出國報告(出國類別：其他)

參加「中西太平洋漁業委員會(WCPFC)第八屆科學次委員會(SC8)會議」報告

服務機關：行政院農業委員會漁業署
姓名職稱：技正　李淑敏
　　技正　高玉瑄
派赴國家：韓國　釜山
出國期間：101 年 8 月 5 日至 8 月 16 日
報告日期：101 年 10 月 18 日

摘要

本次中西太平洋漁業委員會（WCPFC）第八屆科學次委員會（SC8）會議於本（2012）年 8 月 6 日至 15 日在韓國釜山舉行，共有 23 個會員國(我國、澳洲、中國、庫克群島、歐盟、FSM、斐濟、日本、吉里巴斯、韓國、馬紹爾群島、諾魯、紐西蘭、尼威、帛琉、PNG、菲律賓、薩摩亞、索羅門群島、東加、吐瓦魯、美國、萬那杜)、4 個參與領地(法屬玻里尼西亞、新喀里多尼亞、托克勞、瓦利斯和富圖納群島)、2 個合作非會員國(印尼、越南)參加。觀察員包括 IATTC、SPC、ISC、WWF、FFA、PNA、PEW、Green Peace 及 ISSF 等。有關本次會議結果摘要如次：

（一）主要魚種資源狀態及管理建議：

1.大目鮪：(1)資源狀態：最大持續生產量（MSY）為 76,760（範圍：68,360 - 83,720）公噸，漁獲量處於過漁進行中（Overfishing）狀態，但資源存量未過漁（Not Overfished）。(2)管理建議：由於大目鮪 2012 年並沒有進行新的資源評估，因此沿用 SC7 所提之管理建議；考量赤道海域為開發率及資源降低率最高之區域，佔 2001-2010 年漁獲量水準約 88%，親魚資源量在此區域降低約 17%左右，建議考量有效之空間管理措施。應降低對於所有體型大小魚體之漁獲死亡率，以確保漁獲死亡率低於最適水準並降低過漁之風險。

2.黃鰭鮪：(1)資源狀態：MSY 為 538,800（432,000 - 644,800）公噸，漁獲量未過漁，且資源存量未過漁。(2)管理建議：由於黃鰭鮪 2012 年並沒有進行新的資源評估，因此沿用 SC7 所提之管理建議；建議在西赤道海域之漁獲死亡率不應再增加。

3.正鰹：(1)資源狀態：MSY 為 1,503,600（1,274,000 - 1,818,000）公噸，漁獲量未過漁，且資源存量未過漁。(2)管理建議：由於正鰹 2012 年並沒有進行新的資

源評估，因此沿用 SC7 所提之管理建議；因漁獲死亡率及資源量指標快速改變，應監控漁獲努力量增加之情形，建議考慮發展捕撈正鰹之限制。

4.南太平洋長鰭鮪：(1)資源狀態：MSY 為 99,085 公噸，漁獲量未過漁，資源存量未過漁。(2)管理建議：因任何漁獲量或努力量增加將導致漁獲率的降低，特別是延繩釣漁業對於親魚資源的影響。建議漁船活動應以 CMM 2010-05「南太平洋長鰭鮪養護與管理措施」建議案有效管理。若「委員會」欲維持在經濟效益上可行的漁獲率，SC 建議延繩釣的漁獲死亡率應降低。

5.大目鮪資源評估的同儕檢視，檢視重點包含適當的資源架構假設、資料來源、評估方法、管理參考點、適當投射方法等，並針對評估的執行過程進行檢視。由標識放流所回收的資料顯示，大目鮪洄游橫跨東、西太平洋，所以認為評估應針對全太平洋進行且應定期評估。對於評估所做的分區亦建議重新考慮。並認為缺乏作業層級資料是資源評估的阻礙之一。報告中也提到，台灣大目鮪體長資料的一致性比日本的好，不應強將日本體長資料用在評估中。

（二）管理議題：

1. 限制參考點：建議暫設定親魚生物量與原始親魚生物量比列為 20%。

2.CMM 08-01 的執行成效：建議建立全年度 FAD 使用比例限制措施，取代 FAD 禁用期措施；建議應降低延繩釣大目鮪漁獲死亡率。

（三）資料及統計議題：主題包含：（1）針對目前科學資料提報的要求，檢視各國提報資料內容是否符合要求；（2）討論圍網的魚種組成估算問題；（3）延繩釣漁業的漁獲體長資料；（4）區域性觀察員（ROP）資料提報。針對作業層級資料提交，該項議題將提送 TCC8 討論，並要求未提送作業層級資料國家在該會議中提報改善計畫。會員國在提送年度資料時，小組建議在資料說明中加入有關體長資料處理情況以及有關漁業變動說明。

（四）生態系及混獲議題：海鳥忌避措施之管理建議：經過討論、溝通後，小組決定採用分區（南、北緯）進行管理建議，南緯 30 度以南建議採用 3(支繩加重、夜間投繩、避鳥繩)選 2 忌避措施，北緯地區建議刪除 B 欄之支繩加重及水下投繩導管 2 選項。

目次

壹、目的

「中西太平洋漁業委員會（WCPFC）」係依據 1995 年聯合國魚群協定（UNFSA）生效後，於 2004 年成立之區域性鮪類保育管理組織，其宗旨在於透過有效管理以確保中西太平洋海域高度洄游種群之長期保育與永續利用。WCPFC 設有科學（SC）、技術與執法（TCC）及北方（NC）等次委員會，每年均召開會議。

我國於 2004 年 11 月 2 日依公約規定完成加入 WCPFC 所需程序，成為 WCPFC 會員，又我國在太平洋區域無論是近海或遠洋鮪漁業均佔有重要之地位，為維護我國船隊作業權益，我國每年以會員身分參加 WCPFC 委員會及相關次委員會議。

WCPFC 第八屆科學次委員會訂於 8 月 6 至 15 日韓國釜山舉行，共有 23 個會員國(我國、澳洲、中國、庫克群島、歐盟、FSM、斐濟、日本、吉里巴斯、韓國、馬紹爾群島、諾魯、紐西蘭、尼威、帛琉、PNG、菲律賓、薩摩亞、索羅門群島、東加、吐瓦魯、美國、萬那杜)、4 個參與領地(法屬玻里尼西亞、新喀里多尼亞、托克勞、瓦利斯和富圖納群島)、2 個合作非會員國(印尼、越南)參加。觀察員包括 IATTC、ISC、SPC、WWF、FFA、PNA、PEW、Green Peace 及 ISSF 等。主要針對資源評估結果與科學相關建議進行討論。我國由本署李淑敏技正率團，團員包括本署高玉瑄技正、中山大學張水鍇副教授、對外漁協於仁汾組長、劉弘一統計員及圍網公會蔡佳昌幹事等代表。

本次會議討論焦點包括討論大目鮪、正鰹及長鰭鮪等重要鮪魚資源評估與現況，提出重要養護管理措施之建議。

貳、會議過程及結果

我代表團於 8 月 6 日下午 4 時進行團長會議，並於會議後與日本團進行雙邊諮商；7 日 SC8 正式召開，上午開幕並進行中西太平洋漁業回顧，下午進行東太平洋漁業回顧及各國國家報告（第一部分）、並進入資源評估議題；8 日持續進行各魚種資源評估結果討論；

8 月 9 至 11 日繼續召開資源評估議題，並進行管理議題、生態系與混獲物種、研究計畫等主題會議；8 月 13 日進行資源評估、生態系與混獲等主題（或小組，theme）建議紀錄，及各非正式小組（Informal Small Group, ISG）紀錄文字檢視；8 月 14 日就管理主題相關的限制參考點、CMM 08-01 的管理成效、後續資源評估、科學研究安排及其他事務性議程進行討論；8 月 15 日進行本次 SC 會議報告的最後檢視。茲將本次逐日會議情形概述如下：

8 月 6 日

一、 團長會議（8 月 6 日下午 4 時）：會議由日本水研所 Dr. Miyabe 主持，主要針對會議議程安排討論及會議各項主題紀錄人員選定。由於大目鮪資源評估（2011 年）的同儕檢視（peer review）小組主席 Andre Punt 教授僅能在 8 月 7 日出席會議，因此此簡報及討論時間調整至該日上午。

二、 台日雙邊會談（8 月 6 日下午 5 時 30 分，在團長會議會場進行）：我方除圍網公會蔡佳昌幹事未參加外，其餘團員均出席，日方代表包括 Dr. Ogura（團長）、Dr. Okamoto、Dr. Peter Miyake, Dr. Kiyofuji, Dr.Uosaki 等人，會談內容如次：

(一)關於漁業指標的概要（SA-WP-02），其中呈現日本及韓國鮪釣船大目鮪持續下降的 CPUE 趨勢（我團會前已針對我國大釣船做初步趨勢分析，其結果與日、韓相似）。我團希望確認此為名目 CPUE，不具資源指標意義，日方同意。

(二)我團提出 SC 會議架構要恢復生物、方法論及漁業技術工作小組，與 SC6 的會議決議衝突，日方表示此為 2~3 年一次的擴大主題會議，並無違背當時 SC6 決議。

(三)關於鯨鯊列為關鍵鯊種之議題，會談時日方並未表示立場，但隔日水產廳國際課課長補佐 Shuya Nakatsuka 知會我團他們水產廳反對將鯨鯊列為關鍵鯊種，希望我團支持，並表示若我團在 SC 支持此立場，希望其後在 WCPFC 年會議亦能維持相同支持立場。

(四)關於鯨鯊活體釋放，我團表示國內定置網有相關釋放經驗，是將麻繩以塑膠帆布包裹，將繩套住鯨鯊尾柄，再將鯨鯊拖出網外。日方則是在本次會議提出釋放準則報告，但僅是一個構想準則，另表示若我國在鯨鯊活體釋放有實際經驗，可在小組會議中提出供與會代表參考。

(五)關於圍網漁獲組成採樣研究（Project60），我團提出該計畫已執行 4 年，應有足夠資訊可校正歷史資料，而往後圍網觀察員對魚種組成抽樣，直接利用較客觀的 spill 方法即可，不希望計畫繼續進行。日方表示對此計畫尚無固定立場。（雙邊會議於晚間 6 時 30 分結束）

8 月 7 日

一、開幕（8 月 7 日上午 8 時 30 分）：本次會議共有 23 個會員國(我國、澳洲、中國、庫克群島、歐盟、FSM、斐濟、日本、吉里巴斯、韓國、馬紹爾群島、諾魯、紐西蘭、尼威、帛琉、PNG、菲律賓、薩摩亞、索羅門群島、東加、吐瓦魯、美國、萬那杜)、4 個參與領地(法屬玻里尼西亞、新喀里多尼亞、托克勞、瓦利斯和富圖納群島)、2 個合作非會員國(印尼、越南)參加。觀察員包括 IATTC、SPC、WWF、FFA、PNA、PEW、Green Peace 及 ISSF 等。

二、會議由 SC 主席日本水研所 Dr. Miyabe 開場後，由 WCPFC 秘書長 Dr. Glenn Hurry 致歡迎辭，接續由韓國(主辦國)國家漁業研究與發展研究所(NFRDI)首長 Dr. Jae-Hak Son 進行 10 分鐘演說，最後大會安排與會人員團體合照。會議自上午 9 時正式進行。

三、WCPFC 秘書處科學經理人 Dr. Soh 報告各項有關科學委員會的運作狀況（GN-WP-04）。

四、大目鮪資源評估的同儕檢視：此部分首先由同儕檢視小組主席 Andre Punt 教授進行說明該檢視報告（SA-WP-01），主要檢視重點包含適當的資源架構假設、資料來源、評估方法、管理參考點、適當投射方法等，並針對評估的執行過程進行檢視。由標識放流所回收的資料顯示，大目鮪洄游橫跨東、西太平洋，所以認為評估應針對全太平洋進

行且應定期進行評估。對於評估所做的分區亦建議重新考慮。並認為缺乏作業層級資料（operational level data）是資源評估的阻礙之一。報告中也提到，台灣大目鮪體長資料的一致性比日本的好，不應強將日本體長資料用在評估中，寧可丟棄。

五、漁業狀況回顧：

(一)中西太平洋鮪漁業回顧：由 SPC/OFP 統計人員 Peter Williams 及 FFA 科學家 Dr. Peter Terawasi 分別進行報告。2011 年中西太平洋總鮪類漁獲量初估為 2,244,776 公噸，佔全太平洋漁獲量之 79%、全球漁獲量的 55%（估計全球約 4,077,814 公噸，近 10 年最低），是自 2005 年以來最低的漁獲水準。各魚種漁獲量分別為：正鰹 1,540,189 公噸（佔總漁獲之 69%），為歷史第五高量，較 2009 年減少 215,000 公噸；黃鰭鮪為 430,506 公噸（佔總漁獲之 19%），自 1996 年以來最低量，主要是圍網漁獲減少所致；大目鮪為 151,533 公噸（佔總漁獲之 7%），與近 10 年平均水準相近；長鰭鮪為 122,548 公噸（佔總漁獲之 5%），漁獲量穩定且與近 10 年平均水準相近。我國代表提問有關圍網作業船數增加及圍網大目鮪漁獲量增加是否反應在觀察員資料中，渠回應有關圍網船數增加無進一步資料報告，圍網大目鮪漁獲量估計已利用觀察員資料進行修正。

(二)東太平洋資源狀況回顧：由 IATTC 科學家 Dr. Shaefer 進行報告。

六、各國國家報告：我國國家報告由對外漁協劉弘一進行簡報，會中並無國家代表提問或表示意見。相關討論如次：

(一)美國詢問中國 2010 年有 532 公噸花鯊漁獲，但 2011 年卻完全沒有？中國代表回應指出，中國已禁止卸售花鯊，故捕獲漁獲皆放生或丟棄。

(二)我團代表詢問萬那度 2011 年北太長鰭鮪漁獲量達到 8,000 公噸，與 2010 年相較增加近 4 倍，是否有漁業變動?萬那度代表未即時回應該問題，然於休息時間向我方說明實際漁獲量為 4,000 餘噸，作業船數則由 2010 年之 12 艘增至 25 艘。

(三)我團代表與 SPC/OFP 統計人員就萬那度及中國北太長鰭鮪漁獲量提報進行討論，SPC/OFP 人員表示將請萬那度代表重新提供漁獲資料，經檢視中國提報之 2011 年

北太長鰭鮪漁獲組成資料後，認為中國提報之北太長鰭鮪資料不可信。

七、資料及統計主題：SPC/OFP 統計人員 Peter Williams 簡報『WCPFC 可利用之科學資料（ST-WP-01）』，主要是要解決各國提報的歷史性科學資料缺口（data gap）問題。探討主題包含：（1）針對目前科學資料提報的要求，檢視各國提報資料內容是否符合要求；（2）討論圍網的魚種組成估算問題；（3）延繩釣漁業的漁獲體長資料；（4）區域性觀察員（ROP）資料提報。相關討論如下：

(一)索羅門讚許 SPC/OFP 對資料管理、蒐集的努力，希望持續進行資料缺口的檢視，並提供改善資料缺口之建議。

(二)紐西蘭強調各會員國應繳交作業層級資料，此項資料對資源評估非常重要。另外，在 SC6 及 SC7 皆有提議將未繳交此資料的會員國，提報 TCC 處理。針對此議題，會議有許多討論，FFA 國家再次強調提供作業層級資料的重要性，並強調大目鮪 Review Panel 也建議應使用作業層級資料。會議紀錄中則應島國要求，SC8 建議將許多會員國未繳交作業層級資料的現象提報 TCC。

(三)日本強調他們雖然無法提供此種層級資料，但資源評估已可讓科學家使用。韓國隨即表示由於國內法規定，目前無法繳交作業層級資料，若資源評估需要使用該項資料，可提供該資料給 SPC 科學家進行相關分析。另外，建議 SPC/OFP 向 SC 報告，資源評估使用作業層級資料的優點，以及用於評估的相關方法。

(四)紐西蘭接續表示，雖然韓國的作法仍未達到要求，但認為已是一種進步。主席應要求再次確認，至今沒有任何未繳 operational data 的國家提供改善報告。

(五)美、澳另表示未繳交資料，儘管科學家仍有機會用到，但會增加委員會的成本。日本反對會議紀錄中加上「會增加委員會的成本」，但美國不同意，認為是事實。會後與日本官員談成本議題，未來如果由鮪釣國出資請科學家來分析的可行性，日方表示不太可能從日本基金支出，可能各國自己支付，或鮪釣國成立小基金。

(六)SPC/OFP 科學家 Tim Lawson 報告『Project 60—蒐集及評估圍網漁獲組成（ST-WP-02）』及『估計圍網漁獲組成的方法比較（ST-WP-03）』。簡報後，馬紹

爾對 SPC/OFP 的成果表示讚許，並認為相關成果將有助於圍網漁獲資料蒐集的正確性，及對後續資源評估結果的正確性將有助益。

8 月 8 日

一、資料及統計主題（續前日）：對資料及統計主題之會議報告，及資料與統計小組所提出的科學建議，進行檢視及討論。相關討論如次：

(一)日本、韓國、印尼皆表示若資源評估所需，同意提供作業層級資料供資源評估。

(二)針對作業層級資料提送該項議題將提送 TCC 討論，並要求未提送作業層級資料國家在該會議中提報改善計畫。

(三)會員國在提送年度資料時，小組建議在資料說明中加入有關體長資料處理情況以及有關漁業變動說明。

二、資源評估主題：

(一)『大目鮪、正鰹、黃鰭鮪、南長鰭鮪及南劍旗魚漁業指標的概述（SA-WP-02）』，本報告並無進行簡報，第一作者 SPC/OFP 科學家 Dr. Harley 直接接受提問，相關討論如下：

1.帛琉及托克勞分別對該研究的 SPC/OFP 科學家表示讚許及感謝，認為此報告提供極有用的漁業資訊，並對報告中顯示的大目鮪 CPUE 顯著下降，表示憂心。

2.我團詢問報告中所顯示的日、韓延繩釣大目鮪 CPUE 趨勢圖，是全洋區還是僅赤道區的資料所繪製的。Dr. Harley 表示「應」僅為赤道區的資料（他不確定）。

3.韓國希望 SPC 在報告中加上一些說明，以顯示「stock status」。我團表示同意韓國的建議，報告中應增加上一些說明才比較容易懂，但強調此報告內容皆為名目資料，未經任何分析，因此不適合代表「stock status」，僅能作為「fisheries indicator」（反駁島國有關大目鮪續下降的陳述）。SPC 同意，澳、紐也附議。

4.菲律賓詢問印尼及菲律賓漁業體長資訊處理情況。SPC/OFP 統計人員 Peter Williams 回答該資料主要來自漁港口採樣，印、菲延繩釣體長資料已經與各國延繩釣體長資料整併，區域性漁業則獨立處理顯示。

(二)SPC/OFP 科學家 Dr. Simon Nicole 報告「Project 35 大目鮪生物採樣計畫的進展報告（SA-WP-03）」，並表示該計畫已發展出魚體生物採樣的教學講義。報告中建議利用現在架構將採樣擴大到其他鮪魚種，我國表示不反對這種建議，但必須顧到其他已有採樣計畫，如 CSIRO 已有長鰭鮪採樣計畫，不需要重複，以提高經濟效應。SPC 同意。會議紀錄討論時，紐西蘭希望擴大採樣計畫，澳洲則引用我團意見，堅決反對。

(三)韓國學者 Dr. Lee 簡報『中西太平洋韓國鮪釣黃鰭鮪 CPUE 標準化（SA-WP-09）』，主要介紹以泛線性模式（GLM）對韓國鮪釣船黃鰭鮪 CPUE 標準化的初步結果。

(四)SPC/OFP 科學家 Dr. Hoyle 簡報『南太長鰭鮪資源評估（SA-WP-04）』，本次評估結果顯示南太長鰭鮪資源健康（not over fished ＆ not over fishing）。相關討論如下：

1.島國感激 SPC 之報告，並強調雖然資源狀況良好，但關切報告中所顯示的「Longline catch rates are declining, and catches over the last 10 years have been at historically high levels and are increasing. These trends may be significant for management.」，因為南長對許多 FFA 國家都相當重要，因此建議要採漁獲量限制管理。

2.我國提問有關該資源評估提到成長曲線具有高度不確定性，是否有考慮參考其他類似研究（如 CSIRO 報告），另資源評估分區是否有考慮依照 Review Panel 的建議重新進行評估劃分方式，以及其報告所強調 CPUE 近年趨勢下降從實際圖來看似乎不是所有區皆有此現象等問題。渠回覆其研究已有作各種成長式及體長分佈的模擬，因此應該已涵蓋各種變異，至於 CPUE 下降主要發生在 2000 年以後，主要在 1、2、4 區，會再作一張平均化後的圖提供參考。

2.澳洲代表提醒 1960 年代漁業有變動情況，資源評估應列入考慮。

3.越南代表提問有關自然死亡率是否有參考標識放流資料，渠回覆在 2006 年資源評估時，已將該資訊加入。

4.針對管理建議科學資訊部分，會員國同意採用中間數值，提報有關 Kobe Plot、加入量變動趨勢、漁獲死亡率及資源量變動趨勢等。

(五)SPC/OFP 科學家 Dr. Davies 簡報『南太紅肉旗魚資源評估（SA-WP-05）』，本次評估結果顯示，南太紅肉旗魚並未處於過漁正在進行的狀況（not overfishing），但可能已接近過漁發生狀況（approaching an overfished state）。相關討論如下：

1.澳洲代表對於資源評估中自然死亡率不確定性提出問題。

2.紐西蘭提問有關資源評估科學資訊提報是否採用中間數進行處理。

3.澳洲提問從漁獲分布發現在大溪地東北海域漁獲較其他區域大，可能有地區性系群。

4.日本代表提醒在引用日本漁業資料必須注意季節性作業情況，另外在 1975 年前後有漁業作業改變。

5.針對管理建議科學資訊部分，會員國同意採用中間數值，提報有關 Kobe Plot、加入量變動趨勢、漁獲死亡率以及資源量變動趨勢等。

(六)鯨鯊小組會後討論：針對委員會要求 SC 針對圍網圈圍鯨鯊發展釋放指導方針，SC 組成小組就相關議題先進行意見交換，小組成員決定將表列出各種釋放方法之優劣點及科學意見，另負面表列釋放中不應有之作為，會中我國代表提出從定置網釋放經驗，獲美方代表支持並將列入可行釋放方法之一。

8 月 9 日

一、資源評估主題（續前日）：

(一)SPC/OFP Dr. Harley 簡報『中西太平洋南劍旗魚資源評估的進展（SA-WP-08）』，一項重要進展是西班牙提供劍旗魚延繩釣漁業的資料，因此報告中詳述資料的整理過程及分析結果，亦說明相關劍旗魚的標識放流資料所提供的資訊，由於南太劍旗魚漁業資訊趨健全，預計 SC9 將提出相關資源評估報告。相關討論如下：

1、紐西蘭代表提問：西班牙所提供的是 1 度方格漁獲資料，為何資料整理分析會轉換成 5 度方格的資料。負責分析的美國學者 Dr. Kleiber 說明是因為資料空間

及資訊詳細程度不一致。

2、韓國詢問最後使用於 CPUE 標準化的船數為何？Dr. Kleiber 回覆：原始資料共有 28 艘的漁獲資料，但最後只使用 10 艘船的資料進行 CPUE 標準化，因為其他資料品質不好或是資訊不全。

3、IATTC 代表提醒 IATTC 網站有公布東太南劍旗魚資料，可供參考。

4、庫克群島及吉里巴斯分別發言，說明 FFA 會員國關心南太劍旗魚資源狀況，並希望在 SC9 有具體的資源評估結果。

5、澳洲：建議將南太劍旗魚資源評估列為科學研究的優先項目。

(二)北太平洋各魚種資源評估結果及資源狀況：

1、北太平洋紅肉旗魚：由美國學者 Dr. Piner 代表 ISC 報告，其就該魚種歷史評估過程、造成不確定性的因素、本次評估所採用的資料內容、評估模式，作整體詳細報告。依據本次評估之投射分析顯示，北太平洋紅肉旗魚資源狀態目前已處於過漁（overfished），並且過漁正在進行中(overfishing)。

2、北太平洋長鰭鮪：由美國學者 Dr. Brodziak 代表 ISC 進行簡報，今年度並未對此魚種進行評估，最近一次評估是在去（2011）年完成，最新的評估結果認為北太長鰭鮪資源狀況健康，也就是資源不處於過漁狀態（not overfished），過漁也未發生中（not overfishing）。報告結束後，紐西蘭代表發言建議，ISC 的北太長鰭鮪資源評估，也應該進行獨立檢視（independent review）。

3、太平洋黑鮪：由 ISC 黑鮪工作小組主席日本學者 Dr. Takeuchi 進行報告，說明最近一次評估是在 2010 年進行，亦介紹資源評估將採用的評估模式，預計今年 11 月在夏威夷召開資源評估會議。管理建議目前沿用 ISC 10 之建議：太平洋黑鮪總漁獲量應低於 2002-2004 年間的平均水準以下，尤其是幼齡魚群。

(三)大目鮪、黃鰭鮪及正鰹之管理建議：由於大目鮪、黃鰭鮪及正鰹，今年並沒有進行新的資源評估，最近一次評估是在去（2011）年完成，因此這三個魚種皆沿用 SC7 所提之管理建議，說明如下：

1、大目鮪：考量赤道海域為開發率及資源降低率最高之區域，佔 2001-2010 年漁獲量水準約 88%，親魚資源量在此區域降低約 17%左右，建議考量有效之空間管理措施。應降低對於所有體型魚體之漁獲死亡率，以確保漁獲死亡率低於最適水準並降低過漁之風險。

2、黃鰭鮪：建議在西赤道海域之漁獲死亡率不應再增加。

3、正鰹：因漁獲死亡率及資源量指標快速改變，漁獲努力量增加之情形應被監控，建議應考慮限制正鰹之捕撈。

(四)花鯊資源評估：由 SPC/OFP Dr. Rice 報告花鯊資源評估（SA-WP-06）之結果，這是第一次對該魚種進行資源評估，雖然相關的漁獲資料可用來進行評估，然而資料品質並不理想。評估結果顯示花鯊資源已處於過漁狀態（overfished）而且過漁正在進行中（overfishing）。

(五)黑鯊資源評估：同樣由 SPC/OFP Dr. Rice 進行報告（SA-WP-07），這也是第一次對黑鯊進行資源評估，同樣地，雖然有相關的漁獲資料可用來進行評估，但資料品質並不理想。評估結果顯示黑鯊資源同樣已處於過漁狀態（overfished）而且過漁正在進行中（overfishing）。

韓國提問：由於近年的管理，主漁獲的漁獲率已呈現下降趨勢，混獲魚種黑鯊應該也下降，但評估所使用的延繩釣漁獲死亡率卻是逐年升高？Dr. Rice 答覆所使用的 CPUE 趨勢，是目前的唯一可用趨勢，但不一定代表所有漁業的趨勢。

二、日本信託基金（Japanese Trust Fund）：目前此計畫已經進行第二階段的五年計畫，今年是第一年，主要由各島國報告所申請經費之運用方式及成果。

8 月 10 日

一、管理議題主題：小組主席澳洲 Dr. Robert Campbell 首先報告本次會議的主要議題，其中

關於管理所需之工具為限制參考點（MI-WP-01）、目標參考點（MI-WP-02）及漁獲控制規則（MI-WP-03）；並回顧 CMM08-01 的管理成效（MI-WP-04、MI-WP-06），該管理成效相關內容及討論說明如下：

(一)日本學者 Dr. Okamoto 簡報『日本圍網在中西太平洋熱帶區域大目鮪漁獲率與隨附群的關係（MI-WP-04）』，報告指出大目鮪漁獲率與 FAD 禁用期長短關係小，反而與全年度 FAD 使用比例有顯著相關，因此建議考慮建立 FAD 使用比例的限制措施。簡報後我國建議 ROP 資料納入分析，這樣可以更廣泛考慮不同國籍船隊的差異，並藉以了解目前日本的研究結果是否為全面性的趨勢。

(二)SPC/OFP Dr. John Hampton 簡報『主要熱帶鮪保育管理的履行及效力之回顧（MI-WP-06）』，報告指出圍網漁業努力量並未依管理目標下降，2011 年反而比 2004 年增加 31%，而且效率也增加。圍網 drift FAD 在 FAD 禁用期的使用比例有下降，但夜間開 FAD 燈作業的比例反而增加，2011 年整體 FAD 使用量是歷史新高。公海關閉的措施大都有被遵守，努力量都集中到 EEZ 區內，但沒有明顯轉移到東邊海域。2011 年延繩釣漁獲量降為 2001-04 水準的 76%。相關討論如下：

1、日本：重申該國的研究（MI-WP-04）與本研究之結果，皆建議降低 FAD 的使用率對大目鮪資源有顯著效果。

2、我國：(1)強調延繩釣漁業已實質減少了 30%的漁獲死亡率，然而圍網努力量卻不降反升到歷年最高點，SC 應對此表達關切； (2)由於報告中特別強調延繩釣漁獲量與 CPUE 同時降，可能表示是資源下降所以漁獲量下降（負面看法），因此我團提醒因為有大目鮪有配額管理，所以漁船達到配額後，有可能會轉移目標魚種，造成名目 CPUE 下降。SPC 科學家回應：未考慮到此問題，這是有可能的，未來將會進一步分析。

3、日本：請 SPC 比較 CMM08-01 實施後，圍網努力量與 2001~2004 年的努力量之差異。

二、生態系及混獲物種主題：

(一)SPC/OFP Dr. Simon Nicol 簡報『中西太平洋鮪漁業對氣候變遷調適的進展（EB-WP-01）』以及『Kobe III 的混獲工作小組會議（EB-WP-02）』，此二簡報無提問及評論。

(二) SPC/OFP Dr. Harley 報告『鯊魚研究計畫的進展（EB-WP-03）』。對於鯨鯊列為關鍵種以進行資源評估議題，日本表達反對，我國則照署裡指示表達「鯨鯊業已禁捕，因此我們就不會有相關漁獲資料進行資源評估」。主席詢問連混獲資料都沒有？我方回答，所有混獲到的都要釋放。而在休息時間，日本水產廳官員再度表達希望我方能明確表示我們反對。我方發言表達：我們認為鯨鯊資源有問題，才會禁捕，因此很難公開反對列為關鍵種。日本則提醒，若列為關鍵種，以後不管什麼漁業（不光是定置網，還包括圍網）、不管混獲的死活，會員國都有責任蒐集及提供資料。

8 月 11 日

本日主要討論各個魚種的管理建議及進行會議報告文字修正，相關重點如下：

一、資源評估主題：

(一)南太長鰭鮪管理建議：目前評估結果認為資源健康（not overfished & not overfishing），管理建議的第一版為：SC8 提醒該魚種近年漁獲量增加，因此可利用資源的消耗也急速增加，建議對漁船活動進行管理（如 CMM10-05 之要求），而且漁獲量及努力量水準不應再增加。我國首先先對紀錄中有關「延繩釣 CPUE 下降」（指全面下降）一詞表達並非事實，而修改為「延繩釣 CPUE 有區域性下降」。對於這個版本管理建議相關討論如下：

1、紐西蘭提出第二版管理建議：延繩釣漁業應“降低”漁獲死亡率及漁獲量，特別在第一區（經度 180 度以西、南緯 0~25 度之間）（理由為對島國經濟影響大）。隨後東加發言贊同紐西蘭之提議。

2、我國則提出：該魚種目前資源狀況健康，僅需限制漁獲量及努力量水準不再增

加即可，不需要求降低漁獲死亡率及漁獲量。

3、日本、中國皆分別表示贊同我國看法，該魚種不需提出「降低」漁獲死亡率之建議。

4、斐濟表示：非常關心南太長鰭鮪資源，由於近年來漁獲量增加，若沒有對此資源積極管理，恐怕往後該資源可能會有問題，會傷及他們的經濟利益。

5、我國：強調南太長鰭鮪資源 not overfished & not overfishing，而且我方觀點已要求不再增加漁獲量及努力量，應該已足夠對此資源進行保育。另請主席同意於會場提供 CPUE 趨勢圖，該圖顯示並非每一區的 CPUE 都是下降的，尤其是第一區，因此沒有必要要強調第一區的管理。日本隨後再發言，贊同我國觀點，並表示 SC 提出魚種資源狀況及管理建議，沒有必要考慮經濟議題，而且實際上並未分析經濟資料。

6、紐、澳分別再發言，於第一版建議中加入：若「委員會」（而非 SC）顧慮延繩釣對南太長鰭鮪的過度使用，會造成經濟影響時，應考慮降低該魚種的漁獲死亡率及漁獲量等文字。美國贊同。

7、最後，美國建議，將目前我國及紐西蘭提議之文字，修正為更中性的管理建議，並將在最後會議報告檢視時，再進行該項管理建議文字之討論。

8、休息時間，我團感謝日本的發言協助，日團表示是長官當場指示要支援台灣的議題，希望互相合作。

(二)南太劍旗魚管理建議，重點如下：

1、2012 年年底前完成相關漁業指標分析，並於 SC9 前完成最新的資源評估，並於 SC9 報告最新之評估結果。

2、若有區分性別的成長或其他生物參數，應合併至下次的資源評估中。

3、在新的資源評估完成前，將沿用 SC5 的管理建議。

(三)西南太紅肉旗魚管理建議，重點如下：

1、目前南太紅肉旗魚資源已完全被開發，雖然目前過漁並非正進行中（not over

fishing），但可能處於已過漁（overfished）狀態。

2、建議進行管理措施，以減少西南太紅肉旗魚整體漁獲量。

(四)北太紅肉旗魚管理建議：該魚種管理建議主要採用 ISC 之建議。唯該資源評估報告遞交 SC 時間較為延遲，故 SC 針對此問題進行檢討，主要是點出 ISC 資源評估及遞交報告的效率問題，由於各國對於相關文字僵持，故將在下週檢視管理議題報告時再討論。

(五)北太長鰭鮪、劍旗魚及太平洋黑鮪，此三魚種目前皆無新的資源評估，因此都沿用先前的管理建議。

(六)鯊魚管理建議，重點如下：

1、花鯊：雖然相關漁獲資料有限，但考慮各項不確定性因素後，所有的評估結果皆指出目前該魚種資源已處於過漁狀態（overfished）而且過漁正在進行中（overfishing），建議應減少漁獲死亡率，並研擬忌避措施。

2、黑鯊：資源已處於過漁（overfished）及過漁正在進行中（overfishing）。然而評估中的敏感分析（Sensitivity analysis），指出結果高度依賴評估模式的假設，且評估僅採用唯一一條較可信的 CPUE 序列，SC 建議對於黑鯊的 CPUE 標準化及資源評估，應加強精細度。SC 同時認為忌避措施將是改善黑鯊資源的最佳選項。

3、要求 SPC 與美國、日本合作，重新對黑鯊進行資源評估，並於 SC9 報告評估結果。

4、建議建立混獲物種（包含花鯊、黑鯊等）之限制參考點及目標參考點。

二、研究計畫主題：

西太平洋東亞漁業管理計畫及印菲基金指導委員會非正式會議：首先由秘書長說明計畫背景，再由菲律賓、印尼及越南三國簡報資料蒐集資助計畫成效，並進行各項經費運用及執行情況檢視。

8 月 12 日（星期日，休會）

8 月 13 日

一、資源評估小組對各魚種的管理建議：

(一)大目鮪、黃鰭鮪及正鰹：今年並未針對這三魚種進行資源評估，因此皆沿用 SC7 之管理建議。有關科學研究建議部分：

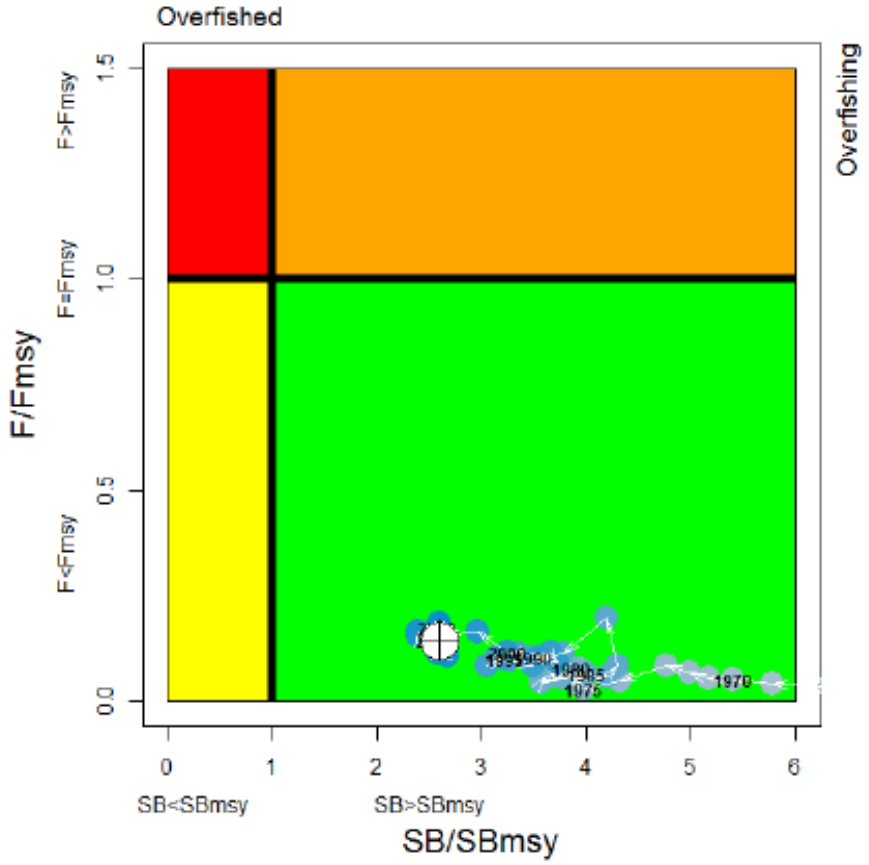
1.針對大目鮪資源評估 peer review 小組各項建議（包含 MFCL 模式）進行改善。

2.漁業指標分析（SA-WP-02）應對相關趨勢圖詳細解釋，並且該指標不代表資源狀況（應我國之建議）。

3.Project 35(SA-WP-03)，生物資訊蒐集對大目鮪資源評估很重要，支持擴大範圍至正鰹、黃鰭鮪及紅肉旗魚等魚種，並注意避免與其他生物採樣計畫重複。

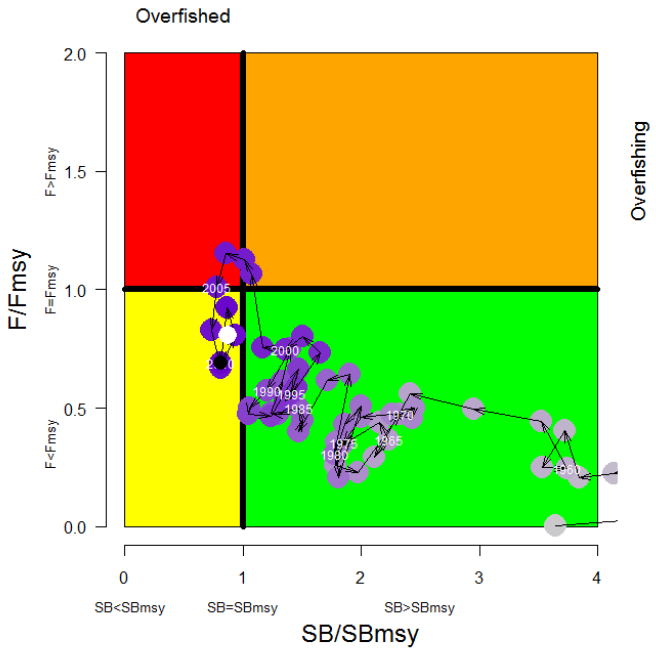
4.鼓勵韓國繼續進行延繩釣黃鰭鮪 CPUE 標準化工作，以進一步提供相關指標資訊。

(二)南太平洋長鰭鮪：本次評估結果 MSY 為 99,085 公噸、F/FMSY=0.21、B/BMSY=1.6、SB/SBMSY=2.6，顯示漁獲量未過漁(Not Overfishing)，資源存量未過漁(Not Overfished)。然而近幾年 SC 持續提醒任何漁獲量或努力量的增加，可能導致「一些區域」（應我國要求加上，以免擴及全南太洋區）漁獲率的下降，因此 SC8 進一步提醒漁業活動應依據 CMM2010-05 進行管理。另上週費時討論的，是否將減少延繩釣努力量或是漁獲死亡率之建議，最後採用之建議文字為『Given the recent expansion of the fishery and recent declines in exploitable biomass available to longline fisheries, and given the importance of maintaining catch rates, **the SC recommends that longline fishing mortality be reduced if the Commission wishes to maintain economically viable catch rates.**』。



(三)南太平洋劍旗魚：今年沒進行新的資源評估，因此沿用 SC5 的管理建議。其餘後續研究及資源評估安排，如上週討論之結果無異議通過。

(四)西南太平洋紅肉旗魚：MSY 為 2,081 公噸、F/FMSY=0.81、B/BMSY=0.83、SB/SBMSY=0.82，顯示漁獲努力量未過漁(Not Overfishing)，資源存量可能已過漁(Overfished)。建議進行管理措施以減少西南太紅肉旗魚整體漁獲量。亦如上週討論之結果無異議通過。



(五)北太平洋各魚種：皆採用或參考 ISC 的管理建議。然而，對於 ISC 的紅肉旗魚資源評估報告延遲遞交 SC 的問題，紐國聯合 FFA 要求將該魚種交由 SPC 評估，我國及日本則聯手強力抵制，然而日本後來自覺理虧，而舉日本受海嘯侵害為延遲的藉口，紐國表同情，但認為已容許 ISC 近 8 年，不願讓步。最後我國解釋，ISC 並非沒有依時限完成，而是年會時程安排不當，所以才造成此結果，我們願解決此程序問題。各國同意此看法，經我方要求先擱置此議題，並於休息期間協商日、美，並與日本共擬新文字，最後採用的妥協文字為『Noting the delay in the WCNPSTR assessment, and the associated lack of timely submission of assessment documents, SC8 recommends that the Commission consider tasking the Scientific Services Provider with conducting the next assessment **unless the ISC can demonstrate that it will prevent such delays in future and that the ISC Chair cooperates for more timely submission of stock assessment analyses and reports.**』

日、美（ISC 旗魚主席）對我國表達感謝，最後由我國聯繫 ISC 各國（除墨國）達成共識，要讓明年年會提早到 6 月，以化解此無止境的爭論，並避免南方國家有機會負責北方系群的評估工作；而美國同意會給 ISC 美籍主席壓力，希望能解決兩組織的嫌隙。

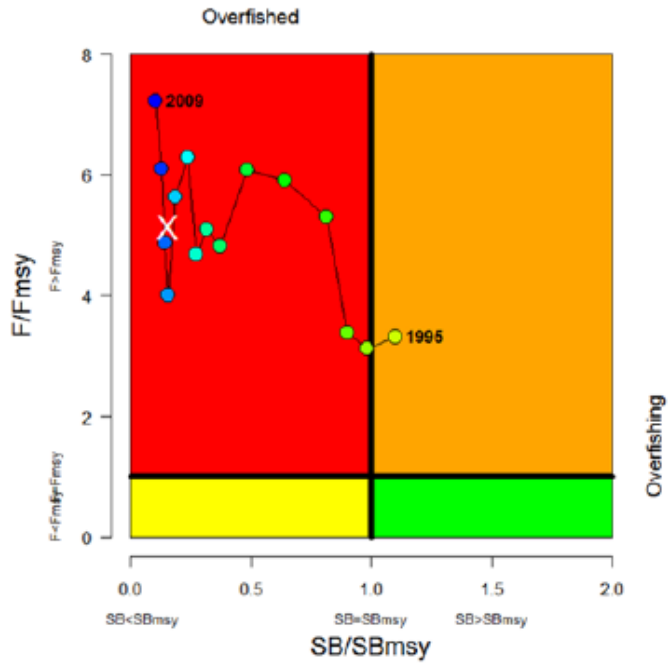
(六)花鯊及黑鯊：如上週討論之結果無異議通過。

1.花鯊：

（1）首次評估結果：MSY 為 46,708 公噸、F/FMSY=6.694、B/BMSY=0.156 、

SB/SBMSY=0.153。

（2）雖然相關漁獲資料有限，但已考慮各項不確定性因素後，所有可接受的模式的評估結果皆顯示該魚種漁獲量處於過漁進行中(Overfishing)，資源存量已過漁(Overfished)。

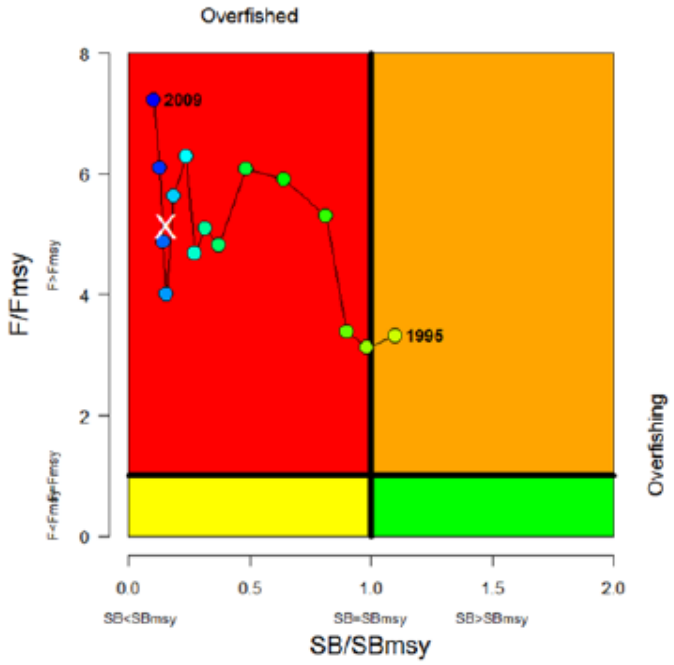


2.黑鯊：

（1）首次評估結果：MSY 為 52,669 公噸、F/FMSY=6.443、B/BMSY=0.725 、SB/SBMSY=0.660，顯示該魚種漁獲量處於過漁進行中(Overfishing)，資源存量已過漁(Overfished)。

（2）但不同的 CPUE 序列存在著衝突，此衝突透過評估，顯示極為不同的管理意含。延繩釣混獲 CPUE 序列，顯示漁獲量下降且處於過漁進行中(Overfishing)狀態，然而若併入圍網 CPUE 序列，估算的資源量極高。SC 認為併入觀察員資料，可能會產生顯著不同的評估結果，故此併入工作是需要的。

（3）SC 結論：目前無法決定資源狀態及估算資源量。



二、生態系及混獲主題的管理建議：

(一)在討論相關管理建議前，由日本科學家接續介紹兩篇工作報告（EB-WP-16 及 EB-WP-17），均是對於圍網利用 FAD 作業時，減少大目鮪幼魚混獲之研究。

(二)此管理建議較大的爭議為海鳥，SC 認為最有效的忌避措施依序為(1)支繩加重、(2)夜間投繩及(3)避鳥繩。紐、澳二國提議將支繩加重的實施細節（位置及重量），置入管理建議之文字敘述中，但日本認為此部份尚未徹底研究其效益而反對；另外對於中、高緯度實施忌避措施的條件、南北緯是否分開討論，都有不同意見看法。最後決定此議程先擱置，在本日會議結束後加開小組討論會議。

三、各非正式小組（Informal Small Group, ISG）會議：由各 ISG 會議召集人口頭報告各小組會議重點，該小組會議紀錄皆無異議通過。

四、海鳥忌避措施之管理建議：傍晚由澳洲代表召開小組會議，經過討論、溝通後，小組決定採用分區（南、北緯）進行管理建議，相關文字如下：

a. Southern hemisphere

SC8 recommends that fisheries south of 30 degrees S are required to use at least two of these three measures: weighted branch lines, night setting and bird scaring lines. When using bird scaring lines the descriptions outlined in WCPFC-SC8-2012/EB-WP-06 should be used.

b. Northern hemisphere

SC8 recommends that the table in CMM 2007-04 be revised to eliminate redundancy by removing weighted branch lines and underwater setting chute in column B.

