Research on Schistosomiasis Epidemic and Schistosomiasis-related Population Decrease

——A Case Study of Yuanjiang County, Hunan Province

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Introduction

The disease Schistosomiasis has a wide geographic distribution in China, almost covering all six provinces along Yangtze River. (See Fig. 1) Epidemiological surveys conducted in 1950s showed that 11,600,000 people got infected by Schistosomiasis nationwide and more than 100,000,000 people were under the shallow. In single Jiangxi Province, 310,000 people died of it, 1300 villages destroyed during 40 years from 1911 to 1949. Then the question is that how these regions, which used to be developed areas of ancient China, could achieve prosperity as Schistosomiasis prevalence had been always such severe? It is frequently claimed in former related medical history research that major outbreak of Schistosomiasis did not happen until Ming Dynasty (1368-1644). Then, when Schistosomiasis appeared? Why disappeared? How it affected human population? These are the focus concerns of this study.

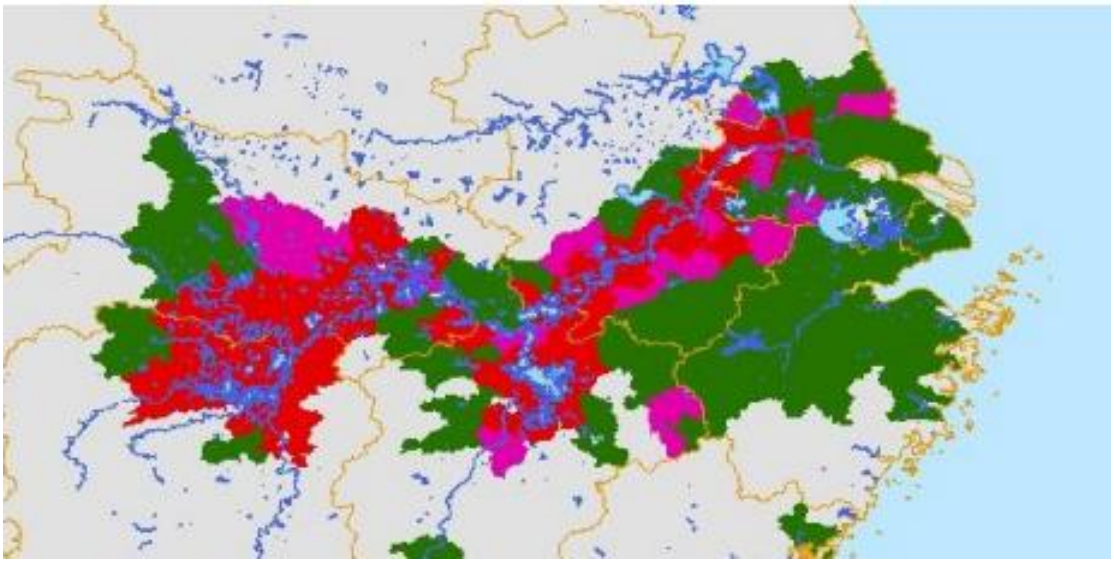


FIG. 1

Schistosomiasis Distribution in 1950s

Schistosomiasis is one of the natural epidemic zoonosis caused by Schistosome,

whose intermediate host is Oncomelania snail. Dongting Lake Region have been the widest habitat for Oncomelania snail as large area of snail infested beaches existing, which makes for the most severely Schistosomiasis afflicted area, both in history and at present.

This study investigated population trends in Schistosomiasis afflicted area from 1400 to 1950, clarified prevalence history, and explored relationship between Schistosomiasis epidemic and environment changes.

Schistosomiasis-related Population Decrease

The demographic effects of Schistosomiasis were diverse and complex, involving issues of mortality, fertility, as well as life expectancy. History is replete with examples of early dead and sterilization in heavy epidemic areas. Therefore, population factors are sensitive indexes for Schistosomiasis epidemic.

