem Services & Stressors –

Example of Shrimp *Fenneropenaeus chinensis*

Example：sharp drop in fishing yield of shrimp *Fenneropenaeus chinensis* after 1990



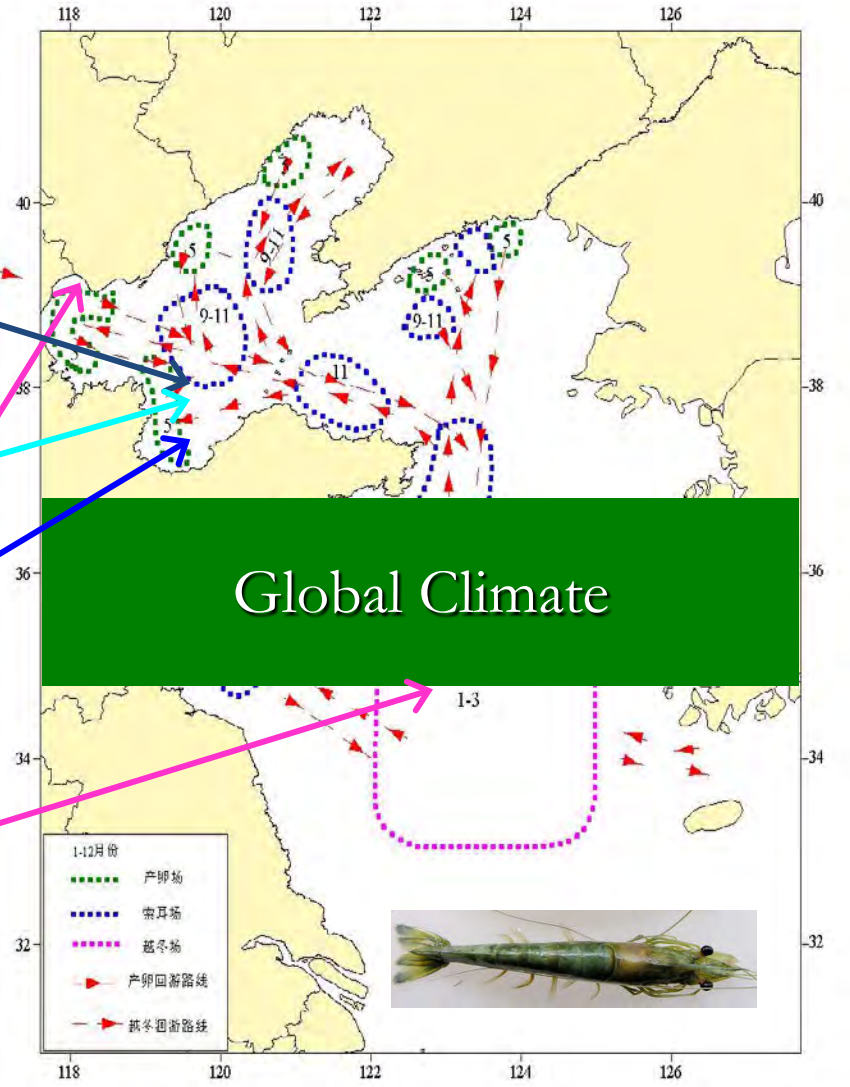
Overfishing, other human activities natural stressors


Life Cycle
of
Penaeid Shrimp
Wetlands
Postlarva
Estuary
Mysis
Juvenile
Zoea
Nauplius
Adults
Eggs
Ocean