8 月 14 日

一、限制參考點的討論重點：原本由管理主題召集人 Dr. Robert Campbell 所彙整的限制參考點建議，是直接建議將親魚生物量的限制參考點設定在 20%，並未標明是哪一個魚種。日本認為 SPC 所提出的報告，僅針對部份魚種（大目、黃鰭鮪、正鰹及南太紅肉旗魚），故不應擴及其他魚種，要求刪除。帛琉則認為所訂定親魚生物量的限制參考點設定在 20%，應適用所有魚種。美國則表示贊同日本看法。主席原偏向島國之看法，爭論最後同意只標明某些魚種，而且 20%是暫訂的。

另一個議題為何時開始啟動管理機制，SPC 建議只要資源狀況低於限制參考的機率只要有 10%就啟動，島國針對正鰹另要求 5%。由於此議題嚴重，因此我國亦與日本極力反對，美國後來亦加入反對。美國及我國皆認為 10%沒有科學根據，是 SPC 為方便模擬所作的假設，主席則強調 10%是一般漁業常用標準，我國認為可能其他漁業有，但鮪漁業沒聽說過（美國會後表示甚至其他漁業也沒聽過），我國反對 SC 用喊價方式來決定。最後會議共識不列實際數字（但請 SPC 分析），但標明一些 CCM 認為 10%合理。

二、CMM 08-01 的管理成效：其中較大爭議是，原本由管理主題召集人 Dr. Robert Campbell 所彙整的進一步之管理建議，包含減少延繩釣的努力量。我國則發言認為不應將減少延繩釣的努力量列入，因為目前延繩釣的整體漁獲降低量已達成 CMM 08-01 之管理要求。日本亦表贊同我方意見。但紐西蘭則認為應該保留此段文字。另外，FSM 提議或許將文字修改為『應降低延繩釣漁獲死亡率』，日本回應，延繩釣之漁獲死亡率已下降，故要求刪除此段文字。我國認為 CPUE 下降是受配額限制而造成目標魚種轉移，並非資源下降。SPC 則回應目前並無所有延繩釣漁業的作業層級資料，因此無法確定有目

標魚種轉移現象。由於主席亦偏向島國意見，最後決議該文字修正為 FSM 所提議之文字，我國和日本並未成功刪除此對委員會建議降低鮪釣漁獲死亡率的文字。

會後與日本討論，雙方應儘量在年會前分析是否有目標魚種轉移現象，不過此問題在科學上很難證明，所以只能盡力而為。

三、後續資源評估及科學研究安排：

(一)大目鮪：2013 年先進行標識放流、延繩釣 CPUE 及模式修正等分析處理，2014 年再進行資源評估。

(二)南長鰭鮪：原先預定 2014 年再進行資源評估，我國提議因該魚種資源健康，建議比照其他 RFMOs 對於資源無問題之魚種每三年評估一次，故可在 2015 年方進行下一次評估。會議通過我國之建議。

(三)黃鰭鮪及正鰹：同大目鮪於 2014 年進行下一次評估。

(四)紅肉旗魚：南、北系群下一次評估皆在 2017 年進行。

(五)黑皮旗魚：下年度（2013 年）ISC 將與 SPC 及 IATTC 合作進行評估。

(六)劍旗魚、黑鯊、水鯊：2013 年進行評估。

(七)花鯊：下一次評估將在 2015 年進行。

(八)馬加鯊：原訂 2013 年進行首次的資源評估，然而美國建議考慮科學服務提供者（SPC）的工作負擔，建議該魚種在 2015 方進行評估。

四、對同儕檢視之建議：

(一)通過未來的資源評估同儕檢視應採用之 Terms of reference。

(二)Reviewer 的遴選程序依照 SC7 報告第 580 及 581 段進行。

(三)會中日本反對要求要針對太平洋黑鮪資源評估結果進行同儕檢視，但最後通過建議委員會應要求 NC，當太平洋黑鮪資源評估完成後，應對評估過程及結果進行同儕檢視。

8 月 15 日

本日進行 SC8 會議報告的最後檢視，會議由上午 11 時開始，主席就會議紀錄草案逐段進行檢視，由於大部份內容皆於前二日充分溝通及討論，本日僅部分文字修正。然而其中有兩項議題，我國在會中極力爭取。

第一項為長鰭鮪 CPUE 下降議題，我國希望在文字述明並非所有漁區的 CPUE 都是下降的，在島國全部反對下，會議紀錄只能寫明是我國單方面之 statement；依據 SPC 提供之資料，認為 CPUE 下降僅出現在 some regions。

第二項為鯨鯊議題，會議已通過將鯨鯊列為關鍵種，但會議紀錄扭曲我國原發言之意思，因此我國再次表明我國已禁捕鯨鯊，因此沒有漁獲資料可供研究；SPC 認為我國有漁獲紀錄，只是不願提供；我國反駁，有漁獲紀錄是指 2008 年以前，但之後就沒有了（因此會議紀錄寫明 2008 年之後）；但該小組主席強調我國定置網有意外捕獲，可以提供資料，要求加上此文字。我國反駁，並要求補充以下文字：我國並未要求漁民提供混獲釋放紀錄，因此沒有資料。然為求慎重，於會場上網查明相關規定，查得「預告自九十七年度起鯨鯊（學名：Rhincodon typus，俗名：豆腐鯊）漁業管理措施」之主要內容第四點規定：誤捕鯨鯊放回海中前，應填報誤捕鯨鯊資料通報表，通報所在地直轄市或縣（市）政府漁業單位及本會漁業署，以建立鯨鯊生態資料。得知我國實際上規定漁民要通報誤捕鯨鯊紀錄。於是會中再度更正刪除原補充之文字。未來我國有義務提供定置網漁業及圍網漁業之鯨鯊混獲紀錄，以提供此關鍵種之資源評估運用。

參、心得與建議

一、 本次會議重要結果如次：

（一）主要魚種資源狀態及管理建議：

1.大目鮪：(1)資源狀態：最大持續生產量（MSY）為 76,760（範圍：68,360 - 83,720）公噸，漁獲量處於過漁進行中（Overfishing）狀態，但資源存量未過漁（Not Overfished）。(2)管理建議：由於大目鮪 2012 年並沒有進行新的資源評估，因此沿用 SC7 所提之管理建議；考量赤道海域為開發率及資源降低率最高之區域，佔 2001-2010 年漁獲量水準約 88%，親魚資源量在此區域降低約 17%左

右，建議考量有效之空間管理措施。應降低對於所有體型大小魚體之漁獲死亡率，以確保漁獲死亡率低於最適水準並降低過漁之風險。

2.黃鰭鮪：(1)資源狀態：MSY 為 538,800（432,000 - 644,800）公噸，漁獲量未過漁，且資源存量未過漁。(2)管理建議：由於黃鰭鮪 2012 年並沒有進行新的資源評估，因此沿用 SC7 所提之管理建議；建議在西赤道海域之漁獲死亡率不應再增加。

3.正鰹：(1)資源狀態：MSY 為 1,503,600（1,274,000 - 1,818,000）公噸，漁獲量未過漁，且資源存量未過漁。(2)管理建議：由於正鰹 2012 年並沒有進行新的資源評估，因此沿用 SC7 所提之管理建議；因漁獲死亡率及資源量指標快速改變，應監控漁獲努力量增加之情形，建議考慮發展捕撈正鰹之限制。

4.南太平洋長鰭鮪：(1)資源狀態：MSY 為 99,085 公噸，漁獲量未過漁，資源存量未過漁。(2)管理建議：因任何漁獲量或努力量增加將導致漁獲率的降低，特別是延繩釣漁業對於親魚資源的影響。建議漁船活動應以 CMM 2010-05「南太平洋長鰭鮪養護與管理措施」建議案有效管理。若「委員會」欲維持在經濟效益上可行的漁獲率，SC 建議延繩釣的漁獲死亡率應降低。

5.大目鮪資源評估的同儕檢視，檢視重點包含適當的資源架構假設、資料來源、評估方法、管理參考點、適當投射方法等，並針對評估的執行過程進行檢視。由標識放流所回收的資料顯示，大目鮪洄游橫跨東、西太平洋，所以認為評估應針對全太平洋進行且應定期評估。對於評估所做的分區亦建議重新考慮。並認為缺乏作業層級資料是資源評估的阻礙之一。報告中也提到，台灣大目鮪體長資料的一致性比日本的好，不應強將日本體長資料用在評估中。

（二）管理議題：

1. 限制參考點：建議暫設定親魚生物量與原始親魚生物量比列為 20%。

2. CMM 08-01 的執行成效：建議建立全年度 FAD 使用比例限制措施，取代 FAD 禁用期措施；建議應降低延繩釣大目鮪漁獲死亡率。

（三）資料及統計議題：主題包含：（1）針對目前科學資料提報的要求，檢視各國提報資料內容是否符合要求；（2）討論圍網的魚種組成估算問題；（3）延繩釣漁業的漁獲體長資料；（4）區域性觀察員（ROP）資料提報。針對作業層級資料提交，該項議題將提送 TCC8 討論，並要求未提送作業層級資料國家在該會議中提報改善計畫。會員國在提送年度資料時，小組建議在資料說明中加入有關體長資料處理情況以及有關漁業變動說明。

（四）生態系及混獲議題：海鳥忌避措施之管理建議：經過討論、溝通後，小組決定採用分區（南、北緯）進行管理建議，南緯 30 度以南建議採用 3(支繩加重、夜間投繩、避鳥繩)選 2 忌避措施，北緯地區建議刪除 B 欄之支繩加重及水下投繩導管 2 選項。

二、 本年 SC8 會議結果將作為本年 TCC8 及 WCPFC9 年會後續討論之科學相關議題背景資料，擬積極研擬準備因應立場，採取務實可行及彈性方案，俾維護相關權益。

三、 有關 SC8 會議所建議各項科學研究議題，將視可行性及重要性規劃納入遠洋相關科技計畫。

肆、附件

附件一、我國代表團成員

我國代表團成員

單位	職稱	姓名
漁業署	技正	李淑敏
	技正	高玉瑄
中山大學	副教授	張水鍇
中華民國對外漁業合作發展協會	組長	於仁汾
	組員	劉弘一
台灣區遠洋鰹鮪圍網漁船魚類輸出業同業公會	幹事	蔡佳昌

附件二、議程

SCIENTIFIC COMMITTEE
EIGHTH REGULAR SESSION

Busan, Republic of Korea
7-15 August 2012

PROVISIONAL AGENDA

WCPFC-SC8-2012/02

AGENDA ITEM 1 OPENING OF THE MEETING

1.1 Welcome address
1.2 Meeting arrangements
1.3 Issues arising from the Commission
1.4 Adoption of agenda
1.5 Reporting arrangements
1.6 Intersessional activities of the Scientific Committee

AGENDA ITEM 2 REVIEW OF FISHERIES

2.1 Overview of Western and Central Pacific Ocean (WCPO) fisheries*
2.2 Overview of Eastern Pacific Ocean (EPO) fisheries
2.3 Annual Report (Part 1) from Members, Cooperating Non-Members, and Participating Territories (CCMs)
2.4 Reports from regional fisheries bodies and other organizations

AGENDA ITEM 3 DATA AND STATISTICS THEME

3.1 Data gaps
3.1.1 Data gaps of the Commission
3.1.2 Species composition of purse-seine catches
3.1.3 Data issues with the ISC
3.2 Requests from CMM 2008-01
3.2.1 Fishing effort for bigeye and yellowfin tuna from other commercial tuna fisheries*
3.3 Regional Observer Programme

AGENDA ITEM 4 STOCK ASSESSMENT THEME

4.1 WCPO bigeye tuna
4.1.1 Review of research and information

a. Peer review of 2011 bigeye tuna stock assessment
b. Indicator analysis
c. Progress report on Project 35 (Refinement of bigeye parameters Pacific-wide)

4.1.2 Provision of scientific information
a. Status and trends*
b. Management advice and implications*

4.2 WCPO yellowfin tuna

4.2.1 Review of research and information

4.2.2 Provision of scientific information
a. Status and trends*
b. Management advice and implications*

4.3 WCPO skipjack tuna

4.3.1 Review of research and information

4.3.2 Provision of scientific information
a. Status and trends*
b. Management advice and implications*

4.4 South Pacific albacore tuna

4.4.1 Review of research and information
a. Review of Project 39 (Stock structure and life-history characteristics of SP albacore)
b. Review of 2012 stock assessment
c. Review of CMM 2010-05

4.4.2 Provision of scientific information
a. Status and trends*
b. Management advice and implications*

4.5 South Pacific swordfish

4.5.1 Review of research and information

4.5.2 Provision of scientific information
a. Status and trends*
b. Management advice and implications*

4.6 Southwest Pacific striped marlin

4.6.1 Review of research and information
a. Review of Project 64 (Collation of SP striped marlin)
b. Review of 2012 stock assessment

4.6.2 Provision of scientific information
a. Status and trends*
b. Management advice and implications*

4.7 North Pacific striped marlin

4.7.1 Review of research and information
a. Review of 2012 stock assessment

4.7.2 Provision of scientific information
a. Status and trends*
b. Management advice and implications*

4.8 Northern stocks

4.8.1 North Pacific albacore tuna

4.8.1.1 Review of research and information

4.8.1.2 Provision of scientific information
a. Status and trends*
b. Management advice and implications*

4.8.2 Pacific bluefin tuna

4.8.2.1 Review of research and information

a. Review of 2012 stock assessment

4.8.2.2 Provision of scientific information

a. Status and trends*

b. Management advice and implications*

4.8.3 North Pacific swordfish

4.8.3.1 Review of research and information

4.8.3.2 Provision of scientific information

a. Status and trends*

b. Management advice and implications*

4.9 WCPO sharks

4.9.1 Oceanic whitetip shark

4.9.1.1 Review of research and information

a. Review of 2012 stock assessment

4.9.1.2 Provision of scientific information

a. Status and trends*

b. Management advice and implications*

4.9.2 Silky shark

4.9.2.1 Review of research and information

a. Review of 2012 stock assessment

4.9.2.2 Provision of scientific information

a. Status and trends*

b. Management advice and implications*

AGENDA ITEM 5 MANAGEMENT ISSUES THEME*

5.1 Terms of Reference

5.2 Limit reference points for the WCPFC

5.3 Target reference points for the WCPFC

5.4 Harvest Control Rules

5.5 Requests from CMM 2008-01

5.5.1 Review of the effectiveness of CMM 2008-01*

AGENDA ITEM 6 ECOSYSTEM AND BYCATCH MITIGATION THEME

6.1 Ecosystem effects of fishing

6.2 Sharks*

6.2.1 Shark Research Plan

a) Assessment of whale sharks against the key shark species criteria

6.2.2 Review of CMM for Sharks

a) CMM 2010-07 (CMM for Sharks)

b) CMM 2011-04 (CMM for oceanic whitetip shark)

c) Development of CMMs on other shark species

d) Guidelines for safe release of encircled animals

6.2.3 International cooperation on shark issues

6.3 Seabirds*

6.4 Sea turtles*

6.5 Other species and issues

6.5.1 FAD bycatch mitigation

6.5.2 Food security issues with bycatch

a) Management advice and implications*

AGENDA ITEM 7 OTHER RESEARCH PROJECTS

7.1 West Pacific East Asia Oceanic Fisheries Management Project*
7.2 Pacific Tuna Tagging Project*

AGENDA ITEM 8 COOPERATION WITH OTHER ORGANISATIONS

8.1 The status of cooperation and relations

AGENDA ITEM 9 SPECIAL REQUIREMENTS OF DEVELOPING STATES AND PARTICIPATING TERRITORIES

9.1 Consideration of the special requirements of developing States pursuant to Part VIII of the Convention

AGENDA ITEM 10 FUTURE WORK PROGRAM AND BUDGET

10.1 Review of the Scientific Committee Work Programme
10.2 Development of the 2013 Work Programme and budget, and projection of 2014-2015 provisional Work Programme and indicative budget*

AGENDA ITEM 11 ADMINISTRATIVE MATTERS

11.1 Rules of Procedure
11.2 Peer review of stock assessments*
11.3 Future operation of the Scientific Committee
11.3.1 Future structure of the SC
11.3.2 Review of SC agenda
11.3.3 Guidelines for the theme conveners and SC chair
11.4 Election of the Chairman of the Scientific Committee*
11.5 Next meeting*

AGENDA ITEM 12 OTHER MATTERS

AGENDA ITEM 13 ADOPTION OF THE SUMMARY REPORT OF THE EIGHTH REGULAR SESSION OF THE SCIENTIFIC COMMITTEE

AGENDA ITEM 14 CLOSE OF MEETING

附件三、WCPFC SC8 會議報告

Commission for the Conservation and Management of
Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Korea
7-15 August 2012

SUMMARY REPORT

(ADOPTED VERSION)

Comments to SK (sungkwon.soh@wcpfc.int)

NOTE

1. 2012.08.27 – Attachment H was replaced with the correct one that was adopted

USP Library Cataloguing-in-Publication Data

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. Scientific Committee. Regular session (8th : 2012 : Pohnpei, Federated States of Micronesia)
Seventh regular session, Pohnpei, Federated States of Micronesia, 7–15 August 2012 : summary report. – Kolonia,
Pohnpei : Western and Central Pacific Fisheries Commission, 2012.

~~203~~ p.

1. Fishery management, International—Oceania—Congresses 2. Fishes—Conservation—Oceania—Congresses 3. Fish stock assessment—Oceania—Congresses 4. Tuna fisheries—Oceania—Congresses 5. The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean—Congresses I. Western and Central Pacific Fisheries Commission.

~~SH214.9.C779 2011~~ ~~333.95609648~~

~~ISBN 978-982-9103-25-3~~

Publisher	Western and Central Pacific Fisheries Commission PO Box 2356 Kolonia, Pohnpei 96941 Federated States of Micronesia
Typesetting	Times New Roman 11
Production	Western and Central Pacific Fisheries Commission, Pohnpei, Federated States of Micronesia

ACKNOWLEDGEMENTS

The financial, logistical and administrative support provided by the Government of the Republic of Korea and the Western and Central Pacific Fisheries Commission Secretariat are gratefully acknowledged. The Secretariat of the Pacific Community's Oceanic Fisheries Programme provided much of the technical material for the session. Dr Shelley Clarke served as chief rapporteur for the meeting. Their efforts are acknowledged with appreciation.

TABLE OF CONTENTS

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Korea
7-15 August 2012

EXECUTIVE SUMMARY

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Korea
7-15 August 2012

SUMMARY REPORT

AGENDA ITEM 1 - OPENING OF THE MEETING

1.1 Welcome address

1. The meeting was opened by the Chair of the Scientific Committee, N. Miyabe. Opening remarks were presented by WCPFC Executive Director G. Hurry (Attachment A) and a welcome address was delivered by J-H Son, President of Korea's National Fisheries Research and Development Institute (Attachment B).

2. Papua New Guinea (PNG), on behalf of the SC8 participants, thanked J-H Son for his remarks, and the hosts, the Republic of Korea, for the excellent meeting arrangements.

3. The following WCPFC Members, Cooperating Non-Members, and Participating Territories (CCMs) attended SC8: Australia, China, Cook Islands, European Union (EU), Federated States of Micronesia (FSM), Fiji, French Polynesia, Indonesia, Japan, Kiribati, Korea, Marshall Islands (RMI), Nauru, New Caledonia, New Zealand, Palau, Papua New Guinea (PNG), Philippines, Samoa, Solomon Islands, Chinese Taipei, Tokelau, Tonga, Tuvalu, United States of America (USA), Vanuatu, Vietnam and Wallis and Futuna. The list of participants is appended as Attachment C.

4. Observers from the following inter-governmental organizations attended SC8: Agreement on the Conservation of Albatrosses and Petrels (ACAP), Inter-American Tropical Tuna Commission (IATTC), Pacific Islands Forum Fisheries Agency (FFA), Parties to the Nauru Agreement (PNA), Secretariat of the Pacific Community (SPC), and Southeast Asian Fisheries Development Center (SEAFDEC).

5. Observers from the following non-governmental organizations attended SC8: Greenpeace, International Seafood Sustainability Foundation (ISSF), Pacific Islands Tuna Industry Association (PITIA), Pew Environment Group, and World Wide Fund for Nature (WWF).

1.2 Meeting arrangements

6. In response to a question, the Secretariat clarified that draft recommendations from the theme sessions would be circulated in hard copy format to all delegations in advance of their consideration during the SC plenary.

1.3 Issues arising from the Commission

7. The Secretariat presented SC8-SC8-GN-WP-03 which lists twelve issues arising from SC7 including assessments of south Pacific swordfish, southwest Pacific striped marlin, and north Pacific striped marlin; stock assessments for sharks and evaluation of mitigation measures; seabird mitigation measures, food security of food fish, the Commission's data provision requirements, species composition of purse seine catches, review of the SC work programme, stock assessments to be presented to SC8 including a peer review of the bigeye assessment; high priority projects for 2012; and future operation of the SC. The paper also refers to three issues arising from WCPFC8: terms of reference for the Management Issues theme, limit reference points and an assessment for south Pacific swordfish.

1.4 Adoption of agenda

8. It was agreed that Japan's paper on reducing fishing mortality of bigeye tuna associated with FADs would be discussed under Agenda Item 5.5.1.

9. One CCM requested that adequate time be provided in the agenda for brief presentations, and questions and answers, on CCM Annual Reports. The provisional was adopted (Attachment D).

1.5 Reporting arrangements

10. The Secretariat explained that if time allows the Executive Summary will be adopted along with the Summary Report on the final day of the meeting. If not, the Executive Summary will be prepared by the Secretariat and adopted through circulation. The WCPFC list of acronyms and abbreviations and the list of SC8 meeting documents are appended as Attachment E and Attachment F, respectively.

1.6 Inter-sessional activities of the Scientific Committee

11. The Secretariat presented SC8-GN-WP-04 on the inter-sessional activities of the SC. The paper highlighted the contribution of the WCPFC Scientific Services Provider, the Secretariat of the Pacific Community (SPC), which produced 30 papers and reports for SC8 in addition to ongoing data collection and management work, and attendance at Commission and other meetings. It also reported on progress with seven projects within the SC's Work Programme, and documented the Secretariat's work in representing the Commission at various science-related meeting, progressing the Western Pacific East Asia Oceanic Fisheries Management Project and administering the Japanese Trust Fund Programme.

AGENDA ITEM 2REVIEW OF FISHERIES

2.1 Overview of Western and Central Pacific Ocean (WCPO) fisheries

12. P. Williams, SPC, and P. Terawasi, FFA, presented SC8-GN-WP-01 which contains a broad description of the major fisheries in the Western and Central Pacific Fisheries Commission Statistical Area (WCP-CA) and highlights activities during the most recent calendar year (2011) including the most recent version of catch estimates by gear and species.

13. The provisional total WCP-CA tuna catch for 2011 was estimated at 2,244,776 mt, the lowest since 2005 and 300,000 mt lower than the record in 2009 (2,544,679 mt) (Figure 1). This catch represented 79% of the total Pacific Ocean catch of 2,833,020 mt, and 55% of the global tuna catch (the provisional estimate for 2011 is 4,077,814 mt, which is the lowest for 10 years). The 2011 WCP-CA catch of

skipjack (1,540,189 mt – 69% of the total catch) was only the fifth highest recorded and around 215,000 mt less than the record catch of 2009 (1,756,628 mt). The WCP-CA yellowfin catch for 2011 (430,506 mt – 19%) was the lowest since 1996 and more than 170,000 mt lower than the record catch taken in 2005 (602,892 mt) due to poor catches in the purse seine fishery. The WCP-CA bigeye catch for 2011 (151,533 mt – 7%) was close to the average for the past decade. The 2011 WCP-CA albacore catch (122,548 mt - 5%) was relatively stable and close to the average for the past decade. The 2011 WCP-CA albacore catch includes catches of north and south Pacific albacore in the WCP–CA, which comprised 81% of the total Pacific Ocean albacore catch of 152,195 mt in 2011. The south Pacific albacore catch in 2011 was 75,258 mt.

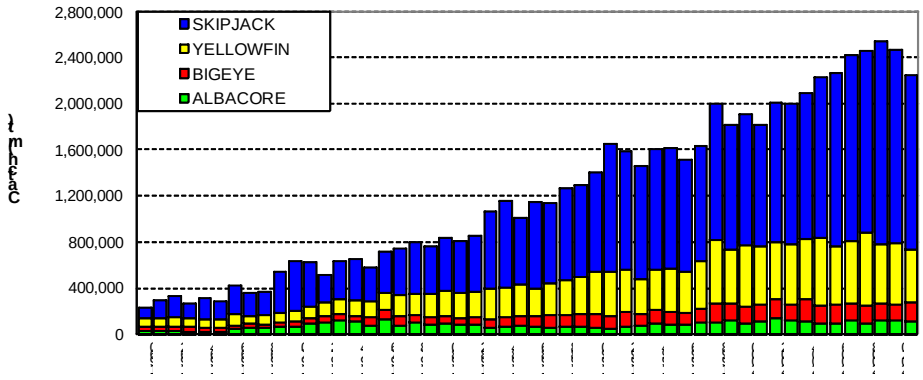


Figure 1. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA.

14. The provisional 2011 WCP-CA purse seine catch of 1,688,336 mt was the lowest catch for five years and more than 220,000 mt lower than the record attained in 2009 (1,919,424 mt). The 2011 purse seine skipjack catch (1,330,667 mt) was also the lowest for five years and significantly lower (nearly 200,000 mt) than the record catch in 2009. The 2011 purse seine catch estimate for yellowfin tuna (280,251 mt – 17%) was the lowest since 1996 and significantly lower (150,000+ mt) than the record catch taken in 2008 (434,149 mt). The provisional catch estimate for bigeye tuna for 2011 (77,095 mt) was amongst the highest on record but may be revised once all observer data for 2011 have been received and processed. The high bigeye catch in 2011 coincides with a record number of associated sets and a pulse of bigeye recruitment in the purse seine fishery, and there may have been changes in catchability in some areas of the fishery. While purse seine catch declined in 2011, the number of vessels and effort (both in terms of days fishing and number of sets) were at an all-time high.

15. The 2011 WCP-CA pole-and-line catch (164,416 mt) was the lowest annual catch since the mid-1960s and continuing the trend in declining catches for three decades. The catches by the Japanese distant-water and offshore fleets in recent years have been the lowest for several decades and this is no doubt related to the continued reduction in vessel numbers (in 2011 reduced to only 90 vessels, the lowest on record). The Solomon Islands fleet recovered from low catch levels experienced in the early 2000s (only 2,773 mt in 2000 due to civil unrest) to reach a level of 10,448 mt in 2003. This fleet ceased operating in 2009, but resumed fishing in 2011 (Figure 2).

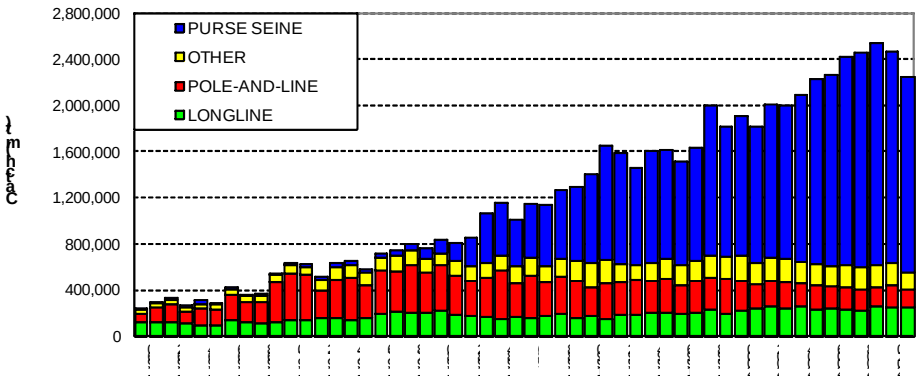


Figure 2. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA, by longline, pole-and-line, purse seine and other gear types

16. The provisional WCP-CA longline catch (251,298 mt) for 2011 was the fifth highest on record, at around 15,000 mt lower than the highest on record attained in 2002 (266,963 mt). The WCP-CA albacore longline catch (96,219 mt – 38%) for 2011 was the second highest on record, 6,000 mt lower than the record (102,763 mt in 2010). In contrast, the provisional bigeye catch (67,599 mt – 27%) for 2011 was the lowest since 1997, but may be revised upwards when final estimates are provided. The yellowfin catch for 2011 (86,187 mt – 34%) was stable but slightly higher than the average catch level for this species over the period 2000-2010.

17. The 2011 South Pacific troll albacore catch (3,119 mt) was higher than the catch in the past two years, mainly due to higher catches experienced in the New Zealand domestic fishery. The New Zealand troll fleet (162 vessels catching 2,798 mt in 2011) and the United States troll fleet (6 vessels catching 321 mt in 2011) typically account for most of the albacore troll catch, with minor contributions coming from the Canadian, the Cook Islands and French Polynesian fleets when their fleets are active (which was not the case in 2011).

18. In regards to the economic condition of the WCP-CA fishery, the overriding issue with canned tuna raw materials and sashimi grade products in the year 2011 was that of supply. The increasingly tight management measures with pressure for sustainably produced tuna and tuna products; relatively poor fishing conditions under the prevalence of La Niña conditions; the residual effects of global financial crises including those in Europe; continuing high fuel/food prices and changing consumer preferences; political disruptions in some of emerging markets; and natural disasters such as those in Japan and Thailand, all contributed to defining the supply and demand conditions during the year. Against this backdrop, prices increased to unprecedented levels in the case of canned tuna raw materials while the long-stagnant sashimi tuna product prices also increased.

19. Prices in the major markets for WCP-CA skipjack catches rose steeply in 2011. The Bangkok benchmark averaged US$1,726 per mt, a substantial 42% rise over the previous year. The Yaizu average price for skipjack was ¥143 (US$1,785) per mt, up 15% (27%) from 2010. The price trend for purse seine-caught yellowfin rose even more with Bangkok prices up by 57% to US$2,435 per mt while the Yaizu prices averaged ¥306 per kg (US$3,825 per mt) or 21% (34% in US dollar terms).

20. The estimated delivered value of the entire purse seine tuna catch in the WCP-CA for 2011 is US$3,092 million, 23% higher than 2010 driven by increases in both skipjack and yellowfin values. Yellowfin values increased by 22% and skipjack 25%.

21. The pole and line price at Yaizu in 2011 averaged ¥189 per kg (US$2,362 per mt) as against an average of ¥197 per kg (US$2,239 per mt) in 2010, a decline of 4% in Japanese yen terms (improvement of 6% in US dollar terms). The estimated delivered value of the total catch in the WCP-CA pole and line fishery for 2011 is US$372 million, almost the same level as in 2010 caused by almost equal offsetting movements in catch (down 12%) and overall price (up 13%).

22. Japan fresh yellowfin import price from Oceania fell by 6% (rose 9% in US dollar terms) to ¥889 per kg ($11.15 per kg). In the US, market prices were also higher at US$9.07 per kg. Japan frozen bigeye import prices rose 7% (18%) to ¥814 per kg (US$10.21 per kg). Average price for fresh bigeye from Oceania declined by 9% to ¥1,015 per kg (US$12.74 per kg). US fresh bigeye import prices were higher by 10% at US$8.87 kg. The Bangkok albacore market benchmark price averaged US$2,778 per mt in 2011 up 11% while Thai frozen albacore import prices improved by 14% to US$3,044 per mt. The US fresh albacore import prices increased by 8% to US$4.56 per kg.

23. The US swordfish market price (fresh and frozen) averaged US$8,340 per mt in 2011 up 9% from 2010. The overall price trend in this US market had been trending upward since 2000. In contrast to the uptrend in prices, the volume of imports into the US had been on a gradual decline. The estimated freight on board (FOB) value of the longline swordfish catch in the WCP-CA for 2011 is US$164 million, a moderate 3% increase on 2010 but a 17% decline from the peak of almost US$198 million in 2007.

24. The estimated delivered value of the longline tuna catch (excluding swordfish) in 2011 is US$1,853 million, an increase of US$145 million on the estimated value of the catch in 2010. The value of albacore catch increased by US$18 million, bigeye by US$37 million and yellowfin by $US90 million.

25. The total estimated delivered value of the WCP-CA catch in 2011 came to US$5.5 billion, an increase of 15% on 2010. The purse seine value was predominant accounting for 56 % of the total value while the longline fishery accounted for 33%. By species, skipjack represented 48% of the total value with yellowfin 29%, bigeye tuna 17% and albacore 7%.

Discussion

26. In response to questions from SC8, SPC clarified the following points relating to the WCPO fisheries in 2011 (SC8-GN-WP-01):

- The total catch in 2011 was the lowest since 2005 (Figure 2) and it was suggested that the main factor for the decline may have been the strong La Niña from the latter months of 2010 to the first quarter of 2011 and in late 2011. The purse seine fishery was concentrated in a small area of the western part of the region (Figure 9) and this may have caused local depletion.
- The estimate of the catch of Indonesia for 2011 was carried over from 2010 (Table 2, SC8-ST–IP–01).
- Although the catches declined in 2011, the value of the catch was a record high. The high prices were related to poor fishing conditions. Also, while the consumption of canned tuna in the United States has declined in recent years, the consumption has increased in Europe and in emerging markets.
- In 2011, yellowfin catches were higher in Australia due to La Niña and environmental drivers of recruitment.
- Small skipjack, less than 30 cm, were absent from the catch in 2011 (Figure 52). It was suggested that this may have been due to changes in the artisanal fisheries of Indonesia and

the Philippines. If the absence of small skipjack was due to recruitment, then its effect may continue for several years.

- From 2005 to 2010, the lengths of most bigeye caught by purse-seine were small, 50–80 cm, whereas in 2011, there was also a considerable catch of mid-sized fish, 90–130 cm (Figure 62). This may reflect a pulse of bigeye recruitment. However, the data upon which Figure 62 are based cover primarily the first and second quarters of 2011; length data for the second half of 2011 will provide more information in this regard.
- Skipjack catch rates for purse seine were average in the first and second quarters, then declined in the third quarter (Figure 20). This was due to the FAD closure, but, in contrast to previous years, catch rates remained low in the fourth quarter.
- The number of purse seiners increased since 2006 (Figure 4). It was not known whether the increase was due to recently constructed vessels.
- The estimates of the purse seine catches were based on species compositions determined from grab samples collected by observers and corrected for selectivity bias (see SC8-ST–WP–03, Case B).

27. FFA members noted that the data from 2011 confirm indications from 2010 of overall flattening and declining catches, but also noted that two years of La Niña effects may have reduced recruitment. Concentration of the fishery in the west in 2010–2011 may be causing a sub-regional depletion effect.

28. FFA members also reiterated their concern about the doubling of catch since 2000, declining CPUE, and increase in effort (including influx of vessels from the Indian Ocean, increase in domestic fleet size, and more high seas fishing) for South Pacific albacore, a fishery of special significance to many FFA members. FFA members suggested that a reduction of fishing mortality and catch of South Pacific albacore should be recommended to the Commission.

2.2 Overview of Eastern Pacific Ocean (EPO) fisheries

29. K. Schaefer, IATTC presented a summary of the EPO tuna fishery and assessments of the major exploited tuna stocks (SC8-GN-WP-02).

30. The fishing capacity of the purse seine fleet fishing in the EPO increased rapidly during 1995 to 2005, but has been fairly steady since about 2006. The reported nominal longline effort has fluctuated between about 300 and 100 million hooks set annually over the past thirty years. Since the highest peak in 2002-2003 of about 300 million hooks there has been a distinct decline to about 100 million hooks. Total tuna catches increased starting in 1996, peaked in 2003, and in 2011 were close to the average of the past eight years.

31. Yellowfin tuna catches have remained fairly stable since the mid-1980s, except for a peak in 2001 through 2003, followed by a substantial decline in 2006 through 2008, a slight increase in 2009 and 2010, and again a decline in 2011. The 2011 catch on dolphin-associated schools decreased from the previous two years. The catches of yellowfin in unassociated schools in 2011 remained low, similar to the past six years. The current stock assessment method being used for yellowfin is Stock Synthesis 3. Since 2004 recruitment has been relatively low, though not quite as low as it was during 1977 through 1983. Recent estimates indicate that the yellowfin stock in the EPO is not overexploited ($S=S_{MSY}$), and that overfishing is not taking place ($F<F_{MSY}$). The current status of the stock is considerably more pessimistic if a stock recruitment relationship is assumed.

32. The status of the skipjack stock has been evaluated using eight different data and model-based indicators. The purse seine catch has been significantly increasing since 1994, and in 2011 was similar

to the other peak years over the past decade, and just below the upper reference level. Except for a large peak in 1999, the catch per days fished on floating objects has generally fluctuated around an average level since 1992. However, for 2011 this value is the highest in the past five years. Except for 2010, the biomass and recruitment have been relatively high over the past several years including for 2011, and the exploitation rate has remained relatively high over the past decade. There is uncertainty about the status of skipjack tuna in the EPO, and there may be differences in the status of the stock among regions. However, there is no evidence that indicates a credible risk to the skipjack stock(s).

33. There have been substantial historical changes in the bigeye fishery in the EPO. Beginning in 1994 purse seine catches increased substantially to targeting tunas associated with drifting FADs in the equatorial EPO. Longline catches have been relatively low during the past 8 years versus the previous 22-year period and the estimated longline catch in 2011 of only about 25,000 mt is the lowest on record in the past 30 years. The current stock assessment method being used for bigeye is Stock Synthesis 3. Recruitment estimates were above average since around 2001. Recent estimates indicate that the bigeye stock in the EPO is not overexploited ($S>S_{MSY}$), but that overfishing is taking place ($F>F_{MSY}$). The current status of the stock is considerably more pessimistic if a stock recruitment relationship is assumed.

34. A tuna conservation resolution was adopted by the IATTC in June 2011 for the three-year period (2011-2013). This includes an EPO-wide closure for purse seine (>182 mt) fishing of 62 day in each of those years, along with a 30-day closure of a core offshore FAD fishing area. There is a special provision for class 4 vessels (182-272 mt) which permits 30 days of fishing during the EPO closure provided an observer is aboard. For longline vessels (>24 m) the resolution includes fixed bigeye catch limits for China, Japan, Korea, and Chinese Taipei, and other CPCs are required not to exceed 500 mt or their respective catches in 2001, whichever is greater.

Discussion

35. In response to questions from SC8, K. Schaefer clarified the following points relating to the EPO fisheries in 2011 (SC8-GN-WP-02):

- There appear to be periodic changes in the average level of yellowfin recruitment (Figure B–2). It was noted that productivity regimes in recruitment indices have been explored in recent years, but they are not directly taken into consideration in management issues. The productivity regime shifts in the EPO appear to be related to the physical oceanography.
- Maps of movements of tagged bigeye (Figure D-1) indicate less mixing between the WCPO and the EPO than indicated in the presentation given earlier by A. Punt on the review of the bigeye assessment (Agenda Item 4.1.1). However, it is difficult to generalise about movements of bigeye (and yellowfin), and levels of mixing, since they depend on when and where the fish were tagged. Tropical tuna usually remain within ~1,000 miles of the location where they are tagged and released. The purse seine observer programme in the EPO has 100% coverage. The level of coverage for distant water fishing nation longline fleets was queried; however, no information was readily available.

36. FFA members noted the value of the presentation, particularly the information on the movement of bigeye between the WCPO and EPO. FFA members also commended both the IATTC and WCPFC on the data exchange agreement that is now operational.

2.3 Annual Report (Part 1) from Members, Participating Territories and Cooperating Non-Members (CCMs)

37. Each CCM briefly presented its Annual Report-Part 1 focusing on important changes in their fisheries over the past year[1].

Discussion

38. ACAP noted that a number of the annual reports made no mention of seabird interactions, even though interactions are known, or are highly likely to have occurred, in the fleets of some CCMs who have not reported interactions. The meeting was reminded that under CMM 2007–04: "*CCMs shall annually provide to the Commission, in Part 1 of their Annual Reports, all available information on interactions with seabirds, including bycatches and details of species, to enable the Scientific Committee to estimate seabird mortality in all fisheries to which the WCPF Convention applies.*"

39. Noting the increase in catches of North Pacific albacore from 2008 to 2010 and in 2011, some CCMs were asked whether there were any changes in those fisheries; however, information was not immediately available and the query was forwarded to SPC.

40. With regard to the Annual Report of China, it was noted that the numbers of Chinese ice fresh tuna longline (IFLL) and deep frozen tuna longline (DFLL) reported to be active in 2011 was 155 and 93, respectively, whereas the total number of longliners reported to be active was 275 (Section 2.1, Fleet Structure, Longline). It was also noted that the catch of oceanic whitetip sharks by Chinese longliners in 2010 was 532 mt, whereas the catch in 2011 was 0 mt (Table 3).

41. China explained that the discrepancy in vessel numbers arose because the 2011 fleet data had not been updated. The total number of longliners is 275, including 79 DFLL and 196 IFLL, all of which have now been reported to the WCPFC. China also explained that as a result of a resolution adopted by ICCAT in 2010, a poster was sent to the longline operators stating that oceanic whitetip sharks cannot be landed.

42. With regard to the Annual Report of Fiji, it was noted that Table 5, Annual Estimated Catch of Species of Special Interest, 2011, reported the number of interactions ("No.") and the number of mortalities ("Dead"). It was also noted that rate of observer coverage of the Fiji longline fleet was 3% in 2011 (Table 9).

43. With regard to the Annual Report of Solomon Islands, the map of catches by the Japanese longline fleet in the waters of the Solomon Islands (Figure 9b) shows a marked shift in the distribution from 2010 to 2011. It was asked whether the shift was real or the result of the limited data that were available for 2011, however, the answer was not immediately forthcoming.

44. The Annual Reports-Part 1 of several CCMs were not available by the start of the meeting, and the quality of the reports submitted was highly variable. SC8 therefore noted the need to improve the timeliness and quality of the reports.

2.4 Reports from regional fisheries bodies and other organizations

[1] CCM Annual Reports-Part 1 for 2011 can be found on the WCPFC website on the SC8 meeting page at http://www.wcpfc.int/node/4587

45. SEAFDEC reported that during the past year it has developed a draft Collaborative Research Program on Tuna Resources in the Sulu Sulawesi Sub-regional Area as requested by SEAFDEC Member Countries. The specific objectives of the collaborative activity include a) assessing the status of tuna stocks and the maximum sustainable yield; identifying the spawning and nursery grounds of the tuna resources; and, investigating the impacts of FADs on tuna populations. To achieve the collaborative program, consultation meeting will be conducted this year to finalise the work plan. It is expected that project activities will be started in 2013.

AGENDA ITEM 3DATA AND STATISTICS THEME

46. The Data and Statistics Theme was convened by P. Maru (Cook Islands). I. Freeman (FFA) and S. Nicol (SPC) served as rapporteurs for the Theme session.

3.1 Data gaps

3.1.1 Data gaps of the Commission

47. P. Williams (SPC) presented SC8-ST-WP-01 on the major developments over the past year with regard to filling gaps in the provision of scientific data to the Commission.

48. All CCMs with fleets active in the WCPFC Convention Area have now provided 2011 annual catch estimates. Several CCMs continue to provide estimates for the key shark species (which is in accordance with the change in the requirements to include the key shark species catches) and some coastal states have begun using the new extended longline logsheets which have the provision for reporting sharks at the species level.

49. In general, the timeliness of the provision of aggregate catch and effort data continues to improve with nearly all CCMs providing data by the deadline of 30 April 2012. The quality of aggregate data provided has also improved with a reduction in the number of notes assigned to the aggregate data in recent years. Operational data for the EU Spanish longline fleet (2004-2011) was provided for the first time, and catch estimates for four new fleets were provided for the first time (Tuvalu longline, Wallis and Futuna longline and Vietnam purse seine and gillnet). The IATTC-WCPFC Memorandum of Cooperation (MOC) on Data Exchange has resolved the issue of gaps in aggregate longline data for the entire South Pacific Ocean which is the area of interest for the stock assessments of albacore tuna and swordfish.

50. The key gaps in aggregate catch and effort data include: a) missing shark species data for most CCMs; and b) missing aggregate catch/effort data from Indonesia. With respect to operational catch and effort data, only four main fleets are not covered by provision of these types of data, and these CCMs therefore need to provide estimates of catch and effort broken down by year and EEZ/high seas areas, according to the rules for WCPFC scientific data provision.

51. The backlog in ROP data provision and processing has improved with observer service providers and ROP data management team becoming more settled in dealing with the requirements for 100% coverage in the purse seine fishery. Some of the shortfall in submission of observer data to SPC is due to, *inter alia*, the rejection of problematic data for some first-time observers during the post-trip debriefing process.

52. The Western Pacific East Asia Oceanic Fisheries Management Project (WPEA OFMP), which provides support to the Philippines, Indonesia and Vietnam with respect to establishing tuna fishery data collection and management systems, is now into the last of its three-year term. Over the past year, the main developments include: a) improved estimates of catch from the Philippines municipal hook-and-line fishery; b) for the first time, annual catch estimates for the Vietnam tuna fisheries for 2000-2011; c) for the first time, annual catch estimates for Indonesia tuna fisheries, including catches in archipelagic waters. However, there remains significant work to improve the coverage and quality of, port sampling and observer data, and the reliability of annual catch estimates for certain gears. For Indonesia, the main data gap continues to be the lack of aggregate catch/effort data (logbook data). For the Philippines, the main data gap is the reliability of the historical estimates for small-scale artisanal hook-and-line fisheries. For Vietnam, the main data gap is the complete lack of historical annual catch estimates prior to 2000.

53. Progress was made in the past year with the attribution of catch under chartering arrangements, with a new database established to facilitate the assignment of charter nation to the catch. However, information is still sought from some flag states to ensure that double-counting of catches for chartered vessels is not occurring.

Discussion

54. FFA members thanked SPC for the information presented in SC8-ST-WP-01 and reiterated previous views that full submission of high quality data is critical to the functioning of the SC in terms of the ability to produce quality scientific advice. FFA members were pleased to note that this year's report indicates a gradual improvement in the amount, quality and timeliness of data that is available to the Commission. The FFA members thanked and congratulated those CCMs that are highlighted in the working paper as having improved the data that they provide.

55. CCMs were encouraged by the high rate of submission of operational level catch and effort data to the WCPFC but noted that the domestic rules of some CCMs prevented the submission of operational level data and only aggregate data were provided.

56. Japan noted that it provides operational level data for the work of WCPFC through conducting collaborative studies with WCPFC scientists.

57. Korea noted that it will make available operational-level data for the use of stock assessment for conducting collaborative work with the scientists undertaking stock assessments.

58. SC8 noted that while making data available to the scientists is not provision of data to the Commission, it is a positive step forward for the stock assessment process, and SC8 thanked Korea for making their data available for use in future stock assessments.

59. Some CCMs noted that there have been improvements to recent stock assessments due to the inclusion of additional operational data, but while there are fewer gaps in the data held by the Commission, those gaps generally relate to operational data.

60. FFA members reminded all CCMs of a decision by WCPFC7 that any CCM not providing operational data must submit a data improvement plan to TCC7 explaining what the constraint to compliance is and how it is being addressed. However, no data improvement plans have been submitted to date. FFA members urged CCMs to overcome whatever national constraints they face to the provision of this information.

61. Some CCMs noted that some aspects of the Annual Reports-Part 1 required access to ROP data. For CCMs requiring these data, the SC was advised that CCMs need to make a formal request to the WCPFC Secretariat to provide the ROP data for their fleets according to the Commission's data dissemination rules[2].

62. The FFA members acknowledged the ongoing difficulties that SPC faces in the possible double-counting of chartered vessels' catch. FFA reminded CCMs that it is the responsibility of the chartering State to provide information on chartered vessels, therefore flag States should remove these vessels from aggregated data that they submit to the Commission to avoid double-counting for scientific purposes.

63. SC8 requested that the next Data Gaps Report include references to the relevant Commission CMMs to clarify data obligations, particularly with regard to chartered vessels.

64. It was noted that SC8-ST-IP-02 states that some of the purse seine observer data (23% for 2010 and 41% for 2011) have not yet been sent to the SPC. Clarification was requested on whether a) the rejection criteria used in the national and sub-regional programs are consistent; b) SPC should handle data rejection through its data audit process; and c) there is documentation on the extent of data rejected.

65. SPC advised SC8 that they would prefer that all data be provided to SPC and that data quality control (data rejection/acceptance) be undertaken by the SPC in collaboration with national and sub-regional observer programmes. SPC noted that significant effort has been placed into observer training and debriefing which is improving data quality, however continual feedback is required from the national and sub-regional observer programmes to understand and resolve remaining and emerging issues.

66. SC8 endorsed the recommendations in Section 3 of SC8-ST-WP-01 "Enhancements to Guidelines for WCPFC Data Provision", relating to the inclusion of text to Sections 1, 3, 4 and 5 of the "Scientific data to be provided to the Commission".

Management recommendations

67. The SC noted the request by the Commission's Scientific Services Provider for CCMs to review their data provision status on the WCPFC website (http://www.wcpfc.int/statprov), to ensure the provisions of scientific data reflects what they have provided to the Commission, and to acknowledge and plan to resolve any of the gaps highlighted.

68. The SC recognised the importance of the provision of operational-level catch and effort data for the work of the Commission, with an important example highlighted as a recommendation in an earlier SC8 presentation summarising the outcomes of the WCPO bigeye tuna assessment peer review (refer to SC8-SA-WP-01).

69. The SC noted that several CCMs have not provided operational catch/effort data and none of these CCMs have submitted a Data Improvement Plan, as recommended by WCPFC7.

70. SC8 recommended that:

[2] http://www.wcpfc.int/doc/data-02/rules-and-procedures-protection-access-and-dissemination-data-compiled-commission-revise

a. **CCMs who have yet to provide operational level catch and effort data provide Data Improvement Plans to TCC8. It was also recommended that until operational catch/effort data are provided, these CCMs should provide annual catch estimates by gear and species for waters of national jurisdiction and high seas areas separately, as per the scientific data provision rules of the Commission.**

b. **The paper SC8-ST-WP-01 Rev.1 be forwarded to TCC8 to highlight data gaps that need addressing and for use in the CCMM process.**

c. **The Data Gaps Report should include references to relevant WCPFC CMMs to clarify the data obligations of CCMs particularly in regards to chartered vessels.**

d. **WCPFC9 adopt and include the recommended length size class intervals in Section 5 of "Scientific Data to be provided to the Commission", as follows:**
   - **Skipjack tuna – 1cm**
   - **Albacore tuna – 1cm**
   - **Yellowfin tuna – ideally 1cm, but not more than 2 cm**
   - **Bigeye tuna – ideally 1cm, but not more than 2 cm**
   - **Billfish – ideally 1cm, but not more than 5 cm**

e. **WCPFC9 adopt and include the following text into Sections 1 and 5 of "Scientific Data to be provided to the Commission":**
   "*The statistical and sampling methods that are used to derive the size composition data shall be reported to the Commission, including reference to whether sampling was at the level of fishing operation or during unloading, details of the protocol used, and the methods and reasons for any adjustments to the size data. Where feasible, this shall also be applied to all historical data.*"

f. **WCPFC9 adopt and include the following text into Sections 3, 4 and 5 of "Scientific Data to be provided to the Commission":**
   "*Information on operational changes in the fishery that are not an attribute in the data provided are to be listed and reported with the data provision.*"

3.1.2 Species composition of purse seine catches

71. T. Lawson (SPC) presented SC8-ST-WP-02 on Collection and Evaluation of Purse seine Species Composition (Project 60). The number of trips covered by paired grab and spill samples under Project 60 increased from 18 in August 2011 (SC7) to 23 in August 2012 (SC8). The number of sets covered increased from 275 sets, including 248 sets on associated schools and 27 sets on unassociated schools, to 348 sets, including 266 sets on associated schools and 82 sets on unassociated schools. An additional 7 trips have been completed; the data are currently being submitted to SPC and processed. Additional trips will be undertaken during the remainder of 2012 and 2013. The number of trips by vessel nationality is presented in Table 1.

Table 1. Target number of paired sampling trips determined at the Fifth Regular Session of the WCPFC Scientific Committee and the numbers of successful and unsuccessful trips completed as of July 2012.

Vessel Nationality / Arrangement	Target Number of Trips	Trips as of July 2012	
		Successful	Unsuccessful
FSM Arrangement	8	16	
China	2		
Japan	6	3	
Korea	8	2	4
New Zealand	2		4
Philippines	2		
Solomon Islands	2	2	
Chinese Taipei	8	1	2
United States of America	8	3	2
Vanuatu	2	3	
EU and EPO-based fleets	2		
TOTAL	50	30	12

72. Additional analyses on sampling bias that were undertaken including: a) the estimation of selectivity bias using splines was developed and applied to paired grab and spill sampling data covering 23 trips; b) the effect of layering by size during brailing on the selectivity bias was examined; c) historical grab samples were corrected with new estimates of the selectivity bias; d) a model-based approach to estimate the species composition of purse seine catches from grab samples corrected for selectivity bias and spill samples was further developed; and e) the catches determined from the model-based estimates of the species composition were used to scale purse seine length frequencies. The spill sampling protocol was documented and referred to the aim of spill sampling and the equipment used and the six steps of the spill sampling protocol. The dimensions of the spill sampling bin are still being determined.

73. A project in the Solomon Islands was implemented in conjunction with National Fisheries Development Ltd, to compare species compositions determined from a) logsheets, b) grab samples, c) spill samples, d) cannery receipts and e) port samples of species and size categories landed at the cannery in Noro, Solomon Islands. The first paired sampling trip was taken in November –December 2011; a total of ten trips will be undertaken by 2013.

74. Funding is currently available to conduct additional paired sampling trips through the end of 2012, but additional funds will be required to conduct trips in 2013.

75. T. Lawson (SPC) also presented SC8-ST-WP-03 which a) updates the estimation of the selectivity bias of grab samples collected by observers at sea with recent paired grab and spill sampling data; b) considers the effect of layering by size during brailing on the selectivity bias; c) corrects historical grab

samples with new estimates of the selectivity bias; d) further develops a model-based approach to estimate the species composition of purse seine catches from grab samples corrected for selectivity bias and spill samples; and e) uses the catches determined from the model-based estimates of the species composition to scale purse seine length frequencies.

76. The increase in the number of paired samples from unassociated sets that are now available has allowed for more reliable estimates of the selectivity bias for larger fish. The use of splines, rather than categorical covariates, results in continuous estimates of the bias as a function of fish length. Layering by size during brailing is shown to occur and may be an important cause of the selectivity bias in grab samples.

77. The species compositions of purse seine catches, 1967–2011, were estimated with models in which geographic area was included as either a) the MFCL Skipjack Areas 2 and 3 (the "low resolution" models) or b) a two-dimensional spline of latitude and longitude (the "high resolution" models). The heat maps of the effect of the latitude–longitude spline on the species composition shows that within each of the MFCL Skipjack Areas, the species composition varies considerably with location, which supports the use of the "high resolution" models to estimate the species composition.

Discussion

78. Concerns were raised about the testing and potential adoption of spill sampling by the ROP given the recent experience of the ISSF cruise where paired spill and grab sampling was conducted (i.e. lengthy time to process spill sample, potential for repetitive strain injury, compromising other observer duties). It was suggested that a compromise between the size of the spill sample and necessary volume of data should be determined while incorporating other modifications such as a false bottom in the spill sample bin to reduce the back strain.

79. SPC advised that the daily logs maintained by the observers that have conducted spill sampling during the 23 paired spill and grab sampling trips for which the data have been received at SPC have not indicated any issues regarding the time taken to complete spill sampling or repetitive strain injury. The spill sampling on the ISSF cruise was more intensive than that usually undertaken by observers, which most likely explains the difficulties experienced. Also, the bin used in the ISSF sampling was larger than the bins used on other spill sampling trips and this may have contributed to the concerns. Regarding the practicality of an observer taking spill samples from every tenth brail as well as all other observer duties, SPC noted that several such trips have been undertaken in PNG and that this will be examined further under Project 60. Noting that Project 60 will probably terminate in 2013, SPC suggested that a long-term plan for mainstreaming spill sampling into observer duties should be developed under the ROP.

80. Some CCMs acknowledged the importance of assessing observer workloads to ensure that all tasks are achievable.

81. CCMs also queried the effect of corrected and uncorrected spill and grab sampling on the estimated species composition. The importance of an accurate understanding of the catch composition of the purse seine fleet, i.e. the largest fleet in the region, was emphasized.

82. SPC advised that significant differences in species composition are observed between sampling methods and referred CCMs to papers on this topic presented at SC6 and SC7.

83. FFA members expressed concerns about the magnitude of changes in purse seine catch composition estimates from year to year. With recent improvements in re-estimation data and methods, statistical correction of historical data sets provides the best way forward at this time, however, longer term solutions to improve the accuracy of collected data should be examined. If spill sampling is identified as the most promising solution, options for when and how to mainstream its use in the ROP should be considered. FFA members noted that practical difficulties in accurate species composition recording should not be used as an excuse for mis-reporting of purse seine catch. FFA members urged those CCMs identified in Table 1 of SC8-SC8-WCPFC8-08 to collaborate with SPC and the WCPFC Secretariat to further increase the number of paired sampling trips, and that this issue be referred to TCC for action.

84. FFA members requested Japan and SPC to collaborate to verify grab and spill sample estimates through paired sampling on Japanese vessels which employ rigorous unloading monitoring procedures when landing domestically.

85. Japan offered to assist with the development of the spill sampling methodology. On the basis that spill, or paired spill and grab, sampling has occurred on Japanese vessels, they offered to assist with the corresponding port sampling of species and size categories of landings to validate the accuracy of the total catch of the cruise by species as estimated through observer sampling.

86. Some CCMs requested that future versions of Tables 4 and 5 in SC8-ST-WP-03 include an extra column showing the deviance explained for each parameter.

87. SC8 supported an extension of Project 60 to include further paired sampling trips and comparisons of species compositions determined from logsheets, grab samples, spill samples, cannery receipt and port sampling of landing categories of catches delivered to the cannery in Noro, Solomon Islands in 2013.

Recommendations

88. SC8 recommended that:

- **a. SC8-WCPFC8-08 "Plan for the improvement of the availability and use of Purse seine catch composition data" be referred to TCC8 for consideration, and to consider the broader application of spill sampling across the ROP.**

- **b. Future papers relating to the availability of purse seine catch composition data should indicate the level of improvement in the accuracy of logsheet reporting of purse seine species composition by fleet.**

- **c. CCMs identified in Table 1 of SC8-WCPFC8-08 should collaborate with SPC and the WCPFC Secretariat to further increase the number of paired sampling trips.**

- **d. Project 60 be continued through 2013. The study has a target of 50 trips to be sampled, of which 35 trips will be completed by the end of 2012. The Data and Statistics Theme forwarded a 2013 budget request of US$75,000 based on US$5,000 per trip for the remaining 15 trips.**

3.1.3 Data issues with the ISC

89. CCMs were invited to comment on the progress of data reconciliation of the Commission and ISC data holdings for North Pacific stocks to identify and address data gaps.

Discussion

90. No issues were reported for data exchange with the ISC.

Recommendations

91. SC8 noted that no significant issues have arisen in the past year, and that the Commission's Scientific Services Provider continues to carry out informal dialogue with the ISC.

3.2 Requests from CMM 2008-01

3.2.1 Fishing effort for bigeye and yellowfin tuna from other commercial tuna fisheries

92. In accordance with para. 39 of CMM 2008-01, SC8 was invited to review estimates of fishing effort or proposals provided by CCMs for the provision of effort data for other commercial tuna fisheries fishing for bigeye and yellowfin tuna.

