臺灣海域船舶事故態樣分析

Research of vessel accident around Taiwan sea area

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壹、前言

臺灣位於西太平洋航線之樞紐，平均每天至少有超過300艘以上的商船在臺灣周遭海域航行，再加東北角、新竹、澎湖、琉球等外海，向來是臺灣所謂四大高度航行風險區海域，發生海難的機率相對增高。以2007年為例，依據行政院海岸巡防署公佈海事統計資料，共有海難救助船隻221艘[1]，經分析以機械故障、擱淺及失火為主要原因，其中在臺灣周遭海域內所發生之海難艘數，機械故障佔54.30%，擱淺佔 12.22%，失火佔 8.14%[2]。

船舶事故之發生，輕者將造成船舶及貨物之損失，重者可使航海人員或乘客喪失生命，一旦船體破裂，也可能引起燃油或貨油外洩，造成我國海洋環境污染及生態浩劫。為瞭解臺灣周遭海域發生船舶事故之各類型船舶與事故發生之海域分布情形及原因，經蒐整臺灣周遭海域 2005 年至 2007 年船舶事故事故資料[3] 加以分析，希望能提供相關單位做為防處海難發生之參考。

表1 2007 年救難統計－遭難船隻統計 單位：艘

事故原因	總計	漁筏	舢舨	漁船	商船	其他
總計	221	69	25	104	11	12
天災	8	1	2	4	1	-
機器故障	120	42	21	51	4	2
碰撞	3	2	-	1	-	-
漏水	4	1	-	2	1	-
擱淺	27	6	1	17	3	-
失火	18	3	-	14	1	-
較擺	11	2	-	7	-	2
其他	30	12	1	8	1	8

資料來源：行政院海岸巡防署96年海巡統計年報。

Part I. Preface

Taiwan situated on core location of west Pacific shipping lines, over 300 merchant vessels sail through waters around Taiwan daily. Open seas around northeast coast of Taiwan, Hsien-Chu, Penghu and Ryukyu Islands, those are 4 risky sailing areas with relatively higher shipwreck rate. According to statistics of Coast Guard Administration, Executive Yuan in 2007, there were totally 221 shipwreck vessels[1] around Taiwan sea area. Major reasons of shipwrecks are Mechanical failure, grounding and fire. For all the shipwrecks occurred around Taiwan waters, 54.30% caused by Mechanical failure, 12.22% caused by grounding and 8.14% caused by fire.[2]

When shipwreck occurs, it may cause loss of vessel or and cargo, even loss of human life. Once hull of the ship ruptured, leaked fuel or heavy oil may cause serious marine environmental pollution, even ecological catastrophe. In order to understand locations and causes of shipwrecks occurred around Taiwan waters, we gathered and analyzed information of shipwrecks from 2005 to 2007, and hope to provide consultation for the authorities about how to prevent and deal with shipwrecks.

貳、臺灣周遭海域船舶活動分布情形

一、商（貨）船航行之海域：臺灣地區共有基隆、臺中、高雄、蘇澳和花蓮五個國際港口，故事故大多聚集在商船的航線分布。

二、漁船活動之海域：由於臺灣海峽水深均在200公尺以內，屬於大陸礁棚，為各類魚種繁殖生長的良好場所，因此，一年四季均為漁船作業的時機。故漁船主要穿梭於漁港及漁場之間，並在漁場內迂迴捕魚。

三、娛樂漁船或兼營娛樂漁船：水上娛樂活動海域，許多縣市都有規劃提供相當多地點能夠提供民眾做水上活動使用。根據資料中顯示目前臺灣的船釣港地區共有13處，且已完成登記為娛樂漁船或兼營娛樂漁船的已有 225 艘。

參、發生事故船舶類型及分布

臺灣海域是世界公認危險海域之一，為瞭解臺灣周遭海域發生船舶事故之各類型船舶與事故發生之海域分布情形及原因，經蒐集彙整臺灣周遭海域2005 年至 2007 年船舶事故報表資料4，藉由電腦程式描繪出各年度發生船舶事故類型、事故原因及海域並加以分析。

本文將船舶分為膠筏、舢舨、漁船、商船、貨船等五種類型，統計並加以比較分析發生之事故型態 (如表2)。

表2 2005 年至 2007 年各類船舶發生事故數統計表

年度	船舶分類					單位：艘
	R：膠筏	S：舢舨	D：漁船	M：商船	C：貨船	合計
2005	98	26	288	8	44	464
2006	100	27	295	12	49	483
2007	96	14	296	10	37	453
合計	294	67	879	30	130	1400

資料來源：行政院海岸巡防署。

一、漁船類：計有879艘，佔62.79 %之多，以基隆、淡水海域、澎湖海域和南部嘉義至高雄沿海為密集、最高地帶，向北延伸往日本方向及向南往菲律賓延伸的海洋地帶也是許多漁船發生事故的區域，因該地區為漁船活動之海域，加以臺灣海峽水深均在200 公尺以內，屬於大陸礁棚，為各類魚

Chart 1 Total shipwrecks occurred in 2007 Unit: Vessel

Cause of Shipwreck	Total	Fishing raft	Sampan	Fishing boat	Merchant vessel	Other vessel
Total	221	69	25	104	11	12
Natural disaster	8	1	2	4	1	-
Mechanical failure	120	42	21	51	4	2
Collision	3	2	-	1	-	-
Leakage	4	1	-	2	1	-
grounding	27	6	1	17	3	-
fire	18	3	-	14	1	-
Propeller problem	11	2	-	7	-	2
Others	30	12	1	8	1	8

Source: 2007 annual report of Coast Guard Administration, Executive Yuan

Part II. Vessel Activities around Taiwan waters

I.Merchant vessels sailing waters: there are five international harbors in Taiwan, including Keelung, Taichung, Kaohsiung, Suao and Hualien. Therefore shipwrecks mostly aggregated alongside shipping line of merchant vessels.

