出國報告(出國類別：其他)

參加2011年大西洋鮪類資源保育委員會(ICCAT)之研究暨統計常設委員會(SCRS)魚種小組會議暨全席會議出國報告

服務機關：行政院農業委員會漁業署
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派赴國家：西班牙(馬德里)
出國期間：中華民國100年9月24日至10月9日

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摘要

本大西洋鮪類資源保育委員會(ICCAT)研究暨統計常設委員會(SCRS)魚種小組會議暨全席會議於2011年9月26至30日假西班牙馬德里舉行，與會者包括ICCAT會員、我國及觀察員等人。魚種小組分爲劍旗魚、熱帶鮪類、長鰭鮪、黑鮪、鯊魚、旗魚、生態、統計等八個小組，分別檢討 年度工作進度，並提出研究以及工作計畫，提報到第二周之全席會議討論，所得結論將送交委員會，做爲未來保育管理措施之參考及研究工作重點。本次會議重要結論包括：

一、 2011 年大西洋各魚種評估指標與管理現況如附件一，摘要如次：

(一)熱帶鮪類小組：

1. 大目鮪：資源評估結果顯示最大持續生產量(MSY)爲 78,700-101,600(中位數爲 92,000)公噸。倘以目前總容許漁獲量(TAC) 85,000 噸的水準利用資源，在未來 5 年有 60%的機會達到管理目標，建議 TAC 爲 85,000 公噸(或少於 85,000 公噸)。
2. 黃鰭鮪：評估結果顯示 MSY 爲 114,200-155,100 公噸間，而 2010 年漁獲量爲 107,546 公噸，顯示在安全邊緣。
3. 正鰹：分爲東西兩群。東大西洋系群估計 MSY 約爲 143,000-170,000 公噸，而 2010 年漁獲量爲 164,000 公噸，建議委員會應注意倘漁獲量超過 MSY，可能會影響正鰹漁業相關物種。西大西洋系群估計 MSY 約 30,000-36,000 公噸，2010 年漁獲量爲 18,000 公噸，在安全範圍。

(二)長鰭鮪小組：

1. 北大西洋長鰭鮪：評估結果顯示 MSY 爲 29,000 噸，2010 年漁獲量爲 19,649 公噸，相對資源量(SSB_{2007}/SSB_{MSY})爲 0.62，相對漁獲死亡率(F_{2007}/F_{MSY})爲 1.045，過漁已發生且正在進行，建議 TAC 爲 28,000 公噸(2010-2011 年)。
2. 南大西洋長鰭鮪：MSY 爲 27,964 公噸，2010 年漁獲量爲 18,900 公噸，相對漁獲死亡率(F_{2009}/F_{MSY})爲 1.07，TAC 若低於 24,000 公噸，則無法回復資源量的機率超過 50%。

(三)劍旗魚工作小組：

1. 北大西洋劍旗魚：評估結果顯示，資源量高於 MSY，漁獲死亡率也低於 MSY 水準之漁獲死亡率，即未發生過漁且過漁並未進行中，惟基於預警措施，設定 MSY 爲 13,700 公噸。
2. 南大西洋劍旗魚：評估結果顯示，估計之相對漁獲死亡率(F_{2008}/F_{MSY})爲 0.75，相對生物量(B_{2009}/B_{MSY})爲 1.04，也略高於 MSY 所需之生物量；MSY 則設定爲 15,000 公噸。

二、 2011 年期中會議報告：1.黑皮旗魚資源評估暨紅肉旗魚資料準備會議：會議重點爲對黑皮旗魚評估產生參考點及更新管理建議、並爲紅肉旗魚評估模式作準備。2.生態系次委員會期中會議：主題爲魚種別及地區別之空間生產模式、環境變數在 CPUE 標準化之整合、生態系指標、混獲評估方法、混獲海鳥及海龜避忌措施、海龜安全釋放及處理協議。3.南大西洋暨地中海長鰭鮪資源評估會議：地中海長鰭鮪資源爲首次評估，並更新南大西洋長鰭鮪 2007 年評估資料。4.黃鰭鮪資源評估會議：運用漁獲量、努力量及體長等統計資料進行分析。

三、 生態系次委員會報告：主要討論生態系評估、海鳥及海龜混獲評估以及避鳥措施等。

四、 美國拉荷雅舉辦的第三屆鮪類 RFMOs 會議及聯合混獲工作小組會議所關切議題：重點於發展資料保密規定及草擬資料共享協議。

五、 2012 年之研究及統計工作計畫：1.長鰭鮪：無資源評估計畫，工作重點爲漁獲統計資料蒐集。2.黑鮪：將進行資源評估。建議 2012 年九月初，進行八天的資源評估，單純更新 2010 年評估資料。3 旗魚：將針對大西洋紅肉旗魚及圓鱗長吻旗魚進行總合資源評估工作。4.劍旗魚：無資源評估，地中海劍旗魚將加強漁獲資料蒐集，北方劍旗魚將持續管制參考點研究。5.小鮪：無資源評估，將加強漁獲資料蒐集。6.鯊魚：無資源評估，將加強生物研究及資料蒐集。7.熱帶鮪類：無資源評估計畫，將進行有關生物參數更新、圍網及竿釣漁業 CPUE 估算方法建立、迦納漁獲資料蒐集。8.生態系次委員會：未來兩年進行海龜的評估。

六、 對委員會要求之回應：1.有關會員國國家觀察員計畫執行資訊：本年度僅少數會員國提送相關國家觀察員計畫執行資訊，無法就此少量資訊進行相關細項分析評估，請會員國配合提供相關資訊。2.有關漁獲資料項目評估：目前僅收到有限資訊，2011 年已經針對黑皮旗魚、南大西洋及地中海長鰭鮪與黃鰭鮪漁獲資料進行評估。

關鍵字：大西洋鮪類資源保育委員會，研究暨統計常設委員會，鮪類，資源評估，參考點，評估指標，混獲。

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壹、目的

大西洋鮪類資源保育委員會(ICCAT)為保護大西洋鮪類資源而於1969年成立之區域性國際組織，在該組織下設有秘書處、按海域魚種劃分成之四任務小組(Panel 1－Panel 4)、及研究暨統計常設委員會(Standing Committee on Research and Statistics，SCRS)、財政常設委員會(Standing Committee on Finance and Administration，STACFAD)、紀律委員會(Committee on Conservation and Management measures, or Compliance Committee)及永續推動小組(Permanent Working Group for the Improvement of ICCAT Statistics and Conservation Measures，PWG)等小組委員會，共同推動會務。其中，研究暨統計常設委員會(SCRS)負責漁獲統計及資源評估等事宜，其運作係由各魚種工作小組(熱帶鮪類(大目鮪、黃鰭鮪、正鰹)、長鰭鮪、旗魚類、劍旗魚、黑鮪、鯊魚等小組)之科學家進行資源評估，將評估結果提交全席會議討論作成管理建議後，再提交大會參考，俾作成最後之管理決議，供各會員國遵守，以落實大西洋區鮪類漁業資源之管理。ICCAT每年均邀請我國以合作非會員國身份參加相關會議。我國對該組織召開之會議均依其必要性分別派員參加，在相關會議中維護我國漁業權益。本年度之研究暨統計常設委員會，我國乃由相關學者、專家及本署人員代表參加。

貳、會議出席代表

大西洋鮪類資源保育委員會研究與統計常設委員會(SCRS)下設二個次委員會及六個工作小組，包括統計次委員會、生態次委員會、黑鮪工作小組、劍旗魚工作小組、熱帶鮪類工作小組、旗魚類工作小組、小鮪類工作小組和長鰭鮪工作小組，每年於九月集會討論近一年各項漁業資源研究及管理狀況，提出保育管理建議及未來工作計畫，送到隔周舉行的SCRS全席會議討論，所得結論送交年會做爲未來保育管理措施之參考以及研究工作重點。今(2011)年ICCAT已舉辦之各項小組期中會議，該等會議結果亦將送交本次會議，以更新ICCAT魚種摘要報告(Executive summary)及相關會議進度。

本年度會議我國出席代表如下：

單　　位	職　　稱	姓　　名
臺灣大學	教授	許建宗
海洋大學	助理教授	黃向文
對外漁業合作發展協會	組長	於仁汾
	組員	張鳳貞
漁業署遠洋漁業組	技正	李淑敏

參、會議過程紀要

(壹)魚種小組會議

本(2011)年 ICCAT 之 SCRS 魚種小組會議於 9 月 26 至 9 月 30 日於 ICCAT 秘書處召開。除秘書處人員外，計有美國、日本、加拿大、巴西、摩洛哥、法國、烏拉圭、西班牙、墨西哥、迦納、塞內加爾及象牙海岸等國家約 40 位科學家參加。我國由台灣大學許建宗教授、海洋大學黃向文助理教授(僅參加 9 月 30 日會議)、中華民國對外漁業合作發展協會於仁汾組長、張鳳貞組員及本署遠洋漁業組研發科李淑敏技正等五位與會。以下謹就各項會議重點陳報如後：

一、統計次委員會會議：統計次委員會會議於 9 月 26 及 27 日在 ICCAT 秘書處舉行，由美國 Dr. G.erald Scott 擔任主席。ICCAT 秘書長 Mr. Driss Meski 亦出席會議並致歡迎辭。我國由台灣大學許建宗教授、中華民國對外漁業合作發展協會於仁汾組長、張鳳貞組員及本署遠洋漁業組研發科李淑敏技正等四位參加。首先 Scott 主席請與會人員簡短自我介紹，指定 Guilermo Diaz 為紀錄員，之後討論並修正確認本次會議議程。謹就 9 月 26 及 27 日舉行之統計次委員會會議，ICCAT 秘書處統計、基礎設備和技術主管 Dr. Mauricio Ortiz 報告 2011 年秘書處在統計和研究協調工作成果(SCI-008)，該議題報告摘述如次：

(一)檢視本年各CPCs提報之漁獲統計：

1.各魚種資料提交時程：4月10日前繳交黑皮旗魚及紅肉旗魚資料、6月5日前繳交鯊魚資料、7月10日前繳交南大西洋及地中海長鰭鮪資料、其餘資料於7月31日前繳交。秘書處建議各國應於每年7/31前繳交資料，若有資料準備會議或資源評估會議，則以小組工作計畫所提日期為繳交期限，各國應徹底配合執行，以利會議進行，巴西代表提出因該國延繩釣漁業跨年作業，故本年度並未依照旗魚小組擬定期程提供黑皮旗魚漁獲量資料，但不應列入會員紀律檢討，會員國漁獲資料提送仍應以委員會規定期程為主，因此會員國資料提送表應加上註解說明。

2.TASK I之漁船特性：38個國家於期限內繳交、28個國家於本年9月15日前尚未繳交，資料繳交比率為58%，其中冰島、挪威及俄羅斯提報無鮪漁船在ICCAT海域作業，且無鮪魚漁獲量，但歐盟會員國保加利亞有提報鮪漁船作業但無提報漁獲量，對此情況主席請統計人員再與這些國家進行確

認。

3.TASK I之名目漁獲量：45個國家有繳交資料(39個國家於期限內繳交、6個國家於期限後繳交)、21個國家於本年9月15日前尚未繳交，資料繳交比率為68%，其中3個國家未以標準格式繳交。各國提報資料應以新格式(Form ST02-T1NC)提報，並參考各魚種之ICCAT sampling areas分區資訊提報，有2年(2011-2012)過渡期，針對秘書處準備之資料提送檢查卡，日本代表提出零漁獲以及未提送資料仍應有區別，去年已經要求會員國如該魚種無漁獲則必須在資料提送表補上”0”，摩洛哥及迦納代表亦分別提出該項質疑，秘書處表示將會重製該表。

4.TASK II之漁獲量和努力量資料：41個國家有繳交資料(38個國家於期限內繳交、3個國家於期限後繳交)、23個國家於本年9月15日前尚未繳交，資料繳交比率為64%。本年各國提報資料雖增加數種的鯊魚資料，但SCRS要求提報所有的種類(包括目標及非目標魚種)和努力量。

5.TASK II之體長頻度資料：34個國家有繳交資料(32個國家於期限內繳交、2個國家於期限後繳交)、29個國家於本年9月15日前尚未繳交，大部份國家以月別5度方格或ICCAT取樣分區(sampling area)來提報體長資料。

6.現行的漁獲統計表格內，並未設定各國提報各魚種的時程，且本年有很多國家在期限之後才提報統計資料，故統計次委員會要求秘書處將資料提報期限都預設為7/31。會員國在此期限後都無法提報資料；若有資料準備會議或資源評估會議，提報期限則預設為該魚種小組工作計畫所提日期。

7.為了順利進行關心之魚種的資源評估工作，統計次委員會建議應加強檢視各國的科學資料，而非僅是在探討資料提報的期限，應重視資料品質，減少資源評估的不確定性，期望能獲得最適當的資源概況和管理建議。

8.會中探討現行的商業資料來源，統計次委員會建議會員國可藉由檢視觀察員資料，確認商業資料的正確性，避免重複計算(double counting)。

9.我國本年提送2008-2010年TASK Ⅰ 和TASK Ⅱ資料完全符合規定之時程。Task I 和Task II 中皆含鼠鯊(porbeagle)，提報“zero” catch。但各國資料繳交情況管制卡(空白代表未繳交，黃色代表未依時程繳交，綠色代表依時程繳交)卻顯示為空白未提報，已向Dr. Mauricio Ortiz提出此問題，請其修改管制卡。

(二)標識放流：標識放流紀錄魚類洄游過程中的環境參數，提供最直接的棲息水層與洄游行為的資訊。目前已知各會員國及組織執行情形：

1.電子標識放流：本年計46個實驗進行中。其中義大利回收1個黑鮪電子標籤；西班牙放流18個電子標籤，2個黑鮪標籤回收；摩洛哥回收1個標籤；World Wide Fund for Nature (WWF)放流47個電子標籤，21個標籤回收。

2.傳統標識放流：2010至2011年約8,880個標識放流。其中西班牙放流7,519個標籤，回收993個；義大利放流82個標籤，回收25個；烏拉圭放流226個標籤，回收1個。

(三)資料復原及改善：

1.評估迦納漁業統計：檢視熱帶鮪類漁獲和漁業資訊，包含迦納作業報表、更新漁獲統計、估計船隊漁獲率和輔助資訊。

2.修正各漁業的歷史漁獲統計資料(Task I、Task II、Size)：包含1995-2007年葡萄牙延繩釣漁業Task II、2005-2007年瓜地馬拉圍網漁業Task II、2005-2007年塞內加爾活餌釣漁業Task II、2002-2007年委內瑞拉流刺網漁業Task II、2007年千里達與托巴哥表層漁業Task II、迦納圍網和活餌釣漁業Task II及1995-2010年日本延繩釣漁業之黃鰭鮪體長別漁獲量(Catch at Size (SCRS\2011\127))等資料，主席重申這些資料修正必須提送正式報告給魚種小組以及統計次委員會作檢視，否則會員國提送之修正資料仍視為未正式更正，但針對聖多美及普林西比所提資料視為補提資料，並非修正資料。

3.重建歷史的黑鮪資料：透過加強全大西洋區黑鮪研究年度計畫(Atlantic-Wide Bluefin Research Program, GBYP)執行。

(四)秘書處目前多使用R語言、SQL、My SQL等軟體進行資料庫建立及維護，另ICCAT網頁(http://www.iccat.int/en/accesingdb.htm)之檔案格式內容、使用者指南、1950-2009年各國漁業別及魚種別之Task I和Task II等資料可提供參考及使用，大目鮪小組主席建議未來是否可以建立資料下載查詢介面供魚種小組資料使用，如此可減輕秘書處統計人員工作負荷量，但此介面必須有詳細使用文件供參考，秘書處人員回覆資料庫系統複雜，如要開發到符合魚種小組需求難度頗大，但如果小組研究人員懂得資料庫架構，秘書處資料人員只需要從資料庫下載資料表就可以提供魚種小組使用。

(五)依據建議案[Rec.10-10]，本年提送國家觀察員計畫摘要報告者，僅有台灣、迦納、韓國、冰島、日本、突尼西亞、墨西哥、那米比亞、美國、加拿大、烏拉圭、法國等國家，會中由秘書處檢視各國觀察員執行及資料蒐集情況，秘書處將使用此資訊作為未來各國觀察員資料提報最低標準參考，另外主席說明委員會Rec.10-04主要規定範圍為大西洋黑鮪漁業，Rec.10-10則是適

用所有會員國，因此會員國必須依照該項建議案執行國家觀察員計畫。

(六)各國提報觀察員混獲物種資料，使用格式不一，提報內容、資料項目也不同，Dr. Mauricio Ortiz建議將提報觀察員混獲物種資料之格式予以標準化。

(七) ICCAT Manual網頁版已更新第3章內容，包括日本延繩釣漁業、表層和其他延繩釣漁業，另建議更新紅肉旗魚、長吻旗魚之內容，加入長尾鯊(狐鮫)、大目午仔、花鯊、白皮仔、黑皮仔、八鰭丫髻鮫之內容。

(八)為了質量管理和透明化，簡易的模式輸入參數、軟體、模式輸出結果、圖表，應發展「資源評估文件之清單(checklist)」，並藉由資料的檢視，加強RFMO科學委員會間的合作。

(九)國際統計活動：持續與Fishery Resources Monitoring System (FIRMS)及Coordinated Working Group on Fishery Statistics (CWP)合辦活動、提供出版資料予Aquatic Sciences and Fisheries Abstract (ASFA)、參與全球環境保護基金(Global Environment Facility)結合t-RFMOs及FAO計畫。

(十)檢視出版品：本年出版雙年報(2010年)、統計公報電子版(No.40)、摘要報告樣版模式、ICCAT作業手冊、鯊魚旗魚辨識圖鑑。

(十一)未來工作計畫及建議：

1.基礎資料及技術：更新ICCAT總部辦公室電力控制及電線配置；更新網路及電話設備；安裝新伺服器、switch控制器、ADSL線路及UPS；於伺服器室安裝冷氣及獨立電源供應；更新伺服器作業系統；檢視ICCAT之Internet安全方案，以保護秘書處之資料庫及所有儲存資訊。

2.資料庫：本年ICCAT秘書處開始將資料庫移至MS-SQL 2008 server，但由於會議等工作負荷量重，致進展有限；本年開始進行重大更新及重建ICCAT漁船清單，此整合性漁船資料，能對抗全球IUU作業漁船；2010年委員會採行的資料保密協定將允許VMS資料使用於科學目的；本年秘書處的ROP計畫執行黑鮪漁獲量電子文件系統研究，該研究將於本年ICCAT年會發表。

二、生態系次委員會會議：生態系次委員會會議於9月27日下午2時開始，由美國Shannon Cass-Calay博士主持，我國由對外漁協於仁汾組長參加，其他與會會員國代表分別有葡萄牙、西班牙、巴西、日本、美國、烏拉圭、加拿大以及觀察員國際鳥盟等。會議首先由主席說明本次會議議程與研究報告發表順序。本次會議重點及所發表之研究報告摘述如次：

(一)(SCRS/2011/150,151)由鳥盟研究人員今年度ACAP研討會中討論有關海鳥忌避措施之結論，該報告建議海鳥減獲最有效之忌避措施爲支繩加重、夜間投鉤以及避鳥繩等三項措施合併使用，其中35公尺以上漁船建議使用2條避鳥繩，35公尺以下漁船則可使用1條短飄帶避鳥繩。美國代表提出應針對支繩加重對目標魚種釣獲率差異比較，如釣獲率無差異，則漁民較易接受支繩加重之忌避措施，烏拉圭及日本代表表示對於35公尺上下漁船使用不同避鳥繩應有比較研究，主席表示支繩加重需要進行釣繩纏絡分析。

(二)(SCRS/2011/187)由烏拉圭代表進行西南大西洋延繩釣混獲對信天翁族群之衝擊，並進行不同鳥種之生產力及敏感性分析(productivity and susceptibility analysis，PSA)。主席表示該海域並非僅有烏拉圭船隊作業，分析資料應包含其他船隊之努力量資訊，另美國代表提問應在該海域要求漁船必須採取忌避措施，分析結果要進行採行忌避措施之前後差異比較，主席表示該研究所提之PSA分析不確定性很大。

(三)日本代表就南緯區海鳥集中熱點進行報告，該項研究使用鳥盟之信天翁移動軌跡資料、ICCAT秘書處之延繩釣與海鳥互動資料以及日本觀察員及研究船資料進行分析。結果顯示海鳥集中熱點區與延繩釣混獲高CPUE區域並非重疊。然與會代表認爲該研究使用之資料僅限於日本觀察員以及研究船資訊，其作業分布範圍有限。因此，該項結論之科學證據尚有不足。

(四)主席就本年度召開之KOBE III有關混獲建議提出討論。主席對於建議中有關會員國提送LOGBOOK資訊表示可能涉及保密協定。在ICCAT目前會員國資料提送規定下，進一步要求可能會產生問題。針對觀察員資料部分，建議建立提送資料最低標準。

(五)針對生態系次委員會下週擬提出之研究優先順序，主席提請與會代表發表意見。與會代表提出加強採樣及資料提送、研究混獲物種生命週期及分布、會員國物種辨識能力建立、混獲參考點分析、遙測技術應用等項目，生態系次委員會另將在本週五(9月30日)再召開會議。主席建議週五進一步討論並進行報告撰寫。

(六)生態系次委員會會議續於9月30日召開會議，由美國Shannon Cass-Calay博士主持，我國由海洋大學黃向文助理教授參加。會議首先由主席說明本日會議議程與研究報告發表順序。本日會議內容包括三篇報告、工作計畫及其他事項：

1.研究報告：

(1)我代表報告有關大西洋海鳥混獲評估，係依據我觀察員計畫資料進行分析，結果認爲北大西洋部分由於我作業位置多於公海，混獲率爲 0，此部分仍仰賴美日以及西班牙等國資料，熱帶水域混獲率亦爲 0，至於南大西洋，則以東南大西洋以及西南大西洋沿岸混獲率較高。與會者則指出現在 ICCAT 網站努力量爲原始資料，可能不盡完善，秘書處應該提供經過估算的資料開放供各國科學家使用。此外，北大西洋資料缺口也賴其他國家提供資料。與會者感謝我國提出此報告，並呼籲其他會員也應該提供類似的分析。

(2)日本代表提出建議，建議在熱區，應該有二種措施，包括設置避鳥繩以及(支繩加重、夜間投餌二擇一)，並給予一年緩衝準備時間。與會者，包括烏拉圭等國對於日本提出此報告感到不解，包括秘書處提醒日本，SCRS 只能提”科學建議”，而只有 CPC 能在年會提建議。ACAP 緩頰認爲可視爲本小組的共識提出。烏拉圭則再三強調此會並非年會，這篇報告也沒有科學依據，何以要具體做出建議，更何況各與會者看法原本就有所不同。即便日本資深科學家嘗試翻案，用比較科學方式解釋而非政治角度，但烏拉圭堅持不希望此種作法成爲慣例。所以，雖然多位與會者不反對其內容，卻難以將之列爲會議具體建議事項。

(3)美國邁阿密科學家則報告有關美國在大西洋蒐集海水溫等環境資料以及漁或資料後，認爲漁獲分布與水中含氧層深度有關係。

2.海龜混獲分析：

(1)ICCAT 已完成海龜專家遴選工作，可在下年度開始工作，屆時將與秘書處以及本小組合作進行各國海龜相關資料蒐集及研究方法之研析。

(2)主席也要求該專家能夠投入有關資料庫標準化工作，而爲配合相關工作進度，下屆工作小組會議可能要延後到六月或七月。

(3)日本提醒應該從混獲角度整體評估，另外遴聘海鳥專家或者混獲專家，建立一致性的標準，而不偏重單一物種。

3.工作計畫：除一般性研究外，主要集中在海龜混獲相關研究，希望在 2012 年建立評估方法以及資料準備標準，在 2013 年完成海龜混獲分析。

4.給委員會的建議：有鑑於 ICCAT 於去年通過 10-10 決議案有關觀察員設置最低標準，因此應該協助相關國家能力建構，確保能夠達成。

5.對於各國是否有蒐集海龜資料，秘書處表示僅有四個國家提報，經詢問後表示係爲韓國、美國、墨西哥及烏拉圭，我國並未在列，因此向秘書處表達

我國亦有蒐集海龜資訊，秘書處則表示該資料爲秘書處參考各國資料彙整，會再予以確認。

三、長鰭鮪工作小組會議：長鰭鮪小組會議於 9 月 28 日舉行，由歐盟(西班牙)Dr. Haritz Arrizabalaga 擔任主席，我國由對外漁協張鳳貞組員與會，與會者尚包括美國、巴西、西班牙、日本等共計 13 位科學家參加，會議重點如下：

(一)秘書處 Mr. Carlos Palma 說明各國在 SCRS 會議期間，若要修改已提報的 Task I 名目漁獲量(nominal catch)，應使用「form T1updatesSCRS」格式，詳列修改前、後的內容和數值，包含魚種代碼、年度、國家、5 度方格或 ICCAT 取樣分區(sampling area)、漁業別、漁獲類別(catch/landing/discards)、漁獲噸數，各國應徹底配合執行，如未依此格式提報，則不予修改已提報的 Task I。

(二) Mr. Palma 說明在資料提報期限之後或是 SCRS 會議期間，秘書處接受會員國修改長鰭鮪漁獲量(Task I)的有貝里斯(1992-1996 年延繩釣、圍網漁業的南大西洋長鰭鮪漁獲量)、西班牙(2010 年延繩釣漁業的南、北大西洋長鰭鮪漁獲量)、萬那杜(2010 年延繩釣漁業的南、北大西洋長鰭鮪漁獲量)。

(三)Dr. Miyake 提及會員國修改黑鮪歷史漁獲量(Task I)，黑鮪小組、統計次委員會都很謹慎，但長鰭鮪小組和秘書處在資料提報期限之後或是 SCRS 會議期間，都接受會員國修改長鰭鮪歷史漁獲量(Task I)。Mr. Palma 回答秘書處會檢視該資料，並接受會員國修改近 2(或 3)年長鰭鮪漁獲量。Ms. Victoria Ortiz de Zarate 亦表示，若會員國有新資訊和新資料，長鰭鮪小組接受在資料提報期限之後或是 SCRS 會議期間的修正資料(Task I)。

(四) (SCRS/2011/156 by Ms. Victoria Ortiz de Zarate)：該報告分析西班牙表層漁業 2010 年夏秋兩季在東北大西洋和 Bay of Biscay 捕獲長鰭鮪之資料。2010 年活餌釣漁業長鰭鮪漁獲量較 2009 年增加 11%，但漁獲努力量(fishing days)減少 3%，2010 年曳繩釣漁業長鰭鮪漁獲量較 2009 年增加 58%，但漁獲努力量增加 31%，2010 年此兩漁業長鰭鮪年齡組成以 1-2 歲魚爲主。Dr. Arrizabalaga 提及 2010 年 7 月活餌釣漁業捕獲到大量的長鰭鮪，建議與 2004-2008 年的中位數、2009 年 7 月活餌釣漁獲量做比較，分析船隊活動、地理資訊系統、族群概況、補充量等。

(五) (SCRS/2011/185 by Ms. Samar Saber)：西地中海是重要的長鰭鮪產卵場，該報告於 2004-2011 年產卵季，在西地中海長鰭鮪產卵場(Balearic Islands)，

採集共 2,651 筆娛樂漁業之體長/體重資料，估算體長/體重關係式，回收的體長範圍介於 56-96 公分。

(六) Dr. Arrizabalaga 簡要說明今(2011)年 7 月 25-29 日南大西洋、地中海長鰭鮪兩系群資源評估方法/結果、各國各漁業別長鰭鮪資源量指標標準化(CPUE)、採用的圖表、管理建議等，並於會中更新相關漁獲統計和圖表。

(七)主席 Dr. Arrizabalaga 事先已草擬 2009-2010 年各國南、北大西洋、地中海長鰭鮪漁業現況比較之執行摘要，草案中提及 2009 年我國北大西洋長鰭鮪量(863 噸)為歷史最低，已於會中說明我國今年提報的 2009-2010 年長鰭鮪量為初估的 Task I，請其刪除「歷史最低」，加入「preliminary」，並修正部份文字，其修正後內容：

ALB-2. Description of fisheries or fisheries indicators

North Atlantic

The Chinese Taipei preliminary catch in 2010 was 1,587 t, an increase as compared to that of 2009, which was a low catch year stemming mainly from a reduction in fishing effort.

South Atlantic

The Chinese Taipei preliminary catch in 2010 was 10,975 t, an increase of 2,297 t as compared to that of 2009. However, the Chinese Taipei catch in the last years has decreased mainly due to a decrease in fishing effort targeting albacore.

(八)長鰭鮪資源評估結果及管理建議摘要表如下：

1.北大西洋長鰭鮪：最大持續生產量(MSY)為 29,000 噸，相對資源量(B_{2007}/B_{MSY})為 0.62，相對漁獲死亡率(F_{2007}/F_{MSY})為 1.045，顯示資源狀況不佳，過漁已發生且正在進行。

2.南大西洋長鰭鮪：MSY 為 20,500-50,000 噸，相對資源量(B_{2009}/B_{MSY})為 0.58-1.69，相對漁獲死亡率(F_{2009}/F_{MSY})為 0.65-2.28，顯示資源狀況不佳，過漁已發生且正在進行。投射指出捕獲量維持在目前總容許漁獲量(29,900 噸)，將使資源處於更差情況，但，近幾年南大西洋長鰭鮪捕獲量約 20,000 噸，若捕獲量繼續維持在此一水準(約 20,000 噸)利用資源，有超過 50%機率(機會)在 5 年內恢復資源和超過 60%機率在 10 年內恢復資源。因此，建議不要增加捕獲量，不超越最近水準(約 20,000 噸)，捕獲量減少會增加資源恢復的機會。

3.地中海長鰭鮪管理建議：從地中海長鰭鮪資源的可用資訊指出，近幾年的長鰭鮪生物量處於相當穩定的狀態，不幸的是，可供 SCRS 用來進行生物

特徵的定量資訊極少，為解決此問題，應重建歷史資料或建立適當的漁業監測資料蒐集計畫。因存有相當大的不確定性，為保護、管理地中海長鰭鮪資源，委員會應制定「限制地中海長鰭鮪漁獲努力量增加」的管理措施。

ATLANTIC AND MEDITERRANEAN ALBACORE SUMMARY			
	North Atlantic	**South Atlantic**	**Mediterranean**
Current (2010) Yield	19,292 t	18,825 t	2,123 t
Maximum Sustainable Yield	29,000 t	20500-50000 [1]	Unknown
Replacement Yield (2009)	Not estimated	Not estimated	Not estimated
SSB_{2007}/SSB_{MSY} [2]	0.62 (0.45-0.79)[2]		Not estimated
SSB_{2009}/SSB_{MSY} [1]		0.58-1.69[1]	
Relative Fishing Mortality			
F_{2007}/F_{MSY} [2]	1.045 (0.85-1.23) [2]		<=1[3]
F_{2009}/F_{MSY} [1]		0.65-2.28[1]	
Management measures in effect	[Rec. 98-08]: Limit	[Rec. 07-03]: Limit	None
	No. of vessels to	Catches to 29,900 t	
	1993-1995 average	until 2011	
	TAC: 30,200 t [Rec. 07-02] for 2008 and 2009.		
	TAC: 28,000 t [Rec. 09-05] for 2010 and 2011.		

[1] Reference points estimates based on 2011 assessment. Range of median estimates from the equally plausible base cases.

[2] Reference points estimates based on 2009 assessment. 95% CI around the reference points were based on estimated 2007 standard errors in the North stock.

[3] Estimated with length converted catch curve analysis, taking M as a proxy for F_{MSY}.

