

Disease and Environment: Implications of Clonorchiasis Infection in Taiwan and Mainland China

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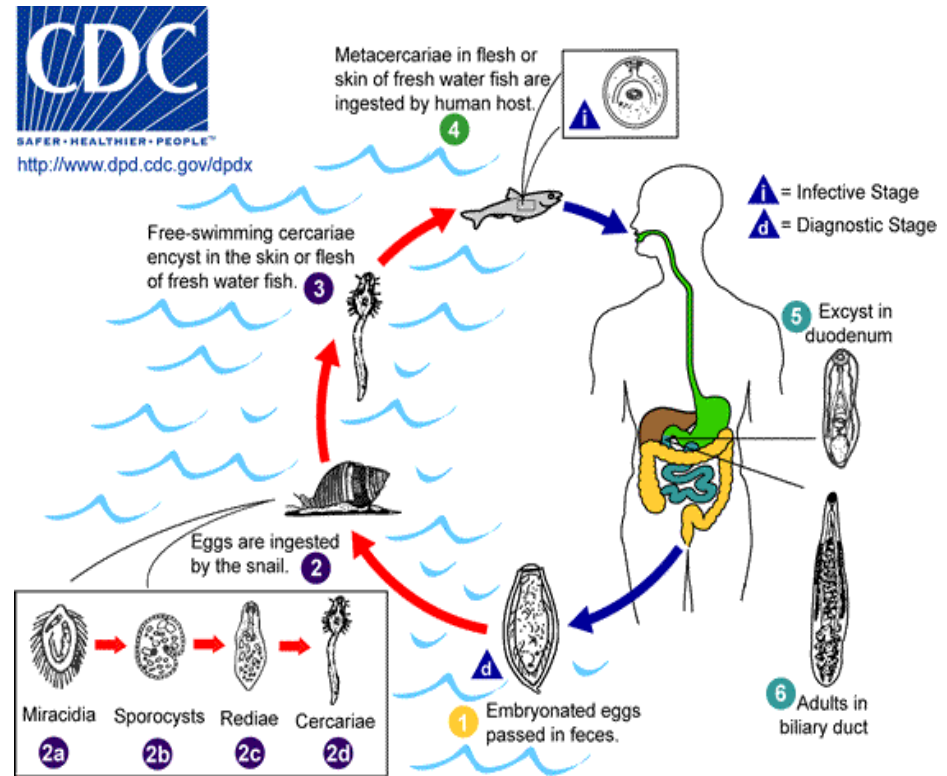
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Definition of Clonorchiasis

- Clonorchiasis is an infectious disease caused by *Clonorchis sinensis* (Chinese liver fluke) and it is a food-borne zoonosis.
- In modern medical science, *Clonorchis sinensis* was first found by McConnel in 1874 from the liver of a Chinese who died in Calcutta, India. The parasite was named *Distoma sinense* by Cobbold in 1875 and its genus *Clonorchis* by Looss in 1907.

Life Cycle

Before growing into adults in the body of its final hosts like humans, pigs, dogs and cats, *Clonorchis sinensis* requires two intermediate hosts, the fresh water snails and the fresh water fishes. The transmission of *Clonorchis sinensis* forms a cycle among the parasite, the intermediate hosts and the final hosts. Rivers, lakes and ponds provide suitable environment for this parasite to survive, but it is human actions that make this cycle of transmission to run over and over again.



Archaeological Findings in China

Archaeological excavations in China during 1956-1994 found seven cases of human infections of *Clonorchis sinensis* at following places:

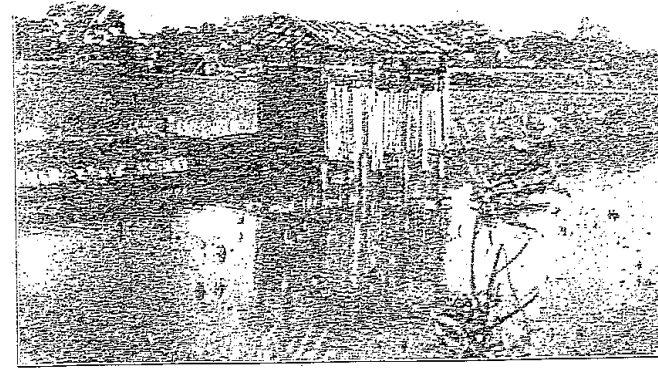
- Guojiagang, Jingmen, Hubei
- Mashan, Jiangling, Hubei
- Fenghuangshan, Jiangling, Hubei
- Hojiazhao, Hengyang, Hunan
- Meihuacun, Dongshan, Guangzhou
- Fuqing, Fujian
- Fuzhou, Fujian