Discussion

93. FFA members noted that no CCM has provided the information required under para. 39 of CMM 2008-01 and suggested that TCC consider this issue as a compliance issue.

94. SC8 noted that this issue can be discussed in the Data Gaps report and need not be covered as a separate item on the SC agenda.

Recommendations

SC8 recommended that:

95. Noting that no reports for "Other Commercial Tuna Fisheries Fishing for Bigeye and Yellowfin Tuna" were received, in accordance with paragraph 39 of CMM 2008-01, this issue is forwarded to TCC8 for consideration.

96. Agenda Item 3.2.1 be removed from future SC agendas, and be addressed in the Data Gaps Report.

3.3 Regional Observer Programme (ROP)

97. SC8 was invited to consider a report on auditing the ROP, issues related to scientific data collection and data gaps, and issues relating to Para. 7, Annex C of CMM 2007-01.

Discussion

98. FFA members thanked the WCPFC Secretariat for the ROP audit summary and noted that most of the minimum data fields of the Commission have been incorporated and used under the FFA/SPC

observer forms. These CCMs expressed general satisfaction with the authorization of observer programmes but recognized that some have yet to comply with all standards, including those relating to data quality. FFA members also noted the need for additional financial resources to sustain Pacific Islands' observer programmes.

99. Some CCMs noted the importance of timely submission of quality observer data for scientific purposes and appreciated the development of the debriefing and debriefing training programmes with the help of the FFA, SPC, NMFS and WCPFC.

100. ACAP drew CCMs' attention to SC8-EP-WP-07 which will be discussed in the Ecosystem and Bycatch Theme but relates to the Data and Statistics Theme in terms of additional data to be collected to support analyses for bycatch mitigation.

101. Some CCMs recognized that although the CMM for the ROP does not specify the area of application for the 5% observer coverage for longline fisheries, longline observer coverage should be spatially and temporally representative of fishing effort. It was acknowledged that existing longline observer coverage may not be sufficient to satisfy some taxa-specific data issues.

102. The Convenor provided an update from the ROP Manager in his absence. SC8 was advised that issues relating to Para. 10 of CMM 2007-01, in particular minimum vessel size, that the IWG-ROP could not reach consensus. The issue was forwarded to TCC who also could not reach consensus. The exemption has been extended to 2015.

Recommendations

103. SC8 endorsed the report on "Summary of Regional Observer Programme Audits" (SC8-ST-IP-03).

104. SC8 noted that consistent with previous SC advice, observer coverage should be spatially and temporally representative of each fishery operating in the Convention Area.

AGENDA ITEM 4STOCK ASSESSMENT THEME

105. The Stock Assessment Theme was convened by J. Brodziak (USA) and M. Ogura (Japan). T. Beeching (WCPFC), S.K. Chang (TAI), D. Itano (USA), H. Kiyofuji (JPN), P. Kleiber (USA), M. Lee (KOR), S. Nicol (SPC), H. Okamoto (Japan), K. Piner (USA), H. Ijima (Japan) and K. Uosaki (Japan) served as rapporteurs.

4.1 WCPO bigeye tuna

4.1.1 Review of research and information

a. Peer Review of 2011 bigeye tuna stock assessment

106. A. Punt, Chair of the international Peer Review Panel for the bigeye tuna assessment in the WCPO presented the findings and recommendations of the Panel which also included Drs Jim Ianelli and Mark Maunder (SC8-SA-WP-01). The Panel's work was focused around nine Terms of Reference established by the Commission. During onsite review in Nouméa, New Caledonia, the Panel requested additional

model runs from the SPC scientists who conducted the assessment to explore the behaviour of the assessment, to identify potential conflicts in the data, and to understand what in the data determines the scale and trend in population biomass and recruitment. The Panel identified 26 general recommendations and 12 specific recommendations related to the assessment software used for the assessment, MULTIFAN-CL. In general, the Panel agreed that the assessment is state-of-the-art and was particularly impressed by the extent to which the raw data have been analysed. The Panel noted that some of the data sources appear to be in conflict, such that re-weighting some data sources can lead to qualitatively different outcomes from the assessment.

107. Key Panel recommendations called for:

a. conducting a Pacific-wide assessment to test the assumption that a WCPO-only assessment is appropriate;
b. addressing the uncertainty related to the tagging data for eastern Australia and the early CPUE data from the Japanese longline fisheries as a priority in the next assessment; and
c. removing Japanese "training vessel" length-frequency data from the assessment until these data are better understood.

Finally, the Panel found no definite basis to select between estimating B_{MSY} based on the entire sequence of recruitment and spawning biomass estimates versus more recent values, and recommended consideration of harvest strategies based on fishing mortality as these should be robust to this uncertainty.

Discussion

108. In response to a question regarding whether the estimated increasing trend of recruitment is true and reliable, A. Punt noted that the Panel had examined this closely but no single cause of the recruitment trend was found. In response to a follow-up question regarding whether an abundance index based on purse seine catches is useful, A. Punt considered that much more analysis would be necessary before this could be considered reliable.

109. In response to a question regarding whether the Panel considered that procedures used in the stock assessment to weight the longline CPUE indices in various regions were appropriate, A. Punt responded that the approach used thus far is sensible.

110. SPC referred SC8 to their detailed response to the Panel's recommendations contained in SC8-SA-IP-02 noting that SPC accepts the recommendations in the review and is working to address them.

111. Regarding the implications of formulating management strategies on the basis of F_{MSY}, A. Punt clarified that using F_{MSY} for management does not require information of unfished recruitment or unfished biomass in comparison to using B_{MSY} and is therefore more robust. Also, an F_{MSY} approach does not require as much management action in response to biomass changes.

112. In response to a question regarding what criteria should be applied to determine whether a Pacific-wide assessment is need, A. Punt suggested that recruitment trends in the WCPO alone should be contrasted with Pacific-wide trends and if there are differences then this would imply the need for regular Pacific-wide assessments.

113. Some CCMS stated that they are comfortable with the results of the review and the finding that the SPC stock assessments are state-of-the-art and provide a good basis for management. These members asked whether the regional stock assessment results could validly be used for domestic management and whether older fishermen should be consulted to help resolve conflicts in historical data.

114. With regard to the first question, A. Punt replied in the affirmative but suggested that the influence of total catch levels, and other broad-scale factors, need to be taken into account and that it would be useful to also conduct separate assessments in national waters. He also considered that obtaining historical information through interviews with older fishermen would be useful, and noted a tendency not to scrutinize historical data as thoroughly as current data.

115. One CCM noted a preference for cooperative, on-site reviews such as this one rather than "desktop" reviews. Noting that the outcomes of the peer review would be discussed in an Informal Small Group later during SC8, requested that A. Punt highlight the highest priority recommendations for immediate implementation.

116. A. Punt considered that determining whether a Pacific-wide assessment is needed is the most important issue, and that investigation of data conflicts should be the next priority.

117. CCMs agreed that all of the TORs were addressed by the panel, and responses and recommendations were reasonable. There were 26 general recommendations and 12 recommendations specific to MULTIFAN-CL.

118. The ISG1 drafted a table (Attachment G) showing each recommendation, an SPC response (SC8-SA-IP-02), implications for the SC to consider, a suggested priority, the preferred timing (ongoing, next assessment, longer term) for completion, the agencies responsible, and applicability to other species. Budget implications were estimated at US$160,000 annually to the Scientific Services Provider to address the general recommendations and US$40,000 to complete the MULTIFAN-CL recommendations. Further discussions were deferred to Agenda Item 11.2.

b. Indicator Analysis

119. S. Harley (SPC) presented SC8-SA-WP-02 on a compendium of fisheries indicators for the principal target tuna species bigeye, skipjack, yellowfin, and south Pacific albacore tunas and for south Pacific swordfish. The fishery indicators presented here complement the information provided in full assessments, and provide the latest fishery information for stocks for which full assessments have not been conducted. The indicators that are documented include: total catch by gear, nominal CPUE trends, spatial distribution of catch and associated trends, size composition of the catch, and trends in average size. These include data loaded into the WCPFC databases at 5 July 2012.

Discussion

120. CCMs welcomed the paper (SC8-SA-WP-02) as useful in providing some information on bigeye and other species for which formal stock assessments had not been prepared this year. However, some participants sought clarification on how to interpret the trends in catch, CPUE, and area covered by the fisheries.

121. SPC, as well as some CCMs, cautioned that management actions should not be based on results outlined in the paper but rather on the results of stock assessments. In particular, it was clarified that the CPUE trends plotted in the paper were not standardized as would be the case in a stock assessment.

However, an indicator approach was considered useful to provide insight into stock status when a new stock assessment is not available, and may be valuable when considering harvest control rules.

122. Specific queries were raised relating to the concentration of longline effort suggested by Figure 4 and the bigeye size class data from Indonesia and the Philippines shown in Figure 5.

123. With regard to the potential concentration of longline effort in Figure 4, SPC explained that this issue will be addressed in conjunction with the suggestion from the bigeye stock assessment peer review to consider taking spatial variation in effort into account when constructing CPUE indices. With regard to the Indonesia and Philippines size data, SPC clarified that these data are only for Indonesia and Philippines artisanal fisheries, and that longline and purse seine fisheries data from these fleets are included in the other data categories (colours) shown in Figure 5.

124. Support was voiced for the Scientific Services Provider to present similar working papers to future SC meetings, but it was suggested that the paper could be improved by more a complete explanation of the indicators and the figures, and a description of the origin and processing of data presented therein.

Recommendations

125. SC8 noted that fishery indicators provide information on trends in the fishery for years when a stock assessment is not conducted. SC8 recommended that future versions of SC8-SA-WP-02 should present explanatory detail for the figures and a brief interpretation of the trends.

c. Progress Report on Project 35 (Refinement of Bigeye Parameters Pacific-wide)

126. S. Nicol (SPC) presented "Bigeye tuna age, growth and reproductive biology (Project 35)" (SC8-SA-WP-03), which reported on the progress of Project 35, a three-year project to collect bigeye tuna otoliths and gonads for a WCPO-wide bigeye tuna age, growth and reproductive analyses. The work plan for 2012 includes the collection of 500 otoliths and 150 gonads from the equatorial WCPO with a concentration of effort to collect gonads from the central Pacific region. As requested by SC7 an itemized budget for 2013 was presented to the SC for endorsement.

Discussion

127. CCMs noted that the biological information obtained by Project 35 is important for stock assessment of bigeye and supported its extension to skipjack, yellowfin, and striped marlin, with the caveat to avoid duplication with other biological sampling programs. Such extension of the project would incur additional costs to gather and analyse more samples. The cost of analysis could be deferred pending the receipt of additional funding because the biological samples in question (otoliths) do not deteriorate.

128. Some CCMs also suggested that Project 35 could be extended to additional areas such as Vietnam or even the entire Pacific.

Recommendations

129. SC8 noted the progress of the Project 35 and recommended continuation in 2013.

4.1.2 Provision of scientific information

130. SC8 noted that no stock assessment was conducted and there is no new information to inform stock status for WCPO bigeye in 2012; therefore, the a) Stock status and trends and b) Management advice and implications from SC7 are still current.

4.2 WCPO yellowfin tuna

4.1.1 Review of research and information

131. S-I. Lee presented SC8-SA-WP-09 on standardization of yellowfin tuna CPUE by the Korean longline fisheries in the WCPO. This is the first attempt to estimate the standardized CPUE of yellowfin tuna by the Korean tuna longline fisheries in the WCPO. This standardization was conducted for 1978-2011 using General Linear Model (GLM) methods. The data used in the GLM were catch (number), effort (number of hooks) and number of hooks between floats (NHF) by year, month and 5°x5° area. Explanatory variables for the GLM analysis were year, quarter, area and NHF. The results suggested that area and quarter effects were the largest factors affecting the nominal CPUE. Standardized CPUEs generally showed a declining trend and then were stable in recent years.

Discussion

132. CCMs noted that the two regions included in the analysis are very large which leads to the question of how the spatial distribution of the Korean longline fishery might have shifted over time. It was suggested that it would be useful to focus the analysis on core areas that have been subject to consistent fishing activity over time.

133. CCMs noted and supported the inclusion of a year by area interaction in the standardization. However, it was also noted that this interaction complicates the derivation of an annual CPUE index and thus the approach to deriving the annual CPUE index should be explained.

134. CCMs also suggested that it would be useful to document the changes from nominal CPUE through the various stages of the standardization. It would furthermore be useful to compare the standardized CPUE with CPUE indices from previous stock assessments.

Recommendations

135. SC8 noted Korea's CPUE analysis as a preliminary analysis, and expanding the work is encouraged as it appears to be a useful approach and may provide an index of yellowfin tuna abundance in the future.

4.1.2 Provision of scientific information

136. SC8 noted that no stock assessment was conducted and there is no new information to inform stock status for WCPO yellowfin in 2012; therefore, the a) Stock status and trends and b) Management advice and implications from SC7 are still current.

4.3 WCPO skipjack tuna

4.1.1 Review of research and information

137. No new information was presented to SC8.

4.1.2 Provision of scientific information

138. SC8 noted that no stock assessment was conducted and there is no new information to inform stock status for WCPO skipjack in 2012; therefore, the a) Stock status and trends and b) Management advice and implications from SC7 are still current.

4.4 South Pacific albacore

4.4.1 Review of research and information

a. Review of Project 39 (Stock Structure and Life-History Characteristics of SP Albacore)

139. CCMs were referred to SC8-SA-IP-15 which presented the results of a study of the population biology stock structure and life history characteristics of albacore tuna within the south Pacific.

b. Review of 2012 stock assessment (South Pacific Albacore)

140. S. Hoyle (SPC) presented the 2012 stock assessment for south Pacific albacore (SC8-SA-WP-04) and referred CCMs to SC8-SA-IP-14 which describes the standardization of CPUE used in the assessment. Excerpts from the Executive Summary of the assessment are provided below, as are several figures and tables regarding trends based on a reference case model and stock status based on the median of the uncertainty grid as decided by the SC for the determination of current stock status and the provision of management advice.

141. The structure of the assessment model was similar to the previous (2011) assessment, but there were some substantial revisions to key data sets. In particular, revised longline CPUE indices, catch, and size data were used in the current assessment. There were also substantial changes to some of the biological parameters: the ogive defining spawning potential at age, and the growth curve. In addition, the assumed steepness for the reference model was increased from 0.75 to 0.8 to be consistent with other tuna assessments and a lognormal bias adjustment was applied to the mean recruitment estimate for reference point calculation. Cumulatively, these revisions resulted in a change in the key results from the 2011 assessment, with increases in the overall level of biomass and increases in the estimates of *MSY*, $B_{current}$ / B_{MSY} and $SB_{current}$ / SB_{MSY}.

142. The model currently includes only a single sex and the same growth curve for all locations, whereas albacore growth is now known to vary between sexes and with longitude (Williams et al. 2012)[3]. The model results are highly sensitive to the growth curve, so this is a key source of structural uncertainty.

143. The main conclusions of the assessment are:

[3] Williams, A.J., J.H. Farley, S.D. Hoyle, C.R. Davies, S.J. Nicol. 2012. Spatial and sex-specific variation in growth of albacore tuna (*Thunnus alalunga*) across the South Pacific Ocean. PLoS ONE 7: e39318. Access online at http://www.plosone.org/article/info:doi/10.1371/journal.pone.0039318

a) Estimated stock status based on the median of the grid is similar to 2009 and 2011 estimates (Table ALB1; Figure ALB5).

b) The fishing mortality reference point $F_{current}/F_{MSY}$ has a median estimate of 0.21 (90% CI 0.04-1.08), and on that basis we conclude that there is low risk that overfishing is occurring. The corresponding biomass-based reference points $B_{current}/\widetilde{B}_{MSY}$ and $SB_{current}/\widetilde{SB}_{MSY}$ are estimated to be above 1.0 (median 1.6 with range of 1.4-1.9, and median 2.6 with range of 1.5-5.2, respectively), and therefore the stock is not in an overfished state.

c) The median estimate of *MSY* from the structural sensitivity analysis (99,085 mt (46,560 – 215,445 mt) is comparable to the recent levels of (estimated) catch from the fishery ($C_{current}$ 78,664 mt, C_{latest} 89,790 mt).

d) There is no indication that current levels of catch are causing recruitment overfishing, particularly given the age selectivity of the fisheries.

e) Longline catch rates are declining, and catches over the last 10 years have been at historically high levels and are increasing. These trends may be significant for management.

f) Management quantities are very sensitive to the estimated growth curve. Given that biological research indicates spatial and sex-dependent variation in growth, which is not included in the model, these uncertainties should be understood when considering estimates of management parameters.

Discussion

144. Some CCMs sought clarification on the use of life history information in the stock assessment. It was noted that the model results were sensitive to the growth curve and the assessment team was asked whether it had considered other published growth curves for stock assessment.

145. SPC clarified that the current analysis includes different growth curves as alternative scenarios.

146. Some CCMs asked if the available tagging data could be used to estimate natural mortality (M).

147. SPC clarified that tagging data had been used to estimate M in a previous assessment but that M estimate was not considered to be reliable. It was also noted that this approach may be revisited in future improvements to the assessment model.

148. CCMs sought additional information on the analysis and use of CPUE information in the stock assessment. Specifically, a clarification was sought regarding which areas showed declines in CPUE in the most recent period and whether catchability for Pacific Island fleets was estimated to be increasing through time in the reference case. For fleets that switched targets this was expected but for other fleets that had not changed targets the plausibility of the increasing catchability was questioned.

149. SPC indicated that CPUE had declined in regions 2, 3 and 4. It was also noted that increasing efficiency of fleets in addition to target switching would influence estimates of catchability.

150. Chinese Taipei considered that albacore CPUE had declined in some regions for recent years based on the moving average CPUE series provided by SPC which was not presented to nor discussed by SC8.

151. CCMs then asked a series of questions about data and data structure in the assessment. Further detail on whether the assessment team will reconsider model area definitions given the apparent spatial structure of the sizes of fish in the population was requested, and whether there are inconsistencies between Japanese length and weight data.

152. SPC responded that redefining model areas is always possible based on additional information or analyses. SPC explained that weight data from Japan was not used in the stock assessment.

153. CCMs then sought clarification on assessment model results. In particular, it was questioned why the time series of the estimated ratios of B to B_{MSY} was less variable than the ratio of SB to SB_{MSY} in the reference model, and whether the model scenarios in the grid should receive differential weighting.

154. SPC explained that the lower variability in B versus B_{MSY} may be due to a shift in selectivity on albacore to the largest sizes which disproportionately affected both the reference points and spawning biomass estimates. With regarding to model scenario weighting, SPC indicated that although the weightings might be subjective, differential weighting might be appropriate.

155. Overall, the SC endorsed the assessment results as the best available science for the basis of management. However, several CCMs while agreeing that the assessment results were the best available science, wanted to emphasize concerns about increasing trends in catch and decreasing trends in CPUE.

4.4.2 Provision of scientific information

a. Status and trends

156. The 2012 assessment results are generally similar to, but more optimistic than those of the 2009 and 2011 assessments (Table ALB1).

157. Time trends in estimated recruitment, biomass, fishing mortality and fishery impacts are shown for the reference case model in Figs. ALB1−4.

158. The key conclusions, based on the median of the grid, are that overfishing is not occurring and the stock is not in an overfished state (Fig. ALB5). Spawning potential depletion levels ($SB_{curr}/SB_{curr_{F=0}}$) of albacore were moderate at ~37% However SC8 noted that depletion levels of the exploitable biomass is estimated between about 10% and 60%, depending on the fishery, having increased sharply in recent years.

Table ALB1: Management parameters estimated from the 2012 base case (determined as the median from the structural uncertainty grid), the 2011 base case model, and the 2009 assessment, for comparison. Note that the definitions for current change through time.

Management quantity	2012 base case (grid median)	2011 base case	2009 base case	2009 median
$C_{current}$	78,664	54,520	66,869	65,801
C_{latest}	89,790	56,275		
MSY	99,085	85,130	97,610	81,580
$C_{current}/MSY$	0.79	0.64	0.69	0.80
C_{latest}/MSY	0.90	0.66		
F_{multi}	4.81	3.86		
$F_{current}/F_{MSY}$	0.21	0.26	0.25	0.29
SB_0	442,350	400,700	460,400	406,600

SB_{MSY}/SB_0	0.23	0.26	0.26	0.24
$SB_{current}/SB_0$	0.59	0.59	0.59	0.60
SB_{latest}/SB_0	0.56	0.47		
$SB_{current}/SB_{MSY}$	2.56	2.25	2.28	2.44
SB_{latest}/SB_{MSY}	2.38	1.82		
$SB_{curr}/SB_{curr_{F=0}}$	0.63	0.63	0.68	0.64
$SB_{latest}/SB_{latest_{F=0}}$	0.58	0.6		

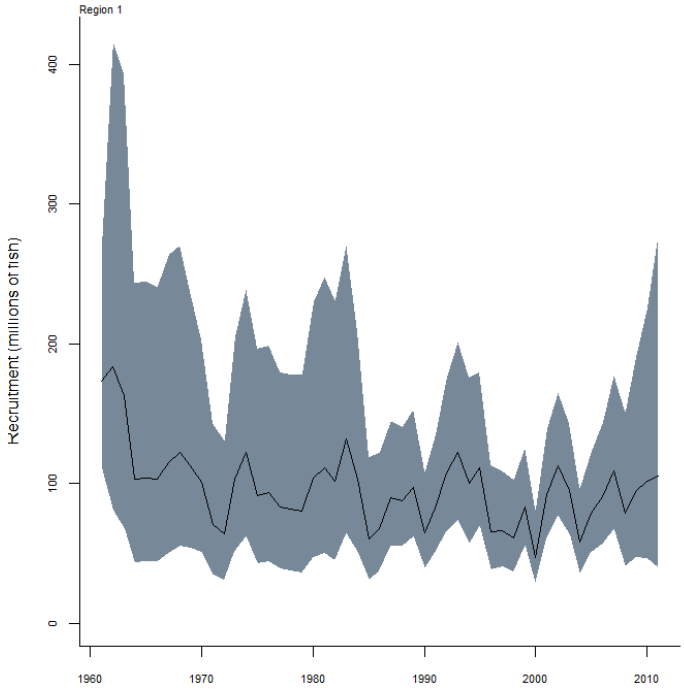


Figure ALB1: Annual recruitment (number of fish) estimates from the reference case model. Grey area represents parameter uncertainty estimated from the Hessian matrix.

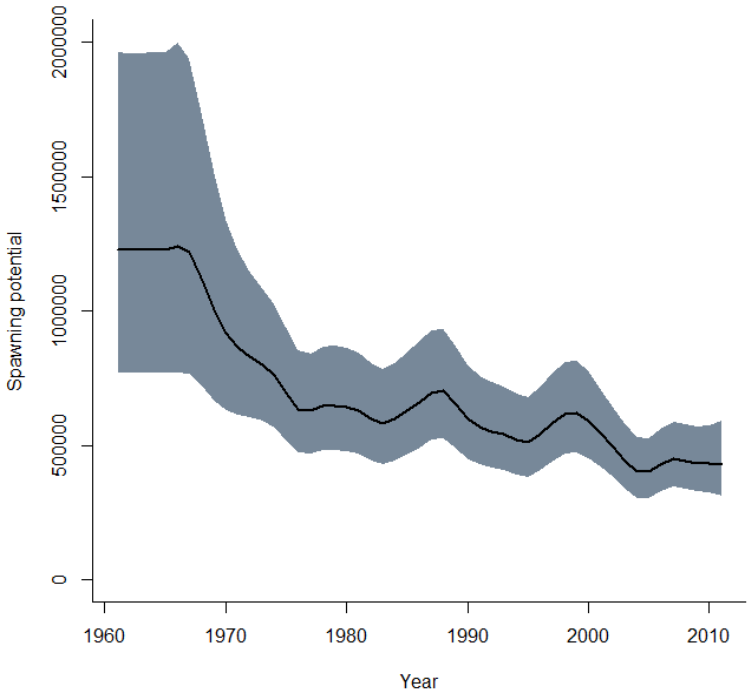


Figure ALB2: Annual estimates of spawning potential from the reference case model. The grey area represents parameter uncertainty estimated from the Hessian matrix.

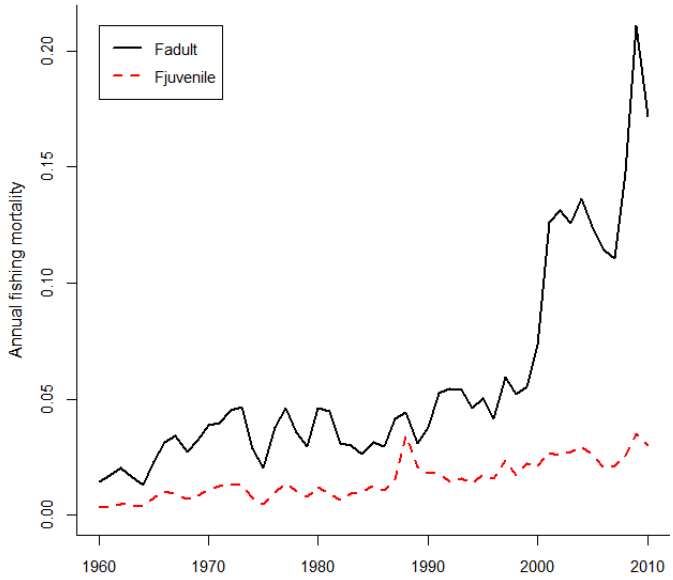


Figure ALB3: Annual estimates of fishing mortality for juvenile and adult South Pacific albacore from the reference case model.

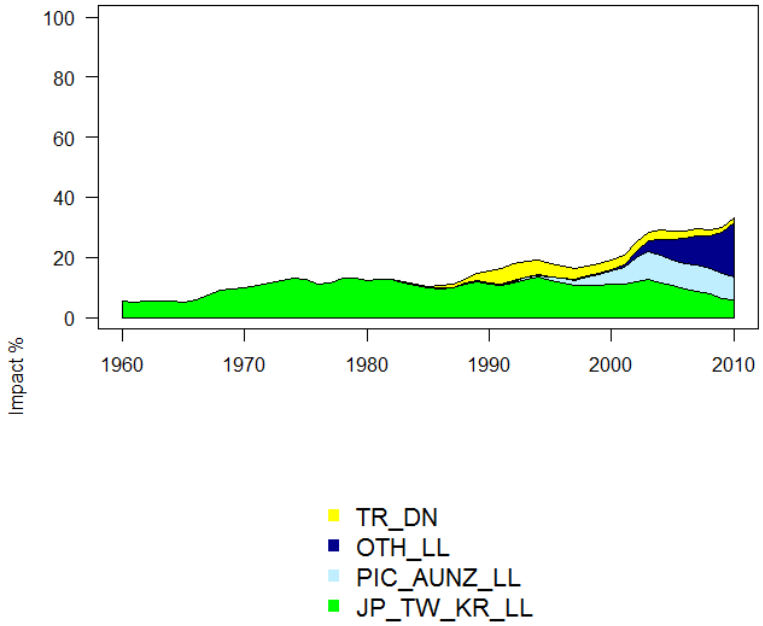


Figure ALB4: Estimates of reduction in spawning potential due to fishing (fishery impact = $\mathbf{1 - SB_t/SB_{t_{F=0}}}$) attributed to various fishery groups (TR_DN = Troll and driftnet fisheries; OTH_LL = 'Other' Longline fisheries; PIC_AUNZ_LL = Pacific Island and Australia and New Zealand longline fisheries; JP_TW_KR_LL = Japanese, Korean and Chinese Taipei distant water longline fisheries).

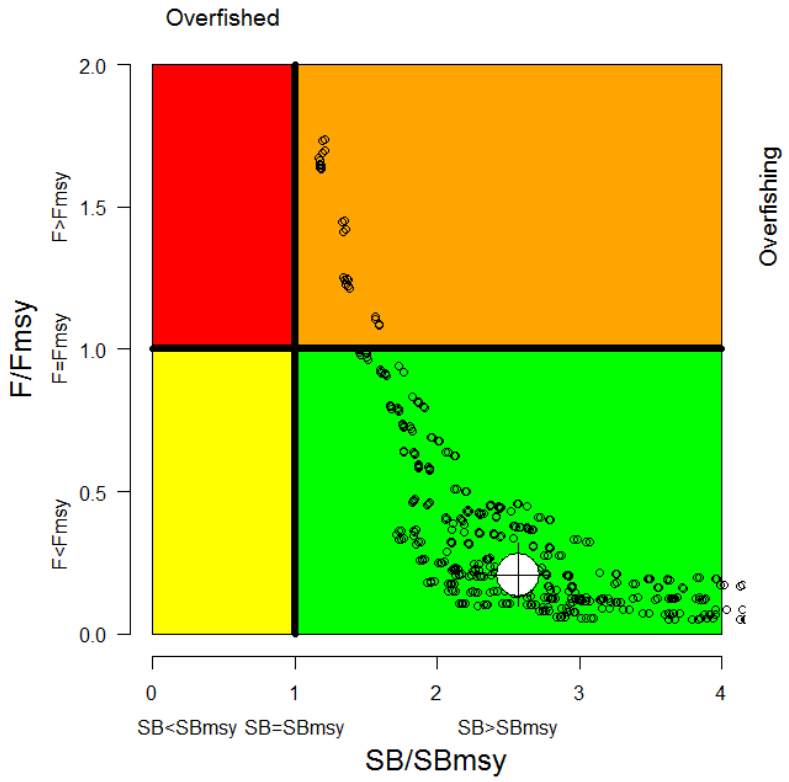


Figure ALB5: $F_{current}/F_{MSY}$ and $SB_{current}/SB_{MSY}$ for 540 model runs in the uncertainty grid (black hollow circles) and the median (large white circle). Note that some grid model runs extend as far as 7 for $SB_{current}/SB_{MSY}$.

b. Management Advice and Implications

159. The South Pacific albacore stock is currently not overfished and overfishing is not occurring. Current biomass is sufficient to support current levels of catch. However, for several years the SC has noted that any increases in catch or effort are likely to lead to declines in catch rates in some regions, especially for longline catches of adult albacore, with associated impacts on vessel profitability. SC8 further noted that vessel activity must be managed, as per the requirements of CMM 2010-05.

160. Given the recent expansion of the fishery and recent declines in exploitable biomass available to longline fisheries, and given the importance of maintaining catch rates, the SC recommends that longline fishing mortality be reduced if the Commission wishes to maintain economically viable catch rates.

Recommendations

161. The SC requests that the Scientific Services Provider conduct deterministic projections for south Pacific albacore to be presented to WCPFC9. Projections would be based on scalars of the 2010/2011 [final year] catches as used in the assessment. Specifically, longline scalars of 0.7 to 1.5 in 0.1 increments and scalars of 1, 2, 5 for the surface troll fishery are proposed. Outputs should be

similar to those commonly reported for projections, plus information on predicted changes in vulnerable biomass. In making this request it is noted that the management advice was based on the median of the uncertainty grid and some consideration will be required of the technical approaches to be used to undertake these projections.

162. SC8 recognized the potential for analysis of trade data to reduce the uncertainty in reported catch.

4.5 South Pacific swordfish

4.5.1 Review of research and information

163. S. Harley (SPC) and P. Kleiber (US) presented SC8-SA-WP-08 describing initial work toward preparing a stock assessment for south Pacific swordfish. CCMs were also referred to an analysis of the spatial dynamics of south Pacific swordfish based on tagging data (SC8-SA-IP-05) and a description of the data and methods used to standardise the CPUE for yellowfin, bigeye, broadbill swordfish and striped marlin caught by the longline sector of the Australian Eastern Tuna and Billfish Fishery (SC8-SA-IP-13).

Discussion

164. CCMs queried whether the recent increase in catch depicted in the presentation came from inside the WCPFC Convention Area or from the IATTC Convention Area.

165. The authors clarified that the recent increases occurred in the IATTC Convention Area.

166. K. Schaefer (IATTC) noted that a swordfish-specific conservation and management measure has not been adopted in the IATTC Convention Area, but that IATTC scientists conduct swordfish stock assessments.

167. CCMs requested further explanation on the standardization of the CPUE data, and in particular, on the effort used in the standardization of the Spanish fleet CPUE.

168. The authors clarified that the effort was number of sets, but it was also noted that the Spanish fleet typically uses 1,100 hooks per set. It was further clarified that the catch is provided in weight rather than numbers of fish.

169. CCMs also requested further explanation on other important factors necessary to standardize effort.

170. The authors noted that fishing methods (e.g. targeting) can influence catch rates of swordfish and information on these factors will be important in the standardization.

171. CCMs commented on the procedures used to filter the data used in the CPUE analysis of the Spanish data and noted that the filtering methods resulted in a loss of a significant number of observations. Concerns were expressed regarding a loss of information about serial depletion resulting from this loss of observations.

172. The authors clarified that the filtering methods are not yet finalized and are subject to revision, but it did not appear that the filtering procedure resulted in a loss of spatial coverage of the fishery because all areas were well represented in the filtered data.

173. CCMs also questioned if the numbers of vessels used in the analysis was affected by the filtering.

174. The authors clarified that, depending on the filtering methods, 10-28 vessels are used in the analysis. The goal of the analysis is to find a representative set of vessels to characterize changes in population's relative abundance, and not to describe catch rates of the fleet. Based on preliminary exploration, the level of filtering in the analysis did not greatly change the results of their analysis.

175. The EU noted its understanding from the last session of the Commission that the results of the swordfish stock assessment should be presented to WCPFC9.

176. The FFA members noted, that while the WCPFC8 report is currently not finalised, the draft report states that WCPFC8 agreed that the Scientific Services Provider should begin work on the swordfish stock assessment and present the available results to SC8. SPC committed to commencing the initial work, describing the data and trends, presenting the interim results to SC8, and continuing the work post-SC8 as necessary. FFA members stated that there was no understanding at WCPFC8 that an assessment that had not been approved by the SC would be presented to WCPFC9.

177. The importance of the study and the significant amount of work necessary to complete the stock assessment was recognized. It was noted that if it is necessary to incorporate sex structure into the stock assessment, it would entail a delay in the completion of the stock assessment. There was general consensus that an update on the progress of the assessment including trends from CPUE could be presented to the Commission in December. However, it was considered that all stock assessments should first be reviewed by the SC before being given to the commission.

178. The EU indicated it did not intend that recommendations on scientific matters would be formulated without the participation of the SC, but that such recommendations could be formulated inter-sessionally. It also noted its understanding that post-SC8 work referred to work prior to WCPFC9. Otherwise, the SWO stock assessment would have simply been deferred to SC9.

179. Some CCMs noted that inter-sessional review of stock assessments is not a preferred practice, except if a peer review is conducted.

Recommendations

180. SC8 recommended that, if possible, the sex specific growth and other biological parameters should be incorporated prior to undertaking the next stock assessment. SC8 recommended that SPC conduct the south Pacific swordfish stock research under the proposed work plan as follows:

- **a. finalise the development of the method of sex specific stock assessment;**
- **b. stock assessment conducted through collaboration from the EU and results will be presented at SC9;**
- **c. the Scientific Services Provider will present an update on their analysis of SWO as a component of their stock status report to WCPFC9.**

4.5.2 Provision of scientific information

a. Status and trends

181. SC8 noted that no stock assessment was conducted for South Pacific swordfish for SC8. Therefore, the stock status description from SC5 is still current.

b. Management Advice and Implications

182. SC8 noted that no stock assessment was conducted for South Pacific swordfish in 2012. Therefore, the management recommendations from SC5 are still current.

183. Since there was no stock assessment conducted in 2012, SC8 recommended provision of management advice to the Commission be deferred to SC9.

4.6 Southwest Pacific striped marlin

4.6.1 Review of research and information

a. Review of 2012 stock assessment (Southwest Pacific Striped Marlin)

184. N. Davies presented SC8-SA-WP-05 containing the results of a stock assessment on striped marlin (*Kajikia audax*) in the Southwest Pacific. SPC thanked all CCMs who contributed to the assessment acknowledging contributions from Australia (SC8-SA-IP-07) and New Zealand (SC8-SA-IP-08) which were partially funded under WCPFC Scientific Committee Project 64. CCMs were also referred to SC8-SA-IP-09 which describes the CPUE standardization used in the southwest Pacific striped marlin stock assessment.

185. Excerpts from the stock assessment are provided below, as are several figures and tables regarding stock status that reflect the model runs selected by SC for the determination of current stock status and the provision of management advice. This assessment is supported by several other analyses which are documented separately, but should be considered when reviewing this assessment as they underpin many of the fundamental inputs to the models. These include standardised CPUE analyses of aggregate Japanese and Taiwanese longline catch and effort data (Hoyle & Davies 2012); standardised CPUE analyses of operational catch and effort data for Australian longline fishery (Robert Campbell 2012); standardized CPUE for the recreational fisheries in Australia (Ghosn et al. 2012) and New Zealand (Holdsworth and Kendrick, 2012), and new biological estimates for growth, the length-weight relationship, and maturity at age (Kopf, 2009, 2011). The assessment includes a series of model runs describing stepwise changes from the 2006 assessment model (bcase06) to develop a new "reference case" model[4] (Ref.case), and then a series of "one-off" sensitivity models that represent a single change from the Ref.case model run. A sub-set of key model runs was taken from the sensitivities that represent a set of plausible model runs, and these were included in a structural uncertainty analysis (grid) for consideration in developing management advice.

186. Besides updating the input data to December 2011, the main developments to the inputs compared to the 2006 assessment included:

a. Japanese longline catches for 1952-2011 revised downwards by approximately 50%;
b. Nine revised and new standardised CPUE time series (with temporal CVs) derived from:
    - aggregate catch-effort data for Japanese and Taiwanese longline fisheries;
    - operational catch-effort data for the Australian longline fishery;

[4] While the Ref.case model run is designated the "reference case" model for the purpose of structuring the modelling analyses, the most appropriate model run(s) upon which to base management advice will be determined by the Scientific Committee.

- operational catch-effort data for the Australian and New Zealand recreational fisheries, and

c. size composition data for the Australian recreational fishery.

187. The main developments to model structural assumptions were to: fix steepness at 0.8; fix growth at the published estimates; estimate spline selectivities for the main longline fisheries; estimate logistic selectivity for the Australian recreational fishery; include time-variant precision in fitting the model to standardized CPUE indices; and remove conflict among the CPUE indices by taking only the Japanese longline index in model area 2 as being representative for the Ref.case. A summary of these and the alternative assumptions for the other key model runs are provided below:

Component	2006 assessment (bcase06)	2012 assessment (Ref.case)	2012 alternatives
Longline CPUE	Japanese and Australian indices areas 1 - 4, no temporal weighting of standardised effort	Japanese indices area 2 only, temporal weighting of standardised effort	-Japanese aggregate indices area 1 only -Japanese aggregate indices area 3 only -Japanese aggregate indices area 2 and Australian indices areas 2 and 3
Steepness	Estimated	Fixed = 0.8	0.65, 0.95
Selectivity	Logistic for most fisheries	Logistic for recreational fisheries only	Logistic for recreational fisheries and longline fisheries in area 3
Growth	Fixed k=0.6, estimate $L_{min,max}$	Fixed at Kopf estimates	Fixed k=0.6, estimate $L_{min,max}$
Size data	High weight	Moderate weight	Down-weighted
Natural mortality	0.4	0.4	0.2, 0.6

188. The primary factors causing the differences between the 2006 and 2012 assessments are:

- The approximately 50% reduction in Japanese longline catches over the entire model time period;
- The faster growth rates;
- Steepness fixed at 0.8 rather than estimated (0.546);
- Selectivities for the major longline fisheries use cubic splines, and are not constrained to be asymptotic;
- Removing conflict among the CPUE indices by separating conflicting indices into different models.

189. Together these changes produce an estimated absolute biomass that is around 30% lower than the 2006 base case and MSY is estimated to be 20% lower. Current biomass levels are higher relative to the MSY reference point levels.

190. The main conclusions of the current assessment (based upon the median of the uncertainty grid estimates, and the plausible range of key model runs) are as follows:

a. The decreasing trend in recruitment estimated in the 2006 assessment remains a feature of the current assessment, particularly during the first 20 years. It is concurrent with large declines in catch and CPUE in the Japanese longline fishery in area 2. Recruitment over the latter 40 years of the model period declines slightly.

b. Estimates of absolute biomass were sensitive to assumptions about selectivity and to conflicts among the standardized CPUE time series. The reference case model (Ref.case) estimated selectivity functions that decrease with age for the main longline fisheries that achieved the best fit to the size data. The CPUE time series for the Japanese longline fishery in area 2 was selected for fitting the Ref.case model because this time series was considered to be the most representative of changes in overall population relative abundance. Alternative options for selectivity assumptions and the CPUE time series included in the model fit were explored in sensitivity and structural uncertainty analyses, and are presented as the key model runs.

c. Estimates of equilibrium yield and the associated reference points are highly sensitive to the assumed values of natural mortality and, to a lesser extent, steepness in the stock-recruitment relationship. Estimates of stock status are therefore uncertain with respect to these assumptions.

d. If one considers the recruitment estimates since 1970 to be more plausible and representative of the overall productivity of the striped marlin stock than estimates of earlier recruitments, the results of the 'msy_recent' analysis could be used for formulating management advice. Under this productivity assumption *MSY* was 16% lower than the grid median value, but the general conclusions regarding stock status were similar.

e. Total and spawning biomass are estimated to have declined to at least 50% of their initial levels by 1970, with more gradual declines since then in both total biomass ($B_{current}/B_0$= 36%) and spawning biomass ($SB_{current}/SB_0$=29%).

f. When the non-equilibrium nature of recent recruitment is taken into account, we can estimate the level of depletion that has occurred. It is estimated that, for the period 2007-2010, spawning potential is at 43% of the level predicted to exist in the absence of fishing, and for 2011 is at 46%.

g. The attribution of depletion to various fisheries or groups of fisheries indicates that the Japanese longline fisheries have impacted the population for the longest period, but this has declined to low levels since 1990. Most of the recent impacts are attributed to the 'Other' group of longline fisheries in areas 1 and 4, and to a lesser extent the 'Other' and Australian fisheries in areas 2 and 3.

h. Recent catches are 20% below the *MSY* level of 2182 mt. In contrast, the 'msy-recent' analysis calculates *MSY* to be 1839 mt, which places current catches 5% below this alternative *MSY* level. Based on these results, we conclude that current levels of catch are below MSY but are approaching MSY at the recent [low] levels of recruitment estimated for the last four decades.

i. Fishing mortality for adult and juvenile striped marlin is estimated to have increased continuously since the beginning of industrial tuna fishing. Apart from those model runs that assumed lower natural mortality or steepness, $F_{current}/F_{MSY}$ was estimated to be lower than 1. For the grid median, this ratio is estimated at 0.58. Based on these results, we conclude that overfishing is not occurring in the striped marlin stock.

j. The reference points that predict the status of the stock under equilibrium conditions at current F are $B_{F_{current}}/B_{MSY}$ and $SB_{F_{current}}/SB_{MSY}$. The model predicts that at equilibrium the biomass and spawning biomass would increase to 129% and 144%, respectively, of the level that supports *MSY*. This is equivalent to 39% of virgin spawning biomass. Current stock status compared to these reference points indicates that the current total and spawning biomass are close to the associated MSY levels ($\frac{B_{current}}{B_{MSY}} = 0.96$ and $\frac{SB_{current}}{SB_{MSY}} = 1.09$) based on the medians from the structural uncertainty grid. The structural uncertainty analysis indicates a 50% probability that $SB_{current} < SB_{MSY}$, and 6 of the 10 key model runs indicate the ratio to be < 1. Based on these results above, and the recent trend in spawning biomass, we conclude that striped marlin is approaching an overfished state.

Discussion

191. SC8 noted that the stock assessment document includes several recommendations for future improvements and that SC8 supports these, particularly those that can be undertaken by relevant CCMs, such as tagging and greater characterization of fisheries capturing striped marlin and greater inclusion of tag related mortality in recreational fisheries.

192. CCMs requested clarification on the meta-analysis that was undertaken for western and central North Pacific Striped Marlin to document plausible estimates of natural mortality.

193. SPC advised that it attended the ISC Billfish WG where a meta-analysis was presented that included a) a review of all known estimates of striped marlin steepness including the 2006 WCPFC assessment of southwest Pacific striped marlin; b) a description of the analytical methods used; and c) a description of the data. The point estimate of steepness from the meta-analysis was M = 0.38 with a credible range of 0.3 to 0.5. Based on the results of this meta-analysis, SPC considers that the southwest Pacific striped marlin model runs where M was set to be 0.2 and 0.6 should have a low weight as they are probably outside the plausible range of natural mortality rates.

194. CCMs also requested clarification on whether the median presented was for the entire grid or only the seven key model runs, as the value presented was quite different to the reference case estimates in Table 8 of SC8-SA-WP-05.

195. SPC explained that the median was for the entire grid, but offered to produce the median and range for the seven key model runs and present it to SC8.

196. CCMs queried whether catches from the extreme northeastern area of the South Pacific should be included in this assessment or whether these catches may be from an eastern stock of striped marlin.

197. SPC considered that there is limited information on mixing of stocks in that region. However it was also noted that the paper by Chambers (SC8-SA-IP-06, not provided to SC8) documented some tag recoveries from the western Pacific region near the Marquises Islands.

198. CCMs noted that there are seasonal trends in the CPUE information presented for area 2 and requested some discussion of these seasonal trends in the working paper. It was also noted that hooks between floats (HBF) information is not available for sets before 1975 and so could not be used to standardize CPUE prior to that time. It was recommended that for this reason future analyses be undertaken to compare the CPUE pre- and post- 1975.

199. SPC advised that seasonal catchabilities are estimated in the model and it is assumed that the standardization averages out the impact of these effects. It also noted that the CPUE standardization was improved when operational rather than aggregate data were used because targeting and vessel or gear effects can be more effectively accounted for in the standardization model.

200. Japan agreed with SPC's response and offered to continue to collaborate with SPC to improve the CPUE standardization for southwest Pacific striped marlin.

201. SPC advised that the Japanese Area 2 longline CPUE showed a sudden decline in the late 1990s and this coincided with lower catches of southwest Pacific striped marlin.

202. The SC requested clarification on whether this decline reflected operational level changes in the fishery.

203. SPC responded that operational changes were likely to have played some role in the observed trend and noted that this was why its influence was tested in the key model runs. The observed trend was consistent with the Australian longline CPUE trend which suggests that both trends were strongly influenced by factors other than operational changes in the fishing patterns of the Japanese longline fleet. The outputs from a key model run (i.e. a one-off sensitivity to the reference case that included the combined CPUE indices for the Japanese area 2 and Australian longline areas 2 and 3 in the model fit) were very similar to the reference case suggesting that this aspect of the data was not influential on the results of the assessment.

204. CCMs also requested clarification on why post release mortalities were not included in the recreational CPUE analyses and whether this was due to difficulties in re-adjusting the size data. The SC also requested advice on whether accounting for this mortality would change the relative fisheries impact, as depicted in Figure 28 of the SC8-SA-WP-05.

205. SPC replied that the size data for the recreational catch was aggregated into larger bins because individual fish sizes are estimated rather than measured. SPC advised that this coarse resolution of the tag-release size bins can be accommodated within the current model structure and it is unlikely that the change in the size stratification will have a large effect on model results. Although that post release mortality has been estimated at ~25% (personal communication, M. Musyl, US Pacific Islands Fisheries Science Center), it was unlikely that this minor mortality rate in comparison to the magnitude of commercial landings would lead to any important changes in assessment results.

4.6.2 Provision of scientific information

a. Status and trends

206. The SC selected the reference case model from the assessment to characterize stock status and selected several key sensitivity runs to characterize uncertainty in trends in abundance and stock status (Figures MLS1-MLS5 and Tables MLS1 and MLS 2). It was noted that the use of the reference case and key sensitivities selected by SC8 (see Table MLS1) leads to slightly different conclusions in terms of stock status compared to that based on the uncertainty grid used in the assessment. The reference case and five of the six other key sensitivity runs estimated $F_{current}/F_{MSY}$ to be less than one indicating that overfishing is unlikely to be occurring. However, when considering $SB_{current}/SB_{MSY}$, the reference case and four of the six other key sensitivity runs are estimated to be less than one, indicating evidence that the stock may be overfished.

Table MLS1. Estimates of management quantities for selected stock assessment models from the 2012 Ref.case model and the six plausible key model runs. For the purpose of this assessment, "current" is the average over the period 2007–2010 and "latest" is 2011.

	Ref.case	sel_JP_AU_3log	CP_JP2_AU_2_3	h=0.65	h=0.95	Growth_est	Sz_data_wt
$C_{current}$	1758	1753	1785	1759	1759	1707	1764
C_{latest}	1522	1523	1512	1522	1522	1476	1521
MSY	2081	2017	2256	1914	2276	2182	2179
$C_{current}/MSY$	0.85	0.87	0.79	0.92	0.77	0.78	0.81
C_{latest}/MSY	0.73	0.76	0.67	0.80	0.67	0.68	0.70
F_{mult}	1.24	1.10	1.39	0.83	1.98	1.79	1.42
$F_{current}/F_{MSY}$	0.81	0.91	0.72	1.21	0.51	0.56	0.71
SB_0	15,130	14,530	16,590	16,790	14,220	15,360	16,000
SB_{MSY}/SB_0	0.27	0.27	0.27	0.32	0.22	0.28	0.26
$SB_{current}/SB_0$	0.24	0.22	0.25	0.21	0.25	0.31	0.25
SB_{latest}/SB_0	0.24	0.23	0.25	0.22	0.26	0.32	0.26
$SB_{current}/SB_{MSY}$	0.87	0.81	0.92	0.67	1.14	1.11	0.95
SB_{latest}/SB_{MSY}	0.90	0.84	0.92	0.70	1.19	1.14	1.00
$SB_{curr}/SB_{curr_{F=0}}$	0.34	0.32	0.37	0.34	0.34	0.44	0.37
$SB_{latest}/SB_{latest,}$	0.37	0.34	0.39	0.37	0.37	0.46	0.40
Steepness (h)	0.80	0.80	0.80	0.65	0.95	0.80	0.80

Table MLS2. Comparison of southwest Pacific Ocean striped marlin reference points from the 2012 reference case model and the range of the seven models in Table MLS1; the 2006 base case model (steepness estimated as 0.51). *NA* = not available.

Management quantity	2012 assessment Ref.case (uncertainty)	2006 assessment Base case
Most recent catch	1758 mt (2011)	1412 mt (2004)
MSY	2081 t (1914 – 2276)	2610 t
$F_{current}/F_{MSY}$	0.81 (0.51-1.21)	1.25
$B_{current}/B_{MSY}$	0.83 (0.70-0.99)	0.70
$SB_{current}/SB_{MSY}$	0.87 (0.67-1.14)	0.68
$Y_{Fcurrent}/MSY$	0.99 (0.93-1.00)	0.99
$B_{current}/B_{current,\ F=0}$	0.46 (0.44-0.53)	0.53
$SB_{current}/SB_{current,\ F=0}$	0.34 (0.32-0.44)	*NA*

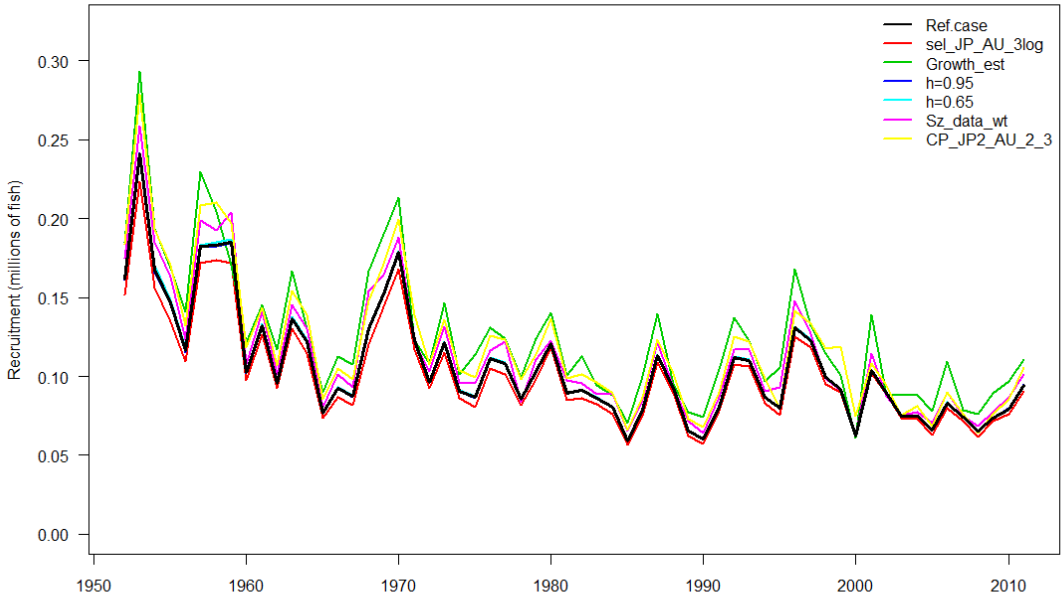


Figure MLS1: Estimated annual recruitment (millions of fish) for the southwest Pacific Ocean striped marlin obtained from the Ref.case model (black line) and the six plausible key model runs.

