

海難搜救之檢討與策進—

以「墾丁8名潛水者失蹤案」為例

A review and improvement on maritime search and rescue—

Taking “The eight missing divers in Kenting” as an example

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壹、前言

海洋巡防總局依法職司海難船舶與人員的搜索、救助等事項，對於海難搜救任務責無旁貸，宜更重視海難搜救之相關研究。海上救人如救火，在茫茫大海，要能迅速到達現場和完成搜救任務並非易事，又受限於海象、天候、潮汐、海流、沿岸及海底地形等因素，使得海上救難工作更顯困難，在執行救難任務過程，搜救技術之不斷提升，殊值深入探討。

貳、案情概述

一、報案時間：97年4月26日12時10分。

二、案發地點：墾丁七星岩海域。

三、遇難主因：主要是表層水流受潮汐影響往南、底層水流受黑潮作用往北，兩者流向相反，致「南青號」娛樂漁船誤判潛水者上升地點為南邊，另潛水者發現海流相反，準備要上升卻因減壓過程歷時20分鐘，即被黑潮洋流往北帶。

四、搜救過程

（一）26日12時12分接獲通報後，隨即通報恆春隊線上3567艇前往搜尋，並加派2012艇緊急出勤協助救援。13時17分空勤總隊直昇機抵達現場搜尋，南機隊、台東隊、高雄隊、直屬船隊也接續派艦艇加入搜救，由海洋巡防總局緊急應變中心負責統籌指揮，各艦船艇依劃定之搜索區域執行搜尋救援任務。

Part I. Preface

Maritime Patrol Directorate General by laws is in charge of search and rescue for vessels and people in maritime casualty. It is duty-bond and related studies on the search and rescue in maritime casualty should be more focused. The marine emergency is far more urgent and difficult to deal with. Such tasks generally result from all the conditions of sea, weather, tides, and currents, as well as costal landforms and submarine topographies. In order to be competent for all these possible search and rescue in the future, we need to improve and study its promising rescuing techniques.

PartII. Summary of the case

I.Reported time: 26th/April/ 2008 AM12:10

II.Reported location: Sea area of Seven Star Rock in Kenting

III.Cause: The surface flows, influenced by tides, went its way to the south; but, the bottom ones, driven by the Kuroshio (Japanese for “Black Tide”)Black Tide went its way to the north. The reverse direction of two streams resulted in the misjudgement of Nan-chin Entertainment Fishing Boat that the missing divers rise up in the southern area. On the other hand, the divers found that the flow on surface and bottom are reverse and prepared to go up. However, it took 20 minutes for the divers to get on the surface during such process of releasing pressures. They were then taken towards the North by Kuroshio.

(二) 27日23時30分教練丁○齡於台東縣香蘭海岸(22.35N、120.59E)自行游泳上岸求救，經詢問丁員相關狀況後再修正救援方向。

(三) 28日01時43分海鷗直昇機於太麻里外2哩吊掛起王○平、郭○顯等2人，02時27分又於金崙距岸2.4哩吊掛起洪○盛、劉○君等2人，5時27分空勤總隊直昇機於太麻里外3哩吊掛起杜○彰，10時45分又於太麻里外13哩吊掛起李○玲及王○堉等2人，本案8名失蹤潛者全數獲救。

參、檢討分析

一、異常海流海上定位不易

七星岩海域位處台灣海峽、巴士海峽及太平洋交會處，附近暗礁多又有暗溝，加上黑潮洋流流經(黑潮主軸沿台灣東岸終年向北流，其支流有時亦會繞過台灣南端北上台灣西岸)及受台灣本島沿岸潮流影響，故該海域海流變化大又強勁，因海域潮水交會且海流紊亂複雜，據獲救潛水教練丁○齡表

IV. Rescuing process:

(I) As soon as the accident is reported, the No. 3567 boat of Heng-chun Flotilla on duty immediately set out to search and was accompanied by the No. 2012 boat, helping this rescue. At 13:17, National Airborne Service Corps sent its helicopter to reach the spot and search. Other rescuing forces also came to help: the Southern Sector Flotilla, Taitung Flotilla, Kaoshiung Flotilla, and Special Mission Flotilla, which were all under command of the ERC (emergency response center) of Maritime Patrol Directorate General; each rescuing vessels was sent in their assigned areas to elaborate their works.