II.Fishing boats operation waters: most areas within Taiwan strait are 200-meter-depth continental shelf and is suitable environment for variety of fishes. Fishing boats usually go b ack and forth between fishing ports and fisheries, and fishing alongside circuitous routes all year.

III.Full-time or part-time recreational fishing boats: mostly operate in recreational waters. Many counties in Taiwan mark out sites for marine recreation. According to statistics, 13 fishing port areas are designated for fishing boats, and 225 ships have been registered as full-time or part-time recreational fishing boats.

Part III.Location and vessel type of shipwrecks

Waters around Taiwan are considered as risky areas for sailing. In order to understand location of shipwrecks and vessel type among them, we gathered and analyzed information from 2005 to 2007. We draw a location chart of shipwrecks based on accident types, causes and sea areas and analyze the result by computer program,

種繁殖生長的良易好場所，因此，一年四季均為漁船作業的時機；而較少漁港分布的東部地區，大多事故則分布在宜蘭蘇澳海域及花蓮近海海域，漁船主要穿梭於漁港及漁場之間，並在漁場內迂迴捕魚。而漁船事故中機械故障類發生最多也遍佈各區，探究原因是船舶出海期間，必須仰賴主機等各項機械設備，每天 24 小時不間斷地正常運轉，當其中任一項設備發生故障時，船舶將失去操控能力因而引發事故。（如圖1~2）。

We divided shipwrecks into raft, sampan, fishing boat, merchant vessel and cargo vessel, calculated and analyzed shipwreck types.

Chart 2 shipwreck analyze based on type of ships

Year	Type of Ships					Unit: Vessel
	R：Raft	S: Sampan	D: Fishing boats	M: Merchant Vessel	C: Cargo Vessel	Total
2005	98	26	288	8	44	464
2006	100	27	295	12	49	483
2007	96	14	296	10	37	453
Total	294	67	879	30	130	1400

Source: Coast Guard Administration, Executive Yuan

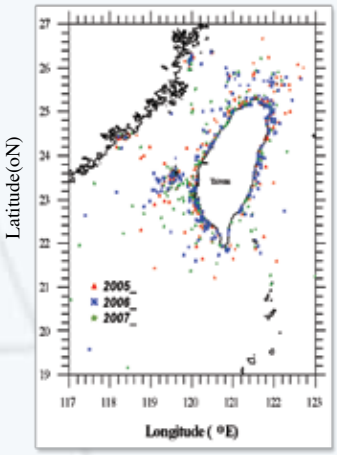


圖1 2005-2007年漁船發生海上事故分布圖
Drawing 1.Location of fishing boats shipwrecks between 2005 and 2007.

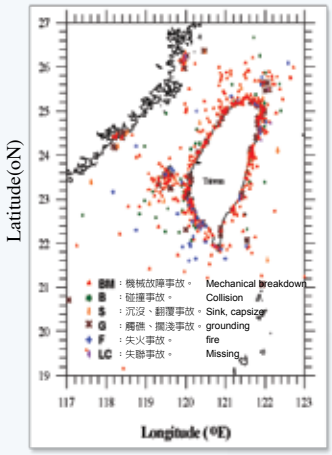


圖2 2005-2007年漁船發生海上事故類別分布圖
Drawing 2. Shipwreck type between 2005 and 2007.

I.Fishing boats: 879 shipwreck vessels encountered, percentage among is 62.76% of total shipwrecks, first place among all vessels. Shipwrecks of fishing boats occurred mostly among coasts of Keelung, Damshui, Penghu, Chiayi and Kaohsiung. Also stretched north to coat of Japan, and south to Philippine. Those areas are operation areas of fishing boats, and 200-meter-depth continental shelf which is suitable environment for variety of fishes. Therefore it's good for fishing through out the year. In the eastern part of Taiwan, shipwrecks occurred mostly alongside coasts of Hualien and Suao.

