

出國報告（出國類別：開會）

參加第 4 屆亞太珊瑚礁國際研討會
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服務機關：內政部營建署

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摘要

第 4 屆亞太珊瑚礁國際研討會於菲律賓宿霧市舉行，主題為「亞太地區的珊瑚礁：在當代挑戰中攜手合作」。本報告就海域遊憩活動對珊瑚礁生態的影響、海洋保護區網絡、藍色經濟、碑礫貝復育與公民科學等主題探討與會者於會中口頭報告及海報展示所發表之內容，以及與場外攤位的 NGO 團體交流討論其所推動的保育行動，透過他國對於珊瑚礁保育的經驗與研究成果，作為我國兩處包含海域範圍的國家公園之借鏡，就遊憩行為與保護區經營管理方面，應用於國家公園之業務推展。

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一、 會議背景及目的

亞太珊瑚礁國際研討會 (Asia-Pacific Coral Reef Symposium) 每 4 年舉辦一次，從 2006 年第一屆由香港中文大學主辦，2010 年第二屆由泰國 Ramkhamhaeng 大學主辦，2014 年由台灣海洋生物博物館主辦，到本屆於菲律賓宿霧市舉辦，與會人數由第一屆的 250 人至第三屆於台灣墾丁舉辦時，有來自 39 個國家地區 500 人，可見此論壇於國際間的重要影響力。

而本屆於 6 月 4 日至 8 日在菲律賓宿霧是的馬可波羅飯店舉辦，主題為「亞太地區的珊瑚礁：在當代挑戰中攜手合作」，與會人數更是攀升至 620 位報名者。亞太地區的珊瑚礁是上百萬的海洋生物棲息之所，更支持了此一地區，超過五億人口生計的生態地區，漁業利用、觀光發展、生技研發等益處皆依賴豐富的珊瑚礁生物多樣性。然而，人類所帶來的破壞及污染已遠遠超過生態所能自動修復的程度，全球暖化、海洋酸化、過漁、各式污染及破壞皆是海洋目前面臨的威脅。珊瑚礁生態是否能在當前的威脅中繼續發揮其生態功能，而人類如何群策群力檢討並解決所帶來的破壞，是目前迫切之問題。透過研討會集結來自各地的學者及組織單位分享當前研究進展，找出問題並對症下藥。

本屆主題包含珊瑚礁生態學、經營管理及保育等領域的研究發表及工作坊討論，有助於亞太地區的科學家、教育工作者、政府管理部門、環境學家、學生及所有在地利益相關者分享珊瑚礁生態、管理及保育的相關知識及經驗。



圖 1 開幕第一天合照，照片出處：4th APCRS 官方 FB

二、過程及內容

5 天的研討會議程中，主題囊括珊瑚礁生物的生態多樣性、全球環境變遷下珊瑚礁物種的適應及馴化、珊瑚礁地質學、評估及監測珊瑚生態技術的創新、亞太地區珊瑚礁與其他棲地的連結性、珊瑚礁生態管理的新興趨勢：公民科學、碑礫貝的保育及管理、海岸資源管理：漁業及海洋保護區管理、海水酸化等多項主題分類，為了取舍重要且與海管處及墾管處相關的議題，皆須先安排好每時段欲前往聆聽的場次，以下為 5 天研討會中與本國兩處包含海域範圍的國家公園之相關主題：

（一）海域遊憩活動對珊瑚礁生態的影響

此一議題分別有來自菲律賓在地、泰國、關島、越南等地相關研究，由於墾丁國家公園及海洋國家公園園區中亦面臨了相當程度的海洋遊憩活動，藉由其他地區的研究分享可作為自身借鏡。

來自關島的 Williams 進行的研究中指出，在關島，水肺潛水是一項熱門的活動，然而許多潛水員常見的幾樣行為為都可能造成珊瑚的傷害，例如：未保持身體流線、過於靠近珊瑚、不佳的中性浮力、未專心或忽略周遭環境等。而從她的研究發現，潛水員意外碰觸珊瑚的比例大於蓄意碰觸，其中，帶有相機及手套的人員碰觸比例較高；所觀察的對象中，亞州人碰觸珊瑚的比例高於其他地區遊客；多人(5 人以上)一同潛



圖 2 學者 Williams 分享關島潛水旅遊經驗

水碰觸到珊瑚的比例較高。由調查結果及事後問卷分析，大多潛水遊客對於珊瑚的生態知識不足，易造成潛水過程中因好奇而碰觸；而大多數的前者都表示，若潛水前獲得珊瑚生態的相關介紹，除可增加潛水的樂趣，亦可了解如何「友善珊瑚」。故講者建議潛水業者可於下水前提供生態及潛水技巧等相關簡介，如此一來可大幅降低潛者觸碰珊瑚而造成傷害的比例。

而另外，Phillips 於泰國薩島 (Koh Sak) 的觀察研究中，亦指出幾項台灣可借鏡檢討的項目：旅遊旺季時，遊客對陸域及海域環境造成的汙染問題，以及便利的潛水設備，例如 Ocean Walker (如圖 3)，降低旅客接觸海洋生態的門檻，然而未有相對的生態認識及規範亦對珊瑚造成嚴重破壞。另，也因季風影響，至薩島旅遊的人潮有淡旺季之分，旺季時沙灘上隨處可見一次性使用後的廢棄物，亦造成環境的破壞。