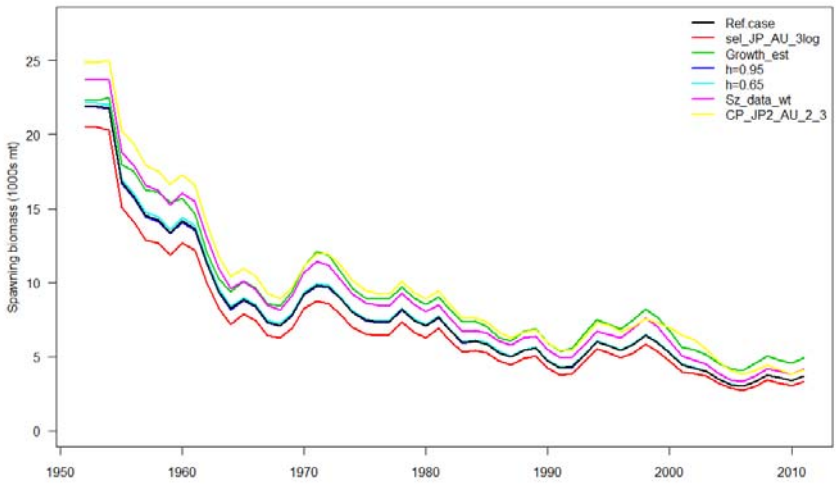


Figure MLS2: Estimated average annual average spawning potential for the southwest Pacific Ocean striped marlin obtained from the Ref.case model (black line) and the six plausible key model runs.

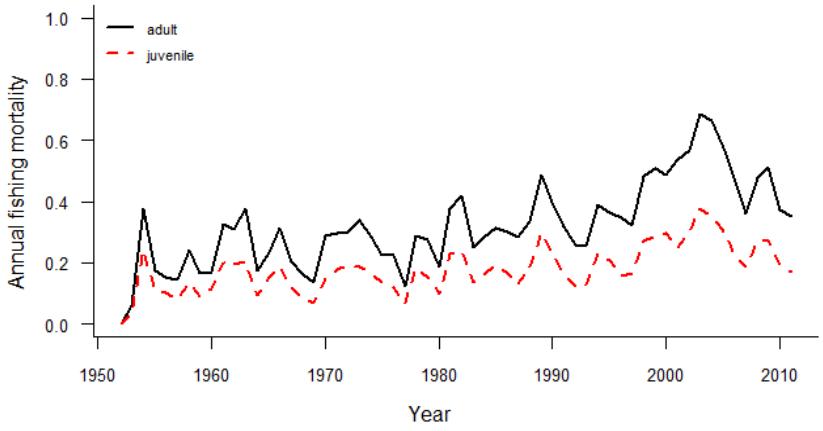


Figure MLS3: Estimated annual average juvenile and adult fishing mortality for the southwest Pacific Ocean striped marlin obtained from the Ref.case model.

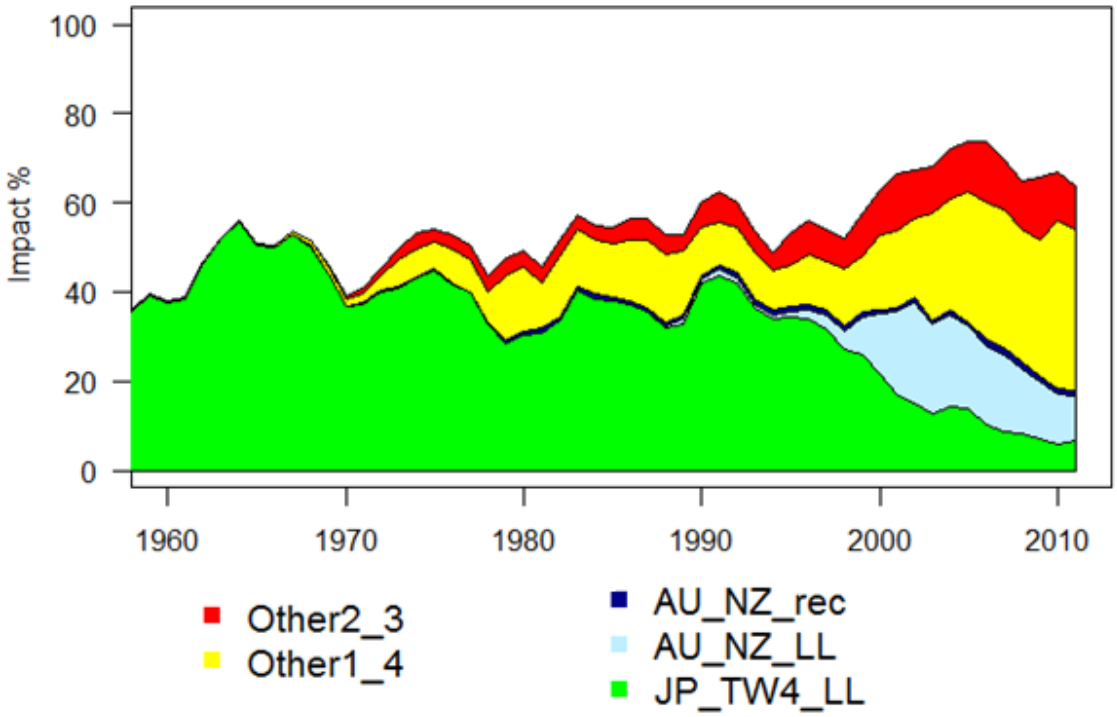


Figure MLS4: Estimates of reduction in spawning potential due to fishing (fishery impact = $\mathbf{1} - \boldsymbol{SB_t/SB_{t_{F=0}}}$) for the southwest Pacific Ocean striped marlin attributed to various fishery groups (Ref.case model). JP_TW4+LL = Japanese longline fisheries in sub-areas 1 to 4 and Taiwanese longline fishery in sub-area 4; AU_NZ_LL = Australian and New Zealand longline fisheries; AU_NZ_rec = Australian and New Zealand recreational fisheries; Other1_4 = all longline fisheries in sub-areas 1 and 4

excluding Taiwanese in sub-area 4 and excluding Japanese; Other2_3 = all longline fisheries in sub-areas 2 and 3 excluding Japanese, Australian and New Zealand.

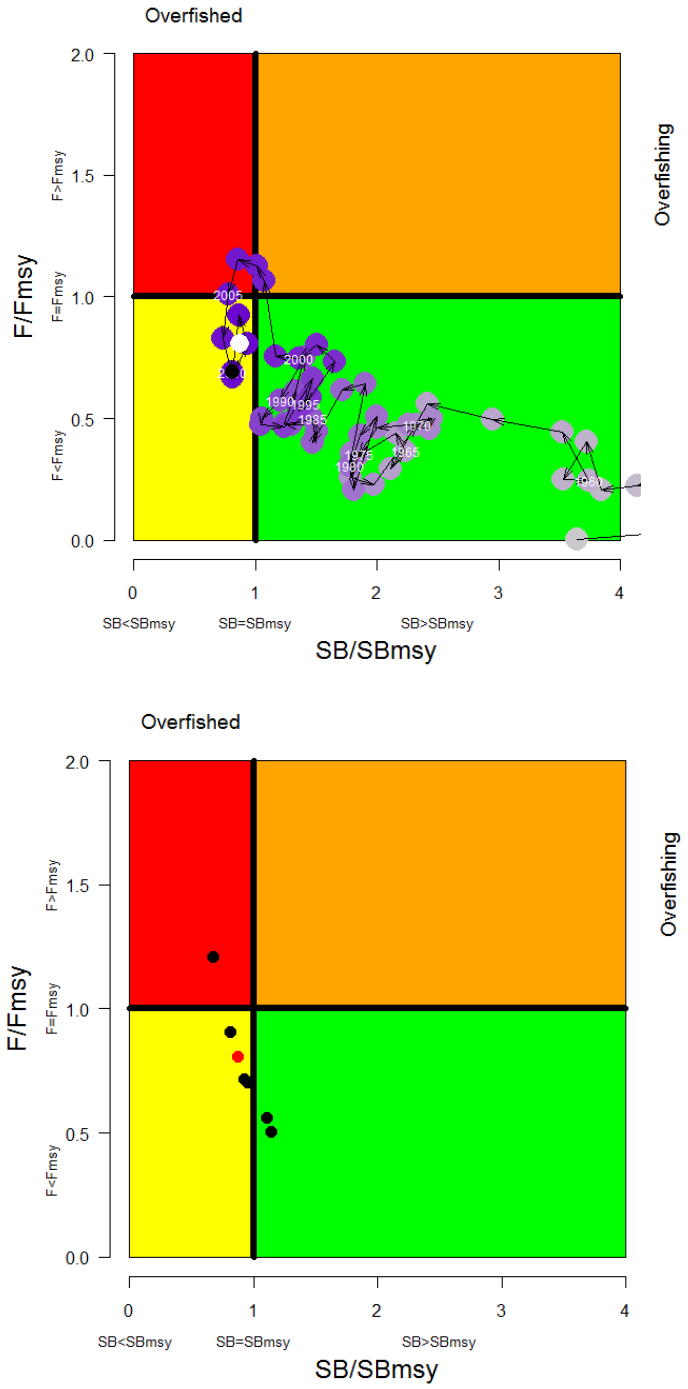


Figure MLS5: Temporal trend in annual stock status, relative to SB_{MSY} (x-axis) and F_{MSY} (y-axis) reference points for the Ref.case (top) and $F_{current}/F_{MSY}$ and $SB_{current}/SB_{MSY}$ for the Ref.case

(red circle) and the six plausible key model runs. See Table MLS1 to determine the individual model runs.

b. Management Advice and Implications

207. The southwest Pacific striped marlin assessment results indicate that the stock is fully exploited, is not experiencing overfishing but may be overfished. The SC noted that recent catches are close to MSY, and that recent fishing mortality is slightly below F_{MSY}, and that recent spawning biomass is slightly below SB_{MSY}. The recent catch increase is driven in part by increases in catch in the northern area of the stock area that is not subject to the current CMM for this stock.

208. SC8 recommends measures to reduce overall catch of this stock, through the expansion of the geographical scope of CMM 2006-04 to cover the distribution range of the stock.

209. In designing such a measure to implement this recommendation from SC8, the Commission may need to consider the historic trends in the fishery, including the catch declines in the traditional central and southern areas and the recent catch increases in the northern areas.

210. SC8 recognizes that striped marlin is often caught as a non-target species. SC8 therefore recommends data analysis be conducted to identify areas of high catch concentration that could be subject to targeted management.

4.7 North Pacific Striped Marlin

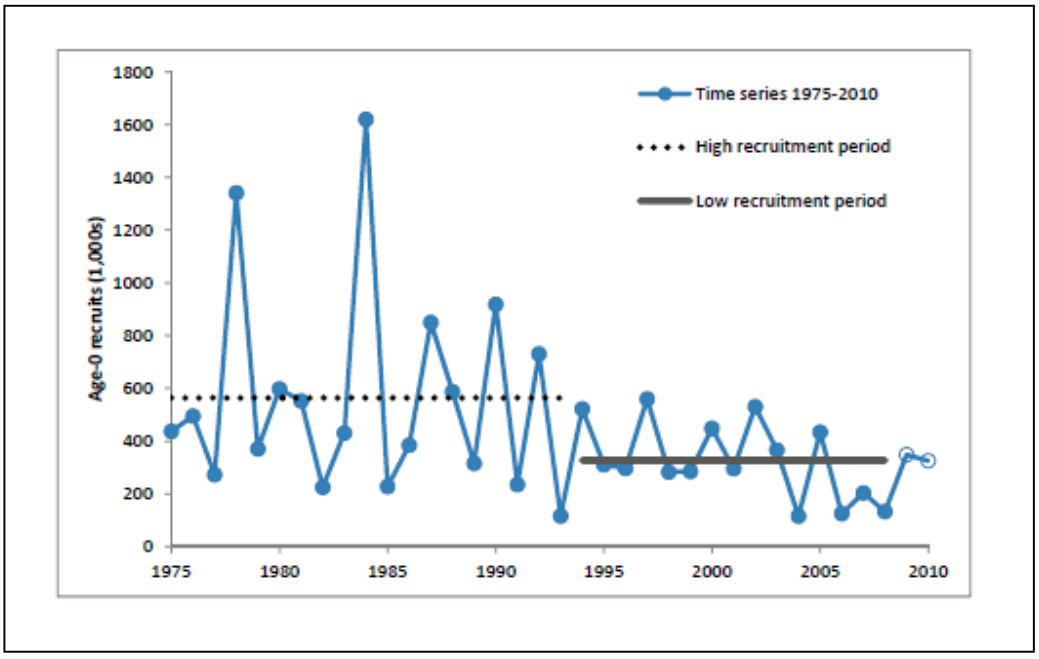
4.7.1 Review of research and information

a. Review of 2012 stock assessment

211. K. Piner (USA) presented the results of the stock assessment for the North Pacific striped marlin conducted by the International Scientific Committee (ISC) (SC8-SA-WP-10 and SC8-SA-IP-16). The ISC Billfish Working Group conducted a new stock assessment of striped marlin in the Western and Central North Pacific Ocean (WCNPO). The assessment area was based on a new definition of stock structure which suggested a separate WCNPO stock west of 140°W. New information on life history, catch, size composition and CPUE from the WCNPO area were included in a Stock Synthesis model. Results of the base case model run indicate that current F=0.76 (average 2007-2009) is 24% above F_{MSY} levels and the spawning stock biomass (SB) is 35% of SB_{MSY} levels. Projections based on the base case results which included eight potential harvest strategies were analysed to provide mangers a range of options and likely outcomes of those options. Figures WCNPSTR1-4 and Table WCNPSTR1 contain further details of the assessment.

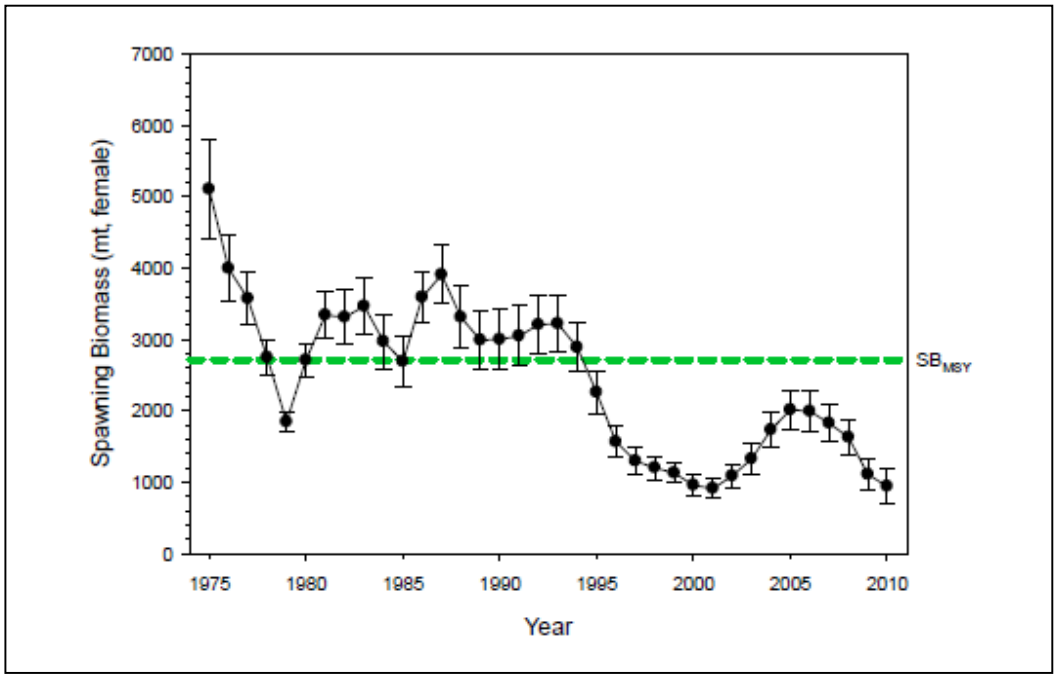
Table WCNPSTR1. Reported catch (mt), population biomass (mt), spawning biomass (mt), relative spawning biomass (SB/SB_{MSY}), recruitment (thousands), fishing mortality (average ages 3 and older), relative fishing mortality (F/F_{MSY}), exploitation rate, and spawning potential ratio of Western and Central North Pacific striped marlin.

Year	2004	2005	2006	2007	2008	2009	2010	Mean[5]	Min[5]	Max[5]
Reported Catch	4,047	3,703	3,706	3,195	3,691	2,560[6]	2,560	6,011	2,560	10,528
Population Biomass	11,679	9,545	10,371	8,430	7,414	5,335	6,625	14,141	5,335	24,886
Spawning Biomass[7]	1,731	2,010	1,992	1,824	1,625	1,106	938	2,439	909	5,104
Relative Spawning Biomass	0.64	0.74	0.73	0.67	0.60	0.41	0.35	0.90	0.33	1.88
Recruitment (age 0)	116	434	125	204	133	349	326	453	116	1,620
Fishing Mortality	0.58	0.56	0.62	0.58	0.86	0.84	0.75	0.79	0.53	1.46
Relative Fishing Mortality	1.22	0.95	0.92	1.01	0.95	1.41	1.37	1.30	0.86	2.38
Exploitation Rate	35%	39%	36%	38%	50%	48%	38%	44%	29%	69%
Spawning Potential Ratio	19%	19%	17%	19%	12%	13%	14%	14%	7%	21%



[5] During 1975-2010
[6] Assumed equal to 2009 value
[7] Female

Figure WCNPSTR1. Historical trends in recruitment of WCNPO striped marlin (age-0) estimated by the SS3 base-case model and the assumed periods of low recruitments used for future projection scenarios.



FigureWCNPSTR2. Trends in estimates of spawning biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2010 along with 80% confidence intervals.

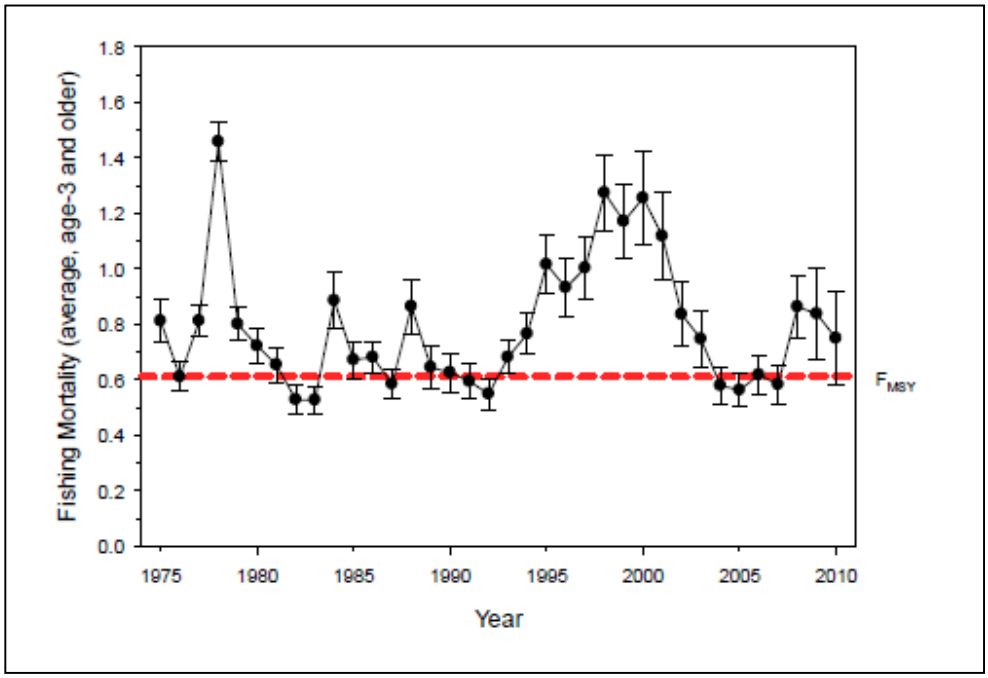


Figure WCNPSTR3. Trends in estimates of fishing mortality of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2010 along with 80% confidence intervals.

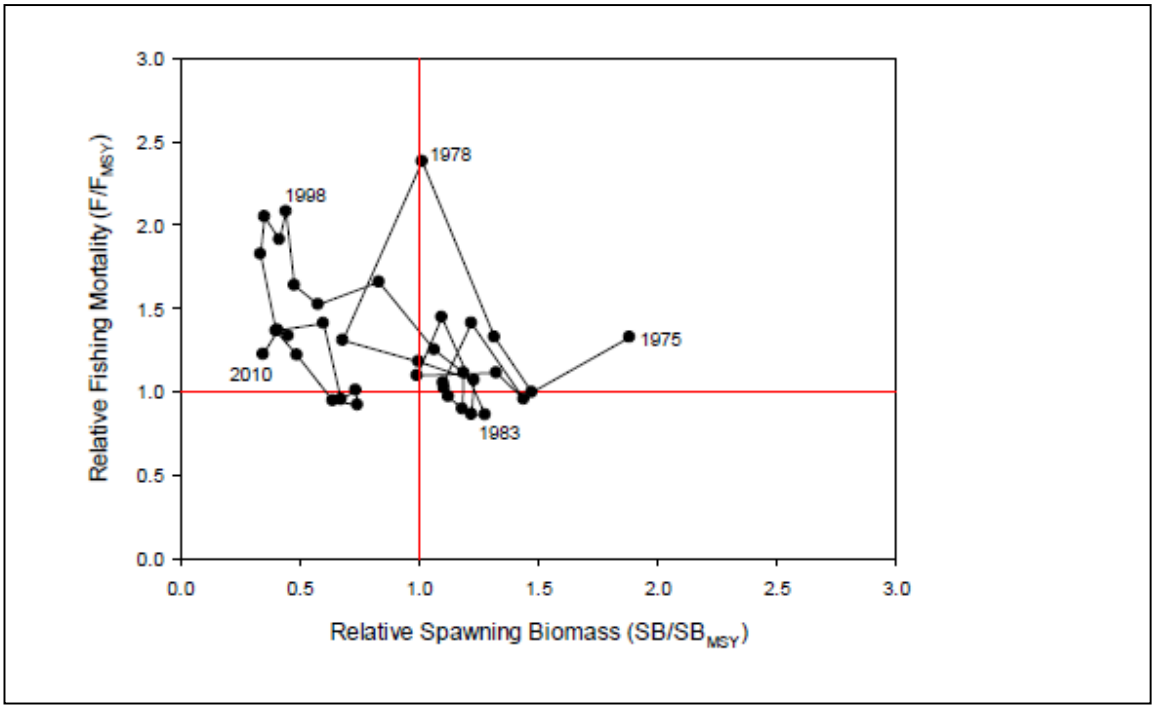


Figure WCNPSTR4. Kobe plot of the trends in estimates of relative fishing mortality and relative spawning biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2010.

Discussion

212. CCMs queried whether recreational fisheries that might be expected to have asymptotic selectivity were included in the stock assessment data.

213. K. Piner responded that recreational fisheries were a minor component of the fisheries in the western and central Pacific region covered by this stock assessment, and that reliable catch and effort statistics were not available. However, it was noted that recreational fishery data were available for a Pacific-wide stock assessment of striped marlin but that the current assessment is only for the western central north Pacific.

214. CCMs also questioned why the stock projection appeared to be optimistic even though the stock status was reported to be pessimistic.

215. K. Piner noted that the projected recruitment sets a lower limit for biomass projections which constrains the degree of pessimism. Furthermore, the final three values in the estimated recruitment time series were negative deviations from the expected recruitment curve and were therefore below the recruitment level used at the onset of the projection. As a result, recruitment in the projection was higher than the most recent observations. The fact that one of harvest strategies in the set of projections

coincided with the current CMM implies that the current regulation should eventually lead to improvement in stock status.

216. Despite this explanation, some CCMs expressed concern that the current CMM is not strong enough.

217. CCMs asked whether the decline in recruitment since the 1990s could be a result of changes in the environment and/or oceanographic dynamics.

218. K. Piner noted that an investigation of environmental correlates with assessment results has not yet been done. He also noted that the decline in recruitment could also have been driven by the decrease in spawning biomass to record low levels.

219. Some CCMs expressed disappointment that the assessment documents had not been made available prior to the meeting.

Recommendation

220. Noting the delay in the WCNPSTR assessment, and the associated lack of timely submission of assessment documents, SC8 recommends that the Commission consider tasking the Scientific Services Provider with conducting the next assessment unless the ISC can demonstrate that it will prevent such delays in future and that the ISC Chair cooperates for more timely submission of stock assessment analyses and reports.

4.7.2 Provision of scientific information

a. Status and trends

221. The WCNPSTR stock is overfished and experiencing overfishing. The current (2010) spawning biomass is 65% below SB_{MSY}=2,713 mt and the current fishing mortality (2007-2009) exceeds F_{MSY}=0.61 by 24% (Figure WCNPSTR4). Reducing fishing mortality would likely increase spawning stock biomass and may improve the chances of higher recruitment.

b. Management Advice and Implications

222. SC8 noted ISC's conservation advice for the Commission's consideration as follows:

> **Noting that the last year of the model was 2010 and F_{2012} is likely to be different to $F_{current}$, current fishing mortality (average 2007-2009) is estimated to be 24% above F_{MSY}. Fishing at F_{MSY} would lead to an estimated spawning biomass increase of roughly 45% to 72% by 2017. Seven additional harvest scenarios were also modelled using either resampled recruitment estimates from 1994-2008 or randomly generated deviations around the assumed spawner-recruit relationship. Included in the alternative harvest scenarios were: constant catch at 2,500 mt, that represents 80% of average catches during 2007-2009; constant catch at 3,600t that represents catch levels prescribed in CMM 2010-01; fishing at the current F (average 2007-2009); and fishing at the average F (2001-2003):**
>
> - **Fishing at a constant catch of 2,500 mt was estimated to increase spawning biomass by 133% to 223% by 2017.**

- **Fishing at a constant catch of 3,600 mt was estimated to increase spawning biomass by 48% to 120% by 2017.**
- **In comparison, fishing at the current (2007-2009) fishing mortality rate was estimated to increase spawning biomass by 14% to 29% by 2017, and fishing at the average 2001-2003 fishing mortality rate would lead to a spawning biomass decrease of 2% under recent recruitment to an increase of 6% under the stock-recruitment curve assumption by 2017.**

223. The SC8 recommends that the ISC conduct an additional set of projections of the WCNPO striped marlin based on the 2012 stock assessment results. The projections should be based on resampling only recruitment from the most recent 5 year period (2004-2008). Recruitment during that period is below the average of the 1994-2008 and may represent a different and more pessimistic recruitment regime than assumed in the current projections. The 8 harvest scenarios examined in the 2012 stock assessment should be evaluated with this more pessimistic assumption, and an additional run using this recruitment scenario and constant catch at the 2011 level should also be included. Probabilities of stock recovery as well as trajectories of spawning biomass and catch should be documented and presented to WCPFC9.

224. Given the current pessimistic status of the stock, SC8 recommends that the Commission strengthen the existing CMM to ensure the recovery of NPSR based on information provided by ISC.

4.8 Northern stocks

225. Information on northern stocks of albacore, Pacific bluefin tuna and swordfish were presented by representatives of the ISC.

4.8.1 North Pacific albacore tuna

4.8.1.1 Review of research and information

226. J. Brodziak (USA) presented the ISC12 conservation advice for North Pacific albacore tuna:

- The stock is considered to be healthy at average historical recruitment levels and fishing mortality ($F_{2006\text{-}2008}$).
- Sustainability is not threatened by overfishing as the $F_{2006\text{-}2008}$ level (current F) is about 71% of $F_{SSB\text{-}ATHL}$ and the stock is expected to fluctuate around the long-term median SSB (~400,000 mt) in the short- and long-term future.
- If future recruitment declines by about 25% below average historical recruitment levels, then the risk of SSB falling below the SSB-ATHL threshold with $F_{2006\text{-}2008}$ levels increases to 54% indicating that the impact on the stock is unlikely to be sustainable.
- Increasing F beyond $F_{2006\text{-}2008}$ levels (current F) will not result in proportional increases in yield as a result of the population dynamics of this stock.
- The current assessment results confirm that F has declined relative to the 2006 assessment, which is consistent with the intent of the previous (2006) WG recommendation."

Discussion

227. Some CMMs questioned the reference points for the north Pacific albacore stock. In particular, it was suggested that the interim reference point $F_{ssbathl}$ is not suitable as a target reference point, and may not be suitable as a limit reference point.

228. Several CMMs requested that the ISC update the SC on the outcome of the 2011 Center for Independent Experts (CIE) peer review of the north Pacific albacore stock assessment and the ISC Billfish Working Group's response to that review.

229. J. Brodziak (US) responded that the peer review documents are expected to be posted soon on the ISC website as part of the package of documents associated with the ISC12 Plenary Report.

4.8.1.2 Provision of scientific information

a. Status and trends

230. SC8 noted that no stock assessment was conducted for North Pacific albacore in 2012. Therefore, the stock status description and management recommendations from SC7 are still current.

b. Management Advice and Implications

231. SC8 noted that no stock assessment and management advice was provided since SC7. Therefore the advice from SC7 should be maintained pending a new assessment or other new information.

4.8.2 Pacific bluefin tuna

4.8.2.1 Review of research and information

a. Review of 2012 Stock Assessment

232. Y. Takeuchi, chair of Pacific Bluefin tuna Working Group of ISC (PBFWG), summarized the stock status and conservation advice for Pacific Bluefin tuna as determined by ISC. Since there has been no new stock assessment since July 2010, ISC carried over its previous advice on stock status for Pacific bluefin, albeit with the precautionary note that the uncertainty in stock status has increased with the passage of time and that the condition of the stock may have deteriorated since the last assessment. Given that stock biomass may have continued to decline since the last stock assessment and because of the increased uncertainty concerning stock status, the PBFWG noted it is even more important to re-emphasize the previous conservation advice. ISC12 also noted that since the last assessment (2010) there appears to be a continuing decline in stock biomass and catch rate, as was projected in the 2010 assessment.

Discussion

233. The Pew Environment Group expressed concerns about stock status and noted the 2012 stock assessment had not been completed as planned. It was also noted that the ISC does not operate with the same transparency as does the SC. The Commission was requested to consider alternative ways to complete the assessment if the ISC cannot complete it.

234. Another CMM requested progress reports on implementation of CMM 2010-04.

235. Several other CMMs then noted that those reports have been submitted as requested.

4.8.2.2 Provision of scientific information

a. Status and trends

236. SC8 noted that no stock assessment was conducted for Pacific bluefin tuna in 2012. Therefore, the stock status description and management recommendations from SC7 are still current.

b. Management Advice and Implications

237. SC8 noted that no stock assessment and management advice was provided since SC7.

238. SC8 noted the following conservation advice from the ISC:

"Until a new stock assessment result becomes available, ISC12 agreed to carry over the previous conservation advice, albeit with the precautionary note that the uncertainty in the stock status has increased through the passage of time and stock biomass may have declined since the last stock assessment. The advice on Pacific bluefin stock status from ISC11 is: *'Given the conclusions of the July 2010 PBFWG workshop (ISC/10/ANNEX/07), the current (2004 -2006) level of F relative to potential biological reference points, and the increasing trend of F, it is important that the level of F is decreased below the 2002- 2004 levels, particularly on juvenile age classes'*. "

4.8.3 North Pacific swordfish

4.8.3.1 Review of research and information

239. J. Brodziak (USA) presented the ISC12 conservation advice for North Pacific swordfish:

"The WCPO and EPO stocks of swordfish are healthy and above the level required to sustain recent catches."

4.8.3.2 Provision of scientific information

a. Status and trends

240. SC8 noted that no stock assessment was conducted for north Pacific swordfish in 2012. Therefore, the stock status description and management recommendations from SC6 are still current.

b. Management Advice and Implications

241. SC8 noted that no stock assessment and management advice was provided since SC6. Therefore the advice from SC6 should be maintained, pending a new assessment or other new information.

4.9 WCPO Sharks

4.9.1 Oceanic Whitetip Shark

4.9.1.1 Review of research and information

242. J. Rice (SPC) presented a stock assessment of oceanic whitetip sharks in the western and central Pacific Ocean (SC8-SA-WP-06). Excerpts from the stock assessment are provided below as are several figures and tables regarding stock status that reflect the model runs selected by SC for the determination of current stock status and the provision of management advice.

243. This paper presents the first stock assessment of oceanic whitetip shark in the western and central Pacific Ocean (WCPO). The assessment used the stock assessment model Stock Synthesis[8]. The oceanic whitetip shark model is an age (36 years) structured, spatially aggregated (1 region) and two sex model. The catch, effort, and size composition of catch, are grouped into 4 fisheries covering the time period from 1995 through 2009.

244. Oceanic whitetip sharks are most often caught as bycatch in the Pacific tuna fisheries, though some directed and mixed species (sharks and tunas/billfish) fisheries do exist. Commercial reporting of landings has been minimal, as has information regarding the targeting, and fate of sharks encountered in the fisheries. Useful data on catch and effort is mostly limited to observer data held by the SPC, but the observer data also suffers from poor coverage, especially in the longline fishery. Therefore multiple data gaps had to be overcome through the use of integrated stock assessment techniques and the inclusion of alternate data that reflected different states of nature.

245. Multiple models with different combinations of the input datasets and structural model hypotheses were run to assess the plausible range of stock status for oceanic whitetips. Each model was given a weight based on the plausibility of the assumptions and data used in each model. The reference case presented here was the highest weighted run. This reference case model is used as an example for presenting model diagnostics. The sensitivity of the reference model to key assumptions (i.e. regarding the stock recruitment relationship, the catch per unit effort time series, the purse seine catch and size data) were explored via sensitivity analyses. We have reported stock status in relation to MSY based reference points, but the actual reference points to be used to manage this stock have not yet been determined by the Commission.

246. The key conclusions of the first stock assessment for oceanic whitetip sharks in the WCPO are as follows:

[8] Stock Synthesis version 3.21B http://nft.nefsc.noaa.gov/Download.html

a. Notwithstanding the uncertainties inherent in the input data, the catch, CPUE, and size composition data all show consistent declines over the period of the model (1995-2009).

b. This is a low fecundity species and this is reflected in the low estimated value for F_{MSY} (0.07) and high estimated value for SB_{MSY}/SB_0 (0.424). These directly impact the conclusions about overfishing and the overfished status of the stock.

c. Estimated spawning biomass, total biomass and recruitment all decline consistently throughout the period of the model. The biomass declines are driven by the CPUE series, and the recruitment decline is driven through the tight assumed relationship between spawning biomass and recruitment.

d. Estimated fishing mortality has increased to levels far in excess of F_{MSY} ($F_{CURRENT} / F_{MSY} = 6.5$) and across all model runs undertaken estimated F values were much higher than F_{MSY} (the 5th and 95th quantiles of the grid are 3 and 20). Based on these results we conclude that overfishing is occurring.

e. Estimated spawning biomass has declined to levels far below SB_{MSY} ($SB_{CURRENT}/SB_{MSY} = 0.153$) and across all model runs undertaken $SB_{current}$ is much lower than SB_{MSY} (the 5th and 95th quantiles of the grid are 0.082 and 0.409). Based on these results we conclude that the stock is overfished.

f. Noting that estimates of SB_0 and SB_{MSY} are particularly uncertain as the model domain begins in 1995, it is also useful to compare current stock size to that at the start of the model. Estimated spawning biomass has declined over the model period by 86% and across all model runs undertaken $SB_{CURRENT}$ is much lower than SB_{1996} (the 5th and 95th quantiles indicate a decline to 8.7% and 45.8% of SB_{1996}).

g. Current catches are lower than the MSY (2,001 versus 2,700), but this is not surprising given the estimated stock status and fishing mortality. Current (2005-2008 average) and latest (2009) catches are significantly greater than the forecast catch in 2010 under F_{MSY} conditions (230 mt).

h. The greatest impact on the stock is attributed to bycatch from the longline fishery, with lesser impacts from target longline activities and purse seining.

i. Given the bycatch nature of fishery impacts, mitigation measures provide the best opportunity to improve the status of the oceanic whitetip population. Existing observer data may provide some information on which measures would be the most effective.

j. Given recent decisions to improve logsheet catch reporting and observer coverage in the longline fishery it is recommended that an updated assessment be undertaken in 2014.

Discussion

247. CCMs questioned whether the stock assessment data from "targeted shark fisheries" included both longline fisheries data coded in the SPC database as targeting "shark and other species" and any longline sets that recorded the use of special shark lines deployed with the intent to harvest surface dwelling sharks.

248. SPC replied in the affirmative, explaining that these two criteria typically overlap in the database. Within these categories, mixed shark species dominated by silky and oceanic whitetip were most common in tropical waters, whereas mako and blue sharks were dominant at higher latitudes.

249. CCMs queried whether the nominal and standardized CPUE indices for oceanic whitetips were similar, with one CCM noting that standardized CPUE trends were noticeably lower than nominal CPUE in some cases. The necessity of further improvement of CPUE standardization and sensitivity model runs using nominal CPUE was highlighted. Questions regarding the effect of changes in depth of sets over time, and the higher uncertainty in catch rates prior to 2000 were also raised.

250. SPC replied that these trends were strongly influenced by vessel effects likely due to small sample sizes in some runs and that every effort should be made to collect more and higher quality data on shark catch rates and fate. It was acknowledged that some CPUE standardizations can suffer from heterogenous data and that in this case could be responsible for the apparent non-normal distribution of model residuals.

251. CCMs noted that the vast majority of observer data used in the assessment were collected high latitude fisheries while the core tropical habitat of oceanic whitetip sharks had very low observer coverage, and it was questioned how many fleets had even achieved the targeted 5% coverage for 2012. It was noted that the two catch estimates (SC8-SA-IP-12) were based on the same observer data set.

252. SPC concurred with the importance of increasing the quantity and representativeness of observer coverage. It was explained that the alternative catch estimates derived from different treatment of the observer data than that in Lawson (2011; SC7-EB-IP-02).

253. FFA members commented on the high fishing mortality levels for oceanic whitetip sharks that have contributed to depressed stock conditions within the WCPO. In order to reduce shark mortality FFA members suggested further efforts to release sharks alive and uninjured, and notified SC8 of their intention to table a comprehensive measure on the conservation and management of sharks at WCPFC9.

254. The PNA supported FFA's statement and added that reference points based on the guidance of the Convention should be developed specifically for non-target species, such as sharks.

255. CCMs expressed their appreciation for the stock assessment and suggested a range of further studies including investigation of biological and life history information, the impact of wire versus monofilament trace, operational factors such as set depth and environmental factors, and tagging studies.

4.9.1.2 Provision of scientific information

a. Status and trends

256. Spawning biomass, total biomass and recruitment all exhibit a declining trend since 1995 (the first year of the assessment) (Figure OCS1). Current spawning biomass is low and is estimated to be at 15% of SB_{MSY}.

257. Fishing mortality from the non-target longline fishery has an increasing trend since 1995 while the fishing mortality from the targeted longline fishery and the purse seine fisheries has varied without trend (Figure OCS4). Current fishing mortality is high and is estimated to be over 6 times greater than F_{MSY}.

258. The key conclusions are that overfishing is occurring and the stock is in an overfished state relative to MSY-based reference points ($SB_{current}/SB_{MSY}$ 0.153 (0.082-0.409)) and depletion based reference points ($SB_{current}/SB_{zero}$ 0.065 (0.034-0.173)) (Tables OCS1-2). This conclusion is robust to uncertainties in key model assumptions.

Table OCS 1. Estimates of management quantities for the reference case and sensitivity runs.

Management Quantity	Units	Reference	Catch_2	Catch_3	CPUE_2	Nat_M_1	Nat_M_3	Steep_1	Steep_3	Init_F_1	Init_F_3_	Samp.Sz_2	SigmaR_2
C_{Latest}	t	1,802	3,160	6,321	1,451	2,534	1,468	1,984	1,630	1,820	1,779	1,803	1,785
$\hat{C}_{Current}$	t per annum	2,001	3,707	7,414	1,891	2,822	1,625	2,195	1,811	2,028	1,967	2,004	2,010
$\tilde{Y}_{F_{MSY}}$	t per annum	2,700	1,645	3,290	2,606	3,596	2,244	2,279	3,000	2,380	3,318	2,697	2,734
$\tilde{B}_0$	t	110,447	67,513	135,032	106,461	230,313	70,350	122,226	99,683	97,390	135,715	110,327	111,860
$\tilde{B}_{MSY}$	t	46,780	28,593	57,188	45,102	99,195	29,001	54,400	39,828	41,249	57,483	46,729	47,377
$B_{current}$	t	7,295	11,212	22,426	4,493	11,436	5,647	8,896	5,917	7,543	7,006	7,327	7,405
$S\tilde{B}_0$		3,537	2,162	4,324	3,409	6,380	2,330	3,914	3,192	3,119	4,346	3,533	3,582
$S\tilde{B}_{MSY}$		1,498	916	1,831	1,444	2,748	960	1,742	1,275	1,321	1,841	1,496	1,517
$SB_{current}$		229	347	694	137	366	156	288	177	237	220	231	230
$B_{current} / \tilde{B}_0$		0.066	0.166	0.166	0.042	0.050	0.080	0.073	0.059	0.077	0.052	0.066	0.066
$B_{current} / \tilde{B}_{MSY}$		0.156	0.392	0.392	0.100	0.115	0.195	0.164	0.149	0.183	0.122	0.157	0.156
$SB_{current} / S\tilde{B}_0$		0.065	0.161	0.161	0.040	0.057	0.067	0.074	0.055	0.076	0.051	0.065	0.064
$SB_{current} / S\tilde{B}_{MSY}$		0.153	0.379	0.379	0.095	0.133	0.163	0.165	0.139	0.179	0.120	0.154	0.152
$SB_{Current} / SB_{1995}$		0.139	0.342	0.342	0.086	0.161	0.127	0.158	0.119	0.121	0.181	0.141	0.140
$\tilde{B}_{MSY} / \tilde{B}_0$		0.424	0.424	0.424	0.424	0.431	0.412	0.445	0.400	0.424	0.424	0.424	0.424
$S\tilde{B}_{MSY} / S\tilde{B}_0$		0.424	0.424	0.424	0.424	0.431	0.412	0.445	0.400	0.424	0.424	0.424	0.424
$F_{current}$		0.469	0.662	0.655	0.861	0.479	0.202	0.535	0.459	0.356	0.249	0.243	0.464
F_{msy}		0.070	0.071	0.071	0.070	0.047	0.091	0.051	0.092	0.070	0.070	0.070	0.070
$F_{current} / \tilde{F}_{MSY}$		6.694	9.298	9.197	12.324	10.287	2.229	10.560	4.992	5.080	3.556	3.469	6.616

Table OSC2. Estimates of management quantities for the reference, median, 5th, and 95th quantiles of the uncertainty grid.

Management Quantity	Units	Reference	Grid Median	Grid 5%	Grid 95%
C_{Latest}	t	1,802	2,218	1,295	6,962
$C_{Current}$	t per annum	2,001	2,703	1,593	8,131
$\tilde{Y}_{F_{MSY}}$	t per annum	2,700	2,713	1,484	4,831
$\tilde{B}_0$	t	110,447	1 ,973	56,366	309,263
$\tilde{B}_{MSY}$	t	46,780	,300	22,321	133,204
$B_{current}$	t	7,295	8,672	3,864	26,001
$S\tilde{B}_0$		3,537	3,554	1,848	8,566
$S\tilde{B}_{MSY}$		1,498	1,505	739	3,690
$SB_{current}$		229	280	112	820
$B_{current} / \tilde{B}_0$		0.066	0.073	0.034	0.192
$B_{current} / \tilde{B}_{MSY}$		0.156	0.175	0.079	0.454
$SB_{current} / S\tilde{B}_0$		0.065	0.069	0.034	0.173
$SB_{current} / S\tilde{B}_{MSY}$		0.153	0.166	0.082	0.409
$SB_{Current} / SB_{1995}$		0.139	0.181	0.087	0.458
$\tilde{B}_{MSY} / \tilde{B}_0$		0.424	0.424	0.399	0.449
$S\tilde{B}_{MSY} / S\tilde{B}_0$		0.424	0.424	0.399	0.449
$F_{current}$		0.469	0.461	0.243	0.909
F_{msy}		0.070	0.070	0.035	0.093
$F_{current} / F_{MSY}$		6.694	6.940	3.001	20.026

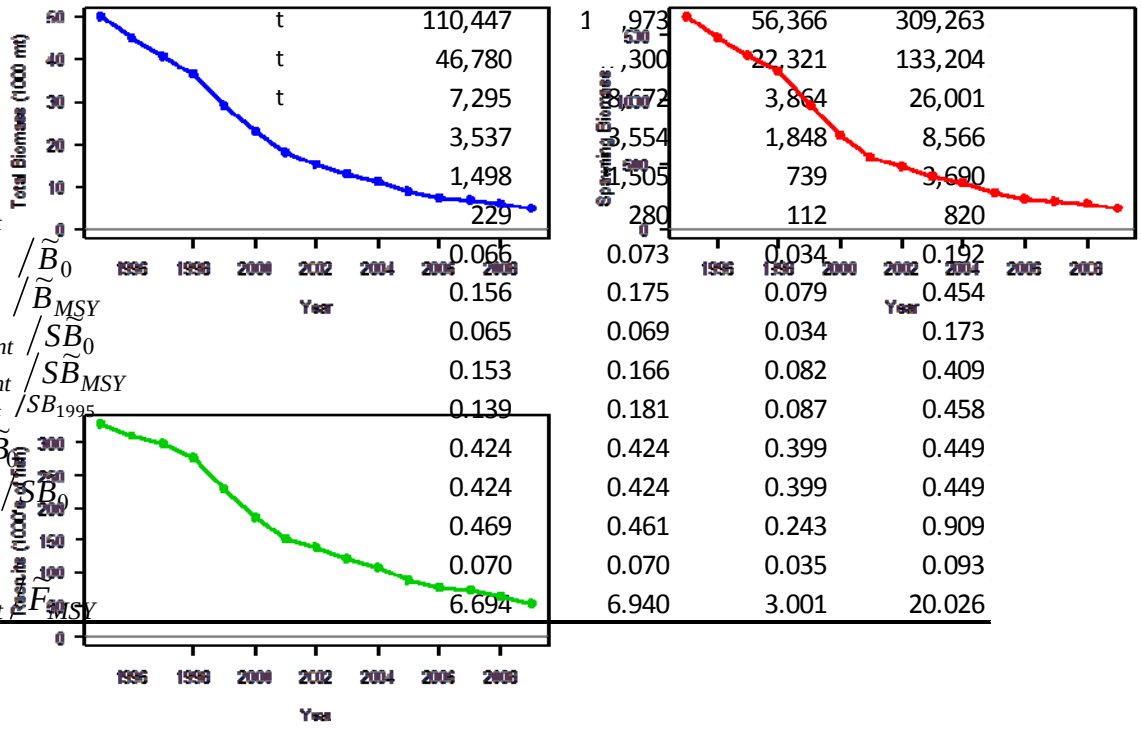


Figure OCS 1. Estimated total biomass (top left, 1000 metric tons), estimated spawning biomass (top right) and estimated annual recruitment (1000's of fish) in the WCPO for the reference case.

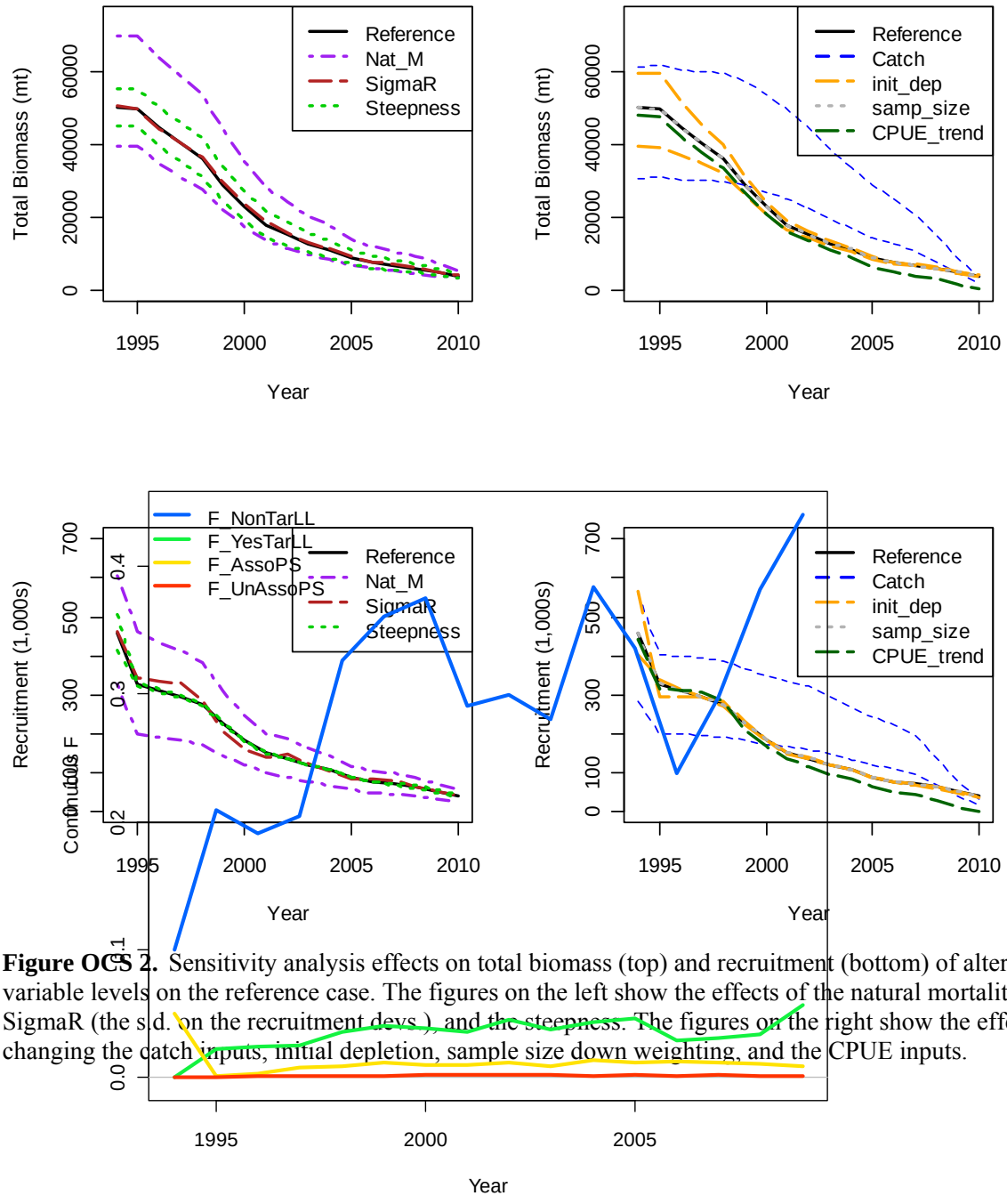


Figure OCS 2. Sensitivity analysis effects on total biomass (top) and recruitment (bottom) of alternate variable levels on the reference case. The figures on the left show the effects of the natural mortality, SigmaR (the s.d. on the recruitment devs.), and the steepness. The figures on the right show the effects of changing the catch inputs, initial depletion, sample size down weighting, and the CPUE inputs.

Figure OCS 4. Estimated fishing mortality by fleet for the reference case over the model period.

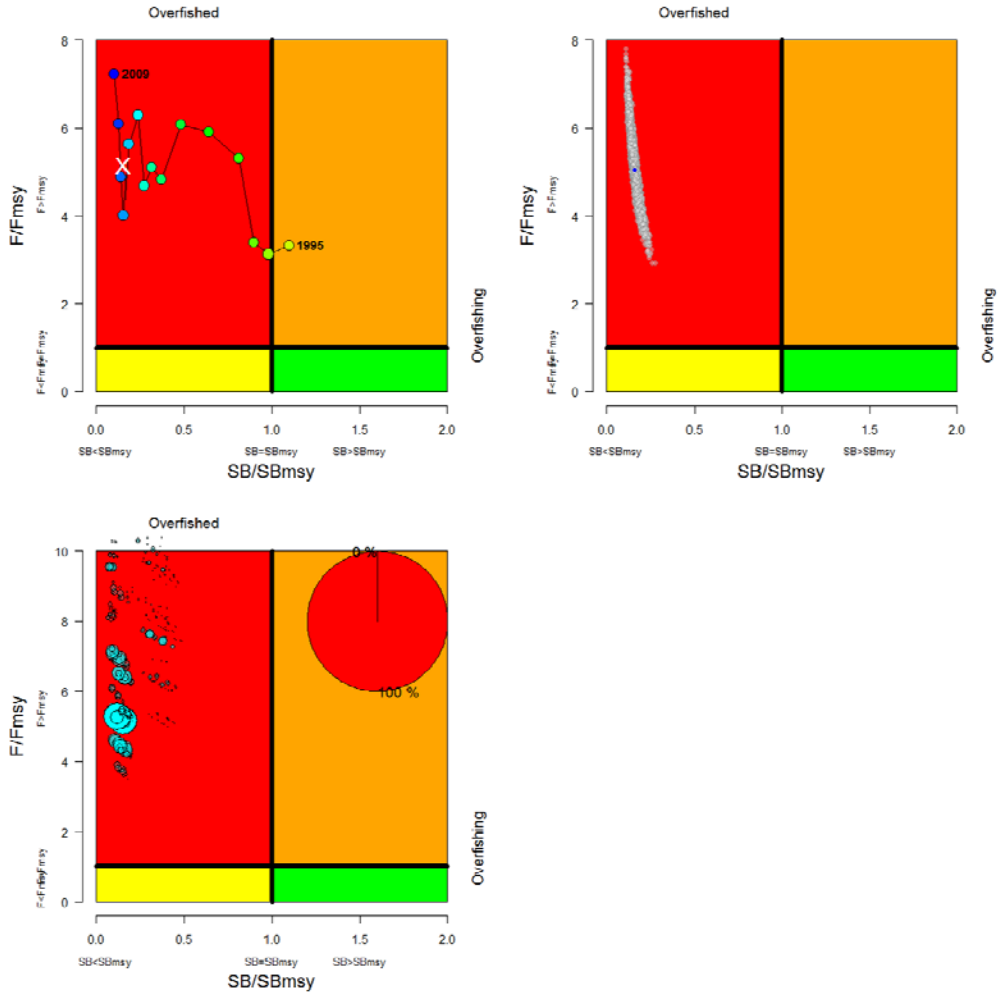


Figure OCS 6. Kobe plots indicating annual stock status, relative to SB_{MSY} (x-axis) and F_{MSY} (y-axis) reference points. These present the reference model for the period 1995–2009 (top left panel), the statistical uncertainty based on the MCMC analysis for the current (average of 2005-2008) status (top right panel, blue dot indicates current estimates), and based on the current (average of 2005-2008) estimates for all 648 models in the grid (bottom panel). In the bottom panel the size of the blue circles is proportional to the weight (plausibility) of the model run. The pie chart in the top right summarises the proportion of model weight in each quadrant. Note that the y-axes range differ in the bottom plot.

b. Management Advice and Implications

259. Despite the data limitations going into the assessment, and the wide range of uncertainties considered, all of the accepted model runs indicate that the WCPO oceanic whitetip shark stock is currently overfished and overfishing is occurring relative to commonly used MSY-based reference points and depletion-based reference points. Management measures to reduce fishing mortality and to rebuild spawning biomass have been agreed to under CMM 2011-04, but mitigation to avoid capture is recommended.