(II) At 23:30 p.m. on the 27th, the coach Ding called for help after his swimming and go on the shore at Shan-lang beach (22.35N, 120.59E) in Taitung. After realizing Ding's description of the situation, the rescuing plan was adjusted.

(III) At 01:43 a.m. on the 28th, the helicopter sent by Airforce Seagull Rescue Group lifted Wang and Kou 2 nautical miles off from the Taimali beach, and lifted Huan and Liu 2.4 nautical miles off from the Jinlun beach at 02:27. At 05:27 Helicopter of National Airborne Service Corps lifted Du 3 nautical miles off from Taimali and at 10:45 lifted Li and Wang 13 nautical miles off from Taimali. The eight missing divers reported in this very case were all successfully rescued.

PartIII. Review

I. Unusual current systems fail the correct positioning

Situated at the crossroad of Taiwan Strait, Bashi Channel, and the Pacific Ocean, the water area of Seven Star Rock has its unusual current systems. There are also various submerged reefs and oceanic trenches. Additionally, the Black Tide passes by (the mainstream of it, along

示，案發時上下水層海流反向，恆春隊3567艇及2012艇雖於第一時間趕抵現場搜救，因表層海流往南與底層流向往北迥異，案發初期相關單位未能明確掌握洋流等水文資料以規劃最適搜救區域。

二、海空聯合搜救尚待精進

巡防艦艇與國軍海鷗部隊及空勤總隊直昇機，這些海上及空中搜救的主力雖積極地從事搜救工作，但彼此間橫向聯繫略顯不足。本總局艦艇與空勤總隊直昇機及民間漁船，海空搜救能量未能統合，各自執行搜尋任務，搜尋模式無法有效指揮管制，與海鷗直昇機無線電系統橫向通聯須透過所屬單位中轉，無法即時通聯，以致降低3度立體空間救援效能。

三、船艇瞭望能見距離受限

救援船艇雖有派員用望遠鏡於前後甲板瞭望，但本署巡防艇受限於船舶功能性之設計，致搜救人員無法於制高點實施瞭望，且海象不佳時，在駕艙瞭望視野受海象浪況及能見度等因素限制，影響搜尋成效。

四、未考量潛水者背景因素

經訪談獲救潛水者了解失聯原因，除因當日海流變化劇烈外，表層海流與底層海流方向相反為出事主因，另隨著時間推估失蹤潛水者應持續隨黑潮洋流向北北東方位漂流，規劃搜索區域時，未考量失蹤潛水者攜帶裝備、潛水經驗及求生意志等人為因素，當漂流至台東海域，為求生存游向太麻里海

the eastern coasts, goes northwardly throughout the year; but, branches wind their ways over the island rear and go all the way up to the western coasts) and some minor costal tides stir. The water area there is changing and violent due to the flux of tides and the disturbance of currents. According to the diving coach Mr. Ding, the upper flow contradicted the lower one during the accident. Although No. 3567 and No. 2021 under the Heng-chun Flotilla arrived immediately, the unclear information of this very water area and the failure of planning ideal rescuing area disappointed the related authorities at the outset.

II.The Cooperation by air and marine rescues is needed to be improved

Though striving to search and rescue, the patrolling naval vessels and helicopters from Airforce Seagull Rescue Group and National Airborne Service Corps still lacked lateral communication between each other. The cooperation forces, originated from our vessels of Maritime Patrol Directorate General and helicopters from National Airborne Service Corps as well as the civil fishing boats, dispersed and not gathered. There was no effective command given in such securing system. The contact with the helicopters of Airforce Seagull Rescue Group was needed to be transmitted via its affiliated authorities. Since the instant contact was not achieved, the three-dimensional rescuing efficacy was lessened.

III.The visibility of naval vessels is veiled

Although certain crews were sent on the front and rear decks on the rescuing vessels, our authority's vessels failed to watch from the peak position because of its functional design. And when the sea weather is not pleasant, the watching efficacy is damaged due to the waves and ill visibility and influences the rescuing result.

