

The Study on the HPAI Range Expansion Pattern in China and its developing Risks




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- BACKGROUND
 - MATERIAL & METHODS
 - RESULTS & ANALYSIS
 - SUMMARY & DISCUSSION
- 




BACKGROUND

- AIV: Firstly reported in 1878(Perroncito) in Italy & 1890 in Germany
 - Remained endemic in Italy & Germany up to 1930, and occurred in Europe, Asian, USA, South America, Africa
 - 1959-H5 &H7 virus in EU
 - Huge loss result from AIV occurred in Pennsylvania in 1983, Mexico/ Pakistan in 1994, Hong Kong in 1997 & Italy in 1999/2000
 - 2003-2006, 67 countries occurred, accumulated occurrence numbered at 4,000 times, poultry loss accounted at 200,000,000 at least. Human infection numbered at 236 across 10 counties, death toll 138.
- 





SIGNIFICANT & PURPOSE

- Significant impact on poultry production & public health
 - Great efforts on molecular evolution, vaccine & Bird migration
 - Regional dissimilarity & AIV---limited
 - Current status & developing risks (purposes)
- 



MATERIAL & METHODS & Etc.

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- Data Expression
 - Related Domain & Knowledge
 - Methods Used and Applied
 - Result and Discussion
- 



Result and Analysis

- 
- Feeding & Animal health status
 - Recognitions on Poultry Breeding & Feeding
 - Recognitions on Bird Flyway
 - Management analysis
 - Immunity
 - Surveillance
 - Pattern recognition
 - National & Regional
 - Developing Risk
- 

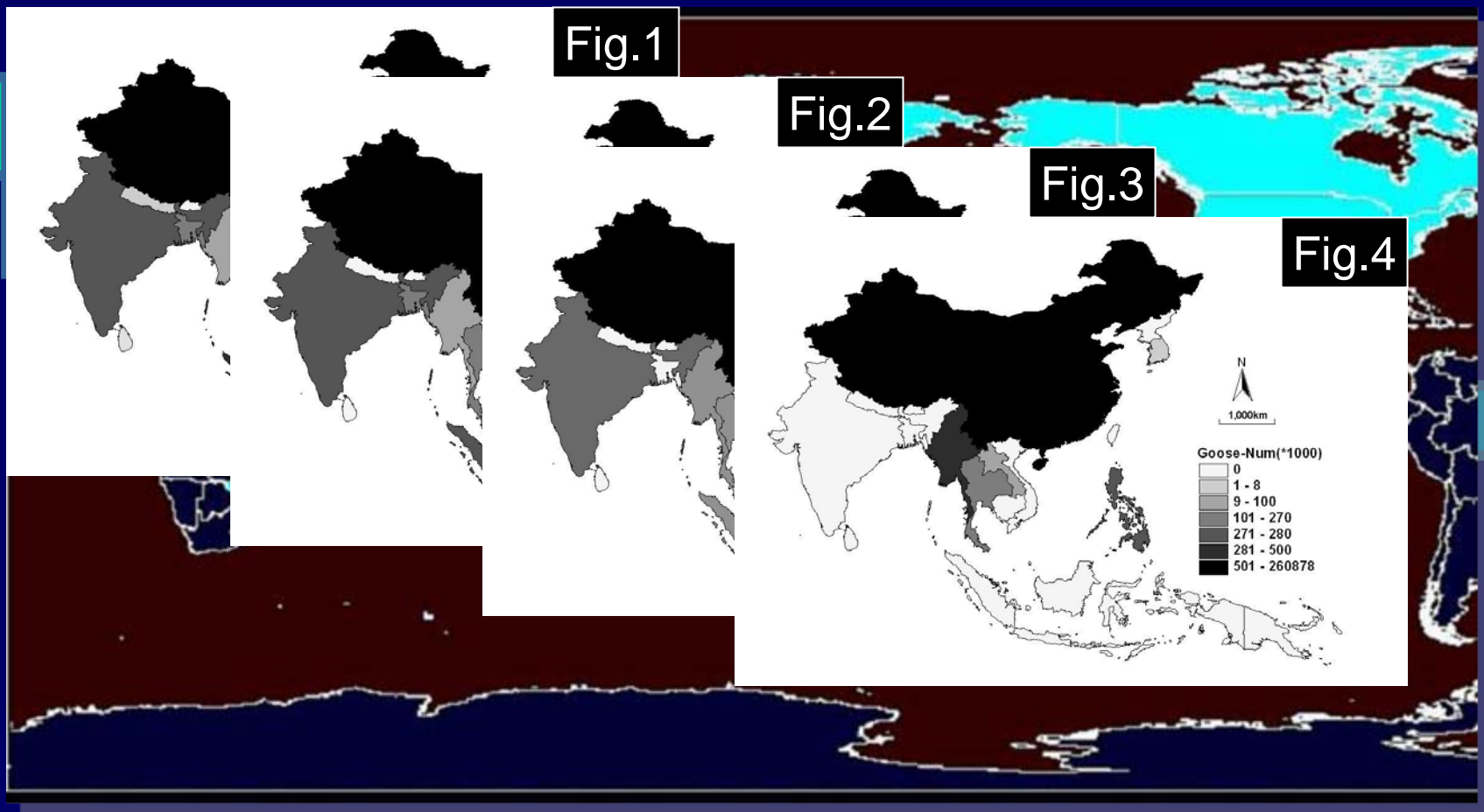


Poultry breeding & feeding pattern

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- Global & ESA AIV environment
 - CHN poultry pattern
 - Spatial diversity
 - Risk populations
- 