260. Given the bycatch nature of most of the fishery impacts, mitigation measures provide the best opportunity to improve the status of the WCPO oceanic whitetip shark stock.

261. Reference points for non-target species, including oceanic whitetip sharks, should be developed as envisaged under Articles 5 and 10 of the WCPF Convention.

4.9.2 Silky Shark

4.9.2.1 Review of research and information

262. J. Rice (SPC) presented a stock assessment of silky sharks in the WCPO (SC8-SA-WP-07). The excerpts from the Executive Summary of this paper are provided below. This summary includes several figures and tables regarding stock status that reflect the model runs selected by SC for the determination of current stock status and the provision of management advice.

263. This paper presents the first stock assessment of silky shark in the western and central Pacific Ocean. The assessment uses the stock assessment model Stock Synthesis[9]. The silky shark model is an age (36 years) structured, spatially aggregated (1 region) and two sex model. The catch, effort, and size composition of catch, are grouped into 4 fisheries, all of which cover the time period from 1995 through 2009.

264. Silky sharks are most often caught as bycatch in the Pacific tuna fisheries, though some shark target and mixed species (sharks and tunas/billfish) fisheries do exist. Commercial reporting of landings has been minimal, as has information regarding the targeting, and fate of sharks encountered in the fisheries. Useful data on catch and effort is mostly limited to observer data held by the SPC, but the observer data also suffers from poor coverage. Therefore multiple data gaps had to be overcome through the use of integrated stock assessment techniques and the inclusion of alternate data that reflected different states of nature.

265. Multiple models with different combinations of the input datasets and structural model hypotheses were run to assess the plausible range of inputs and the resulting estimates of stock status. These models were each given a 'weight' based on the a priori plausibility of the assumptions and data used in each model. The reference case presented here was the highest weighted run. This reference case model is used to represent the stock status along the additional model runs selected by the committee to represent the uncertainty in the model. We have reported stock status in relation to MSY based reference points, but the actual reference points to be used to manage this stock have not yet been determined by the Commission.

266. The key conclusions of the WCPO silky shark stock assessment are:

[9] Stock Synthesis version 3.21B http://nft.nefsc.noaa.gov/Download.html

a. Notwithstanding the difficulties inherent in the input data, the size composition data shows consistent declines over the period of the model (1995-2009) which is coupled with increasing fishing mortality, and a recently declining CPUE trend.

b. The results of the model can be split into two categories which are mutually exclusive with respect to the estimates of stock status. These two categories are characterized by the CPUE input. All runs that included the target longline and purse seine CPUE trends estimated a current total biomass in excess of 150,000,000 mt which is more than 18 times greater than the combined 2010 estimate of bigeye, south Pacific albacore, skipjack and yellowfin tuna total biomass combined. Therefore these runs are not considered plausible and dropped from the summary. The following results are based on the reference case and the minimum and maximum values of the runs selected by the committee to depict the uncertainty in the model.

c. This is a low productivity species and this is reflected in the low estimated value for F_{MSY} (0.078) and high estimated value for SB_{MSY} / SB_{zero} (0.38). These directly impact on conclusions about overfishing and the overfished status of the stock.

d. Based on the highest probability model (the reference case), estimated spawning biomass, total biomass and recruitment all decline consistently throughout the period of the model. The biomass declines are driven by the CPUE series, and the recruitment decline is driven through the tight assumed relationship between spawning biomass and recruitment.

e. Estimated fishing mortality has increased to levels far in excess of F_{MSY}. The reference case estimate of $F_{CURRENT}/F_{MSY}$ = 6.4 (with a range of 4.2 to 10.2 based on the runs selected by the committee to represent the uncertainty in the model). Based on these results we conclude that overfishing is occurring.

f. Estimated spawning biomass has declined to levels far below SB_{MSY}. The reference case estimate of $SB_{current}$ / SB_{MSY}= 0.66 (with a range of 0.48 to 0.81 based on the runs selected by the SC to represent the uncertainty in the model). Based on these results we conclude that the stock is overfished.

g. Noting that estimates of SB_{zero} and SB_{MSY} are particularly uncertain since the model domain begins in 1995, it is also useful to compare current stock size to that at the start of the model. Estimated spawning biomass has declined over the model period to 62% of the 1995 value in the reference case (with a range of 0.51 to 0.95 based on the runs selected by the committee to represent the uncertainty in the model).

h. Current catch based on the reference case is higher than the MSY (5,950 mt versus 1,885 mt), further catch at current levels of fishing mortality would continue to deplete the stock below MSY. Current (2005 to 2008 average) and latest (2009) catches are significantly greater than the forecast catch in 2010 under F_{MSY} conditions (510 mt).

i. The greatest impact on the stock is attributed to bycatch from the longline fishery, but there are also significant impacts from the associated purse seine fishery which catches predominantly juvenile individuals, the fishing mortality from the associated purse seine fishery alone is above F_{MSY}.

j. Given the bycatch nature of fishery impacts, mitigation measures provides the best opportunity to improve the status of the silky shark population. Existing observer data may provide some information on which measures would be the most effective.

k. Given recent decisions to improve logsheet catch reporting and observer coverage in the longline fishery it is recommended that an updated assessment be undertaken in 2014.

Discussion

267. CCMs noted and acknowledged similarities and differences between the oceanic whitetip and silky shark stock assessments.

268. SPC explained that an important difference in the silky shark stock assessment was the significant impact that purse seine associated effort has on the stock exacerbated by a high percentage of juveniles that are taken by that fishery. The basic life history of a K-selected species (slow growth, low fecundity, higher age at maturity) was also noted as a significant negative factor in determining silky shark stock conditions. Similar to the oceanic whitetip shark stock assessment, it was acknowledged that the silky shark assessment would benefit greatly from more and higher resolution data, particularly in observer programmes in Japan and Hawaii.

269. Japan stated it would consider making its data holdings available for analysis under similar conditions offered to the Scientific Services Provider in the past.

270. SPC cited data availability as the main deterrent to conducting additional sensitivity analyses suggested by CCMs. It noted the apparent importance of a vessel effect in the difference between nominal and standardized CPUE series, and clarified that in delta-lognormal models both components (zeros and non-zeros) showed a similar trend.

271. The US highlighted that the divergence in nominal and standardized CPUE indices (SC8-SA-WP-07, Figure 5) occurred post-2004 which coincides with a period of several years for which Hawaii longline observer data has not been provided to the WCPFC due to domestic legal constraints. It was noted that the standardized catch rates of Walsh and Clarke (2011; SC7-EB-WP-03) which included the Hawaii longline data for the period 1995-2010 had not been utilized in the assessment. The US suggested that future assessments should utilize a longer and updated time series from its fleet if possible. The lack of correspondence between an increasing trend in fishing mortality and a decreasing trend in longline catches was also noted.

272. The IATTC representative was asked to comment on whether the trends in silky shark stock status presented for the WCPO are similar to those seen in the EPO. The IATTC representative explained that silky shark assessment work in the EPO is ongoing and currently focused on resolving data issues.

273. FFA members emphasized the need to reduce the fishing mortality of sharks, noting the high mortality of juvenile silky shark in associated purse seine sets, and calling for mitigation measures to be developed and adopted across all pelagic fisheries. FFA members' intention to introduce to WCPFC9 a new CMM discouraging targeting of sharks was reiterated along with a call for the development of appropriate reference points for non-target species.

274. CCMs expressed concerns over the levels of uncertainty in the assessment likely caused by limitations on data and data availability. For example, in the oceanic whitetip assessment all four CPUE series showed similar trends, whereas trends differed significantly among CPUE series in the silky shark assessment. CCMs also noted that when the purse seine CPUE series were used in the assessment, unrealistically high biomass estimates were obtained.

275. Japan expressed its view that it does not support an approach that treats shark species as a whole since it believes CMMs should be developed based on the stock status of each species.

4.9.2.2 Provision of scientific information

a. Status and trends

276. The 2012 silky shark assessment was the first assessment completed for this species. There is conflict among the different CPUE series and this conflict carries through the assessment to indicate very different management implications. The longline bycatch series suggests significant declines in abundance (and overfishing), while the models incorporating the purse seine CPUE series resulted in unrealistically high biomass estimates, with no sustainability concerns.

277. It might be expected that the CPUE series developed on longline bycatch would be more reflective of changes in abundance than the target longline CPUE series, which is extremely spatially limited, or the purse seine CPUE series which has no clear measure of fishing effort. The SC considered that the incorporation of additional existing observer data could lead to significantly different conclusions from the assessment, and therefore additional work is required. Therefore, the SC concluded that it was not possible to determine estimates of stock status and yields.

278. SC8 noted the findings of WCPFC-SC7-2011/EB-WP-03 which state:

> *"Although silky sharks have been shown to have declining catch rate trends in past studies in the Pacific, no strong trends were found in recent (2011) WCPO analyses. Nevertheless, declining size trends in two datasets, declining catch rates in these two datasets for the most recent years of the time series, and increasing removals all indicate a need for close, ongoing monitoring of indicators. Further research may allow better definition of trends and a clearer depiction of stock status."*

Refining standardized CPUE and the assessment

279. There is large structural uncertainty in the silky shark assessment which needs to be addressed in future assessments, however the 2012 silky shark assessment represents the best available information. The conflicting trends in the standardized longline (declines after 2004) and purse seine (increases in most of the time series) fisheries require further investigation. The model fit to the highly influential bycatch longline series is poor. Particular investigation should be made on the divergence between standardized and nominal CPUE after 2004 which occurs when vessel effects are incorporated into the standardization process.

b. Management Advice and Implications

280. Noting SC8s concerns over the data conflict and potential biases in the silky shark assessment, it is not possible to provide management advice based on the assessment at this time. However,

noting that some basic fishery indicators (e.g. mean lengths and some CPUE series) are showing declines in recent years, the SC recommends no increase in fishing mortality on silky sharks.

281. Further, recognizing that the major fishery impacts relate to non-target fisheries, the SC recommends that the Commission consider mitigation measures to reduce the impact of these non-target fisheries as a precautionary measure. SC8 recommends that the silky shark assessment be updated to incorporate all potentially important data series.

282. Reference points for non-targets species, including silky sharks, should be developed as envisaged under Articles 5 and 10 of the WCPF Convention.

4.10 Stock Assessment Methods

4.10.1 Review of research and information

283. CCMs were referred to SC8-SA-IP-01 which describes recent developments in the MULTIFAN-CL stock assessment software.

AGENDA ITEM 5MANAGEMENT ISSUES THEME

284. The Management Issues theme was convened by R. Campbell (Australia). The rapporteurs for this theme were S. Harley (SPC), V. Chan (USA), P. Kleiber (USA) and A. Beeching (Secretariat). The Convener informed the meeting that six Working Papers would be presented during this session and that a further two Information Papers had been prepared.

5.1 Terms of Reference

285. The Convener informed the meeting that SC7 had adopted draft terms of reference (TOR) for this theme and forwarded these to the Commission for consideration. WCPFC8 reviewed these TOR and the adopted TOR are given in SC8-MI-IP-01.

5.2 Limit Reference Points (LRPs)

286. The Convener informed the meeting that WCPFC8 had endorsed the hierarchical approach to identifying limit reference points recommended by SC7 and tasked the Scientific Services Provider with undertaking the work recommended by SC7 on limit reference points for the consideration of SC8. This work is summarized in SC8-MI-WP-01 which was presented by A. Berger (SPC) and contains an evaluation of bigeye, skipjack, and yellowfin and southwest Pacific striped marlin stocks against potential limit reference points.

287. Three important aspects of limit reference points were addressed in the presentation:

- Background information providing context for the MOW on what reference points are, and their purpose in fisheries management;
- Supporting analysis (as requested from SC7) that may allow the Scientific Committee to recommend specific limit reference points to the Commission. This would allow us to refine the analytical material presented to the MOW; and
- Some discussion of technical issues relating to how we incorporate uncertainty into our analyses when calculating or predicting (for projections) the probability that we have exceeded a limit reference point.

The paper updated SC7-MI-WP-04 specifically responding to requests made by SC7 for further analysis. The analyses were based on deterministic projections from a structural uncertainty grid (i.e., the same methodology as SC7-MI-WP-04) and covers the most recent stock assessments available at the time: the 2011 assessments reviewed by SC7 for bigeye, skipjack, and yellowfin tunas, and the 2012 assessments for south Pacific albacore and southwest Pacific striped marlin. Tables and figures are presented expressing the uncertainty in stock status in relation to various reference points on indicators relating to fishing mortality, spawning biomass relative to equilibrium virgin levels, and spawning biomass relative to the levels predicted to exist presently in the absence of fishing. The latter depletion estimator is recommended due to the non-equilibrium conditions estimated for many WCPO stocks – especially when recent average recruitment is used for projections. The paper also considers the recommendation by Preece et al. (2011) that only $20\%SB_0$ be considered for skipjack, albacore, and billfish. Based on the recently published large scale studies on growth and reproductive biology for south Pacific albacore tuna and southwest Pacific striped marlin, SPC believes that the uncertainties relating to key life-history parameters are no worse for these stocks than bigeye or yellowfin tuna, and hence that the stock assessments meet the 'exception' of Preece et al. (2011) being instances where a

thorough examination of model sensitivity exists.

Discussion

288. Some CCMs were concerned about how the level of depletion was set in relation to unfished biomass, noting the inherent uncertainties in estimating recruitment.

289. SPC replied that this uncertainty is addressed in part by including SB_{zero} from a representative period, noting that the selection of that period influences risk, but does not affect the identification of a LRP. SC6 had decided that recent average recruitment was appropriate for bigeye tuna, and consistency in estimating SB_{zero} is desirable. It was noted that as the estimation of recruitment in the last year of the assessment is highly uncertain, this year is not included. Spawning biomass is influenced by environmental factors and the length of the selected time period should take into account a background of changing ocean regimes, and is a key point of uncertainty. On this basis, several CCMs requested additional advice from SPC as to the best period to select for each species.

290. There was also discussion on the level of acceptable risk for exceeding the limit reference point and one CCM asked how the 10% risk level had been derived.

291. SPC stated that the level was suggested as a starting point for discussion but noted that according to the UN Fish Stocks Agreement a precautionary approach accepts a low risk of exceeding a limit reference point. It was also noted that a 10% probability risk is a common value adopted in fishery management but should be evaluated in a Management Strategy Evaluation (MSE). This level of risk can be traded off against other objectives in the fishery, noting that it is important to consider both the nature of the reference point itself, and the risk of exceeding it, at the same time.

292. One CCM asked how one could know at what level recruitment overfishing occurs given that this had not been observed in WCPO stocks. SPC referred to WCPFC-SC7-2011/MI-WP-03 which had reviewed this issue and suggested the use of a depletion estimator of 0.2 for WCPO tuna and striped marlin, and proposed a LRP of 20% spawning biomass where recruitment is calculated over a representative period.

293. Several CCMs proposed the adoption of $20\%SB_0$ as the biomass-based reference point for bigeye, yellowfin, skipjack and south Pacific albacore stating that this was consistent with the provisional recommendations last year. They also accepted a general risk allowance of 10% for tuna stocks but suggested that the SC consider a more conservative risk level of 5% for skipjack and south Pacific albacore given the importance of both of these species to SIDS. They also requested that the Scientific Services Provider develop a common approach to characterisation of uncertainty and estimation of risk in relation to limit reference points in order to ensure consistency in the provision of management advice to the Commission.

294. The USA expressed a preference for fishing mortality-based (i.e. F-based) limit reference points, noting that as fishing mortality is a parameter that the Commission controls, they are more likely to be robust against changes in recruitment, and they require less information about the biological responses of tunas especially at lower biomass. This is pertinent to tunas in this region which have not been fished down to very low levels. The USA also noted that tuna stocks were likely to have above-average resilience and associated %SPR values would be expected to be between 15-25%. It was further noted

that MSY is a natural LRP because it results in the optimum level of depletion. The uncertainties associated with biomass-based limit reference points make them a less attractive option.

295. There was a suggestion that the Scientific Services Provider be encouraged to continue investigation in to appropriate F_{SPR} levels for bigeye, yellowfin and albacore tuna, but that a fishing mortality based reference point is not necessary for skipjack.

296. Several CCMs noted the ongoing absence of reference points for northern stocks and the uncertainty that surrounds the $F_{SSB\text{-}AHTL}$ reference point adopted by the NC for northern albacore. It was noted that SC7 had requested that the ISC model the reference points provisionally agreed to last year for the northern stocks, including a comparison of the $F_{SSB\text{-}AHTL}$ reference point for albacore to conventional reference points. Some CCMs queried whether this work was undertaken but no response was provided.

Recommendations

297. SC8 noted the hierarchical approach to identifying the key limit reference points (LRPs) for the key target species in the WCPFC recommended by SC7 and adopted by the Commission at WCPFC8.

298. SC8 recommended, noting the current level of research and the uncertainties in our knowledge on steepness, particularly on the level where recruitment overfishing may start, that LRPs for BET, YFT and south Pacific ALB be set at Level 2 with regard to the biomass-based LRP of $20\%SB_{recent,F=0}$, with deferral of a recommendation on the value of X% in the Level 2 fishing mortality-based LRP of $F_{x\%SPR}$ to SC9 (note that SPR refers to the spawning-potential-per-recruit and $SB_{recent,F=0}$ refers to the estimated average spawning biomass over a recent period in the absence of fishing). The LRP for SKJ was recommended to be set at Level 3, i.e. $20\%SB_{recent,F=0}$.

299. One CCM recommended $F_{20\%SPR}$ as a LRP for Level 2. This CCM stated that $F_{20\%SPR}$ is logically consistent with $20\%SB_{recent,F=0}$ as a means of maintaining a minimal spawning potential. This CCM noted that it is important to have LRPs for both harvest rate and depletion level to conserve spawning potential. Finally, this CCM stated that estimates of $F_{20\%SPR}$ are more robust to biological uncertainties than $20\%SB_{recent,F=0}$ because $F_{20\%SPR}$ does not require an estimate of unfished recruitment.

300. SC8 recommended that the probability of breaching a limit reference point should be very low.

301. SC8 recommended that the allowable risk of breaching a limit reference point may be applied on a species-specific basis, for example higher risk for yellowfin and bigeye tunas but a more precautionary lower risk to skipjack and south Pacific albacore tuna.

302. SC8 noted that a range of risk levels of breaching the LRP were suggested by CCMs with a majority of CCMs recommending a 10% level and that a lower more precautionary value could be considered in some cases.

303. SC8 recommended that the Management Objectives Workshop review appropriate values for specifying the level of risk for individual species.

304. SC8 recommends that further work be undertaken by SPC on the identification of:

- **the appropriate period for estimating the average recruitment for each species in the LRP $20\%SB_{recent,F=0}$, and**
- **the appropriate values of X for each species in the LRP $F_{x\%SPRo}$,**

and that this work be presented to SC9 for review and for final specification of these LRPs.

305. SC8 recommends that work should continue to move all key WCPFC stocks to the Level 1 reference points.

306. SC8 recommended that SPC further develop a common approach to characterisation of uncertainty and estimation of risk in relation to limit reference points, in order to ensure consistency in the provision of management advice to the Commission, and that this approach be reviewed at SC9.

307. SC8 further recommends SPC present working paper SC8-MI-WP-01 to the Management Objectives Workshop, which is to be held prior to WCPFC9, for further discussion.

5.3 Target Reference Points for the WCPFC

308. The Convener reminded the meeting that SC7 had requested that the Scientific Services Provider (SPC) prepare a paper for the management objectives workshop to identify and evaluate candidate target reference points for skipjack, including empirical reference points such as those based on CPUE, as well possible target reference points derived from stock assessment models.

309. G. Pilling (SPC) presented a paper on target reference points for WCPO stocks with an emphasis on skipjack stocks (SC8-MI-WP-02). This paper is one of a suite of work contracted to inform the WCPFC Management Objectives Workshop, planned to be held prior to WCPFC9. This paper focuses on target reference points, and the other two papers focus on limit reference points and harvest control rules. This paper: discusses biological, socio-economic and empirical target reference points, their strengths and weaknesses, and decisions needed to operationalise them; raises issues to be recognised when considering candidate target reference points, including concepts of risk and trade-offs; provides a simple evaluation of the performance of five alternative target reference points for the WCPO skipjack tuna stock through stochastic projections; provides a preliminary evaluation of the utility of empirical indicators for this stock. Tables and figures are presented examining the performance of alternative targets relative to: a) the risk involved with each target reference point, evaluated relative to candidate limit reference points: $20\%SB_0$, $20\%SB_{CurrentF=0}$ and SB_{MSY}; b) catch levels within the tropical purse seine fishery over the projection period; and c) the stock biomass vulnerable to the FAD associated purse seine fishery. The paper does not aim to identify which target reference point is 'best' for WCPO skipjack. Target reference points should be defined by managers based on their desired goals for the fishery. In turn, the performance measures to be used when evaluating their performance should be linked to the manager's aims for the fishery, and allow decisions on the 'acceptable' trade-offs between these and other consequences arising from a target reference point. Feedback was sought on:

- The planned goals of fishery managers, to help identify new candidate target reference points for evaluation and presentation;
- Performance measures of interest to managers for evaluation, to allow a fuller analysis of the trade-offs inherent in alternative target reference points, and the timeframe for which they should be calculated;

- Definition of the limit reference points to be used within evaluations; and
- Alternative empirical indicator reference points for examination.

Discussion

310. FFA members thanked SPC for the paper but called for a greater recognition of the multi-species implications of target reference points, i.e. that each species plays a different role in the overall fishery, in future papers. These members also noted that the identification of appropriate target reference points is likely to be more difficult than the identification of limits reference points due to the need to also consider social, economic and political objectives as well as biological objectives.

311. In response SPC stated that multispecies implications can be considered in this work, in particular by defining or informing risk levels for what may be considered non-target species in the analysis.

312. FFA members acknowledged a role for empirical indicators in the harvest strategy for the fishery either in their own right or as a supplementary way of monitoring progress of the fishery against model based reference points that that are also under consideration. As such, they asked what additional information might be useful in understanding issues such as effort creep and hyper-stability to allow the use of indicators such as catch rates with a higher degree of certainty.

313. The Convener noted that while the use of a CPUE indicator for skipjack in the purse seine fishery may at present not be considered a reliable indicator of underlying biomass, there may be other fisheries where the use of a CPUE empirical indicator might be more useful, for example for bigeye and yellowfin in the longline fisheries.

314. PNA members noted that they are working towards the adoption of a target reference point for skipjack in the range of 40 to 60% of unfished biomass or an equivalent measure, and called for the Commission to consider adopting a similar standard.

5.4 Harvest Control Rules

315. The Convener reminded the meeting that SC7 had recommended that once adopted, limit and target reference points would need to be implemented along with harvest control rules and that development of these harvest control rules should be included in the SC work plan. The Commission had requested that SC8 review relevant work undertaken on the concept, structure and development of harvest control rules for the WCPFC in preparation for the Management Objectives Workshop.

316. A. Berger (SPC) presented an introduction to harvest control rules for WCPO fisheries (SC8-MI-WP-03). This paper is one of a suite of work contracted to inform the WCPFC Management Objectives Workshop currently scheduled for prior to WCPFC9 in late 2012. This paper aims to introduce the concept of harvest control rules for the WCPO as well as some specific example HCRs applied to the skipjack (effort-based rules) and South Pacific albacore (catch-based rules) fisheries to demonstrate the process for evaluating alternative HCRs and linking results to the Kobe II strategy matrix. Key features of HCRs are that they:

- provide a format to operationalize management objectives;
- integrate management parameters (e.g., target and limit reference points);
- specify pre-agreed management responses to changes in the status of the stock;
- increase transparency in how harvest management decisions are made; and

- provide a means for the development of rational fisheries management strategies through science-based decision-making.

The evaluation of alternative HCRs and eventual establishment of a harvest policy requires key inputs from stakeholders and managers before HCR management system evaluations can meaningfully be conducted. For each management system (e.g., WCPO skipjack tuna fishery) these include the need to: establish a clear set of management objectives; define management target and limit reference points consistent with those objectives; establish a set of performance metrics that correspond to the set of management objectives; define key system uncertainties that should be taken into account during analyses; identify alternative management options (e.g., type of harvest control measure, data to be used, or stock assessment procedures); and formulate candidate HCRs using the above information to be evaluated through simulation analyses. Results from the illustrative examples highlight how the performance of alternative HCRs change when measured against different hypothetical management objectives, and how alternative HCRs can be comparatively evaluated by looking at key trade-offs. These results emphasize some differences between HCRs that do not adjust harvest levels with stock status (more risk prone) and HCRs that do adjust (more risk averse) as well as some differences between the performance of effort-based and catch-based HCRs. Although designed to be illustrative, these examples provide insight into the process for developing HCRs for WCPO tuna fisheries.

Discussion

317. FFA members expressed support for HCRs, noting that they would add to the tools, such as the PNA purse seine VDS and the development of zone-based arrangements for longline fisheries, already used by FFA members. FFA members called for two improvements in future work on this topic: a) use of the LRPs recommended by the SC under agenda item 5.2; and b) inclusion of candidate target reference points on the relevant figures, such as the Kobe plots of modelled 2021 outcomes under various harvest rules.

318. PNA members stated their support for further work on HCRs and for the preceding comments by FFA members.

319. One CCM, while noting that MSY is an important concept in the convention, also noted that it is difficult to estimate and for this reason the SC has also examined proxies. Noting that the IATTC have seem systematic changes or regime shifts in the patterns of recruitment of yellowfin in the eastern Pacific Ocean, such changes can have impacts on MSY-based quantities. It will be useful to examine the robustness of various reference points and HCRs to regime shifts in future work.

320. The Convener noted that a range of reference points, not only MSY-based reference points, will be presented and discussed at the Management Objectives Workshop.

321. Another CCM reiterated that there is considerable uncertainty in comparing stock status against limit reference points. This CCM also supported the consideration of environmental and socioeconomic factors at the Management Objectives Workshop.

322. Australia informed the meeting that they already use reference points and HCRs to manage their Commonwealth fisheries and urged the Commission to continue to progress toward adoption of these tools through the Management Objectives Workshop.

Recommendations

323. SC8 considered working papers SC8-MI-WP-02 and SC8-MI-WP-03 on target reference points and harvest control rules and recommends these papers be presented to the Management Objectives Workshop which is to be held prior to WCPFC9.

324. SC8 also recommends that in preparing information for the Management Objectives Workshop that SPC take into consideration the following:

- **use of the limit reference points recommended by SC8;**
- **consideration of the multi-species implications of target reference points; and**
- **the role for empirical indicators in the harvest control rules.**

5.5 Review of CMM 2008-01

325. The Convener reminded the meeting that WCPFC8 had adopted CMM 2011-01 such that the measures applicable for 2011 under CMM 2008-01 (with several exemptions) shall remain in effect until 28 February 2013. Assisted by the Scientific Services Provider, SC8 had been requested to review the ability of the measure to reduce fishing mortality of bigeye tuna and the effectiveness of CMM 2008-01 and provide scientific advice to the Commission for the development of a revised CMM for bigeye, yellowfin and skipjack tuna stocks. Two papers addressing this issue were considered by the meeting.

5.3.1 Review of the Effectiveness of CMM 2008-01

a. Presentation on Bigeye Tuna Catch by Set Type

326. H. Okamoto (Japan) presented a paper on the relationship between bigeye tuna catch and set type in Japanese purse seines operated in tropical areas of the WCPO (SC8-MI-WP-04). As part of an approach to reduce bycatch of bigeye tuna by Japanese purse seines on FAD sets, the relationship between bigeye catch and set type was investigated. The study related to CMM 2008-01 (paras 25 and 26 (Juvenile Tuna Catch Mitigation Research)). Catch information was collected from logbook and market slips (fish unloading data). In the last two years, sets on free schools (unassociated sets) by Japanese purse seines have dominated, that is, the proportion of associated sets has been reduced. At the same time, catches of bigeye tuna, small yellowfin and small skipjack decreased. Generalized linear model analysis indicated that the decrease of these catches is significantly influenced by the decrease in the proportion of associated sets relative to unassociated sets. Based on these results, it was suggested that the appropriate management of FAD set ratios or the number of FAD sets would be effective to control purse seine effort on FADs and fishing mortality of bigeye tuna.

Discussion

327. One CCM stated that given that a reduction in FAD fishing by the Japanese purse seine fleet has resulted in reduced catches of juvenile bigeye, the FAD closure had been shown to be effective in achieving the objectives of the CMM and should therefore be extended.

b. Presentation on the Implementation and Effectiveness of Key Management Measures

328. J. Hampton (SPC) presented an overview of SC8-MI-WP-06. The paper provides a review of the implementation and effectiveness of key management measures for tropical tuna, using the most current data and stock assessments available. The implementation of the CMM was reviewed for its key

components – purse seine effort, the FAD closure, the high seas pockets (HSP) closure, longline catches and catches by other fisheries. The main conclusions from the paper regarding implementation are as follows:

a. Purse seine effort has expanded continuously since the introduction of CMM 2008-01, with effort (excluding domestic purse seiners based in Indonesia and Philippines) in 2011 estimated to have increased by approximately 31% compared to effort in 2004.

b. The incidence of reported activity related to use of drifting FADs during the FAD closures was considerably lower in 2010 and 2011 (6.0 and 8.2%) compared to 2009 (16.1%). Effort remained at around normal levels throughout the closures. In 2010, the proportions of effort associated with FAD usage outside the closure period, particularly the months immediately before and after the closure, were lower than is typically the case. In 2011, overall FAD usage returned to more typical levels prior to the 2011 closure. It is evident that several fleets (notably Japan, Philippines, New Zealand) have substantially changed their fishing operations, focusing more on unassociated set fishing in 2010 and 2011 than they had in the past, but it is not known if this is a deliberate strategy or rather a response to the availability of surface schools. In spite of this, the total estimated number of FAD sets made in 2011 was a record high, largely due to increased purse seine effort overall. Skipjack, yellowfin and total catches were slightly below average during the 2009 and 2010 closures. Sustained high total catches (particularly skipjack and bigeye) occurred between the 2010 and 2011 closures; however total (and skipjack) catches during the 2011 closure were very depressed. Catches recovered somewhat following the 2011 closure, but did not reach the levels experienced earlier in the year. The catches of bigeye tuna were strongly reduced during closure periods compared to the other months of those years.

c. Available data from all sources indicate that the HSP closure since 1 January 2010 has largely been respected.

d. In 2011, reported longline catch of bigeye tuna was 64,175 tonnes, or 76% of the 2001-2004 level. For some flag states, current catches are lower than their limits and therefore there is scope for increased longline catches within existing management arrangements. Also, there is evidence that the reduction in bigeye tuna catch resulted more from reduced CPUE, possibly indicating stock declines, than from reduction in fishing effort.

329. To evaluate the effectiveness of CMM 2008-01, stock projections were undertaken using the reference case models for the 2011 assessments for bigeye, skipjack, and yellowfin tunas. These models were adopted by SC7 for the provision of management advice. Similar methods were used as in previous years and the results are provided in the form of two excel files with a separate worksheet for each species contained therein. Of particular interest from the projections is that maintenance of bigeye tuna catch and effort levels observed in the fishery in 2009 results in F/FMSY remaining high, with a projected level of 1.40 in 2021. However, for the scenario best approximating the reported catch and effort in the fishery in 2010, F/FMSY declines and is at a projected level of 0.96 in 2021. This is driven by several factors: the lower than usual FAD use in 2010, the lower longline catches, and a large (30%) reduction in reported catches from the domestic fisheries of Indonesia and the Philippines. For the scenario approximating 2011 fishery conditions, F/FMSY stabilises at a projected level of 1.29. The difference between 2010 and 2011 fishery outcomes is mainly due to the return to higher levels of FAD-based purse seine effort in 2011.

330. For scenarios that mimic a total purse seine closure (i.e., where FAD effort is not transferred to unassociated fishing), there is a relatively small incremental reduction in F/F_{MSY} compared to that achieved by a FAD closure. However, this comes at a cost of substantial reductions in total catch, particularly in the purse seine fishery. This conclusion is robust to the use of base years from 2001-2009 to characterize the differences.

331. The projection results were also used to quantify in an approximate way the impact of the various exemptions contained within CMM 2008-01. It was estimated that if the CMM was implemented without exemptions, approximately half of the overfishing that is estimated could occur under the CMM as written could be removed (reduction of bigeye tuna F/F_{MSY} from 1.35 to 1.17). This result is similar to previous analyses of this issue.

332. Finally, we estimated the individual impacts on bigeye tuna F/F_{MSY} of observed levels of catch or effort for the longline, purse seine and domestic Philippines and Indonesia fishery groups in 2009 and 2010 against a base of 2004. The reduction in purse seine FAD effort in 2010 has the greatest effect in terms of removing overfishing (67.4% of overfishing removed) followed by the reduction in longline catch in 2010 (34.7% of the overfishing removed).

Discussion

333. FFA Members noted that fishing mortality on skipjack and yellowfin is estimated to remain sustainable under current conditions and that since fishing mortality on bigeye has not been reduced to the intended level, additional targeted measures to reduce the fishing mortality on bigeye are necessary for all gear types. FFA members expressed concern that the reduction in catch at the same time as constant or even increasing effort suggests not a reduction in fishing mortality but a reduction in the availability of fish. This situation was considered to further strengthen the need for management measures applicable to all sectors of the fishery.

334. In further support of this position, FFA members noted recent technical measures to better control fishing effort, such as the PNA's designation of 2010 as an effort baseline for the future and the establishment of zone-based limits in the EEZs of non-PNA members. FFA members considered that these measures will result in a change from the arrangements under CMM 2008-01 where effort limits were poorly defined, easily misunderstood and largely open-ended to a more explicit articulation of the limits that are applicable in different areas. On this basis FFA members stated that purse seine effort is sustainable for its target stocks, and that improved bigeye conservation needs to come from other technical measures.

335. PNA members requested that skipjack and yellowfin projections be included in the paper as per Figure 10 for bigeye.

336. One CCM noted that based on the projection which assumes that fishing conditions in 2010 will continue, the fishing mortality on bigeye may drop below F_{MSY}. However, as more recent fishing activity indicates a record high of fishing on FADs, fishing mortality will likely remain very high and above F_{MSY}. On the other hand, longline catch was either stable or decreasing.

337. Several CCMs recommended extension of the FAD closure period and further control of purse seine FAD activity outside of the closure period.

338. One CCM, referring to Figure 11 of the paper, queried why the projected total catch of bigeye does not decline given a continuation of the FAD closure.

339. SPC explained that total catch in the final year of the projection is influenced by substantial yield per recruit gains – especially for yellowfin where larger fish are caught. The analysis assumes that characteristics in the fishery are the same now as they would be in the future. There may be capacity for longliners to increase their catch of bigeye because of the reduction of catch by purse seiners.

340. In response to a question regarding whether the analysis accounted for the potentially larger size of yellowfin caught in free schools, SPC explained that this was taken into account through the different selectivities adopted for each of the fisheries in the assessments.

341. FFA members considered that the analysis showed that there is no additional conservation gain for bigeye from a total closure compared to a FAD closure whereas there would be an obvious and significant impact on total yields in the fishery. FFA members thus considered that a well-implemented FAD closure is the most appropriate management measure and asked that the PNA's four-month FAD closure be evaluated in future analyses.

342. One CCM queried whether reducing the number of FAD sets rather than imposing a time closure would be more appropriate for achieving the objectives of CMM 2008-01. This CCM asked whether SPC could analyse historic data and determine what reduction of FAD fishing would be required.

343. SPC explained that the fishing conditions in 2010 reduced fishing mortality to MSY levels and that looking at the number of FAD sets that year would answer the question.

344. FFA members stated their support for CCMs which were voluntarily reducing their reliance on FAD fishing and encouraged other CCMs to follow suit.

345. PNA members noted that the FAD closure apparently made the largest contribution to removing bigeye overfishing, noting that in 2010, 67% of the overfishing was removed by reduced use of FADs.

346. SPC clarified that the figure of 67% relates to the overall pattern in purse seine fishing that occurred during 2010 including the FAD closure period (see Table 9 of SC8-MI-WP-06).

347. One CCM queried the declines in longline catches of bigeye as shown in Figure 9 of the paper asking whether it might be due to target shifting.

348. SPC stated that the analysis did not explicitly define longline targeting but clarified that the area used for the longline fleet was limited to the region 20N-10S and this should define tropical tuna targeting. The analysis of operational data would be the best way to answer this question.

c. Presentation on Mapping the WCPO Conservation Burden

349. Q. Hanich (Australia) presented a paper on mapping the conservation burden in the WCPO (SC8-MI-WP-05). The negotiation over the scope and application of a conservation measure is a negotiation over how the burden of conservation is distributed. The eventual decision will allocate the costs (conservation limits) and the benefits (fishing opportunities and future productivity improvements). Negotiations have to balance diverse interests and agree on how these interests are compromised. The Western and Central Pacific Fisheries Convention requires parties to ensure that conservation and management measures do not result in transferring a disproportionate burden of conservation action on to developing States (Article 30), and prescribes various criteria to be considered when allocating catch or

effort limits (Article 10). Determining the distribution of the conservation burden is a contentious issue as the Commission struggles to adequately respond to scientific advice to limit fishing effort and reduce fishing mortality for bigeye. Given current levels of overfishing and overcapacity, some or all Commission members must necessarily compromise their interests and carry some share of the conservation burden. This paper analyses WCPFC catch data, annual reports and market data, and presents an approximate graph of Commission member interests and discusses the potential impact of proposed conservation and management measures on these interests. The paper concludes with a proposal for a transparent framework for determining the distribution of the conservation burden.

Recommendations

350. The SC8 recommends that the TCC and the Commission note the following conclusions based on the analyses presented in working papers SC8-MI-WP-04 and SC8-MI-WP-06 when reviewing the effectiveness of CMM 2008-01 (and its extension under CMM 2011-01) and in the development of a revised CMM for bigeye, yellowfin and skipjack tuna stocks:

i) the limits placed on purse seine operations have not adequately constrained total purse seine effort, with total effort in 2011 estimated to be 31% higher compared to effort in 2004 and 46% higher than the 2001-2004 level;

ii) that the number of days reported with any activity related to a drifting FAD was 16.1% in 2009, 6.8 % in 2010 and 8.2% in 2011 during the FAD closure periods. The observed incidence of vessels drifting at night with fish aggregation lights on increased from 2.3% in 2009 to 6.8% in 2010 and was 3.4% in 2011;

iii) despite the FAD closure the total estimated number of FAD sets made in 2011 was a record high, largely due to high a FAD set ratio outside of the FAD closure period and increased purse seine effort overall. Nevertheless, several fleets (notably Japan, Philippines, New Zealand) have substantially changed their fishing operations, focusing more on unassociated set fishing in 2010 and 2011 than they had in the past but others remain highly dependent on FADs;

iv) the catch of bigeye tuna, small yellowfin and small skipjack can be significantly reduced by purse seines switching from FAD sets to unassociated sets;

v) the total purse seine catch of bigeye during 2011 was the highest on record (77,095 mt) and only the second time that the purse seine catch had exceeded the longline catch;

vi) available data indicates that the high-seas pocket closure since 1 January 2010 has largely been respected. Since January 2010, effort has been concentrated mainly in the EEZs, with no apparent re-distribution of effort to the eastern high seas, though effort in this area could increase with the predicted return of ENSO-neutral or *El Niño* conditions;

vii) closing areas/time entirely to purse seine fishing without consideration of the fate of displaced fishing effort will not be effective for bigeye conservation and less profitable to purse seine operations as a whole;

viii) the provisional longline catch of bigeye tuna in 2011 is 24% lower than the 2001-2004 level. However, in the core area of the tropical longline fishery, the

reduced catches have been paralleled by a decline in nominal CPUE and no apparent reduction in fishing effort, which indicate that the recent catch declines could be more the result of further declines in adult bigeye tuna abundance than reduced fishing mortality or a shift in target species;

ix) the provisional longline catch of yellowfin tuna in 2011 is close to the 2001-2004 average level;

x) stock projections undertaken using the reference case models for the 2011 assessments for bigeye tuna indicate that maintenance of bigeye tuna catch and effort levels observed in the fishery in 2009 results in F/F_{MSY} remaining high, with a projected level of 1.40 in 2021. However, for the scenario best approximating the reported catch and effort in the fishery in 2010, F/F_{MSY} declines and is at a projected level of 0.96 in 2021. This is driven by several factors: the lower than usual FAD use in 2010, the lower longline catches, and a large (30%) reduction in reported catches from the domestic fisheries of Indonesia and the Philippines. For the scenario approximating 2011 fishery conditions, F/F_{MSY} stabilises at a projected level of 1.29. The difference between 2010 and 2011 fishery outcomes is mainly due to the return to higher levels of FAD-based purse seine effort in 2011;

xi) for scenarios that mimic a total purse seine closure (i.e., where FAD effort is not transferred to unassociated fishing), there is a small incremental reduction in F/F_{MSY} compared to that achieved by a FAD closure. However, this comes at a cost of substantial reductions in total catch, particularly of skipjack in the purse seine fishery. This conclusion is robust to the use of base years from 2001-2009 to characterize the differences;

xii) it is estimated that if the CMM was implemented without exemptions, approximately an additional half of the overfishing that is estimated could occur under the CMM as written could be removed (reduction of bigeye tuna F/F_{MSY} from 1.35 to 1.17);

xiii) estimation of the individual impacts on bigeye tuna F/F_{MSY} of observed levels of catch or effort for the longline, purse seine and domestic Philippines and Indonesia fishery groups in 2009 and 2010 against a base of 2004 indicates that the reduction in purse seine FAD effort in 2010 has the greatest effect in terms of removing overfishing (67.4% of overfishing removed) followed by the reduction in longline catch in 2010 (34.7% of the overfishing removed).

351. Based on the above observations and analyses, and noting that the fishing mortality for bigeye has not been reduced to the level intended under CMM-2008-01, SC8 supports the need for additional or alternative targeted measures to reduce the fishing mortality on bigeye. In the development of a revised CMM for bigeye, yellowfin and skipjack tuna stocks SC8 recommends the Commission consider:

i) a strengthening of the control of FAD activities;

ii) building on the apparent success of some fleets in reducing their dependence on FADs to achieve greater control of FAD activity outside the closures, including control of the number of FADs set throughout a year instead of FAD time-closures;

iii) a reduction of the total number of FAD sets to the levels no greater than those in the fishery in 2010;

iv) clear definition of the limits on purse seine effort that are applicable in different areas;

v) reductions in fishing mortality on bigeye tuna from the longline fishery; and

vi) the adoption of management measures that apply to all sectors of the fishery.

352. SC8 recommends that the Commission take account of the information in working paper SC8-MI-WP-05 "Mapping the distribution of the conservation burden" in its consideration of new management measures for the WCPFC.

353. SC8 recommends that the Management Objectives Workshop consider the issues raised in working paper SC8-MI-WP-05.

5.6 Management Objectives Workshop

354. The Convener informed the meeting that WCPFC8 had reviewed the draft Terms of Reference for the Management Objectives Workshop adopted by SC7 and that the final set of TOR adopted by the Commission were available in SC8-MI-IP-02, together with a draft of the proposed meeting structure.

AGENDA ITEM 6ECOSYSTEM AND BYCATCH MITIGATION THEME

355. The Ecosystem and Bycatch Mitigation Theme was co-convened by D. Itano (USA) and A. Batibasaga (Fiji). Rapporteurs for the theme included A. Bloomquist (USA), V. Chan (USA) and K. Schaefer (IATTC).

6.1 Ecosystem effects of fishing

6.1.1 Review of research and information

356. S. Nicol (SPC) presented SC8-EB-WP-01 which describes a multi-agency collaboration that will improve knowledge on the influence of environmental drivers on tuna fisheries to reduce the uncertainty in short, medium and longer term projections of tuna catches. The project includes research to better forecast ENSO patterns and seasonal and decadal trends and the influence of this variability on tuna fisheries and food webs. The outcomes of the project will have direct application for SEAPODYM and should enhance national and international policy advice and technical support for sustainable tuna fisheries in the Western and Central Pacific Ocean under climate variation and longer-term change. The project complements the work program of the SC.

357. CCMs were also referred to information papers on progress with applying the SEAPODYM model to Pacific tunas and billfishes (SC8-EB-IP-06) and WCPO ecosystem indicator trends and results from Ecopath model simulations (SC8-EB-IP-11).

Discussion

358. FFA members expressed support for the ongoing development of ecosystem modelling efforts, and in particular SEAPODYM, to better understand top-down and bottom-up impacts and eco-system effects

of fishing. It was also noted that ecosystem models are data intensive and will require high quality logsheet data across taxa to better manage target and non-target fishing mortality.

359. SC8 was advised that the proposed project would seek external funding and thus would not impact Commission funds or personnel.

360. S. Nicol (SPC) also presented SC8-EB-WP-02 on the activities of the Kobe Joint tuna RFMO Technical Working Group for bycatch. Substantial progress has been achieved on the harmonisation of purse seine observer data, seabird identification guides and the Bycatch Mitigation Information System. No progress was reported for harmonising other tuna data between the tuna RFMOs or harmonising identification guides for turtles, sharks and marine mammals. No activities on ecological risk assessment of sharks for the IOTC or CCSBT were reported.

Discussion

361. ACAP noted that its seabird identification guide is still in the draft phase and requested CCMs provide feedback as it would like to produce a guide that is useful and reliable for all the tuna RFMOs.

362. SC8 noted that the Commission had previously allocated funds for work on a seabird identification guide, but the money had not been spent and it was suggested that the SC consider the relative importance of implementing the initial Commission decision.

Recommendations

363. **SC8 reiterates the need to improve knowledge on the influence of environmental effects on tuna fisheries to reduce the uncertainty in short, medium and longer term projections of tuna abundance. SC8 recognises that the outcomes of the project proposed in EB-WP-01 and its supportive linkages with the ongoing development of SEAPODYM will complement the SC's programme of work. SC8 recognizes that this project will not require direct contributions in funds or manpower from the Commission and endorses the development and implementation of the project if external funding can be secured.**

364. **SC8 notes the progress of the Kobe Technical Working Group for bycatch and provides the following advice: (1) the participation of the WCPFC secretariat (or its delegate) in the harmonisation of longline observer data is desirable; (2) encourages development of the Bycatch Mitigation Information System into a tuna RFMO wide resource; (3) submission of the ACAP harmonised seabird identification guide to the WCPFC Secretariat to coordinate its review.**

6.2 Sharks

6.2.1 Shark Research Plan

a. Progress Report on the Shark Research Plan

365. S. Harley (SPC) presented a summary of progress against the Shark Research Plan (SRP) since SC7 and an outline of potential work over the next 12 months (SC8-EB-WP-03). Areas of progress include:

- the adoption by the Commission of criteria for the determination of key shark species;
- the adoption by the Commission of a CMM for oceanic whitetip sharks;

- stock assessments for silky and oceanic whitetip sharks;
- preparatory work on stock assessments for blue and mako sharks in collaboration with the ISC (for the northern populations) and CSIRO and other Australasian researchers (for the southern populations);
- an analysis of whale shark against the recently adopted criteria for key shark species; and
- collaboration with the IATTC on the groundwork for a potential Pacific-wide silky shark assessment.

There are some new, emerging shark issues that may require analysis in addition to the previously scheduled (under the SRP) stock assessments for blue and mako sharks (which are likely to be assessed separately as northern and southern hemisphere units). These are outlined in the paper and SC8 was invited to consider and provide guidance on the relative priorities to these. Further, there were some specific recommendations for the SC to consider on ways to improve shark data quality.

Discussion

366. One CCM noted that the shark assessments completed this year suffered from data issues and cautioned against rushing into updating the silky shark and oceanic whitetip stock assessments before further work could be done on collecting and refining data inputs.

367. Some CCMs suggested broadening the scope of proposed mitigation analysis to include all key shark species rather than focusing specifically on silky and oceanic whitetip sharks. However, other CCMs noted that some shark stocks may be in a healthy condition and are targeted, so work should be prioritised on a species-by-species basis. One CCM suggested that an SC7 working paper on potential mitigation techniques for key shark species (SC7-EB-WP-04) could be updated but that this should be of lesser priority than completing the stock assessments for blue and mako sharks.

368. SPC explained that the proposed analysis of mitigation methods involved examining the observer data, estimating the impacts that various factors (shark bait, shark lines, etc) had on catch rates, and predicting what catch rates might be if certain mitigation methods were adopted.

369. FFA members reiterated that Articles 5(e) and 10.1(c) of the Convention provide guidance on the development of reference points for non-target species.

370. In response to a question on the recommended actions for improving fisher-collected data, the SPC suggested that CCMs support the provision of the shark identification guides to fishermen and also ensure that longline vessels are using logsheets that allow them to collect data on key shark species.

371. In response to a question on why a Pacific-wide assessment for silky sharks had not been completed, SPC explained that the IATTC delayed its silky shark assessment due a large amount of data that still needs to be incorporated from their coastal fisheries. Once IATTC completes its silky shark assessment, work toward a Pacific-wide silky shark assessment may progress.

372. One CCM noted that the recommendation from the bigeye tuna stock assessment peer review, regarding the need for further work to refine the WCPO assessment before undertaking a Pacific-wide assessment, should also apply to the silky shark assessment process.

373. One CCM noted that a large amount of data is required to derive a standardized CPUE series for whale sharks and suggested this might be a long-term rather than short-term goal. It was also noted that it might be possible to examine the data for any spatial or temporal trends in interactions.

374. SPC stated that some of the projects were selected because they seemed timely with regards to actions that the Commission was likely to take in the near future. It was suggested that those actions requiring simple analysis be done and passed directly to the Commission whereas those actions requiring greater analysis be presented in future SC meetings.

375. The Secretariat noted that they are developing a proposal with IATTC to the Global Environmental Facility that would help fund some of the Commission's shark and bycatch work. The funding level is yet to be decided and there are several components that are still being considered, but the Secretariat hoped that the proposal would be finalized towards the end of September.

b. Consideration of Whale Shark as a Key Shark Species

376. S. Harley (SPC) presented an evaluation of the whale shark (*Rhincodon typus*) against the criteria adopted at WCPFC8 for the determination of "key shark species" (SC8-EB-WP-04). A summary of known biological information and interactions in WCPFC tuna fisheries indicates that whale sharks meet the basic criteria for becoming a key shark species. There are some data gaps that might prohibit a formal stock assessment of whale sharks, most notably the absence of fisheries-related mortality from non-tuna fisheries in the region and other tuna fisheries besides the tropical purse seine fishery. An evaluation of trends from tropical purse seine fishery interactions may provide some information on trends for part of the stock.

377. CCMs were also referred to whale shark information contained in papers WCPFC8-2011-IP/01, WCPFC8-2011-DP/15a (Rev 1), and WCPFC8-2011-DP/17.

Discussion

378. Most CCMs agreed with SPC's analysis and supported the inclusion of whale sharks as a WCPFC key shark species.

379. One CCM disagreed with the analysis stating that the number of fishery interactions per year is low and whale sharks may not be a species of ecological concern.

380. CCMs considered that if whale sharks are made a key shark species, SPC could consider conducting a CPUE analysis in a couple of years after a greater amount of observer data has been amassed.

381. Chinese Taipei mentioned that they banned the retention of whale sharks in their fisheries in 2008 and thus there are no data from a directed fishery available for analysis since that time.

382. The Convenor noted that the Chinese Taipei coastal pound net fishery has bycatch of whale sharks and this could provide data for the analysis.

383. PNA members reminded SC8 that they have adopted a prohibition on setting purse seines on whale sharks in the waters of PNA members and supported the inclusion of whale sharks as a WCPFC key shark species.

6.2.2 Review of CMMs for Sharks

384. CCMs were referred to several information papers relevant to other shark issues of interest to the Commission including a study on distribution and abundance trends for porbeagle sharks (SC8-EP-IP-03),

a guide to practical mitigation measures for chondrichthyan bycatch (SC8-EP-IP-07), and two documents relating to Australia's National Plan of Action for Sharks (SC8-EB-IP-08 and SC8-EB-IP-09).

a. CMM 2010-07 (CMM for Sharks)

385. Some CCMs noted that the 5% fins-to-carcass ratio does not specify how the ratio should be applied to different forms of fins and carcasses (frozen versus dried weight, whole versus dressed weight), and suggested that the CMM could be amended to provide clearer guidance.

386. Some CCMs encouraged use of the new longline logsheets formats to generate better species-specific data on shark catches.

b. CMM 2011-04 (CMM for oceanic whitetip shark)

387. There were no specific presentations on, or discussions of, this agenda item.

c. Development of CMMs on other shark species

388. One CCM commented that any new CMM should focus on reducing interactions and consider a suite of mitigation measures including the use of circle hooks and a ban on the use of wire traces.

d. Guidelines for safe release of encircled animals

389. An informal small group (ISG3) met on the margins of SC8 to consider the issue of guidelines for the safe release of encircled animals. Guidelines were proposed for the consideration of SC8 and discussed and adopted, and are attached as **Attachment H**. These guidelines will be forwarded to TCC8 for further consideration.