(九) 2012 年工作計畫：

1.調查環境/空間因子對南、北大西洋長鰭鮪資源的影響。

2.北大西洋長鰭鮪資源的永續利用、管理，可參考印度洋、太平洋長鰭鮪資源評估結果與管理建議。

3.進行北大西洋長鰭鮪資源量指標之標準化、評估模式，應考量時空之生物特徵/環境動力學。

4.進行北大西洋長鰭鮪研究計畫，研究項目包括生物及生態研究、漁業統計資料分析及模式發展等。

5.重建/更新地中海長鰭鮪歷史漁獲量(完整的時間序列資料)，進行地中海長鰭鮪資源量指標之標準化。

四、鯊魚工作小組會議：鯊魚工作小組會議於 9 月 28 日上午 9 時舉行，由烏拉圭籍 Andrés Domingo 博士擔任主席，我國由對外漁協於仁汾組長與會，其他會員國代表包括美國、巴西、西班牙、日本、加拿大以及觀察員 ICES

與國際鳥盟等，本次會議共有 3 篇另外 ICES 提報有關白斑角鯊資源評估結果(無會議文件)，以下簡要說明本次會議內容：

(一)西班牙代表報告 SCRS/2011/165 有關太平洋黑鯊生物採樣資料整理，採樣期間自 1990 年至 2011 年共採樣 3,013 尾(雌 1,328 尾、雄 1,621 尾、無性別資訊 67 尾)，全漁獲總計之黑鯊混獲率爲 1.1%，僅計算鯊魚混獲中黑鯊混獲率爲 2.6%，混獲率及漁獲體長區域性差異大，混獲率分布與花鯊呈負相關，估計雌鯊成熟體長爲 164 公分，針對成熟體長部分美國代表提出台灣研究雌鯊成熟全長超過 200 公分，與本研究差異頗大，西班牙代表回覆可能是體長量測方法不同，該研究鯊魚體長採尾叉長。

(二)巴西代表報告 SCRS/2011/135 有關短鰭馬加鯊胃內容物分析，該研究採樣期間自 2007 年 7 月至 2008 年 6 月，研究採樣支位內容物共有 144 種分署 11 綱，其內容物比例排序分別爲硬骨魚、頭足類及甲殼類。

(三)巴西代表報告 SCRS/2011/172 有關巴西延繩釣漁業鯊魚丟棄結果分析，該研究結果顯示馬加鯊及水鯊因價高漁民丟棄率低，一半以上狐鮫類漁獲被丟棄，且狐鮫活鉤放生存活高。

(四)ICES 報告有關西北大西洋白斑角鯊資源評估報告，該鯊種僅有挪威及英國有專捕之漁業，該鯊種自 2009 年設有總可捕量，2010 年總可捕量爲 142 公噸，但自 2011 年起全面禁止專捕，因該鯊種已經列入禁捕，因此 ICES 對此鯊種進行資源評估僅止於測試資源評估模式適用性，並非用於管理建議上。

(五)針對 KOBE III 會議建議，日本代表提出 KOBE III 建議有關鯨鯊、燕魟以及魔鬼魟部分應該視各區域不同而有不同研究重點，ICCAT 鯊魚小組應考慮區域差異性。

(六) ICCAT 秘書處資料人員簡報有關目前鯊魚資料概況，因下年度鯊魚小組將進行短鰭馬加鯊資源評估，故對資料齊備性表示關切。

(七)未來計畫部分，針對短鰭馬加鯊資源評估分工爲烏拉圭研究人員負責生物資料蒐集、美國及巴西研究人員負責有關 CPUE 估算，美國代表表示該鯊種亦將委請 IATTC 研究人員支員使用 SS3 資源評估模式進行評估，日本代表表示該模式需要大量體長資料，預計資源評估會議將在明年七月召開。

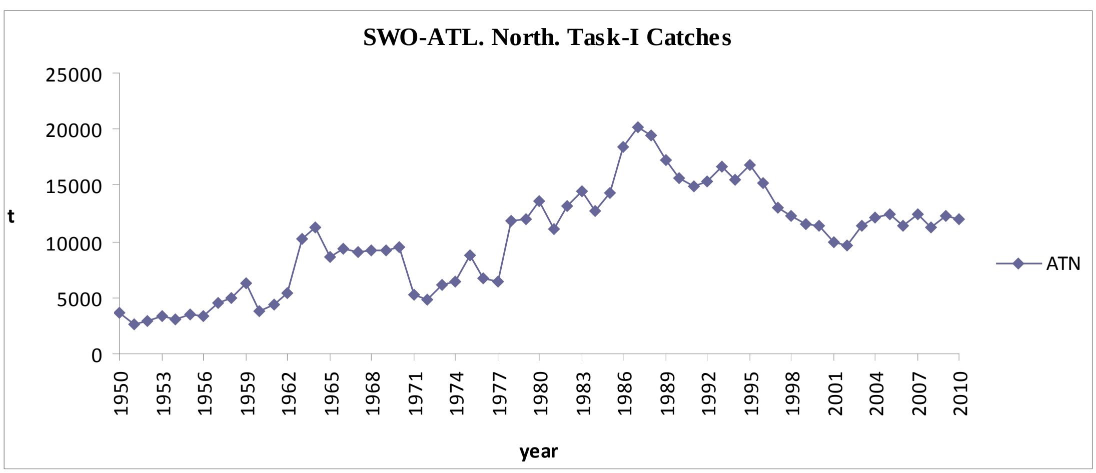
(八)有關管理建議部分，巴西代表表示應將委員會已經通過之管理鯊種作摘要敘述，並對去年委員會未將黑鯊列入管理表示不解，針對與 ICES 合作

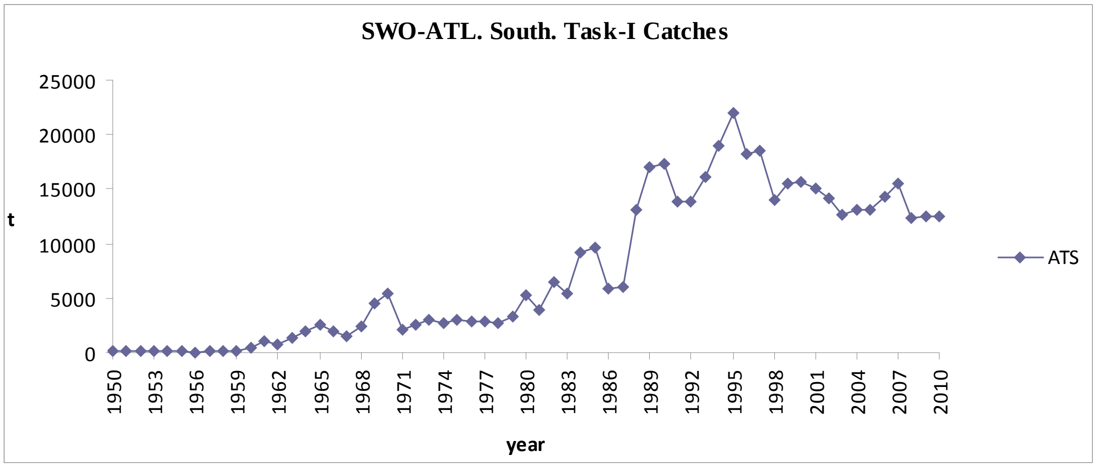
案小組主席表示將會持續與 ICES 進行資料交換以及資源評估合作，另外在歐洲國家對禁捕鯊種管理較嚴情況下可能會影響科學家採樣困難，因此在管理建議中特別提是研究人員可以應研究需求對禁捕鯊種留艙作採樣。

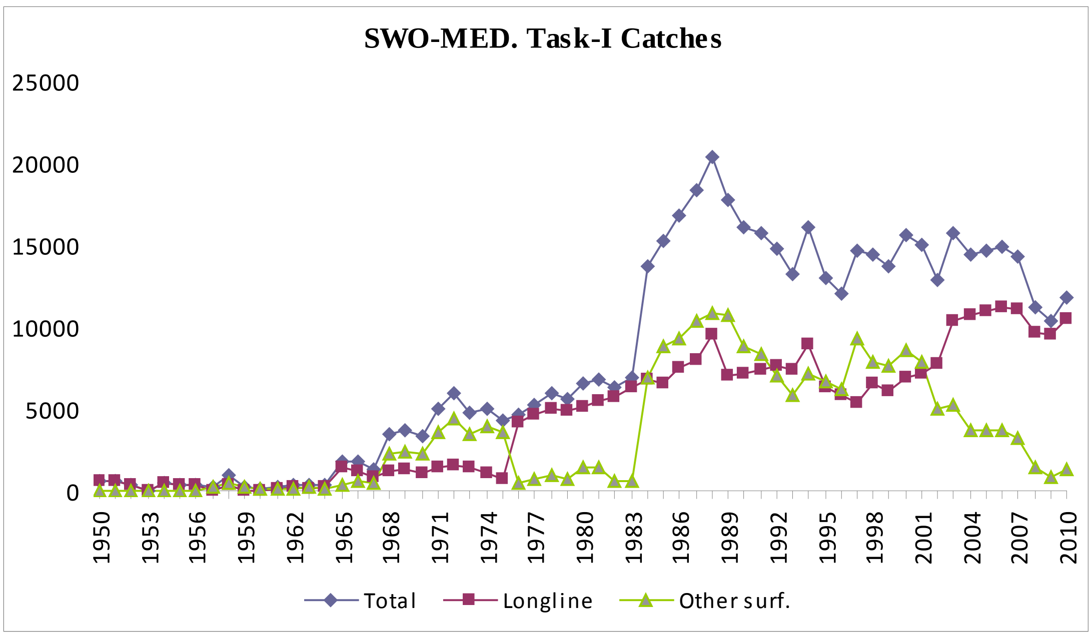
(九)因本年度並無鯊種進行資源評估，該小組執行摘要報告並無重大變更。

五、劍旗魚工作小組會議：劍旗魚工作小組會議於 9 月 28 日上午 9 時舉行，由加拿大籍 John Neilson 博士擔任主席，我國由本署遠洋漁業組研發科李淑敏技正與會，與會者尚包括美國、巴西、西班牙、加納等共計 8 位科學家參加，會議重點如次：

(一)委員會要求所有 CPCs 應每年提供劍旗魚漁獲資料予 SCRS，包括漁獲量、體長別漁獲量、漁獲地點、月別漁獲量、儘可能包括各年齡別並區分性別、丟棄量及努力量等，SCRS 每年會檢視此資料。本次會議經檢視各國繳交之 Task I 名目漁獲量，其中南韓於 2010 年無大西洋劍旗魚漁獲量，但提報 147 噸南劍丟棄量，請秘書處協助查明原因；加拿大 2010 年無北劍丟棄量，請以科學家所提供資料補正；請巴西確認近兩年(2009-2010)無南劍丟棄量。







(二)委員會要求 SCRS 在北劍下次資源評估(2013 年)前，爲北大西洋劍旗魚發展出一個限制參考點，秘書處 Mauricio Ortiz 博士針對此點提出報告，摘要如下：在自然變動及參數未確定下，評估生物量限制參考點，以應用於北大西洋劍旗魚資源管理。目的爲使用二種標準，以建構評估其生物量限制建議。第一種標準：當僅是因加入量而正常變動，卻被認定過漁而採取限制管理，將可能引起錯誤的管理作爲；第二種標準：限制標準若與目標差距太大，此限制管理將無法確認資源正處於過漁狀況。

(三)巴西代表報告 SCRS/2011/134，有關巴西南部海域捕撈之劍旗魚胃內容物

分析，食性組成研究，使用 Bayesian approach 分析資料，收集 2007 年 7 月至 2009 年 6 月巴西南部海域(南緯 17-35 度，西經 27-52 度)延繩釣漁船所釣獲之劍旗魚，101 尾，體長介 60-275 公分之間，於船上收集胃內容物，將胃內容物分爲 4 類，分別爲硬骨魚類、頭足類軟體動物、甲殼類動物及其他。胃內容物分析後，已辨識出 550 種食物類別，屬於 19 種類群，統計劍旗魚最重要的食物類別爲頭足類軟體動物，佔 50.51%，其次爲硬骨魚類，佔 43.62%，此分析結果與 1981 年 Zavala-Camin 對南大西洋劍旗魚、1985 年 Stillwell and Kohler 對西北大西洋劍旗魚、2007 年 Castillo *et al.*及 2009 年 Letelier *et al.*對太平洋劍旗魚之研究報告類似。

(四)因本年度並無進行劍旗魚資源評估，該小組執行摘要報告並無重大變更。

六、旗魚工作小組會議：旗魚工作小組會議於 9 月 29 日上午 9 時舉行，由委內瑞拉籍 Freddy Arocha 博士擔任主席，我國由對外漁協於仁汾組長與會，其他會員國代表包括美國、巴西、西班牙、日本、塞內加爾等，本年度該小組針對大西洋黑皮旗魚進行資源評估，因此主席提示在本次會議將摘要說明黑皮旗魚資源評估結果，另有 5 篇報告將在此次會議進行簡報，以下簡要說明本次會議內容：

(一)美國代表報告 SCRS/2011/161 有關大西洋紅肉旗魚 CPUE 標準化研究，該研究使用資料期間爲 1986-2010 年間美國延繩釣漁船作業報表以及 1992 年以後之觀察員資料，研究結果顯示大西洋紅肉旗魚之標準化 CPUE 呈現長期遞減趨勢，與會者表示大西洋紅肉旗魚與圓鱗長吻旗魚因辨種困難，之前美國觀察員並未將此二魚種分開，雖然最近幾年已開始進行辨種，然歷史漁獲資料仍無法切分，因此該 CPUE 序列資料估算仍具有非常大不確定性，另日本代表提問有關 CPUE 分布似乎有兩個峰，模式套適成一個峰，其原因可能與先前歷史資料無法切分出圓鱗長吻旗魚有關。

(二)美國代表報告 SCRS-2011-162 有關美國娛樂漁船大西洋紅肉旗魚 CPUE 標準化研究，該研究使用資料期間自 1973 年至 2010 年，研究結果顯示在 1980 年代該魚種 CPUE 達到高峰後急遽下降，近年來呈現平穩變動，與會代表提問有關 2000 年後娛樂漁業船數減少但是努力量卻顯著增加，報告者回覆可能是因爲停留在海上作業時間大幅增加有關，且娛樂漁船有非常明顯的淘汰現象，日本代表表示在日本國內也觀察到此一現象，釣客選擇行爲會導致經驗差船主退出作業，另外體長資料在 1996 年以後幾乎沒有小魚，

且卸魚量在 1980 年代末期也出現大幅下降，報告者回覆可能受到美國國內法針對大西洋紅肉旗魚最小漁獲體長限制，導致港口採樣僅採集大魚體長，卸魚量驟減主要因釣客保育概念普及化影響，許多漁獲釣獲後放生。

(三)美國代表報告 SCRS-2011-164 有關大西洋紅肉旗魚標示放流資料分析結果，該項資料主要來自於 2007 年 9 月在西北大西洋執行 14 尾大西洋紅肉旗魚上脫式衛星標示放流，放流標籤在 120-170 天左右脫離標示樣本魚，結果顯示大西洋紅肉旗魚偏好棲息於溫水區域，8°C 為其分布界線溫度，該魚種僅在白天進行索餌，因此釣船夜間作業可有效避獲該魚種。

(四)由小組負責資源評估研究之美國研究人員進行報告 SCRS-2011-168，評估結果顯示 F/FSMY 為 1.69、B/BMSY 為 0.7、估計 MSY 為 2,642 公噸，該種資源已過漁且努力量超過 MSY 水準，日本代表提問有關親魚加入量陡度設在 0.4 與其他國際組織資源評估廣泛使用 0.7-0.8 左右參數值不同，資源評估人員表示該參數值差異並不會對資源評估結果有太大影響，但可進行敏感度分析來觀察該參數對結果變動的情況，與會者表示委員會已經針對商業延繩釣設有管理措施，但資源仍沒有回復跡象，沿岸漁業在 1996 年以後漁獲量大增，因此對沿岸漁業管理是有效復育該魚種資源的方法。

(五)美國研究人員提報有關日本延繩釣黑皮旗魚 CPUE 歷史序列資料檢視(無書面報告)，該研究假設在 1970 年代以前高 CPUE 驟降原因可能有資源急遽減少以及日本延繩釣船轉移漁場及目標魚種，但檢視黃旗鮪 CPUE 歷史變動趨勢發現該鮪種 CPUE 與黑皮旗魚相同也出現驟減現象，且大目鮪 CPUE 雖然有增加趨勢但是增加時期與黑皮旗魚 CPUE 驟降期間不重疊，日本代表回覆此現象在印度洋日本延繩釣漁船標準化後 CPUE 相同，因此建議資源評估使用 1970 年代以後之資料。

(六)針對黑皮旗魚資源評估後之管理建議摘要：考慮對延繩釣及圍網全面禁捕黑皮旗魚、鼓勵延繩釣使用圓形鉤以及移除淺鉤(第 1 鉤及最後 1 鉤)、採取漁區漁期禁捕等。

針對管理建議第 3 項有關大西洋紅肉旗魚資料回報部分，因秘書處所搜集漁獲資料仍難以區分出圓鱗長吻旗魚，因此小組將製作辨種手冊提供會員國作觀察員訓練及提供漁民填報報表辨識。

管理建議原文如下：

BUM/WHM-6. Management recommendations

The current blue marlin stock assessment indicates that the stock is below B_{MSY} and the fishing mortality above F_{MSY} (2009). Unless the recent catch levels (3,240 t, 2009) are substantially reduced, the stock will likely continue to decline. The Commission should adopt a rebuilding plan for the stock of Atlantic blue marlin.

The Commission should implement management measures to immediately reduce fishing mortality on blue marlin stock by adopting a TAC that allow the stock to increase:

1. To facilitate the implementation of the TAC, the commission may consider the adoption of measures such as, but not limited to:

a) Total prohibition of landings of blue marlin from pelagic longline and purse seine fisheries to improve the effectiveness of current management measures.

b) Encouraging the use of alternative gear configurations that reduce the likelihood of deep hooking therefore increasing the post-release survival (for example, circle hooks) and/or reduce catchability (e.g., reducing the number of shallowhooks in a longline set, etc).

c) Broader application of time-area closures.

d) Consider adopting measures to reduce fishing mortality of blue marlin from small-scale fisheries.

2. Noting the misidentification problems between white marlin and spearfishes, the Group recommended that management recommendations combine these species as a mixed stock until more accurate species identification and differentiation of species catches are available.

3.The Commission should encourage the reporting of catches of white marlin and roundscale spearfish separated.

(七)針對雨傘旗魚部分本年度並無資源評估，因此小組對該魚種之執行摘要僅就統計資料修正。

(八)未來工作計畫部分，主席提出希望遠洋漁業國能在觀察員計畫下配合採樣，日本代表表示該項研究配合應可執行，有關旗魚樣本硬棘及脊椎骨樣本可以提供影像作判讀，我國代表回覆因我國觀察員計畫正在調整期間，小組需求可與我國研究人員聯繫，透過研究人員提出研究計畫整合相關資源。

(九)主席就下年度研究經費提出報告，並詢問我國是否有意願捐款資助，我代表回覆將此意見傳回台北並由我委員會代表團正式回覆，另下年度大西洋紅肉旗魚資源評估會議，主席詢問我方科學家較可能參加期間及是否可在台北主辦，我代表回覆 5 月較為恰當，另主辦會議亦須由我委員會代表團正式回覆。

七、熱帶鮪類工作小組會議：熱帶鮪類工作小組會議於 9 月 29 及 30 日 9 時舉行，由熱帶鮪類小組總主席歐盟 Joao Gil Pereira 博士、大目鮪小組主席美國 David Die 博士、正鰹小組主席歐盟 Daniel Gaertner 博士及黃鰭鮪小組主席美國 Craig Brown 博士共同主持。我國由台灣大學許建宗教授、中華民國對外漁業合作發展協會張鳳貞組員及本署遠洋漁業組研發科李淑敏技正等三位參加。與會人員自我介紹後，正式進入熱帶鮪類小組會議，統計次委員會主席美國 G.erald Scott 博士幾乎全程與會。會議重點如下：

(一)大目鮪小組：

1.經檢視討論大目鮪 Task I 漁獲量表後，因大西洋大目鮪小組今(2011)年無進行資源評估，故摘要報告根據新的資訊-2011 Tropical Tuna Species Group Inter-sessional Meeting on the Ghanaian Statistics Analysis (phase II)，*Madrid, Spain - May 30 - June 3, 2009* 報告。獲得新的圍網漁業漁獲量資訊。被圍網漁業在自由群(Free School)所捕獲的大目鮪個體平均重量比利用集魚設施(FAD)所捕獲者約種有兩倍。這兩種漁法在捕獲種類的個體重量差異，從 2006 起較為顯著。

2.經比對在西非港口監控的卸魚量和報告給 ICCAT 的罐頭廠漁獲量，以估計 IUU 圍網漁業的漁獲量。自 2006 年起，IUU 圍網漁業的漁獲量估計是較大的和增加的，而且現在三種熱帶鮪類總漁獲量已超過 20,000 公噸。這些 IUU 漁獲量估計尚未合併在大目鮪資源評估，而且也尚未合併在本報告漁獲量估計中。然而，這些估計的 IUU 漁獲數量可能影響評估和對系群狀態結果之理解。

3.大目鮪漁獲量在 1970 年代中期增加至 60,000 公噸，其後的 15 年呈波動狀態。1991 年，大目鮪漁獲量超越 95,000 公噸，且持續增加，到 1994 年達到歷年來最高漁獲量的 133,000 公噸。至此以後，漁獲量持續下降，到 2001 年時，已低於 100,000 公噸的水準。以後，大目鮪漁獲量更是年年下降。2010 年的初估漁獲量約為 75,783 公噸。

(二)正鰹小組：經檢視討論正鰹 Task I 漁獲量表後，因大西洋正鰹小組今(2011)年無進行資源評估，除將漁獲量表更新至 2010 年，沒有做任何資源狀態的修正。

(三)黃鰭鮪小組：

1.2007 年是大西洋黃鰭鮪 40 年來，下降到近乎在 1990 年最高捕獲量(194,000 公噸)以後的一半。此後，漁獲量稍有約 2007 年水準(100,000 公噸)10%的增

加，2010 年初估約為 108,343 公噸。這種漁獲量逐步增加同時發生東、西大西洋。

2.根據 2011 年 ICCAT Yellowfin Tuna Stock Assessment Session, (*San Sebastián, Spain - September 5 to 12, 2011*)評估。採用年級群模式和非平衡生產量模式分析至 2010 年可用的漁獲量資料。

3.採用 15 種資源量指標於年級群化的年級群分析法做大西洋黃鰭鮪資源評估。年級群分析的基本個案運算顯示，最近年度的漁獲死亡率和產卵群生物量水準估計值，已經非常接近模式估計的最大持續生產量水準(約為 149,200 公噸)。因為整體選擇率轉移到較小魚體，這一估值比過去 10 年來所估者低。改變選擇率在最大持續生產量估計的衝擊，在年級群分析中清楚可見。相對漁獲死亡率(F_{2010}/F_{MSY})估值為 0.76，和以產卵群生物量所估之相對生物量(B_{2010}/B_{MSY})為 0.98。

4.非平衡生產量模式(ASPIC)分析採用 9 項不同漁業和漁具的資源量指標，以及該 9 項指標之以漁業漁區面積做權重的合併指標，進行分析。個別指標的分析無法收斂，固基礎個案運算以合併指標為之。估計的最大持續生產量約為 146,600 公噸。此一估值雖比年級群分析所估者為高，資源狀態結果是稍微悲觀。相對漁獲死亡率(F_{2010}/F_{MSY})估值為 1.09，和以可漁獲生物量所估之相對生物量(B_{2010}/B_{MSY})為 0.70。

5.不同的兩種分析方法所獲的 B/B_{MSY} 和 F/F_{MSY} 軌跡各有強、弱點。年級群分析法所得知結果顯示：最近過漁正在發生中($F>F_{MSY}$)，但目前系群狀態呈稍微過漁($B<B_{MSY}$)，但沒有正在過漁現象；比較悲觀的 ASPIC 分析結果發現：最近年度已經發生過漁和過漁正在持續中，2010 年也正在持續過漁中。變異分析顯示，只有 26%的機率資源是在永續狀況下(即資源沒有過漁和過漁也沒有不是發生中)。

6.綜言之，2010 年漁獲量在最大持續生產量水準之下，系群生物量估計也在協定目標之下和最近的漁獲死亡率稍微比 F_{MSY} 低。2006 年以來，趨勢指出有效漁獲努力量下降和系群水準有些復原，但如將兩種分析的點估計值之不確定性加入考量，系群狀態和協定目標不一致的機率也僅有 75%。

(四)相關研究報告：

1.熱帶海域大目鮪(Thunnus obesus)各性成熟度之體長比較分析(Guo Ping Zhu, Xiao Jie Dai1, Li Ming Song, Liu Xiong Xu)：本報告大目鮪採樣自大西洋 1000

尾，1300 尾自印度洋，400 尾自西太平洋，結果顯示 50%大西洋大目鮪達 50%性成熟度之體長爲 108-109 公分，達性成熟度之最小體長爲 104-108 公分。Turkish Journal of Fisheries and Aquatic Sciences 11: 149-156 (2011) www.trjfas.org ISSN 1303-2712 DOI: 10.4194/trjfas.2011.0119 © Published by Central Fisheries Research Institute (CFRI) Trabzon, Turkey in cooperation with Japan International Cooperation Agency (JICA), Japan.

2.東太平洋赤道海域大目鮪垂直洄游、行爲及棲息地研究(Kurt M. Schaefer and Daniel W. Fuller)：依據 98 個於熱帶東太平洋 PSAT 標識放流標籤，描述大目鮪的垂直移動及日夜洄游行爲，與體長無差異。Mar. Biol. (2010) 157:2625–2642.

3.SCRS/2011/127(Hirotaka Ijima1, Keisuke Satoh, Hiroaki Okamoto)：日本大西洋鮪延繩釣所捕獲黃鰭鮪的體長別漁獲量：一種應用於分析日本鮪延繩釣所捕獲黃鰭鮪之體長別漁獲量的新方法。

4.SCRS/2011/128 (Keisuke Satoh1, Hiroaki Okamoto, Hirotaka Ijima)使用 GLM 分析日本大西洋黃鰭鮪之 CPUE：使用 GLM 及環境因子(SST)標準化日本大西洋黃鰭鮪之 CPUE 資料。

5.SCRS/2011/144(Hazin, H., Hazin, F.H.V., Amorim, C. A., Travassos, P., Freduo, T.)使用線性混合模式分析巴西西南大西洋延繩釣漁船所捕獲黃鰭鮪的 CPUE 標準化序列：巴西使用不同 CPUE 標準化方法，以處理於作業及漁船組成改變的複雜性。

(五)2012 年工作計畫：

1.2012 年熱帶鮪類無進行資源評估，故 2012 年須更新漁業指標。

2.目前係以數年前之生殖、性成熟度、體長體重關係、成長等資料估算生物參數，應將這期間族群結構及其他洋區等新資訊應列入，以更新熱帶鮪類生物參數。各科學家應持續執行熱帶鮪類生物參數研究。

3.評估年齡別漁獲量的最佳估算方法。

4.從 2011 年黃鰭鮪資源評估中，有關漁船 CPUE 標準化序列，結果並不明確。資源評估須仰賴延繩釣漁業 CPUE 資料，近幾年來，部分資料已被簡化，致豐度指數受影響。因此，需在單一延繩釣指數結合不同漁業別的資料。

5.資源評估缺乏加入量及幼魚量的資料，因此，尋求替代豐度指數是重要的。獲取影響圍網、餌釣漁業及標準化豐度指數序列的 CPUE 的因子，以運用

於改善資源評估方法。

6.ISSF 將於 2012 年 3 月舉辦相關主題的研討會，委員會應展現支持此研討會，並鼓勵 ICCAT 科學家踴躍參加。

(貳)全席會議

本(2011)年 ICCAT 之 SCRS 全席會議於 10 月 3 至 7 日於馬德里 Velazquez 飯店召開。除秘書處人員外，計有 ICCAT 會員國、合作非會員(我國)及 GFCM、WWF、ACAP 等組織近百位代表參加，我國由台灣大學許建宗教授、海洋大學黃向文助理教授、中華民國對外漁業合作發展協會於仁汾組長及本署遠洋漁業組研發科李淑敏技正等四位與會。會議由 SCRS 主席歐盟 Josu Santiago 博士主持。

一、10 月 3-5 日會議過程摘述如次：

(一)首先 SCRS 主席歐盟 Josu Santiago 博士歡迎與會者，感謝各位上周的努力，希望本周會議順利。秘書長 Driss Meski 致詞，秘書處已經盡力準備各項文件，希望提供科學資訊給各位參考，特別針對部分瀕危物種。秘書處說明無線網路供與會人員使用，會議文件可透過網路伺服器取得。接著，主席請各會員國討論目前暫定議程及各項安排，無異議下通過，隨後秘書處介紹與會國家、觀察員及組織。

(二)秘書處 Carlos Palma 博士報告統計及研究工作(SCI-008)：今年科學會議報告達 100 餘篇。

1.檢視本年各CPCs提報之漁獲統計資料提交情況：TASK I之漁船特性資料，38個國家於期限內繳交，28個國家於本年9月15日前尚未繳交，資料繳交比率為58%；TASK I之名目漁獲量資料，45個國家繳交資料，21個國家尚未繳交，資料繳交比率為68%；TASK II之漁獲量和努力量資料，41個國家有繳交資料，23個國家尚未繳交，資料繳交比率為64%；TASK II之體長頻度資料，34個國家有繳交資料，29個國家尚未繳交；我國本年提送2008-2010年TASK I 和TASK II資料完全符合規定之時程。我代表團發言指出，目前的資料彙報表，將未交與無漁獲混在一起，應分開為宜，其次，混獲資料等新要求繳交資料並無查核卡，也應該補充。秘書處解釋了解其重要性，特別是混獲部分，如果各會員同意也可以進行，稍後將在統計工作小組繼續討論。另針對TASK1表中會員國回報”0”漁獲及未提報資訊

問題，秘書處表示必須要有SCRS建議案秘書處才能處理相關議題。

2.標識放流標籤回收情形：義大利回收1個電子標籤，25個傳統標籤；西班牙回收2個黑鮪標籤，993個傳統標籤；摩洛哥回收1個電子標籤，World Wide Fund for Nature (WWF)回收21個電子標籤；烏拉圭回收1個傳統標籤。

3.資料復原及改善：評估迦納漁業統計資料、修正各漁業的歷史漁獲統計資料、重建歷史黑鮪資料。

4.資料庫進展：本年ICCAT秘書處開始將資料庫移至MS-SQL 2008 server；本年開始進行重大更新及重建ICCAT漁船清單；2010年委員會採行的資料保密協定將允許VMS資料使用於科學目的。

5.基礎設備和技術：更新ICCAT總部辦公室電力控制、電線配置、網路及電話設備，安裝新伺服器等，檢視ICCAT之Internet安全方案，以保護秘書處之資料庫等資訊。

6.檢視出版品：本年出版雙年報(2010年)、統計公報電子版(No.40)、摘要報告樣版模式、ICCAT統計作業手冊(秘書處今年度嘗試與日本科學家共同努力完成有關延繩釣介紹)，另有關鯊魚旗魚辨識圖鑑在SCRS同意後將在下年度列入工作並提供會員國。

7.國際統計活動：持續與Fishery Resources Monitoring System (FIRMS)及Coordinated Working Group on Fishery Statistics (CWP)進行合作等。

8.科學計畫：大西洋黑鮪研究計畫(GBYP)及強化旗魚研究計畫(ERPB) 於SCRS發表報告。

9.贊助基金(SCI-041 Appendix 2)說明目前基金主要贊助有關改善資料、能力建構以及推動SCRS相關工作，秘書長特別提醒各國有意申請者應儘早提出，避免因為太晚提出加上需要辦理簽證造成延誤(特別點出獅子山共和國)。烏拉圭感謝秘書處安排，但不了解本基金整體實際運用狀況，如何分配?，且經費使用應該較具彈性，秘書處表示很多時候往往是個案決定，較無通則。秘書處的確應該監督該基金妥善運用，先前經費核銷出現稽核問題，故希望建立制度及經費可使用項目，避免核銷稽核問題。主席補充表示目標非常重要，但如何平衡又兼具彈性並不容易，希望先建立此PROTOCOL，再看執行狀況作調整。

10.ICCAT-Japan Data & Management Improvement Project(JDMIP)，由計畫協調人日本Mr. Takahiro Ara說明計畫進度：JDMIP為2010年起之五年計畫，主要係協助聖多美普林西比及其他開發中國家提升資料蒐集能力。包括迦納

(TEMA港)採樣計畫、委內瑞拉港口採樣(尚包括12航次觀察員計畫)、加勒比海港口採樣(千里達，將延至2012開始執行)；塞內加爾VMS中心、迦納觀察員計畫以及漁獲報表蒐集、以及贊助九名成員參加SCRS會議等。下年度計畫則包括資料蒐集以及執法等工作坊、資助資料檢視、持續參加ICCAT會議。烏拉圭及迦納感謝日本基金贊助，迦納特別希望該計畫可以拓展到阿比尚港進行港口採樣。

(三)國家漁業及研究報告：19 個國家已繳交國家報告，33 個國家尚未繳交。與會代表依序口頭簡介其國家漁業及研究概況。秘書處要求各國至遲應於星期三(10 月 5 日)前繳交國家報告摘要電子檔案，我代表團已參酌國家報告，提供我國摘要報告如下：

In 2010, the total number of longline vessel authorized operate in the Atlantic Ocean was 117, including 67 longliners targeting bigeye tuna and 50 ones targeting albacore. The total catch of tuna and tuna-like species of the longline fleet was estimated at 31,007 mt in 2010. Tropical tunas (bigeye tuna, 13,189 mt and yellowfin tuna, 824 mt) were the most dominant species caught accounting for 45% of the total catch, and albacore (12,562 mt) accounted for 41%. The Fisheries Agency has set catch quotas for Atlantic bigeye tuna, northern and southern Atlantic albacore, and for bycatch species, namely swordfish, blue marlin and white marlin. Catches of these species were well below catch limits allocated by the ICCAT for 2010. Statistics data, including fleets characteristics/Task I/Task II/size and bycatch data collected by observer program, was submitted to the ICCAT Secretariat within the required timeframe. In 2010, 18 observers were placed on fishing vessels in the Atlantic Ocean, and the observer coverage was above the requirement set by ICCAT. The research programs for 2010 conducted by scientists included stock assessments, standardizations of catch-per-unit-effort on bigeye tuna, swordfish, albacore and blue marlin (and other incidental catch species), shark fin weight ratio, estimation of shark catch by species, and incidental catch rate of seabirds, sea turtles and cetaceans. The research results were presented at the regular meeting and inter-sessional working groups’ meetings of SCRS.

