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WORLD MARITIME UNIVERSITY

Dalian, China

**Study on Collision between Fishing Vessels and
Merchant Ships within the China Coastal Waters**

By

YI ZAICAI

China

A research paper submitted to the World Maritime University in partial
Fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE

(MARITIME SAFETY AND ENVIRONMENTAL MANAGEMENT)

2015

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DECLARATION

I certify that all the material in this research paper that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this research paper reflect my own personal views, and are not necessarily endorsed by the University

Signature: Yi Zaicai

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50 students and friends, from different places, came together to the World Maritime University Dalian branch, I am also proud of a member in such a big family which is maybe the largest class in Dalian branch. We study together, live together and play together for one and a half years. That is such a great and precious time for us. I have to say so many thanks to WMU, Dalian Maritime University and China Maritime Safety Administration. It is through your great efforts to make this project come true, to unite so many renowned experts and professors to teach and inspire us to pursue our dreams, And to bring up so many young talents for the development of Chinese shipping industry. We are grateful for what you have done and we will remember you.

I am grateful for what Dr. Raphael Baumler has taught us, help us and inspired us to be. Mr Du is a knowledgeable professor, willing to communicate with us, guide us how to promote ourselves, and encourage us to become an expert within our field respectively. You deserve our respect and it's our honor to have this great chance to be your students.

I also would like to appreciate professor Wu Zhaolin, who helps me to reach this point. Honestly, I had confusion about the direction of this topic, and the way how to proceed with this essay at the beginning. Professor Wu asked me few critical questions and helps me to clarify what is the true meaning of this paper. And during writing, he also gave many precious advice and resources, which facilitate my writing very much.

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ABSTRACT

Title of Research paper: **Study on Collision between Fishing Vessels and Merchant Ships within the China Coastal Waters**

Degree: **MSC**

With China's rapid economic growth, domestic and international maritime transportation and coastal fishing industry expanded rapidly, making coastal navigable waters traffic density more and more intensive. What's more, after Japan, Korea fishery agreement coming into effect, the fishermen have lost the Jeju Island, Montenegro, Tsushima Strait fish farm and other large traditional fishing grounds, forced to withdraw the offshore fishing grounds, so that the offshore fishing grounds crowd, exacerbate by the overlap with the merchant shipping route, which also increases the probability of ship collision accident happening. At the same time, because the navigation instrument, fishing vessel's communication equipment is relatively backward, and the ship inspection, supervision and other aspects which are different from merchant vessels, or crew's poorly understanding in '**the International Regulations for Preventing Collision at Sea (1972)**' (COLREG) and other reasons, in recent years, the incidents of merchant vessel and fishing vessels collision causing great economic loss and bad society affect, therefore, how to prevent the collision fishing vessels and merchant ships at sea, has become a topic worth exploring.

This dissertation is based on the purpose of looking for the main causes for collision between fishing vessels and merchant vessel within the Chinese coastal waters, by analyzing the situation on their collision case developing trend in recent years, looking for more deep reasons on human element, fishing vessels ship survey, certification and management problems, and the overall navigation environment change in china coastal waters with the china's fast development in economy, at the end, give some practical suggestions from the upon aspects for preventing or minimizing the happening of similar collision cases.

Key Words: fishing vessels, Merchant ships, OOW, TSS, Collision, Supervision.

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The fishing ground distribution in Tai-wan strait

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The planning and design schematic of nation's coastal ship routing system

LIST OF ABBREVIATIONS

A/B	Able Body Seaman
AIS	Automatic Identification System
ARPA	Auto Radar Plotting Apparatus
CHK	Cosco Hong Kong
CPA	Closest Point of Approaching
COSCO	China Ocean Shipping(Group) Company
COLREG	The International Regulations for Preventing Collision at Sea
CSF	China Society of Fisheries
Df	Draft Forward
Da	Draft Afterward
DCPA	Distance to Closet Point of Approaching
EPIRB	Emergency Position Indicating Radio Bacon
FAO	Food and Agriculture Organization of United Nations
FIG	Figure
HRUS	Hydraulic Release Units
ILO	International Labor Organization
IMO	International Maritime Organization
ISM	International Management Code for the Safe Operation of Ships and for Pollution Prevention
MAIB	Maritime Accident Investigation Branch
MSC	Maritime Safety Committee
MEPC	Marine Environment Protection Committee
MSA	Maritime Safety Administration
MMSI	Maritime Mobile Service Identify
OOW	Officer- On -Watch

OOCL	Orient Overseas Container Line
STCW	International Convention on Standards of Training, Certification and Watch-keeping for Seafarers
STD	Starboard
TCPA	Time to Closest Point of Approaching
TSS	Traffic Separation Scheme
UK	The United Kingdom of Great Britain and Northern Ireland
ZJMSA	Zhe Jiang Maritime Safety Administration
3/O	Third Officer
2/O	Second Officer

Chapter 1 Introduction

1.1 Background of research

With China's rapid economic growth, domestic maritime transportation and coastal fishing industry have expanded rapidly, making the coastal navigable waters' traffic density more and more intense. What's more, with Japan, Korea's fishery agreement coming into effect, the fishermen have lost the Jeju Island, Montenegro, Tsushima Strait fish farm and other large traditional fishing grounds, being forced to withdraw the offshore fishing grounds, so that the offshore fishing grounds were crowded, exacerbated by the overlap with the shipping route, and also increases the probability of ship collision. At the same time, because of the navigation instrument, fishing communication equipment such as navigational instruments is relatively backward, the ship inspection, supervision and other aspects and merchant difference and for preventing collision at sea 1972 "international rules" are poorly understood and other reasons, in recent years, the incidents of merchant ship and fishing vessel(in this paper, fishing vessel include all size and type of vessels, ships and boats engaged in fishing) collision have caused great economic loss and bad society effect. Therefore, how to prevent the collision fishing vessels and merchant ships at sea, has become a topic worth exploring.

1.2 Research objectives

The primary purpose of this research is to look for the main causes for collision between fishing vessels and merchant vessels within the Chinese coastal waters,by analyzing the

situation on their collision case developing trend, looking for deeper reasons on human element, ship survey and management problem and navigation environment. In the end, the author gives some practical suggestions from the aforementioned for preventing or minimizing the similar collision cases.

1.3 Methodology

First of all, the relevant literature was reviewed as much as possible, including appropriate international conventions, articles from contemporary journals, books and information from websites. Furthermore, the secondary resources and statistical figures provided the necessary data to carry out a qualitative research, which is mainly used in addressing the main points of this dissertation.

1.4 Structure of dissertation

This dissertation consists of five chapters. Chapter one gives the overall introduction to the research paper, and Chapter two discloses the necessity of the research by introducing the development trend of occurrence of collision between fishing vessel and merchant vessel within China coastal waters and give some analysis on typical cases. Chapter three provides an in-depth analysis from the perspective of human element (crew on board fishing vessel and merchant vessel), problems on ship equipment and survey quality, the complexity of modern navigation environment due to the increasing number fishing vessels, and the lack of fishing vessel supervision. Chapter four mainly concentrates on providing the practical suggestions to the causes mentioned above based on human element, ship itself, navigation environment and management. Finally, the last chapter includes the conclusions.

Chapter 2

The overall analysis of fishing vessels and merchant ships collision accident

This chapter introduces the main fishery industry development in China within recent years and study the trend of collision accident between fishing vessels and merchant ships within China coastal waters, then, takes two typical examples and try to find the main reason for causing the collision case and look for further measures for preventing the similar incident happening or minimizing the possibility of reoccurring.

2.1 Analysis of the trend of collision accident between fishing vessels and merchant ships within China coastal waters

2.1.1 Fishing: hard job with high risk of danger

In recent years, little progress has been made in improving the safety of fisherman despite attempts by Food and Agriculture Organization of United Nations (FAO) and others to raise the awareness of the severity of the problem. Fishing at sea is probably the most dangerous occupation in the world. The International Labor Organization (ILO) estimates that 24 000 fatalities occur worldwide per year in capture fishery(Baumler, 2015). There are some statistics for the ranking of occupation safety in the UK in 1982(see Fig 2.1) which may support such a statement before.

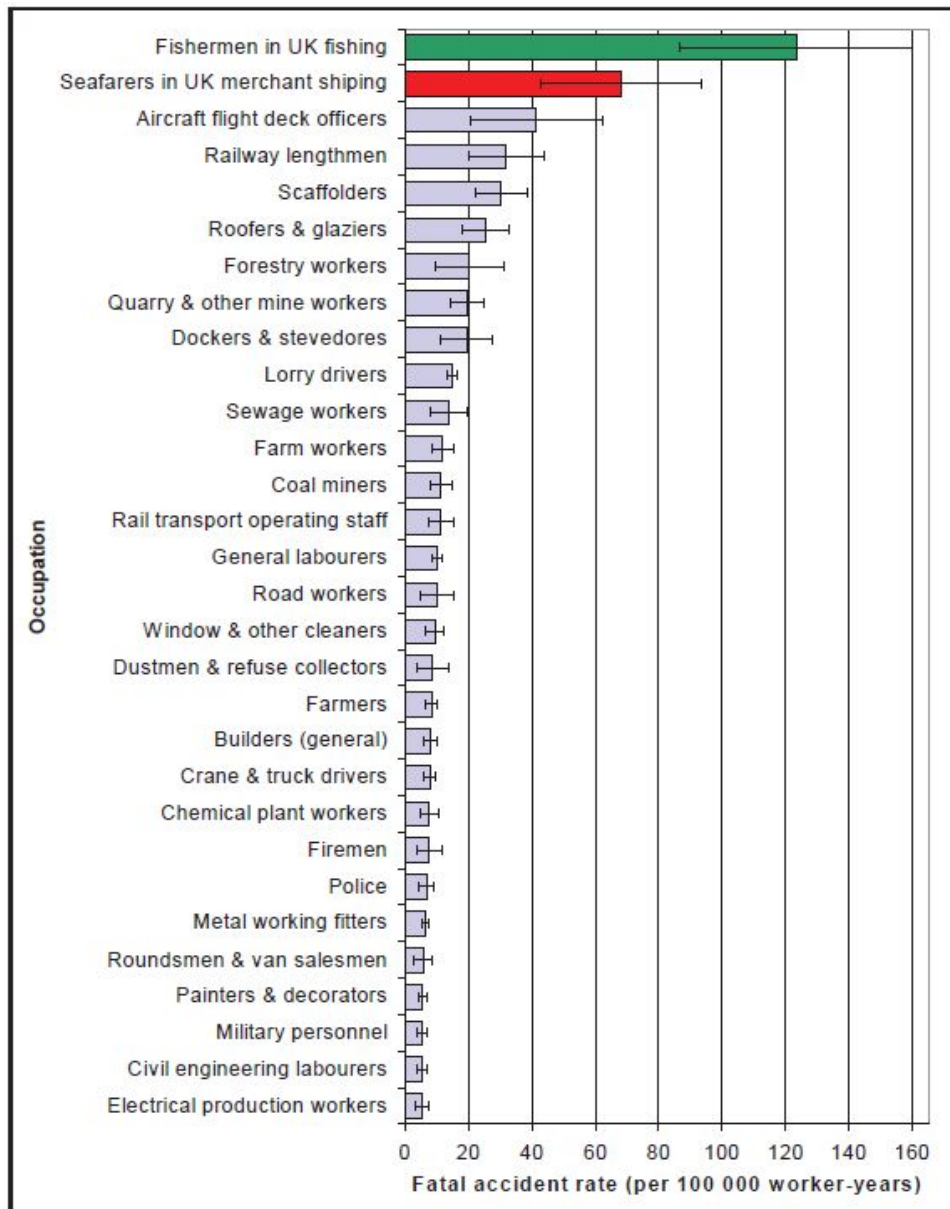


Fig 2.1: Fatality rate in UK for the 30 occupations with the highest risk of fatal accidents at work in 1982
 Source: Baumler,R. (2015). **Fishermen and fishing vessels.***The most dangerous occupation in the world And its growing international regulation, Unpublished lecture handout, World Maritime University, Malmo, Sweden.*

2.1.2 Chinese fishing industry

In terms of Chinese fishing industry, based on FAO database(see **table 1**), China is the top-ranking fishing country in terms of quantity followed by Indonesia, the United States of America, India and Peru. Nineteen countries caught more than one million tonnes each in 2012, accounting for over 75 percent of the global catches(FAO, 2015).