二、膠筏類：計294艘次佔21%居第二，因其大都以近海養殖作業為主，故發生都在近岸3海浬之區域內，且以南部雲、嘉、南沿海地區為密集地帶，東部地區亦有不少的養殖漁場以致時有事故發生；另外，沿海許多膠筏僅使用舷外機做為動力，雖然方便但也容易故障，因此機械故障亦為膠筏海上事故主要原因（如圖3~4）。

Fishing boats usually go back and forth between fishing ports and fisheries, and fishing alongside circuitous routes. Therefore locations of machinery breakdown of fishing boats suffuse within above areas. Reason for that is when fishing boats in operation relied on mechanical parts such as engine to function normally. When one of the major facilities breaks down, the ship will lose maneuverability, and shipwreck might occur. (See drawing 1 and 2)

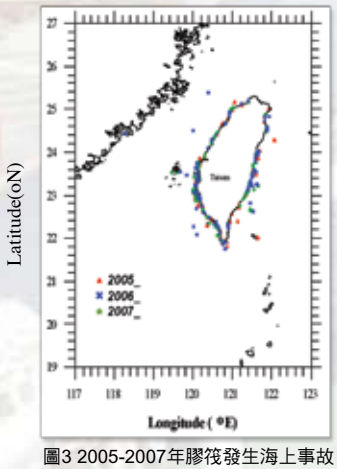


圖3 2005-2007年膠筏發生海上事故分布圖
Drawing 3. Location of raft shipwrecks between 2005 and 2007.

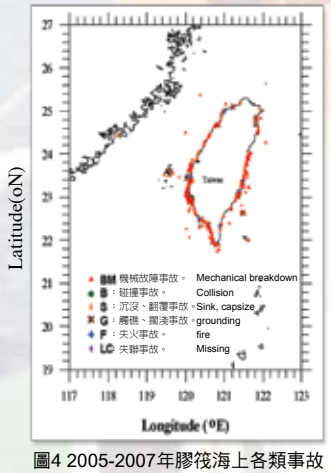


圖4 2005-2007年膠筏海上各類事故分布圖
Drawing 4. Raft shipwreck type between 2005 and 2007.

三、貨船類：計130艘次佔9.29%位第三，臺灣地區共有基隆、臺中、高雄、蘇澳和花蓮五個國際港口，所以事故大多聚集在貨船航線水域較多，且貨船事故大多是因機械故障所引發，其次為行駛不慎觸礁或擱淺，甚至發生沈沒事件。（如圖5~6）。

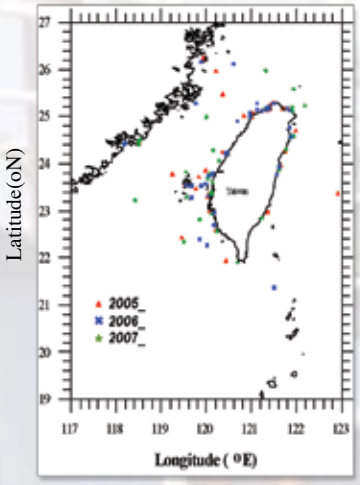


圖5 2005-2007年貨船發生海上事故分布圖

Drawing 5. Location of cargo vessel shipwrecks between 2005 and 2007.

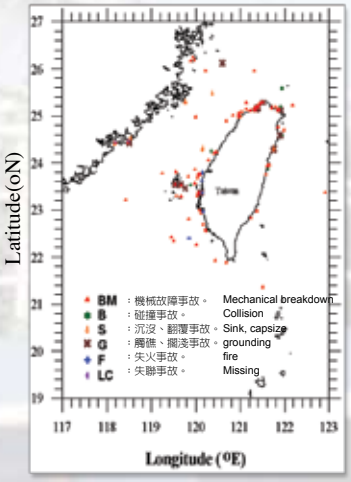


圖6 2005-2007年貨船海上各類事故分布圖

Drawing 6.Cargo vessel shipwreck type between 2005 and 2007.

II.Raft: 294 vessels encountered shipwrecks; percentage among total shipwrecks is 21%, second place among all vessels. Since raft mostly used in costal waters for cultivating operations, raft shipwrecks occur usually within 3 nautical miles off coast, and concentrated in coasts of Yunlin, Chiayi and Tainan. Some raft shipwrecks occur alongside eastern coast of Taiwan, due to numbers of cultivation sites located in that region. The outer engine equipped by raft seems easy to use, but also has a higher rate of malfunction. Therefore engine breakdown is the main reason for raft shipwreck.

四、舢舨類:計67艘次佔4.79%，亦都以近海養殖作業為主，與膠筏類相同，故事故發生地都在離岸較近之區域，以雲、嘉、南沿海地區及北部台北縣、基隆一帶為密集區域。（如圖7~8）

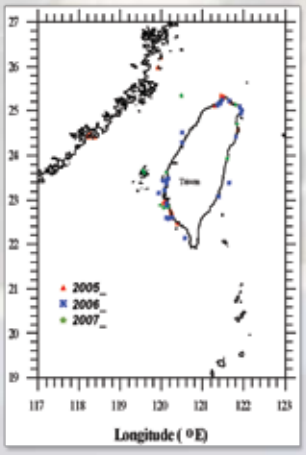


圖7 2005-2007年舢舨發生海上事故分布圖

Drawing 7. Location of sampan shipwrecks between 2005 and 2007.

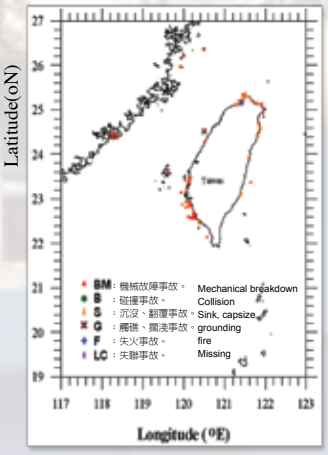


圖8 2005-2007年舢舨海上各類事故分布圖

Drawing 8. Sampan shipwreck type between 2005 and 2007.