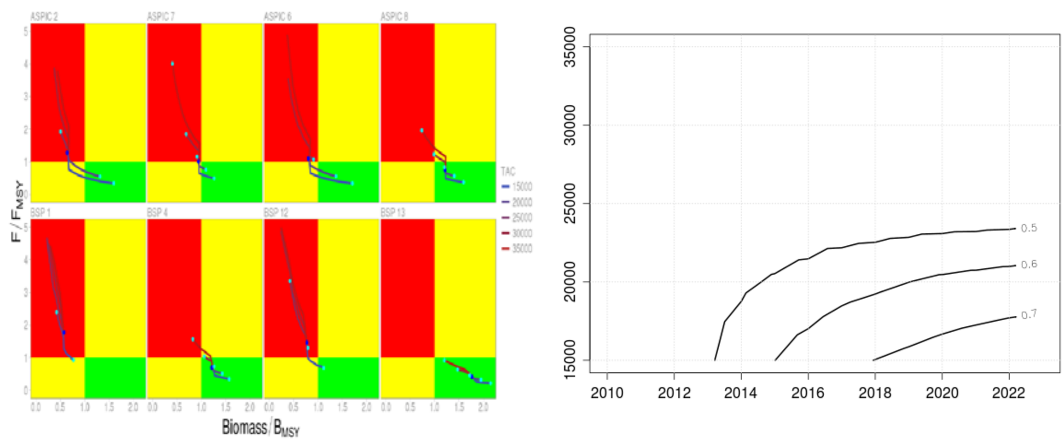
(四)各魚種工作小組報告：

1.長鰭鮪(SCI-017)：

(1)地中海長鰭鮪：2004之後資料比較齊全，多來自希臘、義大利以及西班牙等歐盟船隊，以有限資訊發現近十年漁獲死亡率有增加趨勢。歐盟表示該分析採用簡單模型，故有不少假設，但因為資料有限，實屬難能可貴。並提問2010漁獲量很低(2123公噸)，僅有前一年的一半(四千多噸)，原因為何？有可能是低報嗎？魚種小組主席表示的確不好解釋，可能缺資料，或者跟SWO漁業的混獲比例有關，或者Task I低報。美國

表示的確資料不足，希望跟其他地中海組織合作，然成效有限，先前漁獲資料可能與其他魚種混在一起報，也可能有超報的問題，提醒該小組在資料處理上必須特別注意。魚種小組主席表示目前地中海長鰭鮪資源評估面臨到漁獲統計資料不全、相關生物研究不足以及欠缺成長與自然死亡率研究等。

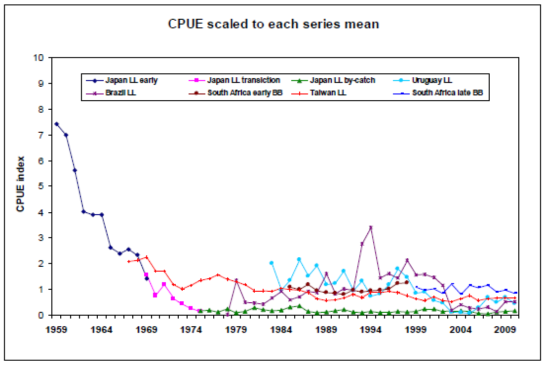
(2)南長鰭鮪：今年七月進行評估，因爲部分國家未報資料，所以使用至2009年資料，利用主要國家CPUE趨勢，以ASPM, ASPIC, BSP三種模式進行評估，結果之B/BMSY 介於0.58 - 1.69， F/FMSY 介於0.65 - 2.28，多數模擬顯示已經過漁且仍在過漁中，MSY介於 20,500 - 50,000 t.，並建議將TAC定爲二萬公噸。



ALB-Figure 13. Upper panel: “Kobe plots” by Run for TAC projections; lines are the median stock trajectories. Quadrants are defined for the stock biomass and fishing mortality relative to B_{MSY} and F_{MSY}; i.e. red if SSB<B_{MSY} and F>F_{MSY}, green if SSB≥B_{MSY} and F≤F_{MSY}, and yellow otherwise. **Lower panel:** Kobe strategy matrix (K2SM) advice plot. Contours correspond to the probability of being in the Kobe quadrant corresponding to SSB≥B_{MSY} and F≤F_{MSY} by year for each of the TAC levels, integrated over all runs with equal probability.

對此，歐盟先提問認爲南大西洋長鰭鮪的平均重量爲多少？比北大西洋大得多？魚種小組主席提供資訊顯示南大西洋長鰭鮪較大。

日本認爲早期CPUE驟減是因爲漁具及目標魚種轉換，所以截然不同，是否會造成影響？主席則表示日本科學家已經提供三個不同時期的CPUE，當然不無可能影響解釋資源的走向，工作小組也採用其他主要漁業的資源指標。



歐盟續表示僅有巴西指標明顯下降(但漁獲不多，只有幾百公噸)，臺灣(超過一半)的資源指標顯示相當穩定，應該更具有代表性。可能要思考資源指標之間的可信度以及代表性。魚種小組主席表示並沒有考慮彼此的權重，認爲應該都具有代表性，工作小組專家已經討論並決定使用所有指標，並非做篩選。

巴西(FABIO)請教最終的評估是否對於CPUE有無權重？魚種小組主席表示某幾種模式採用相同比例，某幾種有權重。歐盟認爲考量漁獲量差異懸殊，應該有不同比重。魚種小組主席重申此結果是工作小組專家討論之後的決定，美國也聲援主席，認爲小組已經在沒有其他評估指標下盡力做最佳評估。

歐盟強烈表達異議，認爲報告內應該將評估方式交代清楚，以及選擇的標準，而非含糊帶過。日本代表表示管理建議應該有平衡作法，管理建議TAC應重設在20,000公噸，遠低於目前設定之TAC，如此採用最悲觀結果來作管理建議並不恰當，且有高度資料不確定問題，也應該真實反映這些不確定性。最後SCRS主席裁示小組討論。

經過一天後，關鍵文字酌修爲" In general, two different production model forms were considered. One showed more optimistic results than the other. However, the comitee lacked enough objective information to identify the most plausible scenarios. Considering the whole range of scenarios, the median MSY value was 27964 t (ranging between 23296 t and 98371 t), the median estimate of current B/BMSY was 0.88 (ranging between 0.53 and 1.86) and the median estimate of current F/FMSY was 1.13 (ranging between 0.25 and 2.25). The wide confidence intervals reflect the large uncertainty around the estimates of stock status. Considering all scenarios, there is 54% probability for the stock to be both overfished and overexploited, 10% probability for the stock to be either overfished or overexploited, and 36% probability that biomass is above and fishing mortality is below the Convention objectives." 。對於原本僅指出20000

公噸有60%機率讓資源復甦的部分，也調整爲” And likewise, increases would reduce rebuilding probabilities and extend the timeframes. Catches over 24000 t will not permit the rebuilding of the stock with at least 50% probability over the projection timeframe.” 。也就是將原本僅說是overfished and overfishing的狀況，換成以機率方式表達，TAC建議的部分，也增至24000公噸。

ATLANTIC AND MEDITERRANEAN ALBACORE SUMMARY

	North Atlantic	South Atlantic	Mediterranean
Current (2010) Yield	19,292 t	18,825 t	2,123 t
Maximum Sustainable Yield	29,000 t	*27,964 (23,296-98,371)* t[1]	Unknown
Replacement Yield (2009)	Not estimated	Not estimated	Not estimated
SSB_{2007}/SSB_{MSY} [2]	0.62 (0.45-0.79)[2]		Not estimated
SSB_{2009}/SSB_{MSY} [1]		0.88 (0.55-1.59)[1]	
Relative Fishing Mortality			
F_{2007}/F_{MSY} [2]	1.045 (0.85-1.23) [2]		<=1 [3]
F_{2009}/F_{MSY} [1]		1.07 (0.44-1.95)[1]	
Management measures in effect	[Rec. 98-08]: Limit No. of vessels to 1993-1995 average TAC: 28,000 t [Rec. 09-05] for 2010 and 2011.	[Rec. 07-03]: Limit Catches to 29,900 t until 2011	None

[1] Reference points estimates based on 2011 assessment. Median range and 80% CI calculated for the whole range of the 8 base cases.
[…]
[2] Reference points estimates based on 2009 assessment. 95% CI around the reference points were based on estimated 2007 standard errors in the North stock.
[3] Estimated with length converted catch curve analysis, taking M as a proxy for F_{MSY}.

2.黑鮪

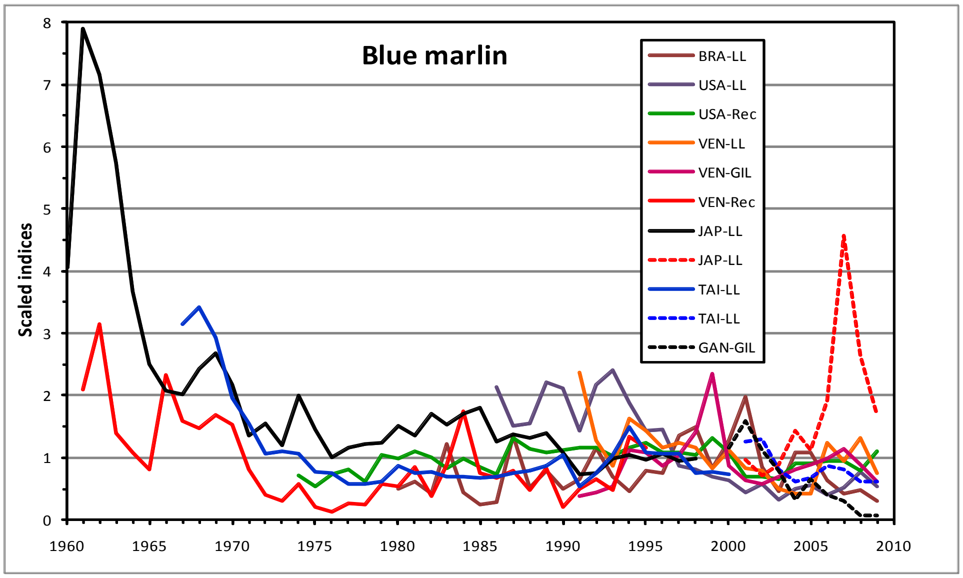
(1)東大西洋黑鮪(SCI- 018)：今年有很多新報告，包括生物參數、標識放流資訊等等，漁獲量爲11294公噸，遠比去年爲少。資源評估部分從0~20000公噸跑了24種模式，如果要達到60%恢復的機率，TAC定在0公噸則可在2019年恢復，13500公噸可在2022年恢復，倘超過14000則要等到2023年之後。目前結果顯示，雖然還有不確定性，但漁獲量以及漁

獲死亡率已經有明顯下降。

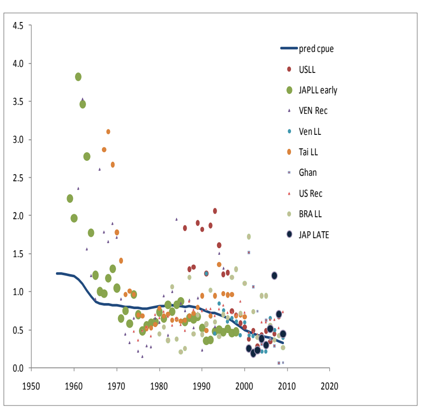
(2)西大西洋黑鮪(SCI-019)：今年並未評估，主要簡述去年評估結果，說明近期生物研究、漁業動向，資源指標等。

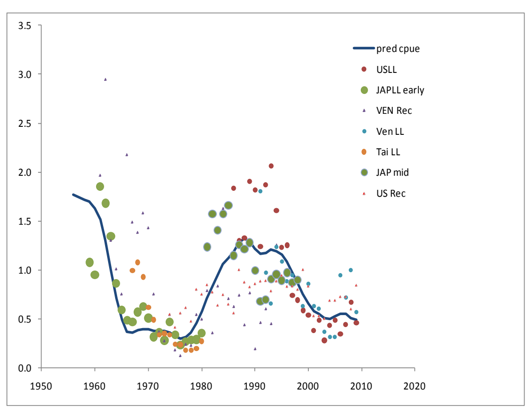
3.旗魚(SCI-029)：

(1)黑皮旗魚(blue marlin)(SCI-23)，主要是延繩釣與娛樂漁業。近年有不少國家提報活體釋放量，本年度評估時，自然死亡率係假設，使用九個國家CPUE，包括台灣鮪釣資料。

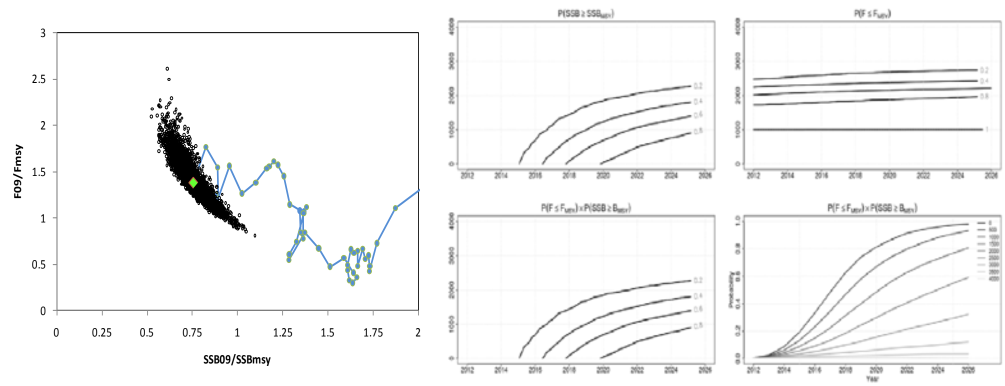


對於各漁業資源指標，使用包括EQW(equal weighting)，區域權重及漁獲量權重，得到資源指數結果接近。但使用ASPIC不能收斂。所以利用替代型ASPIC。分別使用九個與七個資源指標評估。





另外利用SS3估計，則得到overfished and overfishing，MSY爲2837公噸。



ATLANTIC BLUE MARLIN SUMMARY	
	BUM
Maximum Sustainable Yield	2,837 t (2,343 – 3,331 t)[1]
Current (2010) Yield	3,150 t[2]
Relative Biomass (SSB_{2009}/SSB_{MSY})	0.67 (0.53 – 0.81)[1]
Relative Fishing Mortality (F_{2009}/F_{MSY})	1.63 (1.11 – 2.16)[1]
Conservation and Management Measure in Effect	Recommendation [Rec. 06-09]. The annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing must be no more than 33% for white marlin and 50% for blue marlin of the 1996 or 1999 landing levels, whichever is greater.

1. Stock Synthesis version 3.2.0.b model results. Values correspond to median estimates, 95% confidence interval values are provided in parenthesis.

2 2010 yield should be considered provisional. 2009 yield corresponded to 3,240 t. The 2009 yield used in the 2011 assessment was 3,341 t.

(2)紅肉旗魚資料準備會議，前次評估於2006年，2010年漁獲量回報僅有二百餘公噸，遠低於2000年左右的二千公噸。考量到紅肉旗魚產量跟其他旗魚可能混在一起，所以需要綜合性評估，而目前僅有六個CPUE指標，希望各國能夠積極參與2012的資源評估會議。

ATLANTIC WHITE MARLIN SUMMARY	
WHM	
[1]MSY	[5]600-1,320 t
Current (2010) Yield	299 t [2]
B_{2004} / [1]B_{MSY}	< 1.0
Recent Abundance Trend (2001-2004)	Slightly upward
$F_{2004} > F_{replacement}$	No
F_{2004} > [1]F_{MSY}	Possibly > 1.0
[3]$Catch_{recent}/Catch_{1996}$ Longline and Purse seine	0.47
[4]$Catch_{2004}$	610 t
Rebuilding to B_{MSY}	Potential to rebuild under current management plan but needs verification.
Conservation and Management Measure in Effect	Recommendation [Rec. 06-09]. The annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing must be no more than 33% for white marlin and 50% for blue marlin of the 1996 or 1999 landing levels, whichever is greater

[1] As estimated during the 2000 (Anon. 2001) and 2002 (Anon. 2003) assessments.
[2] 2010 yield should be considered provisional.
[3] Catch $_{recent}$ is the average longline catch for 2000-2004.
[4] Estimate of total removals obtained by the Committee.
[5] Range of estimates were obtained in the previous assessments, but recent analyses suggest that the lower bound for white marlin should be at least 600 t.

加拿大注意到有不少活體釋放，故詢及釋放活存率，魚種小組主席表示很難評估，所以要求各國能儘量提供，目前僅有美國資料。日本則認爲黑皮旗魚是鮪釣漁業的混獲物種，而且還有物種辨識的困難，重要的是沿岸國的資訊。特別是日本早期捕撈，所以CPUE較高，後期已經轉成混獲物種，自然CPUE低很多，是否具有代表性必須考量。

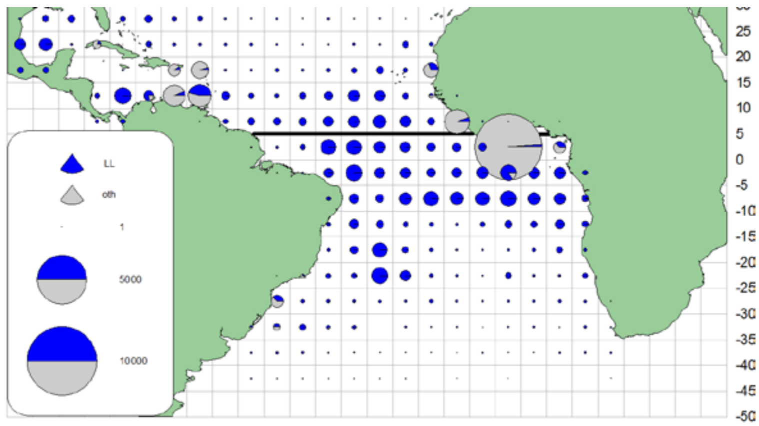
歐盟詢問法屬地馬丁尼克及瓜達洛普漁獲資料蒐集情況，因爲其漁獲量四百多公噸，接近一半，魚種小組主席表示有些法國島嶼的漁獲量多，但似乎沒有提報到Task I 內，希望他們儘量提報。

韓國表示漁民沒有辦法辨識兩種旗魚，所以漁獲量可能沒有確實回報，或許很多國家都有類似問題，資源評估時應該考量。魚種小組主席表示黑皮紅肉應不難辨別，但是紅肉跟其他旗魚可能比較容易混淆。

日本認爲(1)沿岸國漁獲量資料是否經過查核？其次，(2)這些評估模式首次被運用在黑皮旗魚上，其steepness 值似乎太低，是否有進行敏感性分析？結果如何？美國表示有，不同模式結果接近，紅肉旗魚原本生產力就比較低。原本還不是用 0.35 而是採用 0.32，不然結果會更低。日本則堅持0.35太低，已經跟某些鯊魚的水準差不多，應該用到0.6~0.7，美國也說如果用到如此高的值，則結果(MSY)也會跟著高，但小組沒有嘗試這麼多。經過一番爭辯，日本勉強客氣的說自然死亡率的估計原本就不容易，建議以後可以多用敏感度分析模擬不同狀況。SCRS主席建議小組再討論。

對於摘要報告，歐盟則表示圖上有相當大量的其他漁業，究竟爲何？魚種小組主席也不清楚。秘書處解釋是法國提報的未知漁業的量。秘書長進一步澄清秘書處並不負責了解漁獲量的真實性。歐盟認爲不可能有如此大

量，可能是繪圖的問題(也就是資料沒錯，但畫MAPINFO的時候圖例切割的選項選錯)。主席裁示組成小組討論報告細節。



(3)雨傘旗魚 (SCI-024)：因爲並未評估，故摘要報告大致與前次相同，日本提出有關建議中鼓勵使用圓形鉤，但對業界並不容易，目前僅鼓勵活體釋放，而沿岸國有無使用本政策？應該要兼顧平衡性。魚種小組主席表示並沒有提出具體建議，僅表示有些國家自願性採用圓形鉤(應指美國)。歐盟對於TASK1表中摩洛哥近年出現1,000公噸漁獲量，詢問是否有新漁業出現?摩洛哥回覆對此目前尚無資訊，查明後會對此作回覆。

ATLANTIC SAILFISH SUMMARY		
	West Atlantic	East Atlantic
Maximum Sustainable Yield (MSY)	600-1,100[1] t	1,250-1,950[1] t
2010 Catches (Provisional)	467 t	2,894 t
B_{2007}/B_{MSY}	Possibly < 1.0	Likely < 1.0
F_{2007}/F_{MSY}	Possibly > 1.0	Likely > 1.0
2008 Replacement Yield	not estimated	not estimated
Management Measures in Effect	None[2]	None[2]

[1] Results from Bayesian production model with informative priors. These results represent only the uncertainty in the production model fit. This range underestimates the total uncertainty in the estimates of MSY.

[2] Some countries have domestic regulations.

4.劍旗魚 (SCI-022)：今年並未評估，僅就摘要報告小幅修正，僅韓國在資料檢視部分請教discard是否包括live release? 魚種小組主席表示沒有，韓國表示應該要分開統計，因爲韓國有147公噸live release and dead discards，其中包括10公噸live discard. 但都被列爲dead discard。秘書處表示可再調整。烏拉圭提醒南劍旗魚之TAC已經調整爲15000公噸而非17000公噸。歐盟也提醒1950年代的圖應該補回去。秘書處表示因爲年代久遠資料長，所以列在CD，但在此減少列印量以節能，除非SCRS決定要保留，歐盟認爲應該保留在此，因爲有資訊在內，應適用所有物種，總比空白好。秘書處Diazs仍頗爲堅持早期資料少，畫上去也多數是很小或空白的圈圈。烏拉圭、美國則支持歐盟看法，特別是早期漁業發展時期有其特別意義。Pilar表示會調整，也會考量如何透過CD方式提供科學家充裕資訊。

ATLANTIC SWORDFISH SUMMARY

	North Atlantic	South Atlantic
Maximum Sustainable Yield[1]	13,730 t (13,020-14,182)[3]	~15,000 t
Current (2010) TAC	13,700 t	15,000 t
Current (2010) Yield[2]	12,154 t	12,566 t
Yield in last year used in assessment (2008)	11,188 t[5]	12,363 t[5]
B_{MSY}	61,860 (53,280-91,627)	47,700
F_{MSY}	0.22 (0.14-0.27)	0.31
Relative Biomass (B_{2009}/B_{MSY})	1.05 (0.94-1.24)	1.04 (0.82-1.22)
Relative Fishing Mortality (F_{2008}/F_{MSY}[1])	0.76 (0.67-0.96)	0.75 (0.60-1.01)
Stock Status	Overfished: NO Overfishing: NO	Overfished: NO Overfishing: NO
Management Measures in Effect:	Country-specific TACs [Rec. 10-02]; 125/119cm LJFL minimum size	Country-specific TACs [09-03] 125/119cm LJFL minimum size

1 Base Case production model (Logistic) results based on catch data 1950-2008.
2 Provisional and subject to revision.
3 80% bias corrected confidence intervals are shown.
4 Provisional and preliminary, based on production model results that included catch data from 1970-2008.
5 As of 29 September 2010.

地中海劍旗魚(SCI-021)：近期評估是在2010年進行，仍延續去年報告。摩洛哥表示於2010開始縮減流網漁業並於2011全面禁止，希望可以列入。魚種小組主席表示可行。

MEDITERRANEAN SWORDFISH SUMMARY

Maximum Sustainable Yield	~14,600 [1]
Current (2010) Yield	13, 429 t
Current (2008) Replacement Yield	~12,100 t[1]
Relative Biomass (B_{2008}/B_{MSY})	0.54 [1]
Relative Fishing Mortality	
F_{2008}/F_{MSY}	1.03 [1]
F_{2008}/F_{MAX}	0.91[1]
$F_{2008}/F_{0.1}$	1.52 [1]
$F_{2008}/F_{30\%SPR}$	1.32 [1]
Management measures in effect	Driftnet ban [Rec. 03-04] Two month fishery closure [2]

[1] Based on the age-structured analysis.

[2] Various technical measures, such as closed areas, minimum size regulations and effort controls are implemented at the national level.

5.小鮪 (SCI-025)：由於此類鮪類種類多且複雜，達13種，多是沿海西班牙、義大利、摩洛哥和突尼西亞小型漁業所捕撈，僅簡單更新資訊，目前尚無特別管理建議。魷魚建議中提到希望成立研究計畫，烏拉圭提問因爲目前SCRS工作已經很多，是否需要特別成立？ SCRS是否有充裕能力？魚種小組主席表示係巴西提出，所以希望開放討論。GFCM則建議可以共同合作進行小鮪研究，但可以視SCRS工作量酌與調整。巴西認爲可挑Dolphin fish先進行，這也是公約所賦予之責任。在巴西與烏拉圭要求下，SCRS主席確認dolphin fish 應該列爲管理物種，列在SMT小組下應無疑慮。秘書處表示因爲過去資料量很少，所以沒有獨立列表，有需要可以處理。美國提醒摘要報告中表示13種，但表內只有9種，應儘量列入所有種類。另外就是近幾年的資料看似都不齊全？魚種小組主席表示近三年的資料缺口很嚴重，美國建議文字內應該加以說明。

6.鯊魚(SCI-026)：配合委員會要求，本小組今年特別進行九種鯊魚的生態風險評估，包括考量分布、體長、成長、生殖等相關參數，也希望能進一步

獲得日本、西班牙以及台灣的資料。日本對於利用生態風險評估的不定性感到憂心，目前魚種小組主席只提到需要日本、台灣、西班牙這些遠洋船資料，但其實鯊魚有很多沿近海種類可能更需要沿岸國資料。美國表示就因爲資料不夠只好用生態風險評估，並因爲主要對象爲表層物種，所以需要延繩釣資訊勝於圍網及其他漁業資訊。日本想澄清此研究只針對表層延繩釣漁業捕撈的鯊魚嗎？魚種小組主席回應原則如此。巴西認爲因爲會員不交資料，所以只好用生態風險評估。日本表示同意，但強調不應只針對延繩釣，圍網、沿近海都應該提供資料並進行生態風險評估，不應只針對延繩釣進行評估。魚種小組主席也同意。至於摘要報告，主席建議”觀察員應該可以在死鯊魚上進行生物採樣”，巴西認爲如果有研究需要，即便是活鯊應該也不排斥。至於建議鼓勵圍網提供鯊魚統計量，日本提醒是否也要求沿岸國比照辦理？魚種小組主席同意，認爲可以加上artisanal fisheries。除水鯊及馬加鯊統計量更新外，probeagle尚無新資料。

7.熱帶鮪類：

(1)大目鮪(SCI-015)：大目鮪評估於去年進行，主要討論迦納幼魚問題。今年提出幾項新研究，包括來自中國及日本等國研究，研究生長生殖等關係式，和日本早期結果相近，也有其他洋區的資料供分享，目前大目鮪資源狀況尚可稱審慎樂觀(cautious optimitics)。歐盟對於其他洋區資料納入分享可提供其他小組參考，例如印度洋大目鮪標示放流計畫，顯示印度洋黃鰭鮪有兩階段成長，對於成長參數估計有幫助，所以SCRS應該強化此部分資訊，IOTC 2010年將舉辦標識研討會，SCRS也可以考慮參加。另外就是迦納統計以及CAS資料是否已經被用在資源評估？包括罐頭廠資料。魚種小組主席相當贊成，不應該忽略其他洋區資料。至於幾內亞灣資料，尚在進行中，也希望能夠納入文字中。更新內容包括大目鮪成熟年齡、西非大目鮪幼魚統計計畫等。歐盟則質問IUU歷史漁獲量經過追蹤後，究竟來自圍網還是 baitboat呢？各物種量有多少？ISSF(Victor)指出有些黃鰭鮪卸魚量已經被歸爲under-reported，並分魚種，魚種小組主席表示會再澄清。Pilar指出歷史比例其實並不容易切割種類。PEW提問，大目鮪評估原定於2014年，是否考慮提早魚種小組主席表示有考慮提早至2012，稍後會在工作計畫時討論，我方提醒管理決議應該更新(我國漁船數應爲75而非67)。對於圖表，秘書處表示會補回1950年代的分布圖。歐盟認爲圍網漁獲的體重變大，應該要解釋原因？是否因爲減少捕撈小魚？美國表示當初

討論過，但不清楚原因，也可能是因爲資料轉換問題(用尾數換算結果)。

ATLANTIC BIGEYE TUNA SUMMARY	
Maximum Sustainable Yield	78,700-101,600 t (median 92,000 t) [1,2]
Current (2010) Yield[1]	75,783tt [3]
Replacement Yield (2011)	64,900 – 94,000 (median 86,000 t) [1,2]
Relative Biomass (B_{2009}/B_{MSY})	0.72-1.34 (median 1.01) [1,2]
Relative Fishing Mortality F_{2009}/F_{MSY}	0.65-1.55 (median 0.95)[1,2]

Conservation & management measures in effect: [Rec. 09-01], para.1 of [Rec.06-01] and [Rec. 04-01].

- Total allowable catch for 2010 is set at 85,000 t for Contracting Parties and Cooperating non-Contracting Parties, Entities or Fishing Entities.
- Limits on numbers of fishing vessels less than the average of 1991 and 1992.
- Specific limits of number of longline boats; China (45), Chinese Taipei (75), Philippines (10).
- Specific limits of number of purse seine boats; Panama (3).
- No purse seine and baitboat fishing during November in the area encompassed by 0º-5ºN and 10º W-20ºW.

[1] Production model (Logistic) results represent median and 80% confidence limits based on catch data for (1950-2009) and the joint distribution of bootstraps using each of three alternative combined indices.

[2] 80% confidence limits, MSY and replacement yield rounded to 100 t.

[3] Reports for 2010 reflect most recent data but should be considered provisional, all other quantities in table were calculated during the 2010 assessment.

(2)正鰹(SCI-016A)：此魚種主要由圍網以及餌釣船捕撈，西邊漁獲量可能堪稱穩定，今年未評估，採用去年評估結果。歐盟則認爲對於迦納的資料仍未妥善處理，迦納提出程序問題，主席表示此分析在數年前進行，在此是通過摘要報告，並非重啓討論。美國則建議比照YFT，將IUU改爲unreported。對於正鰹捕獲比例增加，歐盟表示應該補充說明係因歐盟船未與塞內加爾達成合作協議，導致以往在塞國海域作業捕撈free school減少，所以SKJ比重增加，魚種小組主席表示將加在圖說。

ATLANTIC SKIPJACK TUNA SUMMARY		
	East Atlantic	West Atlantic
Maximum Sustainable Yield (MSY)	Around 143,000-170,000 t	Around 30,000-36,000 t
Current (2009) Yield [1]	122,000 t	26,000 t
Current Replacement Yield	Somewhat higher than 122,000 t	Somewhat higher than 26,000 t
Relative Biomass (B_{2008}/B_{MSY})	Most likely>1	Most likely>1
Relative Fishing Mortality: (F_{2008}/F_{MSY})	Most likely<1	Most likely<1
Management measures in effect	Rec. 04-01 (effective 2005) [2]	None

[1]Reports for 2009 should be considered provisional.
[2]Although this time-area measure was implemented to reduce mortality on bigeye juvenile tuna, a total area closure has the expected effects on all the tropical tuna species.

