The Satisfaction of the Fishermen in the South China Sea With the Summer Fishing Moratorium System and Its Influencing Factors

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This study investigated the satisfaction of fishermen with the summer fishing moratorium system in the three provinces of the South China Sea through a questionnaire survey and explored the degree of its influencing factors. A multistage random sampling method was used to issue questionnaires to fishermen involved in the summer fishing moratorium. A total of 258 valid questionnaires were collected, and the factors were analyzed them using the factor analysis method by SPSS 23.0 software. The results showed that the variance contribution rate of the first five factors reached 61.859%, and the 11 factors that have potential commonality in influencing fishermen's satisfaction with the fishing moratorium can be summarized and classified into five more significant factors, such as "economic income during fishing moratorium (16.396)," "illegal fishing boat (12.095)," "fishing moratorium time (12.012)," "law enforcement credibility (11.853)," and "summer fishing moratorium effect (9.503)." According to the factor score calculation, the fishermen's satisfaction with the fishing moratorium was F = 3.53, and the overall satisfaction was relatively high. This study reveals the satisfaction degree of the fishermen in the South China Sea with the summer fishing moratorium system and its influencing factors, which can provide a basis for improving the summer fishing moratorium system and ensuring the lives of fishermen.

Keywords: fisherman, summer fishing moratorium system, satisfaction, factor analysis, South China Sea

INTRODUCTION

The fishing moratorium system of China started in 1995. The implementation area is the sea area of the East, Yellow, and Bohai seas from 35°N south to 27°N north. In 1999, the summer fishing moratorium system also began in the South China Sea. During the period, both the time of fishing closure and the type of operation were adjusted several times (Wang, 2008). Now the system has become the most important and influential fishery resource conservation system in China and is also the most suitable fishery resource conservation system for China's national conditions (Zhu, 2009). In 2017, the summer fishing moratorium was adjusted from May 1 to August 16 in the South China Sea. In addition to fishing gear, all types of operations, including fishing vessels and fishing support services for fishing vessels, are listed as closed to fishing, which is the biggest adjustment since the implementation of the system in the South China Sea. At present, the marine summer fishing

moratorium system is still under continuous adjustment. In the current national policy of China's marine summer fishing moratorium, local fishery management agencies are allowed to implement a special fishing license system for special economic fish stocks after being approved by the Ministry of Agriculture and Rural Affairs. The summer fishing moratorium system of China has made a great contribution to alleviating the enormous pressure on marine fishery resources caused by excessive fishing intensity and protecting China's offshore fishery resources, especially the spawning fish and juvenile fish. Fishermen are the main body of the implementation of the summer fishing moratorium, and they have made important contributions to the protection of China's maritime rights and interests and fishery resources (Qian, 2018). The guarantee of fishermen's own rights and interests and their satisfaction with the summer fishing moratorium will affect the implementation of the system, which is also the premise to ensure the smooth implementation of the system. The quantitative and intuitive analysis of fishermen's satisfaction and existing opinions on the summer fishing moratorium system are of great significance to improve the system and fishermen's satisfaction.

At present, the studies on the relationship between fishermen and the fishing moratorium system mainly focus on basic descriptive statistical analysis or fishermen-particular factor analysis (Tyler and Degoey, 1995; Hamm et al., 2013; Liu et al., 2019). For example, the field survey in the fishing ports of Dongguan Xinwan and Shantou Nan'ao in Guangdong Province showed that fishermen, as a special group, are at a natural disadvantage in terms of land management rights and social and economic status (Fwg. 2018). The survey based on the perspective of fishermen in Hainan Province suggested that fishermen need to be constantly optimized and improved in terms of institutional settings, resource allocation, information communication, policy support, and social participation (Zhou and Wan, 2017; Yue et al., 2018). Based on the statistical description method, an empirical analysis of fishermen explored the impact of the fishing moratorium system and oil price subsidy policy adjustment on the family income of marine fishermen (Song and Huang, 2015). But the research on fishermen's satisfaction with the fishing moratorium system, the degree of problems encountered and the impact of various factors influencing satisfaction with the fishing moratorium are still lacking. Therefore, it is necessary to conduct a comprehensive analysis and evaluation from various subjective and objective aspects, such as the needs of the fishermen and the problems of the management department and the system itself.