圖 3 新興潛水方式-Ocean Walker

Si Tuan Vo 以越南三處海洋保護區為例，占婆島 (Cu Lao Cham islands)、芽莊灣 (Nha Trang bay) 諸島及富國島 (Phu Quoc islands) 皆為海洋保護區，亦是近年來熱門的旅遊地點，不論是造訪人數或觀光產值每年皆持續成長。為了遊憩需求而開墾、建設基礎設施及汙染，造成了島嶼及鄰近大陸的海岸棲地破壞，包括森林、海草床及珊瑚礁等。雖然成立了海洋保護區，但陸地與海洋環境息息相關，陸域部分未納入保護區範圍，陸域資源的消耗與汙染仍然對海洋產生重大的影響，因此需要相關法令配合以管理觀光遊憩活動。另外，觀光產業雖改善了當地人的經濟狀況，卻未必能促進社區的發展，這是由於當地人在賺取大量金錢後，便離開島嶼搬遷至其他城市。因此，如何增加當地居民對社區發展的參與程度，是發展生態旅遊的一大重要課題。另一值得探討的議題為觀光費之應用，以占婆島為例，2017 年的人園費收入達 70 萬美金，這樣一筆龐大的經費是如何運用呢？依據講者的說明，以往保育費收入繳納給政府，政府經費限制較多，難以實際用於改善當地社區環境或進行棲地保育，而現今的觀光費收入則改為 50% 繳納予政府，50% 用於海洋保護區，達到專款專用、改善地方的目的。

對於生態旅遊的經營管理，頻繁的潛水活動造成珊瑚礁生態的干擾及損害，是不可否認的事實，為了兼顧生態保育及地方發展，尋找替代旅遊景點，是一紓解遊憩壓力的方式，例如泰國南部的披披東島，欣菲礁 (Hin Phae) 為熱門的潛點之一，具有美麗的水下尖石群 (underwater pinnacles)，蘊藏豐富的海洋生態，多樣的魚群資源媲美珊瑚礁生態系。因此，探索類似的礁石環境並推廣成為新潛水地點，或可分散珊瑚礁潛點的遊憩壓力。

壁報展示中，其中一主題即針對菲律賓海洋觀光現況探究，在菲律賓，「潛水」占總體觀光收益的四分之一，而馬拉帕斯瓜島 (Malapascua Island) 更發展

出鯊魚旅遊，創造約 12.25 億新台幣的觀光收益（2017 年），且統計資料顯示，因潛水而造訪的旅客在菲律賓停留的時間亦較長。透過有制度的潛水規範，旅客可享受與鯊魚共遊的經驗，亦提供在地居民由原本漁民身份轉而投入海洋生態旅遊的維生之道。

（二）海洋保護區網絡

會議中有相當多的研究將海洋保護區與非保護區進行魚類生物量、群聚及多樣性的比較，例如菲律賓的圖巴塔哈群礁國家海洋公園(Tubbataha Reefs National Marine Park)及 57 個地方性海洋保護區和非保護區之比較，即使地方性的小型海洋保護區可能因面積小、缺乏有效管理及高度捕撈壓力，並未達到良好的漁業管理成效，但仍較非保護區好上許多。其他地區的相關研究，亦皆顯示同樣的結果。

菲律賓整體的海洋保護區現況，包含 30 個以上國家級整合型海洋保護區及 1600 個以上由地方政府管理的地方型保護區。由地方性至區域性的海洋保護區，到國家級及跨國界海洋保護區所形成的網絡，由小而大串連起來，遍佈全國。保護區的最佳管理方式包括保育獎勵計畫、社區共有、嚴格管理、政府與民間團體合作及經費撥用等。針對各保護區的管理現況進行評比，在 572 個樣本中，76% 的保護區管理績效良好。研究指出，成立海洋保護區且能夠有效管理者，具有凝聚社區意識、增加魚類生物量及漁獲量、生態旅遊收益、增加珊瑚覆蓋率及生物多樣性等效益。為了持續改善保護區的經營管理模式，未來將增加海洋保護區面積、改善管理效率、對氣候變遷的適應性及進行生態監測等工作。

關於保護區的劃設，到底應該如何決定保護區的面積大小？以日本琉球群島的研究為例，鹿角珊瑚幼生的擴散距離大約為 20 公里，因此若要保護成熟的珊瑚群聚，作為周邊區域的珊瑚幼生來源，保護區的範圍就需大於 20 公里。而香港的研究則提出，海洋保護區除了保護定棲的魚類，亦須考慮到活動範圍較大的魚類，並應包含多種棲地類型，因此保護區的面積除了要夠大，更要能涵蓋多樣化的棲息環境，使保育效益最大化。

（三）藍色經濟

如同所有的財務規劃一樣，開源與節流，藍色經濟利用影響力投資或保育稅等稅收創造財源，重新規劃或減少支出項目，如傷害性漁法的漁業補助，並加強效率與合作，幫助資源更平均分配，以海洋保育為目的，成立信託基金以永續經營相關產業。

大會中數個小型研討會主題之一為 BIOFIN (The Biodiversity Finance Initiative, 生物多樣性財務倡議)，是針對發展中國家政策及資金的需求，提

供財務運作方案，將生物多樣性提供服務所帶來的利益、維護生物多樣性所需的財務需求、支出項目與資金缺口，協助規劃適合該國且永續的財務機制。

任何政策及計畫的推動，皆需有資金的挹注，作為生物多樣性公約的締約國，菲律賓擬定了一系列的生物多樣性策略及行動方案，然而推動執行這些方案需要的經費與菲國實際能支用的經費有顯著的落差，經統計 2008 至 2013 年的財務數據，約有 80% 的資金缺口，因此，為維護各項計畫的持續運作，BIOFIN 的財務規劃協助，包含預算編列、資源運用及生物多樣性的有效管理，是極為迫切需求的。

除了菲律賓以外，另外兩個經由 BIOFIN 使保育行動獲得改善的實例是泰國的龜島及印尼的蘇拉維西島。泰國龜島以其豐富的潛水活動聞名，觀光業的發展造成珊瑚礁破壞及海洋汙染等後果，透過各種評估調查，所提出的解決方案為收取參觀費用，以用於珊瑚礁復育、海龜保育計畫、強化海洋生態系復原力及海洋汙染防治等方面，以付費方式享受生態系所帶來的服務，並回饋於生態系的保育。

印尼設立了為數眾多的海洋保護區，卻因為經費不足而缺乏管理，即使收取觀光費，仍因為嚴格的政府規定及觀光客付費意願等因素，而產生業者削價競爭與生態觀光品質低落的惡性循環。藉由宗教慈善機構(ZISWAF 及 BAZNAS)對於生態旅遊地區的社區關懷與弱勢族群扶助，補充政府單位挹注於生物多樣性基金的不足，用於保育相關之活動。