Table 2.1: the number development of Chinese fishing vessels

		Number of fishing vessels Nombre de bateaux affectés à la pêche Número de embarcaciones pesqueras									No
Country or area Pays ou zone País o área		1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
China	PW	432 674	487 297	513 913	548 189	576 996	630 619	672 633	675 170	696 186	695 555
	NP	516 500	487 576	444 499	412 323	421 423	408 740	369 762	390 475	373 391	374 355
Indonesia	PW	166 616	233 917	337 188	369 935	387 178	421 198	433 758	430 910	453 873	484 750 F
	NP	378 263	345 574	416 793	413 690	401 670	366 990	342 031	311 459	313 314	320 980 F
USA	PW	96 527	88 188 F	...	78 035	76 006	75 862	75 800 F	75 695	...	...
	NP	2 000 F	...	...	...	...	...	...	2 000 F	...	...
India	PW	78 644 F	136 491 F	135 676 F	134 502 F	134 502 F	133 286 F	133 286 F	133 286 F	133 286 F	...
	NP	159 461 F	107 448 F	106 044 F	104 270 F	104 270 F	104 055 F	104 055 F	104 055 F	104 055 F	...
Peru	PW	5 144	5 300 F	...	4 423	...	4 359	4 556	4 812	...	...
	NP	2 324 F	2 100 F	...	700	...	718	852	789 F	...	...
Russian Fed	PW	2 609	2 596	2 256	...	2 137	...	...	...	...	...
	NP	...	...	...	...	...	...	...	...	...	...
Japan	PW	372 090	347 142	317 332	312 530	304 775	297 878	289 898	283 925	280 445	261 477
	NP	13 977	11 545	8 118	8 487	8 622	8 703	8 960	8 897	8 234	8 259
Myanmar	PW	7 694 F	12 846	15 996	...	...	16 098	15 783	15 865	15 325	14 886
	NP	10 600 F	13 253	16 361	...	...	15 219	14 645	17 054	16 240	15 463
Viet Nam	PW	57 137 F	73 918	...	100 377	...	123 860	131 000 F	130 963	129 376	...
	NP	28 000 F	28 000 F	...	...	...	...	...	...	...	...
Chile	PW	9 790	13 929	13 135	13 559	13 884	14 101	14 115	14 643	12 005	11 871
	NP	2 800 F	1 700 F	1 268	1 319	1 354	1 396	1 432	1 452	943	1 082
Philippines	PW	120 000 F	181 627 F	183 127 F	183 627 F	183 998	183 998 F	183 998 F	183 998 F	...	...
	NP	280 000 F	292 180	292 180	292 180	292 180	292 180	292 180	292 180 F	...	...
Norway	PW	14 187	13 017	7 722	7 301	7 041	6 788	6 507	6 310	6 250	6 212
	NP	-	-	-	-	-	-	-	-	-	-

Source: FAO.(2015). *Summary tables of fishery statistics: Capture, aquaculture, commodity and food balance sheets*. The Food and Agriculture Organization of United Nations web site gives further information on courses. ([http:// www.fao.org/fishery/en](http://www.fao.org/fishery/en))

Actually, by the beginning of 2012, the total number of China's existing fishing vessel fleet of 1.06 million(Sinotrans,2012, P.2), is the world's largest number of vessels, accounting for about 1/4 of the total number of the world 316,100. What's more, in

recent years, with the national maritime strategy, more steel fishing vessel are being constructed. Increased the number of fishing vessels may lead to frequent merchant ships and fishing passage used to route intersection. Taking Cheng-shan-tou waters of Shi-dao fishing ground and Yan-wei fishing ground as an example, an average of fishing vessel passing-by about 250,000 to 300,000 times, that means average daily traffic is more than 800 times, and each year the number of merchant ships passing through Cheng-shan-tou waterway is on average more than 120,000 times, with the average daily traffic of more than 400 times. Another one is in Shan-tou waters, more than 900 times(Sinotrans,2012, P.2) than the average merchant ship passing-by, with merchant vessels more frequently there. Especially in the period after the end of the fishing moratorium, hundred and thousands of fishing vessels rushing out for hunting fish is more concentrated, resulting in local ship traffic surge. fishing vessels' sailing route is normally uncertain which depends on where the fish bank is, once they gather in groups or back to fishing port, to some extent, that will result in a crossing situation with the merchant shipping route, which increases the difficulty of the merchant ship to avoid collision .

2.1.3 Accidents to fishing vessel

According to incomplete statistics, there are 5 main threats to the fishing vessel's safety: namely, collision, touching damage, hitting rocks, stranding and fire disaster, and the number of collision accident almost accounts for about 60% of the whole accidents (Zhang, 2012,P.48) (see Fig2.2).

category of fishing boat accident(1999-2008)

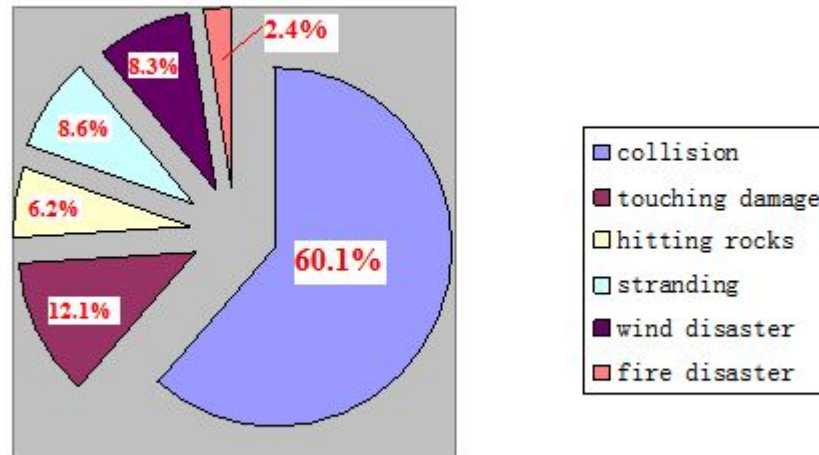


Fig 2.2: The category of fishing vessel accident (1999-2008)

Source: Zhang, Zh.L. (2012). *Analysis of accidents during fishing operations in fishing vessels in China and its countermeasures*, The Journal of Chinese Fishery Quality and Standards, Shanghai, China.

Another figure from the Fishery Command Center of the Ministry of Agriculture of China, from 2006 to 2011(see Fig 2.3, 2.4), is that there were 268 cases of merchant vessel and fishing vessels collision accidents, with the death toll (including missing) as high as 562. There were 2.1 person killed in each accident, and more than 95% of the fishing vessels sank. From 2006 to 2008, the number of merchant vessel and fishing vessel collision accidents increases year by year, from 34 cases to 44; Maybe due to the outbreak of 2008 financial crisis, the shipping industry was impacted, then, in 2009, collision accidents fell sharply, with accidents dropping to 27; With the recovery from financial crisis, shipping industry has come back, but the collision accident surged up to 63 in 2010, the death toll was up to 141; Up to 2011, although the number of accident

and the death (missing) number decreased, yet compared with a few years ago, it is still quite high, causing huge losses not only for the fishermen's life but also their finance(Li, 2012, P.5).

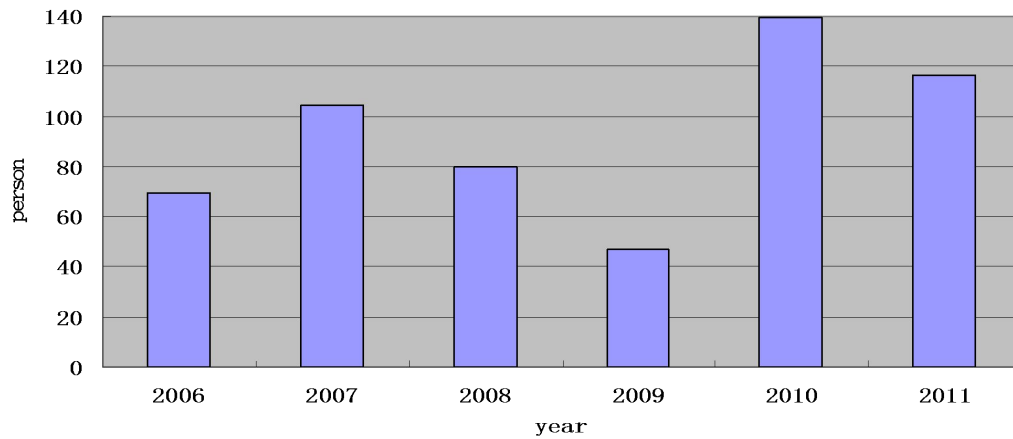


Fig 2.3: The death toll due to collision between fishing vessels and merchant vessels (year of 2006-2011)

Source: Li, Q.Y.(2012). *An study on the collisions of merchant ships and fishing vessels*, The Journal of Chinese Fisheries Economics, 2(30) Beijing, China.

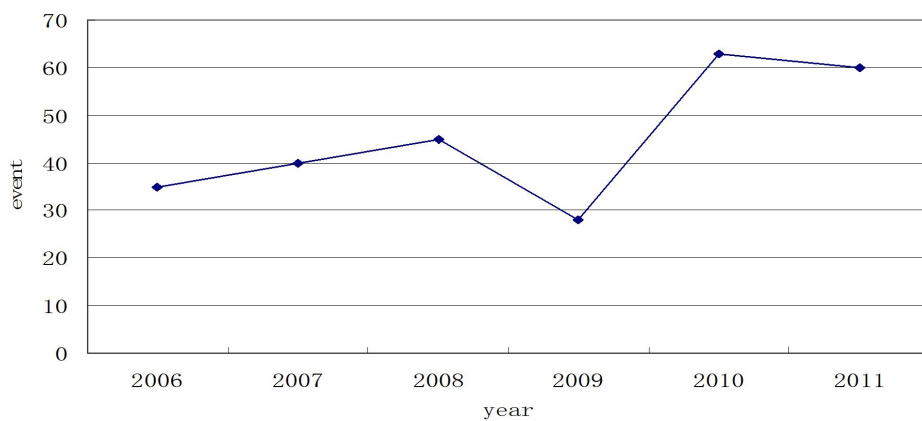


Fig 2.4: The accident figure due to collision between fishing vessels and merchant vessels (2006-2011)

Source: Li, Q.Y.(2012). *An study on the collisions of merchant ships and fishing vessels*, The Journal of Chinese Fisheries Economics, 2(30) Beijing, China.

2.1.4 Another point should be pointed out

Statistics from the Fishery Command Center of the Ministry of Agriculture of China show that more foreign vessels involved in the merchant ship and fishing vessel collision accident which appeared to be in an increasing trend. **Table 2.2** shows that, in 2006 - 2009, the collision accident involving a foreign ship is increasing year by year, from 17.6 percent in 2006 to 44.4% in 2009 ; the number of death (missing) is also in a high growth, increasing from 23 in 2006 to 34 in 2009, accounting for 32.9% to 70.8% (Li, 2012, P.6).

Table 2.2: The number of foreign merchant ships involving in collision with fishing vessel within Chinese coastal waters

year	event			Death (lost)		
		Involving foreign vessel case	distribution		Involving foreign vessel case	distribution
2006	34	6	17.6%	70	23	32.9%
2007	40	7	17.5%	105	44	41.9%
2008	44	10	22.7%	80	53	66.3%
2009	27	12	44.4%	48	34	70.8%
total	145	35	24.1%	303	154	50.8

Source: Li, Q.Y.(2012). *An study on the collisions of merchant ships and fishing vessels*, The Journal of Chinese Fisheries Economics, 2(30) Beijing, China.

2.2 Two typical collision cases

2.2.1 Case I: the Collision between the Container ship “*Cosco Hong Kong*” and the fish transportation vessel “*Zhe Ling Yu Yun 135*”

2.2.1.1 Main case elements:

Date: 5th March 2011

Weather: Good Visibility, Moderate sea state, North-North-West wind

Vessel:

1) Fish Vessel Zhe Ling Yu Yun 135

Sailed from Shi Tang, China, 11 crews , to the east, speed- 8.5kts

2) Cosco Hong Kong

From Hong Kong to Shanghai, autopilot-controlled track of 030° , speed-21kts



Fig 2.5: the two ships in case I

Source: MAIB. (2011). *Report on the investigation of the collision between the container ship ‘Cosco Hong Kong’ and the fish transportation vessel ‘Zhe Ling Yu Yun 135’*, Southampton, United Kingdom , Author.

2.2.1.2 Main Process:

6th 0153 - 0157:

Weather: Heavy rain→→Bad visibility

Cosco Hong Kong (CHK): Heading from 030° to 055° , keep clear of fishing vessels ;

Able seaman do the cooking(see Fig 2.6).