III.Cargo vessels: 130 vessels encountered shipwrecks; percentage among total shipwrecks is 9.29%, third place among all vessels. There are five international harbors in Taiwan, including Keelung, Taichung, Kaohsiung, Suao and Hualien. Shipwrecks of cargo vessels mainly occurred alongside cargo vessel sailing lines. Mainreason of cargo vessel shipwreck ismechanical breakdown. Second reason for cargo vessel encountered shipwreck isstranded in shallow water, in some cases even cause the vessel sunk.

V.Sampans: 67 vessels encountered shipwrecks; percentage among total shipwrecks is 4.79%. Same as raft, shipwrecks of sampans mostly occurred in coastal waters, and concentrated offshore coasts of Yunlin, Chiayi, Tainan and Taipei county, Keelung city. (See drawing 7 and 8)

五、商船類:計30艘次佔2.14%，事故地點多數分布在臺灣西部海域包含北部海域地區，商船事故大多亦是因機械故障所引發事故，有部分是因行駛不慎觸礁而擱淺、沈沒或是不注意引發失火事故（如圖9~10）。

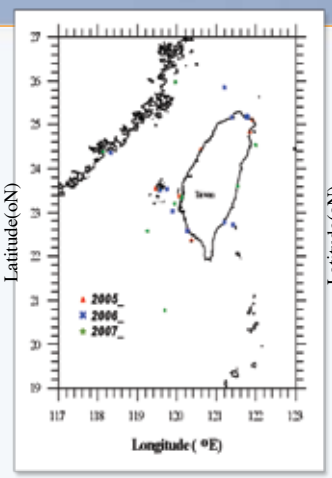


圖9 2005-2007年商船發生海上事故分布圖

Drawing 9. Location of merchant vessel shipwrecks between 2005 and 2007.

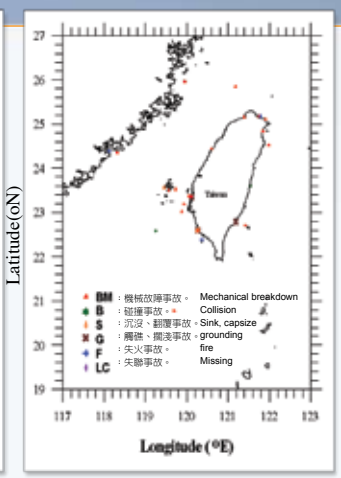


圖10 2005-2007年商船海上各類事故分布圖

Drawing 10.Merchant vessel shipwreck type between 2005 and 2007.

肆、船舶事故種類及分布

船舶事故種類計有機械故障、觸礁（擱淺）、沈沒（翻覆）、碰撞、失火、失聯事故等六大類型統計如表3，茲分述如下：

表3 2005年至2007年發生海上事故分類表 單位：艘

年度	碰撞事故	觸礁、擱淺事故	沈沒、翻覆事故	機械故障事故	失火事故	失聯事故
2005年	32	55	42	308	26	3
2006年	37	39	43	333	26	4
2007年	36	42	26	313	26	4
合計	105	136	111	954	78	11

資料來源：行政院海岸巡防署。

一、機械故障類主要為主機引擎及機器故障、起動、燃油、滑油等系統故障、冷卻水壓力不足、排氣閥間隙調整不良或燒損，增壓機性能不良、燃油幫浦故障、舵機、進水閥、軸心及離合器等零件故障、或因絞繩（網）而失去動力、車葉損壞或掉落及舵斷裂失落等等，計有954 艘，比例佔 68.39%，為比例最高之事故，分布狀況散及臺灣周遭海域，除了近岸也擴及至外海海域，其中以南部地區（嘉義、台南、高雄及澎湖等地區）最為密集，而桃園、基隆、宜蘭地區沿岸至外海區域都有事故之蹤跡；另花東沿岸地區亦有不少事故發生。船舶種類事故分布以漁船類發生佔多數，遍及全臺周遭海域，而膠筏類亦發生不少，位置亦多是在近海沿岸（如圖11~12）。

IV.Merchant Vessel: 30 vessels encountered shipwrecks; percentage among total shipwrecks is 2.14%. Shipwrecks of merchant vessels mostly occurred in the western and northern coast of Taiwan. Shipwreck of merchant vessel mainly caused Mechanical failure, in some cases caused by stranded in shallow water or caught fire. (See drawing 9 and 10)

Part IV.Shipwreck type and location

There are 6 main reasons causing shipwreck, including mechanical breakdwon, grounding, sinking, collision, fire and missing, see chart 3.