Factor analysis, as a multivariate statistical analysis method (Gorsuch, 1983), is widely used in studies of decision-influencing factors (Dangi and Kohli, 2018), or support and satisfaction, etc. (Xu and Xu, 2010). For example, investment institutions classify and analyze investors so that they can accurately allocate assets for their investments (Wei and Chongchong, 2018). The factors influencing the purchase decision of new energy vehicles were analyzed (Brunetti et al., 2020). Jia and Chen (2015) analyzed the influencing factors of the electronic safety system operation to obtain the potential factors affecting the load, which is of great significance to the operation of the electronic safety system (Jia

and Chen, 2015). Jie and Shi-Long (2016) obtained the factors that affect fishermen's fishing insurance satisfaction and their evaluation using factor analysis (Jie and Shi-Long, 2016). Wang et al. (2013)) used questionnaires to conduct principal component analysis on factors affecting residents' satisfaction with hypermarkets (Wang et al., 2013). Galeoto et al. (2018) used the factor analysis method to analyze the customer service satisfaction of second-hand bookstores and determine which factors will affect customers' repurchase intentions (Galeoto et al., 2018).

Therefore, in this study, we aimed to investigate fishermen's satisfaction with the fishing moratorium in the South China Sea and its influencing factors. To accomplish this, we used a multistage random sampling survey to distribute questionnaires to fishermen in the three provinces of the South China Sea during the fishing moratorium. A total of 258 questionnaires were collected, and the principal component analysis was conducted based on factor analysis. The result of this study can provide a theoretical basis for improving the fishing moratorium system and enhancing the livelihood security of fishermen.

MATERIALS AND METHODS

Obtaining Factors Influencing Fishermen's Satisfaction With the Fishing Moratorium System

In order to truly and effectively obtain the factors that affect fishermen's satisfaction with the fishing moratorium system, we conducted a preliminary survey of experts, fishery law enforcement officers, and a small number of fishermen involved in the fishing moratoriums. Everyone was asked to complete an open-ended questionnaire with only one question: What factors do you think affect fishermen's satisfaction with the fishing moratorium system? These items (including duplicate items) were compiled and scored on a 5-point Likert scale, including 5 points for "strongly agree," 4 points for "agree," 3 points for "not necessarily," 2 points for "disagree," and 1 point for "strongly disagree" (Matell and Jacoby, 1971; Laerhoven et al., 2004).

Survey Method of Satisfaction of Fishing Moratorium System

A questionnaire survey is a quantitative research method based on positivist methodology. Standardized questionnaires are distributed or mailed to relevant personnel, collected, and sorted out, and the research results are obtained through statistical analysis (Wu et al., 2003; Zheng, 2014). Therefore, this study used a questionnaire survey to collect the influencing factors of fishermen's satisfaction with the voluntary closed season fishing system. The questionnaire included 1) basic information about fishermen, 2) the collection of factors affecting fishermen's satisfaction with the fishing moratorium, and 3) fishermen's awareness of the fishing moratorium system.

TABLE 1 | Impact factors of fishermen's satisfaction with the summer fishing moratorium system.

Impact factor	Variable
Fishing moratorium subsidies	X1
Fishing moratorium time	X2
Impact on full-year revenue	X3
Effect of fishery resource restoration	X4
Management efforts of fishery law enforcement officers	X5
Degree of fairness of law enforcement officers	X6
Effectiveness of fishery law enforcement management	X7
Three no fishing boats—illegal fishing	X8
Fishing encroachment by fishing vessels of other countries	X9
Rationality of the voluntarily resting system	X10
Publicity training for the fishing moratorium	X11

The questionnaire survey was conducted from May 1 to August 16, 2020. Three hundred questionnaires were distributed to fishermen in Guangdong, Guangxi, and Hainan provinces in China, and 258 valid samples were obtained.