(四) 碑礫貝復育

相較於其他以生態為主軸的討論議題，本屆研討會中，特別有一主題針對「碑礫貝」的復育及管理研究進行討論。在海報展示區中，我們特別與新加坡及台灣的海報發表學生談論復育碑礫貝的困難及其必要性。新加坡學生所進行研究主要針對找出適合的復育條件及環境，而碑礫貝生長過程中，主要藉由外套膜上的共生藻行光合作用及過濾海水中的有機質作為營養來源，故喜好棲息於岩礁底質的淺水域，然而新加坡附近海域由於多為高密度人口區域，過多的陸域沈積物影響碑礫貝於自然環境中生長；另，一位台灣學生進行綠島碑礫貝保育區的數量及現況調查，亦指出縱使有優良的天然環境供碑礫貝生長，然而人類盜採的情況依舊，執法不彰，皆是復育失敗的主因。

(五) 公民科學

海洋的保育光靠科學家研究、政府管理政策是不夠的，而越來越多非政府組織推動公民科學家的概念，引導民眾透過簡單的步驟，協助建立科學數據的資料庫，除可累積一生態狀況的基本資料，亦可透過推廣傳達環境教育及增加科學

研究的趣味性。而台灣幾位喜愛潛水、關心海龜的愛好者組成的「海龜點點名」平台，其中成員「海龜姊姊」---馮加伶，一位海洋環境教育推廣講師，便在研討會中分享台灣集結民眾的力量，拍攝潛水或浮潛時看到的海龜的左右雙頰，因每隻海龜的臉頰鱗片排列組合皆不同，如同人類的指紋，便可辨識不同海龜個體。由於目前尚未了解海龜的洄游機制，相較於陸上觀察，海中研究仍顯得少數，透過「海龜點點名」，除可普查台灣海域中海龜的族群數量及分佈，另與國際間其他單位交流，可進一步了解海龜原生地、洄游路徑、棲息習性等訊息。



(左上至右下)圖 4 海龜點點名官網首頁;圖 5 台灣講者馮加伶請與會聽眾猜猜看哪兩張照片為同一隻海龜；圖 6 小琉球周遭海域海龜分布的族群大小；圖 7 全台海域上傳至海龜點點名的數量統計

(六) 展示攤位

本次會議除各式工作訪及主題研討會外，會場外設有政府單位、NGO 團體、學術單位及潛水用品廠商等近十個攤位，展示各團體的工作內容與訴求，其中最令人印象深刻的為 BIOFIN 和 RARE，BIOFIN 在前文已多有著墨，本段就 RARE 部分簡要說明。

RARE 是一國際保育組織，根據不同國家的民情與發展現況，選擇最適宜的策略，以教育推廣的方式，傳達保育理念至社區權益關係人，藉以從根本改變

人們的行為，認同並配合執行保育行動。該組織在菲律賓推動自發性的永續漁業管理，85%的菲國漁業為小規模漁業，且面臨漁獲量逐年減少的問題。RARE 透過協助漁民進行魚貨產銷及品牌建立推廣，改善漁民收入及協助其財務管理，保障漁民生活，改善經濟狀況，使其理解永續漁業的重要性，進而自主性配合永續漁業政策。RARE 並深入各級學校，設計許多永續漁業的教案與活動，於現場攤位亦有展示示範，如以漫畫圖卡及玩偶角色扮演等淺顯易懂的方式，說明永續及非永續漁業產生不同結果，使孩童們了解正確的保育觀念對家庭經濟、海洋環境、甚至國家發展的影響。



圖 8 RARE 攤位展示的永續漁業教案與教具

三、心得與建議

四年前，第三屆亞太珊瑚礁國際研討會即在墾丁所舉行，由國立海洋生物博物館主辦，主題為「變遷中海洋下，亞太珊瑚礁所面臨的挑戰」，而當時墾丁國家公園亦受邀於研討會現場設攤，提供與會者在地旅遊諮詢服務及恆春半島在地資源英文簡報。第一次參加國際研討會，很幸運且興奮聽到各國學者分享有關珊瑚保育不同領域及層面中的研究成果；隔了四年，再度有機會前往菲律賓宿霧島參加第四屆研討會，而本屆主題為「亞太地區的珊瑚礁：在當代挑戰中攜手合作」，與前一屆主題相呼應，在挑戰中尋求可共同解決的方式。

五天的研討會主題中，珊瑚相關議題豐富，相較於其他主題，海洋廢棄物的研究發表較少，僅於壁報展示呈現，然而仍可從整體研討會的開場及閉幕中嗅出菲律賓政府及民間組織欲解決此問題的急迫性。研討會第一天的開場，邀請到菲律賓的參議員 Loren Legarda 進行專題演講，提到菲律賓正處於快速開發階段，亦產出了許多汙染，其中一段話令我印象深刻：「If this hotel does, if the city does, if the government does, if all of us do, no plastic waste into the water... (若這間旅館、這個城市、這個政府，以及我們所有人都能減少廢棄物，將不會有塑膠廢棄物流入水域中)」高昂的語調中，透露出解決海洋廢棄

物問題的急迫性；而身為政府成員一份子的她亦明確提出相關政府單位應攜手制定政策，且在全民的監督下，改善海洋汙染現況。

而閉幕表演中，則由 Antoinette Taus 擔綱主持人及表演者，Taus 是一位菲律賓藝人，亦是人道主義、氣候變遷、心理健康的運動的倡導者，出席閉幕晚宴中身著一襲淺綠色禮服，而這件禮服正是由回收寶特瓶所製成的，她堅定的聲音謝謝在場的每一位對海洋有所奉



圖 9 藝人 Antoninette Taus 極具渲染力的述說環境保育是環環相扣的，期待每個相關的環節都廉能共同努力。

獻的學者及參與者，也道出她對垃圾問題的看法：「每件事情都是互相影響的，而菲律賓這個目前仍有貧窮、飢餓問題的國家，我們應該正視這些問題，連結所有政府單位、組織的資源；每位住在菲律賓、住在亞洲的居民，我們都應該努力回收，甚至藉此創造循環經濟，如果有任何人已準備好要投入奮鬥，我們都在！」語畢，她帶來一首紀錄片「追逐珊瑚」的主題曲〈Tell Me How Long〉呼籲大家重視這片已遭破壞的海洋環境。