Chart 3 Shipwreck type during 2005 and 2007

Unit: Vessel

Year	Collision	grounding	Sinking	Mechanical breakdown	Fire	Missing
2005	32	55	42	308	26	3
2006	37	39	43	333	26	4
2007	36	42	26	313	26	4
Total	105	136	111	954	78	11

Source: Coast Guard Administration, Executive Yuan

I.Reasons for mechanical breakdown are main engine failure, machine breakdown, fuel injection system breakdown, lubricant system breakdown, and inadequate pressure in coolant system. Other reasons including interval of exhaust valve misadjustment, turbo charger function fail, fuel injection pump fail, steering engine fail, intake valve fail, shaft or clutch breakdown. Some shipwrecks caused by propeller problems, such as propulsion blade malfunction, lose of rudder or propulsion blade. Total shipwrecks caused by mechanical failure are 954 cases; percentage among all shipwrecks is 68.93%. Mechanical failure is the main reason for vessels to encounter shipwrecks. Shipwreck of this type occurs all around Taiwan waters, including coastal waters and high see. The most concentrated areas of shipwreck are southern coasts, including Chiayi, Tainan, Kaohsiun

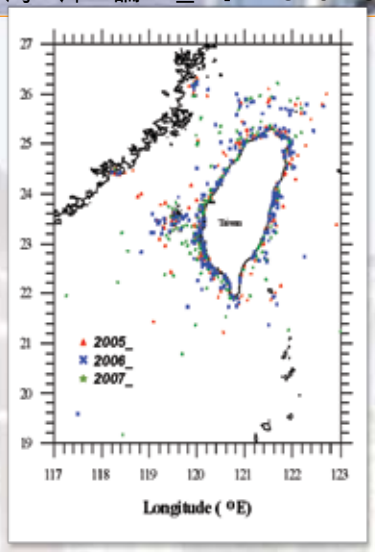


圖11 2005-2007年發生機器故障事故分布圖

Drawing 11. Locations of vessels encountered mechanical failure during 2005 and 2007

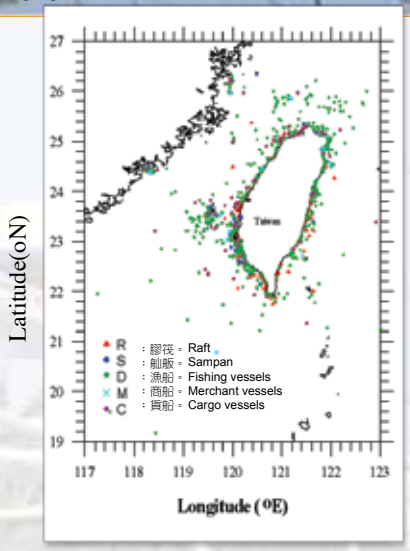


圖12 2005-2007年機器故障事故船筏分類分布圖

Drawing 12. Vessel types and locations of shipwrecks during 2005 and2007

and Penghu. Such accident can also be found in outer waters of Taoyuan, Keelung, Yilan, Hualien and Taidong. Most of shipwreck cases are fishing vessels and occurred around Taiwan and rafts operating in coastal areas suffer mechanical breakdowns as well.(see drawing 11 and 12)

二、觸礁（擱淺）類事故原因主要為誤闖礁區、因平流霧籠罩造成視線不佳而迷航擱淺，再則因漁港施工船舶等候領港時天候不佳遭觸暗礁或操舵失誤等，計有136 艘，佔9.75% ，船舶分類以近海作業漁船發生為多數，膠筏和舢舨亦有發生，在南部海域嘉南地區及澎湖海域最為頻繁，基隆、蘇澳地區亦有集中之趨勢，臺灣西部海域明顯比東部海域多，應該是地形使然，因西部沿線海岸多是沙質地質，地形變化較大，故較不易發現暗礁，而東部海岸為岩岸居多，地形較為固定較易使人辨別出危險區。（如圖13~14）。

II.There are 136 vessels, 9.75% encountered shipwrecks due to grounding. Main reason for this kind of shipwreck including sailing through reef areas by accident, lost of sailing line due to heavy fog, or collide with an unseen reef due to bad weather and navigating wrongly. Most of Vessels encountered grounding are fishing vessels, sampans and rafts. Theis kind of shipwrecks occurred mostly in southern coast and coastal areas of Penghu, Keelung and Suao. They occurred more in the western coast than eastern, due to terrain characteristics. The terrains of western coasts are sandbanks, making detection of hidden reef more difficult. The terrains of eastern coasts are mainly rocky coast, and it is easier for people to recognize dangerous areas. (See drawing 13 and 14)