Feeding & Animal health status

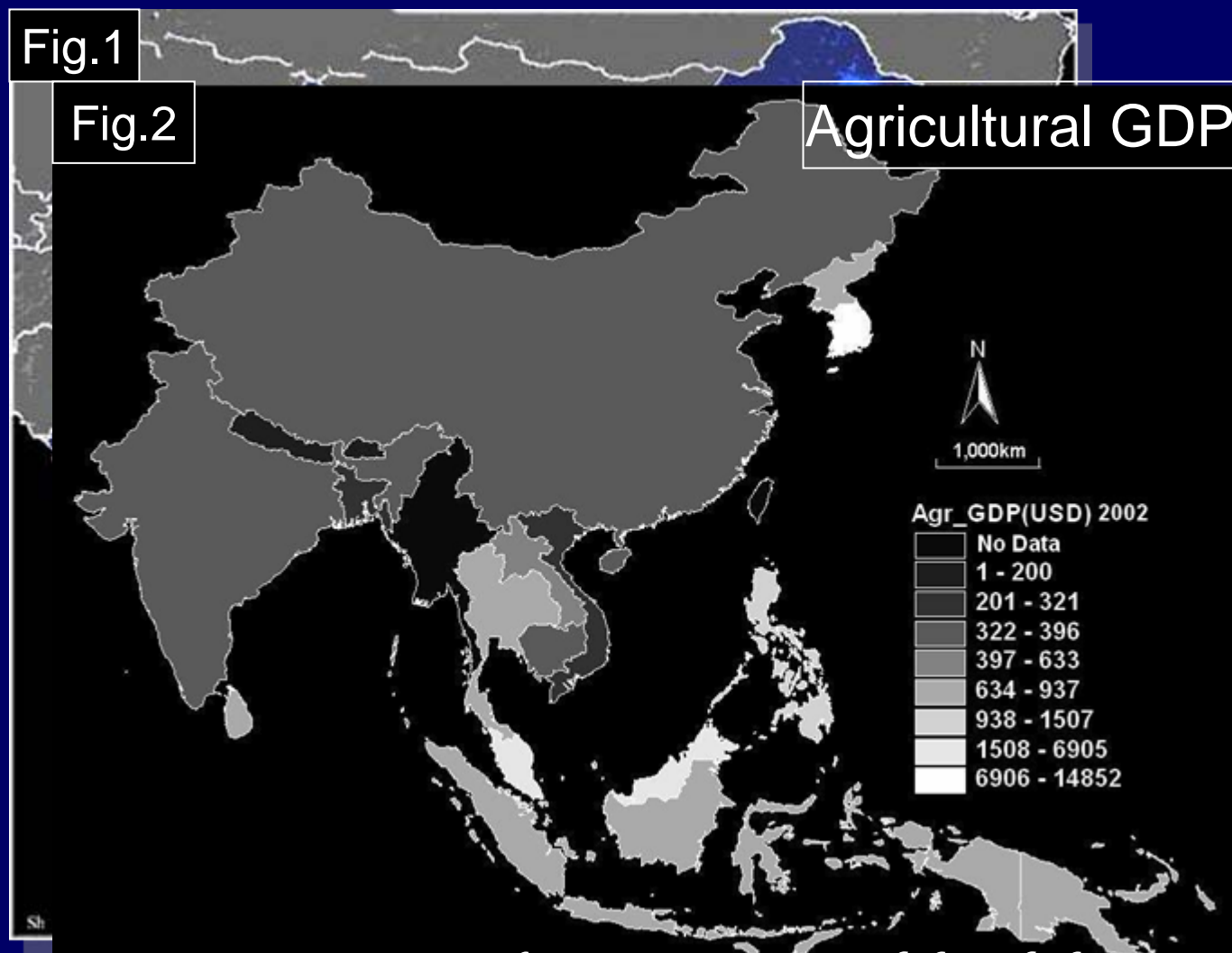
GLOBAL AIV STATUS



Feeding & Animal health status

Poultry density in ES Asian (Fig.1-FAO)

&. Traditional poultry feeding country
&. World average for Agricultural GDP per Economically Active Person is 1083 USD
&. Vietnam, China, Indonesia corresponding value to be 266, 371 & 720 USD



Feeding & Animal health status

CHN Poultry Inventory(2004)

&.14.2 billion
(20.83% globally)

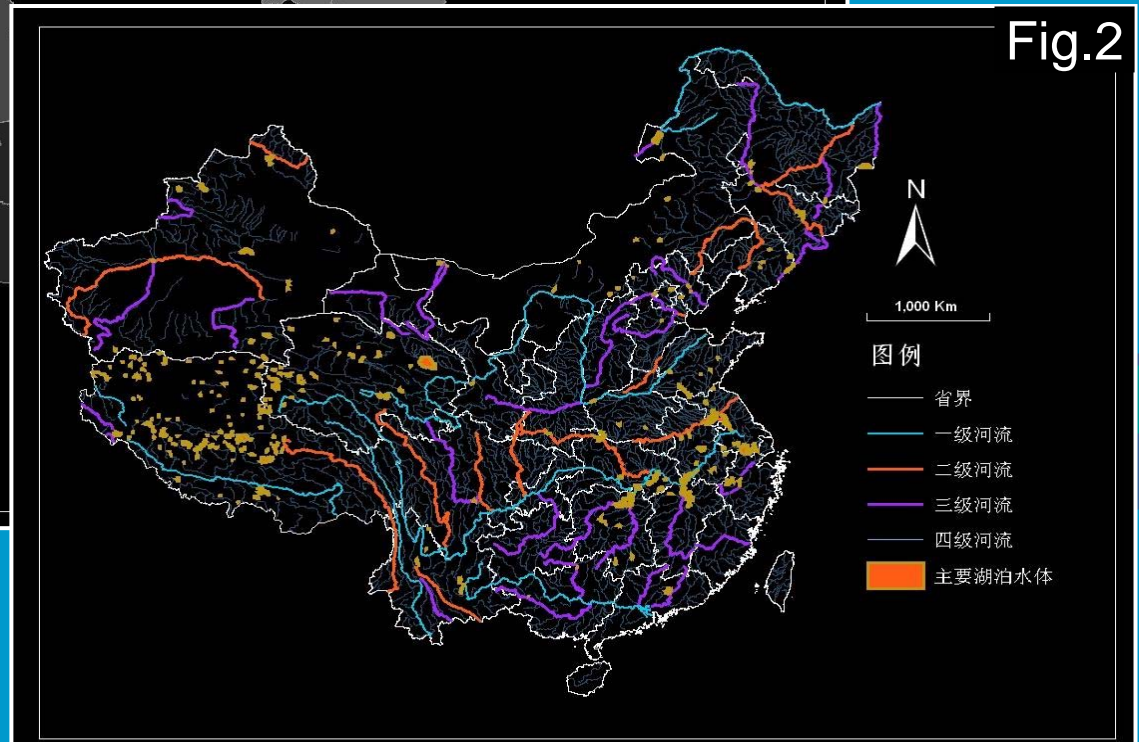
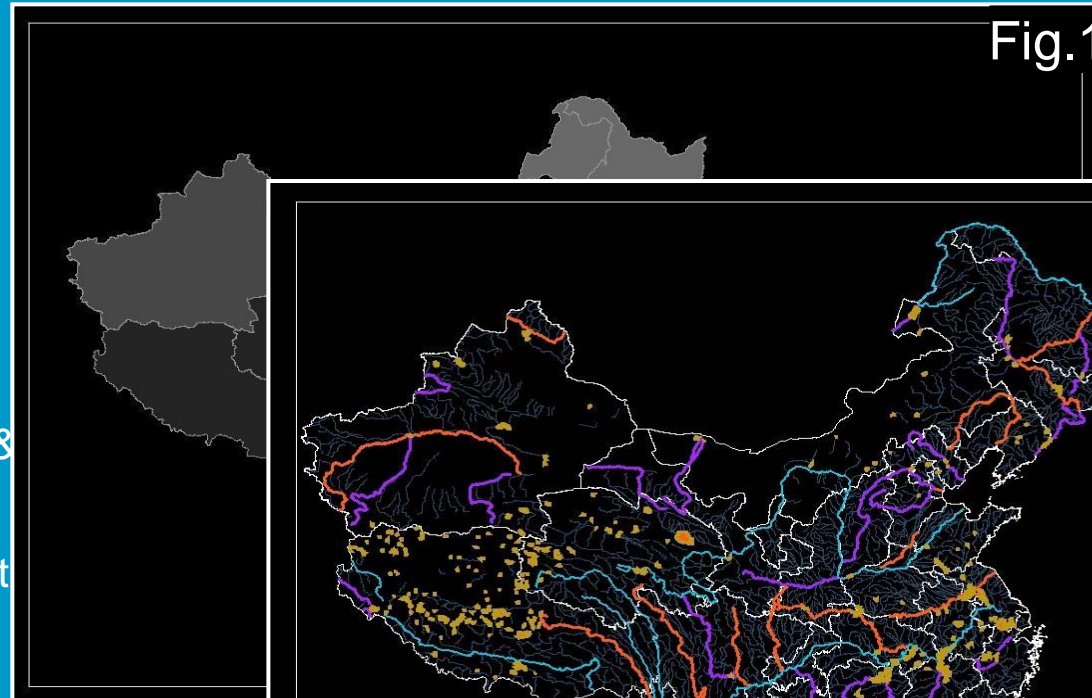
&.Biggest Inv
Pro :SD, HB, HN