Several methods arise in investigating long-term population trends, but as for small-scale historical population, genealogy might be the last remaining material. This study established long-term lineage population series on the basis of *Chen's Genealogy* by utilizing demographic methods.

There are two editions of *Chen's Genealogy* collected by Shanghai Library, compiled in 1941 and 1997 respectively. Two editions of Genealogy record 10,636 males, 7,750 females with their birth, death, and where they lived or buried as well. Birth records date from 1474, and end at 1999, covering more than 500 years. Chen's family lived in Yuanjiang County (Ancient county, whose territory was different from today's.) in Hunan Province generation by generation. Majority of the clan lived in southeastern county, while several branches moved to northern county since 16^{th} century. This study classified the clan's population into two groups according to residence, and subdivided each group's population in 10-13 birth cohorts, then, calculated demographic parameters by grouped birth cohorts separately. It should be noted that only males' records were brought into statistics since genealogy's records about females were mostly inaccurate.

Table 1 lists average raised sons and life expectancy at Age 20 of southern branches changing in period from 1450 to 1949. Children's premature deaths were commonly omitted in genealogy, and nearly all males recorded were finally brought up. So that, this study took average raised sons and life expectancy at Age 20 as indexes. It is

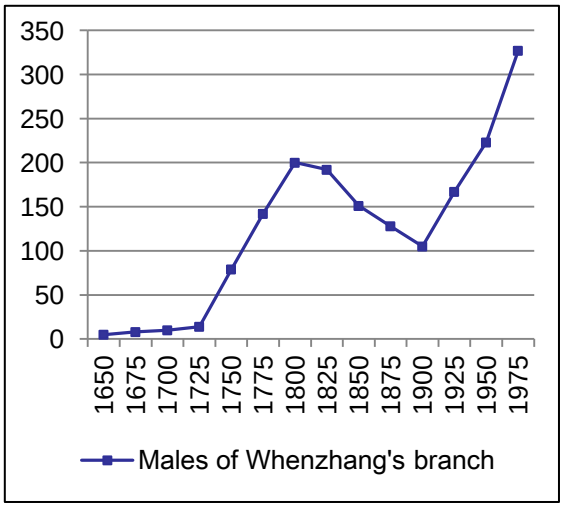
demonstrated from the table that both average raised sons and life expectancy are remarkable low during birth cohort period of 1775-1899, even cohort of 1800-1824 saw the number as low as 0.84, 29.2 respectively, which means, people born in 1775-1899 were short lived and few children were born or brought up.

TABLE 1

Average Raising Sons & Life Expectancy at Age 20 by Birth Cohorts of Southern Branches from 1450 to 1949

Birth Cohort	Samples	Raised Sons	Average Raised Sons	Samples	Life Expectancy at Age 20
1450-1549	13	5	0.38	13	—
1550-1649	26	58	2.23	26	46.2
1650-1699	62	166	2.68	62	37.3
1700-1724	98	304	3.10	97	38.6
1725-1749	191	442	2.31	178	40.1
1750-1774	429	646	1.51	363	37.8
1775-1799	565	618	1.09	426	30.7
1800-1824	619	520	0.84	431	29.2
1825-1849	529	491	0.93	375	31.6
1850-1874	418	554	1.33	337	33.5
1875-1899	497	651	1.31	343	31.1
1900-1924	562	847	1.51	326	37.5
1925-1949	691	1081	1.56	100	33.3

To be more specific, a branch of Chen Wenzhang, whose families lived in a village called Qingcaogang generation by generation, was picked to show how the low average raised sons and life expectancy influenced clan's total population. Curve for population increasing of Chen Wenzhang's branch is illustrated in Fig. 2.