Analysis Method of Satisfaction of Fishing Moratorium System

Factor analysis is a multivariate statistical analysis method that reduces some complicated variables into a few new and unrelated compound factors. The basic idea of factor analysis is to group variables according to the magnitude of correlation, so that the correlation between variables in the same group is stronger, while the correlation between variables in different groups is smaller (You, 2003).

The specific steps of factor analysis generally include the following three aspects: 1) estimate the factor loading matrix based on the original data and determine the common factors; 2) classify and name each common factors according to the total variance contribution of each original factors; and 3) establish the factor score function and calculate the score of each common factor according to the factor score coefficient matrix.

RESULTS

Factor Screening

The Delphi method and the core group discussion method were adopted, and the factors were screened by referring to the actual scores of experts. The mean value and coefficient of variation were set, and the factors with a mean value no less than 4.0 and a coefficient of variation no greater than 0.15 were determined to meet the requirements. Finally, a total of 11 question items were determined (**Table 1**).

Reliability Test of the Questionnaire

A total of 300 questionnaires were distributed, and 281 were actually collected. After eliminating invalid samples, 258 valid samples were obtained, and the effective recovery rate was 86%. The survey results were in line with the actual situation. The overall reliability of the obtained 258 questionnaires was tested using SPSS 23.0, with an overall Cronbach's reliability coefficient

TABLE 2 | KMO and Bartlett's test.

KMO (Kai–Meyer–Olkin measure of sampling adequacy)		0.652
Bartlett's test of sphericity	Approx. chi-square	314.216
	df	55
	Sig	0.000

The value of KMO is usually between 0 and 1. The closer to 1, the stronger is the correlation between variables. If it is greater than 0.6, it is suitable for factor analysis.

of 0.644. The analysis showed that the questionnaire had high overall reliability, and the results obtained through the analysis of the questionnaire were reliable. The overall validity of the questionnaire was analyzed, and the sample Kai–Meyer–Olkin (KMO) index was 0.652, which was greater than the empirical value of 0.500. Bartlett's spherical approximate chi-square value was 314.216, with 55 degrees of freedom and 0.000 significance (**Table 2**). The results showed that this study met the conditions for factor analysis, and there were common factors, so it was suitable for factor analysis.

Descriptive Analysis of Individual Characteristics of the Samples

Through a general descriptive analysis of the respondents' gender, age, education level, and average monthly income, it was possible to understand the composition of the fishermen participating in the fishing moratorium in the South China Sea. These analyses could prepare for the subsequent question of whether the demographic characteristics of fishermen and fishermen's satisfaction with the measured indicators had a significant impact. Among the 258 valid samples obtained in this study, 50.5% of them were 50 years or older, and the overall population was aging. The education level was generally junior high school and primary school, and only 3.5% of the respondents

TABLE 3 | Basic characteristics of the sample

Sample characteristic	Topic options	Number of people	Percentage (%)
Age (years)	Over 60	34	13.3
	50–59	96	37.2
	40–49	75	29.2
	30–39	46	17.6
	16–29	7	2.7
Educational background	College and above	9	3.5
	High school	30	11.5
	Junior high school	121	46.9
	Elementary school and below	98	38.1
Average monthly income (yuan)	Over 5,000	25	9.8
	3,000–4,999	100	38.9
	1,000–2,999	110	42.5
	Less than 1,000	23	8.8
Working time (years)	Over 40	55	21.2
	30–39	89	34.6
	20–29	68	26.5
	10–19	41	15.9

had a college degree or above; 82.3% of the respondents had been engaged in fishery production for 20 years or more. Some families earn a living from fishing, with an average monthly income of 1,000–5000 yuan. The survey showed that 63.2% of the respondents fully understood the fishing moratorium system, while only 5% of the respondents were unclear about the system, and 84% of the respondents agreed with the effectiveness of the system (**Table 3**).