Secondary –
SC, LN, JS, HB, GD.

Limited Num in QH &
XZ.

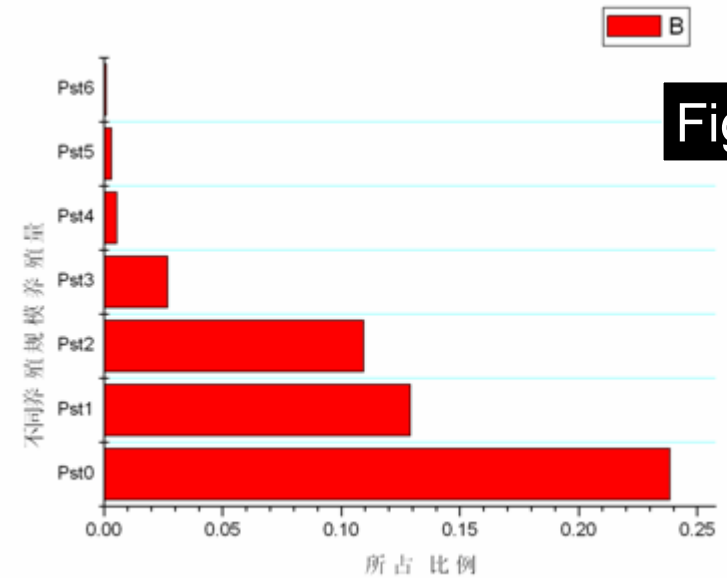
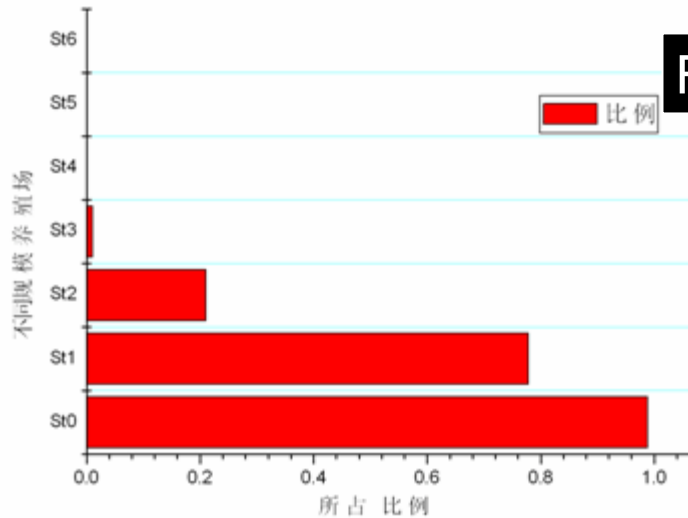
&. Waterfowl Num at
3.7 billion(76%
globally)

Waterfowl mainly
confined within the
south-eastern part of
China, especially in
Zhu-Gan-Yu River
basin.



Feeding & Animal health status

Feeding pattern



Notes: St0 refers to poultry site that feeding number is less than 10,000 (termed as small scaled feeding pattern); St1: 500—2,000; St2: 2,000—10,000; ... St6: More than 100,000 (highly disciplinary feeding pattern-pattern 1); Pst0、Pst1...Pst6 correspondingly refer to St0、St1、St2、St3、St4、St5、St6 Inventory poultry number respectively.

&. Small scaled feeding pattern dominated, accounting 98.83% proportions, while highly disciplinary feeding pattern only account very small proportions ($5.33309E-06$)

Feeding & Animal health status

AIV Susceptible Sector Pattern

&. Small scaled feeding pattern dominated in China poultry pattern, biggest one is in