6.2.3 International cooperation on shark issues

390. There were no specific presentations on, or discussions of, this agenda item.

Recommendations

391. SC8 noted the progress made in support of the Shark Research Plan while also noting that meaningful progress in some areas remains hindered by data availability and quality.

392. SC8 recommended that the Commission assist in providing or identifying funds to distribute existing shark identification guides and promote the development of species identification guides harmonized where appropriate with other RFMOs to improve data reporting.

393. SC8 through the Commission encourages CCMs to adopt and promote the recording of data by their longline fleets on harmonized and sufficiently detailed longline logsheets that include the key shark species.

394. SC8 recommends that the Scientific Services Provider conduct a study on the spatial and temporal distribution of whale shark in the WCPO based on observer data and other data sources as appropriate.

395. SC8 supports the finding of the Scientific Services Provider that whale shark meets the basic criteria for consideration as a key shark species and recommends that the whale shark (*Rhincodon typus*) be defined as a key shark species of the WCPFC.

6.3 Seabirds

396. D. Kirby (Australia) presented the two papers on behalf of the authors. The first was a study showing that new branch line weighting regimes could reduce the risk of seabird mortality without affecting fish catches (SC8-EB-WP-09). This study reported on trials of two new branch line weighting regimes involving custom-made lead weights, which were conducted to determine effects on catch rates of target and non -target fish species. There were no statistically detectible differences in the catch rates of the main target and non-target fish species between branch lines with 60 g lead weights 3.5 m from hooks (the fishing industry standard) and those with either a 120 g lead weight at 2 m from the hook or a 40 g lead weight placed at the hook. Branch lines with 40 g weights at the hook, which have the greatest potential to be adopted in the fishery, commenced sinking immediately upon deployment and took, on average, 4.5 seconds (0.43 m/s) to reach 2 m depth, 33 % less time than 60 g at 3.5m from the hook, the industry standard. The 40 g leads placed at the hook also improved crew safety, reduced the amount of time spent in gear construction and facilitated gear inspection for compliance purposes. The findings provide the fishing industry with new line weighting options that have the potential to reduce seabird bycatch without affecting target fish catch.

397. The second paper examined various branch line weighting options for their effectiveness in reducing seabird bycatch based on key findings from several different experiments (SC8-EB-WG-10). Initial (0-2 m deep) and overall sink rates of a range of line weighting options – each comprising a different combination of weight and leader length (distance between hook and weight) – were compared and several options identified that offer faster sink rates and hence pose reduced risk of seabird bycatch. The effect on catch rates of target and non-target species of placing weights adjacent to the hook was also tested and a new design of lead weight ('sliding hook leads') was developed that offers significant economic and safety advantages over traditional leaded swivels. Key findings include that: i) the fastest initial and overall sink rates were achieved with weights at the hook; these sank significantly faster than the same weight with any length of leader; ii) 60 g weight with 1m leader also performed well, with a significantly faster sink rate than 60 g at 3.5 m from the hook; iii) all weights with longer leaders had slowest initial sink rates and thus pose higher risks of seabird bycatch; and iv) placing weight at the hook had no effect on catch rates of tuna like species or sharks. Based on this research, the authors recommended that consideration be given to revising the line weighting options of CMM 2007-04 to: i) require all fishers to use weighted branch lines and preferably encourage them to use a faster sinking weight option, such as 40 g or 60 g at the hook, or 60 g at 1 m; ii) allow the use of 40 g at no more than 0.5 m from the hook; iii) require 60 g weights to be used at no more than 1 m from the hook; iv) delete the options of 60 to 98 g within 3.5 m of the hook and greater than 98 g at 4 m from the hook; and v) strongly encourage use of the new 'sliding' weights (including 'safe leads' or other proven safer methods of line weighting).

398. CCMs attention was drawn to Annex D of SC8-EB-WP-10 where the sink rate profiles for a range of line weighting regimes are presented.

399. Warren Papworth (ACAP) provided a presentation on the outcomes of a review of research conducted on seabird bycatch mitigation measures for pelagic longline fisheries undertaken by ACAP's Seabird Bycatch Working Group (SBWG) at its meeting in Guayaquil, Ecuador, held from 29 August – 2 September 2011 (SC8-EB-WP-06). The review of recent research confirmed the advice provided to SC6 that the use of appropriate configurations of weights on branch lines is currently the most effective

means of reducing seabird access to baits, although it still needs to be used in conjunction with other measures, such as tori lines and night setting.

400. These measures should be applied in high risk areas, where there is an overlap of longline fishing effort with albatross and petrels, to reduce seabird incidental mortality to the lowest possible levels. Other factors such as safety, practicality and the characteristics of the fishery should also be recognised. Currently, no single mitigation measure can reliably prevent the incidental mortality of seabirds in most pelagic longline fisheries. The most effective approach is to use the above measures in combination.

401. Branch lines should be weighted to sink the baited hooks rapidly out of the diving range of feeding seabirds. Weighted lines sink faster and more consistently, resulting in dramatic reductions in seabird attacks on baited hooks and seabird mortality; no negative effect has been demonstrated on the catch rate of fishes. Continued refinement of line weighting configurations (mass, number and position of weights and materials) through controlled research and application in fisheries, was encouraged to find configurations that are the most safe, practical and effective. Scientific studies have demonstrated that branch line weighting configurations with more mass close to the hook sink the hooks most rapidly and consequently are most effective at reducing seabird interactions and mortalities. SC8-WP-EB-09 and SC8-WP-EB-10 provide the outcomes of further research on branch line weighting that were not available at the time of ACAP's SBWG meeting.

402. A significant amount of research has been conducted on bird scaring lines (tori lines) since SC6 last reviewed this issue. This research has shown properly designed and deployed bird scaring lines deter birds from sinking baits, thus dramatically reducing seabird attacks and related mortalities. Due to practical considerations associated with the use of tori lines on different sized vessels, ACAP has provided two sets of recommended specifications, one for vessels >35m in total length, and a second specification for vessels <35m. Detailed specifications for the construction of tori lines are provided in the BirdLife International/ACAP mitigation fact sheets (SC8-EB-IP-05).

403. Simultaneous use of two bird scaring lines, one on each side of the sinking longline, provide maximum protection from bird attacks under a variety of wind conditions and are recommended as best practice for larger vessels. The bird scaring lines should be deployed to maximise the aerial extent, where aerial extent is a function of vessel speed, height of the attachment point to the vessel, drag, and weight of bird scaring line materials. Vessels should deploy bird scaring lines with the purpose of achieving a minimum aerial extent of 100 m.

404. For smaller vessels (<35m), a single bird-scaring line using either long and short streamers, or short streamers only, has been found to be effective. Streamers should be brightly coloured. Short streamers (>1 m) should be placed at 1 m intervals along the length of the aerial extent. Two designs have been shown to be effective: a mixed design that includes long streamers placed at 5 m intervals over the first 55 m of the bird scaring line and a design that does not include long streamers. Vessels should deploy bird scaring lines with a minimum aerial extent of 75 m.

405. Warren Papworth (ACAP) also reported that at the last meeting of ACAP's Seabird Bycatch Working Group (SBWG), held in August 2011, an assessment was undertaken of the minimum data requirements necessary to monitor fisheries performance with respect to seabird bycatch and the effectiveness of the mitigation measures being used (SC8-EB-WP-07). It was noted that the lack of this information at previous meetings of the SC had hindered an informed discussion on many of the issues related to the management of seabird bycatch in the Convention Area.

406. The SBWG noted that the main objectives of collecting seabird bycatch data are:

a. To characterise and quantify seabird bycatch within a fishery;
b. To understand the nature of seabird bycatch, and the importance of the various factors that contribute to the observed level of bycatch. This is important for identifying specific mitigation solutions for the particular fishery; and
c. To assess and monitor the effectiveness of seabird bycatch mitigation measures in reducing mortality.

407. The WCPFC Regional Observer Program Minimum Standard Data Fields and Instructions already identifies most of the data that is considered by ACAP to be a minimum for monitoring seabird bycatch, however there are a small number of data fields that have not been identified that are considered by ACAP to be essential for evaluating the effectiveness of mitigation measures being used.

408. The specific data fields that are recommended for further inclusion in the WCPFC ROP are:

- Mass of added weight attached to branch-lines. Line weighting is considered a critical mitigation measure for longline fisheries, and it is hoped that most RFMOs will require the mandatory use of line weighting in the near future;
- Distance between weight and hook, in metres. This is an important component of the line weighting regime and should be recorded to assist in evaluating the effectiveness of the mitigation measure;
- The fate (dead/alive/injured) and number of birds (for each species) in each of these categories should be recorded for all observed seabird interactions. The WCPFC ROP currently only requires this information for individuals that are landed on deck.

The following data would also ideally be recorded:

- Regular seabird abundance estimates (presently only the number of animals sighted during an interaction is recorded); and
- Environmental data such as sea state, wind speed and direction relative to the vessel's course, cloud cover, visibility and moon phase (for night fishing operations).

409. CCMs attention was also drawn to a number of information papers relevant to seabird issues including a progress report on the development and testing of the underwater bait setter for pelagic longline fisheries by Australia (SC8-EB-IP-02), and the development of t-RFMO seabird identification guides by ACAP and the National Research Institute of Far Seas Fisheries (NRIFSF) (SC8-EB-IP-04).

Discussion

410. One CCM asked why line shooters, which are used in the Hawaii longline fishery, are not recommended as a mitigation measure within ACAP documents. It was noted that shallow setting has five times higher seabird interaction rates than deep sets (using line shooters) in the Hawaii fishery. ACAP was encouraged to reconsider the use of line shooters in the development of best practices guidelines.

411. ACAP responded that the intent of the documents was to put forth the most robust mitigation measures to be used in a range of circumstances, and those for which there is a large body of evidence of their effectiveness.

412. One CCM noted that although diving seabirds dominate in the seabird bycatch hotspot area of ICCAT and IOTC waters, there is a particular area where diving seabird bycatch is not observed in WCPFC waters.

413. In response, another CCM noted that the reason that seabird mitigation is so difficult in the WCPFC is that the mid- to high- latitude areas of the south Pacific have high densities of deep-diving and other seabirds.

414. Some CCMs asked for clarification about the effectiveness of night setting in mitigating seabird interactions.

415. ACAP and some CCMs explained that the most important factor in seabird mitigation is line weighting, in combination with correct leader lengths between weight and hook, in order to achieve the fastest possible hook sinking rates.

416. CCMs generally agreed with the mitigation measures proposed in the documents.

417. One CCM also noted that given the result and variety of longline operation styles among countries, a variety of effective specifications for weighted branch lines should be considered.

Recommendations

418. Following the review of the papers presented, the SC determined that currently, there is no single mitigation measure that can reliably prevent the incidental mortality of seabirds in most pelagic longline fisheries.

419. SC8 recognizes the advice from ACAP that the following seabird bycatch mitigation measures are the most effective: weighted branch lines, night setting and bird scaring lines.

420. SC8 recommends that a combination of techniques should be used, especially those including weighted branch lines, bird scaring lines, and night setting that have proven most effective for reducing seabird bycatch of the seabird fauna prevalent in a particular region of concern. Other factors such as safety, practicality and the characteristics of the fishery should also be recognised.

421. SC8 recognizes that different longline fleets have obtained lower interaction rates with different mitigation methods. SC8 also noted that a combination of longline deployment techniques and other gear attributes used in the Hawaii-based longline fisheries effectively reduce incidental seabird capture.

422. SC8 reiterates advice that a spatial management approach be employed for seabird mitigation and recommends that the Commission consider the following advice when it revises the seabird CMM 2007-04:

a. Southern hemisphere
SC8 recommends that fisheries south of 30 degrees S are required to use at least two of these three measures: weighted branch lines, night setting and bird scaring lines. When using bird scaring lines the descriptions outlined in SC8-EB-WP-06 should be used.

b. Northern hemisphere
SC8 recommends that the table in CMM 2007-04 be revised to eliminate redundancy by removing weighted branch lines and underwater setting chute in column B.

c. Branch Line Weighting

With regard to branch line weighting, SC8 recognises that research in Australia (SC8-EB-WP-09 and SC8-EB-WP-10) has demonstrated that the use of at least one weight of 40g within 50cm of the hook, or of 45- 60 g within 1 m of the hook, is more effective to quickly sink baited hooks beyond the depths at which they may be available to seabirds. Other options using weights at greater distance from the hook are not as effective.

d. Vessel length

SC8 recommends that the potential impacts of the North Pacific vessel size exemption be addressed. Nations conducting longline fishing in the North Pacific to the north of 23 degrees north should provide vessels numbers <24 and =>24m for recent years. Annual Reports-Part 1 have statistics on vessel size by GRT, however statistics on vessel length should be presented to SC9.

e. Spatial management

SC8 reiterates advice that a spatial management approach should be employed for seabird mitigation. In clearly defined areas south of 30 degrees S and north of 23 degrees N, exemption from the following requirements could be considered if seabird interaction rates can be scientifically demonstrated to be minimal, with observer coverage rates that are sufficient to quantify rare events in these areas. The SC should determine appropriate (minimal) levels of interaction rates when representative observer data are available.

f. ROP Data Fields

SC8 recommends that the TCC give consideration to the inclusion of data fields on: the mass of added weight attached to branch lines, distance between weight and hook (in meters), and the fate (dead, alive or injured) and number of seabirds for each species in each of these categories and whether the seabirds were released alive or discarded dead.

6.4 Sea turtles

423. There were no specific presentations on, or discussions of, this agenda item.

6.5 Other species and issues

6.5.1 FAD bycatch and mitigation

424. D. Itano (USA) presented a summary (SC8-EB-WP-11) of a research cruise conducted on a US-flag purse seine vessel as part of the International Sustainable Seafood Foundation (ISSF) #BycatchProject that facilitates industry collaboration in the development and scientific testing of technical options to minimize undesirable catch in tuna fisheries. The cruise concentrated on bycatch and catch estimation issues related to fishery impacts on sea turtles, oceanic sharks, whale shark, miscellaneous finfish (mahi mahi, wahoo, rainbow runner, etc.) and market tuna of undesirable size, particularly bigeye tuna that aggregate to floating objects. Research activities included: studies on the FAD-associated ecosystem; the ability of fishermen to estimate size and species on FADs before setting (with potential for avoidance of bycatch); the vertical and horizontal behaviour of tuna and other species aggregated to floating objects; the behaviour of tuna and bycatch in the net; best practices for the safe release of whale shark and manta ray from purse seine gear; and a range of studies on oceanic sharks centred on their condition during different phases of the fishing operation and post-release survival. Different sampling protocols for

estimating size frequency and species composition of target catch were also compared along with video monitoring systems for comparison at the set level. The latter half of the cruise concentrated on the selective release of non-target species, particularly silky shark from the net.

425. M. Hutchinson (USA) presented the preliminary findings of post-release survival rates of silky sharks caught during the ISSF Bycatch Project research cruise in the WCPO on a commercial tuna purse seine vessel (SC8-EB-WP-12). Initial results show animals landed and released early in the fishing operations (while still free swimming or entangled in the net) had higher post–release survival rates than animals landed during the brailing stages. Post-release survival of sharks is compromised once they are confined in the sack. Release conditions were correlated to landing stage and animals released in 'good' or 'excellent' condition had high survival rates. Preliminary blood chemistry analysis show pH and lactate levels correlate to release condition and survival. Satellite tag data showed 100% mortality in blood sampled animals when blood pH levels were ≤ 6.5 and lactate levels were higher than 15. All 295 silky sharks caught during the cruise were juveniles. PSAT data shows diel periodicity to the vertical behaviour of juvenile silky sharks: they are deeper at night (30-100 m) and shallow during the day (0-30 m). Initial PSAT depth data suggest the vertical range of juvenile silky sharks is restricted to the upper 100m of the water column. Although whale sharks were not caught during this cruise there was ample opportunity to communicate with the captain and crew regarding the best practices for their safe handling and release. The recommended bridle was made and ready to tow whale sharks out of the net. In addition tagging poles were rigged and ready for deployment on encircled whale sharks.

426. J. Muir summarized work (SC8-EB-WP-13) pertaining to acoustic tagging of several finfish species aggregated on drifting FADs, as well as observations of behaviour displayed by finfish and sharks once encircled by purse seine gear. These experiments were conducted on a dedicated research cruise supported by the ISSF (SC8-EB-WP-11). Skipjack, yellowfin, and bigeye tuna and silky sharks (*Carcharhinus falciformis*) were implanted with pressure sensing acoustic transmitters and monitored on drifting FADs. Assumptions relating to natural behaviour of encircled fish in purse seine gear were clarified: divers repeatedly observed clear separation of target species by species as well as size, with smaller-sized species-specific schools occupying shallower depths in the net, and larger-sized bigeye and yellowfin occupying deeper regions in the net. Additionally, non-target species consistently separated themselves from target species and remained shallow. This species- and size-specific segregation was consistently observed during all sets and lasted for the duration of the haul until the beginning of sacking was reached, at which point individuals and schools were forced to intermingle. Predation attempts also began to occur at this point. These observations provide much needed insight to behavioural patterns of non-target and unwanted species, which may inform further research and development of options to selectively release or sort them from the net before these animals sustain mortal injuries.

427. D. Itano summarized work on the development and testing of an experimental method (SC8-EB-WP-14) to selectively release non-target finfish and sharks from purse seine gear. This was one of several experiments conducted on a dedicated research cruise on bycatch mitigation supported by the ISSF (SC8-EB-WP-14). The concept was developed during the cruise after repeated visual observations confirmed a clear segregation (vertically and horizontally) between tuna and non-target species inside the pursed net. Non-target species were observed to generally remain in the upper 10 m of the water column with tuna generally restricted to greater depths. In particular, silky sharks (*Carcharhinus falciformis*) were observed during several sets to collect in a small pocket of net that forms on the vessel port side during the latter stages of net retrieval. Items on the surface naturally collect in this area due to the nature of the fishing operation that slowly shifts the fishing vessel to starboard. An experimental release panel approximately 5.5 x 11 m deep was installed at this location that could be opened and closed by crewmen from a 6 m auxiliary towboat. After installation of the panel the conditions observed during the earlier part of the cruise were not experienced and only a small number of

sharks exited the panel. However, larger numbers of silky shark, wahoo and mahi mahi were observed in close proximity to the opening suggesting that they may be induced to exit the net if a better location or different stimuli were introduced. Further refinement of the concept through experimental trials was suggested.

Discussion

428. FFA members thanked the ISSF for the opportunity to involve Pacific Island scientists, crews and observers in the research cruises. FFA members welcomed the research results and supported 1) avoidance or selective removal of non-target species from the net; 2) avoidance of exposing sharks to the brailing process given the very low post-release survival after brailing; 3) the use of pop-up satellite archiving tags to verify post release condition of sharks released from purse seine fishing operations; and 4) the development of practices to maximize the survival of released bycatch species. Support was also stated for increasing the ratio of free school to associated purse seine sets.

429. A CCM asked for clarification on the research module of the cruise related to targeting of skipjack after dawn to avoid bigeye on FAD sets.

430. D. Itano noted that both species are tagged with sonic transmitters allowing them to be identified when they are near the FAD or actively tracked when they depart. This technology can determine if there is separation of the species at particular times of day that may help to develop ways to avoid bigeye catch by purse seine. It was acknowledged that this is still a theory and needs a great deal of additional work.

431. In response to question about on how survival pop-up tags can distinguish between a mortality and a tag that has been shed from a live shark, M. Hutchinson (USA) explained if a shark dies it will sink and the tag tether will automatically sever at 1800 m. This depth is beyond the depth a live epipelagic shark can survive, so it is a presumed mortality. Also, the tag manufacturer can confirm the depth at which the tag reports and can supply this information to the tag owner for further interpretation.

432. H. Okamoto (Japan) presented Japanese approaches to mitigate bycatch of juvenile bigeye tuna by purse seine on FADs in the WCPO in recent years (SC8-EB-WP-15). These attempts represent collaborative research between the Japanese fishery industry, the Fishery Research Agency of Japan and the Japanese government, and corresponding to CMM 2008-01, paras. 25 and 26 (Juvenile Tuna Catch Mitigation Research). Almost all of the research was intended to reduce bigeye bycatch on FADs by improving fishing methods and equipment. We applied new fishing methods to FAD operation, such as various depths of underwater structures of FADs, multiple FADs in one operation, acoustic signals or illumination to control movement of tuna foraging relative to FADs. Purse seines with large mesh sizes have been used in the fishing ground as it is supposed that the large mesh allows the escape of small fish. Recently developed broad spectrum sonar was also tested which was intended to identify tuna species and estimate fish size before a fishing operation begins. The effects in terms of reducing bigeye tuna of these experiments were tested using statistical analysis, through field examinations using net pens, and by field research in the fishing grounds conducted by commercial fishing vessels and research vessels. We also investigated the relationship between bigeye tuna catch and oceanographic conditions, and studied the relationship between school type and juvenile tuna catch. These studies are summarized in this document to provide an overview of the results.

433. T. Oshima (Japan) presented a study on methods to reduce bycatch of juvenile bigeye tuna in purse seine FAD operations (SC8-EB-WP-16). Three joint research cruises were conducted during 2009-2012 with the intention of developing methods to mitigate bycatch of bigeye in purse seine FAD operations. The fishery research vessel "Shoyo-maru" of the Japan Fishery Agency and a tuna seiner "Nippon-maru" chartered by the Japan Fisheries Research Agency participated in the research cruises. Light stimuli were applied in attempts to move bigeye schools and let them escape through the mesh or underneath the net. The movements of fish were observed with coded pingers, scanning sonar, a wide-band quantitative echo sounder, and an underwater camera. Introducing new micro coded pingers (Fusion Inc.) in 2011 resulted in longer survival and/or retention of tagged fish. As a consequence large data sets on the movement of bigeye and skipjack around FADs with or without light stimuli were obtained.

434. T. Kawamoto (Japan) presented the results of a study to mitigate bigeye tuna fishing mortality by using two separate FADs with underwater light stimulus (double FADs) (SC8-EB-WP-17). This document reported a decreasing bigeye tuna catch with the use of double FADs as compared with normal FADs. The total number of operations was 48 including six double FADs, 8 normal FADs and 34 free school operations. These were conducted by a commercial vessel "Wakaba-Maru No.3"in November-December 2011 in the EEZs of Papua New Guinea and Solomon Islands under funding from the Fisheries Agency of Japan. Based on onboard sampling data, the number of fish 3.0 kg or more caught by double FADs was larger than that of normal FADs in all species including skipjack, yellowfin and bigeye. The bycatch ratio of bigeye tuna to total number of bigeye, yellowfin and bigeye with double FADs and normal FADs was 6.1% and 8.9% in number, and 7.2% and 14.2% in weight, respectively. The number of bigeye tuna in the catch of 1 mt was estimated as 24 in double FADs and 45 in normal FADs. Although sample size and quality is insufficient to draw a conclusion based on statistically testing, these results suggest that double FADs have some effect on reducing bigeye tuna bycatch as compared with normal FADs.

Discussion

435. The convener on behalf of SC8 thanked the speakers for the large body of work related to bigeye tuna bycatch mitigation efforts conducted by Japan.

436. In response to a question about whether the study considered setting on double FADs equipped with flashing lights that were towed away from the FAD with continuous light, T. Kawamoto responded this was not done but may be tried in the future.

437. In response to a request to outline their future research plan, T. Kawamoto explained that more experiments need to be done in order to draw firm conclusions, and encouraged all CCMs to explore other approaches to testing double FADs with flashing lights.

438. One CCM suggested the research should also look at the effect of light on other species, and asked if total tuna catch was impacted by the use of double FADs.

439. T. Kawamoto responded that generally the total catch quantities were not strongly affected and the amount of time required for fishing was more or less the same as usual.

440. FFA members noted that investigating technical solutions was one of two ways of reducing fishing mortality on bigeye tuna, the other being reducing the number of FAD sets and a higher reliance on free school fishing. FFA members encouraged Japan in seeking other technical solutions to reducing fishing

mortality on bigeye. FFA also encouraged other CCMs to investigate ways of reducing bigeye mortality on associated sets.

441. CCMs noted that the experimental sets using double FADs had all been conducted together in one location while all experimental sets using normal FADs had been conducted at another time and location. The researchers were invited to comment on whether the experimental design could be improved by alternating the different types of sets at the same location and time instead of conducting them at different locations and times. Researchers were also asked about the possibility of testing the effect of light on FADs with nets hanging below them at different depths, rather than just the lights.

442. T. Kawamoto explained that the research was designed to test the effects of double FADs with lights only and so deployed nets at a consistent depth (50 m). It was acknowledged that if the research was adjusted suggested, perhaps it would yield a different result.

Recommendations

443. SC8 supports the research objectives of the ISSF bycatch research cruises and encourages further work by ISSF and all CCMs to develop and test purse seine mitigation efforts that prioritize avoidance or selective release of bycatch from the net; that maximize the condition factor of released animals; and that scientifically verify their post-release condition using pop-up archival tags and other technology.

6.5.2 Food security issues with bycatch

444. S. Nicol (SPC) presented a summary of the preliminary analysis of tropical purse seine edible bycatch (SC8-EB-WP-1) that begins to address the request made at SC7 in the Ecosystem and Bycatch Theme on this subject. The analysis uses ROP observer data and delta-lognormal modelling approaches to estimate the potential level of key finfish (non-tuna) bycatch over the period 2000-2011, along with the potential fate of that bycatch. It should be noted that the estimates presented are preliminary, and a number of areas for improvement in modelling approaches are noted. Purse seine sets associated with FADs and other floating objects result in an on average higher catch rate of non-billfish species, in particular rainbow runner and dolphinfish, and a slightly higher bycatch catch rate overall. By comparison, catch rates of billfish, in particular blue and black marlin, were higher in unassociated sets. The greatest total bycatch of the species examined was estimated in 2011; mean bycatch estimates across the species examined totalled 996 mt. Over 50% of the catches of each species were discarded from both set types, the exceptions being sailfish and wahoo where the majority of catches were retained, and this discard rate was not found to vary between set types. Areas for consideration within a food security-focused research plan were suggested. These include: improving our understanding of the practical reasons behind the pattern of discarding by purse seine vessels; and an understanding of the finer spatial pattern of bycatch, relative to the location of unloading ports.

445. Discussion

446. Regarding the estimates of non-target catch by year (Table 3) one CCM queried whether SPC compared these estimates with other data sources. A CCM's own comparison using observer data from its fleet indicated a range from 30% to 135% of the totals provided in the paper.

447. SPC agreed to examine the data sources and figures further.

448. A CCM noted support for the continuation of Project 60 while suggesting it should also collect detailed data on non-target species and discards.

449. The Convenor suggested that it would also be helpful to see information by fleet, including comparisons between fleets and information on the fate of discards.

450. FFA members requested regularly updated estimates of food fish discarded in tuna fisheries to better inform management decisions on food security issues. These members also considered the possibility of under-estimation of food fish discards in purse seine fisheries. They supported further work as outlined in the paper including extension to the longline fishery and reporting of non-target species in unloadings data.

Management recommendations

451. SC8 requested that the Commission Scientific Services Provider continue to produce and update the type of analysis presented in Estimation of catches and fate of edible bycatch species taken in the equatorial purse seine fishery (SC8-EB-WP-18) for presentation to the SC, with analyses to include the WCPO longline fishery and to address some of the issues raised in the Next Steps section of the paper.

AGENDA ITEM 7OTHER RESEARCH PROJECTS

7.1 West Pacific East Asia Oceanic Fisheries Management Project (WPEA OFM Project)

452. T. Lewis (Chair of WPEA OFM PSC) provided a brief presentation on the outcomes of the WPEA OFM Project Steering Committee meeting, which was held on Saturday, 11 August 2012 on the margins of SC8. The WPEA project is in its final year. The main aim of the project is to support the Philippines, and CNMs Indonesia and Vietnam in the areas of data and statistics, as well as tuna fisheries management and governance. It was noted that excellent progress has been made by all three recipient countries towards achieving the project objectives. It is anticipated that some of the key activities, such as data collection and port sampling, will be able to continue using co-financing funding, which will bridge any gaps before a new project can be finalized and initiated. Plans for terminal evaluation of the WPEA OFM Project and continuity of the 2013 project activities under the auspice of WCPFC were discussed and endorsed by the Steering Committee.

Discussion

453. SC8 welcomed the report of progress of the WPEA OFM Project Steering Committee, and noted the success of the WPEA OFM project.

Recommendation

454. SC8 agreed that the WPEA OFM Project has contributed significantly to the Commission's data holdings for these important fisheries.

455. SC8 recommended the WCPFC Secretariat work with GEF/UNDP to develop a further project to continue the improvement of data collection, fisheries management and governance for tuna species in the southeast Asian region.

7.2 Pacific Tuna Tagging Project

456. J. Hampton made a brief presentation on the Pacific Tuna Tagging Programme (PTTP) Steering Committee, which held its sixth meeting on Friday,10 August 2012 on the margins of SC8. Project activities and future work plans are outlined in SC8-RP-PTTP-02. The report of Steering Committee is contained in SC8-RP-PTTP-01.

Recommendation

457. SC8 adopted SC8-RP-PTTP-01, the Summary Report of the Sixth Steering Committee Meeting for the PTTP, and noted the importance of tagging data for stock assessments of tropical tunas in the WCPFC area.

AGENDA ITEM 8COOPERATION WITH OTHER ORGANISATIONS

8.1 The status of cooperation and relations

458. SC8 noted SC8-GN-IP-01. The SC had no comments on this agenda item.

AGENDA ITEM 9SPECIAL REQUIREMENTS OF DEVELOPING STATES AND PARTICIPATING TERRITORIES

9.1 Consideration of the special requirements of developing States pursuant to Part VIII of the Convention

459. T. Beeching (Secretariat), who is responsible for administering the Japanese Trust Fund (JTF), noted that the JTF is in its second five-year phase which is focused more on monitoring, control and surveillance and compliance issues. In 2012, approximately US$400,000 was available under the JTF which was fully allocated to fifteen projects. He noted that a call for 2013 projects is likely to be made at TCC, but the amount of funding for next year is still to be confirmed.

460. Japan clarified that the main aim of the JTF is to cooperate in developing the capacity of Pacific Island countries, and it strives to improve implementation of measures in the WCPO which will lead to long-term benefits to Japanese fishers. Every year the overall budget for JTF is subject to internal negotiations and approvals, thus it cannot be fixed in advance. Japan encouraged all developing island States to take advantage of the funding while it is available.

Discussion

461. The Cook Islands, on behalf FFA members, expressed thanks to Japan for the generous contribution of a second phase of the JTF. They also expressed their appreciation to those CCMs who have contributed to the Special Requirements Fund, and urged other CCMs who have yet to contribute to do so. It was noted that in 2012 a lack of specific selection criteria hindered the approval and consideration of project proposals to the JTF. FFA members asked that Japan consider providing guidelines for the development of future proposals.

462. The Federated States of Micronesia, on behalf of FFA members, noted that SPC stock assessment training could not to be held in 2012 due to a reduction in donor funding. FFA members requested that donors consider funding future workshops, in recognition of the importance of these stock assessment workshops in developing the capacity of small island developing States (SIDS).

AGENDA ITEM 10 FUTURE WORK PROGRAM AND BUDGET

10.1 Review of the Scientific Committee Work Programme

a. Review of 2011-2012 Activities

463. T Beeching detailed science projects conducted by the Scientific Services Provider (SPC) outside of their core activities related to ongoing data management, stock assessment and other advisory services. Seventeen papers were listed as specific outputs for work requested by SC7 and WCPFC8.

b. Review of SC List of Work Programme Items

464. S. Brouwer (New Zealand), provided a report on the work of an ISG tasked with reviewing and providing advice to the SC on the list of agreed work for SC (SC8-GN-WP-05 (rev. 2), Attachment I). The ISG made recommendations and identified new projects as follows:

- The Secretariat should create a database to manage this process. List of fields should include at least: project number; title; status; research provider; completion date; budget; budget origin.
- The projects listed in the SC List of Work Programme, should include work done for the SC but funded externally to the Commission.
- The Secretariat should include a reason for the inactivity if the project is classified as inactive.
- Active projects should have detailed project descriptions which should be publicly accessible.

465. New projects proposed for inclusion in the SC List of Work Programme included:

- Post release survival of key shark species from purse seine and longline gear (budget to be provided by the Shark Research Plan and likely to be conducted by either SPC, country Scientists and/or ISSF); priority is high).
- Desk top analysis of shark mitigation effects (budget to be provided by the Shark Research Plan; priority is high).
- Collection of catch information on edible species (e.g. mahi-mahi, rainbow runner) in purse seine and longline fisheries and presentation of data already held by SPC (budget to be provided by routine funding; priority is on annual updates to SC8-EB-WP-18.

Recommendation

466. The SC tasked the Secretariat with updating the List of Work Programme of the Scientific Committee (SC8-GN-WP-05 (rev. 2)), in accordance with the recommendations of the ISG as specified above.

10.2 Development of 2013 Work Programme and budget, and projection of 2014-2015 provisional work programme and indicative budget

a. Schedule of Stock Assessments to be Conducted

467. The SC Vice-Chair reported the results of ISG6 he convened to discuss SC work programme and budget issues. A list of stock assessments to be conducted by SPC was created for prioritization purposes and CCMs were invited to comment.

468. SC8 discussed the regularity of stock assessment from both biological and funding perspectives. SC8 considered that the stock assessments for the major tuna species should be conducted every three years, swordfish should be conducted every four years (i.e. next assessed in 2017), and the other billfish species should be conducted every five years. An ongoing programme of shark assessments should be implemented once a decision is taken regarding whether to extend the Shark Research Programme.

469. The outcome of discussions on the prioritization and timing of stock assessments is shown in Table 2.

Table 2. Stock assessments to be conducted by the Scientific Services Provider 2013-2017.

Species	Stock	Last assessment	2013	2014	2015	2016[10]	2017[10]
Bigeye tuna	WCPO	2011		X			
	Pacific-wide				X		
Skipjack tuna	WCPO	2011		X			
Yellowfin tuna	WCPO	2011		X			
Albacore	South Pacific	2012			X		
Striped marlin	SW-Pacific	2012					X
	NW-Pacific	2012					X
Swordfish	SW-Pacific	2008	X				X
Silky shark	WCPO	2012	X				
	Pacific-wide						
Oceanic whitetip shark	WCPO	2012			X		
Blue shark	Pacific-wide		X				
Mako shark	South Pacific			X[11]			
	North Pacific			X[11]			

b. Work Programme and Budget

[10] Indicates stock assessments currently agreed to be conducted

[11] Contingent upon funding approval for the Shark Research Plan beyond December 2013 being agreed at WCPFC9.

470. The SC Vice-Chair introduced the proposed 2012-2013 SC Work Programme and Budget and 2013-2015 SC Provisional Work Programme and Budget (SC8-GN-WP-05). He noted that the budget includes additional costs for the following functions:

- $75,000 for Project 60 (Purse Seine species composition);
- $40,000 for bigeye MULTIFAN-CL improvements (recommended by the bigeye peer review); and
- $160,000 for additional resourcing for SPC for stock assessment tasks and improvements as recommended by the bigeye peer review.

471. In addition, it was noted that there was a proposal to carry over $30,000 over from 2012 unallocated funds to apply to Project 57 (Limit Reference Points) in 2012-2013.

472. SPC noted that, as a general rule, under the current Service Level Agreement for Scientific Services can conduct two tuna stock assessments and one shark stock assessment. Any additional work would require additional funding.

Recommendation

473. **SC8 tasked the Scientific Services Provider to undertake a review of data holdings for sailfish in order to inform discussions at SC9 regarding the necessary budget for undertaking further analyses.**

474. SC8 recommended that the Commission consider the proposed 2013 Scientific Committee Work Programme and Budget and the Provisional 2014-2015 Scientific Committee Work Programme and indicative Budget (SC8-GN-WP-09). SC8 also considered SPC-OFP's indicative science services for 2013-2015 (SC8-GN-WP-10). Both documents are appended as Attachment J.

475. SC8 recommended that the Commission consider extending the Shark Research Programme conducted by the Scientific Services Provider beyond December 2013 when the current funding from the Commission expires.

476. SC8 recommended that the Management Objectives Workshop consider continued research and associated budgets (using funds available in the unobligated budget) for Project 58 (Evaluation of Reference Points and Decision Rules) and Project 66 (Identification and Evaluation of Target Reference Points) and recommend the Commission consider the inclusion of this research within the SC Work Programme and Budget.

AGENDA ITEM 11 ADMINISTRATIVE MATTERS

11.1 Rules of Procedure

477. No proposals were received, and SC8 had no comments on this agenda item.

11.2 Peer review of stock assessments

478. CCMs were referred to the recommendations of the ISG on Peer Review (see Agenda Item 4.1.1a) and Attachment G.

479. Some CCMs expressed support for adequate resourcing being provided to SPC for implementing all the peer review recommendations.

480. Some CCMs suggested using the bigeye peer review assessment experience to develop a Terms of Reference and select a review panel for future peer review of stock assessments; and to set a format for future peer reviews of WCPFC stock assessments.

481. Some CCMs considered that the bigeye peer review could be used to increase transparency and accountability in other WCPFC stock assessment work. The Pacific bluefin or north Pacific albacore stock assessments were considered by some to be candidates for a similar peer review.

482. In contrast, other CCMs believed that peer review of northern stock assessments are best dealt with by the ISC and the Northern Committee.

483. In response to the proposal for a peer review of the north Pacific albacore stock assessment, the USA noted that a Center for Independent Experts (CIE) review had already been conducted and this desktop review, currently held by the USA, would be released in due course.

484. In order to allow time for the benefits of the bigeye stock assessment to flow through to other stock assessments, some CCMs suggested that the next tuna stock assessment peer review should occur in several years' time.

Recommendations

485. SC8 recommended that:

- **the Terms of Reference (Attachment J, SC7 Summary Report) be adopted future stock assessment reviews, noting that minor revision may be required to address assessment-specific issues.**
- **The selection procedure of a review panel developed at SC7 (Paras. 580 and 581, SC7 Summary Report) be used for future peer review of stock assessments.**
- **The Commission requests the NC to conduct a scientific peer review of the Pacific bluefin tuna stock assessment once it is completed.**

11.3 Future operation of the Scientific Committee

11.3.1 Future structure of the SC

486. The SC Chair asked CCMs to consider whether the scope of SC9 should be expanded to include theme sessions on fish biology, fishing technology and methods.

487. FFA members, noting that they already consider the workload of the Commission too onerous, did not support the inclusion of these additional theme sessions at future SC meetings. In addition, FFA members urged convenors to be more selective in their screening of working and information papers, highlighted the ongoing need for funding support to fully participate in the work of the Commission, and looked forward to receiving the Secretariat's paper on rationalisation of meetings and streamlining of agendas.

488. The US concurred with FFA members but cautioned that the SC had already been reduced from 11 to 8 days and should not be further shortened.

Recommendation

489. SC8 agreed that future SC meeting agendas would include Data and Statistics, Stock Assessment, Management Issues and Ecosystem and Bycatch Themes only.

11.3.2 Review of the SC agenda

490. SC8 had no comments on this agenda item.

11.3.3 Guidelines for the Theme Convenors and SC Chair

491. R. Campbell (Australia) presented draft guidelines for theme convenors and the SC Chair.

492. Some CCMs requested that specific guidance be included on the procedures to be used by convenors when formulating recommendations, for example, the need for initial discussion about the nature the recommendation to be drafted, and the amount of time before clearance that the recommendation should be circulated, the method of circulation, etc.

493. An Observer made the point that recommendations should also be drawn from working papers even if these points were not discussed across the floor.

494. These comments were considered and incorporated into the guidelines, along with additional guidance on the timeline for submission of Theme working and information papers.

495. SC8 adopted the guidelines contained in SC8-GN-WP-06 (Attachment K).

11.4 Election of the Chairman of the Scientific Committee and SC Theme Convenors

496. Nominations to fill the position of SC Chair were requested given that N. Miyabe (Japan) will step down as Chair as of the end of 2012.

497. As no nominations were forthcoming, nominations for a new Chair were encouraged to be submitted at WCPFC9 in order to confirm a new SC Chair.

498. L. Kumoru (PNG) was nominated to replace P. Maru (Cook Islands) as the Data and Statistics Theme Convenor.

499. SC8 approved L. Kumoru as the new Data and Statistics Theme Convenor.

500. A. Batibasaga (Fiji) was nominated to replace D. Itano (USA) as one of the Ecosystem and Bycatch Theme Co-Convenors.

501. SC8 approved A. Batibasaga as one of the Ecosystem and Bycatch Theme Co-Convenors.

11.5 Next meeting

502. The Executive Director noted that as a general principle the cost of holding the SC in Pohnpei is less than if it is held elsewhere. Therefore, nominations for other venues will need to be considered in light of the cost differential between the proposed location and Pohnpei.

503. SC9 is provisionally scheduled for 6-14 August 2013 with a venue to be determined inter-sessionally and agreed on at WCPFC9.

AGENDA ITEM 12 OTHER MATTERS

504. Some CCMs questioned the need for support rapporteurs to be provided by national delegations given the presence of a lead rapporteur and several members of Secretariat staff at SC. It was noted that other subsidiary bodies of the Commission do not make use of support rapporteurs.

505. One CCM suggested that better use could be made of the meeting website, rather than email, as a clearinghouse for meeting documents, proposed recommendation text, and other information.

506. The Secretariat agreed to further consider these issues and to provide options to CCMs for consideration prior to SC9.

AGENDA ITEM 13 ADOPTION OF THE REPORT OF THE EIGHTH REGULAR SESSION OF THE SCIENTIFIC COMMITTEE

507. The Report of the Eighth Regular Session of the Scientific Committee was adopted.

AGENDA ITEM 14 CLOSE OF THE MEETING

508. The Executive Director thanked the four Convenors for their diligent efforts during the Theme sessions and in preparing the Summary Report, in particular P. Maru and D. Itano, who stepped down as of this meeting. He also thanked the lead rapporteur, S. Clarke, and N. Miyabe who will leave the Chairmanship of the SC at the end of this year.

509. The Executive Director also expressed WCPFC's sincere appreciation for the meeting organizers and support staff who ably handled the local administrative and logistical arrangements for SC8.

510. The local organizers presented the Executive Director with a token of their appreciation.

511. SC Chair thanked the SC for their efforts over the past years of his Chairmanship and expressed his interest in continuing to work with the SC in the future.

512. Korea thanked all attendees for their participation in an excellent meeting and wished all a safe return home.

513. The meeting closed at 15:30 on 15 August 2012.

Attachment A

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

WELCOME ADDRESS

by Executive Director

Attachment B

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

KEYNOTE ADDRESS

by Dr Jae-Hak Son, President of the National Fisheries Research and Development Institute, Ministry for Food, Agriculture, Forestry and Fisheries

---

The Chair of the Scientific Committee, Dr Naozumi Miyabe, The Executive Director of WCPFC, Professor Glenn Hurry, The Distinguished scientific representatives of Members, Cooperating Non-members and Participating Territories of the Commission, Observers, Ladies and Gentlemen.

"Annyeong Haseyo!" On behalf of the Government of the Republic of Korea, I would like to cordially welcome you all to Busan, Korea and I am honored to make "Key note Address" before you on this occasion of the opening session of the Eight Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission.

For Korea as one of top seafood consumers in the world, WCPFC fisheries are the most important now, accounting for over 90% of the total catch of tuna and tuna-like species by Korean Distant Waters Tuna Fisheries in the world oceans.

Korean longline fishery took the first step in 1958 and tuna purse seine fishery in 1971, into the high-seas and within the coastal states in the South Pacific of the WCPO which have been their main fishing grounds since 1980s.

"The Review of the Status of World Marine Fishery Resource" published by FAO in 2011, reported that, though dealing with 70 % of 584 world fish stocks, 57.4 percent were estimated fully exploited, 29.9 % over-exploited and 12.7 % non-fully exploited as of 2009.

It also pointed out that tuna fisheries compared favorably with the global average. I assume that tuna fisheries have been managed with the dedicated effort of research and management by regional fisheries management organizations (RFMOs) in close collaboration with members and co-operating non-members.

Referring to the your last year's Scientific Committee Report, a set of stock status indicators

and Kobe plots clearly showed us where we are now and to go. What should be done for the stock status to be drawn to the "Green Zone".

To make it realize, among other things to be addressed, data issues are put in the first place. We know well that it is a commonly shared view that timely, complete and accurate fisheries data should be available for carrying out the reliable stock assessment. It seems to me that the importance of data is reflected in your agenda for this meeting by arranging it sitting at the beginning of substantial issues of the agenda.

According to your document regarding the overview of WCPO in 2011, I found that the provisional estimated tuna catch in 2011 was 2,244,776 mt and is corresponding to 55% of world's tuna catch.

Interesting to me, the catch figures in 2011 are the lowest catch since 2005 and 300,000 mt lower than the record in 2009. This decline occurred in all major species. I would like to look forward that you together would work out what happened in the stock status and in the WCPO.

Together with the stock assessment, management issues and ecosystem and bycatch themes are other important issues to be addressed in this meeting. Those issues are listed in your agenda and the importance of which are noted in the report of performance review of the WCPFC.

Distinguished scientists from the member countries, cooperating nonmember countries and from the Commission's scientific consultants, I would like to warmly thank you for your hard work every year and this year again, to enhance our understanding and make available the best scientific information for conserving and managing the fish stocks, related species and ecosystem in the WCPFC area of competence.

I sincerely hope that you would have a pleasant stay here in Busan, Korea, enjoying the culture, the tourist attractions and of course, the food that this region of Korea has to offer. Again, I whole-heartedly welcome all of you to the Eight Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission and to Busan, Korea.