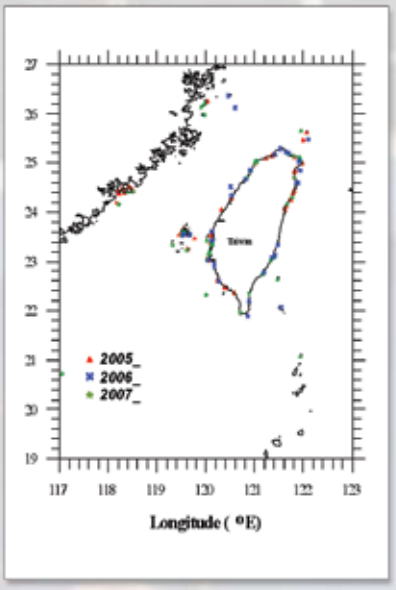


圖13 2005-2007年發生觸礁、擱淺事故分布圖

Drawing 13. Locations of vessels encountered stranding during 2005 and 2007

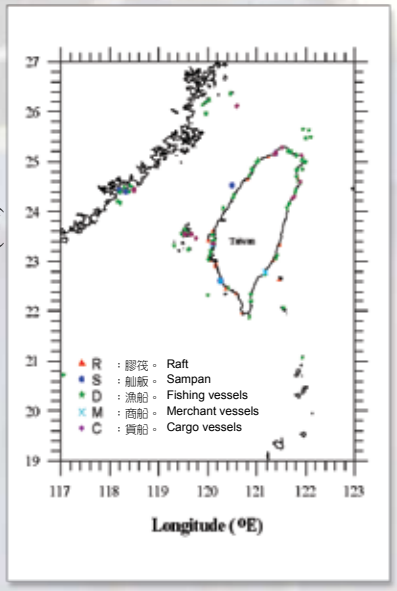


圖14 2005-2007年觸礁、擱淺事故船筏分類分布圖

Drawing 14. Vessel types and locations of shipwrecks during 2005 and 2007

三、沈沒、翻覆類原因有船舶遭遇浪擊再加上自由液面效應進而影響穩定度，或因甲板上、船艙內裝載貨物不平均，致使重心水平偏移過大而造成進水沈沒、翻覆，或因拖救時不諳海域遭浪擊翻覆、失去動力遭打翻等，計有111 艘，佔7.96% ，以近岸佔大宗且都聚集於北部基隆、宜蘭及南部雲嘉地區沿海海域，而北部地區多以漁船為主、南部地區則是膠筏和舢舨較多（如圖15~16）。

III.There are 111 vessels, 7.96% encountered shipwrecks due to sinking or capsizing. Reasons for vessels encountered this type of shipwrecks are caused by hit of heavy waves, unbalanced loading of cargos resulting in center of gravity shifted and too much water getting onboard. Those shipwrecks occurred mainly in coastal areas, and concentrated in offshore area of Keelung, Yilan in the north where most vessels encountered shipwrecks are fishing vessels; and Yunlin, Chiayi in the south, where mostly rafts and sampans encountered shipwrecks. (See drawing 15 and 16)

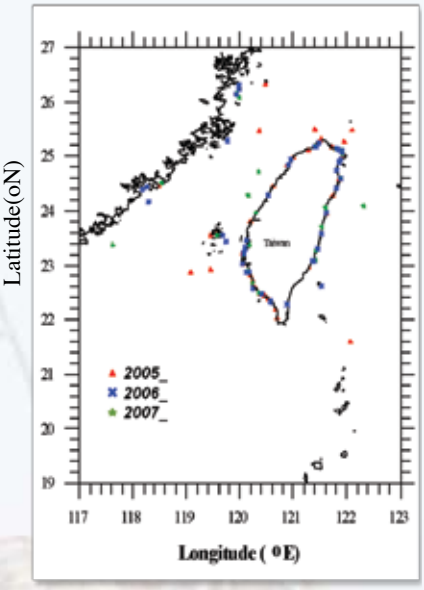


圖15 2005-2007年發生沈沒、翻覆事故分布圖
Drawing 15. Locations of vessels encountered sinking during 2005 and 2007

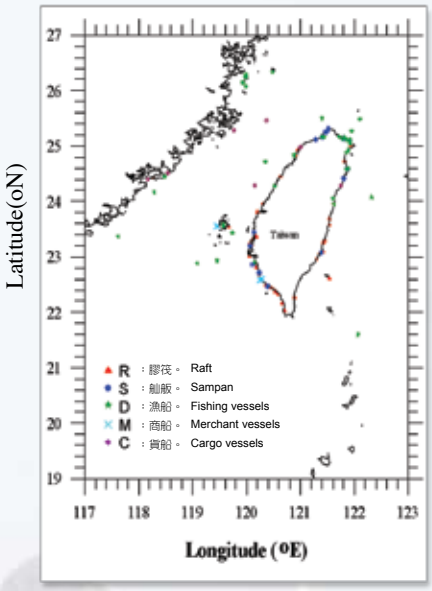


圖16 2005-2007年沈沒、翻覆事故船筏分類分布圖
Drawing 16. Vessel types and locations of shipwrecks during 2005 and 2007

四、碰撞類主要原因為船舶在航行作業或錨泊中，疏於保持應有的瞭望警戒、或是因訓練不足而操舵失誤，再則是船長未善盡督導、輔導之責、於航行中拖網、錨泊而未依規定懸掛號誌或燈號，或顯示不當的燈號，造成他船誤判，以致擦撞。另外則是在天候及能見度不佳時未保持安全速度，同時未善加使用雷達來及早發現他船，判斷是否有碰撞危機存在，儘早採取避碰的行動、或發現有碰撞危機時僅僅小角度的改變航向，及不知道如何以正確的方法(汽笛或號燈)向對方示警遭商(漁)船撞擊；還有因在拖網作業時相互撞擊、迎艏對撞、遭海釣船、漁具漂流撞擊及船屋碰撞等等，其中不少是在船道航線上遭到大型商貨船碰撞而受損，計有105艘，佔7.53% ，發生分布於商港附近及商（貨）船航線水域較多（如圖17~18）。