IV.The background of the missing diver is not put

岸，初期若能掌握遇險人員多為專業潛水人員，靠其裝備具有自救能力，即可研判其存活率甚高，且可能利用純熟泳技往岸際漂移，可據此靈活規劃搜尋路線，提高尋獲機率。

肆、策進作為

一、應適時成立前進指揮所

海洋巡防總局執行海難搜救案件，除依現行海難事故處理機制成立緊急應變中心外，應視案件之危急性、新聞性及社會敏感性，適時成立前進指揮所，指派適階人員親臨現場擔任現場指揮官，整合海、空搜救資源，成立聯合搜救指揮中心，指揮統籌轄內各救援單位能量，並由相關業務單位接續管制作業，將即時搜救能量提供予現場指揮官，使指揮官能立即指揮調度搜救及任務分工協調，以提高搜救效率。

二、持續建置轄區水文資料

目前各海巡隊皆能透過網路鏈結查詢海科中心海洋資料庫、氣象局海象預報觀測資料及港研中心港灣環境資訊，配合轄區海圖，逐步建立轄區基礎水文資料，惟異常海流及特殊水文實為搜救任務之最大阻礙，各隊應建立轄內海洋領域學界專家（學

into consideration

After we talked with the rescued divers, we come to understand the reason why they lose the connection. We've already realized that the unusual, violent currents on that day and the upper and lower flow's contradiction serve as the main cause. During our planned search and rescue, we estimated the floating time of the missing diver, who was carried by the Black Tide and constantly moved toward his northeast way. But we missed the diver's personal consideration on equipments, diving experiences, and mind for survival. In this case, our rescued diver were floated to Taitung sea area and drew closer to Taimali for survival. If we had chances to know our missing divers are professional with equipments, we would say that he would be very likely to survive. They might swim skillfully to be close to the shores. We can predict their rescuing traces according to this acknowledgement to increase the rescue probability.

Part IV. Improvement actions

I.A front line command post should be duly established

When an accident takes place, an emergency response center (ERC) will be immediately established in Maritime Patrol Directorate General according to its accident response procedures. Further, depending on the urgency, news requirement, and the public opinions to the case, a front line command post should be established additionally in proper time, taken over by an officer with proper rank, collecting rescuing information and establishing the cooperation center for the integration of all possible rescuing forces. The related business unit continues its control operation to provide instant rescue energy to the commander at the front line. Thus, the commander may divide rescue task immediately and hence to increase

者)名冊,以供重大海難案件海域水文資料諮詢參考,並結合轄內漁民經驗資訊及歷次海難救援案例,持續蒐集各海域(年度)海流流速資料,供同仁各項勤務之參考。

三、增進船艇聯合搜救技術

為避免海上各救援單位搜救能量互相抵制,救難現場指揮官(機制)應統籌各友軍單位,統一律定任務分工與責任區劃分,依規劃之遇險目標的可能漂流位置,適時調整搜索船艇編隊、搜索順序與模式,以最短的路線、最快的時間達成搜救的目的,才能使整體搜救能量發揮相乘相加的效果,進而提高搜救效率。

四、強化空巡人員偵搜能力

空巡勤務人員目前訓練以海域搜救吊掛基礎訓練、初級緊急救護技術員(EMT1)訓練、求生訓練為主,人員係採隨機共勤作業,由飛行員、機工長和共勤人員一同執勤,平時須培養三方默契,在執行搜救任務時,為提升空中搜索成功率,可依距案發時間長短選定不同之搜索模式,如初期遇險者漂流範圍較小,4小時內可用方形航路模式搜索,4小時以上因漂流範圍擴大,宜採用平行航路模式搜索,故可將直升機搜索模式之選定應用,納入空勤人員組合訓練課程中,並結合一般空巡勤務時機,進行實地模擬搜索訓練,以強化搜尋能力。

五、加強海空聯合搜救機制

直升機雖有滯空時間短、目視不清及夜間搜索困難之缺點,然亦具有搜索範圍廣大、迅速及高

the rescuing efficiency.

II.The establishment of information of hydrology should be continued and maintained

Presently each flotilla can now refers to the information from Ocean Data Bank of the National Center for Ocean Research, Marine Meteorology Forecast of Central Weather Bureau and harbor environment information from Harbor and Marine Technology Center via internet. Combining with the map of the territorial sea, the basic hydrology information is gradually collected unless the unusual currents or unknown water areas hinder. Every flotilla should keep the name list of the marine experts and professors in case of the disastrous marine casualty. Besides, the experiences of civil fishers and past rescuing events, which help us to collect the information of flow speed (every year) for reference among colleagues.