The earliest case dated the middle of Warring States Period (403-247 B.C.) and thus revealed Clonorchiasis existed in South China at least from 2,300 years ago. (Map 1)



Practices that induced Infections

A practice of feeding fresh water fish with feces and thus helps inducing the propagation of *Clonorchis sinensis* could be traced back in Chinese history at least to the mid Northern Song Dynasty (960-1127). Another practice of building latrines or pigpens along fish ponds could be found in many places in South China in the Ming Dynasty (1368-1643). These practices remained in countryside in South China even in the late 1990s. It is also notable that in the 1970s, a practice of farm management by building pigpens along fish ponds was once promoted in Taiwan.



A latrine over a fish pond in Canton
(Hsu and chow, 1937)



Pigpens along a fish pond in Taiwan
(Chen and Yen, 1981)

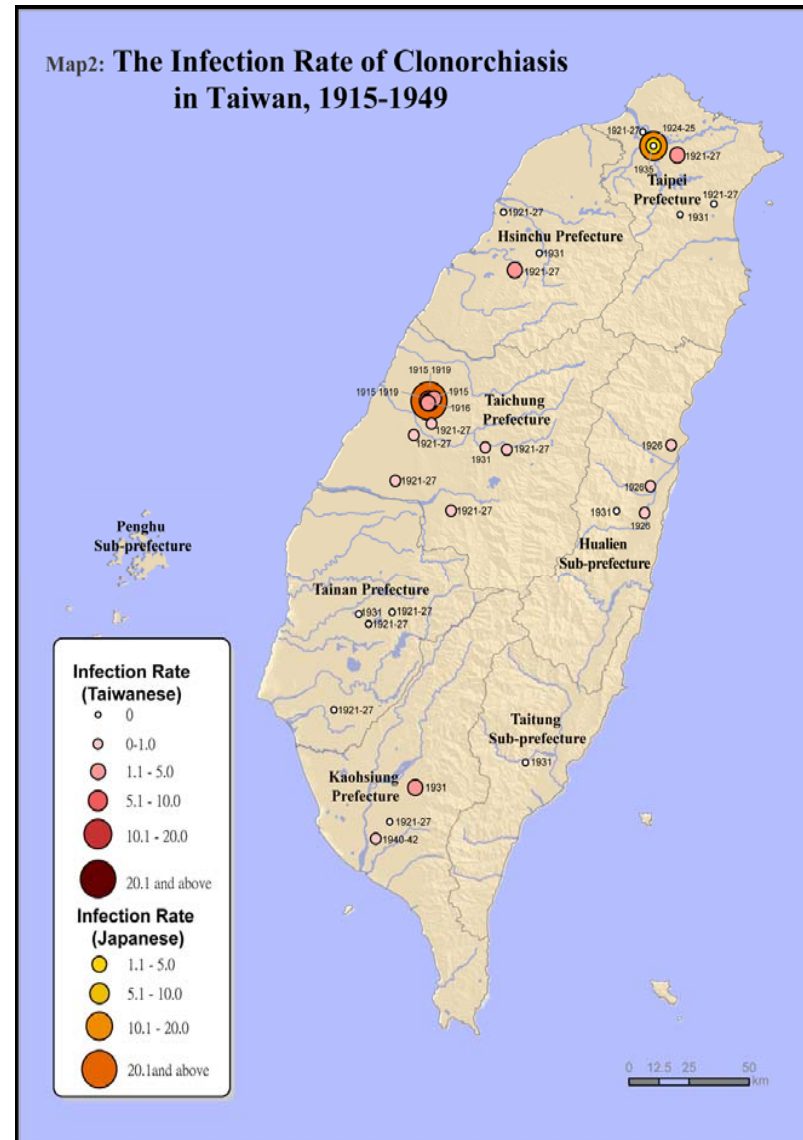
- Through these practices of fish culture, people tried to recycle the waste by letting excrements flowing into water to feed fishes; however, the danger of transmitting parasitic diseases was ignored.
- Moreover, the custom of eating raw or half-cooked fish had a long tradition in China. This cuisine provides a chance for metacercariae of *Clonorchis sinensis* to enter human body and induces diseases related to liver and gallbladder.
- The custom of feeding cats and pigs with fishes also helps in producing animal hosts around the living environment of the people.
- In the 1920s and 1930s, researchers urged that it was necessary to educate the people about harmfulness of eating raw fish. However, in the late 20th century when economic conditions gradually improved in China, there were more people who acquired the ability and habit of enjoying raw fish cuisine and thus spread Clonorchiasis infection.

