

出國報告

(出國類別：開會)

出席「2019 台灣瀕危物種白海豚
復育計畫工作坊」會議報告

服務機關：海洋委員會海洋保育署

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派赴國家：加拿大(安大略省倫敦)

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摘要

2019 台灣瀕危物種白海豚復育計畫工作坊(Workshop on a Recovery Plan for the Critically Endangered Taiwanese White Dolphin (*Sousa chinensis taiwanensis*))目的係參考現有最佳科學研究資訊，經由國際專家學者共同討論，研擬應立即採取的行動，並訂定一份針對台灣西海岸族群的復育計畫，提供台灣政府機關及白海豚保育相關權益關係人列入參考，以恢復台灣特有的極度瀕危海豚種群，降低族群滅絕風險。

本工作坊於 2019 年 8 月 28 日至 8 月 31 日，假加拿大安大略省倫敦—西安大略大學舉行，由世界自然保育聯盟物種生存委員會鯨類組主席—Dr. Randall Reeves、美國海洋暨大氣總署漁業部西南漁業科學中心—Dr. Barbara Taylor、亞洲鯨豚研究小組—Dr. Claryana Araújo-Wang 及國立屏東科技大學野生動物保育研究所—裴家騏教授等人擔任共同主席。與會者共計 17 餘人，分別來自美國、加拿大、台灣等，包括鯨類生物學、生態學、生物聲學、保育政策制定等各領域專家及非政府組織代表，我方則由本署郭庭羽專員共同參與，以瞭解國際鯨類保育及復育行動現況。

本次參與工作坊之國際專家學者群認為，目前可有效提升白海豚族群的 6 大復育行動為：1.立刻禁止在白海豚潛在棲地的 9 縣市(新北市至台南市)水域使用流刺網與拖網 2.停止在白海豚棲地中進行更多開發行為 3.使用安靜船舶並且減少速度及噪音可能產生的影響 4.減少污染(空氣、水、土壤)5.盡可能增加淡水注入量 6.設立人為水下噪音管制措施，希望政府機關及白海豚保育相關權益關係人皆能採納、立即落實執行。本署將參酌工作坊復育計畫，酌情修訂白海豚保育計畫草案，加強與相關權益關係人溝通協調，積極尋找有意願合作之示範區域，推行具體復育行動，共同保育台灣白海豚族群。

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壹、目的

全球被稱為駝背海豚的駝海豚屬(*Sousa* spp.)，一共有四種，分布在大西洋(*S. teuszii*)、印度洋(*S. plumbea*)、印度太平洋(*S. chinensis*)跟澳洲沿岸(*S. sahalensis*)，而台灣西海岸的白海豚族群屬於印太洋駝海豚。目前印太洋駝海豚被國際自然保育聯盟(International Union for Conservation of Nature, IUCN)列為易危 (Vulnerable, VU)等級的物種，但生存於東台灣海峽的白海豚族群被列為極危(Critically Endangered, CR)等級。美國國家海洋暨大氣總署漁業部(National Marine Fisheries Service, NMFS)也在2018年將台灣的白海豚族群納入瀕臨絕種生物法案 (Endangered Species Act, ESA)中，列為瀕危(Endangered)等級。

台灣對於白海豚的調查研究起步較晚，2002年王愈超博士等人於台灣西部中段沿海進行第一次較全面的科學調查時，才首次正式確認台灣有白海豚族群存在。根據其後多年積累的資訊，顯示台灣西岸白海豚主要分布於苗栗通宵至雲林臺西間、長約100公里、水深30公尺內的狹長帶狀範圍。台灣西海岸的白海豚族群量小，具有獨立封閉性，目前族群數量可能已經少於75頭，遠低於台灣黑熊、石虎。又白海豚生存環境與人類行為高度重疊，面臨棲地消失、人為污染、食源減少、漁業混獲、海上活動、水下噪音、能源開發等多項人為衝擊，可能有滅絕危機。農委會於2008年將中華白海豚公告納入「保育類野生動物名錄」，列為一級保育類：瀕臨絕種野生動物，依據野生動物保育法加以保護，同時為保育台灣西部沿海白海豚族群，行政院農業委員會曾於2014年4月21日依據野生動物保育法第8條第4項，預告訂定「中華白海豚野生動物重要棲息環境之類別及範圍」，惟因各方意見分歧，歷經二十餘場公聽會，迄未公告。

海洋野生動物保育之中央主管機關原為行政院農業委員會，自2018年4月28日起變更為「海洋委員會」。海洋委員會海洋保育署成立後，有關海洋生物保育、海洋污染及海洋廢棄物，都為海保署業務範疇及未來努力改善的目標，白海豚保育議題更列為重點業務之一，海保署持續透過監測調查瞭解白海豚族群情況；試辦推行台灣鯨豚觀察員制度，以減緩海事工程對於鯨豚影響與衝擊；整合成立海洋保育類野生動物救援組織

網，救援擱淺受傷保育類鯨豚，並進行紀錄與蒐集科學樣本，以作為後續相關研究及族群保育政策擬定參考；為維護白海豚族群及其生存環境，著手擬定白海豚保育計畫，召開專家學者諮詢會議，邀集跨部會協商溝通，依據野生動物保育法規定與相關機制，持續與各權益關係人溝通協調、所有的努力，都為推動白海豚保育工作，設法搶救這群生活在台灣西海岸脆弱的白海豚族群。

考量國際保育趨勢，並廣納國際專家學者意見，海洋保育署決定派員參與本次白海豚復育計畫工作坊，由海洋保育署郭庭羽專員 1 人代表參加。本次白海豚復育計畫工作坊於 2019 年 8 月 28 至 31 日於加拿大安大略省倫敦-西安大略大學舉行，與會者有來自美國、加拿大、台灣等，包括鯨類生物學、生態學、生物聲學、保育政策制定等各領域專家、我方代表及 NGO 團體代表，共計 17 餘人與會。

本次參與工作坊重點在於了解目前國外各領域專家對於台灣白海豚族群保育意見與想法，希望透過溝通討論，與過去小型鯨豚復育實務分享，提供我方相關白海豚保育行動建議及可行方式，共同保育台灣白海豚族群。

貳、復育計畫工作坊會議過程

一、8月28日會議

由 Dr. Taylor 擔任共同主席歡迎各位參與者，接著由共同主席 Dr. Araújo-Wang 簡述本日工作坊議程內容及進行方式，並於會議開始前，提醒本次工作坊基於隱私因素，請大家不要進行錄音(影)紀錄。共同主席 Dr. Taylor 說明本次工作坊目標，並由所有與會者自我介紹後，隨即進入本次工作坊重點—產出白海豚復育計畫(Recovery Plan)以及針對海洋保育署(OCA)目前草擬之白海豚保育計畫(Conservation Plan)提供意見，重點摘要如下。