SITC Pyeongtaek (SITC): Close to the **CHK**, heading to starboard to 025° , increase the closest point of approach (CPA) (see Fig 2.6)

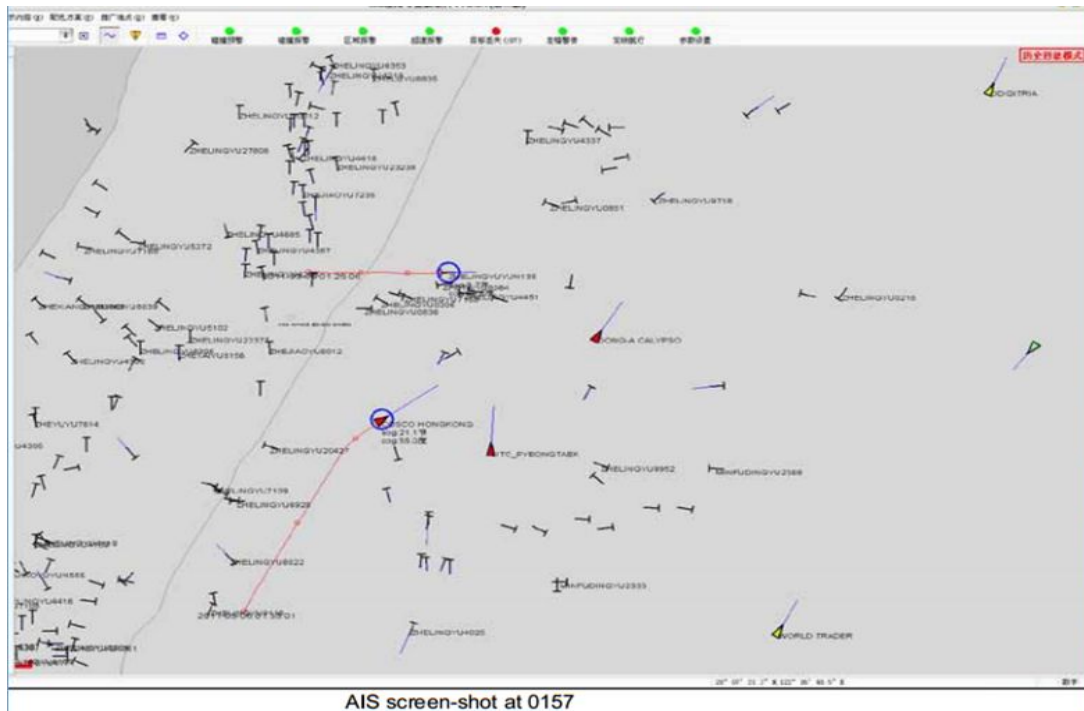


Fig 2.6: the encounter situation between CHK and **Zhe Ling Yu Yun 135** at 0157 from the shore based in AIS center

Source: MAIB. (2011). *Report on the investigation of the collision between the container ship 'Cosco Hong Kong' and the fish transportation vessel 'Zhe Ling Yu Yun 135'*, Southampton, United Kingdom , Author.

0210 -0214:

Cosco Hong Kong: Heading to 040° and then 048°, OOW saw an east-moving radar target, later identified as Fishing Vessel **Zhe Ling Yu Yun 135**, passing ahead of **SITC**, and sounded one blast 3 seconds on the ship's forward whistle and began to turn to port.

Fishing vessel **Zhe Ling Yu Yun 135** : Maintained course and speed

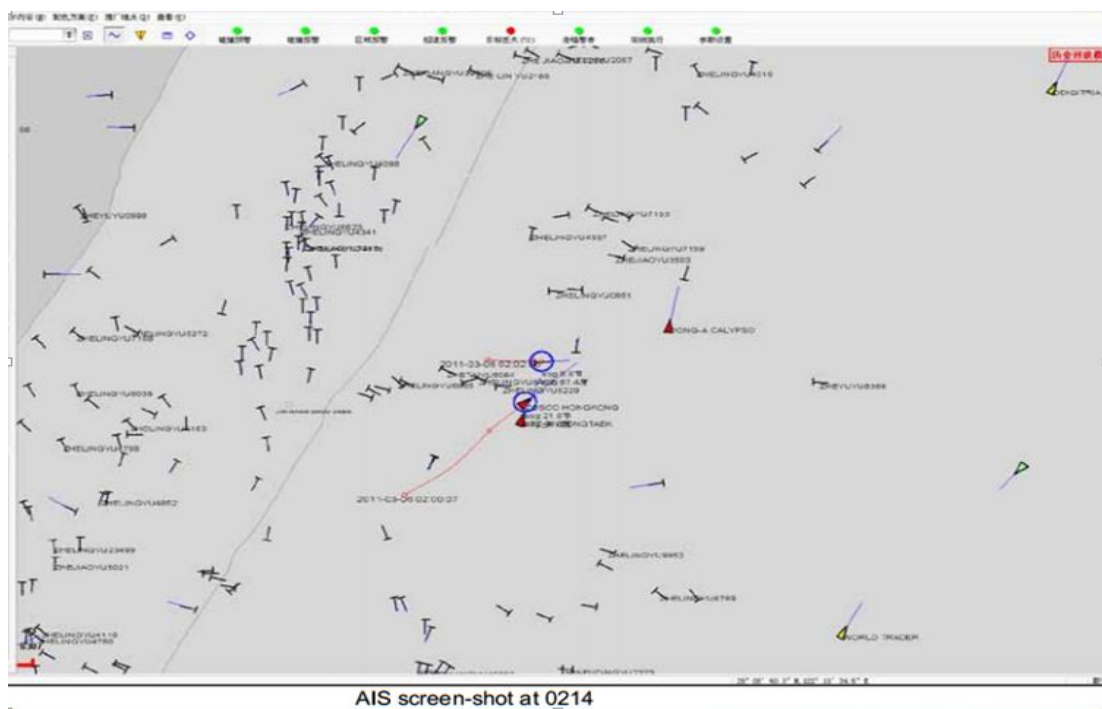


Fig 2.7: the encounter situation between **CHK** and **Zhe Ling Yu Yun 135** at 0214 from the shore based in AIS center

Source: MAIB. (2011). *Report on the investigation of the collision between the container ship 'Cosco Hong Kong' and the fish transportation vessel 'Zhe Ling Yu Yun 135'*, Southampton, United Kingdom , Author.

0214 -0217:

Cosco Hong Kong:

Moved to the port wing to check turning into clear water.

Fishing Vessel Zhe Ling Yu Yun 135 :

Altered course to starboard to make good a course over the ground (COG) of 220°, towards the path of **Cosco Hong Kong**

2.2.1.3 Results:

Cosco Hong Kong collided with Fish Vessel **Zhe Ling Yu Yun 135** .

Fish Vessel **Zhe Ling Yu Yun 135**: Sank, loss of 11 lives.

Cosco Hong Kong: Not damaged , Remain drifting for 1 hour to confirm what had happened.



Fig 2.8: approximate tracks of two ships and the approximate collision point

Source: MAIB. (2011). *Report on the investigation of the collision between the container ship 'Cosco Hong Kong' and the fish transportation vessel 'Zhe Ling Yu Yun 135'*, Southampton, United Kingdom , Author.

2.2.1.4 Safety issues directly contributing to the accident after safety investigation

After the deep investigation to the accident by MAIB officers, the following reasons or causes to the collision accident were found as stated in the report:

- 1) *The **Cosco Hong Kong's** OOW's sounding one blast of approximately 3 seconds whistle was incorrect, which could easily be mistaken by the OOW on board '**Zhe Ling Yu Yun 135'** as one short blast signal, indicating that **Cosco Hong Kong** was turning to starboard.*
- 2) *In order to avoid '**Zhe Ling Yu Yun 135'**, **Cosco Hong Kong's** alteration to port disobeyed the requirements of the COLREGS(1972), which would not have been expected by the crew on board '**Zhe Ling Yu Yun 135'**.*
- 3) *When the heading of '**Zhe Ling Yu Yun 135'** was turned over 120° to starboard, neither this bold alteration nor the fish transporter's resulting approach were seen by **Cosco Hong Kong's** OOW.*
- 4) *Before the collision was potentially pivotal to this accident, the AB lookout from '**Cosco Hong Kong's** bridge was released for about 30 minutes. At such a critical time, allowing the lookout to leave the bridge, the vessel on a night passage through dense shipping in adverse weather conditions, the 2/O appeared not to have appreciated the assessment to the lookout or the potential danger ahead.*
- 5) *'**Cosco Hong Kong'** could have taken more early action to avoid most of the fishing vessels in the vicinity by having her voyage been planned further to the east, similar to the tracks of other vessels which were also passing through the area at that moment.*

6) Although **Cosco Hong Kong** was expected to encounter concentrations of fishing vessels, the ship master's no consideration appears to have been given to altering course, reducing speed, or enhancing the manning for lookout on the bridge.

7) In 2009, **Cosco Hong Kong's** grounded for several time. If further similar accidents are to be prevented in the future, it is important for the masters and deck officers to realize the need of continually assessing the risks to safe navigation and, when and where necessary, implement proper mitigating measures.

8) Although positive steps were taken by the **Cosco Hong Kong's** master to determine whether his vessel had been involved in a collision, it was not adequate precautions which might have triggered the search for '**Zhe Ling Yu Yun 135**' much sooner.

9) The 2/O's performance as the bridge watch-keeping officer on board '**Cosco Hong Kong**' fell well short of the standard required by STCW.

10) There is a potential problem with the continuation and refresher training provided to deck officers by '**COSCO Shanghai**', and possibly other **COSCO** subsidiaries, because of the 2/O's apparent lack of competency, the previous accidents involving **Cosmar** managed vessels and the subsequent unsatisfactory results of the rule of the road tests.

11) The 2/O's performance evaluation did not identify his lack of competency to the application of the COLREGS(1972), and the usefulness of ISM audits and other ship visits by superintendents in identifying competency issues on bridge watch-keeping officers was considerably limited.

2.2.1.5 Other safety issues identified during the investigation also leading to recommendation

1) Two life-rafts secured with HRUs was required to be carried by '**Zhe Ling Yu Yun 135**', but during the investigation, neither life-raft floated to the surface nor inflated was found after the vessel sank. Although it is possible for the vessel's life-rafts to do not

float to the sea surface because of the HRUs being malfunctioned or damaged during the collision. It is also likely that the life-rafts were stopped from floating away from the fishing vessel when it sank by lashings for preventing their loss overboard or movement in bad weather condition.

2) The missing of ‘Zhe Ling Yu Yun 135’ was reported until 18 hours after her collision with ‘Cosco Hong Kong’. Had the fishing vessel been equipped with an EPIRB, a search and rescue could have started within a short time after her sinking(MAIB, 2011,pp33.34).

2.2.2 Case II:the Collision between the Container ship ‘OOCL Kaula Lumpur’ and the fishing vessel ‘Min Lian Yu 0932’

2.2.2.1 Main case elements:

Date: 2nd December 2009

Weather: Moderate Visibility, Moderate sea state, North-North-West wind

Vessel:

1) Fishing Vessel “Min Lian Yu 0932”

Back to Sheng-shan port, China, 7 crew , speed- 9.0kts

2) OOCL Kaula Lumpur

Sailed from Shang-hai to Qing-dao, Hong kong, China, 15 crew, speed -24kts



Fig2. 9: The container ship **OOCL Kaula Lumpur**

Source: ZJMSA. (2009). *The safety investigation report for collision between ‘OOCL KUALA LUMPUR’ and Fishing vessel ‘Min Lian Yu 0932’*, The Zhejiang Maritime Safety Administration web site gives further information on courses. (<http://www.Cnzjmsa.gov.cn/>)

2.2.2.2 Main process:

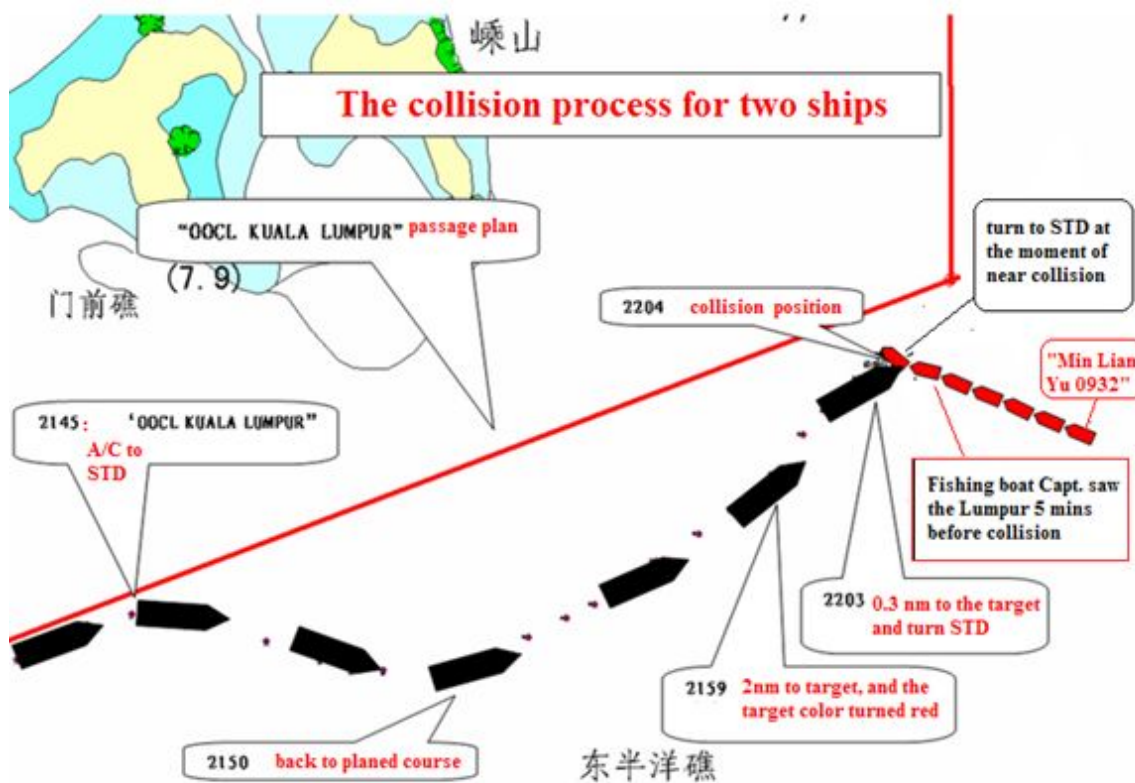


Fig 2.10: the collision process for ‘Min Lian Yu 0932’ and ‘OOCL Kaula Lumpur’

Source: ZJMSA. (2009). *The safety investigation report for collision between ‘OOCL KUALA LUMPUR’ and Fishing vessel ‘Min Lian Yu 0932’*, The Zhejiang Maritime Safety Administration web site gives further information on courses. (<http://www.Cnzjmsa.gov.cn/>)

1) OOCL Kaula Lumpur:

2009.12.2,1900: Departure from Yangshan Port, Shang-hai ,departure Df:8.90m, Da:10.30m.