Human Infections of Clonorchiasis

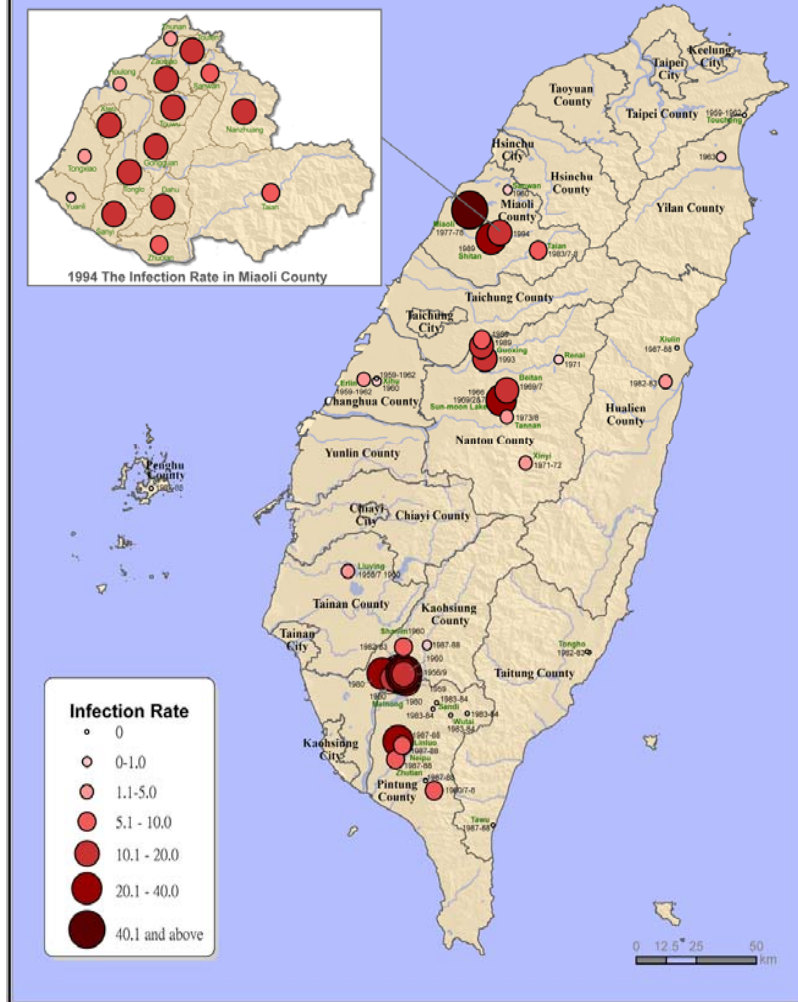
- In modern world, endemic areas of Clonorchiasis are mostly in East Asia, including Japan, Korea, China, Taiwan, and Vietnam. In Japan the infection rate reached more than 50% in 1883, but no more infection was found in 1991. In Korea, the infection rate was over 40% in the 1950s, but it was reduced to around 2% during 1982-1992. In the early 21st century, estimations revealed that 35 million people around the world were infected, of which 15 million were in China.
- The first studies on human infections of Clonorchiasis in Guangdong by G. D. Whyte and C. N. Heanley respectively were published in 1908. The first study on cases found in Taiwan was done by Tsukasa Ōi in 1915.
- For a general view of the distribution of Clonorchiasis infections in Taiwan and Mainland China, the following maps show the infection rates based on available data.