Basic Characteristics of Influencing Factors

Fishermen scored each influencing factor according to the required degree of importance, variables, and statistical characteristics of the investigated influencing factors (**Table 4**). The average value of 11 factors was greater than 3, and the minimum value of 3.388 was "publicity and training during the fishing moratorium," indicating that the factors listed in the questionnaire were indeed the factors considered by fishermen in their satisfaction with the fishing moratorium. Among them, fishing moratorium subsidies ranked first, with an average of 4.806; second to fifth places were the length of the fishing moratorium, the illegal fishing by three non-fishing vessels, the impartiality of law enforcement personnel, and the impact on the restoration of fishery resources, with an average of greater than 4.000. These results showed that fishermen considered these five

factors to be more important, while the fishing moratorium subsidies and the impact on annual income were the most important factors for fishermen.

Influencing Factors Analysis of Fishermen's Satisfaction With Seasonal Fishing Moratorium System

The 11 influencing factors were subjected to factor analysis using SPSS 23.0 (**Table 5**). The results showed that the variance contribution rate of the first five factors reached 61.859%, and the effect was more obvious, indicating that these five common factors could reflect most of the information of the original variable. So the 11 influential factors could be divided into five factors for further analysis.

Component Naming

According to the results of rotation factor loading, the expressions of each factor were obtained (**Table 6**). In the first factor load, the fishing moratorium subsidy had a large influence coefficient on annual income, with an average score of 4.806, ranking first, indicating that it had a decisive influence on the satisfaction of the fishing moratorium system. According to the survey results, Guangxi and Hainan had not received fishery

TABLE 4 | Analysis of variable characteristic.

Impact factor	Variable	Mean	Maximum	Minimum	S.E.
Fishing moratorium subsidies	X1	4.806	5	4	0.3960
Fishing moratorium time	X3	4.721	5	2	0.5782
Impact on full-year revenue	X8	4.628	5	2	0.6841
Effect of fishery resource restoration	X9	4.391	5	2	0.8263
Management efforts of fishery law enforcement officers	X6	4.112	5	3	0.5357
Degree of fairness of law enforcement officers	X4	3.919	5	1	0.6025
Effectiveness of fishery law enforcement management	X2	3.678	5	2	0.8092
Three no fishing boats—illegal fishing	X5	3.574	5	1	0.6210
Fishing encroachment by fishing vessels of other countries	X7	3.473	5	1	0.6785
Rationality of the voluntarily resting system	X10	3.411	5	2	0.6436
Publicity training for the fishing moratorium	X11	3.388	5	1	0.7822

TABLE 5 | Total variance explained of impact factors on fishermen's satisfaction of the summer fishing moratorium.

Component	Initial eigenvalues			Rotating load sum of squares		
	Total	Variance contribution ratio (%)	Cumulative contribution ratio (%)	Total	Variance contribution ratio (%)	Cumulative contribution ratio (%)
1	1.965	17.860	17.860	1.804	16.396	16.396
2	1.362	12.384	30.244	1.330	12.095	28.491
3	1.301	11.832	42.075	1.321	12.012	40.503
4	1.150	10.450	52.526	1.304	11.853	52.356
5	1.027	9.333	61.859	1.045	9.503	61.859
6	0.970	8.817	70.676	—	—	—
7	0.841	7.648	78.324	—	—	—
8	0.818	7.439	85.763	—	—	—
9	0.703	6.390	92.153	—	—	—
10	0.624	5.670	97.823	—	—	—
11	0.239	2.177	100.000	—	—	—

Extraction method: principal component analysis.

TABLE 6 | Rotated component matrix (a) of factors affecting the satisfaction of the summer fishing moratorium.