2010: Drop of pilot at position 30°33.2’N/122°13.9’E. Course100°, Radar range 6NM, Relative motion North-up model with of-center set-up.

2014: Increase revolution to Nav. Full Ahead.

2015: Third Officer (3/O) JEHANGIR and duty Able Body(A/B) SINGH relieved the Second Officer(2/O), and control the ship under the command of ship master.

2055: Altered course to 068° at the way-point 30°32.2'N/122°26.1'E, ship speed 24 kn.

2145: Arrived at the south part of Sheng-shan (嵛山) (see Fig 2.10) , ship position:30°38.4'N/122°46.8'E, around 3NM from the Sheng-shan(嵛山) island, altered course to starboard apparently for avoiding collision with the fishing fleet 2NM ahead which is heading for the North.

2150: Back to the planed course gradually.

2155: Ship position30°38.5'N/122°51.2'E , course 063°、 speed 24.2kn, ARPA Radar display: there were around 10 fishing vessels 4 NM away from the forward part, and a red target with NO. 900268876 appeared (the MMSI number of another fishing vessel"Zhe Pu Yu 68876) (see Fig.2.11).



Fig 2.11: The ARPA Radar screen display at 2159 on Dec. 2,2009 (OOCL Kaula Lumpur)

Source: ZJMSA. (2009). *The safety investigation report for collision between ‘OOCL KUALA LUMPUR’ and Fishing vessel ‘Min Lian Yu 0932’*, The Zhejiang Maritime Safety Administration web site gives further information on courses. (<http://www.Cnzjmsa.gov.cn/>)

2159: Ship position 30°39.5’N/122°52.8’E, course 050°、 speed 24.3kn. On the ARPA Radar the second red target appeared, 2NM ahead, true bearing 57.8°(namely **Min Lian Yu 0932**), with her course 281.3°speed 8.7 kn, DCPA 0.23 NM, TCPA 3.9 Min, maintained course and speed.

2203: Ship position 30°40.5'N/122°53.9'E, course 043°, speed 24.7 kn. Ship master give the Rudder order to the wheel's man by starboard 10, 20 and hard to starboard when she was 0.3NM away from the "**Min Lian Yu 0932**".

2204: Ship position 30°40.8'N/122°54.3'E, heading 071.7°, speed 22.3 Kn. Ship master found that the lights of "**Min Lian Yu 0932**" disappeared, asked the 3/O and Cadet to check at the outside of ship's wing, the fishing vessel collided with the ship port-side and to the aft part of ship.

2350: "**OOCL Kaula Lumpur**" back to the collision point.

2) Min Lian Yu 0932:

2009,12.2,1700: Received the gale forecast when under fishing in the 7th Sector of 179th fishing ground, ready to return to Sheng-shan (嵯山) to avoid the gale.

1800: on the way to the Sheng-shan (嵯山) with other fishing vessel like "**Zhe Pu Yu 68876**", five in all, about 0.5NM between each boat, and "**Zhe Pu Yu 68876**" is the lead ship, with the 4th one **Min Lian Yu 0932** (course 280°, speed 9 Kn).

2130: Ship position 30°40'N/122°58'E, chief mate navigated the boat for relieving the Captain to have dinner.

2140: The captain Mr Zhang back to the bridge, ship course 280°, speed 9 Kn, Radar range 3 NM, all navigation lights displayed normally.

About 5 minutes before collision, captain found the port-side crossing vessel, and saw her green light and Mast light. Keep course and speed.

2204: Captain found the coming vessel located in the South to East of own ship and the distance coming closer, could see the outline of the coming vessel. Turning to Starboard immediately, at that moment, the boat's port-side bridge collided with the coming vessel's bow.

After collision, the boat made a turn due to heavy collision, the engine stopped, and started to sink from the her Aft part. The crew escaped before the ship sank by jumping into the sea.

2220: the fleet boats saved 6 crew, but still one lost.

2.2.2.3 Results:

“**Min Lian Yu 0932**”: Sank due to collision, all the fishery equipment and fishing goods lost.

“**Min Lian Yu 0932**”: 1crew lost.

2.2.2.4 Safety issues directly contributing to the accident after safety investigation

OOCL Kaula Lumpur:

1) Failure to fulfill the responsibility of give-way vessel

“**LUMPUR**”as a give-way vessel, should take early and substantial action as far as possible and keep well clear of **Min Lian Yu 0932**, but she kept course and speed , and took action when the distance became 0.3 NM which was quite difficult to avoid collision only by altering course . She disobeyed the Rule 16 of “**COLREG**” (1972) --Action by Give-way Vessel.

2) Failure to maintain a save speed

Prior to the accident, she encountered a large number of fishing vessels around, which led to a very complicated navigation situation, but LUMPUR remained approximately 24 Kn full speed running, thus unable to take effective action to avoid collision. She disobeyed the Rule 6 of “**COLREG**” (1972) --Save Speed

3) Failure to keep proper look-out

About 9 minutes before the collision, the ARPA Radar of "LUMPUR" has been automatically red "Zhe Pu Yu 68876" target which was the leader ship of that fishing vessel fleet, and 4 minutes later, " Min Lian Yu 0932 " target also turned red , but the ship captain did not maintain continuous observations, until the "Min Lian Yu 0932" ship was close to 0.3 nautical miles when it is considered the existence of a collision danger, this time to take the starboard steering action was unable to avoid collisions.

That means the officer on watch(OOW) did not maintain a proper and effective look-out, which disobeys the Rule 5 of "COLREG" (1972) -Look- out.

Min Lian Yu 0932:

1) Failure to keep proper look-out

About 5 minutes before the collision and the distance about 2 NM between the two involved ships, the captain Mr Zhang did not maintain the look-out(observation), and did not determine the risk of collision, which disobeyed the Rule 5 of *COLREG* (1972) -Look- out.

2) Failure to take proper action to avoid collision in time

Before the collision, the captain has found the green sidelights of **OOCL Kaula Lumpur**, which meant that she was a stand-on vessel. But when the distance was approaching and the ship was apparently not in accordance with the regulations for preventing collisions to take effective action, "Min Lian Yu 0932" did not alone take action to avoid a collision occurring until close to see to the outline of the ship, which was too late for avoiding the collision. She disobeyed the Rule 17 of *COLREG* (1972) -Action by Stand-on Vessel.

2.2.3 Conclusion for the two cases

Based on two typical cases, a lot problems were found which lead to the collision accident, such as the human element (improper look-out, unreasonable passage plan, disobeying the regulations,etc), the problem of ship quality (low ship hull structure, technical status, old aged fishing vessels), the navigational environment(more dense fishing vessels, big traffic flow within the coastal waters, etc.), and other management or supervision deficiencies. The following chapter will mainly focus on those sectors to analyze the major causes which may lead to the collision accident between fishing vessels and merchant ships.

Chapter 3

The cause analysis on the fishing vessels and merchant ships collision accident

3.1 Human element

Human element(or human factor) is a quite a huge topic for maritime accident, actually,on June 23, 1997, IMO Maritime Safety Committee(MSC) and the Marine Environment Protection Committee (MEPC) issued ‘ human factors unified terminology’ of human factors which were classified and divided into 6 categories with 45 items (Jia, 2011,P.7), including the human error, individual factors which affects the human error, the marine environment factors and management factors,etc.

Researches show that the ship collision accidents involving human factors is much higher than other kinds of water traffic accidents. More than 90% of ship collision are related to human factors (Department of Transport,UK, 1991), and 60% of the factors directly caused accidents, with the remaining 30% having an indirect relationship (Kuo, 1998).

This section is mainly from the aspects of human error research business on OOW of merchant vessel and fishing vessel, digging the cause of human factors leading to the accident, from the source of the crew and the overall quality, fishing vessel crew training certification and the understanding in the regulation for preventing collisions, the compliance with collision avoidance rules of merchant vessel duty officer and fatigue management implementation and its effectiveness.

Actually, based on Professor Deng Li-biao's research, from Guang-dong Ocean University, on the statistics and analysis of main causes of 30 typical collision cases between merchant and fishing vessels, indicates that improper look-out of fishing vessels' duty officer domains 19 cases (63% of 30) (see table 3.1), and because of the negligence of the OOW's lookout, no early identification to the target ship and making collision risk judgments, so, the navigators fail to take measures to avoid accident happening, especially for large density fishing ships sailing area near the fishing ground.

Table 3.1: statistics on the human element to fishing vessels and merchant collision accident

Collision case NO.	Collision time	visibility	loss	Improper look-out	Mistake in signal lights display	No sound signal	Take action not under the COLREG	others
1	0340	Restricted	Sink		▲	▲		

		visibility						
2	0340		Sink, loss 3 lives		▲			
3	1445	Restrict ed visibility	Sink	▲		▲		
4	1550		Sink, loss 1 life					▲
5	2210		Sink, loss 5 lives	▲	▲			
6	1750	Restrict ed visibility	Sink, loss 5 lives			▲	▲	▲
7	0238	Restrict ed visibility	Sink, loss 2 lives		▲	▲		
8	0015		Sink, loss 1 life		▲			
9	0331		Sink, loss 1 life		▲			
10	0404		Sink, loss 3 lives	▲	▲			
11	1350	Restrict ed visibility	Sink, loss 1 life		▲			
12	1606		Sink, loss 2 lives					▲
13	0158	Restrict ed visibility	Sink	▲		▲		
14	0140	Restrict ed visibility	Sink, loss 6 lives	▲		▲		
15	0510	Restrict ed visibility	Sink, loss 17 lives	▲		▲	▲	

16	1520		Sink	▲			▲	
17	0500		Sink, loss 3 lives	▲			▲	
18	0200	Restrict ed visibility	Sink, loss 3 lives	▲		▲	▲	
19	0300		Sink, loss 1 life			▲		▲
20	2215		Sink, loss 2 lives	▲			▲	▲
21	2310		Sink, loss 1 life	▲	▲			
22	0336		Sink,	▲			▲	
23	0010	Restrict ed visibility	Sink	▲	▲	▲	▲	
24	2356		Sink, loss 1 life	▲				
25	0055		Sink		▲			
26	1922	Restrict ed visibility	Sink, loss 3 lives	▲			▲	
27	2111	Restrict ed visibility	Sink, loss 7 lives	▲		▲	▲	
28	0810	Restrict ed visibility	Sink, loss 11 lives	▲				
29	1103	Restrict ed visibility	Sink	▲		▲	▲	
30	0325	Restrict ed visibility	Sink	▲		▲		
▲: refers the existing of the listed item								

Source: Deng,2007,*The analysis and Countermeasure of the fault of the fishing vessel in the collision accident of the merchant vessel and the fishing vessel*, p 74.

What factors lead to such a high percentage of neglecting of lookout? Personally, that should be studied from the following several aspects:

1) The cultural level of the fishing vessel crew is low (Xia, 2014, p.4865), not fully aware of the danger of marine navigation and mastering the application of the international regulations for preventing collision at sea.

With the economic development of the coastal areas after China's Opening-up Policy, the local people engaged in coastal fisheries personnel are less and less, and most of the fishermen are from the mainland poorer inland regions such as Guizhou, Henan, with cultural level mostly middle school. Their original intention is to find a job, which can own bread for their family. But they are not aware of the hardships and dangers, in particular, thinking that the sea is so broad, so they can sail anywhere they want, so how could that hit other ships, and sometimes they hold the conservative consciousness of " successfully crossing the big ship bow, three years' harvest for fishing at sea " which is quite dangerous. What's worse, sometimes that is total violation to the COLREG, which will confuse the OOW on the merchant vessel to take proper actions to avoid collision

2)The deficiency of fishing vessel crew training.

On the one hand, not enough attention is paid to the Maritime English of crew . Although in the ocean fishing vessel crew examination syllabus, Maritime English is put forward to meet assessment requirements, yet the extent is not enough, just staying in the written examination (just for passing the examination). It does not focus on cultural applications and language abilities.