透過她高昂的語調，感受到她對於海洋汙染現況的急切，同時也讓我想到了，在菲律賓市集中，曾看到一小包一小包分裝，看似零賣糖果的包裝袋，然而走近一看，那每一小包裡頭的竟是蒜頭！在台灣，市場或超市裡販售的盡是一大袋的蒜頭，實在很難想像這家常料理的好佐料怎需要分裝成一小顆呢？！回想起來菲律賓的機上，翻閱著國家地理雜誌中的介紹：「由於菲律賓國民所得仍偏低，即便是民生必需品（如沐浴乳、洗髮精等）仍偏好一次負擔得起的小包裝。」想必分裝蒜頭亦是類似的消費習慣吧！而果真，過多的塑膠小包裝袋、不完善的垃圾處理機制，造成了市區的河道、大排水溝中盡是塑膠廢棄物，令人不勝唏噓。回應了不管是藝人 Taus 或參議員 Legarda 所提及，廢棄物在國家間、區域間是相互影響的，集結在地居民、組織、教育推廣、及國家政策等力量面對此問題，是迫在眉睫需要群策群力的汙染現況。



圖 10 市場中分裝成一顆一小袋的蒜頭



圖 11 市中心大排下無數累積的廢棄物

參與了這麼多天的議程，不論是珊瑚礁生態或保護區管理，最重要的影響因子取決於「人」，若無法改善貧窮或顧及民眾生計，是難以抵擋開發與獵捕壓力的。因此保育策略的訂定，亦無法將人的因素排除在外，如何兼顧生態與經濟發展，是相當值得思考的課題。透過他國對於珊瑚礁保育的經驗與研究成果，從中學習可行的方法，思考我國在海洋保育工作的成績與不足之處，進而效法成功的案例，調整為適合在地生態與民情的策略與行動，共同為海洋保育而努力。

四、附件(節錄自大會手冊)

CORAL REEFS OF THE ASIA PACIFIC:
WORKING TOGETHER AMIDST
CONTEMPORARY CHALLENGES

PROGRAM
BOOK

4-8 JUNE 2018
CEBU CITY
PHILIPPINES

2018
APCRS 4th Asia-Pacific
Coral Reef Symposium



Republic of the Philippines
Province of Cebu
OFFICE OF THE GOVERNOR

MESSAGE

What comes to mind when guests from around the world think of Cebu is diving and frolicking in beaches – activities that directly or indirectly impact the marine environment.

It is therefore fitting for scientists, educators, managers, environmentalists, and stakeholders in the region to gather here for the 4th Asia-Pacific Coral Reef Symposium (APCRS). Their experiences and knowledge would be invaluable, especially for this island province, which is blessed with beautiful beaches and amazing dive spots.

My sincere congratulations to the organizers for gathering the best minds in this part of Asia and Oceania to tackle, among others, the conservation and management of our coral reefs. With the world reeling from the effects of climate change, safeguarding our underwater ecosystems now, more than ever, should be paramount.

It is an honor for Cebu, the country's top business and tourist destination, to be counted with Hong Kong, Phuket, Thailand, and Pingtung, Taiwan as a host to this distinguished forum. We are blessed to have been included in this noble endeavor.

To the organizers and participants of the 4th APCRS, welcome to Cebu and enjoy the beauty of its surroundings and its people.

I wish you all the best experiences and memories here in Cebu!

The Provincial Capitol, Cebu City, May 17, 2018.




HILARIO P. DAVIDE III
Governor
Cebu, Philippines



The Marine Science Institute
University of the Philippines Diliman

MESSAGE

Welcome to the 4th Asia Pacific Coral Reef Symposium (APCRS). Since the first symposium twelve years back, many of us must have travelled long journeys through our various careers— charting the various historical paths, and learning and sharing new vistas from different geographies.

And now we've come to Cebu. Why are we here? We hope to share lessons from the theory and practice of coral reef science and the seas around it. From our research outputs, we can contribute to sustainable development and inclusive growth. I remember one of my mentors tell me that it would be a pity if our science is so good, but our reefs are still going to be so bad. It is with this welcoming hope that we share our strategy to **ACT NOW**, which seeks to address the six imperatives of 1. Accelerating our efforts to transform science to policy to action; 2. Continue to coordinate based on our connectedness in social-ecological systems to celebrate our cooperative endeavors; 3. Together we should strive to stay within the carrying capacity thresholds; 4. Networking towards resiliency; 5. Organizing ourselves towards a sustainable development agenda; and to utilize 6. Win-win solutions using the best available science. Thus, we can aspire to make wise choices, decisions and actions using tools that will be more effective towards better solutions for our common future.

We welcome you to the 4th APCRS, so that our discussions may contribute to a Blue Economy with Science & Technology (BEST), built on good governance foundations from Highlands to Oceans (H2O). We hope for a better future using Science & Technology Enhanced Wise Resiliency Development Systems (STEWARDS). Our actions today will affect our next generations, and it is with this responsibility that we should bravely face the challenges and ensure the sustainability of our seas.

Despite the challenges we face, we want you to remember to have fun always. I hope the learnings we share and gain and the friendships we form bind us together to bravely yet happily build resilient seas to meet the challenges of the future.

Welcome to the Philippines and welcome to Cebu!




PORFIRIO M. ALIÑO, PHD
Chair
APCRS Local Organizing Committee

About APCRS


The Indo-West Pacific is a region of global ecological significance. It cradles more than half of the world's marine species, with coral reefs being among the most crucial ecosystems distributed within the biodiversity hotspots that encompass Southeast Asia, South China Sea, and Northern Australia. Despite their importance, coral reefs remain to be one of the most threatened marine ecosystems in the world. Reef ecosystems are now bombarded by a variety of stressors – from natural to man-made - giving rise not only to ecological implications but to socio-economic impacts as well.