Anhui(99.62%)
,Secondary to be
Jjiangsu,Hebei,
FJ and Hai-N
less account

Fig.1

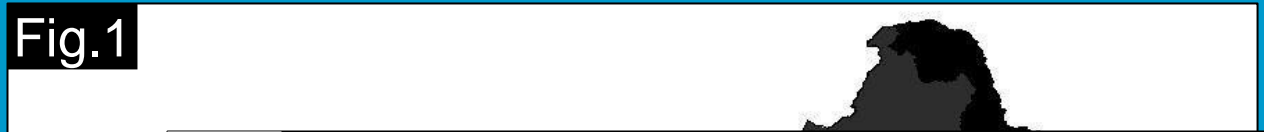
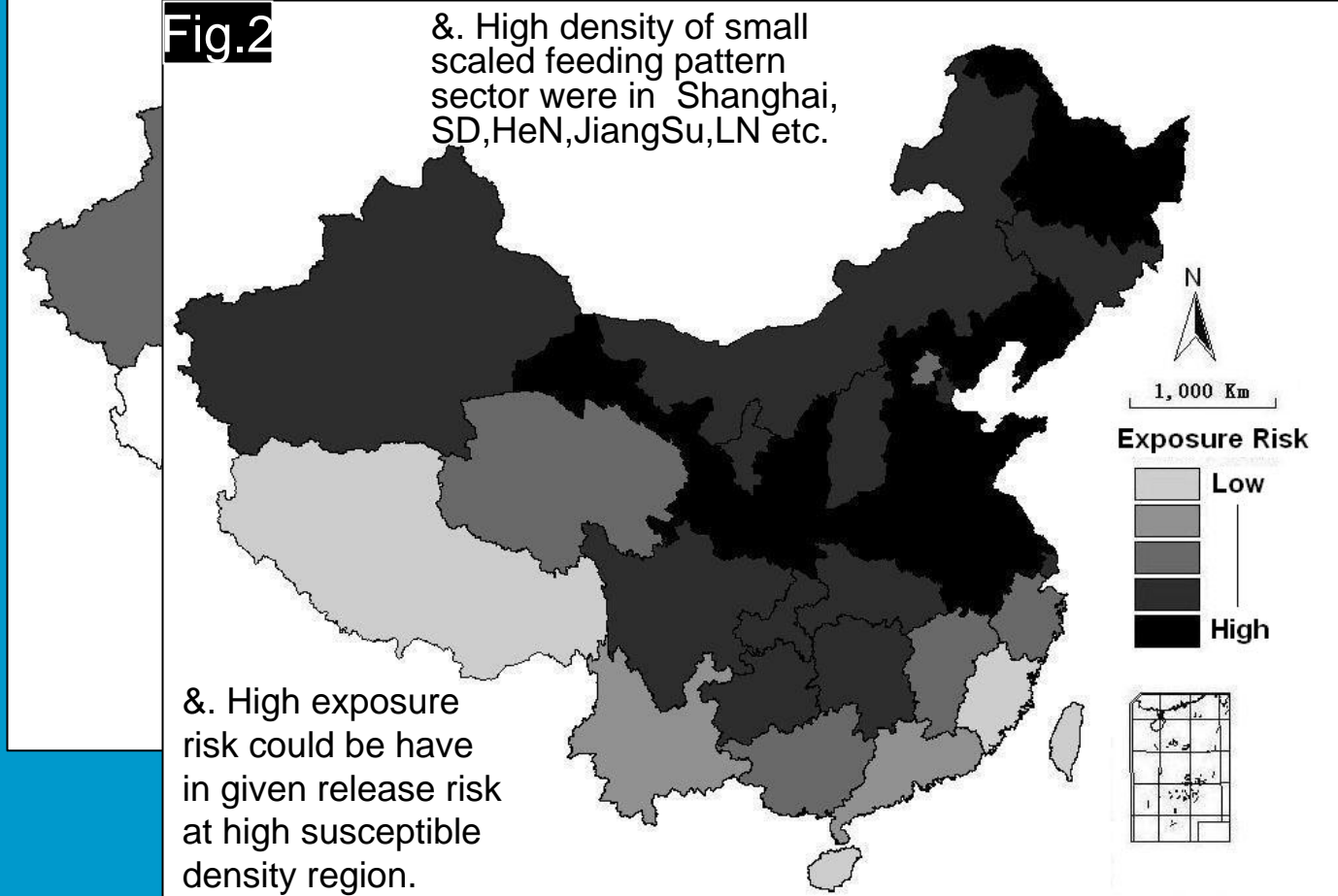


Fig.2

&. High density of small scaled feeding pattern sector were in Shanghai, SD,HeN,JiangSu,LN etc.



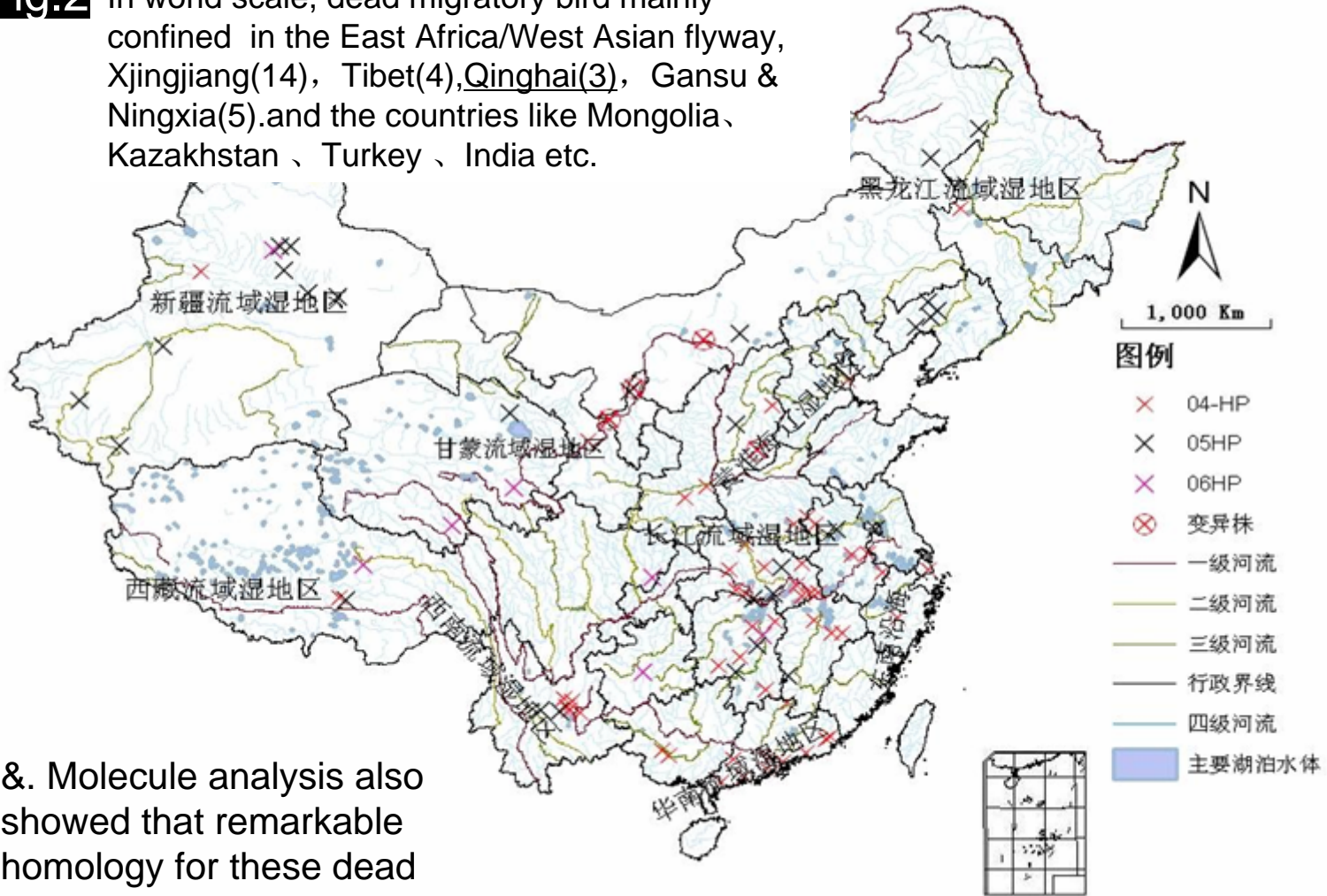
&. High exposure risk could be have in given release risk at high susceptible density region.