What I should say is that, the China's reform and opening-up policy, is a full range of economic development, China's international shipping not only brings more opportunities, but also brings many challenges. As for the large number of foreign vessels entering or passing through Chinese coastal ports, their 'disturb' is not a small impact on coastal fishing, because they have a lot of language obstacles which is properly reflected in **table 2.1** of chapter 2. Many cases indicate that the foreign ship's duty officer called the giving way fishing vessel (not engaged in fishing) in English on the VHF channel 16 for keeping clear of their vessel, without any response. Maybe those fishing vessel are not setting in the VHF channel 16, but most likely to think that the fishing vessel OOW don't know what the merchant vessel is calling for, because they are using international language-- English. This reflects the English ability of the coastal fishing vessel crew to adapt to the changes of the current and future navigation environment is not enough. Of course, maybe the reason is for the stakeholders to save money, and the boss of fishing company is unwilling to spend more time and money to strengthen the training of crew for increasing the safety in production, or maybe the cultural level of the crew themselves is not high enough to meet the high navigation English level requirements, which seems to be too harsh for a fisherman, and that is really a disadvantage to the safe and fast development for the fishing industry. But I have to say, these protections let those poor people pay a price in human lives, perhaps that needs more casualties to grasp more attention.

On the other hand, not understanding or mistaking the COLREG. The rules specify that merchant ships should give way to fishing vessels engaged in fishing, so some fish boat navigators think that the merchant ship will give way to them at any time. This largely plants the seeds for the occurrence of collision event. Therefore, most occurred collision

accidents are due to fishing vessel crew's negligence of look-out, because the crew of a fishing vessel do not really understand what kind of vessel engaged in fishing is (under the Convention), which actually refers to vessel engaged in fishing and restricted in manipulating. So, when the fishing vessels are on their way to fishing grounds or the way back to port, they should be regarded as a power driven vessel, according to the rules. If it is the giving way vessel, they should fulfill the responsibility of giving way to the stand-on vessel. And some of the fishing vessel crew hold the awareness that the small fishing vessels' flexible and convenient operation, so they can be in very close distance to take measures to avoid collision. However, they tend to ignore the flow field formed by the merchant ship's high speed motion which leads to suction effect to the small fishing vessel. This is also another explanation for the request rule that, the navigator should take action as soon as possible to avoid collision, keep well clear of other ship.

3) It is not enough for the merchant ships driver to be familiar with the characteristics of fishing vessels, easily leading to uncoordinated avoiding collision actions.

The duty officer of merchant vessel is lacking in recognition to the vessel engaged in fishing and how to keep clear of them. Once the merchant ships and fishing vessels are in any emergency situation, they fail to take effective actions to avoid collision, then causing accidents. The reason is being un-familiarizing with avoiding all kinds of vessels engaged in fishing. On the one hand, is the **COLREG** does not make specific provisions on how to avoid collision to vessel engaged in fishing, only in accordance with the requirements of good seamanship and the officer's sailing experience. On the other hand, in the teaching materials, monographs on how to avoid the fishing vessels are relatively less in the, and the crew examination and certification on how to avoid

fishing vessel is not as a key requirement. Actually, understanding the characteristics of fishing vessel is very important for merchant driver. Because they should take different collision avoidance technology for fishing with different methods. For example, in order to protect their nets, some boats deliberately constitute a risk of collision by using their motor boats, forcing merchant to go away. In different waters, crew of different quality or different technical conditions of the ship and the avoidance methods are not the same. Therefore, the merchant driver's unfamiliarity with characteristics of the fishing vessel also contributed to the accident.

4) The compliance with the rules of merchant shipping crew and the effectiveness of fatigue management system.

Of course, compared with the fishing vessel navigator, most of the merchant ship drivers, shared college or professional education. Relatively speaking, for understanding the rules and mastering extent, they should have a much higher degree than the fishing vessel crew. However, the non-compliance with rules also caused the tragic collision accident which performs in insufficient arrangement of full-time lookout personnel, failure to use all can be used navigation equipment to assist lookout and determine risk of collision, not as soon as possible to take action to avoid collision, too high assessment on the their individual ability (not timely call the captain's aid), what time to use the Rule 2 of COLREG about 'make a departure from these Rules necessary to avoid immediate danger' and take action properly, always forgetting to reduce the speed to minimize the risk of collision in dense fishing vessel traffic area, and so on, these are the full expression of disobeying rules, or they have become accustomed to. These should cause the attention of the merchant shipping crew and their managers.

Secondly, the validity of the fatigue management system remains to be studied. As for IMO and ILO implementing the fatigue management system for the crew, its original intention is to protect the interests of seafarers to a great extent, to ensure the safety of maritime navigation. But the shipping company, blindly in pursuit of completed work records only for the PSC inspection, actual works on the ship that has not been well reflected. Sometimes, the sailor on duty as a full-time lookout personnel in the corner inside is secretly dozing off, and in order to save the time for rest, the OOW is shifting to the chart room to complete a lot of paper work. They even don't know what happened at night when the ship slightly vibrates (because the merchant vessel hit the small fishing vessel, just like ants hitting into the elephant). At the same time, fatigue management system should also focus more on the mental fatigue of the crew, especially for the ship manager level. They should pay close attention to duty officer's mental state, such as family misfortune for seaman's psychology. For example, in front of the case analysis(**case I**), due to the OOW's pregnant wife's upcoming delivery, he would sign off in the next port. Just that night before his disembarkation, collision case happened. Although the accident safety investigation did not involve this aspect, yet personally speaking, the over-excited mental state would result in a decline in the quality of rest, which may affect the shift in the focus and the judgment to the risk of collision, so this risk should be under the captain's control.

3.2 Ship factors

With ship factors, mainly the marine fishing vessel's overall safety and technical conditions, according to Dalian Ocean University of fishing vessel safety research center's research, in June to September of 2011, to evaluate the states of offshore steel

fishing vessel 24 meters and above according to the requirements of “**the International Convention for the Safety of Fishing Vessels**”(Hereinafter referred to as “**Fishing Vessel Convention**”) by random sampling method, through 5,768 marine fishing vessels’ technology parameters analysis and evaluation (Ren, 2012, P.58), it was found that more than 90% of the fishing vessels is not up to the requirements of the “**Fishing Vessel Convention**” (see Fig 3.1). The overall safety condition of fishing vessels with the ship age became significantly worse, and ship equipment existed more safety deficiencies. Generally speaking, there is quite a safety status gap for the ocean fishing vessel in China based on “**Fishing Vessel Convention**”, so the overall level of fishing vessels and equipment needs to be improved.

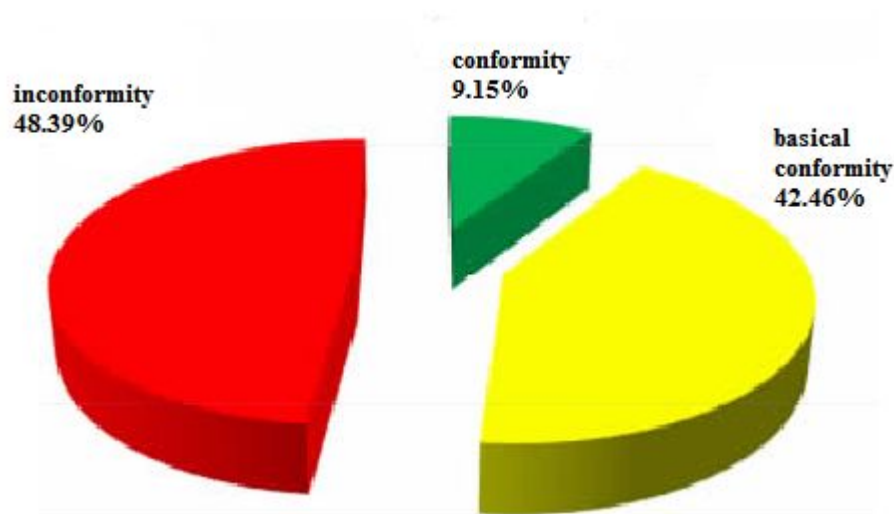


Fig 3.1 : The conformity distribution of Chinese ocean fishing vessel according to “**the International Convention for the Safety of Fishing Vessels**” in 2011 (total 5768 sample fishing vessels)

Source: Ren, (2012), *Assessment on the safety conditions in steel marine fishing vessels of China*, The Journal of fishery modernization, 39(6), Dalian, China.

There are mainly three aspects to analyze the safety status of the fishing vessel , namely, the hull structure, the ship's equipment, and the ship's overall age distribution.

1) Hull structure of fishing vessels

Based on the evaluation of the research center, only 18.03% of the fishing vessels of hull strength and ship layout and structure integrity conforms to the requirements of the “**Fishing Vessel Convention**”, and 55.64% of the fishing vessel is not in conformity with “**Fishing Vessel Convention**” The overall fishing vessels’ arrangement and structural integrity assessment results including water-tight, weather-tight equipment, fireproof structure, emergency escape route,etc, are shown in **Table 3.2**. We can find that the in-conformity fishing vessel domains 3443 in 5768 (nearly 60%), which is quite a high figure, without mentioning the fishing vessels under 24m in length which are much worse(Ren, 2012, P.59).

Table3. 2: Assessment result of sample fishing vessels’ arrangement and structural integrity

fishing vessels’ arrangement and structural integrity		conformity	Basic conformity	In-conformity	total
	quantity	1830	495	3443	5768
ratio	31.73%	8.58%	59.69%	100	

Source: Ren, (2012), *Assessment on the safety conditions in steel marine fishing vessels of China*, The Journal of modern fishery modernization, 39(6), Dalian, China.

2)Ship equipment status

Sample fishing vessels equipping or installing or arranging in fire protection, pollution prevention, electrical, mechanical, navigation, life-saving and radio communication

equipment and so on which are in line with the requirements of “**Fishing Vessel Convention**” accounted for only 5.58% of the total number of fishing vessels in the sample. The fishing vessel basically meeting the requirements of the “**Fishing Vessel Convention**” occupied 45.34%, and 49.08% samples of fishing vessels do not conform to the requirements of the Convention(Ren, 2012, P.59). More detailed assessment results of all kinds of equipment can be found in **Table 3.3**. Based on the statistics, 50% fishing vessels’ pollution equipment, fire protection equipment, machinery equipment do not comply with the requirements of the “**Fishing Vessel Convention**”, and the overall level of equipment needs to be improved.

Table3.3 : Assessment results of sample fishing vessel’s equipment

Sort of Equipment		results	conformity	Basic conformity	In-conformity	total
		quantity				
Fire fighting equipment	quantity	379	1724	3665	5768	
	ratio	6.57	29.89	63.54	100	
Pollution prevention equipment	quantity	103	1176	4489	5768	
	ratio	1.79	20.39	77.82	100	
Electric equipment	quantity	950	1982	2836	5768	
	ratio	16.47	34.36	49.17	100	
Engine equipment	quantity	1079	1770	2919	5768	
	ratio	18.71	30.69	50.61	100	
Navigation equipment	quantity	932	2045	2791	5768	
	ratio	16.16	35.45	48.39	100	

Life-saving equipment	quantity	3810	1162	796	5768
	ratio	66.05	20.15	13.80	100
Radio equipment	quantity	3568	377	1823	5768
	ratio	61.68	6.54	31.61	100

Source: Ren, (2012), *Assessment on the safety conditions in steel marine fishing vessels of China*, The Journal of modern fishery modernization, 39(6), Dalian, China.

3)Fishing vessel age

Sampling evaluation showed that the number of boats with less than 10 years, fishing experience is 2,520. There are only 18.41%, accounting for 464 of the number of fishing vessels (2,520) whose overall security situation is in line with the “**Fishing Vessel Convention**” requirements. The age 10-15 fishing vessel occupies 2,136. Unbelievably, there are only 53 boats meeting the requirements of the “**Fishing Vessel Convention**”, which accounts for 2.48%, and the sampling collection of the fishing vessels of the age of 16-20 is 948, in accordance with the Convention requirements only 1.16%, accounting for 11 of the total number of such fishing vessels. Over the age of 20 years, the sample of fishing vessels is 164, which are all not in conformity with the requirements of the Convention. The relationship between the total evaluation results of the sample and the age of the ship (see **Table 3.4**) shows that the total safety status of the sample was significantly lower than the requirement of the Convention(Ren, 2012, P.59).

Table 3.4: Overall evaluation results according to the distribution of fishing vessel’s age

Ages/ year	Results		Basic conformity		In-conformity		total
	conformity		quantity	ratio	quantity	ratio	
	quantity	ratio	quantity	ratio	quantity	ratio	

<10	464	18.41%	1136	45.08%	920	36.51%	2520
10-15	53	2.48%	931	43.59%	1152	53.93%	2136
16-20	11	1.16%	345	36.39%	592	62.45%	948
>20	0	0	37	22.56%	127	77.44%	164

Source: Ren, (2012), *Assessment on the safety conditions in steel marine fishing vessels of China*, The Journal of modern fishery modernization, 39(6), Dalian, China.