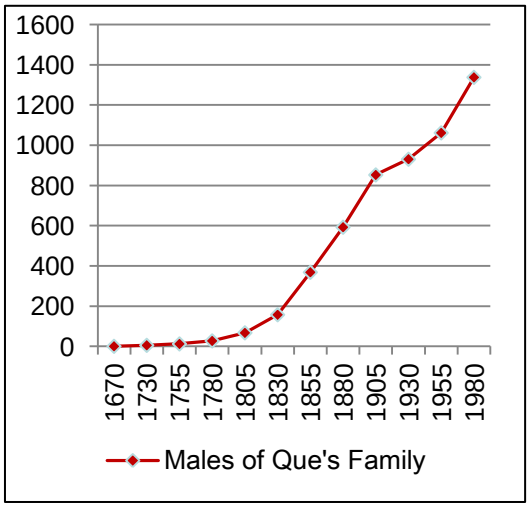


FIG. 2, 3

Males of Chen Wenzhang's Branch & Males of Que's Family

For comparison, curve for males of Que's family, living in Songyang, Zhejiang province, is brought in. Que's family lived in peaceful circumstances, no wars, no catching diseases, and in affluence, which made its population increasing curve take on an ideal status of exponential increase. Different from Que's curve, Chen' curve declines sharply around year 1800, and drops promptly to minimum in 1900, then picks up gradually after that. The valley can be observed clearly which certainly resulted from low average raised sons and life expectancy mentioned above.

The data valley was just caused by Schistosomiasis for the reasons that there's no deadly infectious diseases observed in historical documents during this period, and no population death concentrating in the same year observed in genealogy, which eliminate possibilities of deadly infectious diseases, wars and natural disasters. And further, actually there have been four major parasitic diseases prevalent around Dongting Lake Region, Malaria, Schistosomiasis, Filariasis, Hookworm Disease, and Schistosomiasis is the most severe, disabling and deadly type of the four. Therefore, Schistosomiasis might be the only rational response to population decrease. Similar demographic process influenced by Schistosomiasis also happened with northern branches.

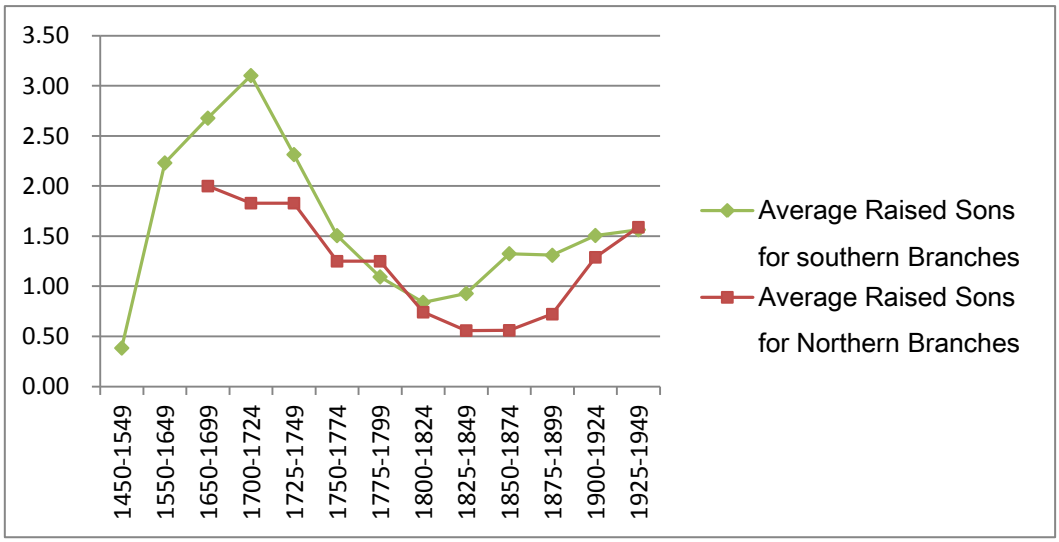


FIG. 4

Average Raised Sons for Southern and Northern Branches

It is illustrated in fig. 4 that demographic decrease of northern branches began later

and lasted longer than southern branches. Situation of northern branches didn't get better until 1950s when large-scale Schistosomiasis control developed. Why is there different time like this? Why appeared? Why disappeared? See under for further information.

