Safe Aquatic Living——Investigation and Analysis on Disaster Prevention and Countermeasure of Typical Aquatic Communities

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Keywords: Fujian province; Fishermen; Fishing rafts; Life and Production; Combination of Peace Time and Disaster; Fish effect

Abstract. With the deterioration of the living environment, water pollution, and the traditional fishing places occupied, frequent occurrence of natural disasters and other issues have become increasingly prominent. Professional fishermen has become the social vulnerable groups in special difficulties. In-depth research of professional fishermen's production, living conditions, and analysis of the corresponding problems have a profound significance on the innovation and guidance of social management of disaster prevention and post-disaster reconstruction process, as well as on promoting the professional fisherman industrial transformation. Based on this, the production and living conditions of professional fishermen who are fishing on fishing rafts in Fujian province are analyzed in this study in order to provide new ideas for combination of peace time and disaster.

Investigation and study background

Fig.1

Research methods and procedure:

Discussion about the importance to improve the living environment of local fishermen

This study researches on the curre living conditions of coastal fishermen in Fujian Province. The traditional mode of life and prod tion is often destroyed by natural calamities which usually cause lots of refugees who are the flotsam and jetsam of it and are get less attention with unsolved problems and become extremely poor and marginalized by inner land inhabitants. Therefore, it is a highly significant of this study on social and economic values.


Fig. 2

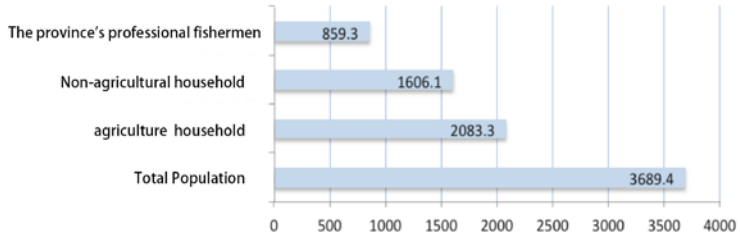
Start with valuable social problem ignored by most people in this study, the authors paied much attention to the bottom of society groups to address the increasingly obvious problem.

To analyze this subject by APH method as follow:

The concept of "aquatic community" and the current situation.

Community refers to concentrations and alliances of people in a specific land for the common purpose of interests, values and goals. People living together are assembled by all kinds of social relations, in which the main relation that to form a society are including family relationship, common cultural and traditional customs. So it is appropriate to define the concentrations and alliances of professional fishermen's as "aquatic community".

1) Situation of professional fishermen in Fujian Province



Total population	Agriculture population	Non-agriculture population	The professional fisherman of the province
3689.4	2083.3	1606.1	859.3

Table 4 - 1 industry of Fujian Province, the proportion of the population (unit: million)

By the end of 2012, through multiple researches on renowned aquatic communities and negotiations with the government of Fujian province, a survey on people who live in aquatic communities has completed, in which total 8,593,000 families with a population of 3.6894 million and a total of 149,000 fishing boats were covered. 1000 families was randomly sampled out, in which the number of agricultural population is 2.0833 million while that of non-agricultural population is 1.6061. Based on analysis, the study shows:

there are 44,934 people in 10,844 families whose Per capita net income are under the absolute poverty threshold which is RMB 809.00, and it is 1/3 of the total number of households; 70,623 people in 16,182 families, whose per capita net income are above the absolute poverty threshold but under RMB 3556.3, and it is 60% of the total number of households; A number of 6,625 people in 1,598 families, whose income are over the per capita net income of Fujian province ,which is less than 10% of the total number of households. A mount of 89,732 people has medical insurance (including the new rural cooperative medical care), which is 62% of the total number; Total 593 people has pension insurance, which is 0.3% of the total number; 7,705 are offered the minimum living security, which is 7% of the total.

2) Situations of fishermen using fish rafts

In summary, fishing boats is a large proportion. Owing to competitive pressures and natural disasters, the average fishing income of professional fishermen declines annually in recent years. Most fishermen follow their father's footsteps to be fishermen because of low educational background. Therefore, aquatic communities are under the transition to the third industrial.

3) Impacts from natural disasters to the Fujian province and their ratio

The direct economic losses due to natural disasters in Fujian have reached to an annual average of about 10 billion Yuan since 2000. Common natural disaster in Fujian are as follow:

4) Typhoon, coastal areas; 2.Mud avalanche, hilly areas; 3.Flood, subtropical regions; 4. Earthquake, the Circum-Pacific seismic belt; 5 Landslides (relatively)

Facing to the South China Sea and adjoining mountain ranges, Fujian province is the prone areas and one of the worst-hit area of typhoon in China. Under the background of global warming, increasing extreme weather and the rapid growth of economy and development, the condition of a disaster will more seriously, which will lead new problems in the disaster prevention and mitigation, especially after typhoons.