IV.There are 105 vessels, 7.53% encountered shipwrecks due to collision. Reasons for vessels encountered this type of shipwrecks during sailing or at anchor is lack of admonishing against danger or poor training. Some cases were captain did not perform his duty of supervising and guiding his crews, or the vessel was trawling, anchoring without proper warning lights or signals. Sometimes in heavy fogs, vessels fail to neither maintain proper distance nor observe other vessels by radar. Or in some occasions the vessel did not use proper

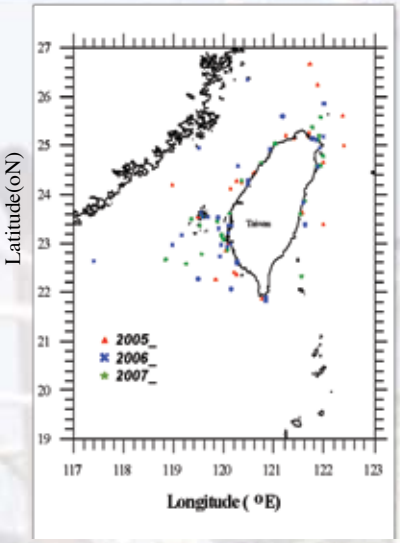


圖17 2005-2007年發生海上碰撞事故分布圖
Drawing 17. Locations of vessels encountered collision during 2005 and 2007

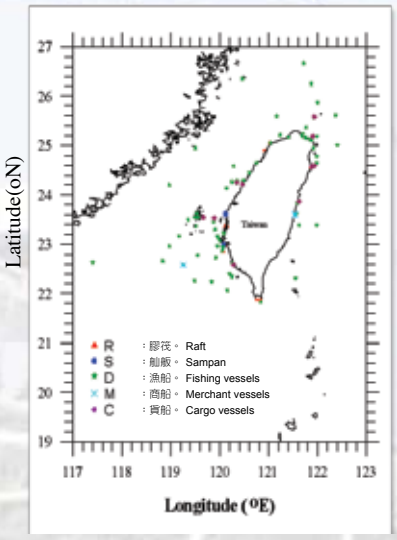
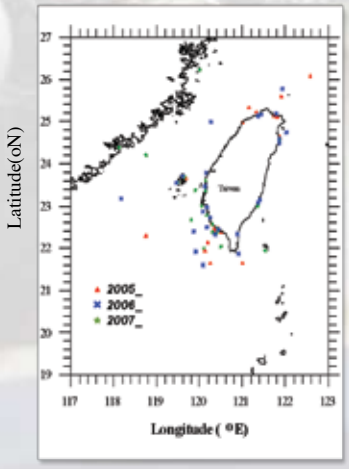


圖18 2005-2007年海上碰撞事故船筏分類分布圖
Drawing 18. Vessel types and locations of collisions during 2005 and 2007

warnings (lights or horn) or fail to maneuver to avoid collision. In other cases, fishing ships were hit by merchant vessels, fishing gears or dwelling barges within sailing lines when trawling. Those shipwrecks occurred mostly in sailing lines, or in areas near harbors. (See drawing 17 and 18)

五、失火類原因為電線老舊走火、炊事不當，機(船)艙、機器漏油起火、爆炸起火、煙囪斷裂起火、或是機艙內使用易燃之塑膠軟管、油布或未加蓋之油桶隨意擺置遇火苗引燃起火、另外原因有滅火器等器材裝設位置不當發生失火時來不及取用，或未帶滅火器出海等，計有78艘，佔5.59%，分布以南部地區發生較為頻繁，多數是在港區內發生，而在海上發生則是在高雄地區外海零星分布等（如圖19~20）。

V.There are 78 vessels, 5.59% among all shipwrecks due to vessel caught fire. Main reasons for catching fire are aging electric wires encountered short circuit, fire in the galley, oil leakage in cabin or engine room, explosion, and smokestack breaking down. In some cases, highly flammable materials such as plastic hose, oilcloth or uncovered oil cans catch fire. Sometimes the vessels leave port without enough fire extinguishers. Those shipwrecks occurred mainly in soutern part of Taiwan, mostly within port areas. Lesser cases occurred in outer sea of Kaohsiung. (See drawing 19 and 20)



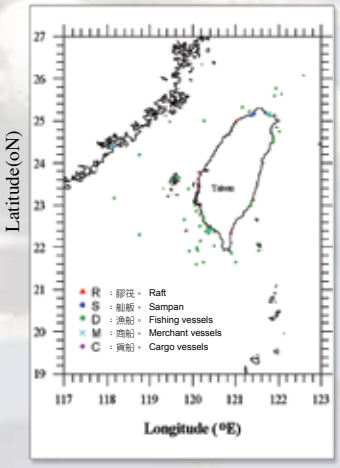


圖19 2005-2007年發生失火事故分布圖
Drawing 19. Locations of vessels caught fire during 2005 and 2007

圖20 2005-2007年失火事故船筏分類分布圖
Drawing 20. Vessel types and locations that caught fire during 2005 and 2007

六、失聯類主要大都是船舶未設置足夠之通信及求救設備、或緊急求救設備未依規定地點放置，再則因設備故障而失聯，使得在岸上人員無法取得聯絡，造成沈沒或翻覆等危險時不及救援等，計有11艘，佔0.79% ，只有少數幾件於北部（基隆、宜蘭）地區及南部台南屏東地區發生，並不是多見之事故型態，以舢舨較易發生（如圖21~22）。