In recognition of these threats, the first Asia-Pacific Coral Reef Symposium was organized in 2006 to provide a platform for scientists, educators, managers, environmentalists, and other local stakeholders in the region to share their knowledge and expertise on the fields of coral reef biology, ecology, management and conservation, with the hopes of forging greater cooperation and concrete programs for collaboration to preserve our common natural marine heritage. Held every 4 years and hosted by different institutions, the number of participants slowly increased from 250 guests in 2006 to more than 500 participants for this year's event. More and more countries are also seen in attendance - sharing the latest research in marine biodiversity, reef adaptation processes, responses to stressors, ocean processes, reef restoration, and citizen science. The expanding networks of people involved in the event show their ever growing interest and urgency in conserving the marine resources in the region.

With the theme "CORAL REEFS OF THE ASIA PACIFIC: Working together amidst contemporary challenges", the 4th APCRS highlights the involvement of various institutions – scientists, policy makers, reef managers, and fisher folk in protecting and conserving our reef ecosystem. It gathers and brings together the champions of coral reef research and conservation in the Asia-Pacific with the hopes to inspire the younger generation in attendance to continue the work that they have started. The conference seeks to share knowledge, forge bridges, inspire and be an entry point for identifying concrete steps in preserving our natural marine heritage.

As the lead organizers for the 4th Asia-Pacific Coral Reef Symposium, the Marine Science Institute and the Department of Environment and Natural Resources are honoured to have worked with various leading institutions in Luzon, Visayas and Mindanao in organizing this momentous event.

General Program

3 June (Sunday)							
1300/ 1700	Early Registration						
4 June (Monday)							
0800/ 0900	Registration						
0900/ 0945	Opening Program						
0945/ 1000	<i>health break</i>						
1000/ 1100	KEYNOTE SPEECH 1 Speaker: Loren Legarda						
1100/ 1200	KEYNOTE SPEECH 2: THE FUTURE OF CORAL REEFS: BRIDGING SCIENCE TO POLICY AND KNOWLEDGE TO ACTION Speaker: Robert Richmond						
1200/ 1330	<i>lunch</i>						
1330/ 1415	PLENARY SPEECH 1: CORAL REEFS OF EAST ASIA- MESSAGES FROM LONG-TERM MONITORING Speaker: Loke Ming Chou						
1415/ 1430	<i>health break</i>						
1430/ 1600	Grand Ballroom BCC	MNL A BEC	MNL B TBE	Hong Kong AMC	Shanghai CRG	Beijing SC	Seoul 
1600/ 1800	Poster Sessions						
1800/ 2100	<i>welcome dinner</i>						

5 June (Tuesday)							
0830/ 0915	PLENARY SPEECH 2: BLUE FINANCE SOLUTIONS: INVESTING IN LIFE BELOW WATER Speaker: Andrew Seidl						
0915/ 0930	<i>health break</i>						
0930/ 1200	Grand Ballroom AAC	MNL A BEC	MNL B TBE	Hong Kong AMC	Shanghai CRO	Beijing SC	Seoul MS 1
1200/ 1330	<i>mentor-mentee lunch</i>						
1330/ 1415	PLENARY SPEECH 3: CONSERVING CORAL REEFS THROUGH THE LENS OF ECOLOGICAL AND EVOLUTIONARY HISTORY Speaker: Danwei Huang						
1415/ 1430	<i>health break</i>						
1430/ 1600	Grand Ballroom AAC	MNL A BEC	MNL B TBE	Hong Kong AMC	Shanghai WS 1	Beijing SC	Seoul
1600/ 1800	Poster Sessions						
1800/ 2100	<i>students' night</i>						
6 June (Wednesday)							
0830/ 0915	PLENARY SPEECH 4: VARIOUS CONNECTIVITY PROCESSES IN TROPICAL LAND-COASTAL-OCEAN COUPLING SYSTEMS UNDER CHANGING ENVIRONMENTAL CONDITIONS Speaker: Kazuo Nadaoka						
0915/ 0930	<i>health break</i>						
0930/ 1200	Grand Ballroom MS 3	MNL A RTS	MNL B TBO	Hong Kong AMC	Shanghai DCC	Beijing SC	Seoul MS 2
1200/ 1330	<i>lunch</i>						
1330/ 1415	PLENARY SPEECH 5: MANAGEMENT CHALLENGES IN MAINTAINING THE CONDITIONS OF INDONESIAN CORAL REEFS FROM INCREASING STRESSORS Speaker: Jamaluddin Jompa						
1415/ 1430	<i>health break</i>						
1430/ 1600	Grand Ballroom AAC	MNL A RTS	MNL B TBO	Hong Kong CRA	Shanghai WS 2	Beijing SC	Seoul
1600/ 1800	Poster Sessions						

7 June (Thursday)							
0830/ 0915	PLENARY SPEECH 6: THE RESILIENCE OF CORAL REEFS FROM LOCAL TO SYSTEMIC PERSPECTIVES Speaker: Peter Mumby						
0915/ 0930	<i>health break</i>						
0930/ 12:00	Grand Ballroom MS 4	MNL A RTS	MNL B TBO	Hong Kong CRA	Shanghai EEM	Beijing	Seoul
1200/ 1330	<i>lunch</i>						
1330/ 1415	PLENARY SPEECH 7: DENR POLICIES AND PROGRAMS FOR REEF MANAGEMENT IN THE PHILIPPINES Speaker: Crisanta Marlene Rodriguez						
1415/ 1430	<i>health break</i>						
1430/ 1600	Grand Ballroom CRM 3	MNL A RTS	MNL B WS3	Hong Kong CRA	Shanghai CRM 1	Beijing	Seoul
1600/ 1800	Poster Sessions						
1800/ 2100	<i>banquet</i>						
8 June (Friday)							
0830/ 0915	PLENARY SPEECH 8: SEX, DEATH AND CORAL RESTORATION Speaker: Peter Harrison						
0915/ 0930	<i>health break</i>						
0930/ 1200	Grand Ballroom CRM 3	MNL A RTS	MNL B CRM 2	Hong Kong CRR	Shanghai GCL	Beijing MS 5	Seoul OA
1200/ 1330	<i>lunch</i>						
1330/ 1500	Grand Ballroom CRM 3	MNL A RTS	MNL B CRM 2	Hong Kong CRR	Shanghai GCL	Beijing	Seoul
1800/ 2100	<i>farewell dinner and closing ceremonies</i>						