Global wild bird migrating pattern (Fig.1 after FAO)

Fig.1

Fig.2

In world scale, dead migratory bird mainly confined in the East Africa/West Asian flyway, Xjingjiang(14), Tibet(4), Qinghai(3), Gansu & Ningxia(5) and the countries like Mongolia, Kazakhstan, Turkey, India etc.



&. East covering part of

&. Molecule analysis also showed that remarkable homology for these dead bird.

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Migration patterns

Fig.1

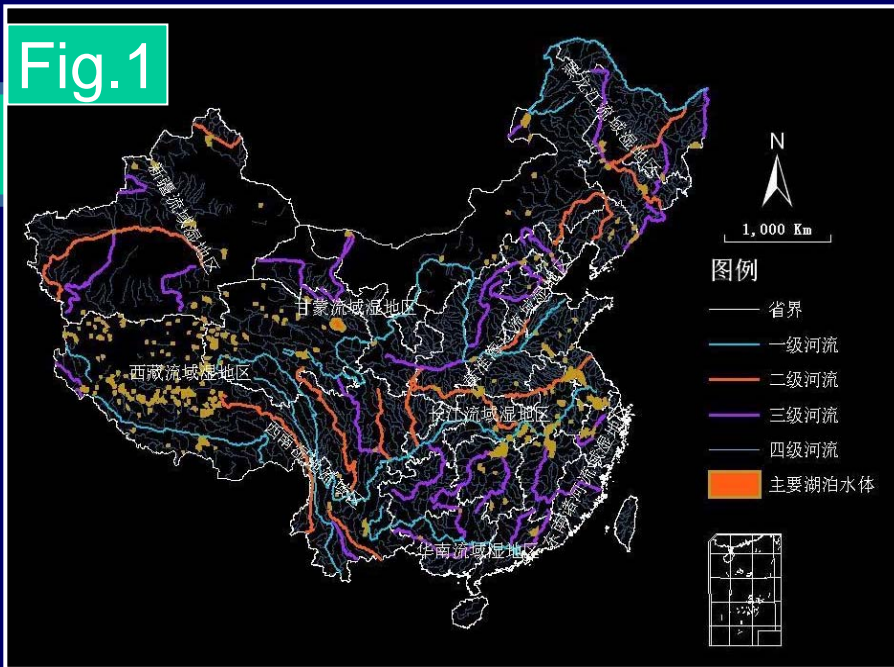
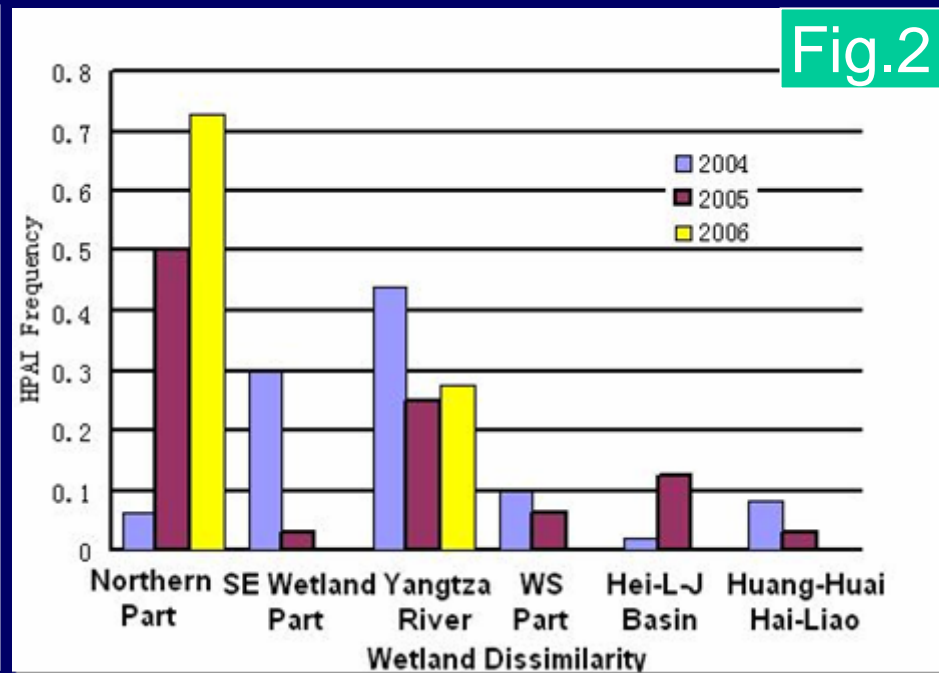


Fig.2



- &. Consisting 10% world wetland , Num one & four in the Asian and world respectively
- &. Richness wetlands resources suitable for bird migration.
- &. AIV frequency have spatial dissimilarity across geographical region.
- &. Northern part wetlands account 6% ,50% ,73% in 2004-2006 correspondingly.