III.The rescuing cooperation between vessels should be upgraded

In order not to contradict rescuing forces between rescue units, the commander on the site (of this system) should connect all rescuing forces and divide their labors and responsibilities. Then, we can predicate possible location of the missing and adjust the scale of vessels, priority of the rescuing procedure, and rescuing types to reach the missing in the shortest route and the quickest time. The rescuing efficiency is thus raised.

IV.The abilities of air searcher are needed to be polished

The air searchers now receive their primary trainings on hanging, emergency medical technicians (EMT1), and survivals. On a rescuing plane, they comprise a pilot, a machinist, and the crew. The three parts need to develop a mutual understanding for better performance. The rescuing modes can be duly adjusted according to the time of accidents. As for those who are just miss-



機動性等優點，因此，當海難事件發生時，現場指揮官應以「直昇機為眼、船艦為手足、勤指中心為大腦」之原則，將直昇機納入搜救體系，統籌規劃指揮岸、海、空整體搜救勤務。直昇機在搜救案件中，雖擁有高機動力及搜索範圍廣等優點，但受限於油料消耗快、空時間短及飛行高度限制等缺點，易忽略海面小目標，如能輔以巡防艦艇續航力高、貼近海面救援容易等優點，由前進指揮所整合海、空搜救作業，將能大幅提高救援成功率。

六、加強岸海橫向通報聯繫

請各海巡隊針對轄內潛水重點海域進行詳細水文及地理環境調查，並預擬遇難人員搜救應變計畫，倘有民眾欲報關前往從事潛水活動，請安檢所應通報轄區海巡隊，派遣線上艦艇加強巡弋，以維安全。

七、評估購置衛星定位浮標

海難一旦發生，最困難是尋找失蹤者的位置，故海流流向、流速數據的取得，對於海難漂流救援

ing, the drifting range is relatively small, we can search them in the square route mode if it's within 4 hours. But for those who drift over 4 hours, we have to search them in parallel route mode. The helicopter search mode should thus be incorporated into the flight crew combination training and also to proceed on spot simulation training in their regular patrol to enhance rescue ability.

V. The cooperation of sea and air rescuing system need to be reinforced

In spite of the short stay in the air, poor visibility, and hardship during the night search, helicopters still take advantages of wide search scope, swift move, and high mobility. So, when the accident takes place, the commander on the site should "take the helicopter as eyes, vessels as limbs, and command center as brain" to execute the land/sea/air rescuing services. Helicopters' disadvantages, resulted from the fast consumption of fuels and the height limits, easily make the air searchers to ignore the small target. If accompanying with the patrolling vessels for the search on the surface of sea, the chance of successful rescues will be enhanced greatly.

VI. The lateral communication need to be strengthened

We ask every flotilla to examine the hydrology and geographical environments of some crucial beaches for divers, and make rescuing plans in advance. If there are any people come for registration to go diving, we also ask the security post to immediately inform the flotilla for intensive service.

VII. The necessity of the satellite navigation buoy need to be estimated

If once the accident takes place, the position searching of the missing becomes a task. The direction and speed of flows are the key factors for the successful rescues. If searchers arrive during the first phase in accident and throw the simulating

成功與否至為關鍵，特別是遇難的第一時間，搜救人員抵達報案地點，如能立即投放有發報定位的模擬漂流物（例如DMB，Datum Maker Buoy），即可依據海域現場取得相關數據資料，研判遇難人員可能漂流方向及速度，以作為後續救生救難及搜索區域的參考基點。

八、成立受難家屬服務中心

面對海難案件，家屬心急如焚，轄區海巡隊應覓適當處所，主動提供家屬服務（茶水及休息場所等），並將搜救狀況適時向家屬說明，俾讓其瞭解官方搜救進度，以便安撫家屬情緒，並發揮海上專業解除家屬疑慮。

navigator buoys (like DMB, Datum Maker Buoy). Some related datas can be calculated according to the condition of the sea. The referential rescuing spots can then be predicated after examining the direction and speed of the flows.