Environment Changed and Schistosomiasis Epidemic

It was no coincidence that Schistosomiasis outbreak in Yuanjiang County, that was caused by environmental changes. Oncomelania snail is the only intermediate host for Schistosomiasis. Snails distribute everywhere around Dongting Lake Region, as there are large area of beaches and aits existing, which always covering by flood in summer and exposing land in winter, and it is very suitable for snails' survival. That's the principal reason why Dongting Lake Region is afflicted so severely. Snails like surroundings with peaceful water and overgrown weeds.

In 1733 and 1901, Chen's clan went to law twice against another local clan for property in land. The two civil judgements were kept in genealogy, as well as re-measured land maps (See fig. 5, 6).

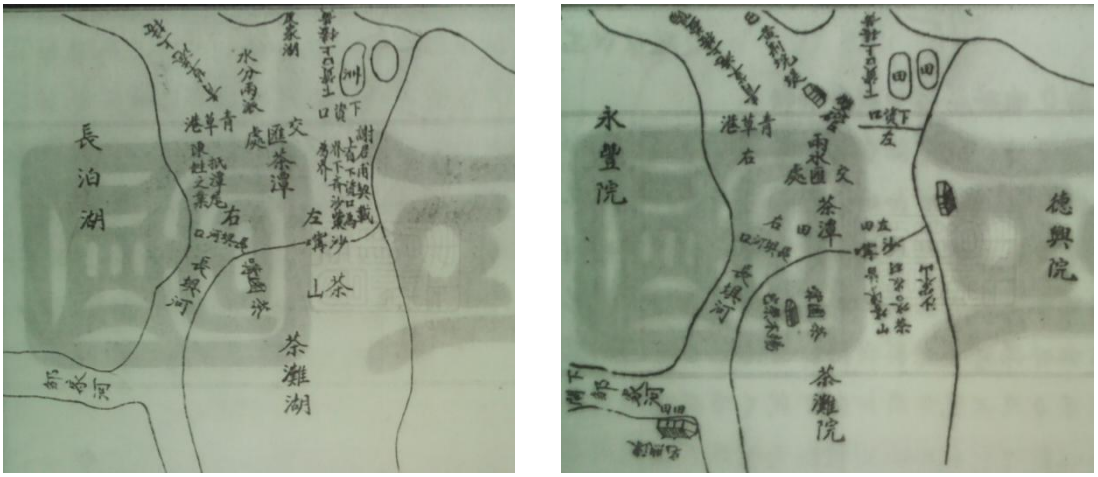


FIG. 5, 6

Re-measured Land Maps in 1733 & 1901

Water surroundings reflected in the two maps were quite different. In 1733, residence was surrounded with lakes and rivers. But in map of 1901, lake body had become continent. Micro-environment nearby residence changed a lot in almost 200 years, and that was related with Jingjiang River and Dongting Lake changes.

River reach of Yangtze River north of the Dongting Lake is commonly called

Jingjiang River, which .feeds Dongting Lake through 4 outlets now (In 1733, merely 2 outlets). Water level changes of Jingjiang River weights heavily upon water quantity into Dongting Lake. The yanglinji stake gauge was set up in 1788 by Emperor QianLong to measure the water level of Jingjiang River, and its records were kept in Palace Memorials of Qing Dynasty. Fig. 7 illustrates historical fluctuations of water level of Jingjiang River.