Index	Principal component				
	1	2	3	4	5
Fishing moratorium subsidies	0.754	0.228	0.089	−0.051	0.050
Fishing moratorium time	−0.030	−0.022	0.782	0.061	−0.151
Impact on full-year revenue	0.832	−0.064	−0.045	−0.006	−0.022
Effect of fishery resource restoration	−0.104	0.132	0.066	-0.099	0.855
Management efforts of fishery law enforcement officers	−0.027	0.102	0.173	0.653	0.063
Degree of fairness of law enforcement officers	−0.002	−0.064	−0.316	0.689	0.120
Effectiveness of fishery law enforcement management	−0.029	0.198	0.238	0.560	−0.172
Three no fishing boats—illegal fishing	0.071	0.897	0.030	0.133	−0.050
Fishing encroachment by fishing vessels of other countries	0.076	0.910	−0.071	0.073	0.047
Rationality of the voluntarily resting system	0.067	−0.021	0.709	0.056	0.217
Publicity training for the fishing moratorium	−0.202	0.207	0.033	−0.218	−0.435

Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization. a, rotation converged in 6 iterations.

subsidies during the fishing moratorium, leaving fishermen with almost no source of income during the fishing moratorium. The average impact score of the annual income was not high indicating that annual income fluctuations were not high, due to various fish species' ability to grow during the fishing moratorium and the increased production and income of fishermen following the fishing moratorium. So the first factor could be named "the economic income factor during the fishing moratorium."

In the second factor load, the coefficient between illegal fishing of three vessels and fishing invasions by other countries was larger. Among them, the average score of illegal fishing by three vessels was 4.628, ranking third. This is an important factor affecting the satisfaction of fishermen who normally participate in the fishing moratorium system. The average score of fishing encroachment by other countries was 3.473, with a relatively low ranking. In the course of investigation, it was found that Vietnamese fishing boats were the main culprits in some areas of Hainan and Guangxi provinces in China, so the second factor could be named the "illegal fishing boat poaching factor."

In the third factor load, the coefficients of the length and the rationality of the fishing moratorium system were larger. In the survey of fishermen, 43% of fishermen thought that the fishing moratorium was too long, 21.6% of fishermen thought that the moratorium should be advanced and the corresponding end time should be advanced, but there were not many opinions on the fishing moratorium system itself. So the third factor could be named "the length of the fishing moratorium factor."

In the fourth factor load, the intensity of management and law enforcement, the fairness of law enforcement personnel, and the coefficient of management effect of law enforcement agencies were relatively large. Among them, law enforcement officers ranked fourth, with an average score of 4.391 in fairness, which is a more important factor for fishermen's satisfaction with the fishing moratorium. So the fourth factor could be named the "law enforcement credibility factor."

In the fifth factor, the influence coefficient of fishery resources restoration was larger, with an average score of 4.112. This showed that fishermen were more concerned about the catches after the fishing moratorium ends, which was also an important

factor affecting fishermen's satisfaction with the fishing moratorium system. So the fifth factor could be named the "effect factor of the fishing moratorium."

Comprehensive Score of Fishermen's Satisfaction With the Fishing Moratorium

In order to more intuitively reflect the fishermen's satisfaction with the fishing moratorium, five main factors were set as F1, F2, F3, F4, and F5 when calculating factor scores. According to the factor score coefficient matrix (**Table 7**), the factor score expression was obtained.

Illegal fishing boats poaching factor is given as $F_1 = 0.075X_1 − 0.029X_2 − 0.104X_3 + 0.102X_4 − 0.102X_5 − 0.107X_6 + 0.051X_7 + 0.497X_8 + 0.514X_9 − 0.032X_{10} + 0.156X_{11}$ Similarly, the expressions of F2, F3, F4, and F5 could be obtained. Then, the variance contribution of each common factor was divided by the total variance contribution, and the expressions of fishermen's satisfaction with the fishing moratorium and the combined factor were obtained by weighted average given as follows:

$$F = \frac{F_1W_1 + F_2W_2 + F_3W_3 + F_4W_4 + F_5W_5}{W_1 + W_2 + W_3 + W_4 + W_5}.$$

In the aforementioned equation, W1, W2, W3, W4, and W5 are the variance contribution of each common factor.

The original variable data of the 11 influencing factors were substituted into the aforementioned 5 expressions. The fishermen's satisfaction with the fishing moratorium was calculated as F = 3.53, and the scores of the 5 main factors were F1 = 2.07, F2 = 3.27, F3 = 3.66, F4 = 4.11, and F5 = 3.52.