From Deng

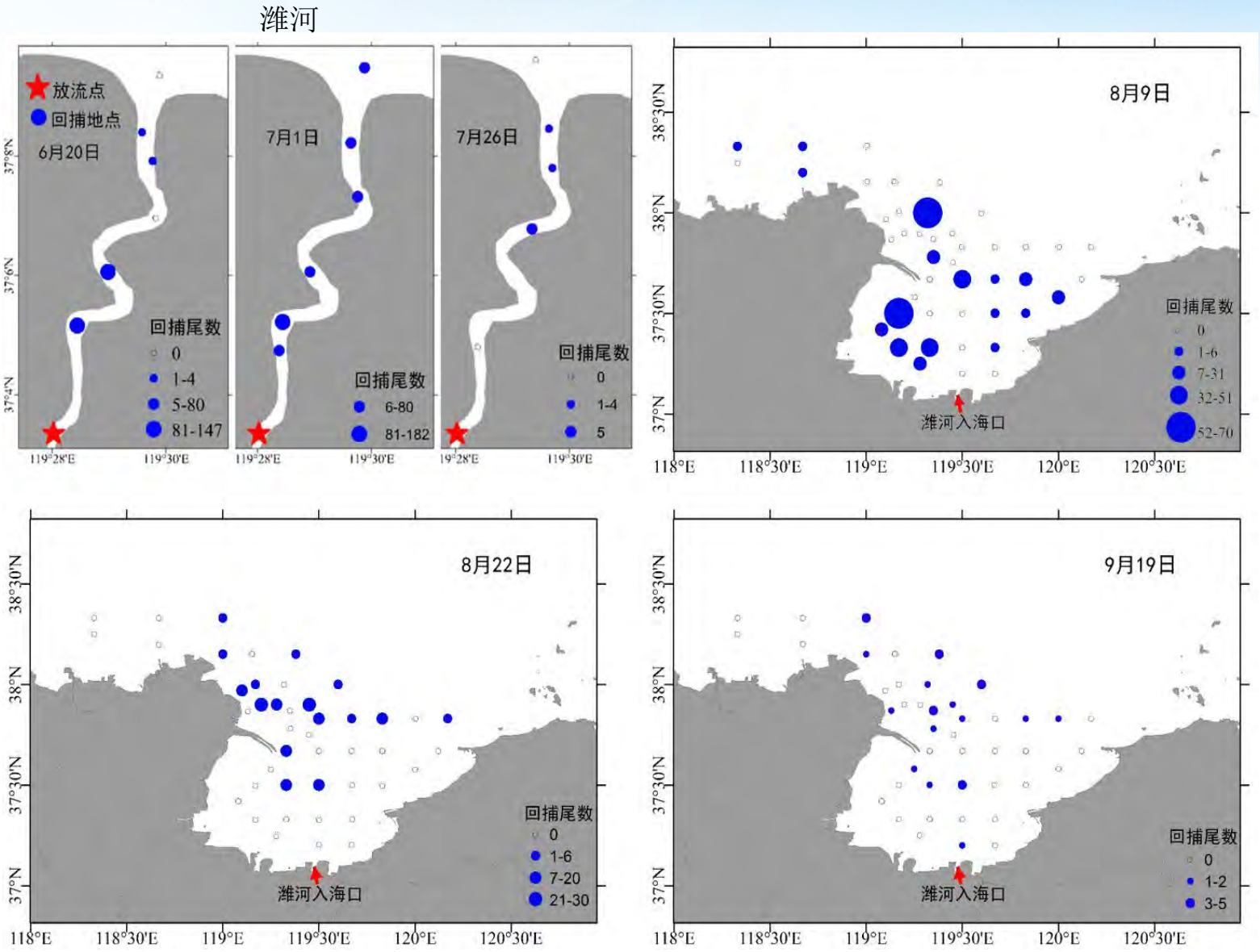
Factors affecting shrimp life-cycle

- Reduced discharge
- Eutrophication
- Reclamation
- Over-fishing



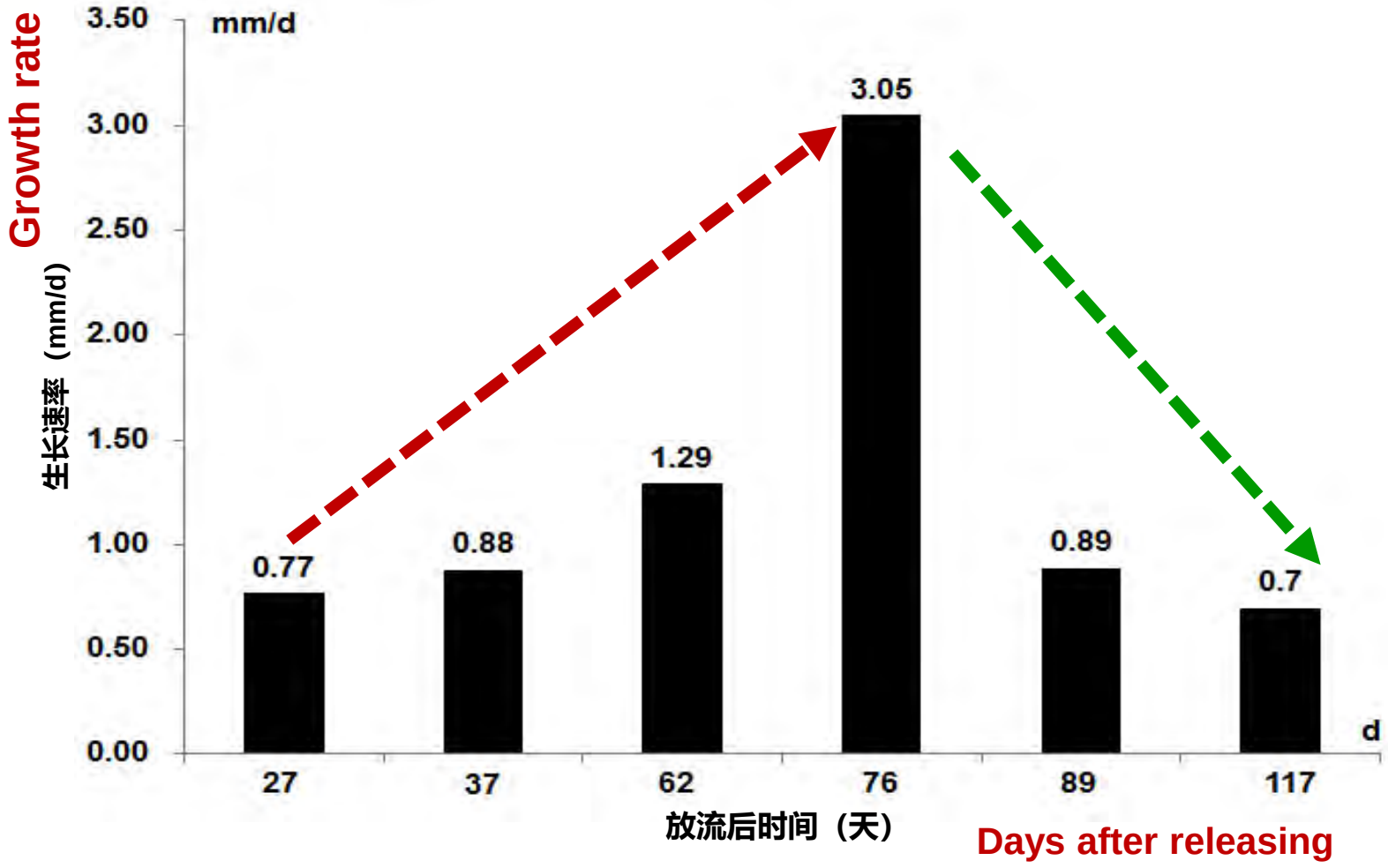
Global Climate

Transport and distribution of Chinese shrimp

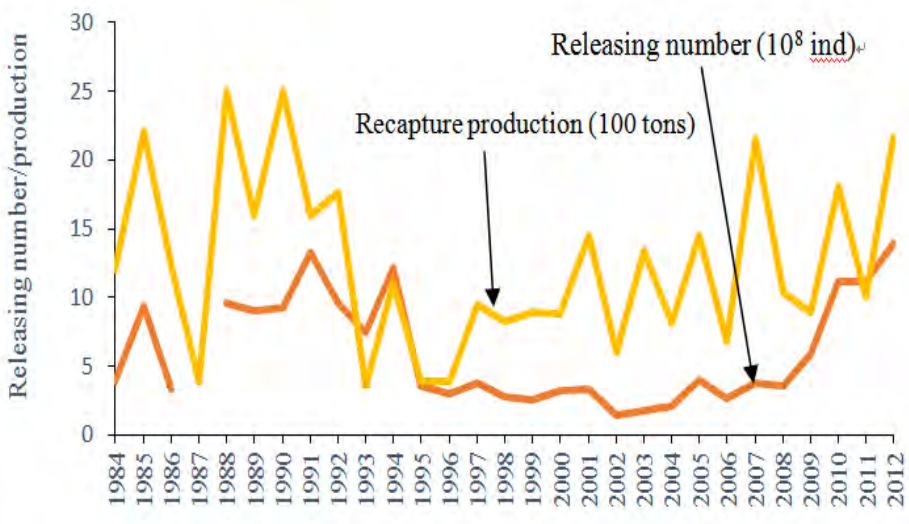


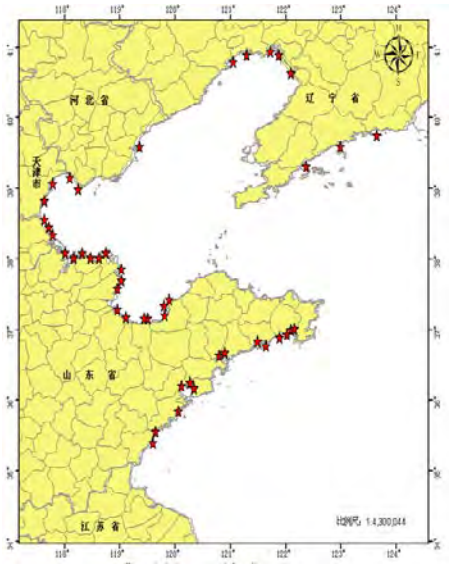
From Zhang X

Growth of Chinese shrimp



From Zhang X.





Year	Fishing vessels (ind)	Production (tons)	Production value (10000 RMB)
2010	4 844	1 686	28 053
2011	4 938	1 009	17 908
2012	4 896	2 163	35 194
Average	4 893	1 619	27 052

Releasing number, catch, and production value of Chinese shrimp *Fenneropenaeus chinensis* from the 1980s to 2012 (Southern waters of Shandong Penisula, From Qiu, 2014)

Conclusions and future marks

- **The catch of commercial fishery species decreased;**
- **The dominant species were changed from large-sized, high valued species to small-sized, low valued pelagic fish species and invertebrate species;**
- **Fishery species number decreased both in fish and invertebrate species since 1982, however, after 2010, slightly increased;**
- **The stock enhancement contributed to the recruitment stock, and increased the biomass of fishery species.**

Thank you !

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