(一) 釐清 Recovery plan(RP)跟 OCA Conservation Plan(OCA CP)的差異性

參與專家表示希望於工作坊一開始即釐清本次工作坊預定產出之 RP 及 OCA CP 兩者的主要讀者是誰，是否具有法律地位，以及未來是否公開等。郭庭羽專員說明，依據野生動物保育法相關規定，保育計畫主要針對野生動物保護區所訂定，不會針對物種訂定保育計畫，但白海豚為我國瀕臨絕種保育類野生動物，目前族群數量可能已經不到 75 隻，面臨嚴重滅絕風險，因此海保署主動針對白海豚訂定保育計畫，希望透過計畫訂定與權益關係人溝通，同時藉以爭取相關經費，執行保育行動，保育台灣的白海豚族群。

Dr. Wang 說明，RP 的概念約在 2 年前開始構思，當時海保署尚未成立，很高興看到台灣新的政府機關對於白海豚保育議題更為重視，願意協助提供意見，也希望政府相關單位能參採國際專家學者意見，保育白海豚族群。另有一學者提及，建議 RP 未來可提供、遞交給 NOAA，美方 ESA 目前雖然將白海豚列入名單，但是因為是白海豚非美國境內物種，NOAA 目前並沒有針對白海豚制訂復育計畫。

經討論後，與會人員同意本次工作坊最重要的目標是完成一份獨立的 RP，內容需包含有優先順序的保育行動，並辨別可能涉及的權益關係人，而保育行動會是最主要重點。此份 RP 完成後，工作坊小組希望派員與台灣政府單位(OCA)再行討論一次。工作坊第二個目標，則是希望提供具有建設性的意見給 OCA CP，以利 OCA 推動後

續白海豚保育行動。

RP 完成後會公開讓大眾知道，希望無論台灣政府相關機關或是其他對於白海豚保育有興趣單位皆能參採，並讓大眾更加瞭解白海豚現況。參與專家學者亦建議，歷年 NGO 辦理的白海豚保育議題相關工作坊成果資料也應該公開，並放在網路上供大眾查詢，瞭解過去各界對於白海豚保育議題已進行的努力。同時，本次工作坊提供給 OCA 的意見，雖是直接提供給 OCA 參考，但將來 OCA CP 仍會紀錄相關資訊來源及訂定歷程，故相關工作坊意見仍視為公開。

(二) 科學背景資料是否有經過同儕審查的重要性

有經過同儕審查的資料代表著有一定的科學品質，但像是白海豚這樣的族群，可能不是所有資料來源都會經過發表。本次工作坊可敘述，在工作坊中過程中的保育建議是如何討論及被提出，經過哪些方式被提出，不須評論其他資料的好壞，主要應該敘述怎樣才是好的決定與建議方式，以及怎樣篩選資料來源才是比較好的方式，並將提出相關建議給政府機關與其他單位參考。

(三) 國際鯨豚復育經驗

建議應定義何謂白海豚的棲地範圍，之前 2014 年農委會預告的重要棲息環境，專家認為當時並未能包含所有白海豚的 suitable habitat，suitable habitat 從新北市到台南市，confirmed habitat 目前則是苗栗縣到台南市，這樣的範圍對鯨豚來說是很小的尺度，牠們會游動，但對台灣來說範圍似乎很大，因為包含了 9 個縣市。現在關於棲地的用詞太多，工作坊文件的用法應該要統一，讓政府機關跟外界都可以更清楚，也不會錯誤解讀。

劃設保護區時要注意，重點不是劃設，而是有沒有實際管制或降低海豚的威脅，像鼠海豚的例子，當他們設了保護區，但其他外圍漁業行為仍持續甚至加劇，保護區無助於保育。所以如果流刺網對於白海豚是最大的威脅，保育行動的重點應該是只要解決漁網就可以保護海豚，劃設保護區不是一定必要。

(四) 台灣政府組織架構及分工權責

白海豚保育涉及的政府機關非常多，在 OCA CP 草稿中有提到各部會機關，但是像

國防部:演習；勞動部:工作機會、就業輔導，這是目前尚未列入，建議可以補列。一般提到保育，大家不會想到除了保育主管機關外的其他機關，但其實其他機關也是有責任的。以台灣情況看來，負責經濟發展的機關通常會有比較多資源，而負責保育的機關通常相對弱勢。與會專家學者，認為 OCA 願意主動開始著手草擬保育計畫，並規劃推動保育行動，對於白海豚保育是較樂觀的情況，期許透過彼此間的合作，讓其他機關及相關單位也共同參與，正視白海豚保育議題。

(五) 漁民-開發商-白海豚如何 3 贏

除了離岸風機以外，海底電纜跟其他海事工程對於台灣西海岸白海豚族群也是重大威脅，目前主要透過環評法相關規定去限制開發商的行為，與會專家學者認為，由於現在台灣負責白海豚保育的機關，似乎願意比以前承擔更多的責任，也比較積極面對白海豚議題，可能有機會達成三贏的契機。工作坊期間可以思考，倘以漸進方式逐步推展保育行動(如全面購回流刺網及拖網)是不是有可能，也要思考，如果要這樣做，在台灣哪幾個縣市最有可能成功推動。另外，由於進行保育行動前，需要跟所有在地權益關係人做好溝通，有沒有哪一個縣市首長支持，OCA 或是合作的 NGO 有沒有跟哪個地區的漁會較為友好，該區域是不是有相關開發商可以支持收購基金等。

討論過程中提及，如能事先跟開發商溝通好，從現在每次開發前都各自要付補償金的方式，轉為開發商們合作，一次談好收購買斷，同時說服相關單位預告在某個時間後將會全面禁用流刺網跟拖網(如預告 5 年後禁網，越早接受補償可以得到更好的刺網收購補償，提高漁民放棄流刺網的意願)，另外積極輔導漁業轉型，用這種棍子跟蘿蔔並用的方式，有機會達到 3 贏的局面(白海豚-開發商-漁民)。初步討論，桃園也許是個可以考慮的示範區，當地已有季節性禁流刺網，且在地漁會對於保育亦有興趣及認知，但當地並非白海豚目擊熱區，效果需再評估；另外在 confirmed habitat (苗栗到台南)應該也要選一個示範區推行。

但討論過程中亦提及，推行這種示範區計畫時須注意，像墨西哥鼠海豚自願性的流刺網收購計畫花很多錢，但由於後續執法不徹底，漁民還是繼續用流刺網捕魚，導

致計畫失敗，示範區能否成功，重點在於能否徹底執法。過去復育失敗的案例，可以考慮當成附錄，避免重蹈覆轍；另外，OCA 代表建請與會專家提供，禁用流刺網成功助於海豚族群恢復的案例，以助於後續跟權益關係人溝通。

(六) 討論復育計畫(RP)的架構

初步針對 RP 架構進行討論，並認為工作坊應該花時間在保育行動跟策略上，背景部分已經有很多敘述及資料，會議中指定人員進行初步檢視，明日再行細部討論。

保育行動是本次重點討論項目，保育行動應該是直接跟提升族群數量有關的，像是監測跟研究非屬直接的保育行動，保育行動跟監測研究應該分開撰寫，也要有優先順序，才能有效幫助族群恢復的可能性。後續將由大家討論後，投票決定目前所有保育行動的必要性及優先順序。