SESSION CODE	SESSION NAME
AAC	Adaptation and Acclimation of Coral Reef Species as a Response to Global Change
AMC	Assessment and Monitoring of Coral Reefs in the Asia-Pacific
BCC	Bioactive Compounds in Coral Reefs
BEC	Biodiversity and Evolution of Coral Reef Organisms
CRA	Coral Reef Assessment, Monitoring and Technological Methods and Innovations
CRG	Coral Reef Geology
CRM1	Emerging Trends in Coral Reef Management: Citizen Science for Reef Management
CRM2	Emerging Trends in Coral Reef Management: Fisheries Ecology and Management
CRM3	Emerging Trends in Coral Reef Management: MPA and Coral Reef
CRO	Coral Reefs and Other Associated Ecosystems
CRR	Coral Reef Restoration: Research to Reality
DCC	Connectivity of Coral Reefs and other Habitats in the Asia-Pacific
EEM	Exploration and Ecology of Mesophotic Coral Ecosystems in the Asia-Pacific
GCL	Bringing Back the Giants: Best Practices, Management and Conservation Research on the Giant Clams
OA	Ocean Acidification

SESSION CODE	SESSION NAME
RTS	Response to Stressors: Natural and Human-induced
SC	Student Competition
TBE	Taxonomy, Biology, and Ecology of Cnidarians
TBO	Taxonomy, Biology, and Ecology of other Reef Organisms
PT	Plenary Talks
MS1	Oceans, Climate, and Coastal Communities
MS2	Biodiversity and Evolution of Coral Reefs in the Asia-Pacific
MS3	Amidst the Science of Coral Reefs: Why Talk About Financing?
MS4	Coral Reef Ecosystem Services and Impacts of Climate Change and Anthropogenic Disturbances
MS5	Sustainable Coral Reef Tourism

Senator Loren Legarda is a three-term senator who chairs the Senate Committees on Finance, Foreign Relations, and Climate Change.

As one of the country's leading champions for environmental protection, she has authored several landmark laws, namely, the Clean Air Act, Clean Water Act, Ecological Solid Waste Management Act, Environmental Awareness and Education Act, Renewable Energy Act, Disaster Risk Reduction and Management Act, Climate Change Act, and the People's Survival Fund Law. Aside from authoring legislation, as Chairperson of the Philippine Senate Committee on Finance, she ensured the funding of government programs aimed at improving the lives of Filipinos and promoting inclusive, sustainable and resilient development.

She has represented the Philippines in many important international assemblies. In 2013, she was Head of the Philippine Delegation to the 37th UNESCO General Conference in Paris, France. In 2014, Japan Prime Minister Shinzo Abe invited her as the lone Philippine delegate to join the World Assembly for Women in Tokyo, Japan. In 2015, Legarda was co-head of the Philippine delegation to the Third United Nations World Conference on Disaster Risk Reduction (3WCDDRR) in Sendai, Japan. In 2017, she was Head of the Philippine Delegation to the 23rd Session of the Conference of the Parties (COP 23) to the United Nations Framework Convention on Climate Change (UNFCCC) in Bonn, Germany. In January 2018, she was the lone Philippine delegate to the 26th Asia-Pacific Parliamentary Forum in Hanoi, Vietnam. In March 2018, she was also Head of the Philippine Delegation to the 138th Assembly of the Inter Parliamentary Union in Geneva, Switzerland. In April 2018, she was Alternate Head of Philippine Delegation to the World Bank Group-International Monetary Fund Spring Meetings in Washington, DC, USA. She was again chosen as the Head of Philippine Delegation to the UN Climate Change Conference in Bonn, Germany in May 2018.

Her inspiring advocacy on environmental protection has earned her global recognition. She is the UNISDR Global Champion for Resilience and UNFCCC National Adaptation Plan Champion. She has been recognized as a Global Leader for Tomorrow by the World Economic Forum and a UNEP Laureate.

KEYNOTE SPEAKER 1



LOREN LEGARDA

*Senator
Republic of the Philippines*

Monday, 4 June 2018
1000 – 1100
Marco Polo Plaza Grand Ballroom

KEYNOTE SPEAKER 2



ROBERT
RICHMOND

*Research Professor and Director
Kewalo Marine Laboratory
University of Hawaii at Manoa*

***“The Future of Coral Reefs:
Bridging Science to Policy and
Knowledge to Action”***

Monday, 4 June 2018
1100 – 1200
Marco Polo Plaza Grand Ballroom

Dr. Bob Richmond is a research professor and director of the University of Hawaii’s Kewalo Marine Laboratory. He received a PhD in Biological Sciences from the Dept. of Ecology and Evolution, SUNY at Stony Brook, and subsequently spent 2-years as a postdoctoral fellow at the Smithsonian Tropical Research Institute in Panama, 18 years on the faculty of the University of Guam Marine Laboratory, and has been a research professor at the Pacific Biosciences Research Center, University of Hawaii at Manoa, since 2004.

He has spent his career studying coral reef ecosystems in the Caribbean and the Pacific, including the Virgin Islands, the Grenadines, the Galapagos Islands, Hawaii, Japan and Micronesia. He has served as President of the International Society for Reef Studies, the convener for the 13th International Coral Reef Symposium, the science advisor to the All-Islands Committee of the US Coral Reef Task Force and a science advisor for the Joint Ocean Commission Initiative. He is both an Aldo Leopold Fellow in Environmental Leadership and a Pew Fellow in Marine Conservation. He presently serves as a member of the U.S. National Academies of Science expert committee on Interventions to Increase the Resilience of Coral Reefs.