(3)黃鰭鮪(SCI-014)：去年原本沒打算做評估，因爲年會有顧慮，特別針對禁漁區幼魚狀況，所以要求進行本評估，特別希望能納入迦納資料。其他漁業指標的部分，台灣部分分爲四段，因爲漁業狀況有所變化，估算得到MSY爲11萬公噸。歐盟請教資源評估使用的第一年爲哪一年?因爲1960年代CPUE都很高，之後急遽下降，因此在資源評估時都被認爲資源快速下降。其他組織也有類似困擾，或者改使用1975爲起始年，魚種小組主席表示印象中VPA模式用1970年，生產量模式則用1950年。歐盟提出十來個相當尖銳的問題，小至圖表呈現方式應該改善，大至迦納沿岸漁業資料不應採用，以及模式是否適合，不確定性很大的情況未必硬要採用K2B等質疑。對此，SCRS主席感謝歐盟的精闢說明，

包括對K2B的見解，也指出此等見解如果能早在WG中提出會更好，或者上周提出能有充裕時間討論。現在已到了收尾階段，必須看如何將文字納入報告中。接下來SCRS主席也有備而來，準備黃鰭鮪從1991到2000到近期的各篇評估報告略做回應。巴西則建議在報告中必須對這些問題加以呼應，不然委員會也會有人提出。小組主席也儘量回應歐盟的提問，包括對於雌雄魚成長的差異可能需要考量，但需要更多生物參數，有些實在是因爲資料限制問題。美國表示熱帶鮪類小組近年儘量採用不同模式去闡釋不同漁業指標，在BET使用還好，但YFT因爲沒有資料準備會議，相對比較困難。基此，與會者主要仍針對歐盟看法，在摘要報告文字上做調整，至於模式評估方式的問題，爾後評估時再做考量。

ATLANTIC YELLOWFIN TUNA SUMMARY	
Maximum Sustainable Yield (MSY)	144,600[1] (114,200 - 155,100)
2010 Yield [2]	108,343 t
Relative Biomass B_{2010}/B_{MSY}	**0.85 (0.61-1.12)[3]**
Relative Fishing Mortality: $F_{current(2010)}/F_{MSY}$	**0.87 (0.68-1.40)[3]**

Management measures in effect:

– Effective fishing effort not to exceed 1992 level [Rec. 93-04].

NOTE: $F_{current(2010)}$ refers to F_{2010} in the case of ASPIC, and the geometric mean of F across 2007-2010 in the case of VPA. As a result of the constant trend in recruitment estimated by the VPA model, F_{MAX} is used as a proxy for F_{MSY} for VPA results. Relative biomass is calculated in terms of spawning stock biomass in the case of VPA and in fishable biomass in the case of ASPIC.

[1] Estimates (with 80% confidence limits) based upon results of both the non-equilibrium production model (ASPIC) and the age- structured model (VPA).

[3] The assessment was conducted using the available catch data through 2010.

[4] Median (10^{th}-90^{th} percentiles) from joint distribution of age-structured and production model bootstrap outcomes considered.

二、10 月 6 日

(一)2011 年期中會議報告：

1.運用R tools 資源評估資料準備工作研討會：2月7-11日於馬德里召開，主題爲資料庫存取、資料分析、體長別漁獲量轉換爲年齡別漁獲量、CPUE標準化等。希望開發中國家使用R tools進行CPUE標準化等工作，主席認爲本工作研討會相當成功。我方建議可將教材放在網頁上，秘書處同意以此法進行e-learning。

2.SCRS組織工作小組會議(SCI-028)：3月2-4日於馬德里召開，主題爲秘書處提供科學援助予SCRS及參與科學會議上所擔任的角色。討論項目包括：秘書處協助SCRS研發計畫、能力建構、確保品質及公開性、與其他組織合作。並討論預警制(PA)(K2B)，MSE protocols, EBGM. 秘書處角色、各國科學家參與SCRS等，而秘書處工作日益吃重，希望各國科學家能更積極參與。並陳述KOBE3 會議科學部分。歐盟特別針對K2B提出質疑，在不確定性大的情況下未必適用，IATTC有很深入的探討，應該思考，而非單純接受照做。SCRS製作各式圖表很容易，但不實際，應優先考慮此點。美國認爲的確有討論空間。ISSF也表示評估都有不確定性，但目前K2B的方法有助於做出決策。美加也提到這些可能也涉及到各國科學家能力問題。對於諸多希望加強能力建構以及邀請外部專家部分，秘書長也指出倘要另外邀請專家與會，涉及預算問題。有國家代表則指出許多生物性研究越來越少，特別對小鮪評估有負面影響，所以此部分應加強。美國對於邀請外部專家的想法認爲或許可以在SCRS會前用專題討論的方式進行。

3.黑皮旗魚資源評估暨紅肉旗魚資料準備會議：4月25-29日於馬德里召開，會議重點爲對黑皮旗魚評估產生參考點及更新管理建議、並爲紅肉旗魚評估模式作準備。

4.生態系次委員會期中會議：5月9-13日於美國邁阿密召開，主題爲魚種別及地區別之空間生產模式、環境變數在CPUE標準化之整合、生態系指標、混獲評估方法、混獲海鳥及海龜避忌措施、海龜安全釋放及處理協議。

5.熱帶鮪類魚種小組期中會議-加納統計資料分析：5月30-6月3日於馬德里召開，主題爲修正東大西洋熱帶圍網漁業資料。小組主席報告迦納資料蒐集計畫，迦納表示感謝，但歐盟繼續追問認爲應該加強漁獲報表蒐集建立Task2，並提到似乎迦納水域也有貝里斯大型圍網船作業，可能會有問題？

小組主席表示將建議熱帶鮪類小組加強此地資料蒐集。

6.鯊魚資料準備會議-應用於生態風險評估：6月20-24日於馬德里召開，目的爲增加現有資料庫，以利於2012年更新生態風險評估資料。

7.ICCAT工作小組資源評估方法-大西洋黑鮪研究計畫暨電子標識放流計畫所開發之黑鮪資源評估方法-聯合會議(SCI-033)：6月27日-7月1日於馬德里召開，會議主題爲檢視GBYP計畫目前之資源評估方法。會議議題集中於黑鮪評估，包括探討黑鮪的steepness, 生物量, K, M 等參數，進而估算資源。並利用harvest control rules 去思考(參考ICES generics control rules)。

針對四種狀況，資源恢復機率(X%)可以有不同思考，

Overfishing, and overfished High X%	Overfishing, not overfished Higher X%
Not overfishing, but overfished LOW X%	Not overfishing, nor overfished Low X%

未來工作包括協助黑皮旗魚以及鯊魚小組進行CPUE標準化，特別是如何處理混獲物種,監控娛樂漁業漁獲量等。日本建議可以納入資料處理人員。

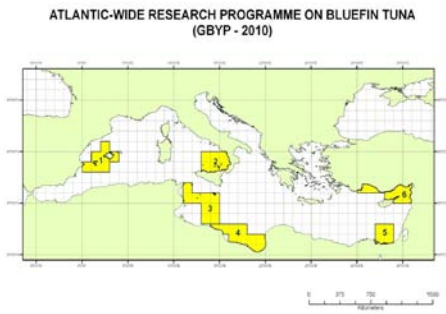
8.南大西洋暨地中海長鰭鮪資源評估會議：7月25-29日於馬德里召開，地中海長鰭鮪資源爲首次評估，並更新南大西洋長鰭鮪2007年評估資料。

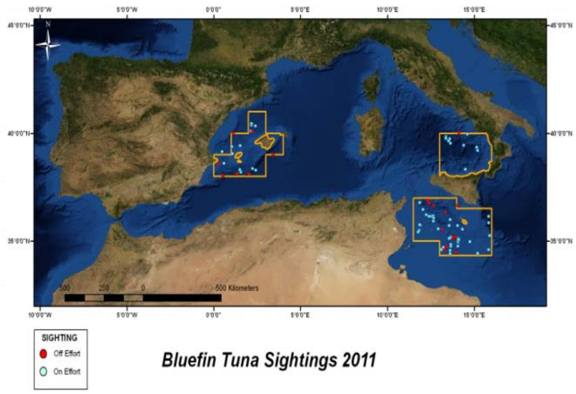
9.黃鰭鮪資源評估會議：9月5-12日召開。運用漁獲量、努力量及體長等統計資料進行分析。

(二)專案研究計畫報告：由計畫負責人 Antonio Di Natale 博士及 David Die 博士分別報告大西洋黑鮪研究計畫(GBYP)及強化旗魚研究計畫(ERPB)進度。

1. 黑鮪研究計畫 (GBYP)：2009開始由美國贊助西大西洋黑鮪研究計畫，2010年開始由ICCAT贊助黑鮪研究計畫，包括台灣，以及一些NGO。迄今已召開七次會議，有明確的資料使用以及報告發表準則。主要研究成果包括：

(1) Aerial Survey(僅有利比亞、敘利亞、突尼西亞及埃及不同意授權空照)，此法得以了解黑鮪族群在地中海特定水域的密度。然涵蓋水域範圍有限，使得變異係數高，而經費昂貴也是主要問題。





(2)資料探勘(dadta mining)：聘請專家分析大量歷史資料。

(3)標識放流，預計標識放流五千尾，目前已完成1950 尾，回收率很低(只有2個)，希望透過獎勵計畫提高回收率。

(4)其餘還有生物採樣以及模式評估等。

為推動本計畫，舉行多次會議，並提出許多報告。但因預算大幅減少，各項子計畫也依比例減少計畫金額，希望第三期計畫能夠稍為恢復。此外，計畫主持人也強調需要額外的研究配額(去年提案並未通過)、排除決議限定的體長大小以及漁法，以獲得更全面的生物採樣資料供分析。與會者提出的各項研究建議，秘書長表示理解其重要性，工作量相當繁重，感謝美國能夠慷慨解囊，也希望其他會員能夠支援。

2.旗魚研究計畫(SCI-040)：美國David Die博士報告該計畫2011年進度，包括持續進行相關的生物及資源評估研究，2011年計畫經費46,850歐元，主要來自委員會及台灣8,000歐元，2012年計畫額度約44,800歐元，希望由委員會支出30,600元，其他由各國捐獻，目前補助國家包括委內瑞拉、巴西、烏拉圭、千里達、薩內加爾、迦納、聖多梅。

(三)統計次委員會報告：由 Gerald Scott 博士報告 9 月 26-27 日會議結果。小組主席報告本次會議參與者非常踴躍，主要檢視各項資料繳交狀況，包括 Task 1, Task 2, tagging 及目前可能的資料缺口，例如有些資源評估資料、混獲資料遲交等等。秘書處則表示鯊魚圖鑑可能要延到明年。美國請問有關觀察員計畫部份表格是否列入 SCI-008，小組主席表示如果各位同意可以列入。美國認為如果資料要列入必須經過檢視清楚。ISSF 特別提出目前在迦納一些罐頭廠的資料蒐集，得到品質不錯的資料，歐盟也並不反對此點，惟仍有加強空間。

(四)生態系次委員會報告：由 Shannon Cass-Calay 博士報告 5 月及 9 月兩次生態次委員會會議結果。今年沒有特別的評估，主要討論生態系評估、海鳥及海龜混獲評估以及避鳥措施等。美國補充 5 月圓形鉤研討會資訊供與會者參考。韓國表示有些圓形鉤研究減少海龜混獲卻增加鯊魚混獲，也應該要小心。日本詢問資訊缺口，以及海龜混獲措施的衝擊問題，何以今年特別提出，主席表示資料缺口在於有些地區仍沒有混獲資料，及某些季節可能缺乏資訊。海龜部分是依據去年通過 10-09 決議案開始推動，未來兩年會集中於此。美國特別提出有關圓形鉤的問題是其本身的定義就很廣，各研究環境不同，實際尚無法比較，不過 90% 研究顯示圓形鉤跟 finfish 餌料的結合明顯有助於減少海龜混獲。相關研究近期也會在 Journal of Marine Science 發表。日本認爲熱點，如果是針對海鳥，可能需要更多資訊，但如果是針對漁業與海鳥混獲的熱點，現在的資訊應該已經相當足夠。小組主席強調有些區域仍有漏洞，所以不敢說已經 fully evaluated。美國認爲日本提出有關海鳥分布、BPUE、努力量等三者，才能了解整體狀況。在西南大西洋的海鳥混獲資料有限，還不足以成熟到指出熱點所在。烏拉圭補充海鳥分佈爲 tracking data，也不盡然代表所有海鳥，還有很長的路要努力。烏盟也歡迎日本、台灣及烏拉圭提供的新資訊。另外地中海也應該補充海鳥混獲資訊。秘書長補充表示海龜專家的聘僱費用由美國贊助。小組主席補充報告有關七月 KOBE 會議討論時同時舉行的混獲小組會議，ICCAT 參加者包括 SCRS 主席、烏拉圭代表、副秘書長、Cass-Calay。主要建議包括資料蒐集一致性(例如資料蒐集最低標準)、鯊魚保育建議、跨組織合作、研究建議及工作計畫。美國請教鯊魚部分之 determine release mortality？小組主席表示主要是要追蹤釋放後死亡率，本小組比較不集中在鯊魚而是其他物種，另補充本小組有優先關注物種，對於鯊魚的處理因涉及目標漁業比較複雜。

(五) SCRS 組織工作小組會議關切議題：由 SCRS 主席 Josu Santiago 博士報告，強調對能力建構及支助參與 SCRS 會議的需求、整合統計模式架構及管理策略評估重要性等。

(六)ICCAT 未來工作小組會議關切議題：由 SCRS 主席 Josu Santiago 博士報告，對預警措施及生態系方法運用於漁業管理提出建議。

(七)美國拉荷雅舉辦的第三屆鮪類 RFMOs 會議及聯合混獲工作小組會議所關切議題：由 SCRS 主席 Josu Santiago 博士報告，重點於發展資料保密規定及

草擬資料共享協議。

(八)未來工作計畫

1.2012年之研究及統計工作計畫

(1)長鰭鮪：無資源評估計畫，工作重點爲漁獲統計資料蒐集。繼續提出北長鰭鮪研究計畫，希望委員會支持(總經費434萬歐元)，其中特別著重生物及生態性研究。歐盟則提醒應該注意南長鰭鮪與印度洋長鰭鮪的關聯性，例如基因、體長頻度分析等，兩族群之間或有關聯。小組主席表示摘要報告也提過，建議各國加強基因交流研究。歐盟另提到研究配額，黑鮪、熱帶鮪類、鯊魚等，應有標準。主席不反對，但認爲此爲長程目標，可以再研究，或者另外找一天開會決定最佳方式再提報給委員會。副秘書長表示可以列在SCRS建議條文中，如果委員會同意可列入下年度相關科學會議議程。歐盟建議可以在GBYP計畫中提及。挪威表示有很多科學配額的經驗，相當肯定該方式，支持提出該建議。

(2)黑鮪：將進行資源評估。希望黑鮪評估期間能延長至四年，但委員會要求二年一次，資料期間短，不容易判斷管理建議之成效。建議2012年九月初，進行八天的資源評估，單純更新2010年評估資料。

(3)旗魚：將針對大西洋紅肉旗魚及圓鱗長吻旗魚進行總合資源評估工作。更新黑皮旗魚的Task I, Task II資料，特別是加勒比海國家。紅肉旗魚預定於2012年進行資源評估，亦會檢討相關生物參數以及steepness。雨傘旗魚方面，希望加強南美以及非洲資料的蒐集，秘書處強調希望各國資料能依規定時間送達。小組主席也要求各國應至少在資源評估前兩周送交相關資料。

(4)劍旗魚(SCI-050)：無資源評估，地中海劍旗魚將加強漁獲資料蒐集，北方劍旗魚將持續管制參考點研究。將在2013年進行南北大西洋劍旗魚資源評估。地中海劍旗魚2013年不進行評估，除非有新資料。明年會思考有關建立參考點、資源指標估計等問題。

(5)小鮪(SCI-051)：無資源評估，將加強漁獲資料蒐集。要求各國應加強資料收集，並希望成立研究計畫(Research Program)，預算額度90,000歐元，在地中海、西非、加勒比海收集資料。歡迎有興趣的國家加入。塞內加爾及象牙海岸表示支持，象國並要求列入計畫內。歐盟認爲沿岸國幅員廣泛，若要確實執行，需尋求其他贊助經費。SCRS主席建議

先用小型計畫試試看，小組主席表示先從Task Ⅰ、Task II開始，之後再考慮生物性資訊。

(6)鯊魚：無資源評估，將加強生物研究及資料蒐集。希望在年底能夠取得相關國家鯊魚參數，俾持續進行生態風險評。將進行馬加鯊的評估，此項評估將主要由烏拉圭(生物)、秘書處(資料蒐集)及美國(評估模式)進行。

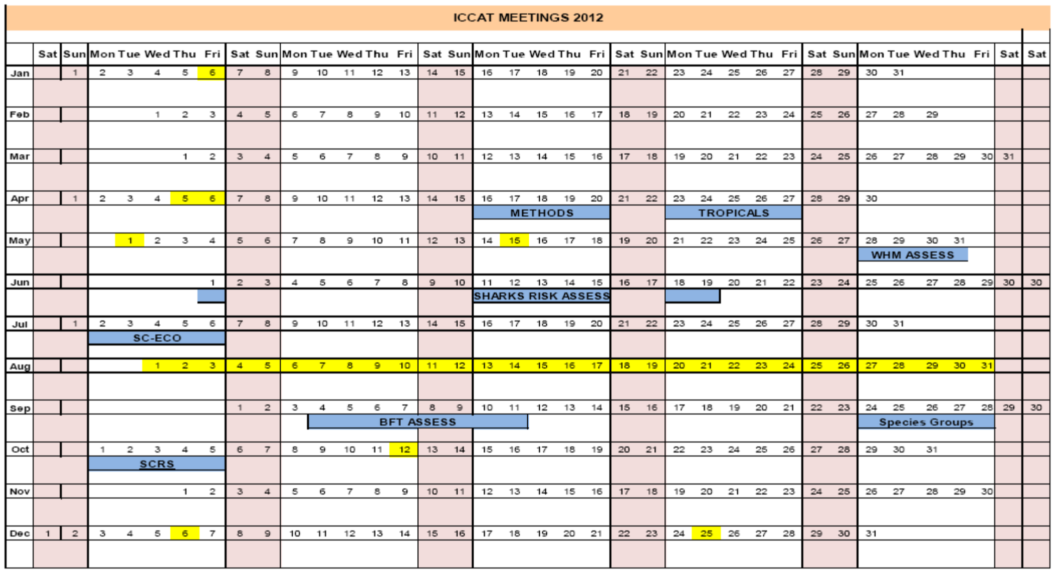
(7)熱帶鮪類(046-53)：無資源評估計畫，將進行有關生物參數更新、圍網及竿釣漁業CPUE估算方法建立、迦納漁獲資料蒐集、特別需要幼魚補充群資訊(需圍網CPUE資料)、鼓勵科學家參加ISSF下年度研討會、希望委員會繼續贊助迦納港口採樣計畫。

歐盟表示熱帶鮪類標識計畫很重要，對於生物參數估計也很關鍵，歐盟可以考量贊助，但需從委員會層面去支持。相關國家(象牙海岸)可以提出要求，歐盟極可能會贊助。主席也請熱帶鮪類小組指定負責人以確保進度。

(8)生態系次委員會：未來兩年進行海龜的評估。

2. 2012年各項會議安排：

日期	星期	會議
101.4.16-20	一至五	ICCAT 資源評估方法論工作小組會議
101.4.23-27	一至五	ICCAT 熱帶鮪類工作小組會議
101.5.28-31	一至四	ICCAT 紅肉旗魚資源評估會議
101.6.11-15	一至五	ICCAT 鯊魚風險評估會議
101.7.2-6	一至五	ICCAT 生態系次委員會
101.9.4-11	二至二	ICCAT 黑鮪資源評估會議
101.9.24-28	一至五	ICCAT SCRS 魚種小組會議
101.10.1-5	一至五	ICCAT SCRS 全席會議



(九)對委員會之建議事項(SCI-054)

1.一般性建議：

(1)未來魚種小組會議可邀請其他非會員國或其他組織科學家與會。

(2)持續提供開發中國加有關能力建立及經費支持，提升開發中國家在漁獲資料統計等工作。

(3)建議秘書處增聘統計資料以及混獲專家各一名。

(4)歐盟強調邀請外部專家很重要，秘書處則提醒所需經費很昂貴!日本贊成歐盟的建議，或許可以用交流方式彈性處理。

2.對魚種小組之經費建議：

(1)長鰭鮪小組：有關北大西洋長鰭鮪生物與生態、漁業資料及管理建議等四年期研究計畫提供經費支援，該項研究計畫預算額度爲430萬歐元。

(2)旗魚小組：SCRS建議委員會對旗魚小組有關基因分析計畫給與額外15,000歐元經費支持。

(3)黑鮪小組：SCRS建議委員會特別針對黑鮪研究給與50公噸科學研究漁獲配額進行相關生物參數蒐集研究，另給與320公噸科學研究漁獲配額給該小組作籌資運用，該配額拍賣權利金得以長期支持GBYP計畫。

(4)熱帶鮪小組：SCRS建議委員會持續給予迦納港口採樣計畫經費支持，另對2012年將進行之熱帶鮪類標示放流計畫給予經費支持。

(5)小鮪小組：SCRS建議委員會針對小鮪資料蒐集設立研究計畫。

3.無關財務之魚種小組建議：

(1)長鰭鮪小組：SCRS建議整合各會員國有關地中海長鰭鮪生物採樣、生活史參數及生態研究計畫。

(2)旗魚小組：SCRS建議持續對旗魚類進行相關生物研究，2012年進行有關大西洋紅肉旗魚及圓鱗長吻旗魚資源評估，主要漁業國家提供細部漁獲資料供資源評估。黑皮旗魚成長參數及魚種辨識研究。

(3)黑鮪小組：SCRS建議持續進行黑鮪耳石樣本蒐集，以進行生物性研究，並建議秘書處建立相關資料庫，網口攝影機技術也應持續進行研究發展，另建議秘書處建立黑鮪漁獲文件電子格式以供科學研究即時分析之用。

(4)鯊魚小組：SCRS建議黑鯊應該有類似狐鮫類之管理措施，另為科學研究應准許觀察員及科學家就管制鯊種進行樣本保存及採樣，不受委員會之不得留艙之措施限制。希望將六種鯊魚列入ICCAT手冊。日本提醒要求圍網與沿岸漁業的資料，主席同意。

(5)生態系次委員會：次委員會建議多增加一名小組召集人就混獲議題整合資訊，建議對會員國資料蒐集系統進行資訊蒐集以瞭解會員國在混獲資料蒐集項目之歷史變動，建議與資源評估方法論小組合作發展混獲之評估方法。

(6)資源評估方法論小組：SCRS建議該小組發展之”羅賓漢”方法(引用資料較充足之資源評估所得之資評參數)進行適用性評估，漁獲管理原則研究應包含ISSF2011會議所提經驗法則進行評估及比較分析，另建議管理策略評估研究應列入相關利益關係者。

(7)統計次委員會：次委員會建議針對黑鮪作業船之VMS資料回報間隔不應超過2小時，針對日本漁獲資料重新修正CAS部分，建議日本對其他魚類資料進行提送，以利各魚種小組資源評估，同意發展旗魚辨種圖鑑，支持持續迦納資料蒐集計畫，針對黑鮪採樣比率建議設在10%，建議會員國與秘書處合作以利發展混獲物種資料提送表格。

(十四)對委員會要求之回應

1.Rec. 10-02，有關北大西洋劍旗魚發展限制參考點：SCRS提出SCI-055號文件回應，建議對此應進一步進行限制參考點評估，將不同資源加入量假設

以及不同漁具選擇率列入考量，另外MSY下資源量比率目標水準也將列入未來評估項目。工作小組檢視相關研究，從 stock-recruitment (SPR)的角度，希望建立生物量參考點，會持續在下次資源評估(2013)年之前思考本問題。

2.Rec. 10-02，有關北大西洋劍旗魚會員國漁獲資料繳交檢視：SCRS提出SCI-056號文件回應，近年會員國大多能依照委員會資料提供規定提交資料，但會員國繳交資料之品質及完整性無指標進行評估，工作小組檢視資料顯示過去十年資料回報已有改善狀況，惟目前提報死亡丟棄量國家僅有美國、加拿大以及日本。

3.Rec. 10-04，有關黑鮪捕獲供圈養之體長與生物量評估技術與方法：SCRS提出SCI-057號文件回應，部分研究報告顯示，目前有些黑鮪箱網養殖，已開始進行網口攝影機技術開發，雖然在體長判讀上仍無法有效進行判讀，但研究人員評估使用網口攝影機仍是有效之技術，SCRS建議黑鮪小組在2012年完成相關研究。

4.Rec. 10-10，有關會員國國家觀察員計畫執行資訊：SCRS提出SCI-058號文件回應，本年度僅少數會員國提送相關國家觀察員計畫執行資訊，SCRS無法就此少量資訊進行相關細項分析評估，SCRS請會員國配合提供相關資訊。黑鮪部分，僅有部分國家提交，因爲不少會員國無提交，所以美國等代表提出是否由區域觀察員公司直接提供？歐盟認爲其實目前觀察員資料還很少，對於如何與task1，task2 結合？可以由秘書處幫忙提供，以確定能夠幫助資源評估。對於觀察員資料提報狀況表，由於係秘書處針對各國提供資料自行整理，有許多空格並未塡報，實際上秘書處並未提供標準格式，我團指出，該資料提報狀況表恐有所疏漏，例如台灣有塡報海龜海鳥資料，但該表格並未塡列，而摩洛哥的資訊則完全空白，倘列出此表，可能造成爭議，因此，若欲列該表爲會議報告附件，應要求相關國家確認。秘書處及統計小組主席解釋當初只是單純製作此表作爲參考，並未逐欄檢視，墨西哥及美國也認爲此表應由相關國家確認，但考量到時間有限，主席最後裁示該表格刪除不列入會議報告。

5.Rec.10-06，有關鯊魚圖鑑製作：秘書處表示鯊魚圖鑑第二部分已提交予委員會，近期將以三種官方語言版本發行，分送各會員國，並在網站公布該文件。

6.Rec. 10-10，有關小於十五公尺漁船配置觀察員之替代方案：目前僅收到

有限資訊，因此SCRS無法評估替代方案回應委員會要求。

7.Rec. 05-09，有關漁獲資料項目評估：目前僅收到有限資訊，SCRS提出SCRS/2011/207號文件回應，2011年已經針對黑皮旗魚、南大西洋及地中海長鰭鮪與黃鰭鮪漁獲資料進行評估。

8.Rec. 10-09，有關會員國提送海龜漁獲影響效果評估：2011年收到4個會員國有關觀察員計畫蒐集之混獲資料，秘書處2012年第一季將招聘一名海龜混獲專家進行短期資訊分析。

(十五)其他事項：

1. 歐盟提到南方黑鮪問題，認爲應該給予更多關注，至少看看趨勢報告等等，不應該全然忽略。秘書處表示 CCSBT 會議報告要經過會員同意才能提供。其他與會者(秘書處、SCRS 前主席、日本)表示 10 年前由日本負責報告，三、四年前，因 SCRS 時間有限等因素而取消，多數報告已上網公布，也沒有足夠時間在此討論。秘書處特別強調並非 CCSBT 秘書處的決定而是 CCSBT 會員的決定。歐盟認爲此一時也，彼一時也，未必要循舊規矩，對此做法感到遺憾，不過撤回提案。

2. 有關海鳥議題，會後日本詢問我方是否願意共同在年會提案(報告)建議選定熱點保育，主要是日方認爲美方有意持續推動兩年前建議全大西洋都要採取避鳥繩等措施，所以藉故反對日本提案，考量到日本提案系擬縮小適用避鳥措施的範圍，我方表示原則可以接受，雙方將維持聯繫。有關北長鰭鮪研究計畫，遲未獲 ICCAT 同意資助，歐盟科學家像我團表示還在積極向歐盟當局尋求經費贊助中，言下之意希望能夠爭取各國的經費贊助。是故，倘我國有預算支應，不妨考慮在年會 Panel 2 討論本研究計畫時表示可以適度捐助，成則有助雙方合作研究，倘未通過亦無損失。

三、10 月 7 日

(一)其他事項：

1.美國提出建議生態次委員會應多增一名小組主席，次委員會下分爲生態系及混獲兩小組，該案無異議通過。

2.KOBE III會議中建議成立跨組織管理策略評估工作小組，美國表示ICCAT應在此工作上擔任領導地位，建議由資源評估方法論小組負責相關聯繫工作，該案無異議通過。

3.法國表示南方黑鮪也是大西洋重要的鮪類資源，SCRS會議中應該有該資源之報告項目，前SCRS主席回應，之前會請日本代表報告CCSBT資源評估結果，但按先前SCRS決議，SBT資源現況，不列入SCRS會議討論。

(二)會議閉幕：本日會議於上午 10 時 30 分開始，主要係檢視會議紀錄報告，經我代表團檢視該報告，發現缺我國國家報告摘要，立即於會前向 ICCAT 秘書處反應更正，秘書處已於會議中宣布，確實缺漏我國國家報告摘要，將修正之，本會議紀錄報告經各方討論修正文字後通過，於 12 時 40 分會議結束。

肆、心得與建議

一、 在本次魚種小組暨全席會議討論過程中，即使如歐盟、日本資深科學家，有豐富經驗及具體科學說詞，仍難以鬆動先前資源評估小組會議的決議，顯見資源評估會議的重要性，擬積極規劃邀請相關科學家 參與我國目標魚種資源評估會議。

二、 各魚種資源評估，皆建立在良好的漁獲統計資料來源。我方將致力於提昇我國漁獲統計資料品質。我國已自 2002 年起執行科學觀察員計畫，迄今觀察員涵蓋率大幅提高，且資料累積已達一定程度，對統計資料品質精進有一定幫助。

三、 黃鰭鮪及旗魚類資源評估會議我國雖未派員與會，但我國科學家仍提供相關 CPUE 指標供小組進行評估。惟鯊魚生態風險評估會議未派員亦無提供資料，小組評估時，出現資料缺口，因此建議對此類不派員出席的會議，應鼓勵相關科學家與小組主席事先聯繫，提供必要資訊，以利魚種小組進行評估。。

四、 有關科學方面的合作，如北長鰭鮪、鯊魚等混獲研究及大目鮪等生物參數研究，過去我國較少參與，擬鼓勵科學家進行相關生物性研究，並與國際間進行合作交流，以提昇研究層面。

五、 有關經費贊助方面，目前贊助黑鮪與旗魚研究計畫，雖非我國目標魚種相關研究，但基於合作保育角度，應持續支援 ICCAT 主導的研究計畫。

附件一

2011年大西洋各魚種評估指標與管理現況

魚種		F/F_MSY	B/B_MSY	最大持續生產量MSY（t）	2010漁獲(t)	總容許捕撈量t(year)	主要決議
長鰭鮪	北	1.045（0.85-1.23）	0.62（0.45-0.79）	29,000	19,649	28,000（2011）	09-05
	南	1.07（0.44-1.95）	0.88（0.55-1.59）	27,964（23,296-98,371）	18,900	29,900（2011）	07-03
	地中海	<1			2,123		
大目鮪		0.95（0.65-1.55）	1.01（0.72-1.34）	86,000（64,900-94,000）	75,783	85,000（2011）	10-01
黃鰭鮪		0.87（0.68-1.40）	0.85（0.61-1.12）	144,600（114,200-155,100）	107,546		93-04
正鰹	東	most likely<1	most likely>1	143,000-17,000	122,000		none
	西	most likely<1	most likely>1	30,000-36,000	26,000		04-01
黑鮪	東	2.9 (1.53)	0.35 (0.62)	13,500 or less	11,303	12,900（2011）	08-05
	西	0.73~1.88	0.15-1.1	2,585-6,329	1,798	1,750（2011, 2012）	10-03
劍旗魚	北	0.76（0.67-0.96）	1.05（0.94-1.24）	13,730（13,020-14,182）	12,154	13,700（2010）	10-02
	南	0.75（0.60-1.01）	1.04（0.82-1.22）	~15,000	12,566	15,000（2010）	09-03
	地中海	1.3	0.54	~14,600	13,429		
黑皮旗魚		1.63（1.11-2.16）	0.67（0.53-0.81）	2,837（2,343-3,331）	3,150		06-09
紅肉旗魚		>1.0 possibly	<1.0	600-1,320	299		06-09
雨傘旗魚	東	likely>1	likely <1	1,250-1,950	2,894		
	西	possibly>1	Possibly <1	600-1,100	467		
水鯊	北	0.13-0.17	1.87-2.74		37,238		
	南	0.04-0.09	1.95-2.80		27,729		
馬加鯊		0.48-3.77	0.95-1.65		6,500		
鼠鯊	西北	0.03-0.36	0.43-0.65		120		
	東北	0.04-3.45	0.09-1.93				
	西南	0.31-10.78	0.36-0.78		14		

REPORT OF THE STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)

(Madrid, Spain, October 3-7, 2011)

October 2011

REPORT OF THE STANDING COMMITTEE OF RESEARCH AND STATISTICS
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REPORT OF THE
STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)
(Madrid, Spain - October 3 to 7, 2011)

1. Opening of the meeting

The 2011 Meeting of the Standing Committee on Research and Statistics (SCRS) was opened on Monday, October 3 at the Hotel Velázquez in Madrid by Dr. Josu Santiago, Chairman of the Committee. Dr. Santiago welcomed all the participants to the annual meeting.