二、8 月 29 日會議

本日有 3 位新參與人員，主席 Dr. Taylor 請大家簡單重新自我介紹一次後，簡述昨天工作內容與進度，再次說明本工作坊的目標(Recovery Plan 以及 comment on OCA Conservation Plan)，及確認更新本日議程，隨即進入議題討論。

(一) 聲學與風場簡報與討論

1. 本日上午先由 Dr. Hsiang-Chih Chan 進行簡報，同時大家提問討論。HC 簡報題目為 Monitoring plan and protection strategy for the impact of underwater noise on cetaceans in the Taiwan strait，HC 簡報內容包括介紹個人及該公司經歷，曾經合作過政府機關與計畫，提出對於目前台灣風機施作及監測情形等。

(1) HC 認為了解水下噪音背景基線，有助於知道打樁及其他人為行為所導致的噪音影響，也提到風機產生的噪音來源來自 Piling、Shipping、Turbine。

(2) HC 以福爾摩沙 1 號 6/28 打樁為例，說明水下監測重要性，因為其施工時的 Soft start 看起來並不是緩啟動，除了緩啟動時間只有 10 分鐘過短外，從聲學監測資料看起來 SEL Variation 跟全速啟動看起來並沒有不同，未能達到緩啟動效果。

(3) 該公司目前有承接海委會國海院計畫進行與台中港附近與白海豚水下聲學監測相關的計畫，該計畫儀器放置位置離岸 12km，在場專家提出，這樣無法將 PAM 儀器設置於白海豚棲息地內進行有效監測，確定白海豚是否有受到噪音影響。同時也提到台灣目前的其他研究同樣有這樣的問題，因為受到沿岸流的影響，船長通常不願意將船開得太靠近河口，且儀器放得較近也容易被其他船隻誤傷或遺失，但未來監測方式應該設法改善。

(4) 關於作業船減噪措施，HC 建議參考加拿大方式，管制、降低船速，而在場專家提醒，船隻的減噪措施不只有減速一種方式，還有其他途徑，而且減速是否能有效減噪會因船隻型態而異，有的船可能降低船速反而累積更多噪音的。

(5) HC 提出，氣泡幕設置應該至少是雙層，且氣泡密度會影響減噪效果，應該也要有所規範跟了解，目前台灣有的廠商 EIA 承諾只會設置單層，對於氣泡幕密度也未有相關規範。在場專家同意，氣泡幕如果設置良好，雖然它不是最完美的方式，但屬於有效的減輕措施。

2. 離岸風機對於 TWD 的影響，可能現階段不會馬上呈現，因為可能不會直接殺死他們，但是後續可能會有所影響，TWD 的棲地範圍就是那麼小，而且族群數量很少。離岸風機可能導致後續的食源魚種減少、TWD 被迫遷徙離開原本棲息的棲地，或是影響生育率等。

3. 在 RP 應該提及，讓風機廠商跟政府明白，目前所有的減輕措施沒有雙贏，沒有減少對於鯨豚的威脅，威脅仍存在；同時也應設法讓開發商瞭解，他們有責任應該做的比現在環評承諾還要更多。並認為，綠能開發如果勢在必行，無法阻擋，但政府機關與相關單位可以做得更多，在自然保育及經濟發展取得平衡。

(二) 分組討論—Discussion of acoustic disturbance [Break-out group: Nowacek, Chan, Würsig, Rose, Robin]

小組討論成員針對水下噪音對於白海豚可能造成之影響及相關議題進行討論，鑒於 2017 年工作坊報告中對於聲學方面已有詳細討論及相關參考資料，本次 RP 不會針

對聲學議題著墨過多，但會摘錄部分內容入 RP。

(三) 分組討論—Discussion of compiled “conservation actions”list [Break-out group:

Everybody else]

1. Recovery Goal

在 Recovery criteria 部分討論許久，大家對於敘述方式跟族群數量數字有各自想法及立場，大家最後同意在 RP 中的敘述方式必須謹慎，避免使用過於學術的字眼，造成閱讀者誤解或是誤用，同時 RP 的目的是希望可以讓白海豚族群脫離瀕危的風險與危機，相關族群恢復數量目標訂定就應該包含族群可以完全恢復的數量。

2. Action table

過程主要為檢視大家對於 Action table 的內容是否有不明白，或是否認為需要在 priority scoring 進行前提出以共同討論之處。眾人對於內容項目討論熱烈，像是此 table 裡究竟應呈現怎樣內容，或是如何呈現等。經過漫長辯論後，初步共識 action 應該是要可以恢復族群量的事情，減緩(減輕)是另一個項目(像是風機的減輕措施等)，會把減緩措施從 action table 裡面分開，不進行 priority scoring。

另，開發商跟政府單位現在多認為進行減緩措施就已經達到雙贏，但事實上並未達到讓族群回升的目的，所以應該是單贏。近來的開發行為都是在白海豚已被宣告瀕危後才出現，倘重視物種瀕危這個議題，根本就不應該出現這些開發。所以應該要讓大家知道，既然開發已勢在必行，他們必須做減緩，設法讓威脅降到零，同時應做出一些補償措施，也就是 action table 裡面重要優先的項目，以幫助族群恢復。

(四) 復育計畫(Recovery Plan, RP)內容討論

說明今天晚上大家的任務需使用基於 IUCN 標準的 5 分系統，進行保育行動(action)項目進行評分。行動項目的評分從 5 到 1，其順序代表該行動將族群增長率從目前的下降趨勢變為恢復的程度。所有行動項目都需要與其他行動項目一起發生，並且需要立即或盡快實施，高分者代表該行動具有直接和有效的積極影響，因此必須立即

進行以阻止 TWD 族群下降。分數較低者代表該行動將需要更多時間才能看出成效，雖對亞種的恢復不具有顯著的可觀察性，但仍然是至關重要的影響因子，因此為了整體族群恢復目的，現在仍應實施較低的評分行動。

必須在 RP 中清楚地表明，Action table 中的所有行動都必須盡快實施，即使它們可能需要更長的時間才能產生效果，但如果現在不開始著手實施，就會需要更久以後才能見到成效。

三、8 月 30 日會議

本日工作坊由討論 Action Table 開始。Dr. Gerrodette 已經將大家投票的結果彙整，但顯然大家對於 table 內容有很多疑慮跟歧見，共同主席 Dr. Taylor 再次解說提醒，Table 上的所有 action 應該都是對於 TWD 有直接益處的，Score 只是代表建議優先執行順序，不是重要與否，Table 上的 action 應該同樣都重要，並且直接對應到 TWD 面臨的威脅。本日討論摘要如下：

(一) 執法重要性

能否徹底執法是相當重要的議題，但 Action Table 列入「徹底執行 3 涇禁拖網」此項目有疑慮，應是所有的相關規定皆須被徹底執行，不僅有拖網，而且不僅是漁業相關執法，其他現有規定(如環評規定等)也應該徹底執行。執法的部分將移到內容中敘述，強調徹底執法重要性。