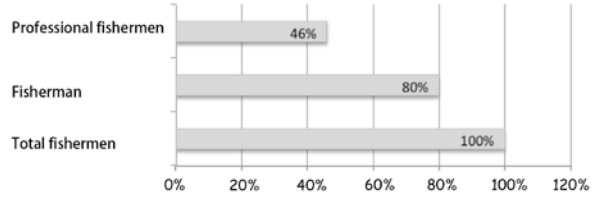


Table 4 -2 Fishermen all kinds of proportion

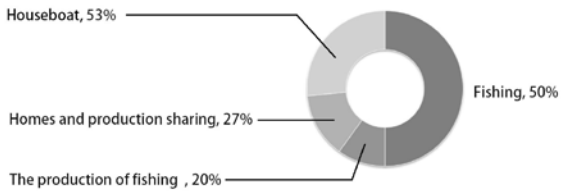


Table 4 - 3 the proportion of fishing boats, fishing boats categories (production boats, homes and production sharing fishing boats, houseboat.)

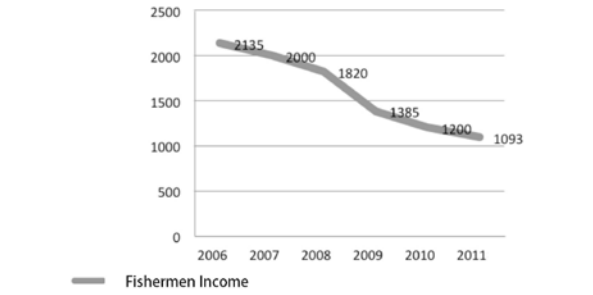


Figure 4 of income (table fishermen to fishing for the student's professional fishermen income per capita decreased year by year)

Figure 4 Income statement of fishermen（the Per Capita Annual Income (RMB) of fishermen who are making a living on fishing is in a trend of declining year by year

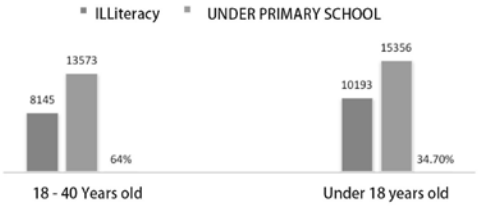


Table 4 - 5 Fishermen Education

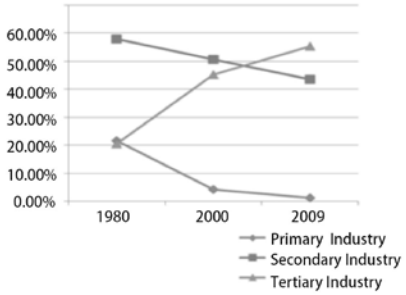


Table 4 - 6 the change of industrial structure

Impacts onto Fujian province from natural calamities, mainly from typhoon and storm tide.

Fujian province, located in the southeast to the South China Sea, is frequently attacked by typhoons and seriously damaged. For example, Typhoon Aere, landed on Fujian just once, caused 2 deaths, 3,479,900 people affected from 421 towns in 48 counties of 6 coastal cities, 3 cities flooded, 10100 houses collapsed, 74.9 th.ha crops and 7 reservoirs damaged, 236 embankments overflowed with 50 crevasses , 15799 places attacked where irrigation facilities are in placement, causing a direct economic losses amounted up to RMB 213,000,000. This is just a tip of the iceberg.

Provinces (autonomous regions, municipalities directly under the central government)	The affected population		agricultural disaster area		Facilities damaged			Direct economic losses (a hundred million / Yuan)
	The affected population (ten thousand)	Death (including the number of missing)	Crops (1000 hectare)	Mariculture (1000 hectare)	Housing (million)	Coastal Engineering (km)	The ship (ship)	
Liaoning	0	0	0	0.2	0	2.8	0	0.74
Hebei	5	0	0	7	0	23.5	20	0.70
Tianjin	—	9	0	0	0	16.4	2	2.49
Shandong	6.5	0	0	2.27	0.0065	5.4	24	3.01
Jiangsu	—	2	0	20.26	0	40	186	0.97
Zhengjiang	—	1	0	42.21	0	13.82	920	11.85
The eastern coast	526.24	30	341.1	23.33	0.77	164.09	1151	58.82
The Guangxi Zhuang Autonomous Region	8.45	8	4.05	—	0.0004	0.42	3	0.14
Hainan	325.93	12	92.16	4.55	0.11	1.38	740	6.25
Total	872.12	57	436.32	99.85	0.89	267.81	3047	84.97