Infections in Taiwan

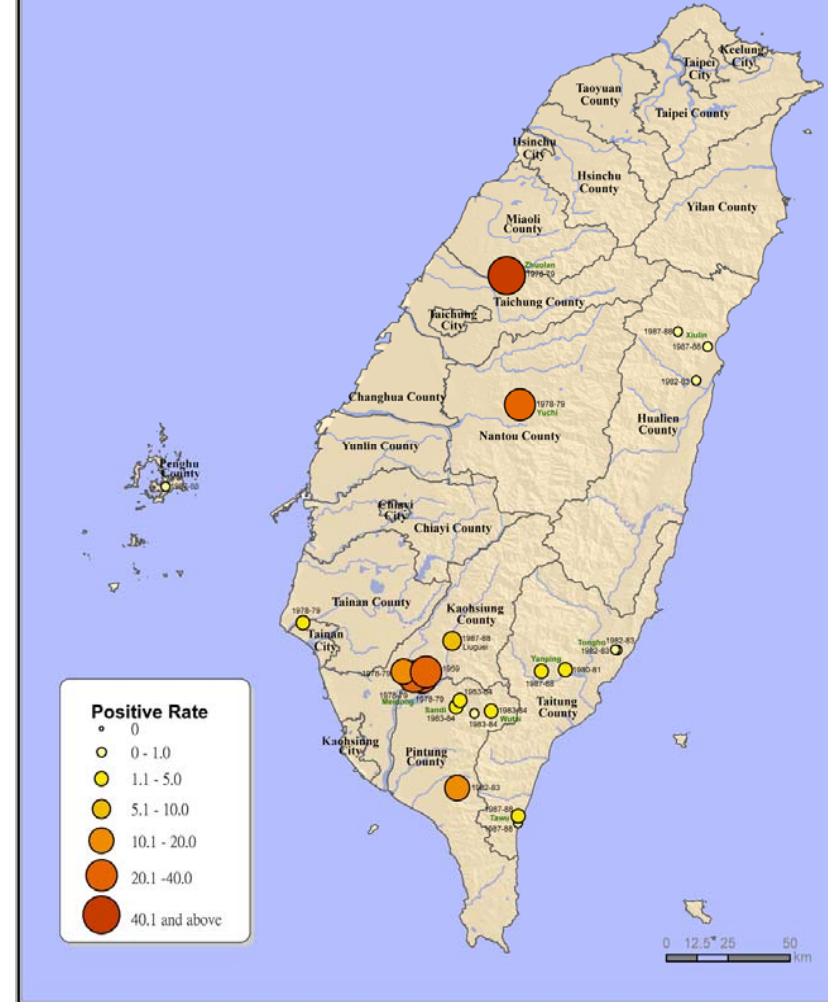
- In the first half of the 20th century, it was found that Japanese living in Taiwan had a higher infection rate of Clonorchiasis than Taiwanese. (Map 2)
- In the later half of the 20th century, the infections were mostly found in Kaohsiung, Pingtung, Miaoli and Nantou counties; the highest rate once reached 70% in 1982-83 at Meinung Township, Kaohsiung County. (Maps 3.1-3.2)
- The difference lies in whether the people are accustomed to eat raw fish.
- After 1990 the infection of Clonorchiasis in Taiwan was gradually under control by using Praziquantel as a cure.



Map3.1: The Infection Rate of Clonorchiasis in Taiwan
(Results of Fecal Examinations), 1950-1999