(二) Action Table 內容釐清

鑒於原本 table 的內容可能對外界閱讀上有誤解或是誤用，將刪除類似、可能被用來替代最優先保育行動的項目，並在內容中說明為何那些項目從 table 中被刪除，並加入過去已經被運用但失敗案例(鼠海豚復育)，或是現況已在進行但是沒有起作用的情況。例如：「即刻全面禁用流刺網」就保留，但其他類則項目刪除。不過像是「流刺網收購(buyout gillnet)」，是要怎麼做到全面禁網的方式，則在內容中加以敘述。

(三) OCA CP 討論

郭庭羽專員說明，白海豚保育工作不是單由 OCA 一個機關可以執行，需要所有其他相關機關(單位)一起努力，希望與會專家學者能夠提供更明確意見，以納入 OCA CP，協請相關機關共同合作；亦請提供建議修改內容相關資訊，倘後續有機會提報行政院並被接受，有助於保育行動執行，及相關機關配合協助，並也有助於爭取預算執行保育行動。

與會專家學者表示，了解 OCA 需要更多執行面的意見，但涉及各議題涉及內容廣泛，並非現場專家能提出具體執行內容的，專家們會盡量將相關意見提供給 OCA，無論放在 RP 中或另外提供建議。

(四) Action Table 內容定案

討論後刪掉大部分 table 的內容只留下 6 大項目，因為 recovery action table 內容應該是精簡的，提供大方向，主要考慮在於”能夠對於族群回升是否有直接關係”以及”對於族群回升的立即性與否”，表格會增加一個欄位將 TWD 的 5 大威脅與此 6 大 actions 進行連結。Action table 中的 6 個項目將會有各自的章節，說明這些 action 被排列優先順序的原因及更詳細的內容等。

白海豚 6 大復育行動包含：立刻禁止在白海豚潛在棲地的 9 縣市水域使用流刺網與拖網、停止在白海豚棲地中進行更多開發行為、使用安靜船舶並且減少速度及噪音可能產生的影響、減少污染、盡可能增加淡水注入量、設立人為水下噪音管制措施。

(五) 白海豚復育相關監測研究討論

針對白海豚復育相關監測研究及執行優先順序進行討論，高優先等級項目包含：白海豚對於干擾的行為反應(短期及長期)、白海豚存活率繁殖率及年齡結構、白海豚動態及棲地使用情形、監測族群豐富度趨勢、監測族群動態、評估流刺網收購費用；中優先等級項目包含：白海豚族群健康評估、擱淺白海豚資訊、瞭解白海豚棲地內流刺網及拖網努力量與產量、瞭解白海豚食源、量化白海豚棲地聲景；低優先等級項目為：瞭解白海豚社會結構變化。

經過討論後，有數種研究都被認為是具有高優先性等級，但在所有高優先性研究中，經過在場參與者投票決定，以「監測族群豐富度趨勢」為重中之重。另，「公開政府補助經費研究資料」項目並不會列入，但會在 RP 中提到研究資料公開透明的重要性。

四、8 月 31 日會議

今天重點在於初步檢視 Dr. Naomi Rose 初編的 Executive Summary 與 Dr. Barbara Taylor 初編的 Action item explanations，同時討論工作坊結束後大家如何完成 RP 內容的工作安排。經過討論，Executive Summary 預計於 9 月 10 日完成，而 RP 預計 10 月完成英文版本。其餘時間則由各負責人員討論及編撰 RP 內容。

有關給 OCA CP 意見的部分，工作坊專家認為 OCA 願意瞭解工作坊的意見，是對於 TWD 保育很好的機會，希望 RP 完成後，OCA 或是其他有興趣的機關(單位)可納入參考。經初步檢視 OCA CP，預計提供意見的許多內容會是重複出現在 RP 中，且目前 OCA CP 英文版為 NGO 先行協助翻譯，並非正式官方版本，內容可能會與原意有所出入造成誤解，在此情況下提供意見恐怕效用不彰，無法確實解決 OCA 想要了解的問題。經過討論工作坊初步共識為，RP 英文版本完成後就會先提供給 OCA 參考，OCA 檢視後，再告知需要專家們協助或提意見的部分，將更有效率達成想要的成果。

參、心得及建議

台灣西部沿海的白海豚族群分布範圍與台灣西部經濟、工業之重點發展區域重疊，所受到的人為衝擊相當大，對白海豚此類數量極低可能已少於 75 隻的小族群來說，承受極大的滅絕風險。白海豚所受的人為活動衝擊主要歸納為 5 大項包括，漁業誤捕、棲地減少、河口淡水注入量減少、環境汙染、人為行為造成的水下噪音等。同時近年來政府積極發展綠能產業，西部沿岸開始廣設風機，海底電纜工程及其他海事工程，亦未曾停歇，對於生存於此的白海豚族群無疑更添威脅。

白海豚保育長期目標是為了能夠確保台灣西海岸白海豚族群能永續生存於自然環境之中，維持其生態功能，為達成此主要目標，歷來各方專家學者、政府機關提出許多行動方案建議，本次工作坊亦將產出一份復育計畫，針對各項白海豚復育行動加以敘述。然而白海豚棲息環境與台灣西部產業發展及人民生活範圍高度重疊，牽涉權益關係人甚多，由工作坊與會國際專家學者群針對白海豚 5 大威脅所提出相對應之 6 大復育行動即可看出，若欲有效落實白海豚保育，非僅靠單一政府部門即能達成，期許未來各相關部會及權益關係人持續溝通，確實共同合作分工，以達成兼顧物種保育、經濟發展及人民生計之資源永續多贏局面。

肆、附錄

一、 工作坊議程

DRAFT ANNOTATED AGENDA FOR THE WORKSHOP ON A RECOVERY PLAN FOR TAIWANESE HUMPBACK DOLPHINS

Wednesday, 28 August – 31 August 2019, London, Ontario (3,5 days)

The meeting will take place at the University of Western Ontario, London, Ontario, Canada. We will start at 09:00 on Wednesday the 28th of August and end no later than 12:00 on Saturday the 31st of August. Coffee/tea breaks will be at mid-morning (10h30) and mid-afternoon (15h30), with lunch at mid-day (12h00 – lunch will be served on site).

Background

The Taiwanese humpback dolphin (locally known as Taiwanese white dolphin, TWD) is found mainly along the west coast of Taiwan between (and including) Miaoli and Tainan counties. However, some animals were observed recently in the waters of Taoyuan county, an area that had been identified as suitable habitat even though we lacked direct evidence of their occurrence there. The dolphins rarely venture into water deeper than 25 m, which means they occur primarily within only a few kilometers of shore (and generally within 3 km). No other cetaceans are common in TWD habitat although bottlenose dolphins (*Tursiops aduncus*) have been observed on a few occasions and both species of finless porpoises (*Neophocaena*) have been caught by local gillnet fishermen. Virtually nothing is known about population history of the TWDs prior to 2002 when dedicated surveys resulted in the scientific discovery of these dolphins.