The ICCAT Executive Secretary, Mr. Driss Meski, addressed the meeting and welcomed all the participants to Madrid. The Executive Secretary reminded the relevance of the work conducted by the Committee and the important role of the SCRS in providing scientific advice to the Commission. Mr. Meski recognized that as the stock status becomes complicated our Commission is requested to provide more clarifications. Mr. Meski highlighted that the SCRS work is very much appreciated by our Commission and on the international level, even though participation of the national scientists has shown a sharp decline in recent years.

Finally, the Executive Secretary hoped that the delegations that have undergone a reduction in their activities will renew their interest by participating more in the work of the SCRS so as to assure that our Committee has the reputation it deserves and wished every success in the work of our Committee.

2. Adoption of Agenda and arrangements for the meeting

The Tentative Agenda was reviewed and adopted (attached as **Appendix 1)**. Stock assessments were carried out this year on South Atlantic and Mediterranean albacore (ALB-Med and ALB-S), blue marlin (BUM) and yellowfin tuna (YFT).

The following scientists served as rapporteurs of the various species sections (Agenda Item 8) of the 2011 SCRS Report.

Tropical tunas- General			J. Pereira
YFT	-	Yellowfin tuna	C. Brown
BET	-	Bigeye tuna	D. Die
SKJ	-	Skipjack tuna	D. Gaertner
ALB	-	Albacore	H. Arrizabalaga, J. Ortiz de Urbina (Med)
BFT	-	Bluefin tuna	C. Porch (W), J.M. Fromentin (E)
BIL	-	Billfishes	F. Arocha
SWO	-	Swordfish	J. Neilson, P. Travassos (Atl.), G. Tserpes (Med.)
SBF	-	Southern bluefin	
SMT	-	Small tunas	N. Abid
SHK	-	Sharks	A. Domingo

The Secretariat served as rapporteur for all other Agenda items.

3. Introduction of Contracting Party delegations

The Executive Secretary introduced the 19 Contracting Parties present at the 2011 meeting: Brazil, Canada, Cape Verde, China, Côte d'Ivoire, Croatia, European Union, Ghana, Japan, Korea, Mexico, Morocco, Norway, Russian Federation, Senegal, Turkey, United Kingdom (Overseas Territories), United States and Uruguay. The List of Participants at the Species Groups Meetings and the Plenary Sessions is attached as **Appendix 2**.

4. Introduction and admission of observers

Representatives from the following Cooperating non-Contracting Party, Entity, or Fishing Entity (Chinese Taipei), intergovernmental organizations (General Fisheries Commission for the Mediterranean-GFCM), and non-governmental organizations (Birdlife International, Federation of Maltese Aquaculture Producers-FMAP, Federation of European Aquaculture Producers-FEAP, Fundatun, Greenpeace, Institute for Public Knowledge-IPK, International Seafood Sustainability Foundation-ISSF and The Pew Environmental Group were admitted as observers and welcomed to the 2011 SCRS (see **Appendix 2**).

5. Admission of scientific documents

The Secretariat informed the Committee that 182 or scientific papers had been submitted at the various 2011 inter-sessional meetings. However, the Secretariat noted that a considerable number of documents (34), presented during the meetings were not provided later in the standard format for SCRS documents.

Besides the scientific documents, there are 11 reports of inter-sessional meetings and Species Groups, 28 Annual Reports from the Contracting Parties, and non-Contracting Cooperating Parties, Entities and Fishing Entities, as well as various documents by the Secretariat. The List of SCRS Documents is attached as **Appendix 3**.

6. Report of Secretariat activities in research and statistics

The Secretariat presented the “Secretariat Report on Statistics and Coordination of Research 2011” which summarizes activities in 2011. This document was discussed at length during the Species Groups meetings and during the session of the Sub-Committee on Statistics. The first eight tables of this document point out the improvements in data submission and the use of the electronic forms. This report also notes the Secretariat’s efforts to implement last year’s recommendations from the Commission and SCRS concerning the implementation of the Data Confidentiality policy and it's implication for the ICCAT database management and organization.

A comment was made to extend the presentation of the catalog of data submitted to include by-catch species in addition to the main tuna species and the three shark species commonly presented. The Secretariat indicated that this proposal should be presented to the Sub-Committee on statistics for its approval.

A summary of the activities carried out by the ICCAT/Japan Data Management and Improvement Project (JDMIP) was presented (ICCAT, 2011). This project continues to support port sampling developed in Tema (Ghana) and the eastern Caribbean (Venezuela). This program has also made financial contributions towards the participation of scientists from developing countries to SCRS meetings.

Likewise, the Secretariat informed of the activities carried out in 2011 in relation to publications, noting that in 2011 a forth volume has been added to the Biennial Report which includes the reports from the Secretariat and other committees.

A protocol for the allocation of capacity building and data improvements was discussed during the Sub-Committee on Statistics. The protocol defines three major areas for funding requests and provides guidelines on the proposal request, evaluation, awarding and deadlines for all requests.

7. Review of national fisheries and research programs

Brazil

In 2010, the Brazilian tuna longline fleet consisted of 96 vessels. Of these 96 boats, 92 were national and 4 were foreign chartered vessels. The total number of vessels increased by about 10% from 2009, when 86 vessels operated. The number of bait-boats operating in 2010 was 41, which all of them are national boats. The number of purse seiner boats decreased from 8 in 2009 to 5 in 2010.

The Brazilian catch of tunas and tuna-like fishes, including billfishes, sharks, and other species of minor importance, was 33,419.9 t, in 2010, representing a decrease of 16.6%, from 2009. Despite the catch estimates for the bait-boat fishery are still preliminary, in 2010, the majority of the catch again was taken by this fishery (14,475.2 t; 43.0%), with skipjack tuna being the most abundant species (87.9% of the baitboat catches). Yellowfin tuna was the second dominant species in the bait-boat fishery, with a total catch of 627.3 t.

The total catch of the tuna longline fishery was 12,349.4t, which was 58.3% higher than 2009, with dolphin fish being the most abundant species, accounting for 41.4% of the longline catches, following by swordfish (21.5%) and blue shark (12.1%). Yellowfin tuna was the fourth most abundant species in the Brazilian longline fishery, accounting for 9.2%. The total catch of white marlin and blue marlin was, respectively, 35 t and 130 t, representing a decreasing trend of 32.7% and 12.7%, from 2009, respectively.

Part of the Brazilian catches resulted again from the fishing activities of small scale fishing boats based mainly in Itaipava-ES (southeast coast) which includes several target species with different gears, including longline, handline, trolling and other surface gears. In 2010, this fleet caught 5,813.0 t of fish, of which dolphin fish contributed with 42.5%. Yellowfin was the second most caught species with 28% following by the skipjack tuna, which accounts with 12.5% of the catches taken by this fishery.

Besides the catch and effort data regularly collected from Brazilian tuna fisheries, in 2010, around 5,000 fishes were measured at sea and while landing. The main fish species measured were: dolphin fish; blue shark; yellowfin; bigeye; swordfish; sailfish; white marlin; and blue marlin.

Brazilian research efforts continued on tunas, billfish and sharks, as well as on the incidental catches of seabirds and sea turtles, aiming at monitoring by-catch and testing mitigation measures.

Canada

In 2010, Canada landed 1,346 t of swordfish in 2010, 505 t of bluefin tuna, 14 t of albacore tuna, 103 t of bigeye tuna, and 166 t of yellowfin tuna. Canada also landed 41 t of shortfin mako, and 83 t of porbeagle. When compared with 2009, these amounts are generally similar.

Bluefin tuna research focused on post-release survival, migration studies, understanding the influences of ocean environment on catch rates and cooperation with the GBYP to improve our understanding of the age and stock origin of the catch in Canadian waters. Swordfish research targeted improved understanding of stock structure, and documenting the recovery of swordfish in the Atlantic, along with many other scientists from the SCRS. Shark research has been directed to improved estimates of post-release mortality, determining spawning areas, and improving biological statistics in support of improved assessments. More details of the Canadian research program may be found in the Annual Report of Canada.

Cape Verde

The Cape Verde tuna fleet in 2010 was comprised of 101 operational vessels over 11 meters. The catch data on tunas and tuna/like species in 2010 are provisional and estimated at 13.304 tonnes, caught mainly by purse seine and pole and line in the industrial or semi-industrial fishery and with hand line in artisanal fishing.

In Cape Verde, at the national level, there was no industrial fishing vessel targeting sharks since 2007. Shark catches are caught incidentally. Due to the fragility of our surveillance, sharks are often part of the by-catches of the foreign longline fleet that fishing in the Cape Verde EEZ.

Sport fishing has been, over time, an important activity for economic, cultural and political development, but unfortunately this fishery is still not monitored.

Billfishes are caught in Cape Verde waters, mainly by EU vessels and by sport fishing. The authorized foreign fleet, fishes in the Cape Verde EEZ based on fishing agreements or contracts. The vessels mostly pertain to European Union and Asian countries.

The objective of the research is to formulate recommendations for the optimal and sustainable exploitation of the aquatic living resources, taking into account the economic and social objectives established in the policy on development, but without neglecting the protection of the environment, the conservation of the resources and the preservation of nature, particularly the biological marine heritage. Research on fishing and the environment and socio-economic studies are thus instruments of considerable importance for the development of fishing. The data compiled are regularly transmitted to the ICCAT Secretariat, thereby contributing to the updating of statistics and to the ICCAT stock assessments.

The implementation of the ICCAT conservation and management measures is carried out through the Fishing Management Plan, which was updated in 2009.

China

Longline is the only fishing gear used by the Chinese fishing fleet to fish tunas in the Atlantic Ocean. Thirty Chinese tuna longliners operated in 2010, with a total catch of 6,873 t including tuna, tuna-like species and sharks (in round weight), 515.5 t more than that of 2009 (63,57.5 t). The target species were bigeye tuna and bluefin tuna, of which catches amounted to 5,489 t and 38.22 t, in 2010, respectively. Bigeye tuna was the major target species in Chinese catch, accounting for 79.9% of the total, however, it was 516 t more than that of 2009 (4,973 t). Yellowfin tuna, swordfish and albacore were taken as by-catch. The catch of yellowfin tuna decreased from 462 t in 2009 to 426.9 t in 2010. The catch of swordfish was 369.1 t, with a tiny decrease from the previous year (383 t in 2009). The catch of albacore was 239.6 t, which represented a 106.6% increase from the previous year.

The data compiled, including Task I and Task II as well as the number of fishing vessels, have been routinely reported to the ICCAT Secretariat by the Bureau of Fisheries (BOF), Ministry of Agriculture of PRC. PRC has carried out a national scientific observer program for the tuna fishery in ICCAT waters since 2001. Two observers have been dispatched on board two Chinese Atlantic tuna longline fishing vessels covering the area of N3°53'~N14°15', W30°07'~W40°20', S4°21'~N10°32', W22°57'~W35°58' (targeting bigeye tuna), N48°49'~N52°42', W16°00'~W33°20' and N47°51'~N52°35', W16°48' ~W34°40' (targeting bluefin tuna) since September, 2010. Data of target species and non-target species (sharks, sea turtles, especially) were collected during the observation.

In terms of implementation of the relevant ICCAT conservation and management measures, BOF requires all fishing companies operating in the Atlantic Ocean to report their fisheries data on a monthly basis to the Branch of Distant Water Fisheries of China Fisheries Association and the Tuna Technical Working Group in order to comply with the catch limits. The BOF has established a fishing vessel management system, including the issuance of licenses to all the approved Chinese fishing vessels operating on the high seas of world oceans. The Chinese high seas tuna fishing fleet has been required to be equipped with a VMS system since October 1, 2006. The BOF has strictly followed the National Observer Program and the ICCAT Regional Observer Program for transshipment at sea.

Croatia

Total Croatian catch of bluefin tuna in 2010 in commercial fisheries was 385.69 metric tons (t). The bluefin tuna were predominantly transferred into farming cages (353.764 t; 91.7%) and 16.14 t (4.19 %) were landed. Bluefin catches were mostly realized by purse seiners (369.54 t; 95,81%), while the remaining was caught using hook and line gears. A difference of 15.77 tons (4.1%) has been registered between the purse seine catch (369.54 t) and caging (353.764 t). The difference is due to the fact that counting and recording of transfers to farm is performed in conditions which allow better results. However, Croatia closed the fishery based on the catch reported and authorized.

The total Croatian catch of Mediterranean (Adriatic) swordfish in 2010 amounted to 5.740 kg.

Research was continued on issues of growth and reproductive biology of bluefin tuna. National sampling program targeting bluefin tuna harvested from aquaculture facilities has been carried out. The research activities are under way aiming to estimate the impact of increased abundance of small bluefin tuna in the Adriatic on small pelagic fishery. Preliminary research on the use of stereoscopic camera for bluefin sizing and counting has been carried out.

Croatia has adopted the Regulation on catch, farming and trade of bluefin tuna that includes all provisions of the relevant ICCAT Recommendations and transposes them into national legislation in full. Croatia has implemented the ROP programme in full accordance with the provisions of the relevant ICCAT Recommendations.

European Union

The European Union fleets caught 192.000 tonnes (t) in 2010, which is close to 40% the total catches of ICCAT. These 2010 catches increased slightly as compared to the 155.000 t in 2007, this following the increasing catches of tropical tunas and the return to the Atlantic of the purse seiners that operated in the Indian Ocean. These catches fall far short of the 300.000 t. that were landed in the early 1990s for the same EU countries. Eight EU countries carry out tuna fishing in the Atlantic and the Mediterranean, whose catches in descending order in 2010 were: Spain (116.000 t), France (43.000 t), Portugal (20.500 t) with high catches of skipjack in 2010, Italy (9.300 t), Greece (1.800 t), Ireland (900 t), Malta and Cyprus. The major species caught by the EU countries in 2010 were skipjack, which sharply increased (68.900 t.), yellowfin (46.500 t), swordfish (21.100 t) and bigeye (18.300 t), albacore (17.100 t), and bluefin tuna (6.060 t). It is noted that while the 2010 catches of tropical tunas have been increasing slightly every year since 2007, the catches of albacore and swordfish are stable, and bluefin tuna catches are declining. All the traditional fishing gears are active in the EU: purse seiners, baitboats, longliners, hand lines, troll, driftnets, harpoons, pelagic trawl, traps and sport fishing.

Since 2001, the EU also largely and routinely finances the collection of biological data and a number of research projects on the tunas of all its member countries. Biological sampling of the tropical tunas catches from European purse seiners is also carried out routinely at the Abidjan canneries and, since 2008, in the French Antilles artisanal fisheries. The Task I and II statistical data submitted to ICCAT in 2011 by the EU countries are overall complete and in accordance with the ICCAT rules. It should be noted that the EU also supports observer programmes on various fleets, the tropical purse seiners with about 10% of the fishing effort monitored by observers, and since 2009, 100% of the fishing days observed on purse seiners fishing bluefin tuna in the Mediterranean. Also of note again in 2011 is the considerable financial support from the EU towards the ICCAT GBYP intensive research on bluefin tuna.

The active participation of European scientists at all the ICCAT scientific meetings and the large number of SCRS documents co-authored by EU scientists covering all ICCAT research areas and species was also noted. EU countries also carry out considerable research of a more fundamental nature on tunas on, for example, ecosystems, the reduction of by-catches, tuna-environment relations, tuna behavior, FADs, spawning and reproduction of larvae and juvenile bluefin tuna, marine protected areas used the for tuna resources, reduction of unwanted by-catches, modeling of high seas pelagic ecosystems, etc. The participation of EU countries is, for example, active in the framework of the CLIOTOP/GLOBEC programme which has broad objectives that are multi-disciplinary and worldwide, and which are aimed at carrying out better modelling of the sustainable exploitation of the tuna resources based on the environment and the ecosystems.

Ghana

The tuna industry in Ghana comprises skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*) and bigeye tuna (*Thunnus obesus*). Twenty-two (22) baitboats and 15 purse seiners are currently fishing within the EEZ of Ghanaian coastal waters and beyond and exploit these tuna species amongst other minor tuna-like species such as the black skipjack (*Euthynnus alletteratus*). During the year under review, skipjack catches were the highest (69%) followed by yellowfin (16%) and bigeye (9%), respectively.

Both fleets employ Fish Aggregating Devices (FADs) in fishing and collaborate extensively sharing their catch during fishing operations. Over 80% of catches are conducted off FADs. Catches for the year 2010 rose slightly to 77,876 t, from 66,470 t in 2009. All data for 2010 were submitted via the AVDTH format during the inter-sessional meeting on Ghana's statistics in May 2011.

Recent improvements in sampling, coupled with the provision of more logbook information from the fishery, has contributed to a better understanding of the spatio-temporal distribution of the species. It is envisaged that further synthesis of the database on Ghana since 1980-2010 which is ongoing will give a clear sampling strategy to improve the catch and species composition of the entire catch in relation to innovations observed in the fishery.

An observer programme was organized in March-May 2010 on board four purse seine vessels with the aim of training officers on proper methods of estimating catches and filling out of information in logbooks. Further in early 2011, four observers sponsored by the JDMIP project were deployed on purse seiners. Reports have been duly sent to the ICCAT Secretariat. Increased port sampling was also carried out during the months of May-July 2011 also sponsored by the JDMIP.

Beach sampling of billfishes under the ICCAT Enhanced Research Programme for Billfish continued off the western coast of Ghana from artisanal drift gill operators with slight declines in catches.

Japan

Longline is the only tuna-fishing gear deployed by Japan at present in the Atlantic Ocean. The final coverage of the logbook from the Japanese longline fleet has been 90-95 % before 2009. The current coverage for 2010 is estimated to be about 90%. In 2010, fishing days was about 22,000 days, which was about 80 % of average value in recent ten years. The catch of tunas and tuna-like fishes (excluding sharks) is estimated to be about 30,000 t, which are about 90 % of the past ten years average catch. The most important species was bigeye representing 55% of the total tuna and tuna-like fish catch in 2010. The next dominant species was yellowfin occupied 17% in weight and third species was swordfish (9%). Observer trips on longline boats in the Atlantic were conducted and total of about 600 fishing days were monitored. In addition to the logbook submission mentioned above, Fisheries Agency of Japan (FAJ) has set catch quotas for western and eastern Atlantic bluefin as well as for northern, southern Atlantic swordfish, blue marlin, white marlin and bigeye tuna, and has required all tuna vessels operating in the Atlantic Ocean to submit catch information every day (bluefin tuna) and ten-day (other tunas) period by radio or facsimile. All Japanese longline vessels operating in the Convention Area has been equipped with satellite tracking devices (VMS) onboard. In accordance with ICCAT recommendations, the FAJ has taken necessary measures to comply with its minimum size regulations, time area closures and so on by a Ministerial Order. Each species statistical or catch document programs have been conducted. Records of fishing vessels larger than 24 meters in length overall (LSTLVs) have been established. The FAJ has dispatched patrol vessels to the North Atlantic to monitor and inspect Japanese tuna vessels and also observe fishing activities of other nations' fishing vessels, and inspected landings at Japanese port to enforce the catch quotas and minimum size limit. A prior permission from the FAJ has been required in the case that Japanese tuna longline vessels transship tuna or tuna products to reefers at foreign ports or at sea.

Korea

In 2010, a total of 16 Korean longliners and two purse seiners were operated in the ICCAT area, of which three longliners and one purse seiner were operated under the chartering arrangement with Côte d'Ivoire, and caught a total of 3,423 t, which was a decrease by 11.3% compared to the previous year. Almost 95.7% of the total catch were from three major species, of which bigeye tuna catch was 2,657 t (77.6%), yellowfin tuna 380 t (11.1%) and albacore 240 t (7.0% of the total). It was notable that no bluefin tuna catch was made in 2010 although one purse seiner was operated in the Mediterranean. Korean longliners have mainly operated in the tropical area of the Atlantic Ocean and targeted bigeye tuna and yellowfin tuna. Fishing season was throughout the year from January to December in 2010 in the central Atlantic Ocean (15°N ~15°S, 10°E~50°W). Compared to the previous year, longline fishing area was slightly extended further south and eastward. However, the fishing grounds have fluctuated every year depending on the fishing and oceanographic condition**s** for target species, with main fishing grounds located in statistical area 34 of the Atlantic Ocean. The National Fisheries Research and Development Institute (NFRDI) has carried out routine scientific monitoring work over the past years. The monitoring was for the collection of catch and fishing effort statistics from the Korean tuna longliners and purse seiners operated in the Atlantic Ocean. The requested Task I and Task II data were already provided to the ICCAT Secretariat. The data coverage for longline fishery was 65.1% of total catch in 2010. There are two sources of statistical data collection. The Korea Overseas Fisheries Association (KOFA) collects total catches by gear from Korean tuna industries, which are used as the official total catch that cover all tunas and tuna-like species. NFRDI collects logsheet sampling data from fishing vessels. The logsheet contains operation location, catches by species, number of hooks and sets, etc. The estimates of annual catch for the ICCAT area presented in this report are made by cross-checking the logsheet data and the official total catch. Korea began developing its observer program for distant-water fisheries including tuna fisheries in 2002. In 2010, the NFRDI's observer program deployed 13 trained observers who carried out 16 trips on Korean distant-water fishing vessels in the major oceans including the Antarctic Ocean. For tuna fisheries in the Atlantic, one observer was deployed on the Korean tuna longline vessel that operated in the central Atlantic. To help with the identification of the species of seabird**s,** sea turtles and sharks incidentally caught by tuna longline and purse seine fishing, guide books and posters summarizing information on these species have been distributed to fishing vessels along with the by-catch logbook sheet since 2008.

Mexico

Fishing for yellowfin tuna (*Thunnus albacares*) in the Gulf de Mexico was carried out by midwater vessels using longline. In this activity besides catching the target species, other species are also caught incidentally, such as: skipjack tuna (*Katsuwonus pelamis*), bigeye tuna (*Thunnus obesus*), Atlantic bluefin tuna (*Thunnus thynnus*), among others. Yellowfin tuna fishing is carried out throughout the year, with the major catches taken in the months of May, June and July. This fishery has certain economic importance at the national as well as the international level, since the export of fresh yellowfin tuna has been one of the important activities in the fishing sector and it has an important place in the economy. The total number of vessels that have maintained a continuous fishing activity has remained between 25 and 32 vessels during the 2001-2010 period. On the other hand, the total catches of yellowfin tuna and similar species amounted to 1,177 t in 2010, which was a decrease of 21% compared to 2009. The *Instituto Nacional de Pesca*-INAPESCA (National Fishing Institute) is in charge of carrying out the scientific research on these fishing resources, besides having the responsibility for the research and collection of statistics on longline tuna fishing in the Gulf of Mexico. The monitoring of this fishery has been strengthened thanks to the Programme of on-board observers who register biological, fishery, and fishing method information with observer coverage on each fishing trip.

Morocco

The fishing of tuna and tuna-like species attained a production of 10,722 metric tons (t) in 2010 compared to 13,956 t in 2009, i.e. a decrease of about 23% in terms of volume.

The major species caught along the Moroccan coasts are bluefin tuna, swordfish, bigeye tuna, yellowfin tuna, albacore, small tunas, and some shark species.

The collection of statistical data on catch and effort data is carried out in an exhaustive manner by the fisheries administration structures, such as the *Département des Pêches* (Department of Fishing) and the *Office National des Pêches* (National Office of Fishing), which are all along the Atlantic and Mediterranean coasts of Morocco. Monitoring of the export of fishing products is also carried out by the *Office des Changes* (the Exchange Office).

With regard to the scientific work, the *Institut National de Recherche Halieutique*-INRH (National Institute of Fisheries Research), through its Regional Centers (of which there are five) covering the entire Moroccan coast, reinforces the collection of biological data on the major species (bluefin tuna and swordfish). The Regional Center of the INRH in Tangiers serves as coordinator of the collection of all these data. In recent years, the monitoring of other species has been started, particularly tropical tunas (bigeye tuna among others), with an extension of the research work towards areas located to the south of Morocco.

Considerable progress has also been reported regarding the collection of biological data, as noted by the series of scientific documents as well as the Task II databases, submitted by Moroccan scientists at the various SCRS meetings for purpose of stock assessments on tunas.

Norway

Approximately 100 kg of Atlantic bonito (*Sarda sarda*) were landed and measured in Norway in 2010. A report entitled: “Atlantic bonito in Nordic waters: biology, distribution and feeding” has been written. There have been no catches and observations of Atlantic bluefin tuna (*Thunnus thynnus*) and Atlantic swordfish (*Xiphias gladius*) in Norway in 2010. Norway continuously works on historical data on tuna and tuna like species, and aims to put the data on these species into an ecosystem perspective. During 2010 new historical data on Atlantic bluefin tuna were found after considerable search in various places along the coast of Norway. The search for bluefin tuna material resulted in Task II data (weight, date of catch and catching area) from a total of 14 839 individuals during the time period 1950-1954. Norway participated in all major international scientific meetings concerning Atlantic bluefin tuna in 2010.

Russia

The fishery. In 2010 and 2011 the specialized purse seine tuna fishery was not carried out by Russian flag vessels. The trawl fishery vessels caught 605 t of tunas and 1042 t of bonito as by-catch from the Central-East Atlantic Ocean during 2010. In the first half of 2011, the trawl fishery vessels caught 640 t of tunas and 968 t of bonito.

Scientific research and statistics. In 2010, observers from AtlantNIRO collected biological material for tunas on board the trawlers in the Central-East Atlantic Ocean (the area SJ71 according to ICCAT classification). The fish length and weight were measured, fish sex, gonads maturity stage and stomach fullness index were determined. The species of the group “little tunas” occurred in trawls as by-catch in amounts from few a individuals to several tens. Material on frigate tuna, bullet tuna, black skipjack and bonito was collected from 4,625 specimens for mass measurements and 2,738 specimens for biological analyses.

Implementation of ICCAT conservation and management measures. During the fishery in the areas where tunas and tuna-like species occur in catches, the ICCAT requirements and recommendations concerning restrictions in the tuna fishery and a ban imposed on fishing quoted species were observed.

Senegal

In 2010, the Senegalese industrial tuna fleet was comprised of 6 baitboats that mainly fish yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*) and skipjack tuna (*Katsuwonus pelamis*), and 1 longline vessel that targets swordfish. Furthermore, some artisanal fisheries (hand line, pole and line and purse seine) and the sport fishery catch billfishes (marlins, swordfish and sailfish) and small tunas (Atlantic black skipjack, mackerel, bonito, frigate tuna, etc.).

The total Senegalese baitboat catch in 2010 is estimated at 4606 tonnes (1168 t of yellowfin tuna, 2412 t of skipjack tuna, 844 t of bigeye). Catches have shown a decline as compared to 2009 (6720 t). This reduction is due to the decrease in fishing effort that went from 1574 fishing days in 2009 to 1220 in 2010. Longline catches in 2010 are estimated at 312 t (590 t in 2009). The catches are comprised mainly of swordfish, sharks and billfishes. As regards the artisanal fisheries, the catches of small tunas and tuna-like species reached 8719 t. Catches have shown an increase as compared to (5315 t). With regard to sport fishing, catches are estimated at 288 t in 2010 with an effort of 682 fishing trips.

Regular monitoring of the tuna fishing activities is assured by the CRODT team in place at the port of Dakar. The work consists of the collection of statistics on catches and fishing effort. This work is supplemented by information from different sources (factories, boat owners, Directorate of Marine Fishing, etc.). Some multi-species sampling is also carried out on industrial and artisanal fishing. Thanks to funds from the Enhanced Research Program on Billfish (EPBR), sampling of the billfish catches, effort and sizes has been intensified at the major landing centers of the artisanal fishery.

Turkey

During the course of 2010, the total catch of tuna and tuna-like fishes amounted to 10,546 t. In 2010, Turkey's total catches of bluefin tuna, albacore, Atlantic bonito and swordfish were 409.377 t, 402 t, 9,401 t, and 334 t, respectively. All bluefin catch was caught by purse seiners, the majority of which have an overall length 30-50 m and 200-300 GRT. The fishing operations were conducted intensively off Antalya Bay and in the region between Antalya Gazi Paşa and Cyprus. In the Mediterranean, fisheries were conducted in the region between Cyprus-Turkey and in the region Cyprus-Syria. The highest bluefin tuna catch amount was obtained in June. Recommendations and resolutions imposed by ICCAT were transposed to national legislation and implemented. All conservation and management measures regarding bluefin tuna fisheries and farming are regulated by national legislation through notifications, considering ICCAT's related regulations. The Fisheries Information System has been updated in order to meet the requirements of data exchange at the national and regional levels. Major research activities in 2010 focused on albacore and swordfish.

United States

Total (preliminary) reported U.S. catch of tuna and swordfish, including dead discards, in 2010 was 9,190 tons (t), a decrease of about 5% from 9,632 t in 2009. Estimated swordfish catch (including estimated dead discards) slightly decreased from 2,878 t in 2009 to 2,845 t in 2010, and provisional landings from the U.S. fishery for yellowfin slightly decreased from 2,788 tons in 2009 to 2,648 tons in 2010. U.S. vessels fishing in the northwest Atlantic caught in 2010 an estimated 925 t of bluefin, a decrease of 303 t compared to 2009. When compared to the levels in 2009, provisional skipjack landings decreased by 65 t to 54 t in 2010, estimated bigeye landings increased by about 157 t to an estimated 673 t in 2010, and estimated albacore landings increased by 140 t to 328 t in 2010.

In 2010, the United States continued research on several tuna and tuna like species in several areas such as genetics, age and growth, tagging, habitat utilization, and assessment modeling among others. The U.S. Atlantic tagging program continued in 2010 and it tagged and released 1,865 billfishes (including swordfish) and 431 tunas during the year. The U.S. Pelagic Observer Program in 2010 had a target coverage of 8% of the sets of the fleet; however, the expanded observer coverage in the Gulf of Mexico during the bluefin tuna spawning season continued this year observing approximately 58% of the longline sets during this period. The bottom longline observer program was also active from January to December 2010, and total of 161 hauls on 105 trips were observed.

Uruguay

In 2010 fishing effort in the tuna fleet was reduced. The majority of the vessels were less than 27 m in length and target mainly swordfish and tunas. The total catch (preliminary) landed and reported in 2010 was approximately 654 tons.

Various activities were carried out in 2010 related to statistics, research and management. Some of these activities are carried out jointly with other national and international institutions. In 2010, independent research continued on board the DINARA research vessel to collect more detailed information on the pelagic oceanic species, experiments on mitigation measures, etc.

The research was carried out mainly on information from the Observers Programme (PNOFA) and during 2010 data obtained on the research vessel were integrated. PANOFA covered part of the activity of the national fleet in 2010 and 100% of the deep longline fleet. The tagging program continued and approximately 100 fish were tagged. Uruguay collaborated in various inter-sessional meetings presenting papers for the stock assessments and the data preparatory meetings (bigeye tuna, blue marlin, sharks, ecosystems, etc.).

Besides, various studies were carried out on biology, genetics, by-catch mitigation, among others, for many of the species under ICCAT mandate. The ICCAT Shark Identification Guide was completed and work was started on the second volume of the Guide.

In 2010, a survey project was continued to determine the possibility of bigeye tuna fishing in Uruguayan waters. This fishing was carried out by Japanese vessels which had 100% coverage by Uruguayan observers.

Venezuela

The Venezuelan fleet that fished in the Atlantic targeting pelagic resources was comprised of 69 industrial vessels in 2010: 53 longliners, 8 purse seiners and 8 baitboats. Besides, 35 artisanal vessels were registered that fish using driftnets. This year, landings of tunas and tuna-like species in the Atlantic Ocean amounted to 8.437 t. Of these, 98.2% were tunas, among which the most important species was yellowfin tuna (*T. albacares*) with 56,7%, while skipjack tuna (*K. pelamis*), black skipjack (*T. atlanticus*) and bigeye tuna (*T. obesus*) catches amounted for 25,1%, 3,9% and 3,4% of the catch, respectively. The by-catch was comprised of billfishes, notably sailfish (*Istiophorus albicans*) with 2,1% and blue marlin (*Makaira nigricans*) with 1,6% and sharks whose landings represented 1,7%. The majority of the landings (61,2%) are from the purse seine fishery, 12,9% from baitboat, 22,5% from longline and 3,3% from the artisanal fisheries. In 2010 research continued on the fishery for large pelagic species, including tunas, billfishes and sharks. The program of scientific observers on board industrial longline vessels continued as did the coverage of the sport fishing tournaments along the central coast of Uruguay.