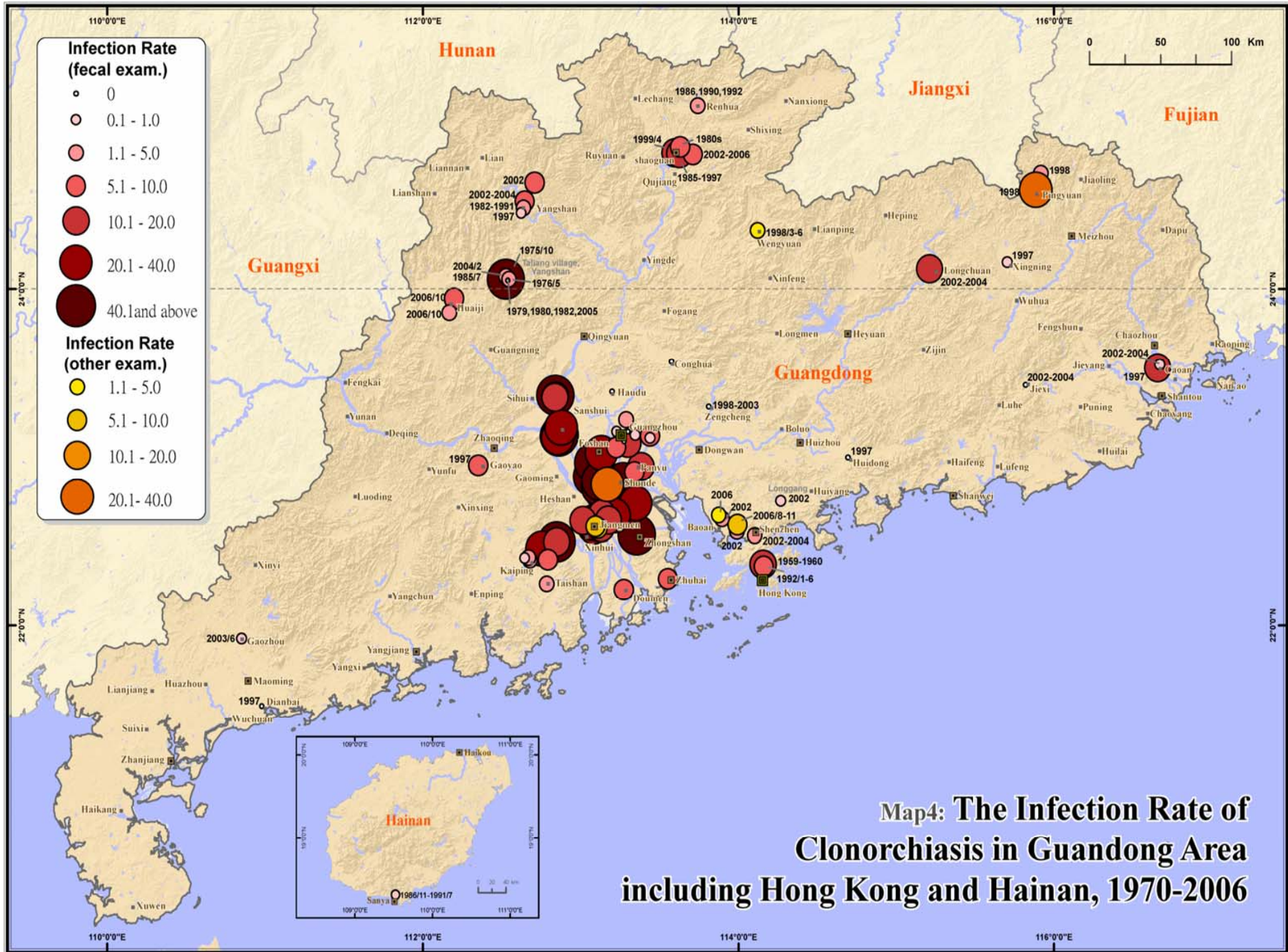


Map3.2: The Infection Rate of Clonorchiasis in Taiwan
(Results of Intradermal Test), 1950-1999