The highest annual estimate of total abundance (in 2010) suggests that there are fewer than 75 individuals in the population and numbers appear to be declining at a rate of close to 3%/yr. The principal known threat is bycatch in fishing gear, especially gillnets (primarily trammel nets), but

the dolphins live in a seriously degraded environment where sublethal threats (e.g., exposure to noise and toxic chemicals (either directly or through trophic transfer), depletion of preferred prey species, loss of habitat) are likely contributing to the decline in numbers and health. Massive offshore windfarm development is underway and planned in and near the dolphins' habitat. Taiwanese authorities appear interested in conserving Taiwanese humpback dolphins but no specific measures have been implemented thus far, despite years of effort by scientists and conservationists to advise and guide the government on what kinds of actions are needed. The Ocean Affairs Council of Taiwan's Ocean Conservation Administration has drafted a 'Conservation Program' (provided to workshop participants as 'OCA con plan v 14'), and one of the purposes of this workshop is to provide the Council with a critique and suggestions for improving the program. Workshop organizers regard the windfarm development not only as an additional threat to the dolphins but also as an opportunity to leverage industry support for swift, effective conservation action to protect the dolphins. This may be the last real chance to prevent the extinction of Taiwan's only endemic marine mammal.

The primary objectives are to: (a) Review and summarize the population's biology, ecology, threats and status; (b) identify, characterize (quantify if possible), and prioritize threats; (c) discuss measures for improving the subspecies' conservation status and propose specific actions to be taken; and (d) review existing monitoring efforts and recommend additional approaches for monitoring the population's size and trend and the effectiveness of conservation measures.

Expected outcomes

The primary expected outcomes are two-fold: (1) produce a recovery plan for consideration (and possible adoption) by the Taiwan government and (2) provide a critique of the OAC's draft humpback dolphin conservation program.

DAY 1 (August 28)

1. INTRODUCTORY ITEMS

1.1 Opening remarks and introductions (30 min for entire section, max)

1.2 Co-chairs and rapporteurs

1.3 Adoption of agenda

1.4 Review of documents available

1.5. Discuss and agree on the content of the “strawman” as a starting point for our RP

* Coffee break (10h30)

* Lunch (12h00 – 13h00)

2. BRIEF OVERVIEW OF THE CONTEXT AND CHALLENGES

2.1. Presentation by Winkler (+ Discussion of the main threats and the win-win-win solution identified by 2017 windfarm workshop participants + Discussion of existing mitigation and monitoring measures and their effectiveness)

* Coffee break (15h30)

* End of day (17h00)

* Dinner (18h00)

DAY 2 (August 29)

4. ACOUSTICS AND WINDFARMS

4.1. Coverage of windfarm noise – presentation by Dr. Chan

– presentation by Dr. Doug Nowacek

* Coffee break (10h30)

4.2. Discussion of acoustic disturbance [Break-out group: Nowacek, Chan, Würsig, Rose, Robin]

4.3. Discussion of compiled ‘conservation actions’ list [Break-out group: Everybody else]

* Lunch (12h00 – 13h00)

5. DEVELOPMENT OF ‘INDEPENDENT’ RECOVERY PLAN

5.1 Discuss the strawman background re-write by Lars, Bernd and Tim

5.2. Discuss the list of conservation actions (+ research - continue long-term monitoring)

* Coffee break (15h30)

5.3. Break-out group to come up with a final table of conservation actions (+ research)

5.4. Break-out group to identify stakeholders, responsible agencies, etc. (local and international) based on the conservation actions list

5.5. Begin drafting recovery plan text in small groups

5.6. Reconvene as plenary and report back on progress, plan for Day 3

* End of day (17h00)

* Dinner (18h00)

DAY 3 (August 30)

6. DEVELOPMENT OF 'INDEPENDENT' RECOVERY PLAN (CONT.)

6.1. Progress on drafting Recovery Plan

* Coffee break (10h30)

6.2. Discussions on RP

* Lunch (12h00 – 13h00)

6.3. Continuing drafting recovery plan text in small groups

* Coffee break (15h30)

6.4. Reconvene as plenary and report back on progress.

* End of day (17h00)

* Dinner (18h00)

DAY 4 (August 31)

09h00-12h00: Open slot for any further discussions

[Possible item?]

1. IDENTIFICATION OF ISSUES ON DRAFT 'CONSERVATION PROGRAM' OF OCEAN CONSERVATION ADMINISTRATION, OCEAN AFFAIRS COUNCIL (Document 'OCA con plan v14' sent to all participants by Araújo-Wang on 11 Aug)

3.1 General discussion on how to proceed in compiling and transmitting comments to OCA – decide who will take lead for sections agreed to be 'important' for us to comment on