− ***Cooperating Parties, Entities or Fishing Entities***

Chinese Taipei

In 2010, the total number of longline vessels authorized to operate in the Atlantic Ocean was 117, which included 67 vessels authorized to target bigeye tuna and 50 vessels authorized to target albacore. The total catch of tuna and tuna-like species of the longline fleet was estimated to be 31,007 metric tons (t) in 2010. Tropical tunas (bigeye tuna, 13189 t and yellowfin tuna, 824 t) were the most dominant species caught accounting for 45% of the total catch, and albacore (12,562 t) accounted for 41%. The Fisheries Agency has set catch quotas for Atlantic bigeye tuna, northern and southern Atlantic albacore, and for by-catch species, namely swordfish, blue marlin and white marlin. Catches of these species were well below catch limits allocated by the ICCAT for 2010. All Chinese Taipei longline vessels operating in the Atlantic Ocean were equipped with satellite tracking devices (Vessel Monitoring System, VMS) on board. Statistics (fleets characteristics/Task I/Task II/size/observer by-catch data) were submitted to the ICCAT Secretariat within the required timeframe. In 2010, 18 observers were placed on fishing vessels in the Atlantic Ocean, and the observer coverage was above the requirement set by ICCAT. The research programs for 2010 conducted by scientists included stock assessments, standardizations of catch-per-unit-effort on bigeye tuna, swordfish, albacore and blue marlin (and other incidental catch species), shark fin ratio, shark by-catch re-estimation, incidental catch rate and mortality rate by sighting of seabirds, sea turtles and cetaceans. The research results were presented at the regular meeting and inter-sessional working group meetings of the SCRS.

8. Executive Summaries on species

The Committee reiterated that in order to achieve a more rigorous understanding of these Executive Summaries from a scientific point of view, the previous Executive Summaries should be consulted, as well as the corresponding Detailed Reports which are published in the *Collective Volume of Scientific Papers.*

The Committee also pointed out that the texts and tables of these Summaries generally reflect the information available in ICCAT immediately prior to the SCRS plenary sessions, since they were prepared during the meetings of the Species Groups. Therefore, the catches reported to ICCAT during or after the SCRS meeting cannot be included in these Summaries.

8.1 YFT – YELLOWFIN TUNA

A stock assessment for yellowfin tuna was conducted in 2011, at which time catch and effort data through 2010 were available **(YFT-Table 1)**. Readers interested in a more complete summary of the state of knowledge on yellowfin tuna should consult the detailed report of the 2011 ICCAT Stock Assessment of Atlantic Yellowfin Tuna (SCRS/2011/020).

Other information relevant to yellowfin tuna is presented elsewhere in this SCRS Report:

- The Tropical Tunas Work Plan **(Appendix 5)** includes plans to address research and assessment needs for yellowfin tuna.

YFT-1. Biology

Yellowfin tuna is a cosmopolitan species distributed mainly in the tropical and subtropical oceanic waters of the three oceans. The sizes exploited range from 30 cm to 170 cm FL; maturity occurs at about 100 cm FL. Smaller fish (juveniles) form mixed schools with skipjack and juvenile bigeye, and are mainly limited to surface waters, while larger fish form schools in surface and sub-surface waters. The main spawning ground is the equatorial zone of the Gulf of Guinea, with spawning primarily occurring from January to April. Juveniles are generally found in coastal waters off Africa. In addition, spawning occurs in the Gulf of Mexico, in the southeastern Caribbean Sea, and off Cape Verde, although the relative importance of these spawning grounds is unknown. Although such separate spawning areas might imply separate stocks or substantial heterogeneity in the distribution of yellowfin tuna, a single stock for the entire Atlantic is assumed as a working hypothesis. This assumption is based upon information such as observed transatlantic movements (from west to east) indicated by conventional tagging and longline catch data that indicates yellowfin are distributed continuously throughout the entire tropical Atlantic Ocean. However, movement rates and timing, routes, and local residence times remain highly uncertain. In addition, some electronic tagging studies in the Atlantic as well as in other oceans suggest that there may be some degree of extended local residence times and/or site fidelity. Natural mortality is assumed to be higher for juveniles than for adults; this is supported by tagging studies for Pacific and Indian Ocean yellowfin. Uncertainties remain as to the scale of these natural mortality rates. Males are predominant in the catches of larger sized fish (over 145 cm), which could be explained if females experience a higher natural mortality rate (perhaps as a consequence of spawning). On the other hand, females are predominant in the catches of intermediate sizes (120 to 135 cm), which could support a hypothesis of distinct growth curves between males and females, with females having a lower asymptotic size than males. These uncertainties in both natural mortality and growth have important implications for stock assessment.

Growth rates have been described as relatively slow initially, increasing at the time the fish leave the nursery grounds; this characterization is supported by results size frequency distributions as well as from tagging data. Nevertheless, questions remain concerning the most appropriate growth model for Atlantic yellowfin tuna; this discrepancy in growth models could have implications for stock assessments.

The younger age classes of yellowfin tuna exhibit a strong association with FADs (natural or artificial fish aggregating devices/floating objects). The Committee noted that this association with FADs, which increases the vulnerability of these smaller fish to surface fishing gears, may also have a negative impact on the biology and on the ecology of yellowfin due to changes in feeding and migratory behaviors.

YFT-2. Fishery indicators

Overall Atlantic catches declined by nearly half from the peak catches of 1990 (194,000 t) to the lowest level in nearly 40 years (100,000 t) in 2007, although catches have increased by about 10% from that level in recent years (a provisional 108,343 t was estimated for 2010 at the time of the assessment; 107,546 t was reported as of the SCRS Plenary session).

In the eastern Atlantic, purse seine catches declined by 60% from 128,729 t in 1990 to 50,392 t in 2007, but then increased by about 40% from that level to 69,953 t in 2010 **(YFT-Table 1; YFT-Figure 2)**. Baitboat catches declined by more than half from 1990 to 2007 (from 19,648 t to 8,896 t), and have since fluctuated at about that level. Longline catches, which were 10,253 t in 1990, have fluctuated since between 5,790 t and 14,638 t and were 13,437 t in 2007 (a 30% increase from 1990), but have steadily declined since to a level of 5,834 t in 2010.
In the western Atlantic, purse seine catches (predominantly from Venezuela) declined by more than 90% from a peak in 1994 to 2009 (from 19,612 t to 1,365 t), the lowest level in more than 30 years, before reversing the

trend by increasing to 4,219 t in 2010. Baitboat catches also reached a nearly 30 year low (886 t) in 2008, declining nearly 90% from 7,094 t in 1994, before increasing again to 1,436 t in 2010. Longline catches, which were 11,790 t in 1994, have fluctuated since between 10,059 t and 16,019 t, were 12,640 t in 2010.

The most recent available catch distribution is given in **YFT-Figure 1.** However, it should be noted that official reports are not yet available from several Contracting and/or non-Contracting Parties, and some of these figures are based upon data provided by CPC scientists and/or derived from recent catch levels.

Purse seine catch levels had been held in check until 2007 in large part by a continued decline in the number of purse seine vessels in the eastern Atlantic. As a recent indicator, the number of purse seiners from the European and associated fleet operating in the Atlantic had declined from 44 vessels in 2001 to 25 vessels in 2006, with an average age of about 25 years (see **SKJ-Figure 7** for trends in number of vessels and carrying capacity**)**. Since then, however, the number of purse seiners has increased by about 40% to 35, as vessels have moved from the Indian Ocean to the Atlantic. At the same time, the efficiencies of these fleets have been increasing, particularly as the vessels which had been operating in the Indian Ocean tend to be newer and with greater fishing power and carrying capacities. Overall carrying capacity of the total purse seine fleet in 2010 has increased to about the same level as in the 1990s and FAD based fishing has accelerated more rapidly than free school fishing (although both have substantially increased), with the number of sets on FADs reaching levels not seen since the mid 1990s.

Unreported purse seine catches were estimated by comparing monitored landings in West African ports and cannery data to catches reported to ICCAT. Estimates of unreported purse seine catches are large and increasing since 2006 and now may exceed 20,000 t for the three main species of tropical tunas. The Committee expressed the need for countries and the involved industry in the region to cooperate to estimate and report these catches correctly to ICCAT. These estimates have not been incorporated into assessments (although the sensitivity of stock status estimates to the inclusion of these catch estimates was evaluated at the 2011 yellowfin tuna stock assessment meeting). These estimates of unreported catch are not included in the total catch estimates presented in this report. The magnitudes of these estimates of unreported catch, however, are likely to influence the assessments and the resulting perception of stock status.

Available catch rate series from purse seine data, after an initial period of apparent declines, showed high variability without clear trend in recent years **(YFT-Figure 3)**. Baitboat catch rate trends **(YFT-Figure 4)** also exhibit large fluctuations, with a somewhat declining overall trend. Such large fluctuations may reflect changes in local availability and/or fishing power, which do not necessarily reflect stock abundance trends. Standardized catch rates for the longline fisheries **(YFT-Figure 5)** generally show a declining trend until the mid-1990s, and have fluctuated without clear trend since.

The average weight trends by fleet (1970-2010) are shown in **YFT-Figure 6**. The recent average weight in European purse seine catches, which represent the majority of the landings, has declined to about half of the average weight of 1990. This decline is at least in part due to changes in selectivity associated with fishing on floating objects beginning in the 1990s. A declining trend is also reflected in the average weight of eastern tropical baitboat catches. Longline mean weights have been more variable.

Apparent changes in selectivity can also be seen in the overall trends in catch at age shown in **YFT-Figure 7**. The variability in overall catch at age is primarily due to variability in catches of ages 0 and 1. These ages are generally taken by the surface fisheries around FADs.

YFT-3. State of the stock

A full stock assessment was conducted for yellowfin tuna in 2011, applying both an age-structured model and a non-equilibrium production model to the available catch data through 2010. As has been done in previous stock assessments, stock status was evaluated using both production and age-structured models. Models used were similar in structure to those used in the previous assessment, however, other alternative model structures of the production model and the VPA were explored in sensitivity runs. These runs confirmed that some of the estimated benchmarks obtained from production models are somewhat sensitive to the assumption used that MSY is obtained at half of the virgin biomass. This assumption was used in the production models that contributed to benchmark estimates found in this report.

The estimate of MSY (~144,600 t) may be below what was achieved in past decades because overall selectivity has shifted to smaller fish (**YFT-Figure 7**); the impact of this change in selectivity on estimates of MSY is clearly seen in the results from age structured models (**YFT-Figure 8**). Bootstrapped estimates of the current status of yellowfin tuna based on each model, which reflect the variability of the point estimates given assumptions about uncertainty in the inputs, are shown in **YFT-Figure 9**. When the uncertainty around the point estimates from both models is taken into account, there was only an estimated 26% chance that the stock was not overfished and overfishing was not occurring in 2010 (**YFT-Figure 10)**.

In summary, 2010 catches are estimated to be well below MSY levels, stock biomass is estimated to most likely be about 15% below the Convention Objective and fishing mortality rates most likely about 13% below F_{MSY}. The recent trends through 2010 are uncertain, with the age-structured models indicating increasing fishing mortality rates and decline in stock levels over the last several years, and the production models indicating the opposite trends.

YFT-4. Outlook

Projections were made considering a number of constant catch scenarios, and the results from all models are summarized to produce estimated probabilities of achieving Convention Objective ($B>B_{MSY}$, $F<F_{MSY}$), for a given level of constant catch, for each year up to 2025 (**YFT-Figure 11** and **YFT-Table 2)**. Maintaining current catch levels (110,000 t) is expected to lead to a biomass somewhat above B_{MSY} by 2016 with a 60% probability. Higher catch levels would have a lower probability of achieving that goal and may require a longer time frame for rebuilding.

The overall catches of yellowfin tuna estimated for 2008-2010 were about 10% or more higher than the recent low of 2007. The relative contribution of purse seine gear to the total catch has increased by about 20% since 2006, which is related to the increasing purse seine effort trend. Estimates of fishable biomass trends from production modeling indicate a slow, continued rebuilding tendency, but estimates of spawning stock and total biomass trends from the age-structured assessment indicates recent decline and corresponding increasing F. In either case, continued increasing catches are expected to slow or reverse rebuilding.

YFT-5. Effects of current regulations

Recommendation 04-01 implemented a closure for the surface fishing in the area 0º-5ºN, 10ºW-20ºW during November in the Gulf of Guinea. Analyses of purse seine catches which have been presented to the Committee confirmed that the new closure has been less effective than previous moratoria in reducing the proportional catch of small fish harvest and avoiding growth overfishing. If management objectives include reductions in juvenile mortality, there is a general agreement that larger time/area moratoria are likely to be more precautionary than a smaller moratoria, providing that the moratoria are fully complied with.

In 1993, the Commission recommended “that there be no increase in the level of effective fishing effort exerted on Atlantic yellowfin tuna, over the level observed in 1992”. As measured by fishing mortality estimates from the age-structured model, effective effort in 2010 appeared to be near (estimates range from about 5% above to about 10% below) the 1992 levels.

YFT-6. Management recommendations

The Atlantic yellowfin tuna stock was estimated to be overfished in 2010. Continuation of current catch levels (110,000 t) is expected to lead to a biomass somewhat above B_{MSY} by 2016 with a 60% probability. Catches approaching 140,000 t or more would reduce the chances of meeting Convention Objectives below 50%, even after 15 years (2025). In addition, the Commission should be aware that increased harvest of yellowfin on FADs could have negative consequences for bigeye tuna in particular, as well as other by-catch species. Should the Commission wish to increase long-term sustainable yield, the Committee continues to recommend that effective measures be found to reduce FAD-related and other fishing mortality of small yellowfin.

If the provisional estimates of unreported purse seine catches are considered, estimates of current stock status and projections would be more pessimistic. It is especially important to implement effective full monitoring of the fleet for which the Committee has provisionally estimated unreported catch.

ATLANTIC YELLOWFIN TUNA SUMMARY

Maximum Sustainable Yield (MSY)		144,600[1] (114,200 - 155,100)
2010 Yield [2]		107,546 t
Relative Biomass	B_{2010}/ B_{MSY}	0.85 (0.61-1.12)[3]
Relative Fishing Mortality: $F_{current(2010)}/F_{MSY}$		0.87 (0.68-1.40)[3]

Management measures in effect:

- Effective fishing effort not to exceed 1992 level [Rec. 93-04].

NOTE: $F_{current(2010)}$ refers to F_{2010} in the case of ASPIC, and the geometric mean of F across 2007-2010 in the case of VPA. As a result of the constant trend in recruitment estimated by the VPA model, F_{MAX} is used as a proxy for F_{MSY} for VPA results. Relative biomass is calculated in terms of spawning stock biomass in the case of VPA and in fishable biomass in the case of ASPIC.

[1] Estimates (with 80% confidence limits) based upon results of both the non-equilibrium production model (ASPIC) and the age-structured model (VPA).

[2] Reported as of the SCRS Plenary session. The assessment was conducted using the available catch data through 2010. A provisional 108,343 t was estimated for 2010 at the time of the assessment.

[3] Median (10^{th}-90^{th} percentiles) from joint distribution of age-structured and production model bootstrap outcomes considered.

YFT-Table 1. Estimated catches (t) of yellowfin tuna (Thunnus albacares) by area, gear and flag. (v03, 2011-10-05).

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	as of Plenary 2009*	as of Plenary 2010*	as of Assess. 2009	as of Assess. 2010
TOTAL			146673	145361	136265	162247	193536	166901	163762	162753	172584	153251	153043	137218	148566	140366	136249	164650	140279	125590	119972	107234	106564	99619	109590	117340	107546	115671	108343
	ATE		108839	113379	101671	125345	160805	130004	126050	124009	124369	117977	119987	104877	117647	109656	101730	124327	110619	100608	88735	81166	78292	75452	91466	98326	85761	96663	86133
	ATW		37834	31982	34594	36902	32731	36897	37712	38745	48215	35274	33056	32341	30919	30710	34519	40323	29660	24982	31238	26068	28272	24167	18123	19008	21785	19008	22210
	MED		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6	0
Landings	ATE	Bait boat	15301	16750	16020	12168	19648	17772	15095	18471	15652	13496	13804	12907	17330	19256	13267	19071	13432	11513	15354	12012	10434	8896	11721	10949	8132	10949	8132
		Longline	5779	6624	8956	7566	10253	9082	6518	8537	14638	13723	14236	10495	13872	13561	11369	7570	5790	9075	11442	7317	7219	13437	8566	6321	5834	6321	6229
		Other surf.	2296	2932	2646	2586	2175	3748	2450	2122	2030	1989	2065	2136	1674	1580	2424	2074	1826	2540	2928	3062	3615	2726	1731	2843	1842	2843	1819
		Purse seine	85464	87074	74049	103025	128729	99402	101987	94880	92050	88770	89882	79339	84771	75260	74670	95612	89572	77481	59011	58776	57024	50392	69449	78213	69953	76550	69953
	ATW	Bait boat	2421	5468	5822	4834	4718	5359	6276	6383	7094	5297	4560	4275	5511	5349	5649	5315	6009	3764	4868	3867	2695	2304	886	1331	1436	1331	1436
		Longline	18490	14291	19046	17128	18851	13667	16594	11439	11790	11185	11882	11554	11671	13326	15760	14872	11921	10166	16019	14449	14249	13557	13192	13019	12640	13019	13065
		Other surf.	7101	5557	3692	3293	2362	3457	3483	4842	9719	12454	5830	4801	4581	5345	5241	7027	3763	6445	7134	5118	6880	5959	1973	3285	3482	3285	3482
		Purse seine	9822	6665	6034	11647	6800	14414	11359	16081	19612	6338	10784	11710	9157	6523	7870	13108	7966	4607	3217	2634	4442	2341	2067	1365	4219	1365	4219
	MED	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6	0
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discards	ATW	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	167	0	0	0	0	0	0	5	6	5	9	8	9	8
	ATE	Angola	59	51	246	67	292	510	441	211	137	216	78	70	115	170	35	34	34	34	34	111	0	405	98	98	98	98	98
		Belize	0	0	0	0	0	0	0	0	0	1	0	3	0	0	5	0	0	0	0	0	0	0	0	0	273	0	273
		Benin	19	3	2	7	1	1	1	1	1	1	1	3	1	1	1	1	0	0	0	0	0	0	0	0		0	
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0		0	
		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Cape Verde	3326	2675	2468	2870	2136	1932	1426	1536	1727	1781	1448	1721	1418	1663	1851	1684	1802	1868	3236	7154	8112	4057	8413	3273	4492	3273	4492
		Cayman Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		China P.R.	0	0	0	0	0	0	0	139	156	200	124	84	71	1535	1652	586	262	1033	1030	1112	1056	1000	365	214	169	214	169
		Chinese Taipei	254	193	207	96	2244	2163	1554	1301	3851	2681	3985	2993	3643	3389	4014	2787	3363	4946	4145	2327	860	1707	807	1180	532	1180	532
		Congo	20	15	15	21	22	17	18	17	14	13	12	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Cuba	1332	1295	1694	703	798	658	653	541	238	212	257	269	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Curaçao	0	0	0	0	0	0	0	0	0	0	3183	6082	6110	3962	5441	4793	4035	6185	4161	0	1939	1368	7351	6293	5302	6293	5302
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	2	0	0	673	213	99	302	565	175	482	216	626	90	470	90	470
		EU.España	61878	66093	50167	61649	68603	53464	49902	40403	40612	38278	34879	24550	31337	19947	24681	31105	31469	24884	21414	11795	11606	13584	24409	32793	25560	32793	25560
		EU.Estonia	0	0	0	0	0	234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		EU.France	17756	17491	21323	30807	45684	34840	33964	36064	35468	29567	33819	29966	30739	31246	29789	32211	32753	32429	23949	22672	18940	11330	16115	18923	20280	17261	20280
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0		0	
		EU.Latvia	0	0	0	0	0	255	54	16	0	55	151	223	97	25	36	72	334	334	334	334	334	0	0	0		0	
		EU.Lithuania	0	0	0	0	0	332	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		EU.Portugal	295	278	188	182	179	328	195	128	126	231	288	176	267	177	194	4	6	4	5	16	274	865	300	990	554	990	554
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	
		Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0		0	
		Gabon	0	0	0	0	0	0	0	12	88	218	225	225	295	225	162	270	245	44	44	44	44	0	0	0		0	
		Gambia	0	0	0	0	2	16	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Georgia	0	0	0	0	0	25	22	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Ghana	11821	10830	8555	7035	11988	9254	9331	13283	9984	9268	11720	15437	17657	25268	17662	33546	23674	18457	15054	17493	11931	15463	14250	18355	12512	18355	12512
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2906	5265	3461	3736	2603	3124	2603	3124
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	892	892	892	892
		Guinée Conakry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	730	0	730
		Honduras	0	0	0	0	0	0	2	0	0	4	3	4	3	0	0	0	0	0	0	0	0	0	0	0		0	
		Japan	3634	4521	5808	5882	5887	4467	2961	2627	4194	4770	4246	2733	4092	2101	2286	1550	1534	1999	5066	3088	4206	8496	5266	3563	3037	3563	3037
		Korea Rep.	965	1221	1248	1480	324	259	174	169	436	453	297	101	23	94	142	3	8	209	984	95	4	303	983	375	324	375	324
		Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	208	73	73	0	0	0	0	0	0		0	
		Maroc	2266	1529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	79	108	95	183	95	102	110	110	44	110	44
		Mixed flags (FR+ES)	138	933	932	825	1056	2220	2455	2750	1898	1172	1166	981	1124	1369	1892	1427	599	992	1052	933	1063	655	626	459	533	459	533
		NEI (ETRO)	0	2077	3140	5436	12601	4856	10921	9875	8544	8970	9567	6706	7225	5418	5448	10169	8209	5396	4294	1781	219	0	0	0		0	
		NEI (Flag related)	150	285	206	280	1115	2310	1315	1157	2524	2975	3588	3368	5464	5679	3072	2090	133	466	0	0	0	0	0	0		0	
		Namibia	0	0	0	0	0	0	0	0	35	14	72	69	3	147	59	165	89	139	85	135	59	28	11	1	9	1	9
		Norway	813	418	493	1787	1790	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0	
		Panama	1944	1858	1239	901	1498	7976	8338	10973	12066	13442	7713	4293	2111	1315	1103	574	1022	0	1887	6170	8557	9363	6175	5813	5048	5813	5048
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	126	173	86	0	50	9	68	13	30	88	53	10	21	10	21
		Russian Federation	0	0	0	0	0	3200	1862	2160	1503	2936	2696	4275	4931	4359	737	0	0	0	0	4	42	211	42	33	**0**	33	
		S. Tomé e Príncipe	180	178	298	299	164	187	170	181	125	135	120	109	124	114	122	122	122	122	134	145	137	0	160	165	169	165	169
		Senegal	0	0	0	2	90	132	40	19	6	20	41	208	251	834	252	295	447	279	681	1301	1262	819	588	1279	1212	1279	1212
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	11	0	0	0	0	0	0	0		0	
		South Africa	55	68	137	671	624	52	69	266	486	183	157	116	240	320	191	342	152	298	402	1156	1187	1063	351	303	235	303	235
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	14	0	101	209	83	74	28	74	28
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		U.S.S.R.	1851	1275	3207	4246	3615	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		UK.Sta Helena	82	93	98	100	92	100	166	171	150	181	151	109	181	116	136	72	9	0	0	0	344	177	97	104	65	104	65

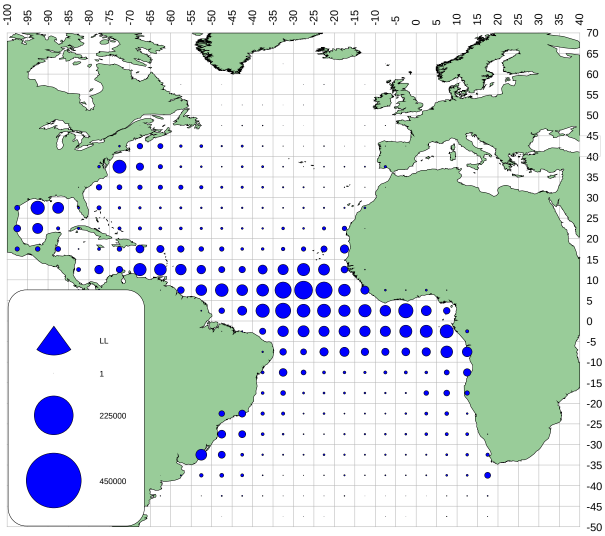
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
		Ukraine	0	0	0	0	0	215	0	0	0	0	0	0	0
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0
		Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0
	ATW	Argentina	23	18	66	33	23	34	1	0	0	0	0	0	0
		Barbados	39	57	236	62	89	108	179	161	156	255	160	149	150
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brasil	1837	2266	2512	2533	1758	1838	4228	5131	4169	4021	2767	2705	2514
		Canada	2	40	30	7	7	29	25	71	52	174	155	100	57
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	628
		Chinese Taipei	1156	709	1641	762	5221	2009	2974	2895	2809	2017	2668	1473	1685
		Colombia	211	258	206	136	237	92	95	2404	3418	7172	238	46	46
		Cuba	2081	1062	98	91	53	18	11	1	14	54	40	40	15
		Curaçao	150	160	170	170	170	150	160	170	155	140	130	130	130
		Dominica	0	0	0	0	18	12	23	30	31	9	0	0	0
		Dominican Republic	0	0	0	0	0	0	0	0	0	0	0	0	89
		EU.España	0	0	1	3	2	1462	1314	989	7	4	36	34	46
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0
		FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0
		Grenada	506	186	215	235	530	620	595	858	385	410	523	302	484
		Jamaica	0	0	0	0	0	0	0	0	0	0	21	21	0
		Japan	2103	1647	2395	3178	1734	1698	1591	469	589	457	1004	806	1081
		Korea Rep.	853	236	120	1055	484	1	45	11	0	0	84	156	0
		Mexico	658	33	283	345	112	433	742	855	1093	1126	771	826	788
		NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0
		NEI (Flag related)	806	1012	2118	2500	2985	2008	2521	1514	1880	1227	2374	2732	2875
		Panama	5278	3289	2192	1595	2651	2249	2297	0	0	0	0	0	0
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	36
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0
		St. Vincent and Grenadines	0	0	0	1	40	48	22	65	16	43	37	35	48
		Sta. Lucia	125	76	97	70	58	49	58	92	130	144	110	110	276
		Trinidad and Tobago	0	0	1	11	304	543	4	4	120	79	183	223	213
		U.S.A.	9938	9661	11064	8462	5666	6914	6938	6283	8298	8131	7745	7674	5621
		UK.Bermuda	44	25	23	22	15	17	42	58	44	44	67	55	53
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0
		Uruguay	270	109	177	64	18	62	74	20	59	53	171	53	88
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0
		Venezuela	11755	11137	10949	15567	10556	16503	13773	16663	24789	9714	13772	14671	13995
	MED	EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0
Discards	ATW	Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0

			1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*	2009	2010
		Ukraine	0	0	0	0	0	0	0	0	0	0	0		0	
		Vanuatu	0	0	0	0	0	0	24	145	483	450	331	26	331	421
		Venezuela	0	0	0	0	0	0	0	0	0	0	0		0	0
	ATW	Argentina	0	0	0	0	0	327	327	0	0	0	0		0	
		Barbados	155	155	142	115	178	211	292	197	154	156	79	129	79	129
		Belize	0	0	0	0	0	0	0	143	1164	1160	988	1785	988	1785
		Brasil	4127	6145	6239	6172	3503	6985	7223	3790	5468	2749	3313	3617	3313	3617
		Canada	22	105	125	70	73	304	240	293	276	168	53	166	53	166
		China P.R.	655	22	470	435	17	275	74	29	124	284	248	258	248	258
		Chinese Taipei	1022	1647	2018	1296	1540	1679	1269	400	240	315	211	292	211	292
		Colombia	46	46	46	46	46	46	46	46	0	0	0		0	
		Cuba	15	0	0	65	65	65	65	65	0	0	0		0	
		Curaçao	130	130	0	0	0	0	0	0	0	0	0		0	
		Dominica	80	78	120	169	119	81	119	65	103	124	102	110	102	110
		Dominican Republic	220	226	226	226	226	226	226	226	0	0	0		0	
		EU.España	30	171	0	0	0	0	0	1	84	81	69	27	69	27
		EU.France	0	0	0	0	0	0	0	0	0	0	0		0	
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	1		1	
		EU.Portugal	0	0	0	0	0	0	151	60	88	179	260	99	260	99
		FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0.2		
		Grenada	430	403	759	593	749	460	492	502	633	756	630	673	630	673
		Jamaica	0	0	0	0	0	0	0	0	0	0	0		0	
		Japan	1304	1775	1141	571	755	1194	1159	437	541	986	1431	1668	1431	1668
		Korea Rep.	0	0	0	0	0	0	580	279	270	10	52	56	52	56
		Mexico	1283	1390	1084	1133	1313	1208	1050	938	890	956	1211	916	1211	916
		NEI (ETRO)	0	0	36	0	0	0	0	0	0	0	0		0	
		NEI (Flag related)	1730	2197	793	42	112	0	0	0	0	0	0		0	
		Panama	5	0	0	0	0	0	0	2804	227	153	288	2134	288	2134
		Philippines	106	78	12	79	145	299	230	234	151	167	142	67	142	67
		Seychelles	0	32	0	0	0	0	0	0	0	0	0		0	
		St. Vincent and Grenadines	38	1989	1365	1160	568	4251	0	2680	2989	2547	2274	854	2274	854
		Sta. Lucia	123	134	145	94	139	147	172	103	82	106	97	223	97	223
		Trinidad and Tobago	163	112	122	125	186	224	295	459	615	520	629	788	629	788
		U.S.A.	7567	7051	6703	5710	7695	6516	5568	7091	5529	2473	2788	2648	2788	2648
		UK.Bermuda	59	31	37	48	47	82	61	31	30	15	41	37	41	37
		UK.British Virgin Islands	0	0	0	0	0	0	0	1	0	0	0		0	
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	1	0	0		0	
		Uruguay	45	45	90	91	95	204	644	218	35	66	76	122	76	122
		Vanuatu	0	0	0	0	0	681	689	661	555	873	816	323	816	748
		Venezuela	11187	10558	18651	11421	7411	5774	5097	6514	3911	3272	3198	4783	3198	4783
	MED	EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	6		6	
Discards	ATW	Mexico	0	0	0	0	0	0	0	5	6	5	9	8	9	8
		U.S.A.	167	0	0	0	0	0	0	0	0	0	0		0	

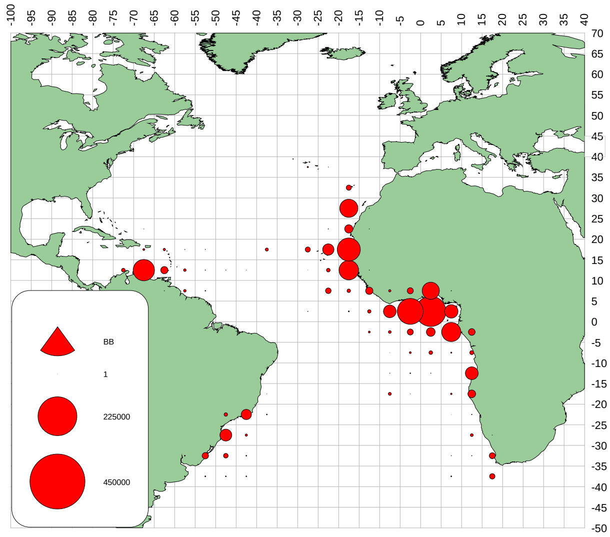
* Current Task I figures (2009 and 2010) where the shaded cells indicate which catches have changed since the assessment.

YFT-Table 2. Kobe II matrices giving the probability that the biomass will exceed the level that will produce MSY and the fishing mortality will fall below the fishing mortality rate that would maintain MSY, in any given year, for various constant catch levels based on combined model results.