Actually, there are quite a range of wooden fishing vessels engaged in fishing within China's coastal waters, and most of them are under 24m in length. Taking Tai-zhou city as an example, among nearly a million fishing vessels, at present, the wooden fishing vessels are still accounting for nearly 1/4, fishermen' income decreased year by year, slowing pace of steel fishing vessel reconstruction, the wooden fishing vessel without timely maintenance and overhaul in a long period , such as sound equipment, lights, etc, which can not be normal use and they go to sea for production with quite a lot deficiencies. As for the signal and navigation lights, although the existing fishing vessels are equipped with navigation lights, they can not meet the requirements of specification. For example, the installation position is not standard or not according to requested number, light color. The fishing signal lights displayed are just in the stern gantry crane beam, with 2 to 3 round lamps with white light, and one green round lamp as fishing signal light is installed on the top of white lights with a distance of less than 1 m, which is not in conformity with Rule 26 paragraph b,c,d in the COLREG (1972).

Therefore, fishing vessels' light equipment and installation is not standardized while engaging in fishing or sailing, and it is difficult for other ships to distinguish the fishing vessels heading, especially in poor visibility, it is more difficult to judge the fishing

vessel trends, and sometimes it is hard to find their location, hence, these situations are more prone to cause collisions with merchant vessels.

Compared to the fishing equipment and poorly equipped in terms of, merchant ships' navigation equipment installed with really a lot of rich, modern automatic navigation system, fully automatic unmanned engine room, automatic identification system (AIS), automatic radar plotting apparatus(ARPA), modern electronic chart display and information system, and so on, these devices indeed modernize navigation to bring convenience and we are used to and proud of the arrival of the E - navigation. But behind the modern equipment, it hides a lot of minefields. The majority of the crew are in the enjoyment of relaxation, the fast, easy sailing life, but seldom think about equipment in case of failure or what consequences it will bring about, how to reduce the risk of accidents, and ensure the ship safety once something happens. They just have crazy reliance on that 'good' things with full trust, because they believe that they can work seriously, without any slightest mistake.

In conclusion, in terms of Chinese fishing vessels and equipment for the performance of the overall situation: hull corrosion, the poor ship layout and structure integrity, a serious lack of anti pollution equipment, fire protection, lack of communication equipment, lifesaving equipment cannot ensure people to escape. With the deficiency above in hull structure and equipment, those will naturally bring risks of collision from the ship operation side. Compared with the mighty ships, collision of small boats with low insubmersibility, inadequate life-saving equipment, will unilaterally cause excessive loss of life and property to the fishing vessel.

3.3 The navigation environment factor

In chapter 2, we already talked about Chinese fishing industry, which is the world's NO.1. Here, the author would like to highlight another marine environment point which is about mariculture. we can also get the figure about China's annual mariculture production distribution maps, the area whose average production is over 1000,000t located in Bo-hai sea, Taiwan strait, the Guangdong coastal waters(see Fig 3.2). Actually, there is a very busy maritime traffic in these areas, especially in the Taiwan strait, so to a certain extent, those large areas of fishing farms will cause navigation obstacle to merchant vessels.

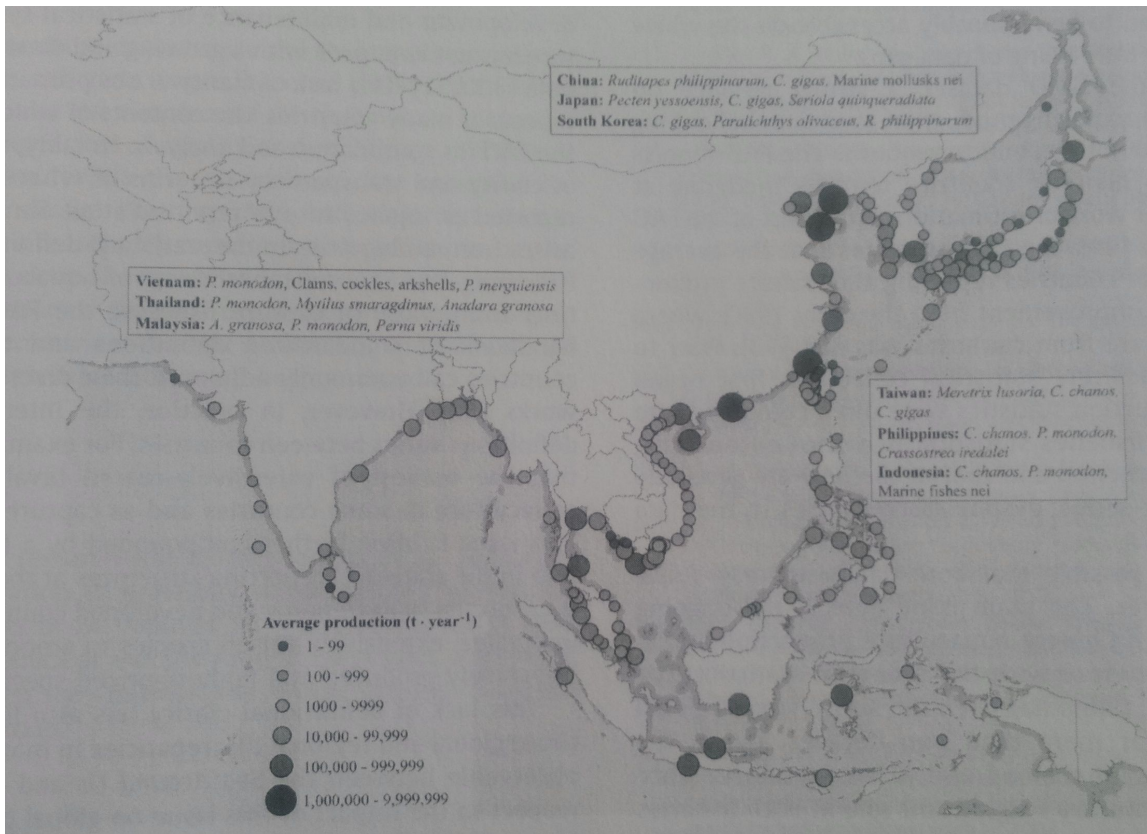


Fig 3.2: Mean annual mariculture production(t) in Asia from 2000to 2004, Inshore Fishing Area(IFA) is represented as a darker border along the coastline

Source: Campbell.B., Pauly, D. (2013). *Mariculture: A global analysis of production trends since 1950*, the international Journal of Marine Policy, 39,97.

The second one is fishing ground distribution overlapping with merchant vessel's accustomed course. China's coastal areas from north to south are mainly distributed in Shi-dao fishing ground, Da-sha fishing ground, Lv -si fishing ground, Zhou-shan fishing ground, Min-dong fishing grounds, Min-nan -Taiwan shoal fishing ground, the Pearl River Gulf fishing ground, etc. Here, taking Tai-wan strait as an example, there are Min-dong, Min-zhong, Min-nan and Tai-wan qian tan fishing ground which almost cover the hall strait, thus causing quite a lot trouble to merchant vessel navigators(see Fig 3.3).



Fig 3.3: The fishing ground distribution in Tai-wan strait

Source: Lin, G.X.(2015). *Research on reason pattern of merchant and fishing vessel collision in Taiwan Strait and associated countermeasures*, The Journal of China Maritime Safety, 2, 41.

If in the fishing season, a large number of fishing vessels rush for production due to traditional bad fishing habit of always adventuring to cross the bow of merchant vessels. At the beginning or end of the fishing season, a large number of fishing vessels go or return often gathering in crowds and groups, unattended or not arranging appropriate personnel on duty, not regulating the navigation lights and shapes, bright lights and other irregular deck lights, which may bring serious influence to the merchant ships' safe sailing.

The last one is the dense ship traffic flow. Large density of merchant ship traffic flow combining with many fishing vessels in China coastal waters with a variety of cross routes, especially from the mouth of the Yangtze River to the Strait of Taiwan waters, the Outer route, Eastern Road and the Middle route, the route for in-out of port, all of these route in a relatively complex crossing situation which is hailed as the "Oriental Bay of Biscay", objectively increase the difficulty for the ship's driver to analyze the ship's dynamics and judge the collision risk. Hence, this also gives more opportunities to the merchant vessel to collide with fishing vessel, because most of the big vessel navigators would not like to choose to collide with another big vessel which may cause more huge damage. That may be another reason for fishing vessels becoming the victim.

3.4 Management problems

3.4.1 Irregular fishing vessels

Part of the irregular fishing vessels (without certificates for ship and navigators), not in accordance with the provisions of the equipped with safety facilities and exercise of

violate the rules and regulations for legal fishing--all these phenomena have occurred from time to time, which means the government needs more supervision to control this situation. Objectively, in some areas without fixed fishing port, many fishing vessels usually disordered distribution in coastal and other merchant ports which made the coastal navigation difficult to the merchant ships.

There are some overlapping or missing for the supervision of fishing vessels. In China, marine fishing vessel inspection authority is in charge of fishing vessel inspection and certification, and the China Fishery Bureau takes the charge of the scene of a fishery law enforcement, but the safety of navigation is on the shoulder of the Maritime Safety Administration, which seems to be two parallel lines which can not level cross. Thus, for the management of the fishing vessels, the maritime safety administration sector is bloated.

3.4.2 Merchant shipping management

As for the merchant shipping management, current maritime administration because of their limited manpower and equipment, the investment for the intensity of on-site supervision is very limited, or too little ratio for coastal or marine supervision compared to the port supervision, only unilaterally posting penalties for violation of the accident ship, which is less helpful to accident prevention, so that kind of maritime supervision work needs more promotion. For the shipping company, they need more training and management to their on-board fleet, but most of the shipping company would like to choose more money not more management to their crew about responsible bridge team construction, good company safety culture, obtaining the latest ship's safety and technology status, etc.

3.4.3 Supervision technology

The current regulatory technology for fishing vessels is indeed limited, and there must be some on-site supervision to those who do not comply with the rules. With the application of AIS, it is indeed helpful to maritime departments for supervision of fishing vessels, but the present AIS supervision is mostly used in the investigation of the accident. And most of the time, many fishing vessels turn off AIS equipment for escaping the supervision of the maritime safety administration. In order to save costs, some of the old fishing vessels do not want to install AIS equipment. Therefore, currently, for fishing vessels management technology, still remain in the previous radio report, which cannot be timely positioned and identified by the supervision department.

3.5 The summary of key problems in the fishing vessel, its crew and administration department

3.5.1 Lower cultural level , the lower overall quality

Along with the development of the marine fishery industry, the number of fishing vessels and the crew is increasing, and also, the development of the economy provides more choices for people's employment. But due to the hard work and boring life in fishery production , coastal regions with a higher cultural level and living environment are usually reluctant to engage in fishery work, so, less practitioners received junior and senior middle school education, and primary school education accounted for the majority, and some are illiterate, leading to the low performance of knowledge level, cultural level and professional quality. A lot of the crew did not go through formal professional education, but through short-term technical training, taking the exam and getting a

certificate. Part of the crew of a fishing vessel is not in the awareness of collision avoidance, and the manipulation technique is poor, with only mechanical understanding to the international regulations for preventing collision at sea. So, they lack judgement ability to the risk of collision. Some fishing vessel's captains can not differ their rights and obligations while they are engaging in fishing or not, and they do not know what to do while the giving way vessel did not take evasive action or the stand-on vessel gave unreasonable avoidance action. Some collision cases happened directly due to the fact that the fishing vessels crew did not understand the lights, shapes and warning sound.

3.5.2 Intense labor and insufficient crew manning

China has implemented the system of fishing control, so the fishermen have lost production opportunities in the fishing moratorium. Once the moratorium ended, in order to increase revenue, 'some ships only rush for benefits, regardless of safety, day and night hard work, the crew's operating fatigue existed quite often. The number of fishing vessels increased with a relatively shortage in the qualified and experienced crew, many of the crew without training from the inland immediately working on the fishing vessel.

According to the investigation of the relevant maritime administration departments, some in the pelagic fishing vessels with only a captain and a chief engineer trained holding the certificate issued by the fishery supervision department, and the rest of the crew are not trained. One voyage always costs a few days, in the whole voyage round, the captain and chief engineer must not stop working, which is beyond the normal labor intensity, resulting in inevitable psychological and physical fatigue, and the consequences can be imagined.

So, some fishermen's focus on economic interests, illegal operations, insufficient manning, the neglect of safety, fatigue operation are another factor for the accidents.

3.5.3 Backward equipment, lack of proper maintenance

The technical situation of some fishing vessels is poor, and the lack of normal maintenance, especially the equipment of old wooden boat is simple and crude. Some navigation aids such as lights and shapes are irregular and displayed disobeying the rule. Due to the fishing vessel lights, display sizes are not standardized. In restricted visibility especially with large storms and other strong wave situations, the radar echo is weak, so the merchant drivers can not correctly judge the fishing vessel's intention. What's worse, the fishing vessel is not in accordance with the provisions of equipping with electricity (gas) whistle equipment or due to no regular use of the equipment causing erosion damage or other reasons, which also increases the probability of collision. According to statistics, every year, several collision cases happened due to the failure of the fishing vessel whistle, which can not be timely sounded for a signal to avoid accident.