DISCUSSION

The influencing factors of fishermen's satisfaction with the summer fishing moratorium system include fishery management (Chen, 2007), deficiencies in the system itself (Yang, 2018), fishermen's income (Liu and Chen, 2001), and many other aspects. These major aspects also include various

TABLE 7 | Factors score coefficient matrix.

Index	Composition				
	1	2	3	4	5
Fishing moratorium subsidies	0.554	0.075	0.057	−0.055	0.028
Fishing moratorium time	−0.025	−0.029	0.594	0.012	−0.150
Impact on full-year revenue	0.642	−0.104	-0.044	0.023	−0.046
Effect of fishery resource restoration	−0.120	0.102	0.050	−0.121	0.826
Management efforts of fishery law enforcement officers	−0.019	−0.102	0.095	0.494	0.043
Degree of fairness of law enforcement officers	0.019	−0.107	−0.277	0.566	0.098
Effectiveness of fishery law enforcement management	−0.024	0.051	0.150	0.414	−0.178
Three no fishing boats—illegal fishing	−0.015	0.497	0.002	0.009	−0.047
Fishing encroachment by fishing vessels of other countries	−0.015	0.514	−0.072	−0.037	0.049
Rationality of the voluntarily resting system	0.038	−0.032	0.535	0.004	0.200
Publicity training for the fishing moratorium	−0.164	0.156	0.039	−0.190	−0.403

Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization.

factors. These factors have different degrees of influence on different investigators in different regions and in the same region. These effects cannot be measured directly with one measure (one question). A set of measurements must be used and then combined with the results to be more accurate. Therefore, by issuing questionnaires to quantify the influence degree of the influencing factors and scoring them, more influencing factors can be grouped into several new comprehensive factors by using the factor analysis method. These comprehensive factors can well cover each item of the original data and, at the same time, simplify the analysis process into the analysis of factor items, making the research process more concise and clear and reducing the intensity of research. However, factor analysis can only be used for comprehensive evaluation, and it also needs the quantity and composition of the data. When the respondents are fishermen, their age, education, and the dialects of each region are very challenging for the collection of respondents. When designing the questionnaires, the questions should be designed specifically and filled in and understood as simply as possible to ensure that the data can be used for molecular analysis.

From the perspective of the contribution degree of each common factor, the five common factors analyzed by SPSS 23.0 software had the highest contribution to the satisfaction of the summer fishing moratorium closure period (16.396), and the overall satisfaction score was the lowest (F1 = 2.07). All these indicated that this factor was the main factor influencing fishermen's satisfaction during the fishing moratorium, and it was also the worst factor. For fishermen, gaining economic resources is a profession, and the three-and-a-half month fishing moratorium means that it is impossible to obtain benefits from fishing. Previous studies have shown that the implementation of the summer fishing moratorium ensures the reproductive and growth of most fish (Musiello-Fernandes et al., 2017), and that fishing efficiency is improved and the corresponding cost is reduced after the fishing moratorium. Thus, the annual income fluctuation of fishermen is not significant (Chen et al., 2008). However, others believe that the increased cost of fishing at sea, the increase in production without an increase in income. In

addition to the implementation of the summer fishing moratorium system, the subsidies are insufficient, and the heavy economic burden makes it difficult for fishermen to solve the production and living problems during the summer fishing moratorium (Hou et al., 2009). According to our survey, the subsidies for the summer fishing moratorium are only issued in some areas of Guangdong Province, and there is almost no fishing moratorium subsidy in Guangxi and Hainan provinces in China. This led to the fact that these fishermen, who were already living on the sea, had no source of income during the three and a half months of the moratorium, and some families rely on the income from fishing to pay school fees for their children, while some fishermen's bank loans for fishing vessels were not repaid, making life very difficult for these fishermen during the moratorium. Therefore, fishermen have a higher demand for appropriate subsidies during the summer fishing moratorium, and the government should consider increasing fishery subsidies to meet the basic needs of fishermen during this period.