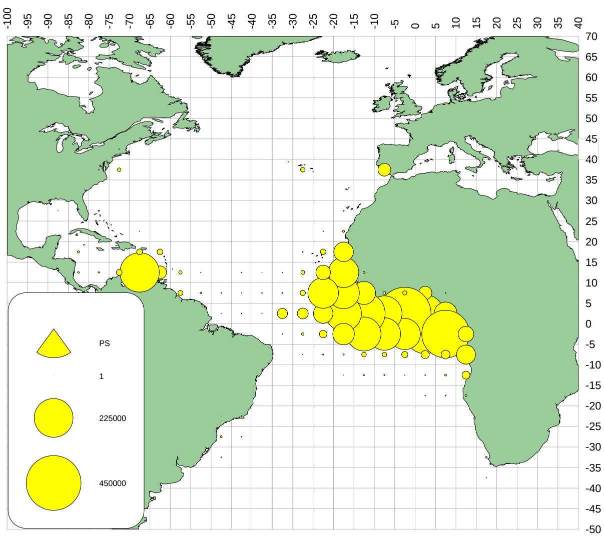
Constant Catch (t, in 1000s)	*Probability (%) that $B>B_{MSY}$ and $F<F_{MSY}$ in each year*													
	2012	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*
50	25	51	70	78	84	87	89	91	92	93	94	95	95	96
60	24	48	66	76	81	85	87	89	90	92	93	93	94	94
70	24	45	63	73	78	82	85	87	89	90	90	92	92	93
80	24	43	59	69	75	79	82	84	86	87	88	89	90	90
90	24	40	54	65	71	75	78	81	82	84	85	86	87	88
100	24	37	49	59	66	70	73	76	78	80	81	82	83	84
110	23	35	45	53	59	64	67	70	72	74	75	76	77	78
120	23	32	40	46	51	55	58	61	64	65	66	68	69	70
130	23	29	35	39	43	45	47	49	51	53	54	55	56	58
140	22	26	29	31	33	34	36	36	37	38	39	39	40	40
150	20	21	22	22	22	21	21	21	21	21	21	21	20	20



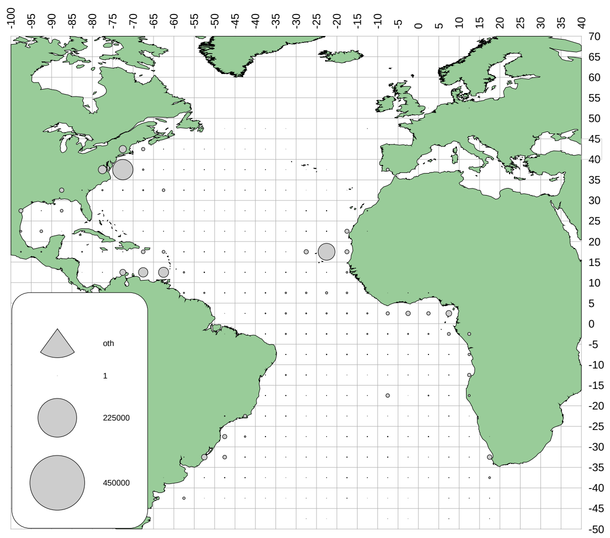
a. YFT (LL)



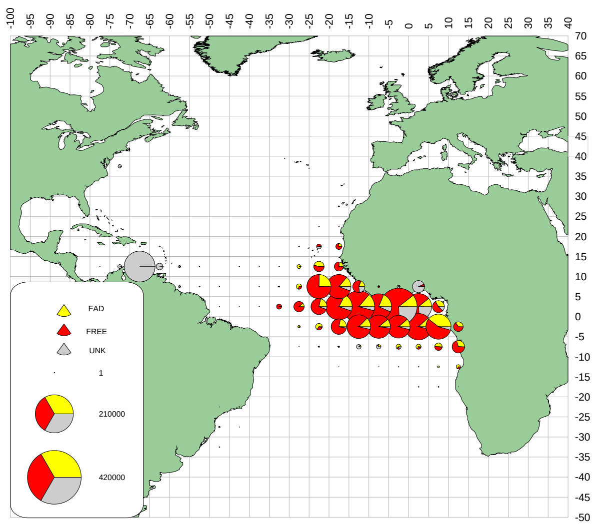
b. YFT (BB)



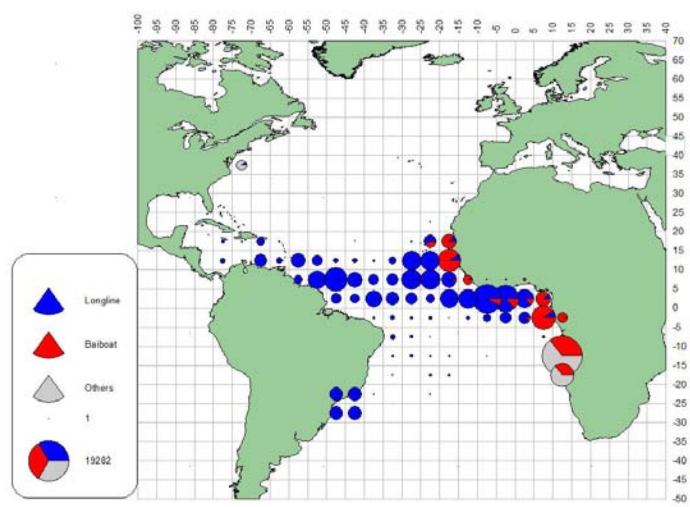
c. YFT (PS)



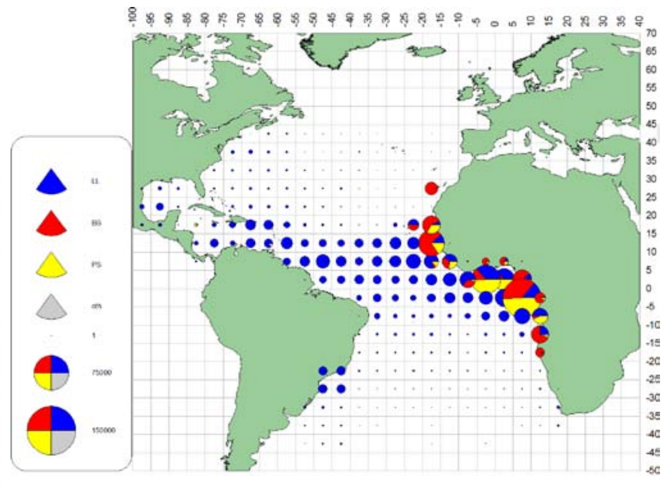
d. YFT (oth)



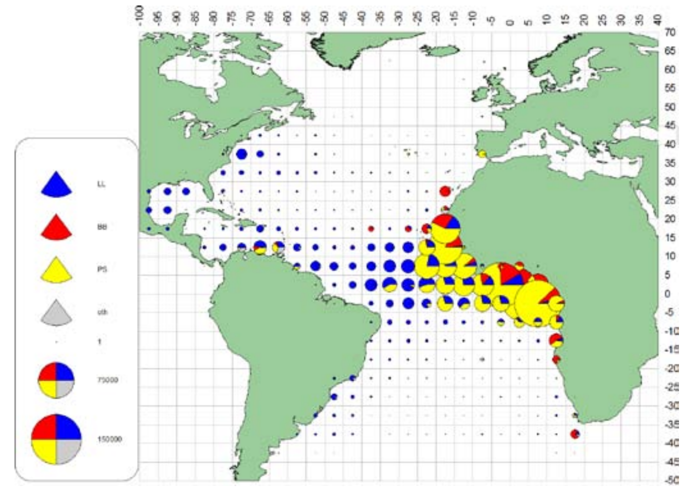
e. YFT (FAD/FREE 1991-09)



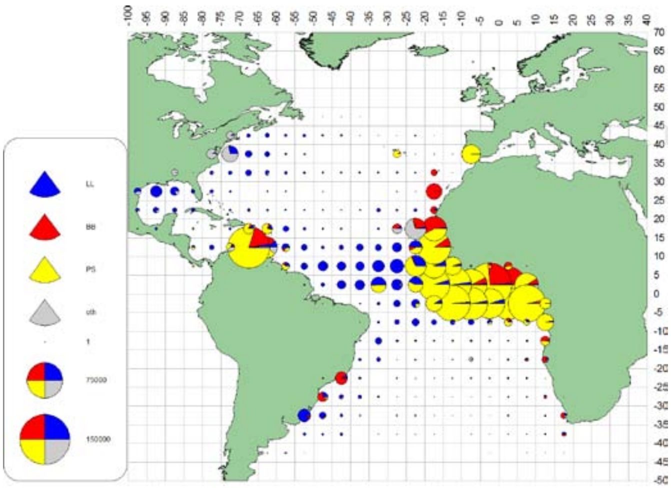
f. YFT(1950-59)



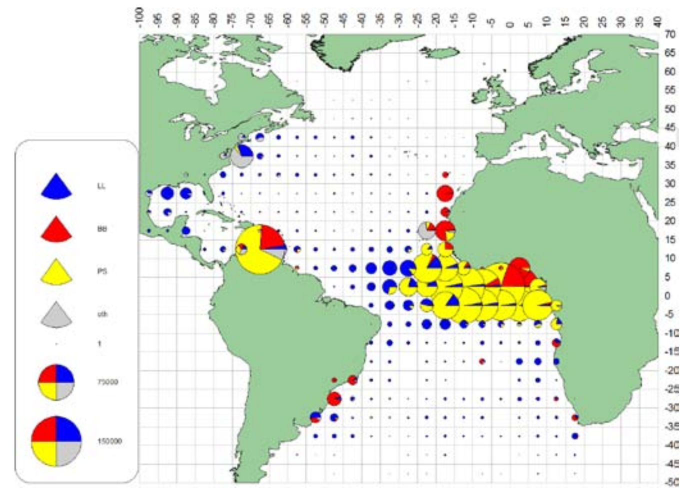
g. YFT(1960-69)



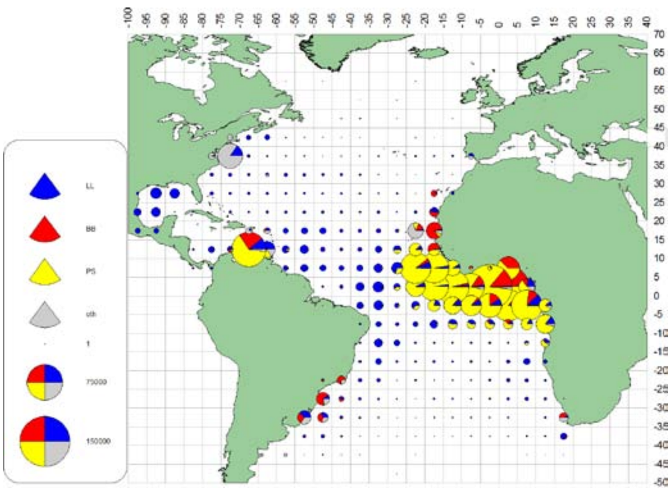
h. YFT(1970-79)



i. YFT(1980-89)

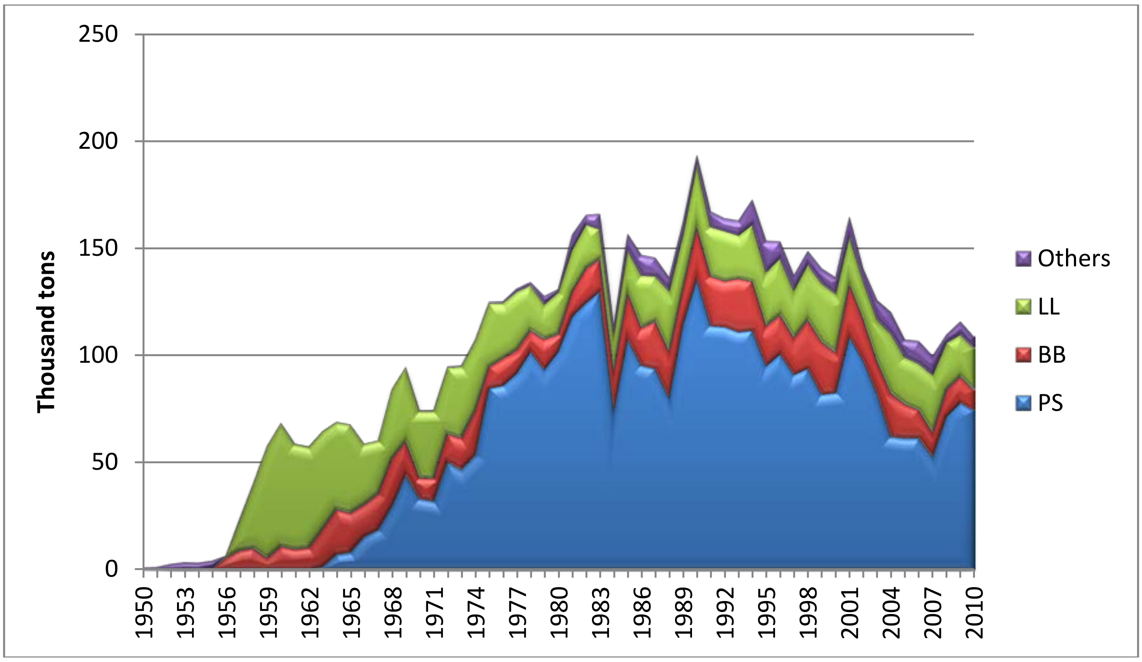


j. YFT(1990-99)

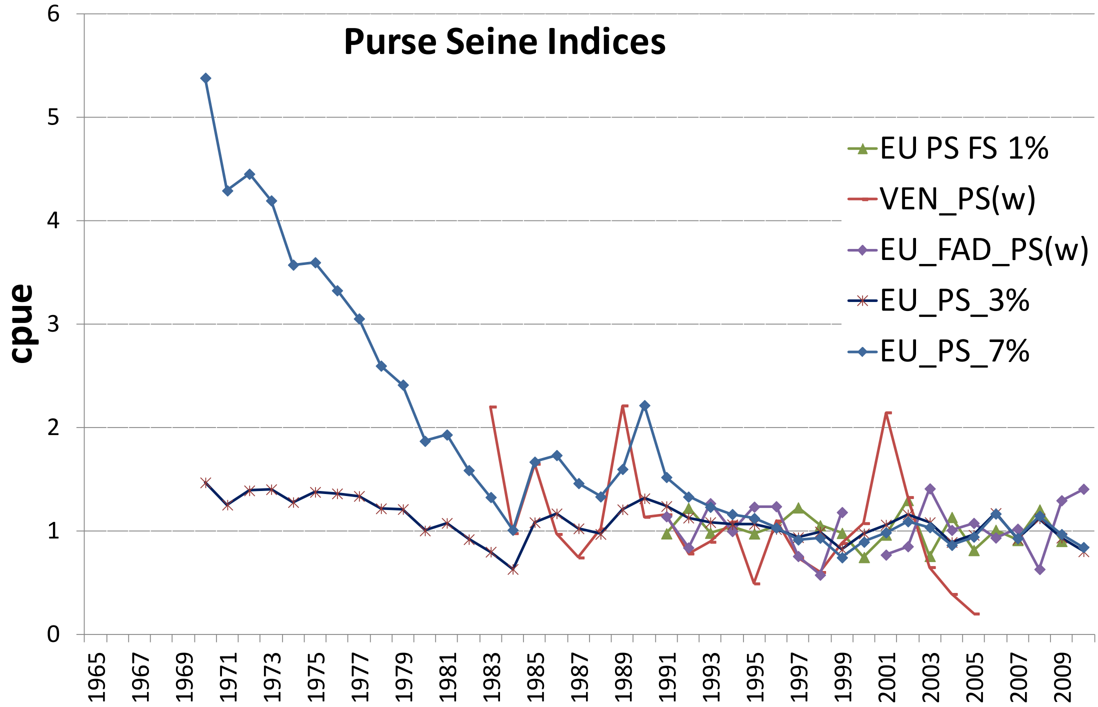


k. YFT (2000-09)

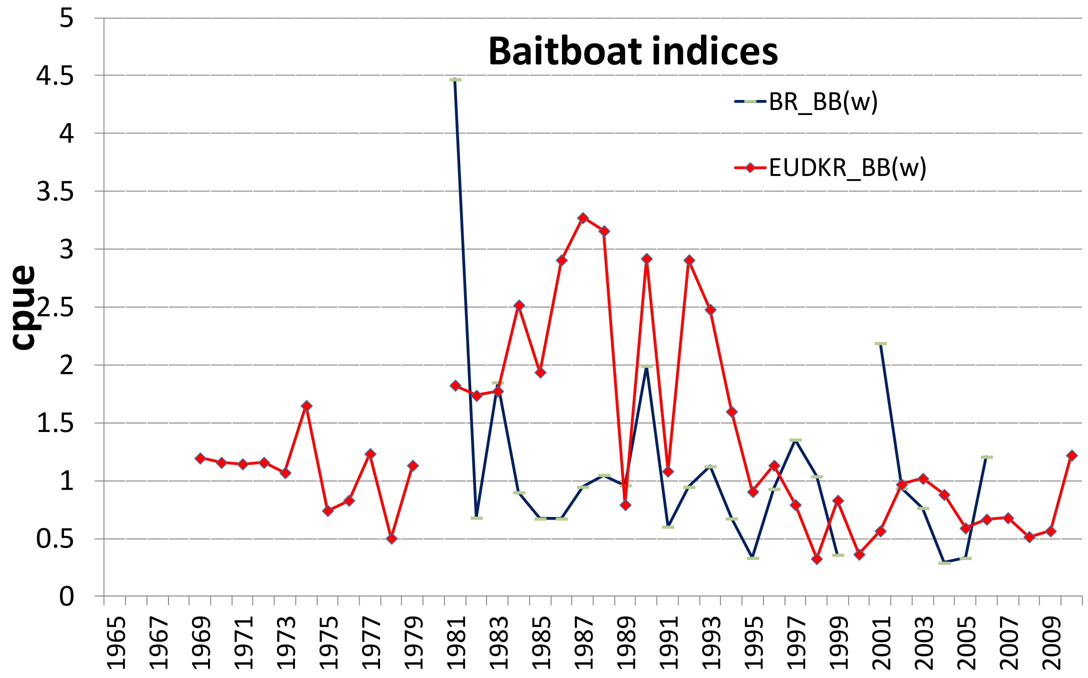
YFT-Figure 1. Geographical distribution of yellowfin tuna catches by major gears **[a-e]** and decade **[f-k]**. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.



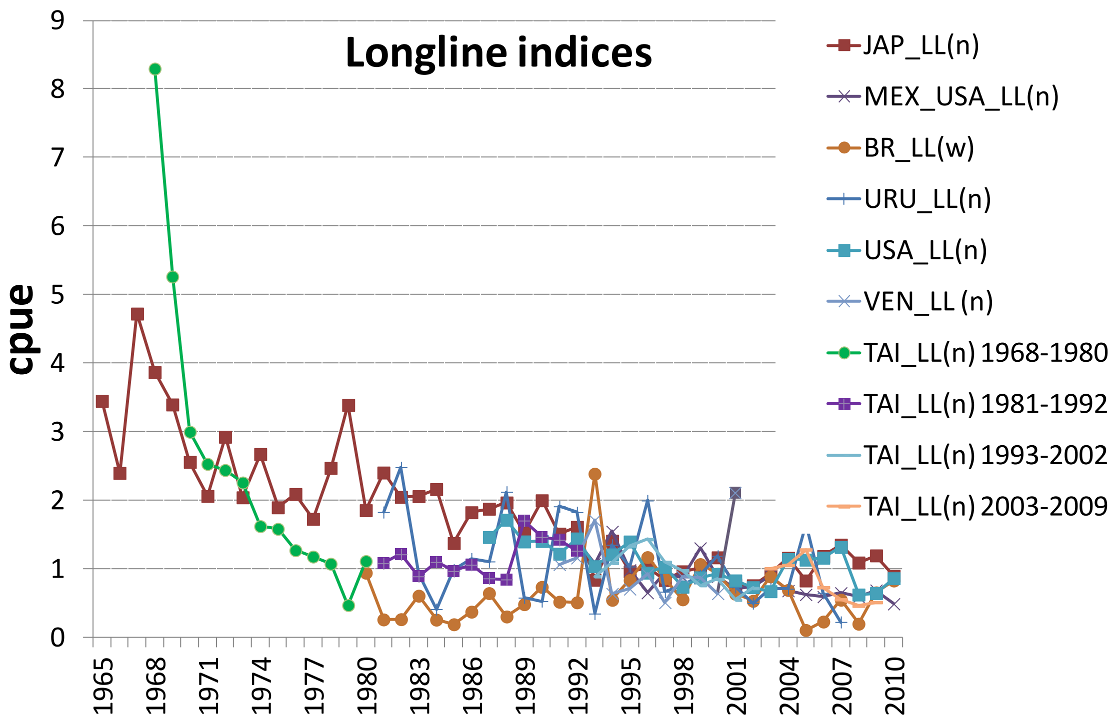
YFT-Figure 2. Estimated annual catch (t) of Atlantic yellowfin tuna by fishing gear, 1950-2010.



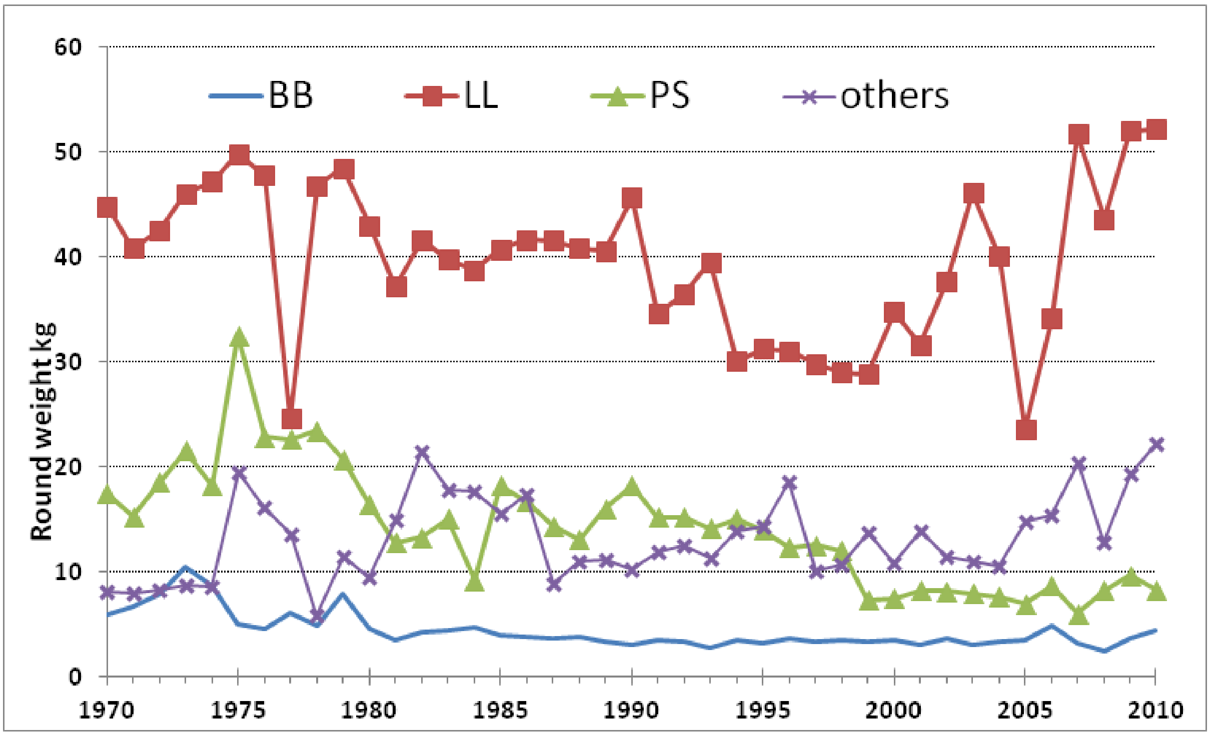
YFT-Figure 3. Yellowfin relative catch rate trends (both nominal and applying various annual increases in effectiveness) from purse seine fleets, in weight.

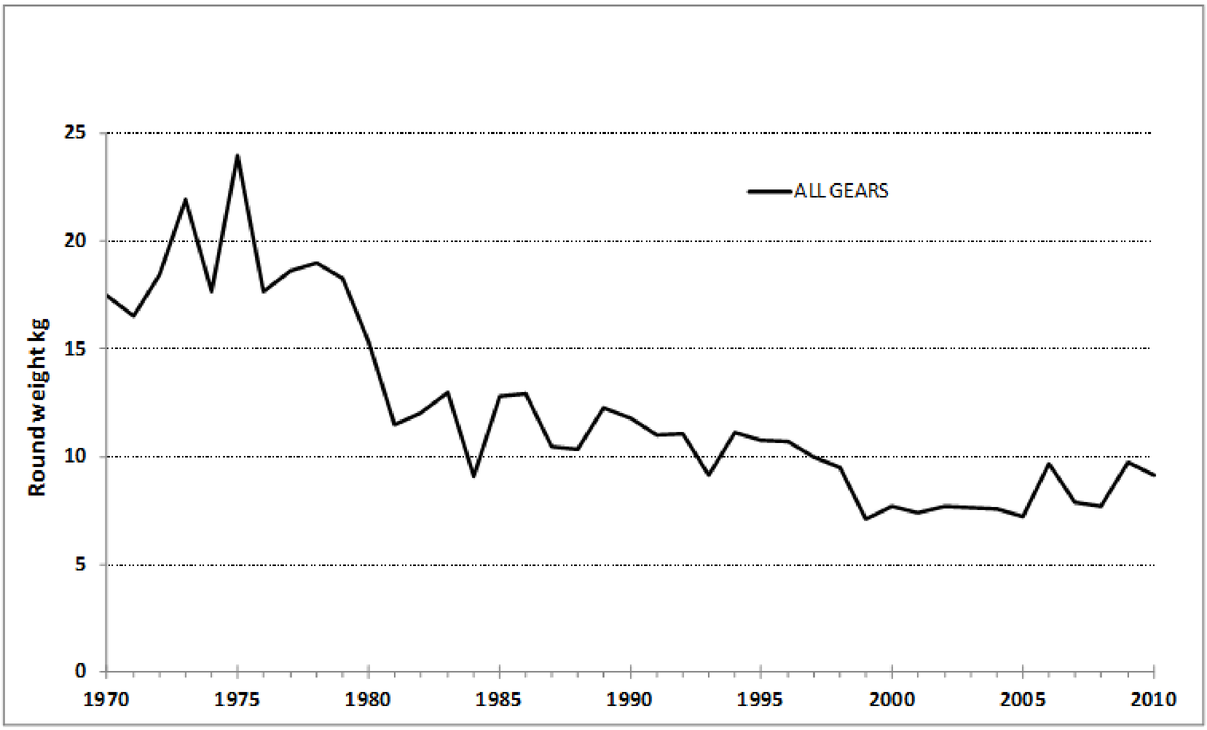


YFT-Figure 4. Yellowfin standardized catch rate trends from baitboat fleets, in weight.

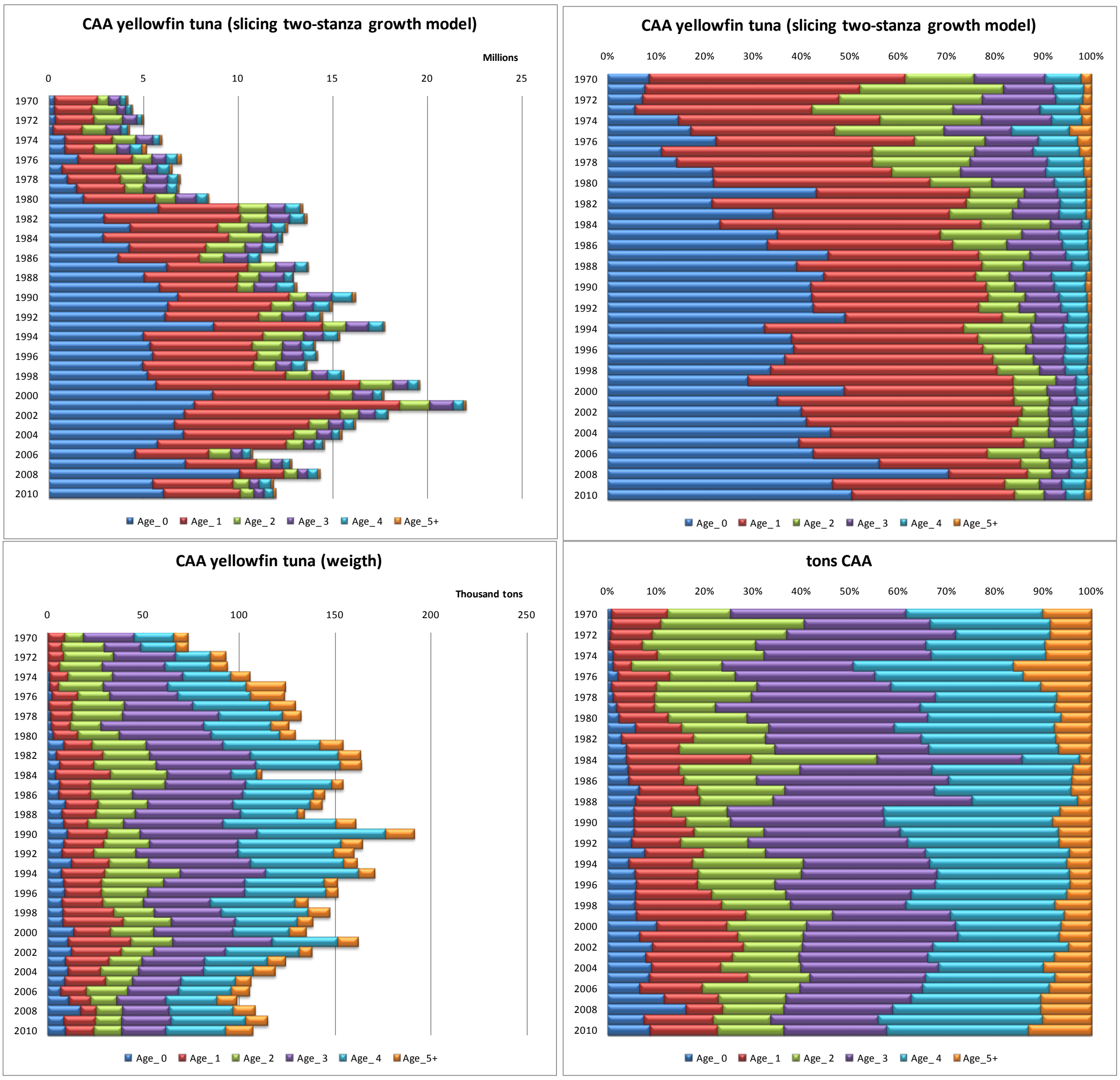


YFT-Figure 5. Yellowfin standardized catch rate trends from longline fleets, in weight and numbers.