3.5.4 Different ship management system leads to difficulty in communication and coordination

The supervision responsibility to Chinese fishing vessels and merchant ships respectively belongs to different departments. The Ministry of maritime transportation departments supervises the merchant shipping safety, while those in charge of the supervision and administration of the safety of fishing vessels are of the fishery supervision department under the Ministry of agriculture. Both the ship management

laws, regulations and technical standards are considerably different, such as the in-out port procedures, safety inspection standards, especially on the crew certificate issuing procedures. The merchant ship management gradually keeps in line with international standards, perfecting the management system by relatively stringent requirements. The maritime administration is of a vertical(Central organization) management system, while the fishery department is of local government management, so the information exchange between the two systems is not so smooth, causing also difficulty or obstacle in accident investigation, search and rescue area. So, the merchant shipping and fishing vessels are managed by different departments and the relevant laws and regulations are not perfect which is the objective factor to the collision accidents.

Chapter 4

Suggestions for preventing collision between fishing vessels and merchant ships

4.1 Strengthening the control of human element

4.1.1 Selection of proper personnel for culturing qualified seafarers

Seaman is a special occupation, which needs special qualities. The mental quality, physiological adaptability, strength of the technical quality are the indexes of the quality of a crew, and can not be ignored.

To reduce human error for decreasing the occurrence of collision accidents, we must be in advance to choose the proper person who will become the navigator.

4.1.1.1 Psychological quality of crew

different people are suitable for different industries. As for the crew to adapt to the work on the ship, their psychological quality should also meet the requirements.

Psychological quality includes many aspects such as ideological quality, professional morality, temperament, personality, mood, etc. In choosing seamen, first of all it should be to ensure that it is a person with normal psychological states. If the boat driver is mentally disordered, the consequences are unimaginable; Secondly, consideration should be given to whether it is a loyal and dedicated person; Thirdly, we should consider his personality---whether resolute and capable, or indecisive, etc. The good psychological quality is the top priority in choosing of seafarers.

4.1.1.2 Technical quality of crew

Technical quality mainly includes the mastery of the international regulations for preventing collision at sea, emergency measures and navigation technology and ability in special conditions. Both drivers and sailors must have certain professional theoretical knowledge and practical ability to post on duty. The good technical quality is the essential condition for choosing crew.

4.1.2 Quality cultivation of young crew members

From the years of statistical data (CSF,1996, pp43.59), the number of crew of a fishing vessel undertaking professional training or education before going on board are relatively small, less than 35%; In recent years, a large number of technical schools, colleges or universities strive to culture of fishing professionals, but those graduates who

would like to work on board fishing vessel are in a relatively small number, about in the proportion of 20%. In order to improve the quality of the crew, some corresponding measures must be taken:

First, the investment of the fishery company, and entrust a high school to develop the professional and technical personnel for their company. In school education, the tendency of subject oriented education should be weakened, and the principle of vocational education should be strengthened to meet the position's requirements. Which kind of students is suitable for working on board? It depends on the psychological quality, and then, the cultural and professional knowledge of the systematic training and education, to improve the professional skills, knowledge structure, adapt to the requirements.

Second, it is recommended that the relevant departments formulate the fishing vessel personnel qualifications, the pre-job training for young crew and by relying on fulfilling the **STCW (78/95)** convention , based on “ the people's Republic of China Maritime Education and training quality management rules”, to establish quality management system, improve training standards and strengthen the monitoring of the training institutions. In training, it is not only imperative to carry on the training of professional and technical knowledge, but also for the general culture quality training, only when they have a high cultural quality, can they enhance the understanding of professional knowledge, and quickly improve their ability of practical operation(Wang, 2001, P.21).

4.1.3The re-selection and cultivation of crew in the post

If an individual or part of crew station with congenital physical defect or disease who can not work normally or with risks hindering the work, he should be advised to change to another industry. Practical experience has shown that a crew member with mental

disorder or other abnormal performance, should also be advised to abandon the sailing job. Only in this way can we effectively reduce the risk of accidents.

At present, the cultural quality and the technical level of the fishing vessel crew is quite low, which can not suit the need of fishery development. In order to improve the quality of the crew, the government or shipowner or the operator should organize various forms of training, and the post crew training should be in the performance of “**the Quality Management Rule of the Crew Examination, Assessment and Certification of the people's Republic of China**”, the implementation of "quality system certification" system. The education agency should emphasize the main training lines of adapting to the post ability, from the crew cultural conservation, psychological quality to technical quality to improve the knowledge structure, enhance the quality of the crew thought, professionalism and enhance understanding of navigational rules and regulations of the actual operation ability in using the navigation instrument, and only in this way, can the quality of the crew be improved, can human error and the opportunity of occurrence of accident be reduced.

4.1.4 More care for the merchant vessel crew in the post about their psychological health

As we all known, due to the hard working and living environment, dull, monotonous life, tense working condition, etc., sailing life can change the seaman a lot in the psychology, Some of the crew will inevitably have a psychological problem, which may seriously damage the crew's physical and mental health and safety of the ship, so the company, the ship and the individual must attach great importance to ease their psychological problem.

Firstly, appropriately to shorten the period for the crew working on board. Normally, one contract period for crew on board is 9 months, what's more, during the officer shortage, that would be prolonged to 11 months or 1 year. Actually, Crew by a period of rest, just came on board to waded into the work, but after 3 to 4 months, entering a period of fatigue, thought easy to lax, response and action will become dull. So if reasonably to shorten the period of on board for crew will relatively reduce the accident occurrence.

Secondly, the company according to the shipping situation, an appropriate increase in the wages of crew, as far as possible to ensure that the crew in the region have better standard of living, to improve crew professional identity sense and work enthusiasm.

Thirdly, companies increase investment of marine cultural and recreational activities, such as opening the electronic mail, satellite TV installation, equipped with fitness equipment and books, to enrich crew amateur cultural life, it will also enhance crew constitution, relieve fatigue, improve work efficiency.

The last but not the least, the company should set up a specialized research of seafarers mental state department, stepping up to study the ocean seamen mental activity subject, guiding ships to carry out crew psychological and behavioral adjustment(Wang, 2013,P.30).

4.2 To improve technical status of fishing vessels

According to statistics, by the end of 2011, China has all kinds of 1,069,600 fishing vessels, but in such a large scale of fishing vessels, marine fishing motor vessels only occupy 297,000. What's more, the wooden fishing vessels account for more than 85%, and 95% of the boats are less than 24 meters in length(Xiao,2011, P.9). According to preliminary estimation, China's fishing vessel technology and equipment has lagged

behind the developed countries for nearly 40 years, and the level of modern shipbuilding industry technology is backward for nearly 30 years, according to the Chinese steel marine vessel safety evaluation results (see Chapter 3): less than 10% samples boats satisfy the "Fishing Vessel Convention" requirements, and the overall performance of the Chinese fishing vessels and equipment is as follows: hull corrosion, poor ship layout and structure integrity and safety protection of machinery equipment, a serious lack of anti pollution equipment, inadequate fire fighting and radio equipment, not guaranteed lifesaving life-saving equipment for emergency escape. To a certain extent, China needs to promote the modernization of fishing vessel equipment as soon as possible.

4.2.1 The establishment of inspection and supervision system for fishing vessels

The inspection and supervision system of the fishing vessel plays an important role in the establishment of a scientific, standardized and efficient unified coordination and supervision management system, and in improving the management level of the fishing vessels inspection work. The system fully embodies the guiding ideology of "unified leadership, classification management, classification responsibility", to carry out administration according to law and the concept of scientific development, the fisheries policies, laws and regulations, inspection and management regulations, inspection certification program and operation requirements through various functions of the system, which can not only promote the informatization of the fishing vessel inspection management in China, but also standardize the management of fishing vessel inspection, for the full implementation of the fishery informationization of ship management and laying a solid foundation. This set of management system is to enhance the ocean fishing vessel inspection and certification of efficiency, enhance the ocean fishing vessel

inspection and management level, promote the ocean fishing vessel inspection quality, standardize and improve the testing and certification program, and to strengthen the coordination, supervision and management.

4.2.2 To strengthen the international exchange and cooperation, to improve the ability of implementation of “Fishing Vessel Convention”

China as a class A member in the international maritime organization, has a pivotal status in the international ship safety management. After the reform and opening-up policy, along with the development of the inspection of fishing vessels, China gradually strengthened the close contact with the international maritime organization, and actively participated in the international fishing vessels’ safety affairs. Actually, China has been already involved in these affairs, such as the formulation of many positive and reasonable proposals presented in the “1993 Torre Molinos Protocol”(Fishing Vessel Inspection Bureau, 2009, P.16), in which active participation in the research work of international standard for the safety of fishing vessels was involved. So, in the following years, it is necessary to continue strengthening the exchanges and cooperation with neighboring countries and regions, in ship inspection business, promote regional ship safety management, the healthy development of the technology of ship. Just as China and South Korea established a regular exchange of visits and exchange mechanisms, and the two sides have signed a cooperation letter of intent in the fishing inspection system, the fishing inspection technology, fishing inspection areas for special seminars, and providing information for each other to cooperate.

4.2.3 To reform and innovate the inspection management system for small fishing vessels

The small fishing vessels account for nearly 90% in the total fishing vessels, and the ship structure and technical status differ, and security risks exist very prominently. In order to strengthen the inspection and management of the fishing vessels, the fishing vessel inspection bureau should put forward the principle of “unified leadership, classified management, graded responsibility”. The main views are as follows:

The first is the reform and innovation of small fishing vessel inspection system, combining on-site inspection with the examination of the shipowner “technical conditions of the ship security statement” mode; The second is scientifically formulated small fishing vessel inspection technical regulations, mainly by national legislation to establish the fishing vessel technical regulations, also considering the local matching principle; The third is to reform and improve the small wooden fishing ship design and build enterprise qualification management approaches; The fourth is to reform and improve the small fishing vessel with provisions of marine product inspection.

4.3 To improve navigational environment

4.3.1 The route of merchant vessel should be considered to avoid the risk of the collision with fishing vessels. In the waters of implementing TSS navigation, the passage should be in accordance with traffic lanes, and in other waters navigation, the vessel should be in line with the seafarers' habit of the accustomed channel, appropriate to stay away from the shore of navigation, to help avoid or reduce possibility of encountering dense fishing vessels. Therefore, as long as the environment and conditions permit, the route should not be too close to the offshore side. To advance the familiarization of the voyage involving going through the fishing area and its surrounding environment, marine weather, tidal current situation, before entering the fishing zone, ships should be

carefully observed, as far as possible to avoid entering the intensive fishing place. Near the intensive fishing area, we should notice the engine room to stand-by for slowing down. Especially in the case of poor visibility, we should strengthen the lookout, request the captain to steer command and control the ship.

4.3.2 At any time we should keep a proper lookout, visual, auditory and adapted to the prevailing circumstances and conditions of all effective means, so as to make a full estimate of the situation and the risk of collision. If in poor visibility or complicated situations, increasing the lookout persons should be considered. If necessary, we should arrange personnel to the bow or other places to keep proper watch.

4.3.3 Regardless of the state of visibility, merchant vessels in the coastal fishing areas should maintain a safe speed to take proper and effective action to avoid collision, and adapted to the prevailing circumstances and conditions within a distance to stop the ship. Furthermore, the Radar equipment should be switched on in advance, with far and near range used alternately to detecting fishing vessels, and with a telescope observation to check the detection performance of radar. Always keep in mind that, in order to take evasive action, meeting the requirements of "early, large, wide, clear " .

4.3.4 Reasonable planning of Traffic Separation Scheme and Overall Route Plan in China coastal waters

Traffic Separation Scheme(TSS) is a point concept(consider the special water area as an point compared to the overall coastal waters) for the coastal high-risk waters. And the overall route planning is the concept of line. Coastal navigation waters route is for ships in and out of the coastal port waters(including ports, anchorages, dock and berth waters, import and export channel), also for other vessels passing by. The route planning can secure separation in the opposite direction of vessel traffic flow of in and out of ports, or safe separation to large vessel's traffic flow with small boats', and guide ships to safely pass through the dense fishing area, offshore and marine traffic control area. Overall ship

route planning and Traffic Separation Scheme are an organic whole, complementary to each other.

Actually, there is already a plan for the overall ship route planning within the china coastal waters, taking Bohai sea water as an example **Table 4.1** shows some detailed information about route planning in this area, and the sketch map is in **Fig 4.1**.

Table 4.1: the overall route plan for Bohai Sea and eastbound waters

No	Water area	Route category	Name of route	remarks
1	Bohai Sea and eastbound waters	Deep water route	LaoTieShan channel - Caofeidian	Width 1000m
2			LaoTieShan channel - Yingkou xianren island	Width 1000m
3		Main road two-way route	LaoTieShan channel —Tian jin	Width 6 NM
4			LaoTieShan channel —Qin Huan dao	Width 6 NM
5			LaoTieShan channel —North of Bohai sea	Width 6 NM
6			Changshan Channel - Tianjin (westbound, eastbound)	Width 3NM (each bound)
7			Chengshan Jiao - LaoTieShan channel	Width 6 NM
8			Chengshan Jiao - Changshan channel	Width 4NM
9			Dalian - Yantai	Width 3 NM
10			Recommended route	Chengshan Jiao - Dalian
11		Branch	North of Bohai sea—Jinzhou	Width 3 NM

12		two-way route	North of Bohai sea—Yinkou	Width 3 NM
13			Qin huang dao—Tianjin	Width 3 NM
14		Branch two-way route	LaoTieShan channel ---Huanghua port	Width 3 NM
15			LaoTieShan channel—Jingtang port	Width 3 NM
16			LaoTieShan channel—Yantai port	Width 3 NM
17			Dalian port—LaoTieShan channel	Width 3 NM
18			Changshan Channel—Huanghua port	Width 3 NM
19			Laizhou Port—Changshan Channel	Width 3 NM
20			Longkou port—Changshan Channel	Width 3 NM
21			Dandong port—Dalian port	Width 3 NM
22			Dandong port—Chengshanjiao	Width 3 NM
23			Dandong port—Yantai port	Width 3 NM

Source: Ministry of transport of the people's Republic of China, (2011). *The overall ship route planning within china coastal waters*, pp. 5.6, Beijing, China, Author.