Feeding & Animal health status

Immunity Density & HPAI Occurrence

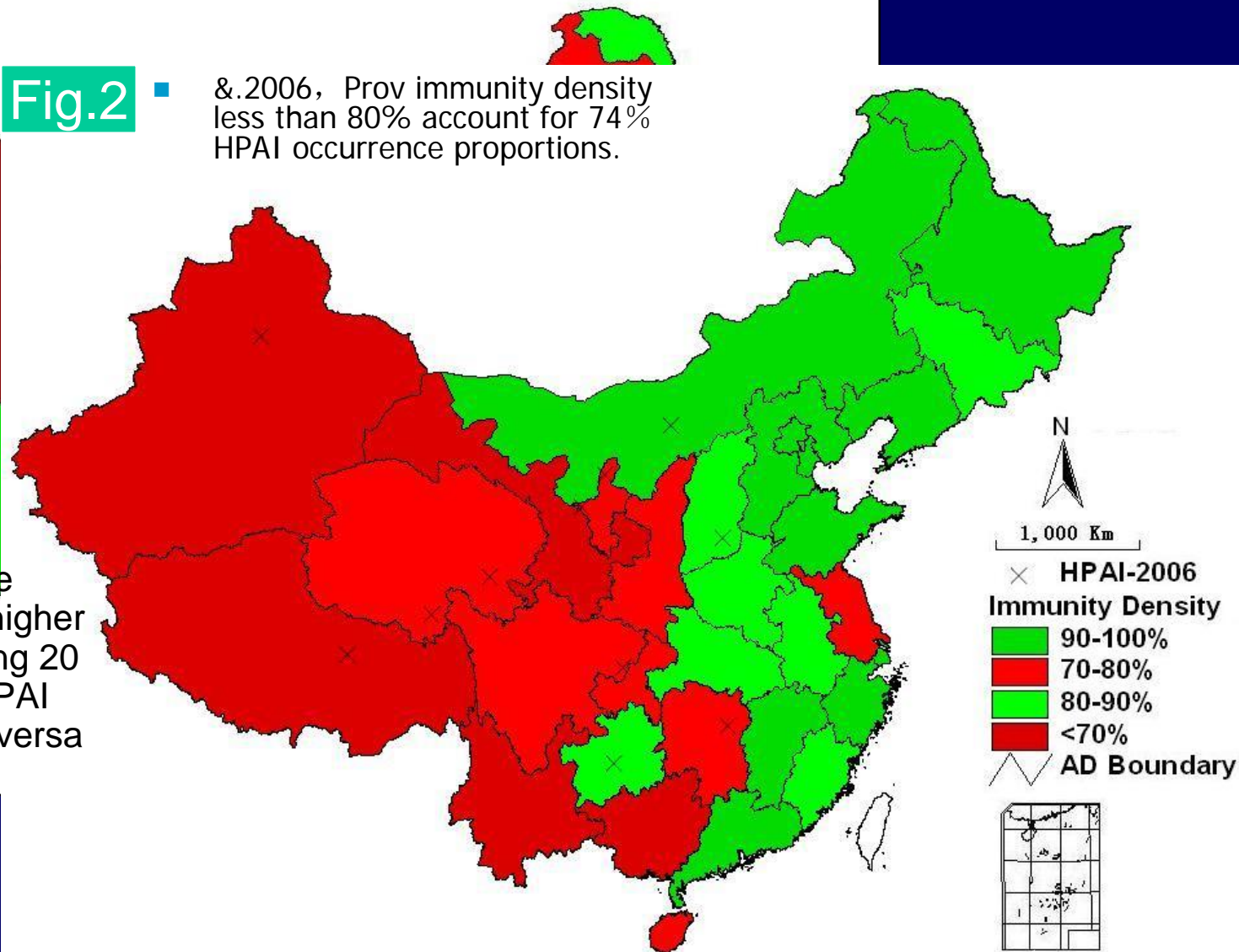
Fig.1



■ &.2005, province immunity density higher than 80% consisting 20 % proportion of HPAI occurrence; vice versa 80%.

Fig.2

■ &.2006, Prov immunity density less than 80% account for 74% HPAI occurrence proportions.



Sub-summary: immunity Risk & aftereffects

- Epidemic situation of AIV have been getting better come alone with initializing immunity policy, but need more effective monitoring.
- Problem aroused:
 - &.Having unreachable corner
 - &.Possible mutated subtype

Surveillance

- Initializing surveillance 2000.
- 2004-sampled more than 2 million, 11 waterfowl-RT-PCR positive--- coming from southern part of China.
- 2005---close to 3 millions (poultry & wild bird). 21 positive samples in Anhui, Hunan, Yunnan, which showed that recessive infection existed.