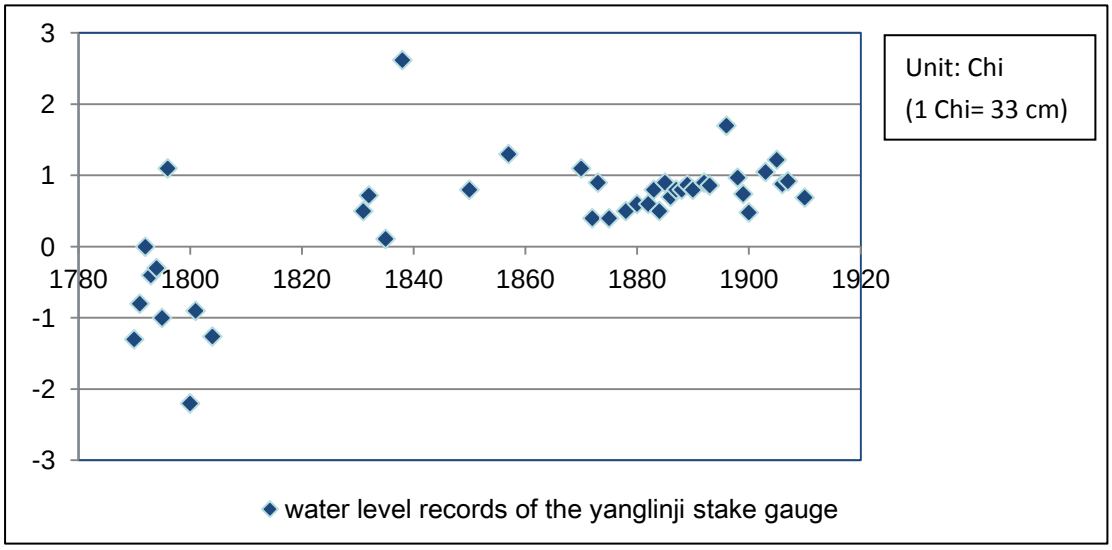


FIG. 7

Historical Water Level records of Yanglinji Stake Gauge

Judging by remaining records, peak water level of Jingjiang River heightened significantly after 1830s. Based on historical record, the fundamental cause of the rising up lies in sediment deposition led by soil erosion in up streams regions of Yangtze River. High water level of Jingjiang River made water quantity into Dongting Lake increase continually, in addition to sediment deposition in Dongting Lake body, leaving flood no ways to go and gradually invading southward.

In 1852, the Jingjiang Levee collapsed at Ouchi. 50% of the sediment into Dongting Lake went this outlet. In 1860, the Jingjiang Levee collapsed at Songzi. Water quantity into lake significantly increased. Since then, the situation four outlets into lake formed. Flood continued to go south, and Dongting Lake sedimentation accelerated.

There used to be two rivers Qianxi and Qingcao meeting at Chatan nearby Qincaogang village in southern Yuanjiang county, then flowing through Changba River into Dongting Lake. Water flow was quickly then, not suitable for snails. In 1736, a dyke-enclosed place Huangjin were built, which dammed the river Qianxi, the

remaining river Qingcao became silting-up day by day as well. Environment began to get fit for snails.

Micro-scale surroundings changes were related with large-scale environment transformation. To hold back flood which invading southward, in 1848, small dyke-enclosed places were combined into bigger ones around southern Yuanjiang county, and the river Qingcao was dammed and became little creek at that time. Soon, rivers through northern county became silting-up as up streams like Qingcao River dammed and dried up. After 1875, broad-scale dyke-enclosed places were built up around northern Yuanjiang County, which made southern branches residence become far from Dongting Lake and get continent, then not suitable for snails shortly. Although dyke-enclosed places had been built up in northern county, people still suffered for floods, since Dongting Lake had been getting more and more sediment deposition.

Conclusion

Schistosomiasis outbreak in this southern and northern Yuanjiang County occurred around year 1800, 1830 respectively, when water environment began to silt up. Then the disease weakened around 1900 in southern county when water surrounding formed field, while prevalence persisted in northern regions for its frequent flood disasters.

Reasons why Schistosomiasis boomed up were diverse and complex, which are closely related with water level changes of Jingjiang, the sedimentation of Dongting Lake, even water conservancy project as well.