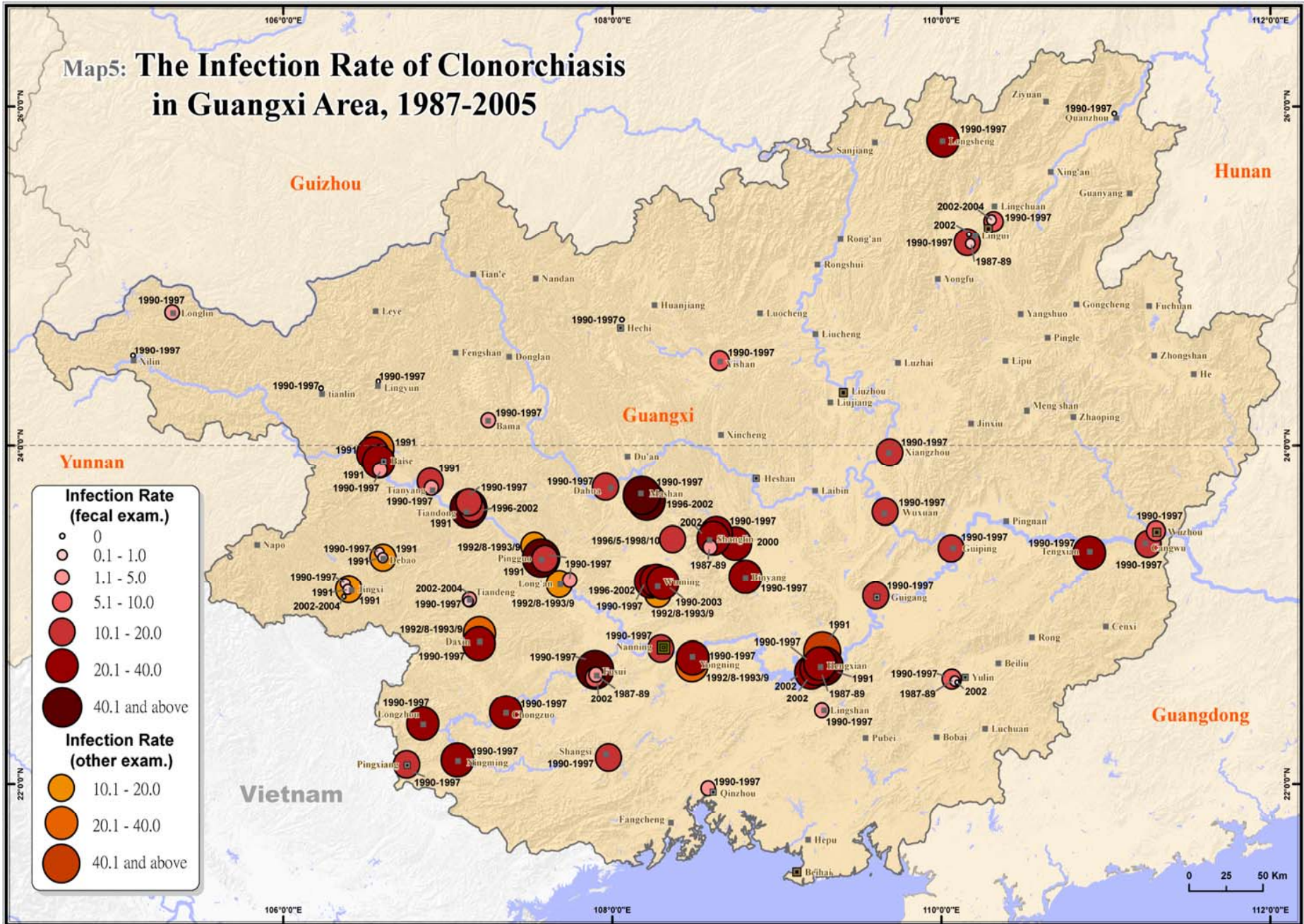


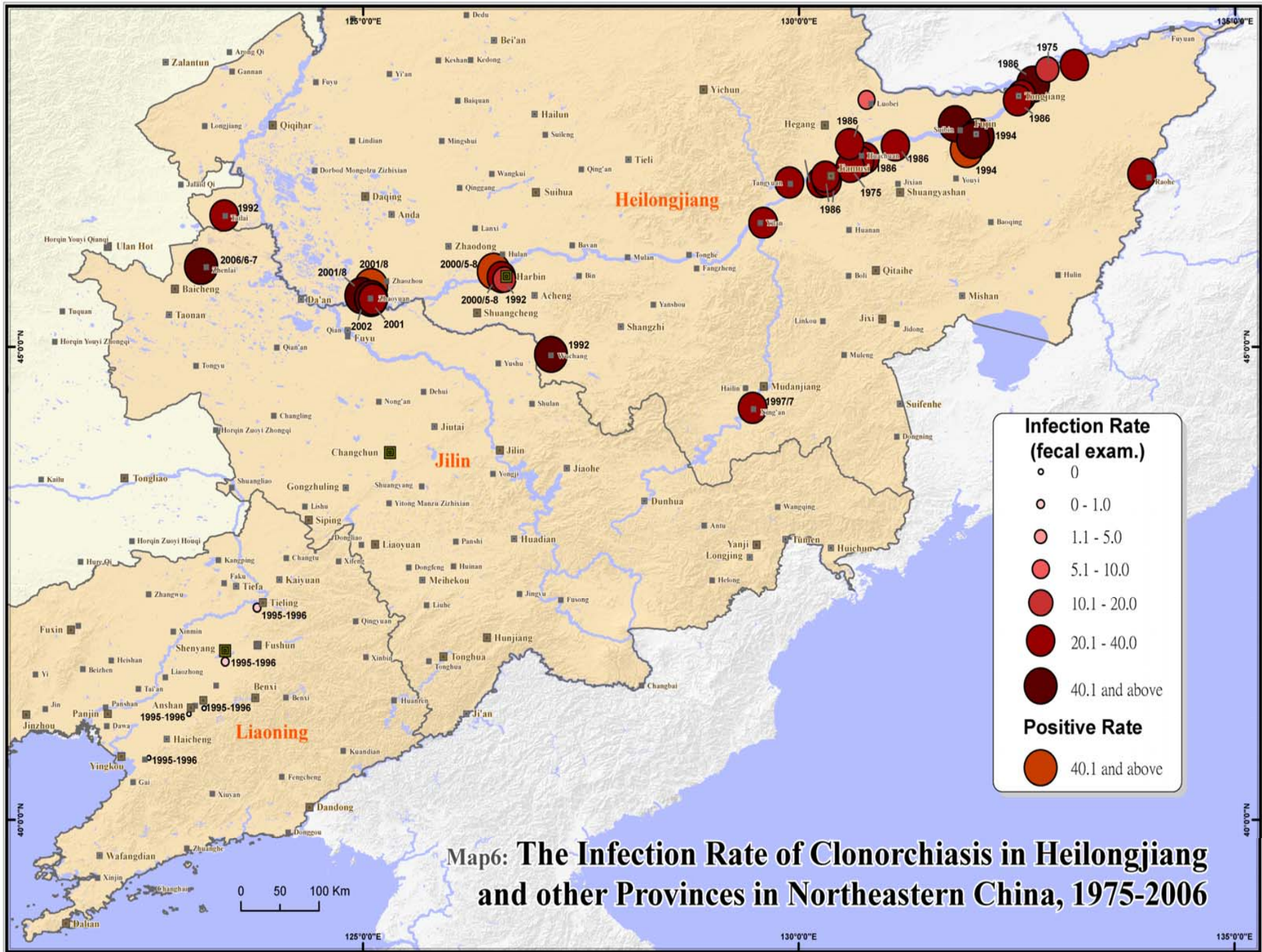
Infections in Mainland China

- The first national investigations during 1988-1992 in China found the total infection rate of *Clonorchis sinensis* in 22 endemic provinces was 0.365% with the highest rate of 1.824% in Guangdong. The second national investigations during 2001-2004 in 27 endemic provinces found the total infection rate was 2.40%, with Guangdong 16.42%, Guangxi 9.76%, Heilongjiang 4.73%, Jilin 2.89% and Chongqing City 1.18% ranking on the top.
- Maps 4-8 illustrate major infection rates in Guangdong, Guangxi, Heilongjiang and Northeast China, Other provinces in South China, and in North China.