Attachment C

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

LIST OF PARTICIPANTS

CHAIRMAN

Naozumi Miyabe
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6000
miyabe@fra.affrc.go.jp

AUSTRALIA

Robert Campbell
Senior Fisheries Scientist, CSIRO
Private Bag No.1
Aspendale VIC 3195
Australia
Ph: 61-3-92394681
Robert.Campbell@csiro.au

David Kirby
Acting Section Manager & Senior Scientist
Australian Bureau of Agricultural & Resource Economics and Sciences (ABARES)
Australian Government
Department of Agriculture, Fisheries & Forestry (DAFF)
Australia
Ph: 61-4-1684-4156
davidskirby@gmail.com

Quentin Hanich
Fisheries Governance Programme Leader
Australian National Centre for Ocean Resources and Security (ANCORS)
University of Wollongong,
WOLLONGONG, NSW, 2522, Australia
Ph: 61 2 4221 3389
hanich@uow.edu.au

CHINA

Xiaojie Dai
Professor
Shanghai Ocean University
999 Hucheng Huan Road
201306, Shanghai
China
Ph : 86-21-61900325
xdai@shou.edu.cn

COOK ISLANDS

Pamela Maru
Data Manager
Ministry of Marine Resources
P.O. Box 85
Rarotonga, Cook Islands
Ph: 682-28721

P.Maru@mmr.gov.ck

Kelvin Passfield
Ministry of Marine Resources
P.O. Box 85
Rarotonga, Cook Islands
Ph: 682-28721
K.Passfield@mmr.gov.ck

EUROPEAN UNION

Francisco J. Abascal Crespo
Fisheries Scientist
Spanish Institute of Oceanography
Dársena Pesquera. Parcela 8. 38180 Santa Cruz de Tenerife (SPAIN)
Ph : +34 922 54 94 00
francisco.abascal@ca.ieo.es

FEDERATED STATES OF MICRONESIA

Eugene R. Pangelinan
Deputy Director
National Oceanic Resource Management Authority(NORMA)
P.O. Box PS122, Pohnpei FSM 96941
Ph: 691 320-2700/5181
eugenep@mail.fm

Naiten Bradley Phillip Jr.
Chief Researcher
National Oceanic Resource Management Authority (NORMA)
P.O. Box PS122, Pohnpei FSM 96941
Ph: 691 320-2700
bradley.phillip@norma.fm

FIJI

Aisake Batibasaga
Principal Fisheries Officer
Ministry for Fisheries and Forest
Fisheries Department
P.O.. Box 2218
Government Building, Suva
Fiji
Ph : 679-330-1011
abatibasaga@gmail.com

Netani Tavaga
Fisheries Officer
Ministry for Fisheries and Forest
Fisheries Department
P.O.. Box 2218
Government Building, Suva
Fiji
Ph : 679-330-1011
stone_domain@hotmail.com

Meli Wakolowaqa Raicebe
Fisheries Officer
Fisheries Department
Takayawa Towers
Toorak Suva
Fiji
Ph: +679 330 1611
raicebe@yahoo.com

JAPAN

Miki Ogura
Director of Skipjack and Tuna Resources Division
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6042
ogura@fra.affrc.go.jp

Koji Uosaki
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6044

uosaki@fra.affrc.go.jp

Hiroaki Okamoto
Chief of Skipjack and Albacore Section
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6043
okamoto@fra.affrc.go.jp

Hidetada Kiyofuji
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6043
hkiyofuj@fra.affrc.go.jp

Ijima Hirotaka
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6000
ijima@fra.affrc.go.jp

Kotaro Yokowa
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6045
yokawa@fra.affrc.go.jp

Hiroshi Minami
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6047
hminami@fra.affrc.go.jp

Daisuke Ochi
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6047
otthii@affrc.go.jp

Yukiko Inoue
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6046
yuinoue@affrc.go.jp

Hideki Nakano
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6032
hnakano@affrc.go.jp

Yukio Takeuchi
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6039
yukiot@affrc.go.jp

Makoto Miyake
National Research Institute of Far Seas Fisheries,
Fisheries Research Agency
5-7-1 Orido, Shimizu-ku
Shizuoka 424-8633
Japan
Ph : 81-54-336-6000
p.m.miyake@gamma.ocn.ne.jp

Shuya Nakatsuka
Assistant Director
Fisheries Agency of Japan
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo 100-8907
Japan
Ph: 81-3-3502-8459
shuya.nakatsuka@nm.maff.go.jp

Masahiro Yamaguchi
National Ocean Tuna Fishery Association
Coop Bldg. 7F, 1-1-12 Uchikanda,
Chiyoda-ku
Tokyo 101-0047
Japan
Ph: 81-3-3294-9634
mas-yamaguchi@zenyoren.jf-net.ne.jp

Kiuo chiyo
Japan Tuna Fisheries Cooperative Association
2-31-1 Eitai, Koto-ku
Tokyo 135-0034
Japan
Ph: 81-3-5646-2382
gyojyo@japantuna.or.jp

Taro Kawamoto
Kyokuyo Suisan Co. Ltd.
1441-1 Habuchi, Yaizu, Shizuoka
Japan
Ph: 81-54-622-5112
tarokawamoto@nifty.com

Minoru Honda
Japan Far Seas Purse Seine Fishing Association
6F Shonan Bldg. 1-14-10 Ginza, Chuo-ku
Tokyo 104-0061
Japan
Ph: 81-3-3564-2315
japan@kaimaki.or.jp

Nobuyuki Sugimoto
Associate General Manager
Environment and Safety Dept.
Ajinomoto Co., Inc.
15-1 Kyobashi 1-chome, Chuo-ku
Tokyo 104-8315
Japan
Ph**:** +81-3-5250-8169
Nobuyuki_sugimoto@ajinomoto.com

Kazushige Hazama
National Offshore Tuna Fisheries Association of Japan
1-3-1 Uchikanda, Chiyoda-ku
Tokyo 101-0047
Japan
Ph: 81-3-3295-3721
zenkinjp@kinkatsukyo.or.jp

Tatsuki Oshima
JAMARC of Fisheries Research Agency
Assistant Leader
Pelagic Fish Research Group
15F Queen's Tower B, 2-3-3 Minatomirai,
Nishi-ku,Yokohama, Japan
Ph: 81-45-227-2737
oshima@jamarc.go.jp

Kazutaka Yamada
Consulate General of Japan at Busan
1147-11 Choryang-3 dong, Dong-gu,
Busan, Korea
Ph: 82-51-465-5101
kazutaka.yamada@mofa.go.jp

Akio Fukuma

Team Leader
Taiyo A&F
4-S, Toyomi-cho, Chuo-ku, Tokyo
Ph: 81-3-6220-1263
fishery2@maruha-nichiro.co.jp

KIRIBATI

Kaon Tiamare
Fisheries Officer
Ministry of Fisheries Marine Resource Development
P.O. Box 64
Bairiki, Tarawa
Kiribati
Ph: 686-21099
kaont@mfmrd.gov.ki

KOREA

Zang-Geun Kim
Senior Scientist
National Fisheries Research and Development Institute
216, Haean-ro, Gijang-up, Gijang-gun
Busan, Republic of Korea
Ph**:** 82-51 720 2310
zgkim@nfrdi.go.kr

Sung Il Lee
National Fisheries Research and Development Institute
Rep. of Korea
silee@nfrdi.go.kr

Mi Kyung Lee
National Fisheries Research and Development Institute
Republic of Korea
mklee@nfrdi.go.kr

Hyun-Wook Kwon
Deputy Director
International Fisheries Organization Office
Ministry of Food, Agriculture, and Fisheries
88 Gwanmon-ro, Gwacheon-si
Gyeonggi-do Korea
Ph: 82-2-500-2414
6013kwon@naver.com

Bundo Yoon
Director
International Fisheries Organisation Division
Ministry for Food, Agriculture, Forestry and Fishery (MIFAFF)
Korea
Ph: 82-10 2574 9790
sslim789@korea.kr

Jung-re Riley Kim
Advisor
Ministry for Food, Agriculture, Forestry and Fishery (MIFAFF)
Ph: 82 16 590 1219
Drew1126@naver.com

Lim Sung Su
Assistant Director
Ministry for Food Agriculture, Forestry and Fishery (MIFAFF)
Ph: 010-8542-0736
sslim789@korea.kr

Tuna Lee
Executive Managing Director
Silla Co. Ltd.
Baekjegobunnno #362, Seockchon-dong,
Songpa-gu, Seoul, Korea
Ph: 010-5306-7171
tunalee@sla.co.kr

Won-Ou Lee
Managing Director
Silla Co. Ltd.
Baekjegobunnno #362, Seockchon-dong,
Songpa-gu, Seoul, Korea
Ph: 010-4735-2007
leewonou@sla.co.kr

Hennah Kim

Silla Co. Ltd.
Baekjegobunnno #362, Seockchon-dong,
Songpa-gu, Seoul, Korea
Ph: 010-6611-8856
jihyunk@sla.co.kr

Brendon Kwak
Silla Co. Ltd.
Baekjegobunnno #362, Seockchon-dong,
Songpa-gu, Seoul, Korea
Ph: 010-3571-5919
sbkwak@sla.co.kr

Lonnie(MG) Kang
Silla co., Ltd/Assistant Manager
Baekjegobunnno #362, Seockchon-dong,
Songpa-gu, Seoul, Korea
Ph : 010-2938-1779
mgkang@sla.co.kr

Lee-Soo Jeong
Observer Manager
Fisheries Negotiation Advisor
Institute for International Fisheries
Cooperation
soojeonglee@gmail.com

Kim Hyo Sang
Korea Overseas Fisheries Association
6th Fl. Samho Center Bldg. "A" 275-1,
Yangjae-Dong, Seocho-Ku
Seoul, Korea
Ph: 82-2-589-1615
coelho@kosfa.org

Gwang Cheon Choi
International Fisheries Advisor
Institute for International Fisheries
Cooperation
Kyunggido Kwacheonshi Byungyangdong
1-15 Grace Hotel 1107
Ph: 010-2505-5343
joshchoi.snu@gmail.com

Jiwon Yoon
International Fisheries Advisor
Institution for International Fisheries
Cooperation
Ministry for Food, Agriculture &
Fisheries Government Complex Bldg. #2 88
Gwanmun-ro, Gwacheon-si, Gyeonggi-do
427-719 Korea
missjyoon@gmail.com

Joon Young Lee
International Fisheries Advisor
Institute for International Fisheries
Cooperation
#1107 Grace Hotel, 1-15 Byulyang-dong,
Gwacheon-si, Gyeonggi-do, Korea 427-040
Ph: 82-10-8522-3292
geodynamics@hanmail.net

Ilkang Na
Korea Overseas Fisheries Association
ikna@kosfa.org

HyunAi Shin
Korea Overseas Fisheries Association
fleur@kosfa.org

Hwang Seonjae
Research Fellow
Korea Fisheries Resources Agency
19th FL Centum Science Park B/D, 79
Centum Chungangro, haeundae-gu
Busan, Korea
Ph: 82-51-740-2541
eco@fira.or.kr

Byung Goo Min
Dongwon Industries Co., Ltd.
bgmin@dongwon.com

Hayoon Chang
Dongwon Industries Co., Ltd.
chy0415@dongwon.com

Jea Hun Jeong
Dongwon Industries Co, Ltd
Seoul, Korea
Ph: 82 - 2 - 589 – 3337

opa114@dongwon.com

REPUBLIC OF THE MARSHALL ISLANDS

Berry Muller
Chief Fisheries Officer, Ocean Division
Marshall Islands Marine Resources Authority
P.O. Box 860
Majuro, RMI
Ph: 692-625-8262
bmuller@mimra.com

Dike Poznanski
Information Officer
Marshall Islands Marine Resources Authority
P.O. Box 860
Majuro, RMI
Ph: 692-625-8262
dikep@mimra.com

NAURU

Terry Amram
Oceanic Manager
Nauru Fisheries and Marine Resources Authority
P.O. Box 449
Nauru
Ph: 674-4444-3733/3739
tamramnr@yahoo.com

Karlick Agir
Nauru Fisheries and Marine Resources Authority
P.O. Box 449
Nauru
Ph: 674-4444-3733/3739
k.agir1957@gmail.com

NEW ZEALAND

Arthur Hore
Fisheries Manager
HMS Pelagic
Ministry for Primary Industries
PO Box 19747
Auckland, New Zealand
Ph: 64 9 820 7686
arthur.hore@mpi.govt.nz

Stephen Brouwer
Principal Scientist
Ministry for Primary Industries
Pastoral House 25 The Terrace
P.O. Box 2526
Wellington, New Zealand
Ph: 64 (0) 4-819-4249
stephen.brouwer@mpi.govt.nz

PALAU

Kathleen Sisior
Fisheries Revenue & Licensing Officer II
Burea of Marine Resources
Ministry of Natural Resources, Environment & Tourism
P.O. Box 359
Koror, Republic of Palau 96940
Ph: (680) 488-3125/2897
katzpma@palaunet.com

PAPUA NEW GUINEA

Ludwig Kumoru
Executive Manager
Fisheries Management Division
National Fisheries Authority
P.O. Box 2016
Port Moresby, NCD PNG
Ph: 675-309-0044
lkumoru@fisheries.gov.pg

Brian Kumasi
Fisheries Management Officer - Tuna
National Fisheries Authority
11 Floor Deloitte Tower, Douglas Street
Port Moresby
Ph : 675 3090444
bkumasi@fisheries.gov.pg

Leontine Baje
Fisheries Management Officer – Tuna
National Fisheries Authority PNG
P.O. Box 2016
Port Moresby
Ph : 675 3090444
lbaje@fisheries.gov.pg
leontinebaje@gmail.com

PHILIPPINES

Rafael Y. Ramiscal
Supervising Aquaculturist/Chief Researcher
M/VDA-BFAR
Bureau of Fisheries and Aquatic Resources
PCA Compound, Elliptical Road
Diliman, Quezon City
Philippines
rv_ram55@yahoo.com

Elaine Garvilles
Asst. National Tuna Coordinator/Aquaculturist 1
Bureau of Fisheries and Aquatic Resources
National Fisheries Research and Development
Institute – Philippines
Corporate 101 Bldg. Mother Ignacia Avenue
Quezon City 1103
Ph: 63-2-372-5063
egarvilles@yahoo.com

Fileonor O. Eleserio
Senior Aquaculturist/Chief
Policy Evaluation Section
Capture Fisheries Technology Division
Bureau of Fisheries and Aquatic Resources
PCA Compound, Elliptical Road
Diliman, Quezon City
Philippines
Ph: (02) 929-4296
f_eleserio@yahoo.com

Rhoda S. Bacordo
Researcher/MV DA-BFAR
Bureau of Fisheries and Aquatic Resources
National Marine Fisheries Development Center
PCA Compound, Elliptical Road
Diliman Quezon City
Philippines
Fax (02) 929-6668
jadesummer21@yahoo.com

SAMOA

Ueta Faasili
Principal Fisheries Officer
Ministry of Agriculture and Fisheries
Apia
Ph: 685-20369
ueta.faasili@maf.gov.ws

SOLOMON ISLANDS

Phil Roberts
Managing Director
National Fisheries Development Limited
P.O. Box 717
Honiara
Solomon Islands
Ph: 65-9829-3112
philroberts@trimarinegroup.com

Edward Honiwala
Deputy Director of Fisheries
Solomon Islands Government
Ministry of Fisheries & Marine Resources
P.O. Box G13
Honiara
Solomon Islands
Ph: 677-39143/742-8098
ehoniwala@fisheries.gov.sb

CHINESE TAIPEI

Shu-Min Lee
Specialist
Fisheries Agency, Council of Agriculture
70-1, Sec.1, Jinshan S. Road
Taipei, Taiwan

Ph: 886-2-33436101
shumin@ms1.fa.gov.tw

Yu-Syuan Gao
Specialist
Fisheries Agency, Council of Agriculture
70-1, Sec.1, Jinshan S. Road
Taipei, Taiwan
Ph: 886-2-33436063
yushuan@ms1.fa.gov.tw

Shui-Kai Chang
Associate Professor
National Sun-Yat Sen University
No.70, Lienhai Road, 80424
Kaohsiung, Taiwan
Ph: 886-7-52520050
skchang@faculty.nsysu.edu.tw

Ren-Fen Wu
Director
Information Division, Overseas Fisheries Development Council
19, Lane 113,Roosevelt Road, Sec.4
Taipei, Taiwan
Ph: 886-2-27381522 ext. 118
fan@ofdc.org.tw

Hung-I Liu
Fisheries Statistician
Overseas Development Council
19, Lane 113,Roosevelt Road, Sec.4
Taipei, Taiwan
Ph: 886-2-27381522 ext. 124
luoe@ofdc.org.tw

Chia Chang Tsai
Assistant
Taiwan Purse Seiners Association
jason@ttpsa.org.tw

TONGA

Sione Vailala Matoto
Chief Executive Officer
Ministry of Agriculture & Food, Forestry and Fisheries
P.O. Box 871
Nuku'alofa, Tonga
Ph: 676-23402
vailalam@yahoo.com

Talaofa Lotoahea
Acting Principal Fisheries Officer
Fisheries Division
Ministry of Agriculture & Food, Forestry and Fisheries
P.O. Box 871
Nuku'alofa, Tonga
Ph: 676 21399
talaofa@gmail.com

TUVALU

Kakee P. Kaitu
Permanent Secretary
Ministry of Natural Resources
Tuvalu Government
Private Mail Bag
Funafuti, Tuvalu
Ph: 688 20836
kpkaitu@yahoo.com.au

Samasoni Finikaso
Director of Fisheries
Fisheries Department
Ministry of Natural Resources and Environment
Vaiaku, Funafuti
Tuvalu
Ph: 688- 20836 Ext. 2206/901007
Fax: 688-20151
sfinakaso@yahoo.com

Efoti Koula Lea Ala
Fisheries tuna Data Officer
Ministry of Natural Resources and Environment
Vaiaku, Funafuti
Tuvalu
Ph: 688- 20836
efo.ala@gmail.com

UNITED STATES OF AMERICA

Keith Bigelow
Fisheries Biologist
PIFSC
2570 Dole Street, Honolulu, HI 96822
Ph: 808 983 5388
Keith.Bigelow@noaa.gov

David G. Itano
Research Associate
PFRP
University of Hawaii-Manoa, MSB 312, 1000 Pope Rd., Honolulu HI 96822
Ph: 808 956 4108
dgi@hawaii.edu

Valerie Chan
Fishery Policy Analyst
NOAA – National Marine Fisheries Service
1601 Kapiolani Blvd., Suite 1110
Honolulu, HI
Ph: 808-944-2161
valerie.chang@noaa.gov

Kevin Piner
Research Fisheries Biologist
NOAA
8604 La Jolla Shores Drive
La Jolla, California
USA
Ph : 858-775-9065
kevin.piner@noaa.gov

Jon Brodziak
Mathematical Statistician
PIFSC
2570 Dole Street, Honolulu, HI 96822
Ph: 808 983 2964
Jon.Brodziak@noaa.gov

Pierre Kleiber
Fisheries Biologist
PIFSC
2570 Dole Street, Honolulu, HI 96822
Ph: 808 983 5705
Pierre.Kleiber@noaa.gov

Adam Bloomquist
Foreign Affairs Officer
Department of State
2201 C Street
NW, Washington DC 20520
Ph: 202 647 3941
BloomquistA@state.gov

Joe Hamby
Managing Director
Tri-Marine Group
15 Fishery Port Road
Ph: 65 62610663
jhamby@trimarinegroup.com

VANUATU

Tony Taleo
Principal Data Officer
Vanuatu Fisheries DepartmentVMB 9045
Ph: 678-27244
ttaleo@gmail.com

Lucy Andrea Joy
Senior Data Officer
Vanuatu Fisheries Department
VMB 9045
Ph: 678-27244
lujo_andrea@yahoo.com.au

COOPERATING NON-MEMBERS

INDONESIA

Agustinus Anung Widodo, MSc
Research Ctr for Fisheries Management &Conservation
Patrajasa Bld. 1st Floor, Jl. Jenderal Gatot Subroto, Kav. 32-34, Jakarta, Indonesia
Ph: 622152900006/622152900007
Fax: 622152900005
anungwd@yahoo.co.id

Fayakun Satria, PhD
Head of Research Institute for Fisheries Enhancement & Conservation (RIFEC)
RCFMC – RIFEC
Cilalawi 1 Jatiluhur Purwakarta 91152
Indonesia
Ph: 62 81321505651/62 269231036
Fax 62 269208768
fsatria-2@yahoo.com

VIETNAM

Pham Viet Anh
National Tuna Coordinator
DECAFIREP
Ha Noi, Vietnam
Ph : 844437744238
phvietanh2003@yahoo.com

Pham Trong Yen
Deputy Director
International Cooperation Department
MARD, Vietnam
10 Nguyen Cong Huan
Ph : 84912252772
ptrongyen@yahoo.com

PARTICIPATING TERRITORIES

FRENCH POLYNESIA

Marie Soehnlen
Fisheries Officer
Direction des Resources Marinés
Marine Resources Authority
BP 20, 98713 Papeete
Tahiti, French Polynesia
Ph: 00 689-23 69 64 /00 689- 50 25 50
marie.soehnlen@drm.gov.pf

NEW CALEDONIA

Fonfreyde Christophe
Deputy Head of Fisheries
New Caledonia Government
3 bis rue Russeil
98800 Noumea, New Caledonia
Ph: 687-272626
christophe.fonfreyde@gouv.nc

Ducrocq Manuel
Fisheries Scientist of the ZonéCo programme
ADECAL
BP2384 98846 Nouméa Cedex
New Caledonia
Ph: (687) 24 90 77
manuel.ducrocq@adecal.nc

TOKELAU

Mose Pelasio
Manager
Fisheries Division
EDNRE
Fakaoko, Tokelau
Ph: 690-3127
pelasio.iulio2@gmail.com

WALLIS AND FUTUNA

Bruno Mugneret
Principal Fisheries Officer
Agriculture and Fisheries Dept.
BP 19, 98600
Wallis and Futuna Islands
Ph: 681-722-606
bruno.mugneret@agripeche.wf

OBSERVERS

AGREEMENT ON THE CONSERVATION OF ALBATROSSES AND PETRELS

Warren Papworth
Executive Secretary
27 Salamanca Square
Battery Point 7004
Tasmania, Australia
Ph: 61-0-439 323 505

warren.papworth@acap.aq

PACIFIC ISLANDS FORUM FISHERIES AGENCY (FFA)

Wez Norris
Director
Fisheries Management
Pacific Islands Forum Fisheries Agency
P.O. Box 629 Honiara, Solomon Islands
Ph: (677) 21124 Fax: 677- 23995
wez.norris@ffa.int

Samasoni Sauni
Fisheries Management Advisor
Pacific Islands Forum Fisheries Agency
P.O. Box 629 Honiara, Solomon Islands
Ph: 677- 21124 Fax: 677-23995
samasoni.sauni@ffa.int

Ian Freeman
Fisheries Management Advisor
Pacific Islands Forum Fisheries Agency
1 FFA Rd., P.O. Box 629
Honiara, Solomon Islands
Ph: 677- 21124/7525259 Fax: 677- 23995
ian.freeman@ffa.int

Maruia Kamatie
Fisheries Management Advisor
Pacific Islands Forum Fisheries Agency
1 FFA Rd, P.O. Box 629
Honiara, Solomon Islands
Ph: 677- 21124 Fax: 677- 23995
maruia.kamatie@ffa.int

Roseti Imo
Fisheries Economist
Pacific Islands Forum Fisheries Agency
P.O. Box 629 Honiara, Solomon Islands
Ph: 677- 21124 Fax: 677- 23995
roseti.imo@ffa.int

Peter Terawasi
Fisheries Economics Officer
Pacific Islands Forum Fisheries Agency
P.O. Box 629 Honiara, Solomon Islands
Ph: 677- 21124 Fax: 677- 23995
peter.terawasi@ffa.int

GREEN PEACE

Cat Dorey
International Coordinator Sustainable Seafood Project
Greenpeace International
Level 2,33 Mountain St.
Ultimo Sydney, NSW 2007
Australia
Ph: 61-2-9263-0359
cat.dorey@greenpeace.org

Chow Yuen Ping
Senior Oceans Campaigner
Greenpeace East Asia
Ph : 852 94982124
apple.chow@greenpeace.org

INTER-AMERICAN TROPICAL TUNA COMMISSION (IATTC)

Kurt M. Schaefer
Senior Scientist
IATTC
8604 La Jolla Shores Drive
La Jolla, CA 92037
USA
Ph : 858-546-7159
kschaefer@iattc.org

INTERNATIONAL SEAFOOD SUSTAINABILITY FOUNDATION (ISSF)

Victor Restrepo
ISSF
805 15th St. NW, Suite 650
Washington DC 20005
USA
Ph : 1-3054502575
vrestrepo@iss-foundation.org

Melanie Hutchinson
Hawaii Institute of Marine Biology
University of Hawaii
46-007 Lilipuna Rd.
Kaneohe HI 96744
USA
Ph: 808-927-3781
melanier@hawaii.edu

Jeff Muir
Contractor
ISSF
2651-C, Waiomao Rd.
Honolulu, HI 96816
Ph: 808-520-5224
jmuir@hawaii.edu

Bob Gillett
Director
GPA
P.O. Box 3344
Lami, Fiji
Ph: 679-336-2855
gillet@connect.com.fj

Shiham Adam
Marine Research Centre
Ph: (960) 779-2687
msadam@mrc.gov.mv

Paul Bannerman
Fisheries Scientist
paulbanner@hotmail.com

PEW CHARITABLE TRUSTS

Adam Baske
Officer
PEW Environmental Group
901 E St., NW
Washington, DC 20004
USA
Ph: 202-540-6448
abaske@pewtrusts.org

Shana Miller
Advisor
PEW Environmental Group
901 E St., NW
Washington, DC 20004
USA
Ph: 631-671-1530
smiller-consultant@pewtrusts.org

PITIA

Naitilima Tupou
Pacific Islands Tuna Industry Association
P.O. Box 1704
Nuku'alofa, Tonga
Ph: 676 28867
secretariat@pacifictunaindustry.com

PNA

Les Clark
Adviser
85 Innes Rd
Ph: 6433562892
les@rayfishresearch.com

SEAFDEC

Chumnarn Pongsri
Secretary-General
SEAFDEC Secretariat
Suraswadi Building,
Kasetsart University Campus
P.O. Box 1046 Kasetsart Post Office
Bangkok 10903
Thailand
Ph: 66-29406332
sg@seafdec.org

Somboon Siriraksophon
Policy and Program Coordinator
SEAFDEC Secretariat
Suraswadi Building
Kasetsart University Campus
P.O. Box 1046 Kasetsart Post Office
Bangkok 10903

Thailand
Ph: 66-29406333/6326 Ext. 110
somboon@seafdec.org

SECRETARIAT OF THE PACIFIC COMMUNITY (SPC)

John Hampton
Programme Manager
Secretariat of the Pacific Community
BP D5, 98848 Noumea CEDEX
New Caledonia
johnh@spc.int

Graham Pilling
Fishery Scientist
Secretariat of the Pacific Community
BP D5, 98848 Noumea CEDEX
New Caledonia
grahamp@spc.int

Shelton Harley
Principal Fishery Scientist
Secretariat of the Pacific Community
BP D5, 98848 Noumea CEDEX
New Caledonia
sheltonh@spc.int

Simon Nicol
Principal Fishery Scientist
Secretariat of the Pacific Community
BP D5, 98848 Noumea CEDEX
New Caledonia
simonn@spc.int

Tim Lawson
Principal Fishery Scientist
Secretariat of the Pacific Community
BP D5, 98848 Noumea CEDEX
New Caledonia
timl@spc.int

Peter Williams
Principal Fisheries Scientist (Data mgmt.)
Secretariat of the Pacific Community
BP D5, 98848 Noumea CEDEX
New Caledonia
Ph: 687282382
peterw@spc.int

Joel Rice
Fishery Scientist
Secretariat of the Pacific Community
BP D5, 98848 Noumea CEDEX
New Caledonia
joelr@spc.int

Simon Hoyle
Senior Fishery Scientist
Secretariat of the Pacific Community
BP D5, 98848 Noumea CEDEX
New Caledonia
simonh@spc.int

Nick Davies
Senior Fishery Scientist
Secretariat of the Pacific Community
BP D5, 98848 Noumea CEDEX
New Caledonia
nickd@spc.int

Aaron Berger
Fishery Scientist
Secretariat of the Pacific Community
BP D5, 98848 Noumea CEDEX
New Caledonia
aaronb@spc.int

WWF

Alfred Lee (Bubba) Cook Jr.
WCPO Tuna Programme Officer
WWF
4 Ma'afu Street, Suva, Fiji Islands
Ph: 6799035008
acook@wwfpacific.org.fj

SECRETARIAT

Charles Karnella
WCPFC Chairman and International Fisheries Administrator
NOAA - National Marine Fisheries Service

1601 Kapiolani Blvd., Suite 1110
Honolulu, HI 96814
Ph : 808-944-2206
charles.karnella@noaa.gov

Glenn Hurry
Executive Director
P.O. Box 2356
Kolonia, Pohnpei 96941
Federated States of Micronesia
Ph: 691-320-1992/1993 Fax: 691-320-1108
glenn.hurry@wcpfc.int

SungKwon Soh
Science Manager
P.O. Box 2356
Kolonia, Pohnpei 96941
Federated States of Micronesia
Ph: 691-320-1992/1993 Fax: 691-320-1108
sungkwon.soh@wcpfc.int

Lara Manarangi-Trott
Compliance Manager
P.O. Box 2356
Kolonia, Pohnpei 96941
Federated States of Micronesia
Ph: 691-320-1992/1993 Fax: 691-320-1108
lara.manarangi-trott@wcpfc.int

Samuelu Taufao
ICT Manager
P.O. Box 2356
Kolonia, Pohnpei 96941
Federated States of Micronesia
Ph: (691)320-1992/1993 Fax: 691 320-1108
sam.taufao@wcpfc.int

Anthony Beeching
Assistant Manager Science
P.O. Box 2356
Kolonia, Pohnpei 96941
Federated States of Micronesia
Ph: 691-20-1992/1993 Fax: 691 320-1108
anthony.beeching@wcpfc.int

Lucille A. Martinez
Administrative Officer
P.O. Box 2356
Kolonia, Pohnpei 96941
Federated States of Micronesia
Ph: (691)320-1992/1993 Fax: 691 320-1108
lucille.martinez@wcpfc.int

Shelley Clarke
Rapporteur
1675 Sasama-kami, Kawane-cho,
Shimada-shi, Shizuoka-ken, Japan 428-0211
Ph: 81-547-54-0275
shelley.clarke@imperial.ac.uk

Andre Punt
Presenter
aepunt@uw.edu

Antony Lewis
Chair, WPEA Steering Committee
37/22 Riverview Terrace Indooroopilly
Brisbane 4068
Australia
Ph: 61738787126
al06975@pigbond.net.au

Attachment D

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

Agenda

AGENDA ITEM 5 OPENING OF THE MEETING

1.7 Welcome address
1.8 Meeting arrangements
1.9 Issues arising from the Commission
1.10 Adoption of agenda
1.11 Reporting arrangements
1.12 Intersessional activities of the Scientific Committee

AGENDA ITEM 6 REVIEW OF FISHERIES

2.5 Overview of Western and Central Pacific Ocean (WCPO) fisheries*
2.6 Overview of Eastern Pacific Ocean (EPO) fisheries
2.7 Annual Report (Part 1) from Members, Cooperating Non-Members, and Participating Territories (CCMs)
2.8 Reports from regional fisheries bodies and other organizations

AGENDA ITEM 7 DATA AND STATISTICS THEME

3.4 Data gaps
3.4.1 Data gaps of the Commission
3.4.2 Species composition of purse-seine catches
3.4.3 Data issues with the ISC
3.5 Requests from CMM 2008-01
3.5.1 Fishing effort for bigeye and yellowfin tuna from other commercial tuna fisheries*
3.6 Regional Observer Programme

AGENDA ITEM 8 STOCK ASSESSMENT THEME

4.10 WCPO bigeye tuna

4.10.1 Review of research and information

a. Peer review of 2011 bigeye tuna stock assessment

b. Indicator analysis

c. Progress report on Project 35 (Refinement of bigeye parameters Pacific-wide)

4.10.2 Provision of scientific information

c. Status and trends*

d. Management advice and implications*

4.11 WCPO yellowfin tuna

4.11.1 Review of research and information

4.11.2 Provision of scientific information

c. Status and trends*

d. Management advice and implications*

4.12 WCPO skipjack tuna

4.12.1 Review of research and information

4.12.2 Provision of scientific information

c. Status and trends*

d. Management advice and implications*

4.13 South Pacific albacore tuna

4.13.1 Review of research and information

d. Review of Project 39 (Stock structure and life-history characteristics of SP albacore)

e. Review of 2012 stock assessment

f. Review of CMM 2010-05

4.13.2 Provision of scientific information

c. Status and trends*

d. Management advice and implications*

4.14 South Pacific swordfish

4.14.1 Review of research and information

4.14.2 Provision of scientific information

c. Status and trends*

d. Management advice and implications*

4.15 Southwest Pacific striped marlin

4.15.1 Review of research and information

c. Review of Project 64 (Collation of SP striped marlin)

d. Review of 2012 stock assessment

4.15.2 Provision of scientific information

c. Status and trends*

d. Management advice and implications*

4.16 North Pacific striped marlin

4.16.1 Review of research and information

b. Review of 2012 stock assessment

4.16.2 Provision of scientific information

c. Status and trends*

d. Management advice and implications*

4.17 Northern stocks

4.17.1 North Pacific albacore tuna

4.17.1.1 Review of research and information
4.17.1.2 Provision of scientific information
c. Status and trends*
d. Management advice and implications*

4.17.2 Pacific bluefin tuna

4.17.2.1 Review of research and information
b. Review of 2012 stock assessment
4.17.2.2 Provision of scientific information
c. Status and trends*
d. Management advice and implications*

4.17.3 North Pacific swordfish

4.17.3.1 Review of research and information
4.17.3.2 Provision of scientific information
c. Status and trends*
d. Management advice and implications*

4.18 WCPO sharks

4.18.1 Oceanic whitetip shark

4.18.1.1 Review of research and information
b. Review of 2012 stock assessment
4.18.1.2 Provision of scientific information
c. Status and trends*
d. Management advice and implications*

4.18.2 Silky shark

4.18.2.1 Review of research and information
b. Review of 2012 stock assessment
4.18.2.2 Provision of scientific information
c. Status and trends*
d. Management advice and implications*

4.19 Stock Assessment Methods

4.10.1 Review of research and information

AGENDA ITEM 7 MANAGEMENT ISSUES THEME*

7.1 Terms of Reference

7.2 Reference Points for the WCPFC

5.2.1 Limit reference points
5.2.2 Target reference points
5.2.3 Harvest Control Rules

5.3 Requests from CMM 2008-01

5.3.1 Review of the effectiveness of CMM 2008-01*

5.4 Management Objectives Workshop

AGENDA ITEM 16 ECOSYSTEM AND BYCATCH MITIGATION THEME

8.1 Ecosystem effects of fishing

6.1.1 Review of Research and Information

8.2 Sharks*

8.2.1 Shark Research Plan

b) Assessment of whale sharks against the key shark species criteria

8.2.2 Review of CMM for Sharks

e) CMM 2010-07 (CMM for Sharks)

f) CMM 2011-04 (CMM for oceanic whitetip shark)

g) Development of CMMs on other shark species

h) Guidelines for safe release of encircled animals

8.2.3 International cooperation on shark issues

8.3 Seabirds*

6.3.1 Review of Research and Information

8.4 Sea turtles*

8.5 Other species and issues

8.5.1 FAD bycatch mitigation

8.5.2 Food security issues with bycatch

b) Management advice and implications*

AGENDA ITEM 17 OTHER RESEARCH PROJECTS

7.3 West Pacific East Asia Oceanic Fisheries Management Project*

7.4 Pacific Tuna Tagging Project*

AGENDA ITEM 18 COOPERATION WITH OTHER ORGANISATIONS

10.1 The status of cooperation and relations

AGENDA ITEM 19 SPECIAL REQUIREMENTS OF DEVELOPING STATES AND PARTICIPATING TERRITORIES

15.1 Consideration of the special requirements of developing States pursuant to Part VIII of the Convention

AGENDA ITEM 20 FUTURE WORK PROGRAM AND BUDGET

15.1 Review of the Scientific Committee Work Programme

15.2 Development of the 2013 Work Programme and budget, and projection of 2014-2015 provisional Work Programme and indicative budget*

AGENDA ITEM 21 ADMINISTRATIVE MATTERS

16.1 Rules of Procedure

16.2 Peer review of stock assessments*

16.3 Future operation of the Scientific Committee

16.3.1 Future structure of the SC

16.3.2 Review of SC agenda

16.3.3 Guidelines for the theme conveners and SC chair

16.4 Election of the Chairman of the Scientific Committee*
16.5 Next meeting*

AGENDA ITEM 22 OTHER MATTERS

AGENDA ITEM 23 ADOPTION OF THE SUMMARY REPORT OF THE EIGHTH REGULAR SESSION OF THE SCIENTIFIC COMMITTEE

AGENDA ITEM 24 CLOSE OF MEETING

Attachment E

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

WCPFC Acronyms and Abbreviations

Attachment F

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

List of Documents

MEETING INFORMATION

WCPFC-SC8-2012-01	Meeting notice and information
WCPFC-SC8-2012-02	Provisional agenda
WCPFC-SC8-2012-03	Provisional annotated agenda
WCPFC-SC8-2012-04	Indicative schedule Rev 1 (4 August 2012)
WCPFC-SC8-2012-05	Registration form
WCPFC-SC8-2012-06	Guidelines for submitting meeting papers
WCPFC-SC8-2012-07	List of Documents Rev 3 (15 August 2012)
WCPFC-SC8-2012-08	Provisional agenda for head of delegation (HOD) meeting (1600-1700, 6 August 2012)
WCPFC-SC8-2012-09	Provisional Agenda of the JTF Steering Committee Meeting
WCPFC-SC8-2012-10	Provisional Agenda of the PTTP Steering Committee Meeting
WCPFC-SC8-2012-11	Provisional Agenda of the WPEA OFM Project Steering Committee
WCPFC-SC8-2012-12	Notes on Reorganisation of the SC Documents List
WCPFC-SC8-2012-13	Theme Agendas Annotated with Associated Papers

GENERAL PAPERS

GENERAL PAPERS – Working Papers	
GN-WP-01	Williams, P and P. Terawasi. . Overview of tuna fisheries in the western and central Pacific Ocean, including economic conditions – 2011.
GN-WP-02	IATTC. Summary of the fishery and assessments of the major stocks of tuna exploited in the eastern Pacific Ocean.
GN-WP-03	Secretariat. Issues arising from the Commission
GN-WP-04	Secretariat. Intersessional activities of the Scientific Committee
GN-WP-05	SC8 ISG5 List of Work Programme of the Scientific Committee Rev 2
GN-WP-06	SC8 ISG4 Guidelines for the SC Chair and Theme Conveners Rev 1

GN-WP-07	Secretariat. Recommended Requirements for Hosting the Scientific Committee Meeting of the WCPFC.
GN-WP-08	Secretariat. Recommendations from the Review of the WCPFC.
GN-WP-09	SC8 ISG6 List of Scientific Committee work programme titles and budget for 2012, and indicative budget for 2013–2014
GN-WP-10	SC8 Indicative plan of the SPC-OFP Science Services for 2013-2015
GENERAL PAPERS – Information Papers	
GN-IP-01	Secretariat. Cooperation with other organizations
GN-IP-02	ISC (Chair). Report of the 12th Meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean.
GN-IP-03	Harley, S. A proposal to investigate range contraction for tropical tunas in the WCPO

SCIENCE-RELATED DOCUMENTS PRESENTED AT WCPFC8

SC8-WCPFC8-01	SPC-OFP. Review of Implementation of Effectiveness of CMM 2008-01 (WCPFC8-2011/43 Rev1)
SC8-WCPFC8-02	SPC-OFP. Projections recent av-recruitment (WCPFC8-2011/43 A)
SC8-WCPFC8-03	SPC-OFP. Projections srr recruitment (WCPFC8-2011/43 B)
SC8-WCPFC8-04	SPC-OFP. Summary Information on Whale Shark and Cetacean Interactions in the Tropical WCPFC Purse Seine Fishery (WCPFC8-2011-IP/01 Rev 1)
SC8-WCPFC8-05	SPC-OFP. WCP Tuna Fishery: 2010 Overview and Status of Stocks (WCPFC8-2011-IP-02)
SC8-WCPFC8-06	Secretariat. South Pacific Albacore Fishery (WCPFC8-2011-IP/04 Rev 1)
SC8-WCPFC8-07	SPC-OFP. WCPFC CMM 2008-01 Background Stats (Rev 1) (WCPFC8-2011-IP-11 (Rev 1))
SC8-WCPFC8-08	SPC-OFP. WCPFC-2011-IP06. Plan for Improvement of the Availability and Use of Purse Seine Catch Composition Data (Project 60)
SC8-WCPFC8-09	Australia Proposals to Address the Impact of Purse Seine Fishing Activity on Whale Sharks (WCPFC8-2011-DP/15a (Rev 1))
SC8-WCPFC8-10	Japan. A Guideline for safe and live release of encircled whale sharks during purse seine fishing operation (WCPFC8-2011-DP/17)

DATA AND STATISTICS THEME

ST THEME – Working Papers	
ST-WP-01	Williams, P. Scientific data available to the Western and Central Pacific Fisheries Commission. Rev 1 (30 July 2012)
ST-WP-02	Lawson, T. and F. Lasi. Report on Project 60: Collection and Evaluation of Purse-Seine Species Composition Data.

ST-WP-03	Lawson, T. Estimation of the species composition of the catch by purse seiners in the Western and Central Pacific Ocean using grab samples and spill samples collected by observers Rev 1 (27 July 2012)
THEME – Information Papers	
ST-IP-01	Williams, P. Estimates of annual catches in the WCPFC Statistical Area. SPC-OFP
ST-IP-02	Williams P. and C. Cole. Status of Observer Data Management
ST-IP-03	Secretariat. Summary of Regional Observer Programme Audits
ST-IP-04	Dickson et al. Analysis of Purse Seine/Ring Net Fishing Operations in Philippine EEZ
ST-IP-05	Piasente et al. Electronic onboard monitoring pilot project for the Eastern Tuna and Billfish Fishery (Australia)
ST-IP-06	Kumasi, B. Determination of age-classes from length frequency data collected from port sampling in Papua New Guinea
ST-IP-07	Usu, T. Assessment of Independent fishery data collected from the PNG Purse Seine Fishery between 2008 and 2011.

STOCK ASSESSMENT THEME

SA THEME – Working Papers	
SA-WP-01	Ianelli, J., M. Maunder, and A. E. Punt. Independent Review of 2011 WCPO Bigeye Tuna Assessment.
SA-WP-02	Harley S., P. Williams and J. Hampton. A compendium of fisheries indicators for bigeye, skipjack, yellowfin, and south Pacific albacore tunas and south Pacific swordfish
SA-WP-03	Nicol, S. Project 35: Bigeye tuna age and reproductive biology progress report
SA-WP-04	Hoyle, S. Stock Assessment of Albacore in the south Pacific Ocean Rev 1 (29 July 2012)
SA-WP-05	Davies, N. et al. Stock Assessment of Striped Marlin (Kajikia audax) in the Southwest Pacific Ocean.
SA-WP-06	Rice, J. and S. Harley. Stock Assessment of Oceanic Whitetip Sharks in the Western and Central Pacific Ocean
SA-WP-07	Rice, J. Stock Assessment of Silky Sharks in the Western and Central Pacific Ocean
SA-WP-08	Kleiber, P. and S. Harley. An update on progress towards a stock assessment for swordfish in the southern WCPO including standardized CPUE for Spanish swordfish fleet.
SA-WP-09	Lee, S., Z. Kim, M. Lee, J. Ku, S. Yoon, and D. Lee. Yellowfin tuna CPUE standardization of the Korean tuna longline fisheries in the Western and Central Pacific Ocean. Rev 1 (6 August 2012)
SA-WP-10	ISC. Stock Assessment for North Pacific Striped Marlin
SA-WP-11	SC8 ISG1 Implications and priorities from the Peer Review of Bigeye 2011 Stock Assessment
SA THEME – Information Papers	
SA-IP-01	Davies, N. et al. Recent developments in the MULTIFAN-CL stock assessment

	software
SA-IP-02	Hampton, J. et al. SPC-OF response to the Independent Review of the 2011 bigeye tuna stock assessment
SA-IP-03	Servidad-Bacordo, R., A. Dickson, L. Nepomuceno and R. Ramiscal. Composition, Distribution and Abundance of Fish Eggs and Larvae in the Philippine Pacific Seaboard and Celebes Sea with Focus on Scombrids Larvae (Tuna and Tuna-like Species).
SA-IP-04	Holdsworth, J. Yellowfin Tuna Fisheries in New Zealand and the Southwest Pacific Ocean.
SA-IP-05	Evans, K., D. Kolody, F. Abascal, J. Holdsworth, P. Maru and T. Sippel. Spatial dynamics of swordfish in the south Pacific Ocean inferred from tagging experiments.
SA-IP-06	Not Provided
SA-IP-07	Ghosn, D., D. Collins, C. Baiada and A. Steffe. Catch per unit effort and size composition of striped marlin caught by recreational fisheries in southeast Australian waters. NSW Department of Primary Industries. Rev 1 (11 July 2012)
SA-IP-08	Holdsworth, J., and T. Kendrick. Characterisation and catch per unit effort of striped marlin in New Zealand.
SA-IP-09	Hoyle, S. et al. CPUE Standardisation for Striped Marlin in the Western and Central Pacific Ocean
SA-IP-10	Rice, J. Catch per unit effort of oceanic white tip sharks in the Western and Central Pacific Ocean.
SA-IP-11	Rice, J. Catch per unit effort of silky sharks in the Western Central Pacific Ocean (Rev 1).
SA-IP-12	Rice, J. Alternative catch estimates for silky and oceanic whitetip sharks in the WCPO
SA-IP-13	Campbell, R. Abundance indices for striped marlin and broadbill swordfish in the south-west Pacific based on standardised CPUE from the Australian longline fleet.
SA-IP-14	Bigelow, K. and S. Hoyle. Standardized CPUE for South Pacific albacore
SA-IP-15	Farley, J. et al. Population Biology of Albacore Tuna in the Australian Region
SA-IP-16	ISC. Annex 7 Report of the Billfish Working Group ISC 2-9 April 2012

MANAGEMENT ISSUES THEME

MI THEME – Working Papers	
MI-WP-01	Harley, S. et al. Evaluation of stock status of south Pacific albacore, bigeye, skipjack, and yellowfin tunas and southwest Pacific striped marlin against potential limit reference points Rev 1 (24 July 2012)
MI-WP-02	Pilling, G. et al. Consideration of target reference points for WCPO stocks with an emphasis on skipjack tuna
MI-WP-03	Berger, A. et al. An introduction to the use of harvest control rules for WCPO tuna fisheries
MI-WP-04	Satoh, K., H. Okamoto and M. Ogura. Relationship between bigeye tuna catch and school type of Japanese purse seine operated in tropical area of the western and

	central Pacific Ocean
MI-WP-05	Hanich, Q. Mapping the Conservation Burden in the Western and Central Pacific Tuna Fisheries
MI-WP-06	Hampton, J. et al. Review of the Implementation and Effectiveness of Key Management Measures for Tropical Tuna.
MI THEME – Information Papers	
MI-IP-01	WCPFC8. Terms of Reference for MI Theme Attachment J, WCPFC8 Summary Report
MI-IP-02	WCPFC8. Terms of Reference for the Management Objectives Workshop, WCPFC8 Summary Report

ECOSYSTEM AND BYCATCH MITIGATION THEME

EB THEME – Working Papers	
EB-WP-01	Evans, K. et al. Progressing adaptation to climate variability and change in Western and Central Pacific Ocean tuna fisheries.
EB-WP-02	Nicol, S. Progress on Kobe III bycatch technical working group.
EB-WP-03	Rice, J. and S. Harley. A Progress Report on the Shark Research Plan Rev 1
EB-WP-04	Rice, J. and S. Harley. Assessment of the whale shark as a key shark species
EB-WP-05	Withdrawn (2 August 2012) Kirby, D. and P. Ward. Review of bycatch mitigation and management measures for highly migratory (oceanic) shark species.
EB-WP-06	ACAP. Review of Seabird Bycatch Mitigation Measures for Pelagic Longline Fisheries.
EB-WP-07	ACAP. Minimum Data Requirements for Monitoring Seabird Bycatch
EB-WP-08	Withdrawn (2 August 2012) Kirby, D. and I. Hay. Review of bycatch mitigation and management measures for seabirds.
EB-WP-09	Robertson, G. et al. New branch line weighting regimes reduce risk of seabird mortality in the Australian pelagic longline fishery without affecting fish catch'.
EB-WP-10	Robertson, G. et al. Branch line weighting options that reduce the risk of seabird bycatch'.
EB-WP-11	Itano, D. et al. Overview of the ISSF Bycatch Mitigation Research Cruise in the WCPO
EB-WP-12	Hutchinson, M. et al. The post-release condition of FAD associated silky sharks (Carcharhinus falciformis) caught in tuna purse seine gear Rev 1
EB-WP-13	Muir, J. et al. Behaviour of target and non-target species on drifting FADs and when encircled by purse seine gear.
EB-WP-14	Itano, D. et al. Development and testing of a release panel for sharks and non-target finfish in purse seine gear.
EB-WP-15	Satoh, S. et al. Review of Japan's approaches to reduce bycatch of juvenile bigeye tuna by purse seine on FADs in tropical area of the western and central Pacific Ocean.
EB-WP-16	Oshima, T. et al. Study on the methods to reduce the by-catch of juvenile Bigeye tuna in purse seine FADs operations. Rev 1

EB-WP-17	Kawamoto, T. et al. Study on the methods to mitigate the bycatch of juvenile bigeye tuna by introducing Double FADs with light stimulus for tuna purse seine fishery in the Western and Central Pacific Ocean.
EB-WP-18	Pilling, G. et al. Estimation of catches and fate of edible bycatch species taken in the equatorial purse seine fishery. Rev 1 (25 July 2012)
EB-WP-19	ISG 3 Guidelines for the Safe Release of Encircled Animals, including Whale Sharks
EB THEME – Information Papers	
EB-IP-01	Fitzsimmons, L. Bycatch Mitigaation Information System
EB-IP-02	Graham Robertson and Ian Hay. Progress report on the development and testing of the underwater bait setter for pelagic longline fisheries'
EB-IP-03	Semba, Y., K. Yokawa and H. Matsunaga. Distribution and trend of abundance for porbeagle (Lamna nasus) in the Southern Hemisphere.
EB-IP-04	Beck, N., Y. Inoue and W. Papworth. Progress Report on the Development of a Seabird Identification Guide for use by tRFMOs. Rev 2 (31 July 2012).
EB-IP-05	Birdlife International and ACAP. Seabird Bycatch Mitigation Fact Sheets.
EB-IP-06	Lehody, P. et al. SEAPODYM applications in WCPO – progress report.
EB-IP-07	Patterson, H. M. and M. J. Tudman. Chondrichthyan Guide for Fisheries Managers
EB-IP-08	Australia. National Plan of Action for the Conservation and Management of Sharks 2012 – Shark Plan 2
EB-IP-09	Australia. Operational Strategy: National Plan of Action for the Conservation and Management of Sharks 2012 - Shark-Plan 2
EB-IP-10	Mitsunaga, Y. et al. Association of early juvenile yellowfin tuna Thunnus albacares with a network of payaos in the Philippines
EB-IP-11	Allain et al. WCPO ecosystem indicator trends and results from ecopath simulations.
EB-IP-12	Poisson F. et al Good practices to reduce the mortality of sharks and rays caught incidentally by the tropical tuna purse seiners.

RESEARCH PROJECTS

JAPAN TRUST FUND	
RP-JTF-01	Secretariat. Japan Trust Fund Status Report (2012)
RP-JTF-02	Secretariat. Japan Trust Fund Steering Committee Report
PACIFIC TUNA TAGGING PROJECT	
RP-PTTP-01	PTTP-SC. Report of the PTTP Steering Committee
RP-PTTP-02	Hampton, J. et al. PTTP progress report and work plan for 2012-2013
WEST PACIFIC EAST ASIA OCEANIC FISHERIES MANAGEMENT PROJECT	
RP-WPEA-01	Secretariat. Information on WPEA OFM Project Steering Committee
RP-WPEA-02	Secretariat. Summary Report on 2011-2012 WPEA OFM Project Activities
RP-WPEA-03	Secretariat. WPEA OFM Project Financial Statement
RP-WPEA-04	Indonesia. WPEA OFM Project: Progress Report – Indonesia Rev 1
RP-WPEA-05	Philippines. WPEA OFM Project: Progress Report – Philippines Rev 1
RP-WPEA-06	Vietnam. WPEA OFM Project: Progress Report – Vietnam Rev 1

RP-WPEA-07	Secretariat. Report of the fourth session of the WPEA OFP Project Steering Committee. August 2012
RP-WPEA-08	Key Notes Reported to UNDP for 2012 APR/PIR for PIMS 4084: West Pacific East Asia Oceanic Fisheries Management Project

ANNUAL REPORT – PART 1[12]

Symbol	CCMs
AR-CCM-01	**Australia**
AR-CCM-02	**Canada**
AR-CCM-03	**China**
AR-CCM-04	**Cook Islands**
AR-CCM-05	**European Union**
AR-CCM-06	**Federated States of Micronesia**
AR-CCM-07	**Fiji**
Covered by its territories	***France***
AR-CCM-08	**French Polynesia**
AR-CCM-09	**Japan**
AR-CCM-10	**Kiribati**
AR-CCM-11	**Korea (Rev 1)**
AR-CCM-12	**Marshall Islands**
AR-CCM-13	**Nauru**
AR-CCM-14	**New Caledonia**
AR-CCM-15	**New Zealand**
AR-CCM-16	**Niue – Not Provided**
AR-CCM-17	**Palau**
AR-CCM-18	**Papua New Guinea**
AR-CCM-19	**Philippines Rev 1 (7 August 2012)**
AR-CCM-20	**Samoa**
AR-CCM-21	**Solomon Islands**
AR-CCM-22	**Chinese Taipei**
AR-CCM-23	**Tokelau**
AR-CCM-24	**Tonga Rev 1**
AR-CCM-25	**Tuvalu**
AR-CCM-26	**United States of America**
AR-CCM-27	**Vanuatu**
AR-CCM-28	**Wallis and Futuna**
Covered by USA Annual Report	***American Samoa***
	Guam
	Northern Mariana Islands
AR-CNM-29	**Belize**

[12]Part 1 Annual Reports not posted on the WCPFC SC8 website have not been received

AR-CNM-30	**Democratic People's Republic of Korea**
AR-CNM-31	**Ecuador**
AR-CNM-32	**El Salvador Rev 1**
AR-CNM-33	**Indonesia Rev 1 (6 August 2012)**
AR-CNM-34	**Mexico**
AR-CNM-35	**Panama**
AR-CNM-36	**St. Kitts and Nevis**
AR-CNM-37	**Senegal**
AR-CNM-38	**Thailand**
AR-CNM-39	**Vietnam**

NGO and Others

Pew Statement to SC8
Greenpeace Statement to SC8
SEAFDEC Statement to SC8
Letter to SC8 on behalf of and in coordination with Shark Advocates International

Attachment G

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

Implications and Recommendations taken from the Peer Review of the Bigeye 2011 Stock Assessment

Timing	Priority/Importance
1 = ongoing 2 = next assessment 3 = longer term	1 = highest 2 – 4 = moderate 5 = lowest

Review recommendation	SPC-OFP response	Implications for SC to consider	Timing	Priority	Responsibility	Applicability to other species
1) When moving from one reference model to a modified one, care should be taken to change only one factor at a time to ensure the impact of changes can be fully understood.	Agree.		1	2	SPC	SKJ/YFT
2) The way the fisheries are linked should be more fully documented in the assessment report, and the implications of	Agree and will include a table like Table E1 in future assessment reports.		2	3	SPC	SKJ/YFT

such linkage should be more fully evaluated.						
3) A Pacific-wide assessment should be conducted soon to evaluate whether the past conclusion that the results from a WCPO-only assessment are consistent with expectations from a Pacific-wide assessment remains true.	Agree	This represents another stock assessment and therefore needs to be prioritized with other assessment requests.	3	1	SPC	None
		It will require collaboration and travel resources to work with the IATTC.				
4) Pacific-wide assessments should be conducted regularly (~ every five years) to confirm the assumption that a WCPO-only assessment will provide robust estimates of stock status.	Agree	See above		2	SPC	None
5) Continue tagging programs to allow estimates of movement rates to be obtained for a wide range of environmental conditions	Agree, and emphasise that this is also of importance to yellowfin and skipjack tuna which are predominantly taken in surface fisheries. It has been shown that assessments using integrated statistical models for WCPO skipjack in particular are at best unreliable and at worst impossible without good quality and high volume tagging data.	This will have considerable budgetary implications. The costs (including tag recovery, database and analytical support) of an annual three month pole-and-line based tagging cruise in the western WCPO and an annual 4-6 week tagging cruise in the central Pacific Ocean (targeting BET) are around USD1.5 million.	3	2	Commission, CCMs, SPC	SKJ/YFT

6) High volume small-fish fisheries (e.g., Philippines and Indonesia) should be retained in the model to ensure their catches are removed from the population correctly with respect to length. However, the model should be formulated so that the data for such fisheries do not have a large impact on estimates of population trend and size.	Agree, although we note that data from these areas continue to improve and become more informative, and stock assessments should respond to this evolution over time.		1	2	Commission, CCMs, SPC	SKJ/YFT/BET
6b) spatial variation in biological parameters should form a focus for future model development	Agree		3	2	SPC	SKJ/YFT
7) To better address the assumption of homogeneity in tag-recapture data, split region 3 into two regions and examine whether region 5 should be split into two regions for tagging off eastern Australia.	Agree		2	1	SPC	SKJ/YFT
8) Further explore methods for weighting purse seine length frequencies by catch.	Agree		2	3	SPC	SKJ/YFT
9) Further explore methods for the calculating longline size-composition data by weighting spatial data by long-term average catches.	Agree		2	3	SPC	SKJ/YFT
10) Length-frequency data for	Agree	A request will be needed from	2	2	SPC	None at

the Japanese longline fishery should be omitted from the reference model until these data are better understood and can be shown to be compatible with the associated weight-frequency data.		SC/WCPFC to Japan to seek access to these data.			and NRIFSF	this time
		If access to these data requires travel to Japan then additional funds will be required. Also availability of such data to be explored beforehand.				
11) Separate the training vessel length frequency data from the commercial data and create a "survey" length composition series to be included in the model. Analysts should gain access to how training vessel trips and any other sampling programs are undertaken, and analyze the available data at the set-by-set level before these length-frequency data are considered for re-inclusion in the assessment.	Agree, this is a good idea. It is an approach adopted in the skipjack assessment to utilize longline training vessel data.	See above	2	2	SPC and NRIFSF	Possibly YFT
12) A more appropriate method should be used to calculate the CVs for the Japanese CPUE indices (e.g. Francis' canonical method or prediction-based	Agree		2	3	SPC	Apply to all longline fisheries

methods)						
13) Drop the region 5 tagging data unless the model can be re-structured to make the area where the Australian tagging took place in region 5 a separate region.	Agree. Drop or consider spatial restructuring instead. We also plan to carefully examine tagging data and model fits for both recent and historical tagging to determine if other issues exist. This will be complimented with analyses of mixing rates to determine the best way to model tagging data.		2	1	SPC	YFT
14) Available data on tag shedding should be examined and be used to provide a value for use in the assessment, noting that this may be challenging given the possibility of correlation between tag loss for each tag for double-tagged animals.	Agree. To date, modeling of double tagging data has not indicated continuous longer-term shedding to be an issue. Tag shedding is currently included (along with non-reporting, etc.) in a general instantaneous tag loss component.		3	5	SPC	SKJ/YFT
15) Tag loss and tagging-induced mortality should be modeled separately	Agree, although we note that specific estimates of tagging-induced mortality are not available.		3	5	SPC	SKJ/YFT
16) Future analysis of operational CPUE data should focus on how to identify targeting and investigate year-area interactions and the implications of increasing numbers of year-area cells without data.	Agree, and also note the additional point made in the main body of the report regarding the development of models to interpolate catch rates for cells with no data.	Analyses of Japanese operational data have been undertaken in collaboration with NRIFSF. Further discussion with NRIFSF in 9.2012	2	1	CCMs, SPC	YFT

16b)Removing these unidentified vessels from the latter period is advised '(Japanese LL operational data)		These trips to Japan are expensive and do not provide the best environment to analyze these important data (i.e. the trips are short and we cannot retain the data for follow-up analysis).	2	2	NRIFSF, SPC	YFT
16c) further developments of this very useful tool. Multifan Cl The additional outputs provided in R (e.g. graphs of mean and variation in length and weight composition over time) were also very useful.		If access to these data requires travel to Japan then additional funds will be required.	1	3		Not applicable
17) Use methods that simultaneously use both age-length and growth increment data, ideally within MFCL.	Agree, and note that this is important for other assessments, notably South pacific albacore.		3	3	SPC	SKJ/YFT/SPALB
18) Continue seeding experiments due to the impact that reporting rates have on the present model configuration and estimation.	Agree, and this is being done with the cooperation of national observer programmes across the region.	These costs will be included within existing tagging programs while the funds are available.	1	3	SPC	SKJ/YFT
19) Sensitivity analyses should continue to be shown to the assumed value for steepness and an appropriate means (e.g., a decision table) used to summarize the management implications of uncertainty regarding steepness.	Agree		Clarify with Panel		SPC and sec	SKJ/YFT/SPALB

20) The size of the stock recruitment penalty should be selected which allows the asymptote of the stock-recruitment relationship to be estimated, but is otherwise uninformative about stock size.	Agree		Done		SPC	SKJ/YFT/SPALB
21) Moved to MFCL - Consider fitting the stock-recruitment relationship to the annual rather than seasonal recruitments.	Agree, and note that this capability currently exists in MFCL.				SPC	
22) The statistical weights for each data component (e.g., size composition, tagging, effort deviations) should be re-evaluated and revisited with each subsequent assessment.	Agree		2	3	SPC	SKJ/YFT/SPALB
23) Future assessments should include both standard and historical retrospective analyses.	Agree		2	2	SPC	SKJ/YFT/SPALB
24) Methods should be developed to provide output which accounts for uncertainty regarding the values for the factors considered in the structural analysis.	Agree, and this is been developed in the context of the 2012 oceanic whitetip and silky shark assessments.		2	2	SPC	SKJ/YFT/SPALB
25) Stochastic yield functions should be presented because they may not indicate the same values for management reference points such as *F*MSY	This can be done, and we are currently finalizing coding for stochastic projections which could be used to generate stochastic yield functions.		3	4	SPC	SKJ/YFT/SPALB

and *B*MSY.						
26) Projections considering MSY estimates should account for fishery-specific changes (i.e., likely proportional catches by fishery).	Agree, and note that this is currently done as a matter of course in projections, and fishery selectivity can be re-computed for each time step of the projection.		1	3	SPC	SKJ/YFT/SPALB

Recommendations that specifically refer to MULTIFAN-CL

Definitions: Timing	Definitions: Priority/Importance
1 = immediate, 2 = 2013, 3 = 2014+	1 = highest, 2 – 4 = moderate, 5 = lowest

Review comment	SPC-OFP response	Timing	Priority	Responsibility
a. Test the options for time-varying selectivity – allowing for time-varying selectivity may address some of the issues related to the sometimes poor fits to the length- and weight-frequency data.	This is currently possible by specifying time breaks in fisheries, but we agree a more elegant solution using time blocks as in Stock Synthesis would be better.	2	2	SPC
b. Allow the length bins to be of different widths. One might, for example, want many narrow length bins for the smaller lengths, but fewer but wider length bins for the larger lengths. Allowing for a more flexible length bin structure should also reduce computational times as well as better reflect the available data.	Agree this would be useful.	3	3	SPC
c. Allow for long-term and initial tag-loss. Currently initial tag-loss is implemented by reducing the number of animals tagged when inputting data to the model and no account can be taken of long-term tag-loss.	Initial tag loss is also allowed through the reporting rate parameter. But agree that the addition of long-term tag loss, while it is not seen to be significant in the double tagging data available, would be useful.	3	4	SPC
d. Include an option which allows the tagging data to inform movement only rather than movement and mortality.	A tag likelihood conditional on tag recapture exists in MFCL but has not been used for WCPO tuna assessments.	2	3	SPC
e. Allow conditional age-at-length data to be included in the likelihood function. This will allow the ageing data from current sampling (e.g. WCPFC-SC6-2010/GN IP-04) to be formally included in the assessment.	Agree that this is a priority. Likewise for tag length-increment data.	2	2	SPC
f. Extend MFCL to allow gender to be explicitly represented. This will allow the impacts of differences in growth and natural mortality between the sexes to be represented. The current	This development is close to completion in MFCL.	1	1	ns and SPC

approach to modeling, for example, length-specific natural mortality (e.g. WCPFC-SC4-2008/ ME-WP-1) seems unnecessarily complicated given the lack of gender-structure in the model.				
g. Create an output table which lists all of the likelihood components by fleet and automates the process of computing effective samples sizes (and other summary statistics related to model fit).	Agree	2	1	SPC
h. Allow for more general selectivity options, including selectivity patterns where the first age for which selectivity is non-zero is pre-specified. This should help to avoid selectivity being non-zero owing to the functional form for selectivity rather than data.	Agree	3	3	SPC
i. Include a "tail compression" option, which would pool all length- and weight-data for large and small sizes based on a specified percentage (e.g. all lengths would be pooled so that the "plus" length-class contained 0.1% of the length-frequency).	We probably need to discuss the merits of this further with the reviewers.	3	5	
j. Add an option which allows the analyst to assume a multinomial likelihood for the compositional data in the first phases and only transition to the robust normal likelihood in the later phases.	Agree	2	2	SPC
k. When maturity data are based on length, converting to ages should be done within the model. Presently, the maturity-at-age is based on a fixed age-length relationship.	Agree	3	3	SPC
l. An option to add a likelihood weight to the tagging data component should be added.	Agree, although to an extent this exists through the over-dispersion parameter of the negative binomial.	2	3	SPC
m) moved from general rec #21. Consider fitting the stock-recruitment relationship to the annual rather than seasonal recruitments.	Agree, and note that this capability currently exists in MFCL.	2	3	SPC

Attachment H

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

Guidelines for the safe release of encircled animals, including whale sharks

Summary

An Informal Small Group 3 (ISG3) meeting was held during the WCPFC SC8 in Busan, Korea on 8 August 2012. Fourteen (14) SC8 participants took part in the meeting and discussed the development of guideline for the safe release of encircled animals, including whale sharks. ISG3 reached the conclusion that it is currently not possible to determine the "best" practical method for the safe release of encircled animals. Additionally, there have been no scientific investigations as to the survival of whale sharks that have been caught or entangled in purse seines. Therefore, ISC3 recommended further research primarily to investigate the survival of encircled animals associated with various release techniques.