3.2 Agree a strategy and timetable for following through on commitment to provide comments (including 'terms')

二、 與會者名單

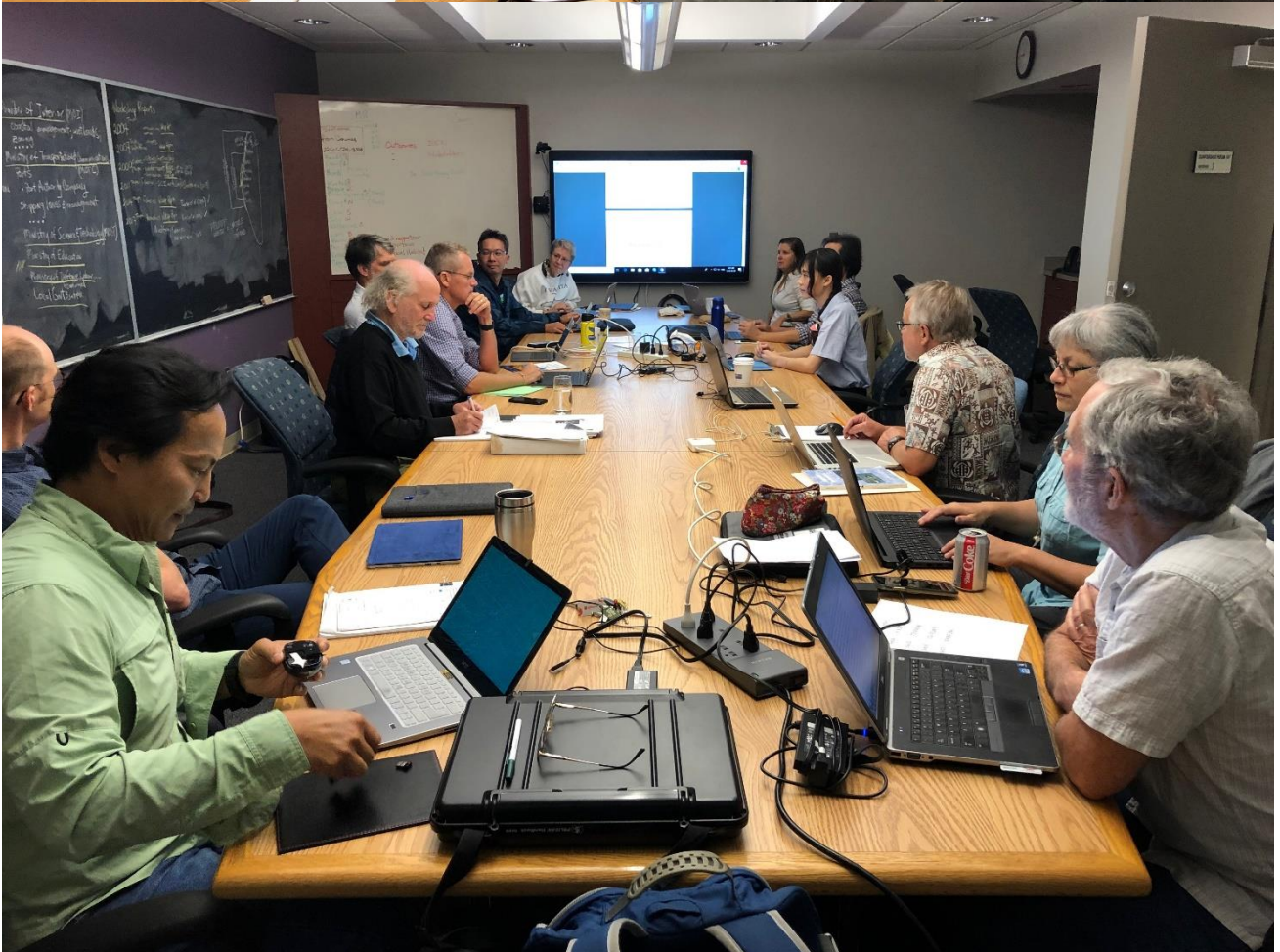
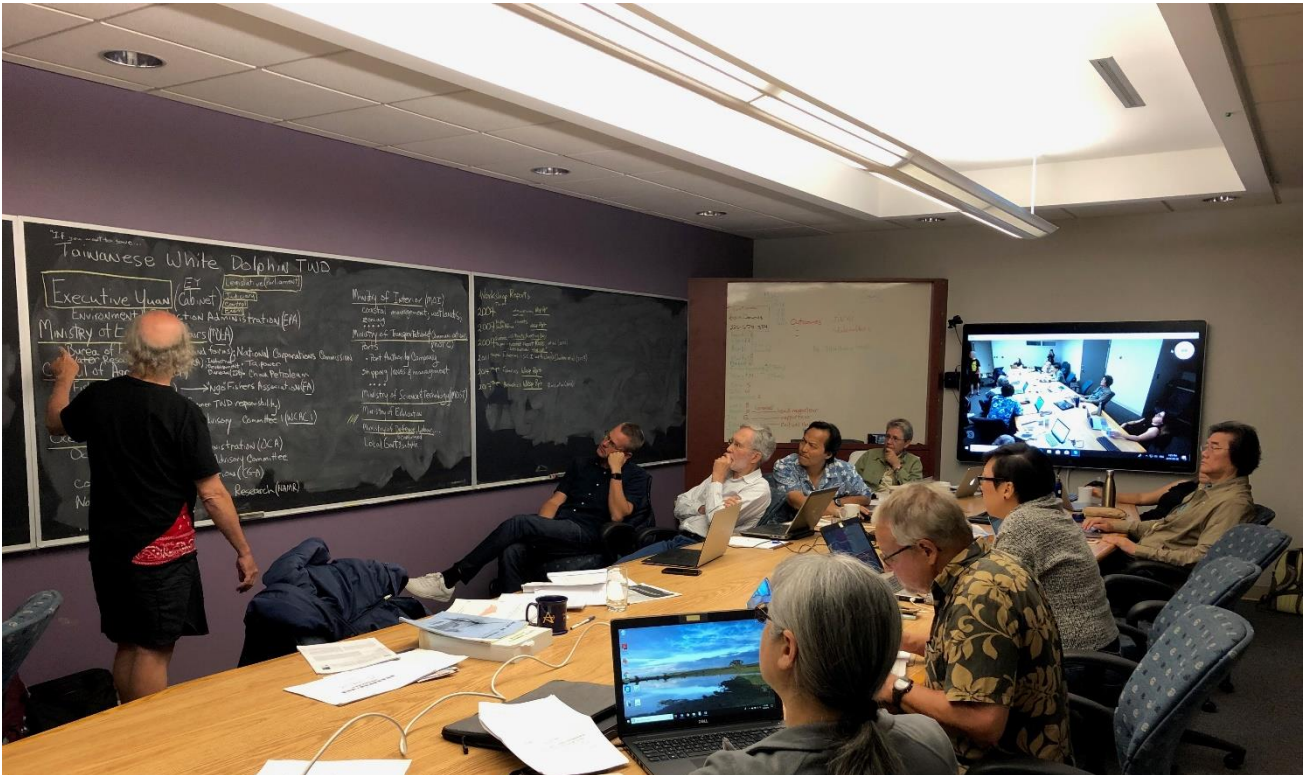
➤ Co-chairs:

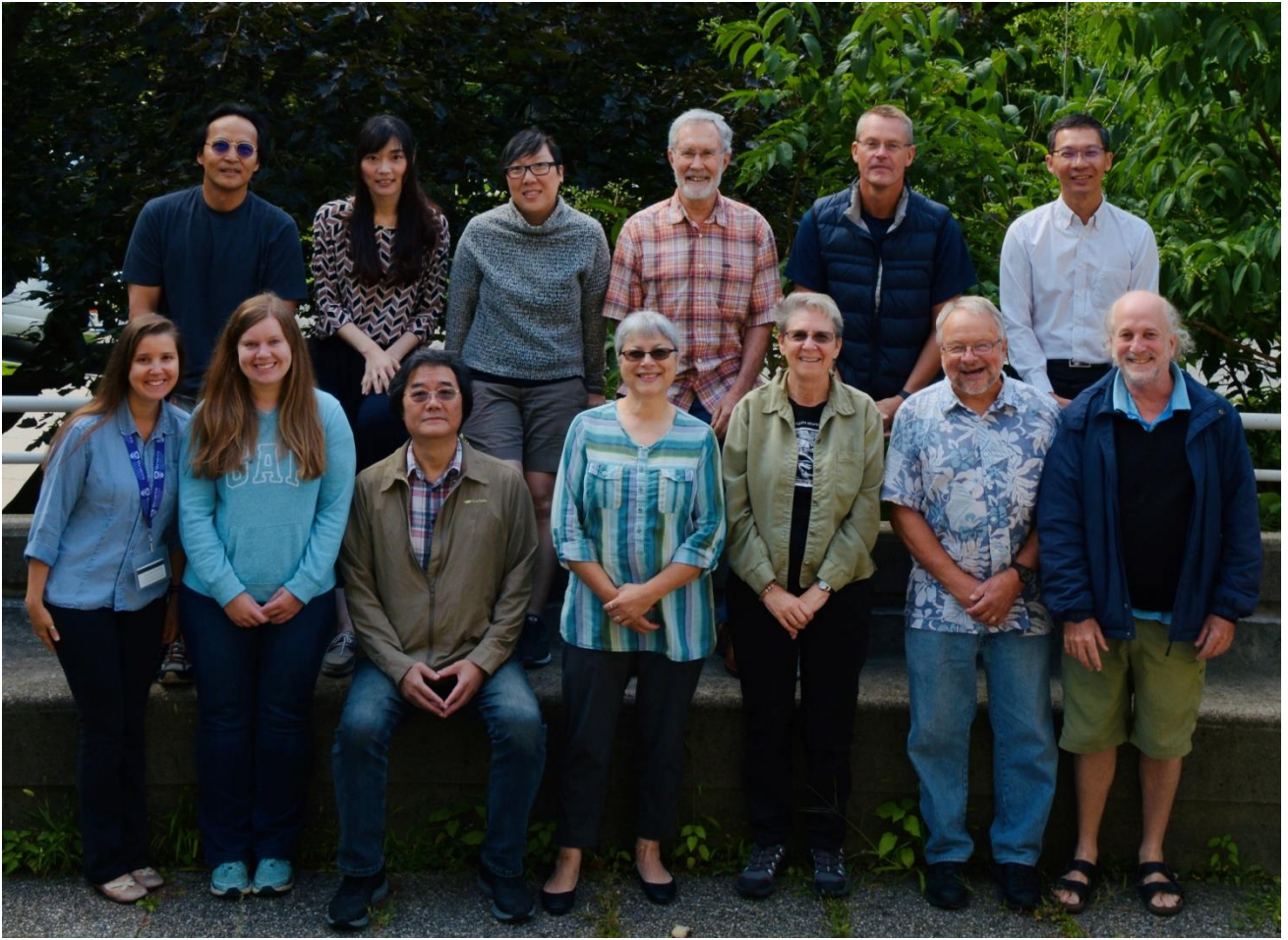
- 1) Dr. Randall R. Reeves (Chair of the IUCN Species Survival Commission Cetacean Specialist Group - Canada)
- 2) Dr. Barbara Taylor (Southwest Fisheries Science Center, NMFS, NOAA – USA)
- 3) Dr. Claryana Araújo-Wang (Research Associate of the CetAsia Research Group - Canada)
- 4) Dr. Kurtis Jai-Chyi Pei (裴家騏, Professor of the Institute of Wildlife Conservation, National Pingtung University of Science and Technology – Taiwan)

➤ Participants:

- 5) Dr. Bernd Würsig (Professor Emeritus of Texas A&M University - USA)
- 6) Dr. Naomi Rose (Marine Mammal Scientist at Animal Welfare Institute - USA)
- 7) Dr. Lars Bejder (Director of the Marine Mammal Research Program at University of Hawaii at Manoa – USA)
- 8) Dr. John Y. Wang (Chief Biologist of the CetAsia Research Group - Canada; Adjunct Researcher of the National Museum of Marine Biology and Aquarium - Taiwan)
- 9) Robin Winkler (Director of Wild At Heart Legal Defense Association - Taiwan)
- 10) Dr. Hsiang-Chih Chan (Awareocean Technology Co., Ltd. – Taiwan)
- 11) Ting-Yu Kuo (OCA – Taiwan)
- 12) Dr. Doug Nowacek (Duke University – USA)
- 13) Dr. Tim Gerrodette (Southwest Fisheries Science Center, NOAA – USA)
- 14) Erin Schormans (St. Mary's University – Canada)
- 15) Dr. Simon Bonner (University of Western Ontario – Canada)
- 16) Katherine Chong (Legal Advocacy Coordinator of Wild At Heart Legal Defense Association - Taiwan)
- 17) Peter Ross (remote)

三、 工作坊照片





四、 EXECUTIVE SUMMARY (DRAFT)

EXECUTIVE SUMMARY

International Workshop on a Recovery Plan for the Taiwanese White Dolphin

28-31 August 2019

University of Western Ontario

London, Ontario, Canada

Objective

The primary objective of this workshop was to produce a recovery plan that specifies actions needed to stop the decline of the Taiwanese white dolphin and promote its recovery.

Introduction

A group of 15 international experts in cetacean biology and ecology, bioacoustics, and conservation policy conducted a workshop in August 2019 to prepare a recovery plan for the Taiwanese humpback dolphin (*Sousa chinensis taiwanensis*). This subspecies is endemic to Taiwan, where it is commonly referred to as the Taiwanese white dolphin, or TWD.

TWDs exist only in a very small population in Taiwan's central western nearshore waters. Their known distribution includes roughly 750 km², but their primary distribution occupies ~330 km² in a thin strip of water only some 110 km long, from about Tongshiao (Miaoli County) to Taixi (Yunlin County). The subspecies is currently thought to number fewer than 75 individuals. Since 2008 it has been listed as Critically Endangered in the Red List of Threatened Species of the International Union for Conservation of Nature (IUCN), meaning that it is globally recognized as facing an extremely high risk of extirpation, i.e. the complete loss of the subspecies.

The recent extinction of the Yangtze river dolphin, or baiji (*Lipotes vexillifer*), in China, the impending extinction of the vaquita porpoise (*Phocoena sinus*) in Mexico, and the near-extirpation of the Māui dolphin (*Cephalorhynchus hectori maui*) in New Zealand have demonstrated how quickly populations of small cetaceans with restricted distributions can disappear once their numbers have fallen below 100. Accidental mortality in fishing gear (bycatch) was the primary factor driving these cetaceans to extinction or near-extinction. There is no question that the TWD is in serious trouble and the chance of its complete disappearance increases with every passing year. An international workshop in Changhua City in 2007 concluded, "Unless tough management action is taken immediately to protect them and improve the quality of their habitat, this small group of animals unique to Taiwan will be lost forever." Despite the TWD being listed as an Endangered Species under Taiwan's Wildlife Conservation

Act with level-one protection (it may not be killed, captured, or disturbed), no effective action has yet been taken to halt the subspecies' decline or promote its recovery.

It is important to avoid viewing the plight of these dolphins as an isolated concern of little relevance to the everyday life of the people of Taiwan. As fellow mammals, the dolphins are sentinels of environmental health in coastal waters and estuaries, living as they do at the interface between land and sea. Stopping environmental neglect and abuse, and indeed reversing the trend towards deterioration and loss, is as urgent for the people and other organisms living along Taiwan's west coast and in the watersheds flowing into the Taiwan Strait as it is for the dolphins. The overarching objective of this recovery plan is to ensure the long-term viability and ecological functioning of TWDs in their natural environment.