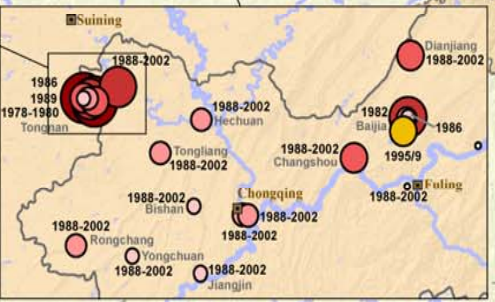
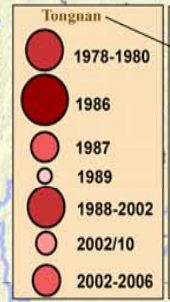
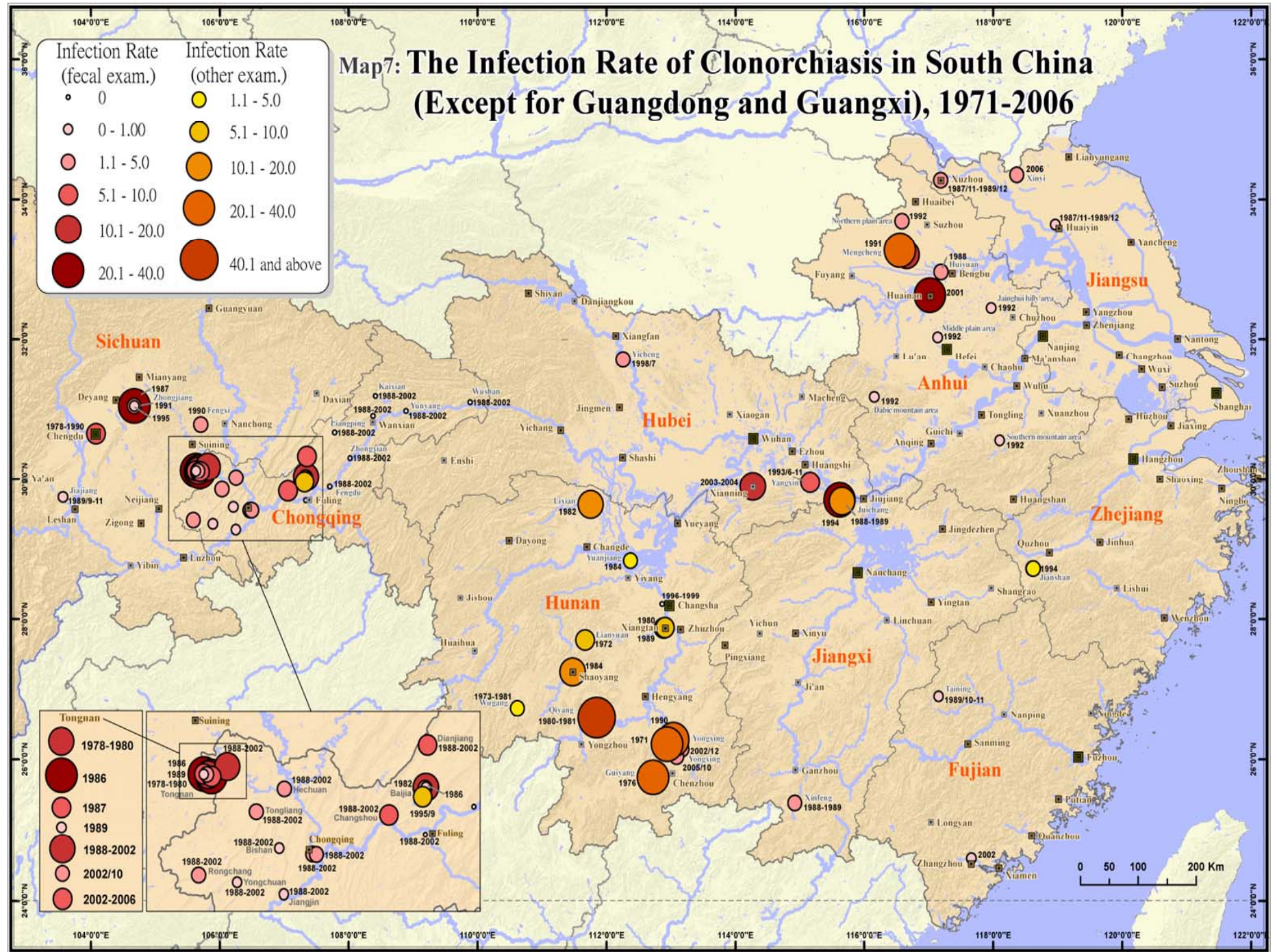
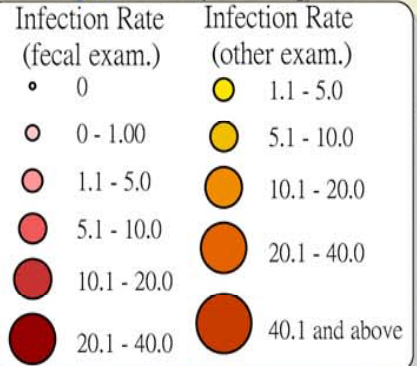


Map5: The Infection Rate of Clonorchiasis in Guangxi Area, 1987-2005





Map7: The Infection Rate of Clonorchiasis in South China (Except for Guangdong and Guangxi), 171-2006



Map8: The Infection Rate of Clonorchiasis in North China, 1960-2004



Concluding Remark

- The infection of *Clonorchis sinensis* provides a good case for illustrating interaction of human actions and the environment.
- Since the 1990s, the infection of CS in Taiwan and Mainland China was gradually under control with medical treatment. However, the opening of trade and traveling between Taiwan and the Mainland as well as entrance of foreign brides and workers into Taiwan also brought certain danger of new infection, particularly the Thai liver fluke.
- In Mainland China, the infection rate was still increasing in many places as economic conditions were gradually improved since the late 20th century.
- In addition to medical care, whether education alone can be effective in preventing the infection of CS among the people and to break the cycle of transmission is a problem required serious study