The factor with the second highest contribution rate is the illegal fishing boat poaching factor (12.095) and the overall satisfaction score (F2 = 3.27), and this factor has a greater impact on fishermen's satisfaction and a higher degree of satisfaction with this factor. In this study, based on the research project "Assessment of the order of marine fishing moratorium in the South China Sea" of the South China Sea Fisheries Research Institute, several batches of fixed-point cruises were conducted in the South China Sea. The survey found that 73% of the fishing boats operating illegally during the moratorium period were small "three-no" fishing boats, and the main type of illegal operation was gillnetting. The existence of "three-no" fishing boats not only violates Chinese laws and regulations and hinders the implementation of the reduction policy but also destroys the fishery ecological environment, disrupts the fishing moratorium system and the normal fishery production order, and infringes upon the legitimate rights and interests of the majority of fishermen (Xu, 2007). Some studies have shown that in the face of the current scarcity of fishery resources in China, cleaning up and banning fishing-related "three-no" boats are

crucial to restoring the original order and relieving the pressure of marine fisheries, restoring fishing grounds, and eliminating the "tragedy of the commons" (Li, 2015). In some fishing areas, some seasonal aquatic economic species will disappear if not fished for a certain period of time. For example, in the Duntou fishing port of Dongfang city in Hainan Province, most of the local fishermen especially use small gillnet boats to catch a kind of seasonal crab. However, they are not allowed to operate during the seasonal fishing moratorium, resulting in the waste of these crab resources. A similar situation exists in the Yunao fishing port of Nan'ao county of Guangdong Province. A species of small squid is present in this sea during the fishing moratorium and if not harvested, will disappear after the moratorium. All of these problems in the system will affect fishermen's satisfaction with the fishing moratorium. Therefore, local government fishery agencies should issue special fishing permits for special economic fish stocks. In addition, it is necessary to strengthen the joint coordination with the fishery administration and the marine police and other aspects to implement the crackdown on Vietnamese fishing vessels infringing on fishing and to defend the rights and interests of our fishermen.

The length of the fishing moratorium factor (12.012) also has a great influence on the satisfaction of the fishing moratorium. The survey found that about 56% of the fishermen hope to appropriately shorten the duration of the fishing moratorium and 72.3% of the fishermen hoped that the moratorium would be brought forward due to the frequent typhoons in the South China Sea every August, which will affect the fishermen's fishing at the end of the moratorium. Some studies have shown that most of the typhoons in the South China Sea are concentrated from July to September (He and Ding, 2007), which marks the end of the fishing moratorium; fishermen cannot catch fish due to frequent typhoon weather. The current time of the three major sea areas in China is unified for the beginning of May. The development of the fishing moratorium time is measured according to the breeding period of the main economic fish in China's major sea areas, the growth period (Ling et al., 2004; Fu, 2008) and China's regions can be unified management and other comprehensive situations (Lu, 2005). It reduces the pressure of fishery law enforcement, increases the operability of law enforcement, and facilitates unified supervision. Some studies have concluded that the current fishing moratorium in the South China Sea is still unable to cover the growth period of juvenile fish, suggesting that the current fishing moratorium should be advanced by half a month or from April 1 every year, or even try to close fishing in spring in the future (Feng et al., 2019), so as to protect the growing juveniles and spawning brood stock. However, whether to adjust the time of the fishing moratorium in China's sea season still needs further study.

CONCLUSION

The satisfaction score of the summer fishing moratorium system was F = 3.53, which was still an overall system that made fishermen more satisfied. However, there are still some regulations that do not match the reality and overestimate the responsibility of fishermen to the fishing moratorium system. This system is too idealistic and neglects operability to accommodate different contradictions. In addition to various subjective factors and macro-conditions, the actual implementation has encountered many new situations and problems. The improvement process should be biased toward the actual needs to find a balanced system between fishermen, people, and the system so that it can be sustainable.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material; further inquiries can be directed to the corresponding authors.

AUTHOR CONTRIBUTIONS

LZ and QW designed the study. LZ, YZ, and SM collected the fishery data. LZ analyzed the data. SM and YZ helped with data collection and analysis. LZ wrote the article. All authors have read and agreed to the published version of the manuscript.

FUNDING

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