VIII. The service center for the relatives of the missing should be established

Since the relatives of the missing get very anxious, the patrolling group should need to offer an appropriate place for services (drink and rest). And we should duly explain the latest rescuing progress to have the relatives understanding and may comfort them as well as to dispel their anxiety with maritime specialty.

IX. We need to keep a good relationship with the media

As soon as the accident happens, we should actively maintain good communication with the media and duly assign an officer with proper rank as the spokesman. First we need to actively broadcast the accident and report our information on the spot and rescuing procedures. We need to be cautious about the press; thus, we can avoid some crises and public doubts. By doing so, our positive reputation can be held up and the press will not report insufficiently due to lack of correct information to mislead the misunderstanding of the public.

X. The businessmen should declare the safety notions

Generally speaking, divers can't keep on swimming if wind scale reach over 4 or 5 or the speed of sea flow go over one knot. In this case the wind scale is over 6 and any diving activities should be stopped; however, the careless businessmen and diving couches are to be blamed for promising the divers to dive and had this accident happened. We need to avoid such cases and already ask every flotilla to present the government-

九、與媒體保持適切之互動

海難案件發生時，應隨時與媒體進行互動聯繫，並指派適階人員擔任新聞發言人，主動發布新聞，提供現場資料與搜救處置作為，對於媒體須具備高度警覺性，將危機化為轉機，消除外界對搜救工作之疑慮，進而提升本署正面形象，避免媒體未獲充分正確資訊，不能周延完善報導，產生民眾誤解及負面報導。

十、宣導業者安全防護觀念

一般而言，風浪級數達4至5級或海流超過1節以上，潛水者即難以在海中游動，檢視本案發生時，風浪已達6級以上，不適合下海潛水，惟業者及潛水教練疏忽研判，仍讓遊客潛水才導致意外發生。為避免類案發生，已請各海巡隊對於轄區內經營水上活動業者，正式行文請渠等在做任何水上遊憩活動時，應增加船隻、人員的安全配備，以維護海上遊憩民眾之安全。

十一、公布水域遊憩活動範圍

對於轄區內特殊海域暨地形之區域，海洋巡防總局已函請各地縣市政府（南投縣政府除外）及水域管理機關，公告危險海域及水域遊憩活動範圍，並宣導活動安全教育，防止民眾誤入危險海域發生意外，並對危險海域應就海象狀況，規範水域活動之種類、範圍、時間及行為等，以維護遊客安全，如有必要進入需由縣市政府訓練合格之專業人員帶領或陪同，對於不按規定或不聽勸告從事水上活動人員，致發生意外者，依「發展觀光條例」及水域遊憩活動管理辦法處罰。

伍、結語

民眾在海上遇難，最期待的是海巡人員能夠及時出現，執勤人員應秉持「將心比心」及「人溺己溺」的精神，將遇難人員當成自己人全力趕往救援。因海上搜救具高度危險性與專業性，故須以有系統、有組織等科學方式執勤，再加以專業知識、技術及設備配合，始可因應未來各種海難事故，提升整體搜救能量，圓滿達成搜救任務，以保障我國海域海上人命及財產安全。

（本文作者任職於海洋巡防總局海務組）

tal notions for the businessmen in the precinct that they should be equipped with abundant vessels and tools to make sure whether the people in recreation are safe.

XI. The need to publicize the water recreational area

Maritime Patrol Directorate General has already notify in writing and ask local county(city) governments (except for Nan-tao Government) and certain administration of water areas to publicize dangerous water bodies and the allowed range. They're also asked to publicize the safety education so as not to cause accidents by entering dangerous sea area. Types, range, time of activities should be clearly announced in the dangerous water areas according to the weather condition. Thus, the tourists' safety is ensured. And if it's necessary, certain certificated professionals can be allowed to accompany the applicants to enter. But for those who transgress or disobey, they will be punished according to the Statute for the Development of Tourism and Regulations Governing Water Recreation Activities.

Part V . Conclusion:

If people suffer a marine casualty, they would expect the immediate presence of the coast guard. The searchers should feel for the missing and take the missing as themselves. We strive to give our services of systematic, scientific methods so as to succeed in the dangerous, professional works. With professional knowledge, technics and equipments, we hope to deal with various marine accidents and upgrade, integrate our rescuing forces to close every rescuing mission, to ensure the safety and property of our people on the sea.

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