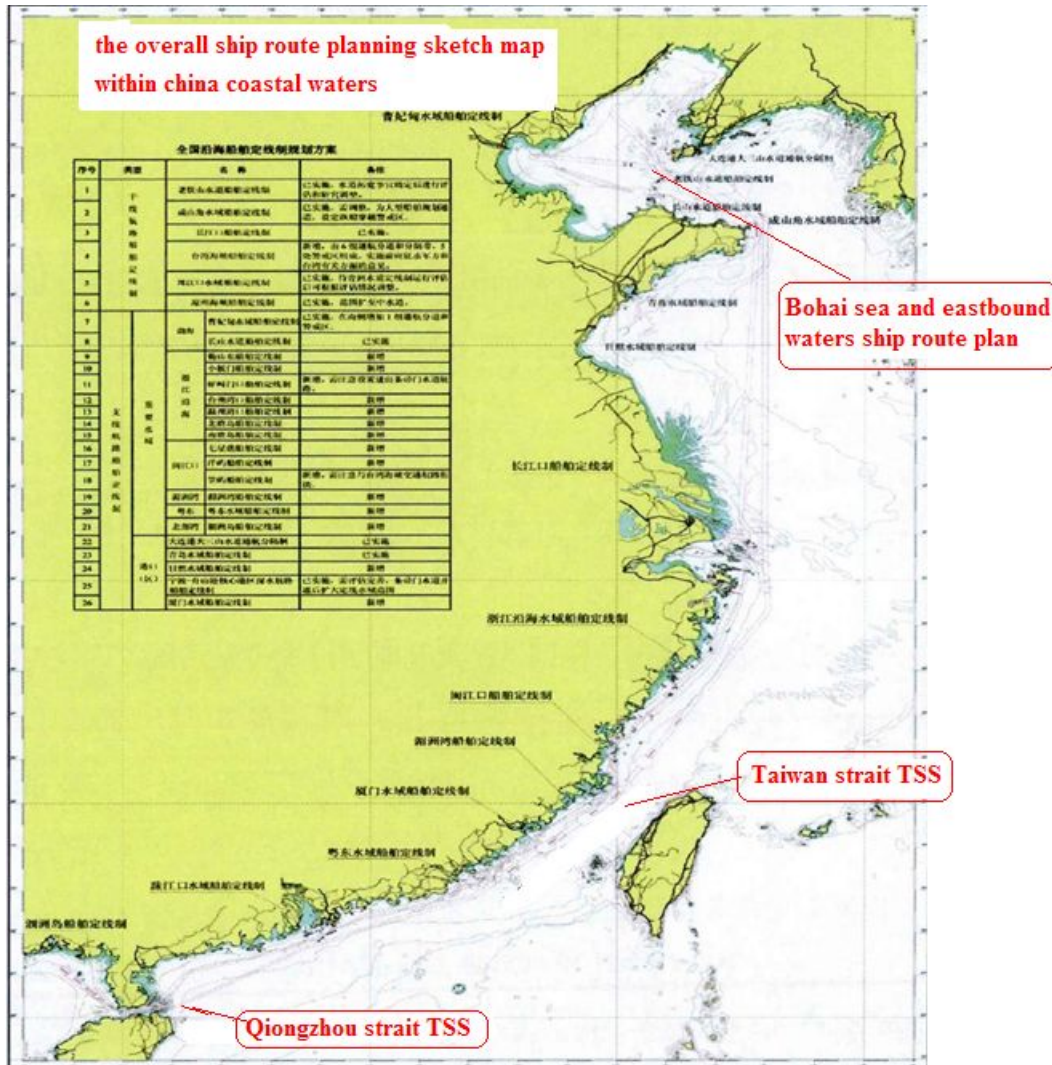


Fig 4.1: The planning and design schematic of nation's coastal ship routing system
 Source: Ministry of transport of the people's Republic of China, (2011). *The overall ship route planning within china coastal waters*, p.11, Beijing, China, Author.

So, if China can implement the overall ship route planning measures, that will largely improve the navigation environment based on the navigators obeying the plan accordingly, which will also partially decrease the opportunity of collision accidents.

4.4 To improve the safety management regulations of the merchant and fishing vessels, and upgrade the means of technical management

According to the Maritime Safety Law of the people's Republic of China, Article 48, national fishery administration and fishing port supervision and management mechanism, in the fishing port waters, shall exercise the functions and powers of the competent authorities of the provisions of this law, be responsible for the supervision and administration of traffic safety, and for the investigation and handling of traffic accidents between fishing vessels in coastal waters. The concrete measures for implementation shall be formulated by the State Council separately. It seems that the fishery administration department only takes charge of the fishing vessels safety in the fishing port waters, others are the China Maritime Administration's affair. But actually, the MSA cannot manage that affair; Hence, it seems there is no other department which is responsible for supervising the safety of fishing vessels while they are out of fishing port. We should clarify the safety management for fishing vessels.

4.4.1 Improve the legal terms, improve the production responsibility of the fishery safety

The competent departments shall establish documented standard operating procedures, especially in some key operations and work on the need to establish a sound legal system, for example, shipbuilding, ship drawings must go through the approval of the national authorities to establish safety supervision and management institutions and government agencies at all levels, improve the fishery safety management system,

perfect safety production system of administrative responsibility, ensure the effective implementation. and to strengthen the relevant legal rules of training and learning on the navigator, earnestly implement the responsibility system for safe production, supervise the shipping company to take effective measures to strengthen internal security management, to link the fishery authorities economic interest with the fundamental fishery safety management, and enhance the sense of emergency and responsibility of the relevant personnel, at the same time, in case of serious safety accidents, the main persons in charge shall be blamed. And after the accident, the need for timely summary, which can help the related department seriously find deficiencies existed in the mechanism for disaster prevention and emergency plan, strive to improve ability and level for handling various safety accident.

4.5 Some suggestions for the problems of the fishing vessels, crew and their management

4.5.1 To rationalize the division of the jurisdiction of the fishing vessels, and strengthen the unified leadership and management of the fishing vessels management.

The first is to clear the ship inspection, registration, crew management division of authority, and the Ministry of agriculture should provide guidance division standard for them, try to make the same fishing vessel of different link management implemented by the same level of fishing vessels management departments. Currently, it can be launched a pilot project on the pelagic fishing vessels, from the construction of fishing vessel, approval of the project, name of vessel, inspection, registration, fishing license etc, link management authority all unified to agriculture department or bureau level institutions.

The division of management authority of other fishing vessels is complex, and can be classified and processed on the basis of investigation and argumentation.

The second is the unified leadership and management to strengthen the management of fishing vessel, the fishery administration departments at all levels in accordance with the law, the principles of convenience, efficiency. Doing more research on set-up and functions of local fishery department, fishing port supervision and boat inspection agencies, as far as possible by one leader in charge or by the designated offices for three unified coordination mechanism to management of fishing vessels; fishery or fishing port supervision and inspection agencies in the introduction of fishing vessels management regulations, must do well with the other two branches of coordination and communication work, and solicit opinions, to avoid contradictions; In the implementation of the fishing vessel management, for fishing certificate not only to strictly perform the functions, but also complement each other, mutual supervision, to prevent the introduction of the policy of mutual separation or the loop-holes.

4.5.2 The establishment of long-term mechanism for the supervision of fishing vessels.

To take measures to establish a long-term and effective supervision mechanism to adapt to the characteristics of fishing management is the key to implementing the scientific concept of development, and to the fishing management. The first is to establish the fishing network management system as soon as possible, using modern science and technology, fishing vessels are carried out examination and approval, a permit, query, statistics, timely updated data of network management, accurate knowledge of the fishing vessel's dynamic status. The second is to make scientific setup for institutions

and manning which adapts to fishing management task in the specific region, with full management power, enhancing the boats boarding inspection and port visa rate. At the same time, strengthen the fishing management personnel in accordance with the law of administrative and professional skills training and education, improve the administration according to law and case level, such as the pre-job training for the new joiner, the related laws, regulations and business knowledge training for the on post staff. The third is to strengthen the on-site supervision of fishing vessels at sea, to improve the effectiveness of law enforcement to the existing fishing vessels. To establish China's Exclusive Economic Zone (EEZ) management tasks and adapt to national fishery law enforcement fleet, in weather permitting conditions, at least in important fishing seasons and before and after a period of fishing moratorium time to ensure that fisheries management ships' effective cruising range can cover all the common fishing zone. The purpose is to study the effective implementation of measures for illegal fishing and other violations of laws, safeguard the normal operation order and the legitimate rights and interests of fishermen.

4.5.3 The simplified fishing management procedures, to prevent the emergence of “no certificates” fishing vessels.

Conducting a comprehensive clean-up to existing fishing vessels management laws, rules and regulations and normative documents, according to fishing management link, sorting classification for the various laws and regulations in the management of fishing vessels which are scattered, and clear fishing management institutions in each link of the division of functions and procedures for, make the specification of the fishing vessels management process and in a unified national implementation. The second is the

implementation of 'one window' service or 'one station' type accreditation, to simplify the management procedures. The third is to straighten out the annual inspection time on fishing licenses and vessel certificate. By clearly defining that annual inspection for vessel certificate should be ahead of fishing license within a year.

4.5.4 Strengthening and regulating the management to the main engine of fishing vessel.

Fishing vessel inspection agencies are to carry out main engine products governance action, considering the fact that the annual inspection certificate, a comprehensive clean-up main engine real power and inspection certificate contain that the power does not match the nameplate. The authority should accord to the law to strengthen the supervision and administration to production enterprises of vessel engine, to stop the phenomenon of main engine nameplate from the source, and the Fishery department, fishing vessel Harbor Supervision, Fishing Vessel Inspection Agencies should strive to strengthen supervision in certificate issuing.

4.5.5 Measures should be taken by maritime safety supervision departments

4.5.5.1. Strengthening information sharing between Maritime Administration Department and Fisheries Department.

While maritime authorities announce the anchorage, safe operation zones, no sailing zones, traffic control area, intensive navigation areas, the navigation conditions restricted area, traffic lanes, separated zone, the coastal navigation zone, the warning area for navigation safety relevant provisions, they should inform the fishery administrative department, and the fisheries authorities will also inform the maritime

administrative department of fishing vessels operating region and other relevant information in a timely manner(Yang, 2013, P.223).

4.5.5.2. Try to avoid merchant route overlapping with a fishing vessels' routes.

Maritime sector can command the merchant vessel to pass through on the planned timetable to control the traffic. And Fisheries sector in determining the moratorium, in addition to giving the increasing the output of the fish and protect marine ecology, marine fisheries development functions, but also taking proper consideration to China's coastal sea fog and collision characteristic of distribution, and the early implementation of fishing policy.

4.5.5.3 Further strengthening the management to fishing vessels.

It is necessary to highlighting the inspection and certification of fishing vessels, registration, arrival or departure visas and other related aspects of the safety closely related supervision and inspection, and improve the fishing vessel inspection and examination rate, and ensure that the fishing vessel has the statutory safety of navigation equipment, effective technical certificate, fire and other life-saving appliance safety in good, readily available state, in accordance with the standard quota manning of adequate qualified crew members to ensure ship safety .

Chapter 5

Conclusion

Although there are multiple objective reasons for merchant ships and fishing vessels collision accidents within China's coastal waters, yet as long as the joint efforts of all parties, this situation is expected to change. Therefore, we should improve the threshold for access to the fishing vessel navigator, strengthen the fishing vessel driver safety education and business training, improve the overall quality of the fishing vessel officer, and strictly implement the provisions of the international regulations for preventing collision at sea, to strengthen legal education in the crew of a fishing vessel and try to change the fishing vessel crew of the conservative consciousness and the bad driving habits; improve the merchant seamen education and training content, enhance the sense of a merchant seaman social responsibility education. The appropriate way to increase the "fishing vessel navigating, operating characteristics" and "attention matters for avoidance of fishing vessels", raising the awareness of risk of merchant drivers navigating through intensive fishing area by actual case analysis, etc. To improve the social responsibility of the driver of a merchant ship. Another perspective is to maintain a relatively clear navigation environment by the maritime administration department and fishing vessel supervision authority, to decrease the possibility of the happening of merchant and fishing vessel collision accident.

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