General principles

- Safety of the crew is a paramount consideration.
- When releasing encircled whale sharks, the stress the animal receives should be minimized to the extent possible.
- The following possible release methods should be used as general guidelines.
- The effectiveness of the following possible release methods has not been fully evaluated. Further scientific research is necessary in order to investigate survival after the release by various release methods. Therefore, CCMs are encouraged to conduct analysis on methods used by their purse seine vessels. In addition, the WCPFC could initiate a program of satellite tag deployments by experienced observers to assess survival of encircles animals associated with various release techniques.
- The appropriate release method should be chosen in a flexible manner depending on the circumstances and condition of the particular purse seine set, e.g. the size and orientation of the encircled animal, amount of fish in the purse seine set, weather conditions and brailing operation style.

Possible release methods

- 1.Cutting net

- Experience indicates that cutting the net vertically (about 3-5 meters) is quick and efficient.
- Caveat: Possible uncontrolled ripping of the net if under load from catch or currents, loss of entire catches and time to repair the net.

- 2.Passive removal or letting sharks go over corkline (ref. Japan proposal in WCPFC8-2011-DP-17, see Appendix 1)
  - Would be easy particularly for vessels sacking up with a skiff.
  - The manipulation of cork line is possible only if the vessel concentrates and loads catch using a brailing boom.
  - Very situation dependent and based on size and orientation of the animal.
  - Caveat: If it takes a long time to roll a shark out of the net which may expose the sharks to excessive stress, Some loss of catch is possible during the operation.

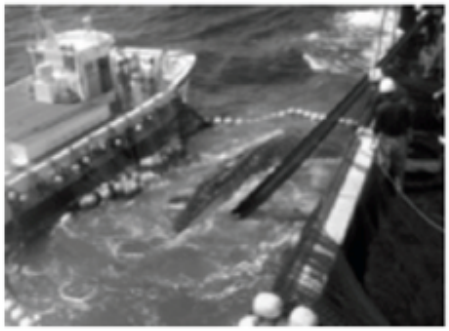
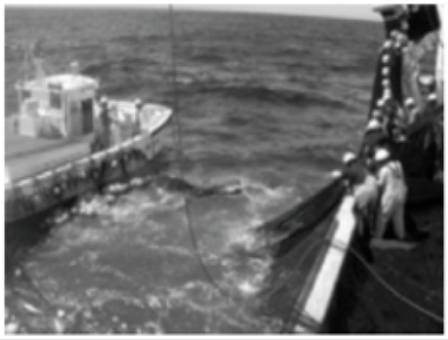
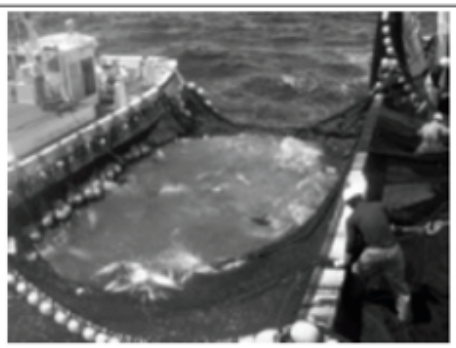
- 3.Horizontally pulling sharks by the tail or a Sling Method, see Appendix 2)
  - Encircling the caudal peduncle of the shark with a smooth sling (non-abrasive material) that is attached to a heavy line and towboat. A second line is run from the skiff through the sling and back to the skiff. The skiff slowly moves the shark's tail/body next to the cork line and is gently led over the cork line. Lowering corks from brailing boom or releasing some corks from attachment to net skiff. Slowly towing shark horizontally by the tail until clear of corks when rope is released and sling falls away.
  - Caveat: This procedure could be traumatic although likely less traumatic for small and medium sharks (5-6 m maximum). Probably inappropriate for fish >6 m.

Note, animals should be kept in water at all times when using release methods 1-3.

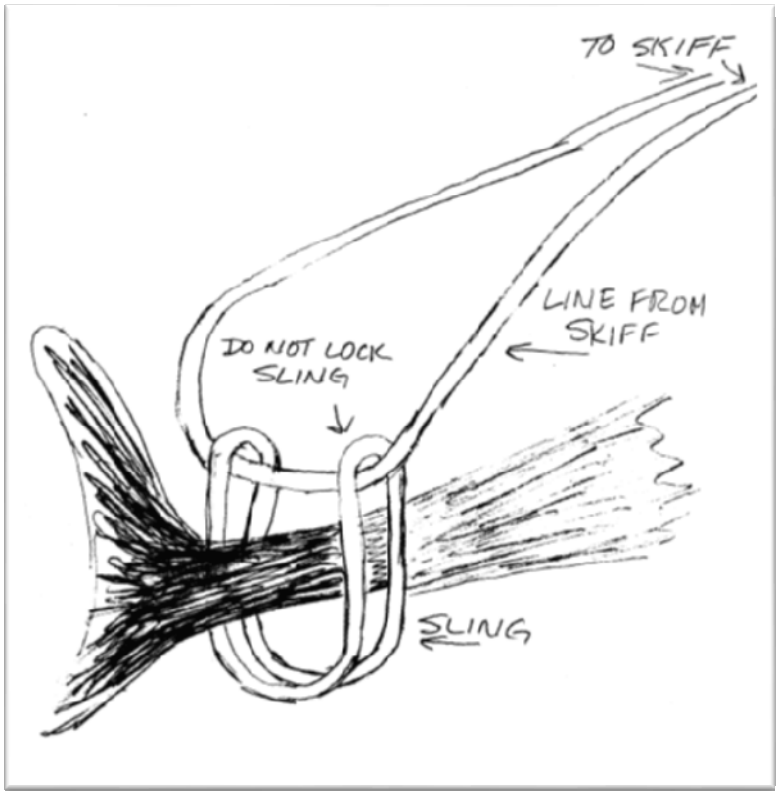
- Brailing sharks
  - Could be very easy and quick. Appropriate length is probably less than 3 m.
  - Exposure time out of the water should be minimised
  - Caveat: sharks must be small enough to be scooped by brailing without stress

Release methods not recommended:Vertically lifting sharks by tail because internal organs may be damaged. Pulling sharks by a loop hooked around its gill or holes bored into a fin.

[Appendix 1] proposed by Japan at the SC7 (Guideline for safe and live release of encircled non-target animals during purse seine fishing operation)

a). lead the head to approach nearest cork rope by rolling up the net under the ventral and tail side.	
b). Release cork rope from their head side. c). Roll up the net of the tail side to run the head on the cork line d). Control the net carefully to keep whale shark calm down because if they wriggle, their body could be entangled in the net	 
e). Wait for escaping from the net themselves (whale shark swim away from the net)	

[Appendix 2]
Design and deployment of a release mechanism for mid to small sized whale sharks



Attachment I

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

List of work programme of the Scientific Committee

An Informal Small Group (ISG) will meet to update the List of SC Work Programme. The purpose of this List is to allocate a unique number to individual SC projects for future reference, to describe explicit terms of reference for any project contract, and compile historical project activities. This will be a standing document for an annual update if needed. The ISG will meet in the margin of SC8 to review the priority, TOR and any further background descriptions, and consider the budget implications for review and recommendation to the Commission for high priority projects.

DRAFT WORK PROGRAMME OF THE SCIENTIFIC COMMITTEE FOR 2008-2010

(Indicative budget in USD)

Project items (Priority)	Description	Status
Project 28. (Priority = Medium)	**Development of procedures and decision rules (harvest control rules) to assist the interpretation of stock assessment results and the formulation of management recommendations.** Tasks/TOR History • SA-SWG priority. • 2012: SPC conducted a project "development of a simple harvest control rules for the WCPO fisheries"	**Active** (Due for completion 2012)
Project 38. (Priority = Low)	**Feasibility study to determine the effectiveness of otolith microchemistry to estimate stock mixing and large-scale tuna movement.** Tasks/TOR • Recent advances in extraction of microchemistry	**Active** (Due for completion 2012)

	samples from fish otoliths provide the potential for observing regional water chemistry differentiation in the otoliths of pelagic species – hence a natural tag for estimating stock mixing and large-scale tuna movement. History • **Budget level:** 60K over 1 year (SPC and University of Hawaii proposal). – is this valid? Comments: 1. Not sure about this one. Independent of WCPFC funding I (Itano) have been involved in an otolith microchemistry project for stock discrimination of yellowfin and bigeye tuna in the central Pacific. That project is complete and a publication is in press. 2. This may refer to ongoing work between SPC and CSIRO Hobart. 3. Recommend: consult with SPC for their opinion. SPC Comment (Nicol) We do have some ongoing otolith microchemistry with CSIRO for albacore. I always assumed that this project though was the Itano YFT but we could capture our work under this project if that is desired. Maybe this could be determined after consideration of the SP Alb assessment report.	
Project 55. (Priority = Medium)	**Undertake studies on the behaviour and distribution of target and non-target species around FADs, and on the various specifications and use of FADs and fishing gears in influencing purse seine catches taken in association with FADs, with a view to identifying their impact in relation to mitigation measures to reduce catches of juvenile tuna and non-target species by purse seine gear.** Tasks/TOR History • FT-SWG Priority • Includes seeking collaboration with industry to Design of industry -associated studies related to selectivity and avoidance of small tunas and bycatch on floating objects. Assistance of the commission in promoting industry cooperation with in kind contribution of vessel time is requested. • PNG supported $25K for FAD Bycatch Mitigation Research and David Itano working with ISSF conducted this research (contracted in January 2011). Comments: 1. Funds have been used as per the project proposal to support established FAD bycatch mitigation programs as the funds were insufficient to mount a stand-alone project of effective scope. Funds to date have been used to support bycatch mitigation research sponsored by the ISSF. This project will be fully reported	**Active** (Due for completion 2012)

	to SC8 as Funds will be fully expended to close the project in 2012.	
Project 57. (Priority = High)	**Identifying Provisional Limit Reference Points for the key target species in the WCPFC** Tasks/TOR • Identify candidate indicators (e.g. $B_{current}/B_o$, SB/SB_{MSY}) and related limit reference points (e.g. $B_{current}/B_o,=X$, $SB/SB_{MSY}=Y$), the specific information needs they meet, the data and information required to estimate them, the associated uncertainty of these estimates, and the relative strengths and weaknesses of using each type within a management framework. • Using past assessments, evaluate the probabilities that related performance indictors exceed the values associated with candidate reference points. • Evaluate the consequences of adopting particular limit reference points based on stochastic projections using the stock assessment models. • Undertake a literature review / meta-analyses to provide insights into levels of depletion that may serve as appropriate limit reference points and other uncertain assessment parameters (e.g. steepness). • Include the consideration of multi-specific effects on harvest control rules History • Several researches on reference points have been conducted by SC.	**Active** (Due for completion 2012)
Project 58. (Priority = Medium)_	**Evaluation of reference points and decision rules (harvest control rules).** Tasks/TOR • Undertake a formal evaluation (e.g. Management Strategy Evaluation and robustness of stock assessments) of reference points and decision rules to guide the long term management of the key target species in the WCPFC. History • The work program recommended in the second consultancy report and at SC4 would provide some guidance on progressing this task. •As of SC8, WCPFC-SC considered LRPs, TRPs, and Harvest Control Rules.	**Active** (Due for completion 2012)
Project 60. (Priority = High)	**Collection and evaluation of purse-seine species composition data** Tasks/TOR • Collection of fish weight data onboard longliners and purse seiners using “at sea” scales • Continued study into sampling regimes for size and species	**Active** (Due for completion 2013)

	composition of purse-seine catches • Port sampling programmes to determine the accuracy of cannery receipts in Noro, SI and possibly other ports • Collaboration with other tuna RFMOs to examine factors affecting the sampling of purse-seine species composition Tasks/TOR for 2013 • Collect paired grab and spill samples from the WCPO purse-seine fishery and quantify the bias in species and size compositions determined from grab samples • Compare species compositions determined from (i) logsheets, (ii) grab samples, (iii) spill samples, (iv) cannery receipts and (v) port sampling of landing categories of catches delivered to the cannery at Noro, Solomon Islands and possibly other ports • Document the spill sampling protocol • Develop procedures to correct historical catch and size data covering the WCPO purse-seine fishery for biases History • In April 2009 (to be presented at SC5 in 2009), $54,500 was contracted to fund the "Collection and Evaluation of Purse-Seine Species Composition Data". In December 2009, $54.5K was budgeted and in 2010, $90K was endorsed to support this project. • In December 2011, no further budget was allocated to this project but requested to submit a *Plan for Improvement of the Availability and Use of Purse Seine Catch Composition Data* (WCPFC8-2011-IP/06). SC8 will consider budgetary implications of this Plan. • 2013 = $75,000	
Project 37. (Priority = High)	**Analysis of FAD impacts on trophic dynamics.** Tasks/TOR • **This work is required for a better understanding of the biological impacts of FADs.** History • **Budget level**: 70K over 2 years (SPC and University of Hawaii proposal). – is this valid? SPC Comment (Nicol) –the only progress on this is the collection of samples for isotope analyses and fatmeter for condition. Lab analyses have not been undertaken. SPC will host a PhD student from University of South Hampton in 2013 who will address hypotheses on this topic but we will not have results from this work until the 2014 SC. We might want to grant an extension to this project.	**Active** (Due for completion 2014)

Project 42. (Priority = High)	**Pacific-wide tagging project.** Tasks/TOR • The main objectives are to obtain information on movement, stock structure, growth, mortality, behaviour, habitat utilization, and vulnerability for use in stock assessments for yellowfin, bigeye and skipjack tuna. • Undertake a preliminary analysis of the vertical distribution of skipjack, yellowfin and bigeye tuna associated with fish aggregation devices, as indicated by acoustic tagging data. This item is related to the analysis of data from the PNG Tagging Project and scientists from other CCMs will participate in this project. Future work will be in the context of Phase 2 tagging. • Ongoing and newly funded research with sonic and archival tags in Hawaii, PNG and other areas. On-going. **(**Currently funded SPC-OFP and Univ. of Hawaii projects). History • Refer to GN WP-10 for the Phase 2 proposal of Regional tuna tagging • Funding is a limiting factor for Pacific Ocean tuna tagging experiments and should be sought from a broad range of sources, including member and non-member countries with substantial financial interests in these fisheries, GEF, and non-governmental organizations, particularly foundations interested in supporting scientifically based tuna conservation efforts. • The budget required for a 2 year pan-Pacific tagging project would need at least USD 9 million to do a wide coverage project in the WCPFC-CA alone. Approximately USD 2.4 million has been identified through SPC projects. To provide some additional perspective, the IOTC tagging project over 3 years in a much smaller area than the Pacific (or even the WCPFC-CA) cost USD 19 million.	**Active** (Due for completion 2015)
Project 67. (Priority = High)	**Range contraction of tropical tunas, sharks, and billfish** Tasks/TOR • Recognizing that biomass for most WCPO stocks is estimated to be at historical lows and concerns have been raised by non-tropical coastal states about declines in the abundance of tropical tuna species, this project seeks to: a) Examine existing data to examine the spatial distribution of tropical tunas and related species is changing through time and with change is abundance; b) Develop models that allow the simulation testing of alternative hypotheses about spatial distribution patterns including range	Active (Due for Completion 2015)

<table>
<tr>
<td></td>
<td>contraction; and
c) Provide advice on the how the preservation of the spatial distribution of tropical species may impact on target and limit reference points.

<u>History</u>
• This is a newly proposed project in 2012 and no funding is sought from WCPFC at this time.</td>
<td></td>
</tr>
<tr>
<td>Project 35. (Priority = High)</td>
<td>Refinement of bigeye parameters Pacific-wide: A comprehensive review and study of bigeye tuna reproductive biology.

<u>Tasks/TOR</u>
a)Objectives
To obtain accurate scientific information on maturity, spawning locations, sex ratios, and fecundity for inclusion in stock assessments of bigeye tuna in the Pacific Ocean.

b)Items to be considered as a joint research between IATTC and WCPFC
Based on tagging studies to date, the movements of bigeye are geographically restricted. The limited amount of mixing across the Pacific Ocean can create differences in life history characteristics as a function of differences in oceanography and genetic structure. Therefore, obtaining size and age based estimates of bigeye reproductive characteristics from spatial strata across the Pacific Ocean would be useful for inclusion in bigeye stock assessments, since current estimates are based on inadequate spatial strata and limited sample sizes to have much confidence for inclusion in Pacific-wide assessments.

<u>History</u>
• Original proposal
<table>
<tr><td colspan="2">Pilot study</td><td colspan="4">Pacific-wide study</td></tr>
<tr><td>2009</td><td>2010</td><td>2011</td><td>2012</td><td>2013</td><td>2014</td></tr>
<tr><td>30K</td><td>29K</td><td>62K</td><td>236K</td><td>350K</td><td>129K</td></tr>
</table>
• Adjusted proposal, as of July 2012
<table>
<tr><td>Planning stage</td><td colspan="3">Pilot study?</td><td colspan="5">Pacific-wide study?</td></tr>
<tr><td>2008</td><td>2009</td><td>2010</td><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015</td><td>2016</td></tr>
<tr><td>15K</td><td>30K</td><td>30K</td><td>31K</td><td>55K</td><td></td><td></td><td></td><td></td></tr>
</table>
• It is important to address some of the outstanding issues related to the biological parameters for BET, but we also need to ensure work is done on other species for which much less data are available. Hopefully, the priority species will identify themselves</td>
<td>Active (Due for Completion 2016)</td>
</tr>
</table>

	through the Ecological Risk Assessment process. In the WCPO, we have a range of similar or even more critical issues related to YFT and ALB.	
Project 36. (Priority = High)	**Age and growth of the target tuna species.** Tasks/TOR • An initial project within this category is regional differences in growth from length-frequency data for YFT and BET. History •	**Active** (Part of project 35)
Project 65. (Priority = High)	**Peer review of stock assessment** Tasks/TOR History • In 2012, a peer review was conducted on 2011 bigeye stock assessment. • Include any others e.g. Yellowfin CIE review. •	**Active on-going**
Project 1. (Priority = High) SPC-OFP Services	**Incorporate data provided by Members, Cooperating Non-Members and Participating Territories (CCMs) under the Commission's data provision policy into existing databases and facilitate access of Commission secretariat staff to those data as appropriate.** Tasks/TOR History	**Active on-going**
Project 11. (Priority = High) SPC-OFP Services	**Identify known data / information gaps in the current stock assessment, particularly in relation to operational level CPUE data** Tasks/TOR History • A number of potential explanations for different data gaps were identified, including the time and resources required to access and collate historical records, the long voyage times for some distant-water longline fleets and the large and dispersed nature of small boat fleets in Indonesia and the Philippines. • A number of members cited specific issues with the summary of data gaps presented in the paper and SPC-OFP undertook to revise the information accordingly in consultation with the relevant members	**Active on-going**
Project 14. (Priority = High)	**Indonesia and Philippines Data Collection Project (IPDCP)** **West Pacific East Asia Oceanic Fisheries Management Project**	**Active on-going**

Consolidate with project 8	Tasks/TOR • IPDCP: data collection from port sampling in Indonesia and Philippines • WPEA OFM: i) Monitoring, data enhancement and fishery assessment; and ii) Policy, institutional strengthening and fishery management History • Refer to SC3-GN-WP-07 Report of the Steering Committee on IPDCP • 2004-2009: IPDCP activities in Indonesia and Philippines • 2010-2012: WPEA OFM Project activities • WCPFC Secretariat and UNDP is working on the 2nd Phase of WPEA OFM	
Project 15. (Priority = High)	**Rescue of historical commercial catch data from countries in the western Pacific Ocean, including Vietnam.** Tasks/TOR History • Highest priority to minimize data gaps in stock assessments and has been implemented as part of WPEA OFM Project	**Active on-going** (Refer to Project 14)
Project 2. (Priority = High) SPC-OFP Services	**Compile estimates of annual catches by species, gear type and flag, as specified in the procedures for Scientific Data to be Provided to the Commission** Tasks/TOR History	**Active on-going**
Project 22. (Priority = High) SPC-OFP Services	**Undertake stock assessment for target and non-target species as requested by the Commission.** Tasks/TOR • Refinement of data and data structure used for stock assessment • Quantification of changes in fishing efficiency due to changes in fishing gears and fish finding technologies – Medium Priority. (Used to model changes in selectivity over time required in MFCL assessment models - Cross-reference with Project 27 for non-OFP project work) • Quantification of changes in longline selectivity due to changes in gears and patterns of deployment – Medium Priority. (Used to model changes in selectivity over time required in MFCL assessment models. SPC-OFP services as time allows.)	**Active on-going**

	History • Annual commitment	
Project 23. (Priority = High) SPC-OFP Services	**Undertake standardisation of longline catch and effort data, including where appropriate operational-level data, and the construction of indices of stock abundance for species of interest to the Commission.** Tasks/TOR • There are many issues to explore relating to CPUE standardization. Need to develop a specific work programme on this with funding support. History •	**Active on-going**
Project 24. (Priority = Medium) SPC-OFP Services	**Development and reporting of stock indicators for those key species not formally assessed.** Tasks/TOR • Formulate most-up-to-date management advice to Commission if full assessment not undertaken. History • SA-SWG priority	**Active on-going**
Project 25. (Priority = High) SPC-OFP Services	**Continued exploration of sensitivity of stock assessment outcomes to structural assumptions in models and data issues, including the comparison of various stock assessment models.** Tasks/TOR • This work also includes the development of better diagnostics to more objectively determine plausible model structure. • Work program for 2008 includes a comparison of MFCL, SS-2 and other stock assessment models for yellowfin or bigeye tuna. • This will be more routinely incorporated into the assessments if it is felt to be informative. History • ME-SWG Priority.	**Active on-going**
Project 26. (Priority = High)	**Stock assessment on southern swordfish** Tasks/TOR History • SA-SWG priority. • 2006: Full stock assessment of swordfish in the southwest Pacific • 2008: full stock assessment • 2011: data collection and CPUE analysis • In March 2012, WCPFC8 agreed to conduct	**Active on-going (Periodic)**

	swordfish stock assessment as requested by the EU. SPC-OFP is undertaking this work.	
Project 29. (Priority = High) SPC-OFP Services	**Further refinement of the stock assessment model, MULTIFAN-CL, including simulation testing of new developments as appropriate and refinement of models for CPUE standardization.** Tasks/TOR • Work program for 2008 included designing a more efficient recruitment parameterization (High priority) and incorporation of length-based selectivity (Medium priority). • There are a number of other matters that need to be addressed, including a long-term project to re-write the software to make it more transparent, better documented, and include new features (multi-sex, species, and stock options). History • ME-SWG and SA-SWG Priority. •	**Active on-going**
Project 3. (Priority = High) SPC-OFP Services	**For catches for which estimates are not otherwise available, conduct statistical analyses to estimate catches, particularly in regard to (a) purse-seine catches of bigeye tuna and yellowfin tuna, (b) discards of target tuna species, and (c) catches of non-target species.** Tasks/TOR History • Related with (c) above, refer to WCPFC-SC8-2012/EB-WP-18	**Active on-going**
Project 32. (Priority = Medium)	**Further consideration of how to reflect uncertainty in projections.** Tasks/TOR History • ME-SWG Priority.	**Active on-going** (now project 28)
Project 41. (Priority = Medium)	**Development of a biological database for inclusion on the WCPFC website.** Tasks/TOR History • BI-SWG Priority. • The Commission contracted with SPC for the development of *Bycatch Mitigation Information System*, which is annually updated with the budget of TCC.	**Active on-going - now as BMIS?**

Project 5. (Priority = Medium) SPC-OFP Services	**Produce and publish on the Commission's website the Tuna Fishery Yearbook, containing annual catch estimates by gear type, flag and species.** Tasks/TOR History	**Active on-going**
Project 50. (Priority = Low)	**Offal discards and haul-back mitigation studies.** Tasks/TOR History • Development of bycatch and bycatch mitigation database (currently BMIS is developed and managed by SPC, funded by TCC budget). • If any use is to be made of this database, there would be considerable ongoing work required to populate the various database tables. Some of this, but not all, could be done under other OFP service items (bycatch estimation). • There is also a concern that the additional components added on (e.g. ERA attributes, non-target catch estimates and species utilisation) probably weren't envisaged at the start and the work involved will go beyond the time/funds originally envisaged in the contract. • Some funding would need to be allocated in future budgets if this work is to be ongoing.	**Active on-going** (TCC funded BMIS; Remainder Inactive)
Project 52. (Priority = High) SPC-OFP Services	**Shark Research Program.** Tasks/TOR • Refer to Shark Research Plan History • EB-SWG Priority. • Shark Research Plan was proposed at SC6 and adopted at WCPFC7. • CMM 2006-05 (replaced by 2010-07) requested that shark stock assessments be undertaken for key shark species. • Shark research plan was approved by WCPFC7.	**Active on-going**
Project 6. (Priority = High) SPC-OFP Services	**Compile estimates of catch and effort in support of the functions of the Commission and its subsidiary bodies, such as (a) estimates of annual catches by vessel flag, EEZ, and archipelagic waters, for use in determining the catch component of the Commission's assessed contributions, and (b) estimates of catch and effort in support of Conservation and Management Measures.** Tasks/TOR History	**Active on-going**

Project 7. (Priority = High) SPC-OFP Services	**Disseminate public domain catch, effort and size data on the Commission's website at agreed level of resolution.** Tasks/TOR History	**Active on-going**
Project 8. (Priority = High) SPC-OFP Services	**Participate in data collection project in the West Pacific East Asian waters** Tasks/TOR • Participate in the Indonesia and Philippines Data Collection Project (Projects 15 and 16) and the compilation of information on the tuna fisheries of Vietnam. • Participate in the WPEA OFM Project History •	**Active on-going** (The 1st phase of WPEA OFM finishes 2012)
Project 46. (Priority = Medium)	**Development / review of models, such as full development of an ECOSIM model, for evaluation of fishery and environmental impacts on ecosystem, including development of reference points.** Tasks/TOR History • Required modeling and assessing fishery impacts on the ecosystems. • This is separate from the ERA work. SPC-OFP will be undertaking work under SCIFISH project on continued development of SEAPODYM model and application to WCPO pelagic ecosystems.	**Active on-going** (SEAPODYM – long term)
Project 62. (Priority = Medium)	**SEAPODYM simulation modelling** Tasks/TOR • Collaboration between CLS, Space Oceanography Division and SPC-OFP • Development of a Pacific swordfish application • Simulation experiments to improve the model calibration for tuna species, using higher resolutions of fishing data and oceanic environmental data • Model calibration for albacore with a basin-scale application including both north and south populations. • Incorporation of conventional and archival tagging data in the model calibration. • Projection of impact of global climate change on distribution and	**Active on-going see project 46**

	abundance of tuna stocks History •	
Project 16. (Priority = Medium)	**Publication and distribution of Commission's training and educational materials.** Tasks/TOR • Development of training materials and the production of material to facilitate the identification of target and non-target species by fishermen, observers, and port samplers with the objective of improving data quality. History • During 2007, additional guides were developed by the FT-SWG on longline and purse seine bycatch species. **Comments:** 1. Work included the production of three identification guides for distinguishing yellowfin from bigeye tuna in three condition states (fresh, brine frozen, damaged) useful for the training of observers and port samplers. The guides were produced in English and have since been translated into 7 languages for use by all tRFMOs. Additional photographic guides were produced to assist the identification of longline and purse seine non-target species. Expenditures under this Project were mainly used to fund the reproduction and distribution of these guides to various agencies and organizations for training purposes. 2. These guides are still available on the Commission website at no cost but funds for their printing and distribution in hard copy may be desirable in the future. 3. Recommend that this Project be moved to a list of inactive but potentially useful projects.	**Completed**
Project 17. (Priority = High)	**Draft list of minimum data fields for the regional observer program be annotated with explanations of what each field is and why it is needed and detail describing the format (units of measure, codes etc) to be used when collecting each field.** Tasks/TOR • As shown in the title above. History • ST-SWG priority	**Completed**

	• Undertaken by WCPFC Secretariat during 2008	
Project 34. (Priority = High) SPC-OFP Services	**Further review of spatio-temporal aspects of catches of juvenile bigeye and yellowfin tuna caught in association with fish aggregating devices (FADs) by updating the analysis presented in WCPFC 3-2006-16. Refine the assessment of management options presented in the paper on the basis of the latest available fishery information.** Tasks/TOR • Research items to be considered over the 3 year planning horizon: a) With new SKJ and BET assessments and YFT 2007 assessment, conduct multi-species management options analyses, including economic outcomes of options on each sector. b) PS fishery characterisation – as a first step in developing an operational model of the fishery and more formal management strategy evaluation (MSE) work. c) More spatial analysis – perhaps adopting the statistical approach of estimating lat/long/season effects on associated set (small juvenile) YFT and BET catches. History	**Completed**
Project 39. (Priority = High)	**Regional study of the stock structure and life-history characteristics of South Pacific albacore.** Tasks/TOR History • BI-SWG Priority. • A proposal to undertake this work is being developed by Australia and conjunction with New Zealand, SPC-OFP and other CCMs (e.g. New Caledonia, French Polynesia, FFA countries). • **Total Budget**: AUD820K over 3 years, and the Commission supported $25K for 2008, 2009, and 2010 to CSIRO (Jessica Farley). • This project was successfully finished and final report was submitted to the Secretariat in July 2012, which was posted on SC8 website.	**Completed**
Project 43. (Priority = High)	**Ecological Risk Analysis, including PSA.** Tasks/TOR History • On-going ERA Work Program submitted to SC-3 and endorsed (cf. EB-WP-3). • Includes $30,000 for identifying areas of spatial and temporal overlap of seabird and sea turtle interactions with tuna fisheries in the WCPO	**Completed** (ERA complete in 2009 Shark Research Plan Ongoing)

	(ACAP). • ERA budget of $130K was included in SPC-OFP science services budget in 2009 (SC5). • WCPFC7 switched ERA to shark research: *WCPFC7* 144. WCPFC7 approved the shark research plan and the reallocation of existing funds within the Scientific Services budget ($792K in 2012) to support shark assessments during 2011 and 2012. WCPFC7 agreed to add porbeagle and four species of hammerhead sharks to the Commission's key shark species in CMM 2009-04 (Attachment DD). This amendment raises the number of key shark species to be reported to the Commission to 13 but maintains the original 8 key species as the focus of the Shark Research Plan until further funding is made available.	
Project 56. (Priority = Medium)	**Utilize underwater videos and other tools to characterize species, size composition and spatial distribution of tunas aggregating around floating objects.** Tasks/TOR History • FT-SWG Priority • The unit used in the EPO by IATTC cost approximately $3000. On advice from IATTC, it will likely be necessary that gear be suitable to depths of at least 100 m due to deeper thermocline and mixed layer depth in the WCPO. This will require greater pressure ratings and length of cables. • This project was conducted by David Itano for two years and project outputs were presented at SC meetings.	**Completed**
Project 9. (Priority = Medium) SPC-OFP Services	**Develop data standards for port sampling and observer programmes in association with WCPFC Secretariat** Tasks/TOR History	**Completed**
Project 10. (Priority = High) SPC-OFP Services	**Advise the Executive Director regarding the development of (a) Rules and Procedures for the Access to and Dissemination of Data and (b) the Information Security Policy** Tasks/TOR • Will require on-going periodic monitoring as the information and data management policies and procedures of the Commission evolve. • This has been in each annual work plan for many years. There has not been much year-to-year progress. It would be better to engage in this process only periodically (e.g. once every 3 years). Also need legal advice beyond the expertise of SPC.	**Completed** (retain as required for periodic inputs)

	History •	
Project 12. (Priority = High) SPC-OFP Services	**Within the next 12 months deploy on the WCPFC website a prototype computer programme that would allow gaps in data to be easily identified.** Tasks/TOR History • ST-SWG priority • Undertaken in 2008 jointly with WCPFC Secretariat	**Completed 2008**
Project 13. (Priority = High) SPC-OFP Services	**Review current unloadings data forms used in the region, and the proposed WCPFC transhipment reporting form, to determine their adequacy for scientific purposes.** Tasks/TOR History • ST-SWG priority	**Completed 2008**
Project 40. (Priority = Medium)	**Life-history characteristics of non-target species identified by the ERA as high risk.** Tasks/TOR History • BI-SWG Priority.	**Completed** 2009
Project 51. (Priority = High)	**Extension services to member countries for within EEZ ERA.** Tasks/TOR History • ERA methods can value add to EAFM approaches being adopted by WCPFC member countries for fisheries planning and management at the EEZ scale. • The extension services will be capacity building of ERA skills within these countries.	**Completed 2009**
Project 61. (Priority = High)	**N. Pacific striped marlin mitigation methods** Tasks/TOR • Analyze catch rates with regard to gear and operational modifications, spatio-temporal and oceanographic considerations.	**Completed 2010**

	• Modelling to incorporate gear and spatio-temporal effects to identify potential factors contributing to striped marlin catch reductions in N. Pacific longline fisheries. History •	
Project 44. (Priority = High)	**Seabird and turtle education and extension of fishers (Promotion of mitigation methods to fishers)** Tasks/TOR History	**Completed 2012**
Project 45. (Priority = High)	**Education and dissemination of information relating to Turtle de-hooking devices.** Tasks/TOR History	**Completed 2012**
Project 64. (Priority = High)	**Revised stock assessment of SW Pacific Striped Marlin** Tasks/TOR • A project to undertake this work is being developed by Australia in conjunction with New Zealand, SPC-OFP and other CCMs. • This species is not one of the principal target species assessed by the SPC-OFP but is an important target species for a number of CCMs. Australian and New Zealand scientists are proposing to undertake this work and are seeking the endorsement of the Commission as the research will have broader regional benefits. Support from the Commission would help secure funds from funding sources from Australia and New Zealand. History • 2011: Collation of SP striped marlin data for a planned stock assessment in 2012 (USD 30,000), which is coordinated by Stephen Brower (NZ) – SC6 Report, Para 514 • 2012: SPC-OFP will conduct stock assessment	**Completed 2012**
Project 66. (Priority = High)	**Identification and evaluation of target reference points** Tasks/TOR History • SPC-OFP conducted the Commission's consultancy in 2012 to identify and evaluate candidate target reference	**Completed 2012**

	points for skipjack, including empirical reference points such as those based on CPUE as well possible target reference points derived from stock assessment models	
Project 63. (Priority = High)	**Identifying Provisional Decision Rules** Tasks/TOR • For the key target species in the WCPFC, develop candidate harvest strategies (decision rules) based on present stock status. • Define and/or quantify assessment uncertainty and articulate how this is to be incorporated within decision rules. History • SC8 will review the concept of **harvest control rules** and the Commission will have a workshop on management objective WS, 28-29 December 2012.	**Completed 2012 possible extension**
Project 30. (Priority = Medium) SPC-OFP Services	**Development of recruitment indices independent of the MFCL model, including the investigation of recruitment and oceanographic trends.** Tasks/TOR • Required to index recruitment in stock assessment models. Major advances made in 2007 need to be followed up and formally incorporated into assessments. History • SA-SWG and ME-SWG Priority. •	**Deleted as requested by the SC4**
Project 4. (Priority = Medium) SPC-OFP Services	**Produce and publish on the Commission's website two issues of the Regional Tuna Bulletin, containing estimates of monthly catch rates for WCPO fleets, based on the most recent data available.** Tasks/TOR History	**Dis-continue**
Project 18. (Priority = High)	**Determine appropriate sample sizes for length frequency sampling strategies.** Tasks/TOR • Relates to all target species but yellowfin was identified as priority species. History • SA-SWG priority Comments: 1. Incorporated into Project 60 2. Recommend deleting this item	**Inactive Delete**

Project 19. (Priority = High)	**Identification and description of operational characteristics of the major WCPO fleets and identification of important technical parameters for data collection.** Tasks/TOR • Includes characterization of operational features at both vessel and set/operational levels useful for effort standardization and the evaluation of fishing efficiency, targeting and bycatch mitigation. • Includes use of simple proxies and other means as tangible indicators of increasing fishing power, i.e. individual or fleet landings per annum, and/or estimates of the number of FADs deployed each year. • Includes monitoring of operational features related to depths fished by longline hooks and depths of purse-seine nets. • Includes monitoring and reporting on new developments in fishing gear and practices, fishing modes and related shore side developments as they relate to changes in fishing power. • Supply TDRs and hook timers to regional observer programs undertaken by SPC-OFP. History • FT-SWG priority. Comments: 1. FT-SWG no longer exists so no progress. ~~2. Recommend that this Project be moved to a list of inactive but potentially useful projects.~~	**Inactive**
Project 20. (Priority = Low)	**Examine and review the technical aspects of capacity measurement and monitoring of fisheries within the WCPFC-CA.** Tasks/TOR • This project may be undertaken by the TCC, but the FT-SWG terms of reference were modified in 2006 to accommodate capacity work. History • FT-SWG priority Comments: 1. FT-SWG no longer exists so no progress. ~~2. Recommend that this Project be moved to a list of inactive but potentially useful projects.~~	**Inactive**
Project 21. (Priority = Low)	**Investigate and promote studies on socio-economic influences on fishing strategies, spatio-temporal fishing patterns and influences on effective fishing effort.**	**Inactive**

	Tasks/TOR History • FT-SWG priority Comments: 1. FT-SWG no longer exists so no progress. ~~2. Recommend that this Project be moved to a list of inactive but potentially useful projects.~~	
Project 27. (Priority = Medium)	**Investigation and quantification of changes in catchability of target and non-target species, including bycatch and incidental species, over time not included in the CPUE standardization.** Tasks/TOR • Many factors, not reported on logbooks, influence catchability. The comparison of catch rates obtained by individual research projects where details of gear and fishing practices have been extensively documented may allow changes in catchability to be investigated and possibly quantified. History • SA-SWG priority (cross-reference Project 23/22).	**Inactive** (links with other projects)
Project 31. (Priority = High)	**Improve existing, and explore alternative, models for standardization of effort and the construction of indices of stock abundance.** Tasks/TOR • Includes tasks identified by the ME-SWG at SC3 – the continued identification of factors which influence CPUE, understanding and quantification of the changes in catchability over time not included in the CPUE standardisation models, and identification of alternative catchability trends for inclusion in stock assessment models, and the calculation of regional weighting factors. History • SA-SWG and ME-SWG Priority.	**Inactive**
Project 33. (Priority = ~~Medium~~) Low	**Development of new stock assessment models and associated software.** Tasks/TOR History • ME-SWG Priority.	**Inactive** (links to project 60)
Project 47. (Priority = Medium) Low until	**Turtle population assessments.** Tasks/TOR • Three year project to continue into 2009, involving	**Inactive**

enough observer coverage	collation of data eventually leading to quantitative assessments. History •	
Project 48. (Priority = Medium)	**Survival of hooked and released seabirds.** Tasks/TOR • History • Will require sourcing external funding for satellite/archival tags.	**Inactive**
Project 49. (Priority = Medium)	**Turtle tagging and associated materials.** Tasks/TOR • History • Will require sourcing external funding for satellite/archival tags. Conventional tags can probably be obtained at little or no cost from SPREP	**Inactive**
Project 53. (Priority = Medium)	**Investigation into the fishing activities and catch composition of small vessels (e.g. longliners<24m)** Tasks/TOR • To create a better understanding of the catch and effort and operational activities of small high seas vessels so that appropriate management measures (e.g. sharks and seabirds) can be considered for these vessels. History • EB-SWG Priority.	**Inactive**
Project 54. (Priority = Medium)	**Review scientific data to assess the inter-relationship between ~~in a holistic manner~~ the effects of bycatch management measures using the different longline gears and mitigation measures on the catch of turtle, shark and other target and non-target longline species.** Tasks/TOR • Assess the impact of circle hooks, line weighting and other mitigation methods impact the capture of target species, sea turtles, seabirds and sharks. History • EB-SWG Priority. • Some work has been done in the Atlantic and we could assess that.	**Inactive**
Project 59. (Priority =	**Management Strategy Evaluation for non-target and protected species using semi-quantitative models.**	**Inactive**

Medium)	Tasks/TOR • ERA will identify species at risk from to the effects of fishing. For some of these species the information available will be insufficient for a robust statistical stock assessment approach. However a need to evaluate management options for these species will remain. History •	
Project 68. (Priority = High - once there is sufficient observer coverage)	**Estimation of seabird interaction, bycatch and mortality** Tasks/TOR • EB-SWG Priority? • Subject to the requests by CMM 2007-04 History	Inactive

Attachment J

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

Work Programme and Budget for 2012, Provisional Work Programme and Indicative Budget for 2013-2014, and Indicative Science Services for 2-13-2015

Indicative plan of the SPC-OFP Science Services for 2013-2015

Species	Stock	Last assessment	Comments	Proposed assessment		
				2013	2014	2015
Bigeye tuna	WCPO	2011	Review recommendations to implement with priority on analysis of tagging and longline CPUE data. Not all recommendations will be complete by 2013. Good to do tropical tunas together for the purpose of examining management options.	Analysis of tagging data and longline CPUE data and complete the model Within the services budget	Stock assessment 2014	No
	Pacific-wide		Suggested that this not be conducted until the WCPO stock assessment updated.	N/A	N/A	2015 following completion of changes and conduct of WCPO assessment
Skipjack tuna	WCPO	2011	Will benefit most from the PTTP data for which more data is now available..	1) Analysis of tagging data and complete the model.	Stock assessment 2014 but start earlier in 2013	No
Yellowfin tuna	WCPO	2011	Many BET recommendations will also benefit YFT.	Analysis of tagging data and longline CPUE data and complete the model	Stock assessment 2014	No
Albacore	South Pacific	2012	Next assessment would benefit from the implementation of sex-structure in MULTIFAN-CL.			Stock assessment 2015

Striped marlin	SW-Pacific	2012	Just updated after several years. Next assessment 2017			
	NW-Pacific	2011-12	Just updated after several years. Next assessment 2017			
Blue marlin	Pacific-wide	2002	Would appropriately be conducted collaboratively; SC noted this is a pacific wide stock and request ISC to present assessment to SC in advance. SC requested assurance that ISC assessment would be submitted to WCPFC	ISC 2013		
Swordfish	SW-Pacific	2012/13	Update underway	SA be finish by SC9 2013		
Silky shark	WCPO	2012	SC8 request for an updated assessment to address some input data issues	Stock Assessment 2013		
	Pacific-wide		Collaboration with IATTC. Not to be conducted until after the revised assessment for the WCPO stock.	Following WCPO Assessment		
Oceanic whitetip shark	WCPO	2012	First assessment conducted this year			Next assessment 2015
Blue shark	South Pacific		Currently scheduled for 2012/13	2013 Pacific wide assessment		
	North Pacific		Currently scheduled for 2012/13.			
Mako shark	South Pacific		Currently scheduled under the SRP for 2012/13	No decision pending agreement on future funding		
	North Pacific		Currently scheduled under the SRP for 2012/13.			

Attachment K

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Scientific Committee
Eighth Regular Session

Busan, Republic of Korea
7–15 August 2012

Guidelines for the SC Chairs and Theme Convenors

In the document circulated after SC5 outlining potential benefits to moving to a Theme based meeting structure (now adopted), several additional comments were noted that in the past each Chair/Convener had run their session according to their own rules and that this had caused some confusion and delays. Whilst set in stone rules can cause problems, there has been general agreement that the running of the Scientific Committee (SC) could be improved if the Chairs and Convenors could agree on some basic guidelines for running the meeting and ensuring consistency throughout the meeting.

According to the decision made by the SC7 (paragraph 584.f), the Secretariat prepared a draft guidelines for the review of SC8 officers.

General guidelines for SC Chair and Theme Convenors

1. The SC Chair and Convenors will be involved with the Commission's Secretariat in developing the provisional annotated agenda for the approval of Heads of Delegation.

2. The SC Chair will convene an SC Officer's Meeting prior to Heads of Delegation meeting. The Meeting will consider SC meeting procedures, including reviewing the indicative schedule according to the volume of theme papers to be covered.

3. The SC Chair and Convenors will direct discussions at the plenary, subject to the approval of Heads of Delegation.

4. The SC Chair and Convenors will make sure that all presentations and discussions should stay focused on the science and the relevant agenda item. Furthermore, while discussion on agenda items to be encouraged the SC Chair and Convenors are to remind the plenary to keep specific questions and commentary concise.

5. The SC Chair and Convenors will ensure observance of the Commission's Rules of Procedure, mutatis mutandis, to accord the right to speak, announce the list of speakers and, with the consent of the Scientific Committee, declare the list of speakers closed.

6. The SC Chair and Convenors should be mindful of non-English speaking delegations, particularly when text is edited on screen. Draft text will be circulated prior to being submitted for the approval of the SC. Appropriate time should then be given for plenary to consider the text prior to approval.

7. The SC Chair and Convenors, in consultation with the Secretariat, may formulate Informal Small Group (ISG) meetings that will be held, as needed, in the margin of the plenary to formulate a conceptual framework and/or develop consensus views, and submit a summary paper of the ISG meeting to the plenary for consideration. The plenary will try to make every effort to avoid duplicating discussions that were made at the ISGs. The SC Chair and Theme Convenors will consult with the facilitators of ISGs to coordinate meeting schedules.

8. SC Chair and convenors should help develop consensus by briefly summarising discussions across the floor. They should not indulge in monologues and should remain alert to CCMs wishing to make interventions across the floor of the meeting.

9. SC Chairs and convenors should not directly or indirectly advocate their own views or the positions of their own delegations when chairing the plenary or theme sessions.

10. The SC Chair and Convenors will consult on how non-consensus is to be handled and accommodated into the provision of advice to the Commission. The use of break-out groups may help to achieve a consensus view.

Guidelines for SC Chair

1. The rules and powers of the SC Chair are explained in Rule 9 of the Commission's Rules of Procedure, which is annexed below.

Rule 9 (Function of the Chairman)

1. In addition to exercising the powers conferred upon him or her elsewhere in these rules or by the Convention, the Chairman shall declare the opening and closing of each plenary meeting of the Commission, direct the discussions in plenary meeting, ensure observance of these rules, accord the right to speak, announce the list of speakers and, with the consent of the Commission, declare the list of speakers closed, put questions and announce decisions. He or she shall rule on points of order and, subject to these rules, shall have complete control of the proceedings at any meeting and over the maintenance of order thereat. The Chairman may, in the course of discussion of an item, propose to the Commission the limitation of the time to be allowed to speakers, the limitation of the number of times each representative may speak, the closure of the list of speakers or the closure of the debate. He or she may also propose the suspension or the adjournment of the meeting or the adjournment of the debate on the item under discussion.
2. The Chairman, in the exercise of his or her functions, remains under the authority of the Commission.
3. The Vice-Chairman acting as Chairman shall have the same powers and duties as the Chairman.

Guidelines for Theme Convenors

1. Convenors will provide draft agendas for their Theme session. This will be done in consultation with the Commission's Secretariat to take account of specific requests from the Commission and with the scientists who are providing a paper to the Theme. Based on this process, Convenors will also decide which papers will be presented as Working Papers and which will be provided as Information Papers. Papers that are not relevant to agenda items should not be accepted. Information papers are not normally presented verbally but may be referred to by the SC in discussion and in formulating recommendations to the Commission.

2. The submission of papers for sessions of the Scientific Committee should be in accordance with the specified timeline. Convenors in consultation with the Secretariat should give consideration towards deadlines for submission of papers, recognizing that CCMs need time to consider the papers in consultations domestically and with other CCMs.

3. Convenors will provide guidance to each presenter on the time allowed for the presentation and discussion of their paper in order to facilitate staying within the time allocated to the Theme session.

4. Convenors will enlist support rapporteurs to take notes on the discussion for each agenda item. Convenors will also work with the Head Rapporteur on the production of the final summary report for each Theme session.

5. During the sessions at the SC, Convenors should identify Information Papers that support and are relevant to Working Papers in line with Theme Session Agenda. Other information papers should be separated by posting directly beneath Agenda related papers.

6. After the completion of presentations and the discussion of agenda items and possible management advice Convenors will draft recommendations and circulate these to the meeting seeking comments and feedback. Each Theme will then reconvene during a time provided for in the Meeting Agenda to undertake the final review and adoption of recommendations for their Theme. For this final review changes made to the initial draft recommendations are to be presented in track changes format. The Head Rapporteur will assist in the finalization of the recommendations for each Theme.

7. Convenors should assist the plenary reach consensus in adopting recommendations.

8. Convenors should be mindful of the time allocated to their session and where possible take advantage of any time saving opportunities.