Table 4 - 6 Hard-Hit East coast

Years	Affected population		Affected area of agriculture & livestock		Facilities damaged	
	Affected population (per 10 thousand)	Death (including missing persons)	Crops (th. ha)	Mariculture (th. ha)	House (thousand houses)	Sea embankments (km)
1998-2000	18	9	341.1	0.2	0	2.8
2000-2002	12	0	92.16	7	0	23.5
2002-2004	9	6	164.09	0	0	16.4
2004-2006	10	0	58.82	2.27	0.0065	5.4
2006-2008	5	2	23.5	20.26	0	40
2008-2010	3	1	11.85	42.21	0	13.82
2010-2012	1	0	6.25	23.33	0.77	164.09

Disaster / Hazard	King	Serious	Larger	Mild	Total	Statistical life
Surge disaster	0	4	6	61	71	1950-1990
Typhoon storm Surge disaster	12	27	17	36	92	1949-1990

Table 4 - 6 Frequency of storm surge statistics

Level / Year	Storm Tide bit ⩾1m	⩾2m	⩾3m	Total number of tidal disasters	Large number of tidal disasters
1950-1959	49	3	1	15	1
1960-1969	59	20	5	24	3
1970-1979	71	13	0	21	1
1980-1989	74	9	2	27	6
1990-1997	76	15	3	23	7

Table 4 - 7 Storm surge and tide of disasater statistics

Figure 10(1) Damage from the natural calamities in Fujian in different years

In addition, typhoons frequently land in Fujian with an average of 7 times, up to 12 when 1990. Although the number of casualties caused by typhoons decrease compared with that in the last year, the economic loss is increasing year by year for the development of economic. Especially since the 1990s, a total amount of economic losses caused by typhoon reaches an average of RMB 2.35 billion per year. It can been seen from above that typhoons have become important economic constraints in sustainable development of Fujian.

Pearl River Delta of China was hard – hit

item	Name of typhoon (code)	Date (year.month. day)	observation station	Highest storm tide (cm)	The highest tide level (cm)	Disaster area	Number of deaths and injured	Direct economic losses(a hundred million RMB)
1	Wand (5612)	1956.8.1	Seokpo	502	437	Hangzhou bay,etc.	4626	3
2	Fred (6508)	1965.7.15	Namtu	287	333	Leizhoubandao etc.	2451	1
3	Viola(6903)	1969.7.18	Shantou	302	328	Eastern Guangdong	3254	2.5
4	Elsie(6911)	1969.9.27	Meihua town	199	457	Minjiangkou	7770	6
5	Mary(7413)	1974.8.20	Jianshan	224	609	Hangzhou bay& Changjaingkou	1890	1.3
6	Joe(8007)	1980.7.22	Namtu	594	593	Leizhoubandao&Hainan	1059	3
7	Agnes(8114)	1981.9.1	Lvsi	203	439	Changjaingkou,etc.	530	5
8	_____(8609)	1986.7.21	Stone port	117	396	The Guangxi coastal area	737	3.9
9	Wayne(8616)	1986.9.5	Namtu	352	337	Leizhoubandao&Hainan	383	4.7
10	Gordon(8908)	1989.7.18	sanzao	176	275	Pearl River Delta of China	175	11.1
11	Vera(8923)	1989.9.15	Haimen	146	467	Taizhou city ,Zhejiang ,etc.	861	13.2
12	Dot(9018)	1990.9.8	Wenzhou	241	387	coastal areas of Guangdong and Zhejiang	1100	12.2
13	Fred (9111)	1991.8.16	Namtu	384	270	Leizhoubandao etc.	229	12.9
14	Polly(9216)	1992.8.30	Ruian	203	430	Guangdong, Zhejiang and Shandong ,etc.	867	92.6
15	Becky(9316)	1993.9.17	Lantern Mountain	162	262	Pearl River Delta of China	70	177.6
16	Fred(9417)	1994.8.21	Wenzhou	269	488	coastal areas of Guangdong and Zhejiang	2160	79.5
17	Gloria(9608)	1996.7.31	Meihua toun	225	456	coastal areas of Guangdong and Zhejiang	430	79.5
18	Winnie(9711)	1997.8.18	Jiantiao town	261	527	coastal areas of Zhejiang,Jiangsu and Shandong	584	337

Current countermeasures carried out by Fujian government

Fujian government has drawn up countermeasures for preventing storm tide which can result in great effect on the safety of people's lives and properties and operations of industry and agriculture because of the dense population and developed economies.

The local government considers that the key method to reduce the losses from disasters is to enhance vulnerability of the disaster-bearing bodies, which means they must get down to strengthening constructions of typhoon defense projects, because it is impossible to eliminate natural calamities radically.

To build the sea embankments in accordance with high standards.

Currently, because of the existence of many incompetent sea embankments, the government has been gradually strengthening constructions of key projects and their maintenance with functions of moisture proof and flood control measures to withstand typhoon according to the national standards, and pay much attention to construction of sea embankments when urban construction.