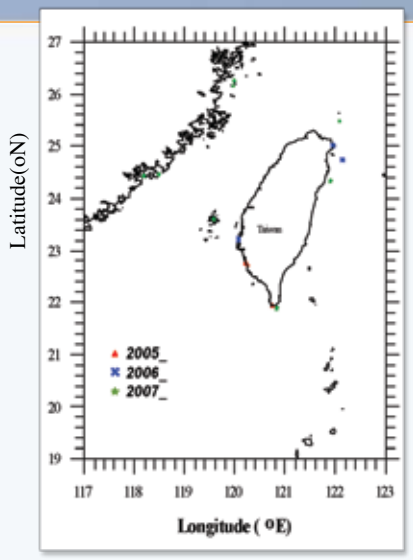


圖21 2005-2007年發生失聯事故分布圖

Drawing 21. Locations of vessels caught fire during 2005 and 2007

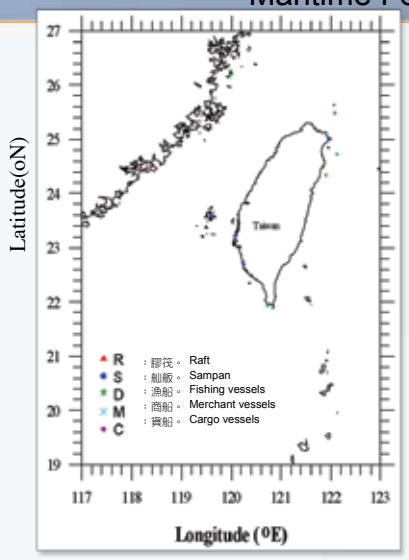


圖22 2005-2007年失聯事故船筏分類分布圖

Drawing 22. Vessel types and locations that lost during 2005 and 2007

VI.There are 11 vessels missed during 2005 and 2007, 0.7% among all shipwrecks. Main reasons for vessels get lost are lack of communication and rescue equipments. Sometime the equipments are not placed in proper position or breakdown. Those vessels ended up sinking or capsizing before rescue team arrived. This type of shipwreck occurs rarely, only a few cases in coastal areas of Keelung and Yilan, and some in Tainan and Pingtong. Mostly the vessel type is sampan. (See drawing 21 and 22)

伍、結論與建議

綜合以上分析，在臺灣海域航行船舶與港口進出船隻的遂漸增加造成了航行危機日漸嚴重，船舶碰撞與擱淺之可能性也隨之增加。許多歐、美研究報告指出「在限制水域中碰撞危機與船舶密度之平方成正比」；另外「擱淺危機與船舶距岸距離成反比」。各種事故類型分布情形都是集中在臺灣南部和北部地區海域及澎湖附近海域，約略可以勾勒出臺灣附近海域多發事故的地區在南北二區船筏密集之處，也大概可以看出漁港較密集及船筏較多之地區，事故發生的機率較高，藉此解析描繪出各種事故之分布狀況，為使船舶航行時注意安全、降低航運風險，以保障海上安全，幾點建議如下：

一、航政機關應即時更新危險海域範圍並發布航行布告。

二、漁業主管機關應透過漁會加強宣導注意海上航行安全並提供危險作業海域範圍。

三、漁業電台應隨時提供最新海域及海象狀態。

四、安檢所應落實宣導及提供所轄海域安全狀況。

五、加強船舶事故重點海域海上勤務巡弋規劃。

六、政府應儘速制定海上拖救相關法規及建構相關拖救設備。

（本文作者任職於海岸巡防署署本部）

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鐘祥華，「臺灣周遭海域船難事故分布研究」，國立臺灣海洋大學海洋環境資訊學系碩士論文，2008.7。

註解：

1.行政院海岸巡防署2007年海巡統計年報。

2.參見附表1。

3.鐘祥華，臺灣周遭海域船難事故分布研究，國立海洋大學海洋環境資訊研究所碩士論文，2008.6

4.行政院海岸巡防署。

Part V.Conclusion and Suggestion

To sum up the analyses above, we found that rising amount of vessels sailing in Taiwan waters and harbors also increase risk of collision and grounding. Based on many researches of Europe and the United States, the collision rate of vessels has a direct ratio with the square of vessel density. The risk of grounding has an inverse ratio with distance to shore. Every type of shipwreck occurs mainly in coastal areas of northern, southern part of Taiwan and Penghu islands. We also found relation between shipwrecks to density of vessels. In northern and southern part of Taiwan, where fishing ports and fishing vessels congregate, the rate of shipwrecks increases. In order to prevent shipwrecks from happening and maintain marine safety, we have following suggestions:

I.The navigation administrations must update information of risky sailing areas constantly, and issue report regularly.

II.The fishing administrations must announce safety regulations through fishery associations, and provide detail information of risky fishing areas.

III.Fishing radio station must provide latest weather and sailing information.

IV.The security inspection office must enforce safety regulation faithfully, and provide detailed and accurate sailing information.

V.To enhance and plan maritime patrol in risky areas of shipwreck.

VI.Government must enact regulations of towing and rescue and establish towing equipment with all haste.

(The Author is currently with the dissertation holds post in Coast Guard Administration)