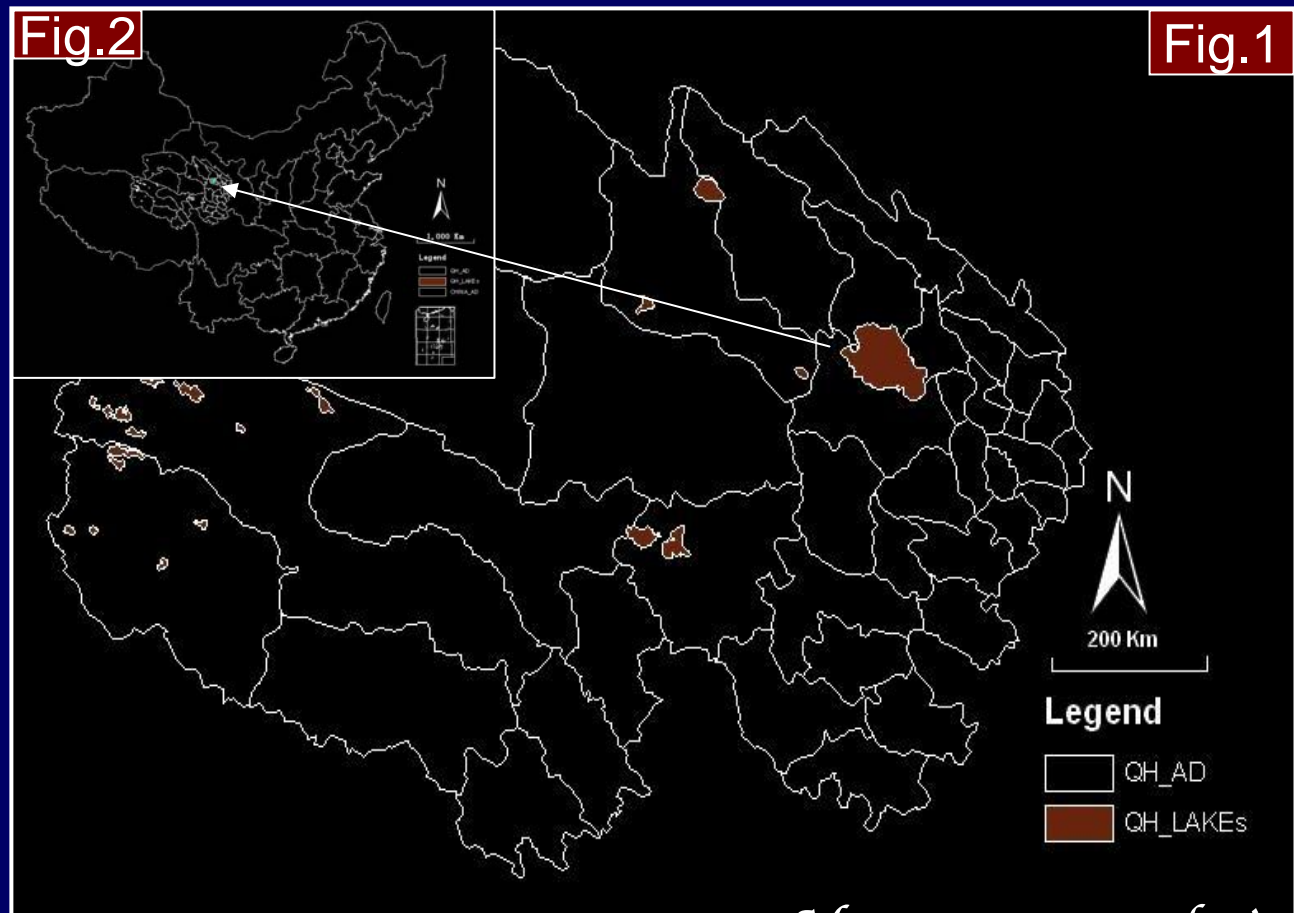
Sub-summary

- High frequency: 2004-2006, 93 AIV occurrence across 23 provinces
 - &. 91 poultry AIV
 - &. 2 migrated bird AIV
- Wild range hosts:
 - variety including poultry, duck, goose, dove, ostrich, peacock, keet, turkey, partridge, swan, pie, wild goose, sheldrake, *Anser indicus*, *Larus brunnicephalus*, *Todorna ferruginea* ect.
 - &. After integrated control measures, AIV showed drop-down trend

Another characteristics: Virulence getting stronger

&. morbidity and mortality in poultry & waterfowl is getting higher.

&. 2005, in QH lake, H5N1 infection result in the dead of wild bird, show that AIV host range getting larger,





PATTERN ANALYSIS

- 
- Pattern recognizing- disease spatial range process & Disease control
 - Three stage:
 - &. Stochastic & dispersed pattern
 - &. Clustered pattern
 - &. Endemic & pandemic pattern
- 

AIV national scaled pattern analysis

Fig.1

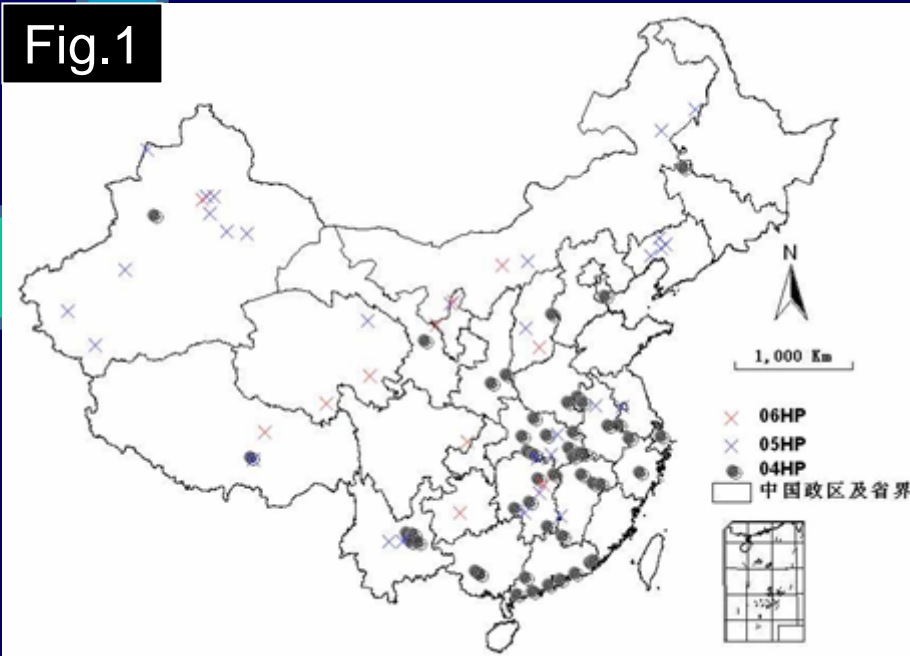
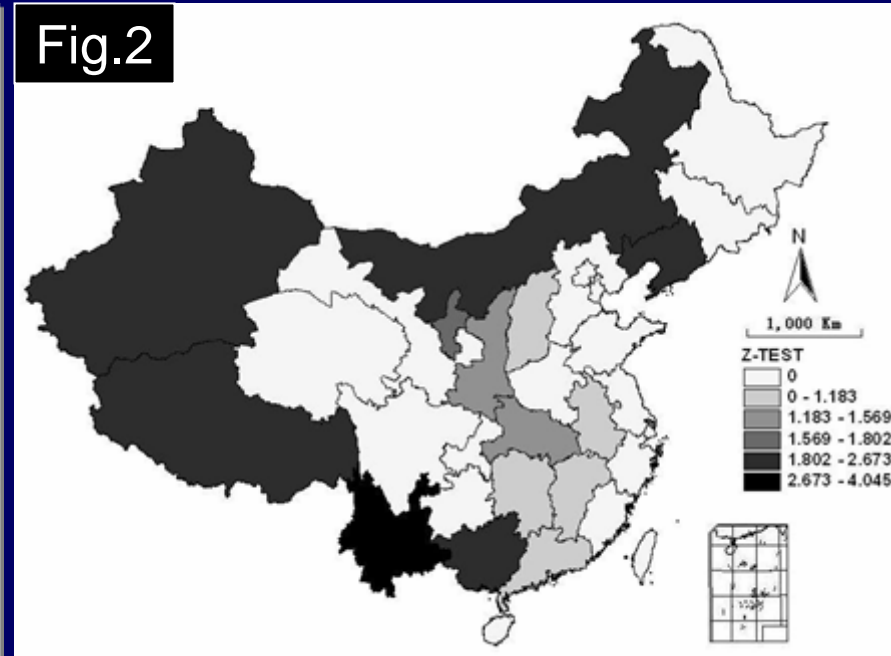