His research interests include coral reef ecology, marine conservation biology, ecotoxicology, bridging science to management and policy, and the integration of traditional ecological knowledge with modern approaches to resource use and protection. His childhood fascination with “Dr. Doolittle” helped inspire his approach to studying coral reefs by “listening” to corals and other reef creatures through the use of ecological indicators and molecular biomarkers.

PLENARY SPEAKER 1



CHOU
LOKE MING

*Adjunct Research Professor
Tropical Marine Science Institute
National University of Singapore*

***"Coral Reefs of East Asia -
Messages from Long-term
Monitoring"***

Monday, 4 June 2018
1330 – 1415
Marco Polo Plaza Grand Ballroom

Prof. Chou Loke Ming is an adjunct research professor at the Tropical Marine Science Institute of the National University of Singapore. He obtained his PhD in Zoology from the University of Singapore in 1976 and has been with the university since 1977. His research on coral reef ecology and integrated coastal management covers Southeast Asia and he coordinated and edited the 2009 State of the Marine Environment Report for the East Asian Seas for the United Nations Environment Programme.

His current research focus is reef restoration and he is particularly interested in how corals can be re-established in the highly turbid conditions of rapidly developing coastal areas. Prof. Chou has been a member of the Scientific Advisory Committee of the Global Coral Reef Monitoring Network (International Coral Reef Initiative), serving as its chairman from 2003 to 2005. He is currently an honorary fellow of the Singapore Institute of Biology and a fellow of the Singapore National Academy of Science. He has provided consultancy services in the field of marine environment management to international agencies like UNEP, FAO and the World Bank, as well as many national agencies.

PLENARY SPEAKER 2



ANDREW
SEIDL

*Professor, Colorado State University
Senior Technical Advisor,
Biodiversity Finance Initiative
(BIOFIN)*

***"Blue Finance Solutions: Investing
in life below water"***

Tuesday, 5 June 2018
0830 – 0915
Marco Polo Plaza Grand Ballroom

Dr. Andy Seidl's work focuses on natural resource-based economic development. He employs economic approaches to help decision makers identify, quantify and capture the wealth of nature. He has been a senior technical advisor to the UNDP Biodiversity Finance Initiative (BIOFIN) since 2015. Part of the BIOFIN Global Team, he is directly responsible to Indonesia, Malaysia, Fiji, Belize and Brasil. He has been a professor & public policy specialist in the Department of Agricultural and Resource Economics at Colorado State University since 1997. From 2009-12, he was head of the Global Economics Programme, International Union for Conservation of Nature (IUCN), based in Switzerland. Previously, Andy was a natural resource economist at the Brazilian Center for Agricultural Research in the Pantanal (CPAP-EMBRAPA) in Brazil, and commodity analyst at the FAO in Rome, Italy.

Through Erasmus Mundus, Fulbright and other support, he has served as a visiting scholar at a variety of academic institutions, including the University of Trento, Italy, the University of Manchester, UK, Central European University, Hungary, and the Central American Institute for Business Administration (INCAE), Costa Rica.

His recent work appears in professional journals including Ecosystem Services, Tourism Economics, Ecological Economics, Journal of Regional Science, Journal of Environmental Management, Journal of Environmental Policy and Management, Journal of Environment and Development, and Economic Systems Research and in popular press including New Europe, the OECD Observer and World Conservation.

Dr. Seidl holds a BA in Economics and International Relations from the University of Wisconsin and a PhD in Food and Resource Economics from the University of Florida, USA.

PLENARY SPEAKER 3

Danwei Huang focuses on the biodiversity, ecology and evolution of corals and reef-associated organisms. His work is based primarily on the coral reefs of Singapore and the Southeast Asian region. Using a variety of field, genetic and computational methods, and by integrating across morphological, genomic and phylogenetic approaches, his research team evaluates spatial and temporal patterns and drivers of reef biodiversity. Overall, the team is interested in how the environment and biological processes of the past have driven the present, and applies this information to project the future of coral reef biodiversity, distribution and health.

Danwei received his education and training at the National University of Singapore, Scripps Institution of Oceanography and University of Iowa, before returning to the National University of Singapore as a member of its faculty and the Reef Ecology Lab.



DANWEI
HUANG

*Assistant Professor
Department of Biological Sciences
National University of Singapore*

***“Conserving coral reefs through
the lens of ecological and
evolutionary history”***

Tuesday, 5 June 2018
1330- 1415
Marco Polo Plaza Grand Ballroom

PLENARY SPEAKER 4



KAZUO
NADAOKA

Professor

*School on Environment and Society
Tokyo Institute of Technology*

***"Various connectivity processes
in tropical land-coastal- ocean
coupling systems under changing
environmental conditions"***

Wednesday, 6 June 2018
0830 – 0915
Marco Polo Plaza Grand Ballroom

Dr. Kazuo Nadaoka is a professor at the School of Environment and Society, Tokyo Institute of Technology. He is currently an executive board member of Japanese Coral Reef Society (JCRS) and a council member of International Society for Reef Studies (ISRS). He was also the former vice president of JCRS and chair of the Coastal Engineering Committee in Japan Society of Civil Engineers (CEC/JSCE).

His main research fields are coastal ecosystem conservation studies, integrated coastal zone management, and coastal oceanography & engineering. His recent research topics cover wide areas: 1) Analysis and prediction of multiple environmental stresses on coastal ecosystems, 2) Coastal ecosystem modeling for analyzing its dynamic response to various anthropogenic impacts and global environmental changes, 3) Monitoring and modeling of physical and bio-chemical processes in coastal zones, 4) Development and application of remote sensing methods to monitor coastal environments, 5) Reef connectivity study for establishing desirable MPA networks based on larval dispersal simulation and population genetics, 6) Establishing a decision support system for ICZM, and 7) Comprehensive assessment and conservation of blue carbon ecosystems and their services.