Ecological Engineering projects.

Coastal shelterbelt can effectively reduce the speed of wind, which can mitigate the impact of the typhoon on the coastal areas. Thus, besides the protection of existing shelter-forest at present, Fujian has been actively carrying out related work of shelterbelt by introducing in new species of trees to develop and enlarge the coastal shelterbelts with a hope of the coastal shelterbelts playing a positive role in reducing the losses of natural calamities.

Constructions of projects to enhance flood storage capacity and flood discharge capability. The government has been dredging various waterways and their entrance to the sea, making the full use of large, middle and small-scale water storage projects to regulate floods in the watershed while improving the prediction accuracy of each meteorological and hydrological site to be prepared timely to tackle disasters and reduce the effects of natural calamities, such as typhoons or storms.

Post-disaster rehabilitation and recovery

Post-disaster rehabilitation and recovery is a necessary procedure to resume production and life following natural calamities. A concept of "slice" is put forward by us to achieve a prefabricated production to assemble fish rafts with an advantage of strong response capability. Even damage, if any, the data would be easily counted and a compensation will be provided by the government. It is very significant to ponder over which way is the best to post-disaster rehabilitation and recovery, how to debase the losses to professional fishermen, how to make a positive government intervention and people could better participate in rebuilding corporately.

Think about the development in future

Although it is certainly important to strengthen preventions and post-disaster reconstructions before maritime disaster, achieving an organic integration of stable income growths and Nature is the real and final target for future development. We should strive to develop a third industry which is less affected on oceans to promote employment while the coordinated development of rational industrial structure, which is the only way to gain steady incomes and improve our living standard.

Preliminary preventions based on current conditions.

1) Strengthen and improve the typhoon disaster prediction, forecasting and early warning systems. Typhoon weather forecast is a prerequisite for disaster reduction as well as the main measures to reduce disaster losses by sending signals warning disasters that may occur.

2) Create a disaster prevention and reduction information system. A database should be established to collect the disaster cases, aimed at studying features of typhoon’s emergence and development. Through the usage of mathematical and physical model on the basis of multi-dimensional virtual technology to research the causal factors of disasters, mechanism of occurrence and propagation law, the whole process how it act on the environment and engender a natural disaster, the information system can not only assists in decision making and act against

disaster by human beings, also be used to build the data and information systems of typhoon disaster, which is the foundation of active defense.

Strengthen disaster preparedness, self-help after disaster and assess damages. We should assess the economic losses and social effects form typhoon disasters based on scientific method established and strengthen the research of those valuation results to ensure people's life and social production in normal order.

3) Enhance public awareness of disaster prevention. Legislation on this issue is urgently be speed up. Activities of disaster prevention and mitigation and disaster relief are carried out under the law.

Change way of thinking from "Passive" to "active".

The local government consider the natural calamities as an uncontrollable force, so they choose to strengthen the projects of construction and defense, which we think is a passive measure of security and defense. We advocates a relatively proactive solution proposed in this paper. That is, by social management and innovation, to deal with natural calamities in a proactive approach instead of reinforcement to the construction and installations. To get this method, we have thought over as follow:

Simulate ecological processes utilizing fish effect theory (fish effect: fishes are swimming in the sea chaotic and orderly. When they attacked by a hunter, they will disperse immediately or get together freely, which just like an organization with strict cooperation and division of responsibilities. Interests and their securities are different from one single fish swimming in the sea it in a group. For a fish, swimming lonely in the sea is an action hit or miss and lack of guarantee both in predation and escape from the hunter. While in a group, peripheral fishes will quickly escape when encounter a hunter.)

Let us suppose, through different combinations by assembling mobile boards and the various components of the nodes, scale of traditional communities will be adjusted based on the existing condition to form a new neighborhood traffic pattern. In addition, breeding areas may be enlarged or reduced according to the principle of flexibility of data and scales. It is an useful way to improve economic by development of underwater sightseeing.

Fish Effect

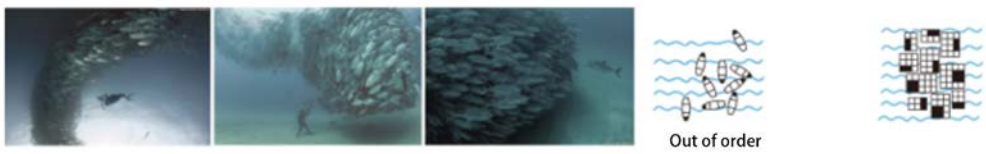


Figure 6 - 1 Fish Effect

Inspiration from fish effect: in fish groups, teams assembles to form a system principles to play an integral role.In conclusion, we adopt an "Active" strategy to change the negative space in to positive space and make good use of them, which is a good solution to the real problem of the fishermen’s communities.

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