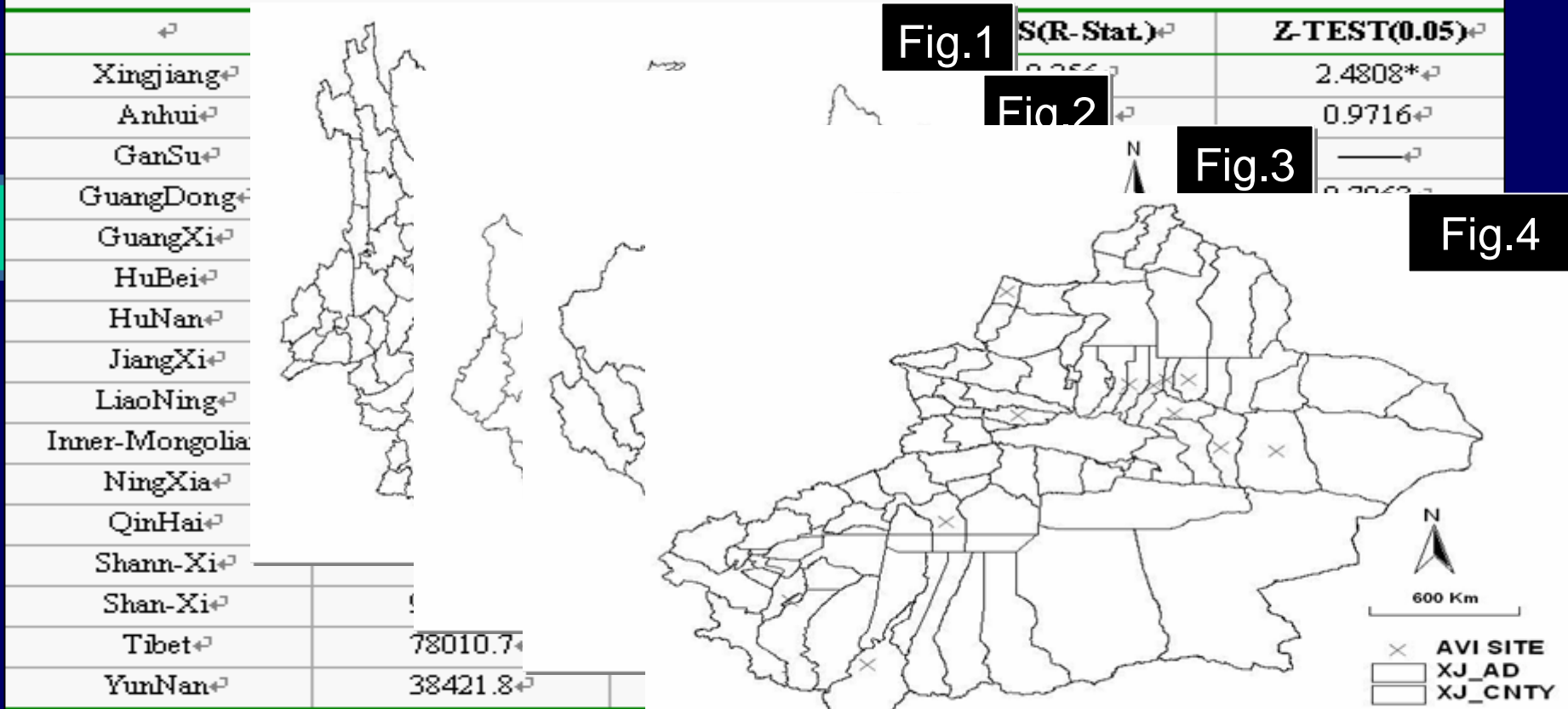
Fig.2



- R-STATISTIC combined with NEIGHBOR-ANALYSIS
- R-STAT in national scaled -0.43126 , standardized $Z_R - 7.69399$ (0.05 level), 95% confidence interval -AIV status to be aggregated.

REGIONAL SCALED PATTERN ANALYSIS

Tab. 1 Regional pattern analysis on AVI occurrence



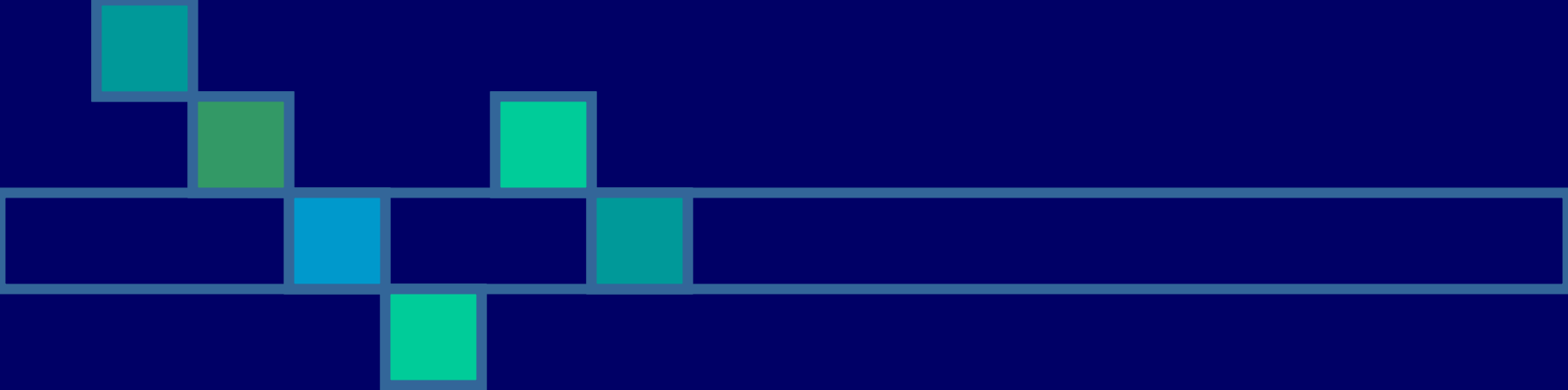
Notes : OBD— Observation Dis(M); END— Expected nearest Dis(M), 1000 R Stat.

- &. AVI status in YN, LN, XZ, XJ NM& GX clustered, point spatial association to be significant.
- &. Other 16 provinces AIV pattern to be dispersed pattern.

Pattern recognition

Results and Discussions

- &. After integrating measures & immunity in the year 2005 & 2006, occurrence status of AIV in China have getting control, but mutation risk and range expansion trend still exist, especially small scaled feeding pattern can make the release & exposure AIV risk larger.
- &. Pattern analysis showed that current status of AIV in China loom to be clustered pattern, which means that the AIV in China are very serious , in which AIV status within YN, LN, XZ, XJ, NM are spatially significant associated, other 16 province's AIV occurred at a dispersed pattern.
- &. Pattern analysis also showed that AIV multi-epidemic center have been came into shape, including south-eastern wetlands center, south-western wetlands center, northern wetlands center, Yangtza wetlands center, and Heilongjiang wetlands center. AIV corridor role in the Northern part of wetlands, South West part wetlands, and Yangtza Rive wetlands could play a significant role in AIV occurrence in the future.
- &. Recessive virus in health poultry have resulted to the current status of AIV cluster range pattern , and also be the main reason for China AIV occurrence pattern skipped directly from dispersed pattern into cluster pattern.
- &. Risk analysis showed that relatively highest risk region to be in Xingjiang, Hubei, Hunan, Guangdong, Yunnan, Anhui, Liaoning, secondary to be Jiangxi, Inner-Mongolia, Xizang, Qinghai, Shannxi, Ningxia, Third region to be Henan, Jiling, Sichuang etc, Beijing, Hainan were relatively less risked.



THANKS FOR
PARTICIPATING & ATTENDANCE