Prof. Jamal Jompa received his PhD at the James Cook University, Australia in 2001. He also graduated from McMaster University, Canada for his master degree in 1996. He is a senior lecturer and formerly served as dean of faculty of Marine Sciences and Fisheries at Hasanuddin University (UNHAS) (2013-2017). In the past few years, he also has been involved in various programs of the Indonesian Academy of Science (AIP), including chairing the study committee of Indonesian Science Agenda and now serving as the president of Indonesian Young Academy of Science (ALMI). From 2004-2013, he served as director of research and development at the Center for Marine, Coasts, and Small Islands, UNHAS. His researches have expanded from aquaculture to marine biology, marine ecology, coral reef biology, reef bio-prospecting, and more recently on coral reef ecology and coastal management. His current research projects are coral reef health and marine protected area. He has published about 70 journals/books; the majority of them are international publications. He is also active in several organizations including serving as the secretary general of Indonesian Coral Reef Society, chairman of South Sulawesi Sea Partnership Program, president of Association of Diving School International-Indonesia, member of National Fisheries Stock Assessment, etc.

In 2007, in addition to his ongoing duties at UNHAS, Jamal was seconded to the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia to assist in managing and directing the national Coral Reef Rehabilitation and Management Program Phase II (COREMAP-II). This was one of the largest coral reef management projects in the world in terms of area, finance, and project length. Jamal served as executive secretary of this very challenging project and successfully brought the project to a successful completion in December 2011. Jamal is now the chairman of the Center of Excellence on Marine Resilience and Sustainable Development (MARSARE) at UNHAS, MARSARE welcomes any parties/individuals to collaborate in education, training, research, and development to save our ocean!

PLENARY SPEAKER 5



JAMALUDDIN JOMPA

*Senior Lecturer
Faculty of Marine Science and
Fisheries
Hasanuddin University*

***"Management Challenges of
Maintaining the Conditions of
Indonesian Coral Reefs from
Increasing Stressors"***

Wednesday, 6 June 2018
1330 – 1415
Marco Polo Plaza Grand Ballroom

PLENARY SPEAKER 6



PETER
MUMBY

*Professor
School of Biological Sciences
University of Queensland*

***"The Resilience of coral reefs
from Local to Systemic
Perspectives"***

Thursday, 7 June 2018
0830 – 0915
Marco Polo Plaza Grand Ballroom

Prof. Peter Mumby began his career helping to design marine reserves in Belize and experienced first-hand the limited scientific basis for decision-making. He then began a research pathway with a goal of providing science that can inform practical conservation and management action. His research combines field observations, experiments, remote sensing, and ecological modelling to answer questions about ecosystem resilience, impacts of climate change, marine reserve functioning and design, connectivity of ecosystems, coral reef fisheries, and marine spatial planning to capture ecosystem services. To achieve this, Peter's students and post-docs work on a variety of taxa and processes including corals, algae, sponges, herbivory, predatory fishes, food web models, metapopulation models, and so on. He collaborates extensively with friends in other fields including economics, engineering, oceanography, and business.

Peter undertook a PhD at the University of Sheffield (UK), followed by a NERC post-doctoral fellowship at the University of Newcastle. This was followed by a Royal Society fellowship at the University of Exeter (UK), and a move to Brisbane to take up an ARC Laureate Fellowship in 2010. Peter is a Pew Fellow in Marine Conservation and winner of the Rosenstiel Award for Contributions to Marine Biology, Marsh Award for Marine Conservation, and the inaugural ISRS Mid-Career Award for contributions to reef science. He is happiest on a coral reef with a camera in his hands.

Dir. Crisanta Marlene P. Rodriguez is a forestry graduate from the University of the Philippines Los Baños, with a post-graduate degree in environmental protection management in Bicol University Graduate School. She rose from the ranks as a forester and is currently the newly appointed director of the Philippine's Department of Environment and Natural Resources - Biodiversity Management Bureau (DENR-BMB).

Her role then as a community environment and natural resources officer, assistant regional director for technical services, and regional director of DENR V, moulded her knowledge in addressing key environmental concerns which include biodiversity, climate change adaptation, environmental law enforcement, air shed protection, foreshore management, land titling and environmental governance.

Being the new person-in-command of the DENR-BMB, one of her marching orders is to immediately get on board to rehabilitate the pollution-challenged Boracay Island, a top global beach destination.

As a budding manager, she is able to integrate her experiences on the ground and conform with emerging perspectives and technologies of the present generation.

PLENARY SPEAKER 7



CRISANTA MARLENE RODRIGUEZ

*OIC Director
Biodiversity Management Bureau
Department of Environment and
Natural Resources*

***"DENR Policies and Programs for
Reef Management in the Philippines"***

Thursday, 7 June 2018
1330 – 1415
Marco Polo Plaza Grand Ballroom

PLENARY SPEAKER 8



PETER
HARRISON

*Director
Marine Ecology Research Center
Southern Cross University*

"Sex, Death and Coral Restoration"

Friday, 8 June 2018
0830 – 0915
Marco Polo Plaza Grand Ballroom

Prof. Peter Harrison is the founding director of the Marine Ecology Research Centre at Southern Cross University, Australia. Peter is an internationally recognised researcher on coral reproduction ecology and has been actively researching and teaching a wide range of marine science and ecology programs for more than 35 years. He was a key member of the coral research team at James Cook University that discovered the mass coral spawning phenomenon on the Great Barrier Reef, resulting in a Eureka Prize for Environmental Research with colleagues. He is passionate about marine ecology and environmental science and their applications to conservation management, and has led many successful international and national research projects and teams including work for the UN.

His current major research focus is coral restoration and he leads a 1.2 million USD grant from ACIAR to develop the world's first large scale coral reef restoration project using millions of coral larvae to restore damaged reefs in the Philippines, working with colleagues from the University of the Philippines. He has been awarded more than 10 million USD in research grants and Antarctic field support and published more than 150 scientific research papers, books, invited major review chapters and major reports. He has successfully supervised more than 50 postgraduate and Honours students, and been awarded various prizes for excellence in science research and University teaching. He also manages the whale and dolphin research at SCU, and was a long-term member of the Australian Threatened Species Scientific Committee. He has also been appointed to a wide range of other science and environmental management research panels, and enjoys communicating scientific research discoveries and their implications for managing our extraordinary planet.