Dolphin Biology, Demography, and Ecology

Like other members of the family Delphinidae, TWDs are long-lived (ca 40 years), late-maturing (females attain sexual maturity at 10-11 years), and slow to reproduce (a single calf is born at intervals of at least 3 and often up to 5 or 6 years). Individual females may give birth to no more than 5 or 6 calves in their lifetime. These life history characteristics mean that even under the of circumstances, with favorable environmental conditions and little or no exposure to risks from human activities (e.g. entanglement in fishing gear, vessel strikes, or continued urban and industrial development of the coastal zone), the potential rate of population increase is no more than 3% per year. Therefore, rapid recovery is out of the question, and it will take years and possibly decades to confirm a significant and sustained shift in the population's trajectory.

The population size was estimated at around 100 animals based on line-transect surveys in 2002-2004. A much more precise estimate of around 75 animals was obtained in 2010 using photographic mark-recapture methods. Preliminary annual estimates since then have all been somewhat lower. Although more data are needed before a significant trend can be confirmed, all available estimates, produced by different research teams using different techniques, point to a likely continuing decline.

TWDs have a strong affinity for shallow waters (< 25 m deep) within 3 km of shore. They are most often encountered within 1 km of shore and in water 7-8 m deep (they can be seen in water shallower than 1 m). Like other humpback dolphins, they tend to be associated with estuaries. As feeding generalists, their diet is dominated by a large variety of small fish species.

Main Human-Caused Threats to the Dolphins

Five main threats have been recognized for the last 15 years. By far the best-understood and

most serious is bycatch in fisheries. The others are habitat loss (e.g. due to land reclamation); reduced river flow into estuaries; industrial, agricultural and municipal pollutant discharges into the water and air; and underwater noise from vessel traffic, percussive pile driving, and other noise-producing human activities. These threats are in addition to the inherent vulnerability of small populations with restricted ranges. Thousands of vessels fish with gill and trammel nets—gears known to entangle, injure, and kill dolphins—in the waters used by TWDs along the west coast of Taiwan. At least 30% of the animals in this population bear wounds, scars, or disfigurements from encounters with fishing gear, and dead stranded TWDs have been found with clear evidence that they died as a result of entanglement.

The massive development of windfarms off the west coast of Taiwan represents a new threat to the dolphins, as it necessarily involves a substantial increase in vessel traffic and construction noise (including but not limited to the noise from percussive pile driving). The proliferation of windfarms offshore could also result in fishing effort becoming more concentrated in the TWD's nearshore habitat.

Recommended Recovery Actions

Although there is much more to learn about TWDs and the threats facing them, enough is already known to justify moving ahead immediately with a series of actions, without waiting for further research. Six actions needed to recover the species were identified at the workshop and are described in the plan. These are:

1. Immediately establish an effective ban on gill and trammel nets in TWD suitable habitat.
2. Locate any further development away from TWD suitable habitat.
3. Require use of quiet vessels, speed limits, and mandatory routes to reduce both noise and the risk of vessel strikes.
4. Reduce problems from pollution.
5. Increase river flows to the extent possible.
6. Establish regulations for anthropogenic underwater noise levels.

A structured expert decision-making process was used at the workshop to identify which action(s) will have the largest immediate impact to halt the decline. The recommended ban on gill and trammel nets was supported unanimously and was recognized as *the key action*, needed urgently and immediately. Unless it is implemented, and soon, the TWD is likely to meet a fate similar to that of the baiji.

While it is recognized that an effective gill and trammel net ban is essential to stop the decline of these dolphins, it is also important to *initiate* action immediately on all five of the other

action items listed above. Unlike the net ban, the benefits to the dolphins of the other recommended actions will take time, in some cases decades, to be realized, but they will be essential to achieve sustained recovery.

Role of Stakeholders

Active engagement, meaningful contributions, and vigorous and sustained efforts by all stakeholders are essential for the successful implementation of this recovery plan. Key stakeholders for implementation of the gill and trammel net ban include non-governmental organizations (NGOs), scientists familiar with TWDs, offshore windfarm developers and their financiers, fishers and fisher associations. Strong leadership from central and local government agencies is also essential. The workshop strongly recommended a series of government-led, mandated, issue-focused stakeholder meetings to facilitate collaboration on the implementation of the recovery plan's identified actions.

In addition, as cetacean conservation is a global priority and international experts are eager to assist in the recovery of species and subspecies such as the TWD, the Taiwanese government should take full advantage of this and ensure that international experts are able and encouraged to participate in efforts to implement this recovery plan.

Effective Enforcement

Protecting TWDs and their habitat must be central in Environmental Impact Assessments (EIAs) for all development projects in or near the west coast of Taiwan, including upstream watershed areas. The EIA process must be public and transparent, and scientific uncertainty must be explicitly acknowledged. Where such uncertainty is present, decisions must be made in favor of the dolphins, to avoid errors in judgment that could put the dolphins at greater risk.

It is critically important that existing environmental laws and regulations are rigorously enforced by relevant government agencies, including an effective regime to supervise and monitor activities, with penalties that will deter violations. This process too must be public and transparent.

TWD recovery will be promoted if government agencies ensure that development companies and financial institutions follow international best practices (at a minimum) in their planning, construction, and operations. This responsibility has special force in situations where development is sited in or near the habitat of an endangered wildlife population, as is the case in western Taiwan.

Recommended Research and Monitoring

The workshop identified 11 areas of research and monitoring as priorities for the recovery of the TWD. Research priorities were rated as high, medium, or low through a majority vote. Of these, the following six were identified as “high” priority, with the first supported unanimously:

1. Monitor trends in abundance.
2. Estimate survival rates, reproduction rates, and age structure.
3. Conduct health assessments of living dolphins.
4. Gain an understanding of behavioural responses to disturbance.
5. Monitor changes in distribution, movement patterns, and habitat use.

Furthermore, research on the socioeconomic consequences and other human dimensions of a buyout of the gill and trammel net fisheries is important, specifically research to estimate the cost of such a buyout. Lastly, the workshop stressed that once a reasonable period (e.g. 2 to 3 years) to ensure researchers’ right to first publication has elapsed, data from government-funded research on the TWD should be made publicly accessible.

Creative and effective actions needed

Small populations are vulnerable to many risks, including catastrophic or chance events such as several successive years of poor food production. In combination, these risks can hasten declines. The baiji went extinct within 10 years after declining to fewer than 100 individuals, and bycatch in fisheries has recently caused the small remaining vaquita population to decline by 50% per year. Small populations such as that of the TWD are in the emergency room, where immediate action is required to enable them to survive.

Eliminating gillnets to protect endangered marine mammals is a difficult problem worldwide. However, Taiwan has good governance, established enforcement infrastructure (along its entire coastline), and an active Coast Guard, which are key elements that could make it the first jurisdiction to solve this global problem. Creative solutions are possible, using the good corporate environmental stewardship of windfarm developers to help solve the bycatch problem. For example, companies and financial institutions involved with offshore windfarm development (which is already underway) could contribute to government programs to eliminate gill and trammel nets from TWD habitat. In grasping this opportunity, the industry would help mitigate and offset harmful effects caused by its activities and thereby provide an immediate benefit to this critically endangered mammal. The developers win, the fisheries community wins, and, most importantly, the Taiwanese white dolphins win.