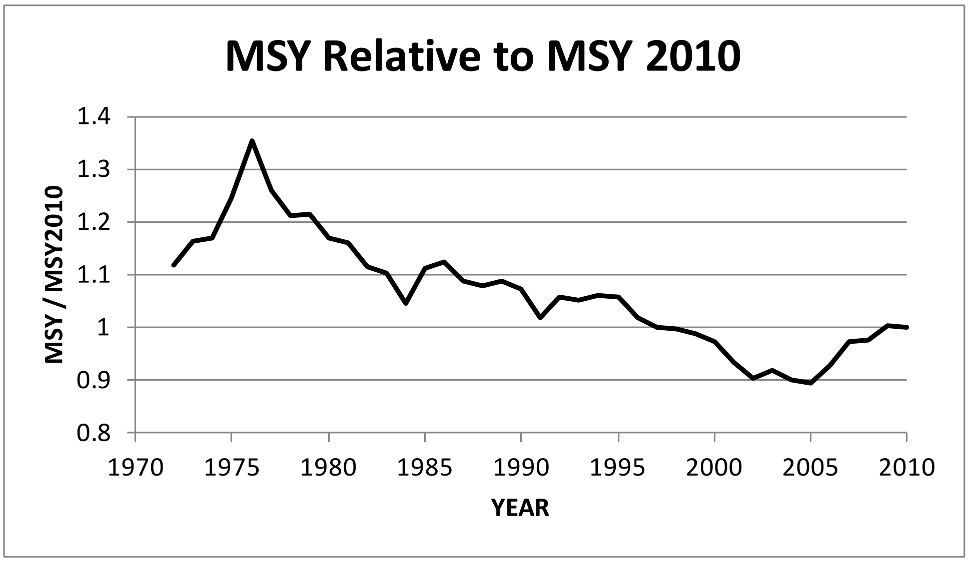




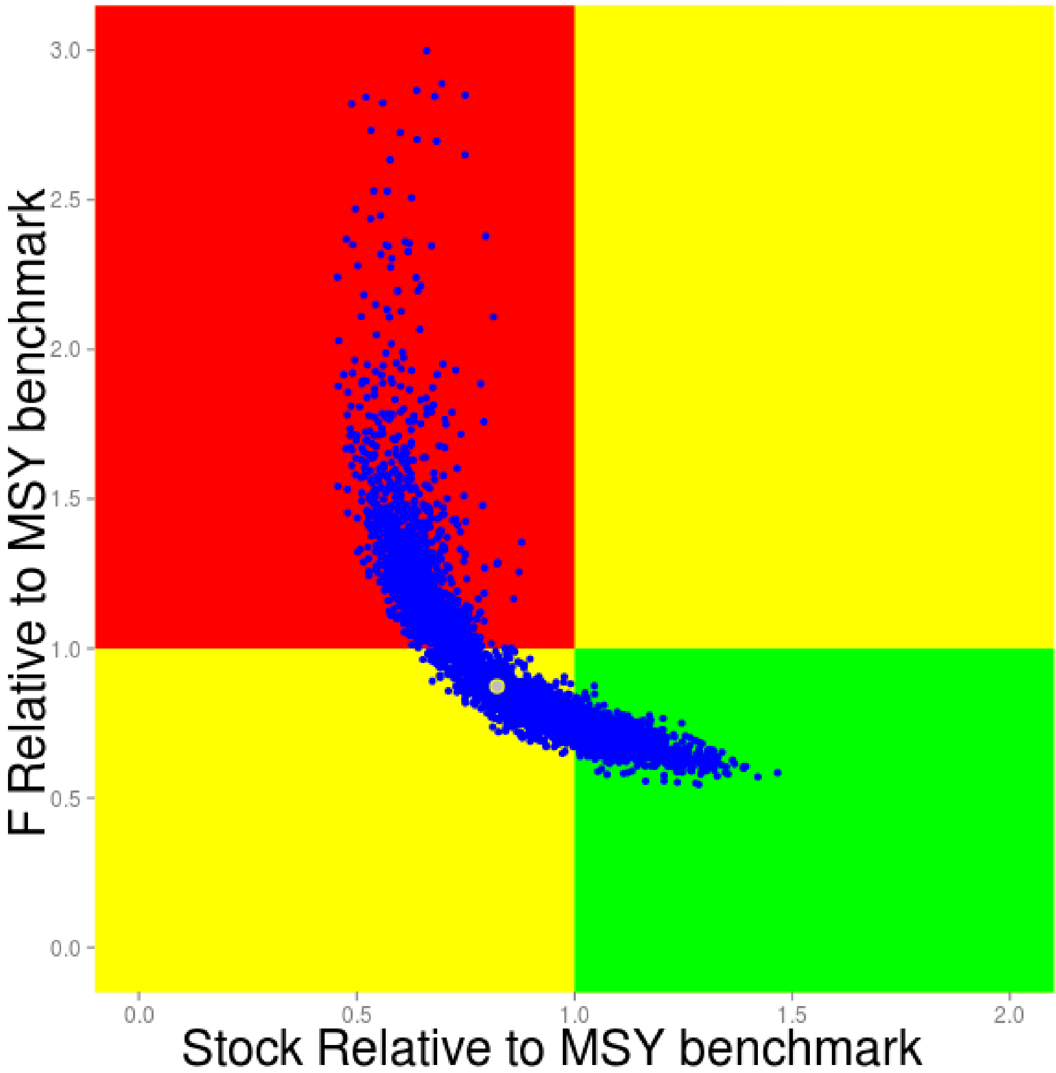
YFT-Figure 6. Trend in yellowfin tuna average weight by gear group (top) and total (bottom) calculated from available catch-at-size data. Purse seine averages are calculated across all set types (floating object and free school).



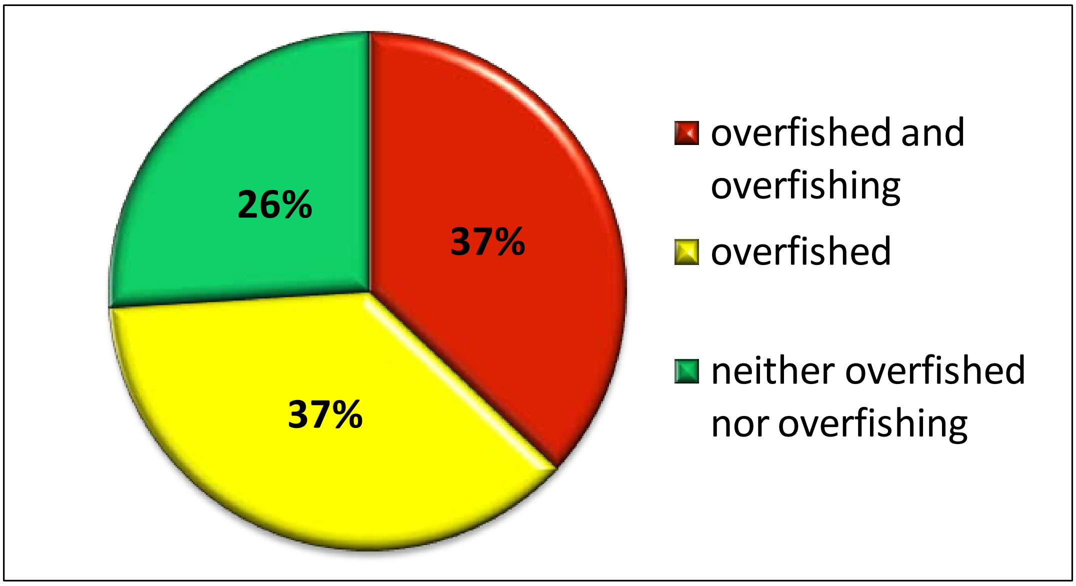
YFT-Figure 7. Distribution of Atlantic yellowfin catches by age (0-5+) in numbers of fish (top row) and in weight (bottom row) for 1970 – 2010.



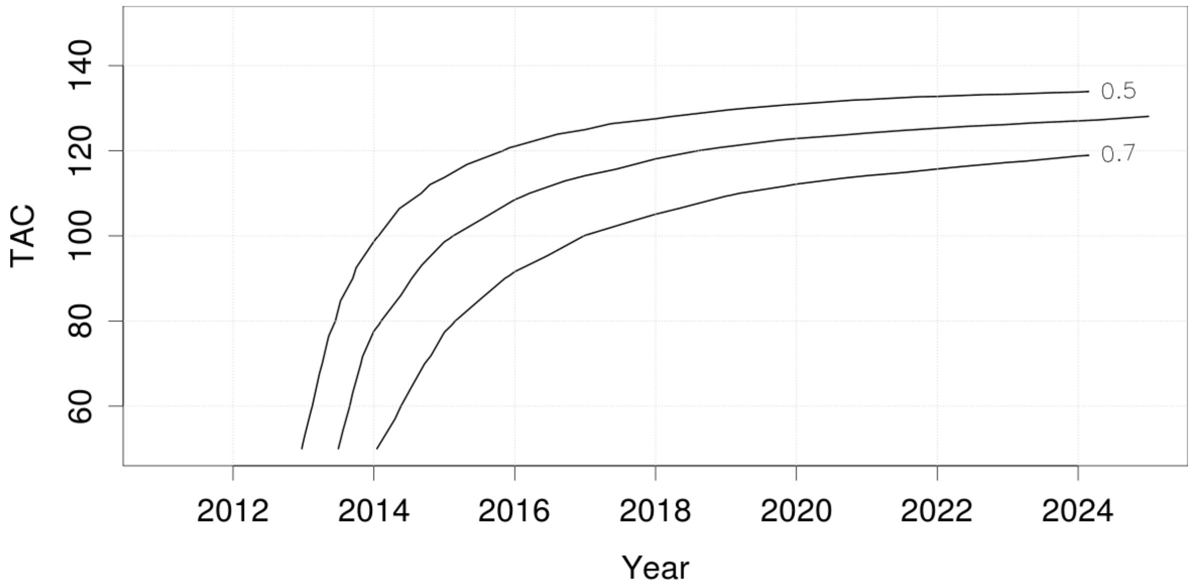
YFT-Figure 8. Estimates of historical MSY values, relative to the MSY estimated for 2010, for Atlantic yellowfin obtained through the age-structured model analysis, which considers the changes in selectivity that have occurred.



YFT-Figure 9. Current status (2010) of yellowfin tuna based on age structured and production models. The results are shown combined in a joint distribution. The median point estimate is shown as a gray circle and the clouds of symbols depict the bootstrap estimates of uncertainty for the most recent year.



YFT-Figure 10. Summary of current status estimates for the yellowfin tuna stock based on age structured and production models making use of the catch and effort data through 2010.



YFT-Figure 11. Probability plot based on Kobe II matrices giving the probability that the biomass will exceed the level that will produce MSY and the fishing mortality will fall below the fishing mortality rate that would maintain MSY, in any given year, for various constant catch levels based on combined model results.

8.2 BET- BIGEYE TUNA

The last stock assessment for bigeye tuna was conducted in 2010 through a process that included a data preparatory meeting in April (SCRS/2011/011) and an assessment meeting in July (SCRS/2010/017). The last year fishery data used was 2009 but most indices of relative abundance stopped in 2008.

BET-1. Biology

Bigeye tuna are distributed throughout the Atlantic Ocean between 50ºN and 45ºS, but not in the Mediterranean Sea. This species swims at deeper depths than other tropical tuna species and exhibits extensive vertical movements. Similar to the results obtained in other oceans, pop-up tagging and sonic tracking studies conducted on adult fish in the Atlantic have revealed that they exhibit clear diurnal patterns: they are found much deeper during the daytime than at night. In the eastern tropical Pacific, this diurnal pattern is exhibited equally by juveniles and adults. Spawning takes place in tropical waters when the environment is favorable. From nursery areas in tropical waters, juvenile fish tend to diffuse into temperate waters as they grow larger. Catch information from surface gears indicate that the Gulf of Guinea is a major nursery ground for this species. Dietary habits of bigeye tuna are varied and prey organisms like fish, mollusks, and crustaceans are found in their stomach contents. Bigeye tuna exhibit relatively fast growth: about 105 cm fork length at age three, 140 cm at age five and 163 cm at age seven. Bigeye tuna over 200 cm are relatively rare. Bigeye tuna become mature after they reach 100 cm at between 3 and 4 years old. Young fish form schools mostly mixed with other tunas such as yellowfin tuna and skipjack. These schools are often associated with drifting objects, whale sharks and sea mounts. This association appears to weaken as bigeye tuna grow larger. Estimated natural mortality rates for juvenile fish, obtained from tagging data, were of a similar range as those applied in other oceans. Various pieces of evidence, such as a lack of identified genetic heterogeneity, the time-area distribution of fish and movements of tagged fish, suggest an Atlantic-wide single stock for this species, which is currently accepted by the Committee. However, the possibility of other scenarios, such as north and south stocks, should not be disregarded.

BET-2. Fisheries indicators

The stock has been exploited by three major gears (longline, baitboat and purse seine fisheries) and by many countries throughout its range of distribution and ICCAT has detailed data on the fishery for this stock since the 1950s. Scientific sampling at landing ports for purse seine vessels of the EU and associated fleets have been conducted since 1980 to estimate bigeye tuna catches **(BET-Figure 1, BET-Table 1)**. The size of fish caught varies among fisheries: medium to large for the longline fishery, small to large for the directed baitboat fishery, and small for other baitboat and for purse seine fisheries.

The major baitboat fisheries are located in Ghana, Senegal, the Canary Islands, Madeira and the Azores. The tropical purse seine fleets operate in the Gulf of Guinea in the East Atlantic and off Venezuela in the West Atlantic. In the eastern Atlantic, these fleets are comprised of vessels flying flags of Ghana, EU-France, EU-Spain and others which are mostly managed by EC companies. In the western Atlantic the Venezuelan fleet dominates the purse-seine catch of bigeye tuna. While bigeye tuna is now a primary target species for most of the longline and some baitboat fisheries, this species has always been of secondary importance for the other surface fisheries. In the surface fishery, unlike yellowfin tuna, bigeye tuna are mostly caught while fishing on floating objects such as logs or man-made fish aggregating devices (FADs). During 2009, landings in weight of bigeye tuna caught by the longline fleets of Japan and Chinese Taipei, and the purse seine and baitboat fleets of the EU and Ghana represented 75 % of the total bigeye tuna catch.

The total annual Task I catch **(BET-Table 1**, **BET-Figure 2)** increased up to the mid-1970s reaching 60,000 t and fluctuated over the next 15 years. In 1991, catch surpassed 95,000 t and continued to increase, reaching a historic high of about 133,000 t in 1994. Reported and estimated catch has been declining since then and fell below 100,000 t in 2001. This gradual decline in catch has continued, although with some fluctuations from year to year. The preliminary estimate for 2010 is 75,833t.

After the historic high catch in 1994, all major fisheries exhibited a decline of catch while the relative share by each fishery in total catch remained relatively constant. These reductions in catch are related to declines in fishing fleet size (longline) as well as decline in CPUE (longline and baitboat). The number of active purse seiners declined by more than half from 1994 until 2006, but then increased since 2007 as some vessels returned from the Indian Ocean to the Atlantic. The number of purse seiners operating in 2009 and 2010 was similar to the number operating in 2003-04 **(SKJ-Figure 6)**.

IUU longline catches were estimated from Japanese import statistics but the estimates are considered uncertain. These estimates indicate a peak in unreported catches of 25,000 t in 1998 and a quick reduction thereafter. The Committee expressed concern that historical catches from illegal, unreported and unregulated (IUU) longliners that fly flags of convenience from the Atlantic might have been poorly estimated. The magnitude of this problem has not yet been quantified, because available statistical data collection mechanisms are insufficient to provide alternative means to calculate unreported catch.

Unreported purse seine catches were estimated by comparing monitored landings in West African ports and cannery data to catches reported to ICCAT. Estimates of unreported purse seine catches are larger and increasing since 2006 and now may exceed 20,000 tons for the three main species of tropical tunas. The Committee expressed the need for countries and the involved industry in the region to cooperate to estimate and report these catches correctly to ICCAT. These estimates have not been incorporated into assessments and are not included in the catch estimates presented in this report. The magnitudes of these estimates of IUU catch, however, are likely to influence the assessments and the resulting perception of stock status.

Significant catches of small bigeye tuna continue to be channeled to local West African markets, predominantly in Abidjan, and sold as "*faux poissons*" in ways that make their monitoring and official reporting challenging. Monitoring of such catches has progressed in some countries but there is still a need for a coordinated approach that will allow ICCAT to properly account for these catches and thus increase the quality of the basic catch data available for assessments.

Mean average weight of bigeye tuna decreased prior to 1998 but has been relative stable, at around 10 kg during the last decade **(BET-Figure 3)**. This weight, however, is quite different according to the fishing gear, around 62 kg for longliners, 7 kg for bait boats, and 4kg for purse seiners. In the last ten years all longline fleets have shown increases in mean weight of bigeye tuna caught, with the average longline-caught fish increasing from 40 kg to 60 kg between 1999 and 2010. During the same period purse seine-caught bigeye tuna had weights between 3 kg and 4 kg. Bigeye tuna caught in free schools are more than two times heavier than those caught around FADs. This difference in weight between these two fishing modes is even more pronounced since 2006. Since FAD catches began being identified separately in 1991 by EU and associated purse seine fleets, the majority (75%-80%) of bigeye tuna are caught in sets associated with FADs. Similarly baitboat-caught bigeye tuna weighted between 6 and 10 kg over the same period, showing greater inter-annual variability in fish weight than longline or purse seine caught fish.

BET-3. State of the stock

The 2010 stock assessment was conducted using similar assessment models to those used in 2007 (Anon. 2008a) but with updated data and a few new relative abundance indices and data. In general, data availability has continued to improve, notably with the addition of relative abundance indices for an increasing number of fleets. There are still missing data on detailed fishing and fish size from certain fleets. In addition, there are a number of data gaps on the activities of IUU fleets (e.g., size, location and total catch). All these problems forced the committee to assume catch-at-size for an important part of the overall catch.

Three types of indices of abundance were used in the assessment. A number of indices were directly developed by national scientists for selected fleets for which data was available at greater spatial and or temporal resolution to that available in the ICCAT databases. These indices represented data for seven different fleets, all of them longline fleets, except for one baitboat fleet **(BET-Figure 4)**. Other indices were estimated by the committee from data available within the ICCAT databases. These two types of indices were used for age-structured assessment models. Finally, a series of combined indices (**BET-Figure 5)** were calculated by the committee by synthesizing the information existing in individual indices for the seven fleets mentioned above. The later were used to fit production models.

Consistent with previous assessments of Atlantic bigeye tuna, the results from non-equilibrium production models are used to provide the basic characterization of the status of the resource. Results were sensitive to the combined abundance index trends assumed. As the relative likelihoods of each trend could not be estimated, results were developed from the joint distribution of model run results using each of three alternative combined indices. The plausible range of MSY estimated from the joint distribution using three types of abundance indices was between 78,700 and 101,600 tons (80% confidence limits) with a median MSY of 92,000 t. In addition, these estimates reflect the current relative mixture of fisheries that capture small or large bigeye tuna; MSY can change considerably with changes in the relative fishing effort exerted by surface and longline fisheries. Historical estimates show large declines in biomass and increases in fishing mortality, especially in the mid

1990s when fishing mortality exceeded F_{MSY} for several years. In the last five or six years there have been possible increases in biomass and declines in fishing mortality (**BET-Figure 6)**. The biomass at the beginning of 2010 was estimated to be at between 0.72 and 1.34 (80% confidence limits) of the biomass at MSY, with a median value of 1.01 and the 2009 fishing mortality rate was estimated to be between 0.65-1.55 (80% confidence limits) with a median of 0.95. The replacement yield for the year 2011 was estimated to be about MSY.

The Committee notes, as it did in previous assessments, that there is considerable uncertainty in the assessment of stock status and productivity for bigeye tuna. There are many sources of uncertainty including which method represents best the dynamics of the stock, which method is supported more by the available data, which relative abundance indices are appropriate to be used in the assessment, and what precision is associated with the measurement/calculation of each of the model inputs. In general, data availability has improved since 2007 but there is still a lack of information regarding detailed fishing effort and catch-at-size data from certain fleets. This, combined with the lack of detailed historical information on catch and fishing activities of IUU fleets (e.g., size, location and total catch), forces the Committee to make many assumptions about the catch-at-size for an important part of the overall catch. In order to represent this uncertainty the Committee decided to combine sensitivity runs from a range of method/data combinations. There are differences in the estimates of management benchmarks, including the estimates of the current biomass and fishing mortality, depending on both the method used as well as the input data used (**BET-Figure 7**).

BET-4. Outlook

The outlook for Atlantic bigeye tuna, considering the quantified uncertainty in the 2010 assessment, is presented in **BET-Table 2** and **BET-Figure 8**, which provide a characterization of the prospects of the stock achieving or being maintained at levels consistent with the Convention Objective, over time, for different levels of future constant catch. It is noteworthy that the modeled probabilities of the stock being maintained at levels consistent with the Convention Objective over the next five years are about 60% for a future constant catch of 85,000 t. Higher odds of rebuilding to and maintaining the stock at levels that could produce MSY are associated with lower catches and lower odds of success with higher catches than such constant catch (**BET-Figure 9**). It needs to be noted that projections made by the Committee assume that future constant catches represent the total removals from the stock, and not just the TAC of 85,000 t established by ICCAT [Rec. 09-01]. Catches made by other fleets not affected by [Rec. 09-01] need to be added to the 85,000 t for comparisons with the future constant catch scenarios contemplated in **BET-Table 2**. Furthermore, any future changes in selectivity due to changes in the ratios of relative mortality exerted by the different fleets - such as an increase in the relative mortality of small fish - will change and add to the uncertainty of these projections.

BET-5. Effects of current regulations

During the period 2005-2008 an overall TAC for major countries was set at 90,000 t. The TAC was later lowered [09-01] to 85,000 t. Estimates of catch for 2005-2010 **(BET-Table 1)** seem to have been always lower than the corresponding TAC.

Concern over the catch of small bigeye tuna partially led to the establishment of spatial closures to surface fishing gear in the Gulf of Guinea [Rec. 04-01 and 08-01] The Committee examined trends in average bigeye tuna weight as a broad indicator of the effects of such closures. Although there have been significant changes in the average size of bigeye tuna caught since 2004 by certain fleets, such as increases in average size of fish caught by purse seiners operating in free schools and by longliners, it cannot be quantified whether changes are the result of spatial closures. The Committee also analyzed the ICCAT conventional tag database for evidence of an effect of spatial closures. Again, this analysis failed to provide any conclusive evidence in support of the hypothesis that spatial closures led to a reduction in the fishing mortality of juvenile bigeye tuna.

BET-6. Management recommendations

Projections indicate that catches reaching 85,000 t or less will promote stock growth and further reduce the future chances that the stock will not be at a level that is consistent with the convention objectives. The Commission should be aware that if major countries were to take the entire catch limit set under Recommendations 04-01 and 09-1 and other countries were to maintain recent catch levels, then the total catch could well exceed 100,000 t. The Committee recommends that the Commission sets a TAC at a level that would provide a high probability of maintaining at or rebuilding to stock levels consistent with the Convention objectives. In considering the uncertainty in assessment results, the Committee believes that a future total catch of 85,000 t or less would provide such high probability.

The assessment and subsequent management recommendations are conditional on the reported and estimated history of catch for bigeye tuna in the Atlantic. The Committee reiterates its concern that unreported catches, including those part of the "*faux poisson*" category, from the Atlantic might have been poorly estimated. There is a need to expand current statistical data collection mechanisms to fully investigate any evidence of significant catches that have been unreported.

ATLANTIC BIGEYE TUNA SUMMARY	
Maximum Sustainable Yield	78,700-101,600 t (median 92,000 t) [1,2]
Current (2010) Yield[1]	75,833t [3]
Replacement Yield (2011)	64,900 – 94,000 (median 86,000 t) [1,2]
Relative Biomass (B_{2009}/B_{MSY})	0.72-1.34 (median 1.01) [1,2]
Relative Fishing Mortality F_{2009}/F_{MSY}	0.65-1.55 (median 0.95)[1,2]
Conservation & management measures in effect: [Rec. 09-01], para. 1 of [Rec. 06-01], [Rec. 04-01], and [Rec. 10-01].	
	− Total allowable catch for 2010 is set at 85,000 t for Contracting Parties and Cooperating non-Contracting Parties, Entities or Fishing Entities. − Limits on numbers of fishing vessels less than the average of 1991 and 1992. − Specific limits of number of longline boats; China (45), Chinese Taipei (75), Philippines (10), and Korea (16). − Specific limits of number of purse seine boats; Panama (3). − No purse seine and baitboat fishing during November in the area encompassed by 0º-5ºN and 10º W-20ºW.

1 Production model (Logistic) results represent median and 80% confidence limits based on catch data for (1950-2009) and the joint distribution of bootstraps using each of three alternative combined indices.
2 80% confidence limits, MSY and replacement yield rounded to 100 t.
3 Reports for 2010 reflect most recent data but should be considered provisional. All other quantities in the table were calculated during the 2010 assessment.

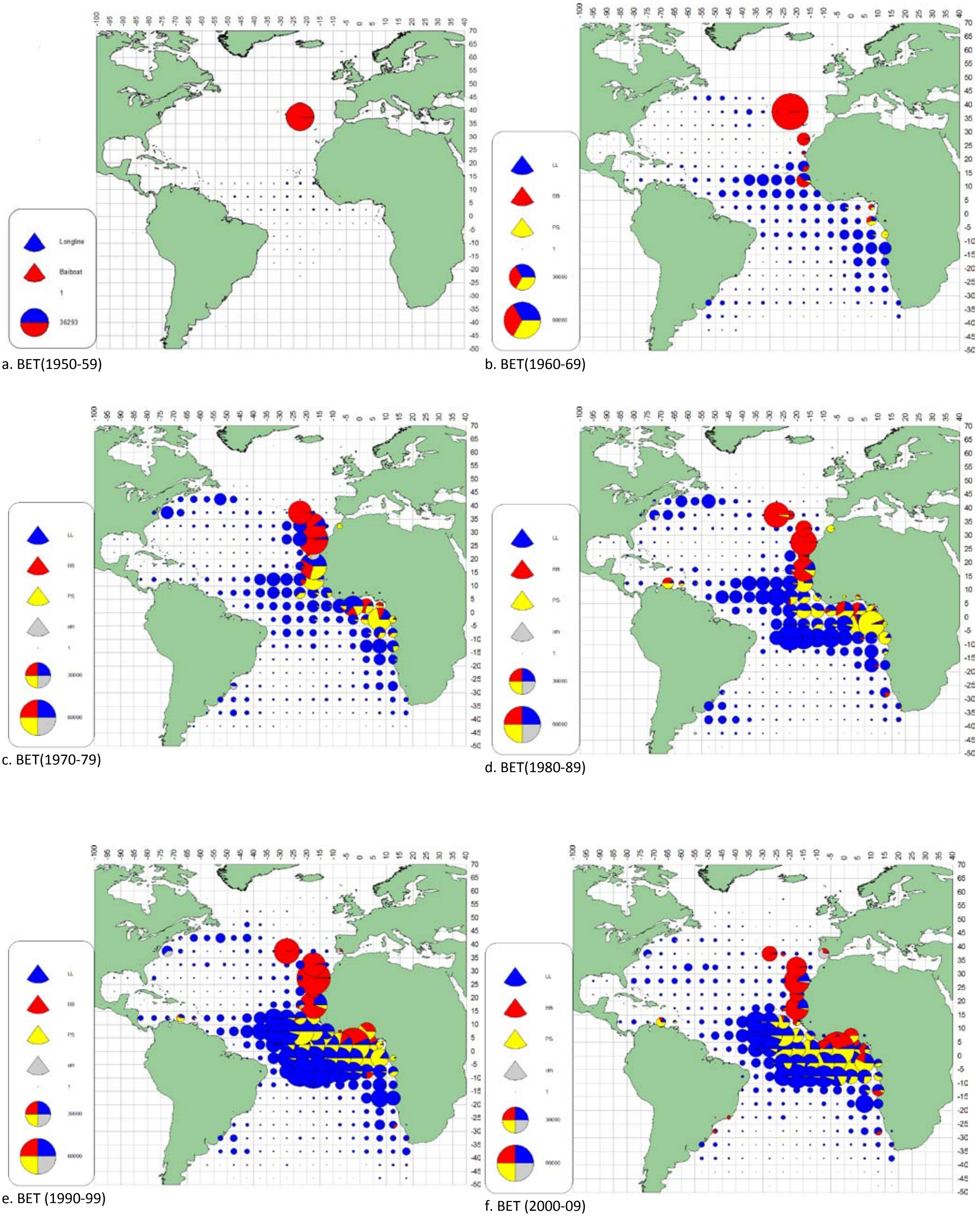
BET-Table 1. Estimated catches (t) of bigeye tuna (Thunnus obesus) by area, gear and flag. (v02, 2011-09-30).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL AT+MED	65447	57141	66148	78376	84901	96074	99374	112572	133630	126778	121689	109289	110438	128304	103651	94291	77225	92106	87054	72348	65888	79664	69342	81813	75833
Bait boat	15618	13458	9710	12672	18280	17750	16248	16467	20361	25576	19059	21037	21377	25867	12634	15842	8756	13569	18940	15007	14671	15432	12359	14940	8968
Longline	39942	35570	47766	58389	56537	61556	62403	62871	78934	74852	74930	68310	71856	76527	71193	55265	46438	54466	48396	38035	34182	46232	41063	43533	42638
Other surf.	550	626	474	644	293	437	607	652	980	567	357	536	434	1377	1226	1628	1138	1340	1301	716	552	447	224	273	457
Purse seine	9336	7487	8198	6671	9791	16331	20116	32582	33355	25782	27343	19406	16771	24533	18599	21556	20894	22731	18417	18590	16483	17553	15696	23067	23769
Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	476	75	0	0	0	0	
Argentina	41	72	50	17	78	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Barbados	0	0	0	0	0	0	0	0	0	0	0	24	17	18	18	6	11	16	19	27	18	14	14	7	12
Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	60	70	60	249
Benin	15	6	7	8	10	10	7	8	9	9	9	30	13	11	0	0	0	0	0	0	0	0	0	0	
Brasil	873	756	946	512	591	350	790	1256	601	1935	1707	1237	644	2024	2768	2659	2582	2455	1496	1081	1479	1593	958	1189	1151
Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	
Canada	11	144	95	31	10	26	67	124	111	148	144	166	120	263	327	241	279	182	143	187	196	144	130	111	103
Cape Verde	86	60	117	100	52	151	105	85	209	66	116	10	1	1	2	0	1	1	1	1092	1437	1147	1069	827	1164
China P.R.	0	0	0	0	0	0	0	70	428	476	520	427	1503	7347	6564	7210	5840	7890	6555	6200	7200	7399	5686	4973	5489
Chinese Taipei	1125	1488	1469	940	5755	13850	11546	13426	19680	18023	21850	19242	16314	16837	16795	16429	18483	21563	17717	11984	2965	12116	10418	13252	13189
Congo	19	10	10	14	15	12	12	14	9	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cuba	171	190	151	87	62	34	56	36	7	7	5	0	0	0	0	0	16	16	0	0	0	0	0	0	
Curaçao	0	0	0	0	0	0	0	0	0	0	1893	2890	2919	3428	2359	2803	1879	2758	3343	0	416	252	1721	2348	2688
Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	790	576
Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	
EU.España	10884	9702	8475	8263	10355	14705	14656	16782	22096	17849	15393	12513	7110	13739	11250	10133	10572	11120	8365	7618	7454	6675	7494	11966	11272
EU.France	4266	3905	4161	3261	5023	5581	6888	12719	12263	8363	9171	5980	5624	5529	5949	4948	4293	3940	2926	2816	2984	1629	1130	2313	3329
EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	33	0	0	0	0	**0**
EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EU.Portugal	7428	5036	2818	5295	6233	5718	5796	5616	3099	9662	5810	5437	6334	3314	1498	1605	2590	1655	3204	4146	5071	5505	3422	5605	3682
EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	32	0
FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	28	6	0	2	3	0	2
Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	11	8	0	0	0	0	0	0	0	0	0	
Gabon	0	0	0	0	0	0	0	1	87	10	0	0	0	184	150	121	0	0	0	0	0	0	0	0	
Ghana	1720	1178	1214	2158	5031	4090	2866	3577	4738	5517	5805	9829	13370	17764	5910	12042	7106	13557	14901	13917	9141	13267	9269	10554	6769
Grenada	0	0	0	0	0	65	25	20	10	10	0	1	0	0	0	0	0	0	0	0	0	10	31	0	
Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	998	949	836	998	913	1011
Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	50	
Honduras	0	0	0	0	0	0	44	0	0	61	28	59	20	0	0	0	0	0	0	0	0	0	0	0	
Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**0**
Japan	23081	18961	32064	39540	35231	30356	34722	35053	38503	35477	33171	26490	24330	21833	24605	18087	15306	19572	18509	14026	15735	17993	16684	16395	15220
Korea Rep.	6084	4438	4919	7896	2690	802	866	377	386	423	1250	796	163	124	43	1	87	143	629	770	2067	2136	2599	2134	2646
Liberia	0	0	0	206	16	13	42	65	53	57	57	57	57	57	57	57	57	57	0	0	0	0	0	0	
Libya	0	0	0	0	0	0	508	1085	500	400	400	400	400	400	400	31	593	593	0	0	4	0	0	0	
Maroc	0	8	0	0	0	0	0	0	0	0	0	0	0	700	770	857	913	889	929	519	887	700	802	795	276
Mexico	0	0	0	0	0	0	0	1	4	0	2	6	8	6	2	2	7	4	5	4	3	3	1	1	3
Mixed flags (FR+ES)	50	339	339	300	384	807	893	1000	690	426	424	357	409	498	688	519	218	361	383	339	386	238	228	381	
NEI (ETRO)	0	85	20	93	959	1221	2138	4594	5034	5137	5839	2746	1685	4011	2285	3027	2248	2504	1387	294	81	0	0	0	
NEI (Flag related)	758	1406	2155	4650	5856	8982	6151	4378	8964	10697	11862	16569	24896	24060	15092	8470	531	0	0	0	0	0	0	0	
NEI (UK.OT)	0	0	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Namibia	0	0	0	0	0	0	0	0	715	29	7	46	16	423	589	640	274	215	177	307	283	41	146	108	181
Norway	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Panama	5173	5616	3847	3157	5258	7446	9991	10138	13234	9927	4777	2098	1252	580	952	89	63	0	1521	2310	2415	2922	2263	2405	3047
Philippines	0	0	0	0	0	0	0	0	0	0	0	0	1154	2113	975	377	837	855	1854	1743	1816	2368	1874	1880	1399
Russian Federation	0	0	0	0	0	0	0	0	0	0	13	38	4	8	91	0	0	0	0	1	1	26	73	86	**0**

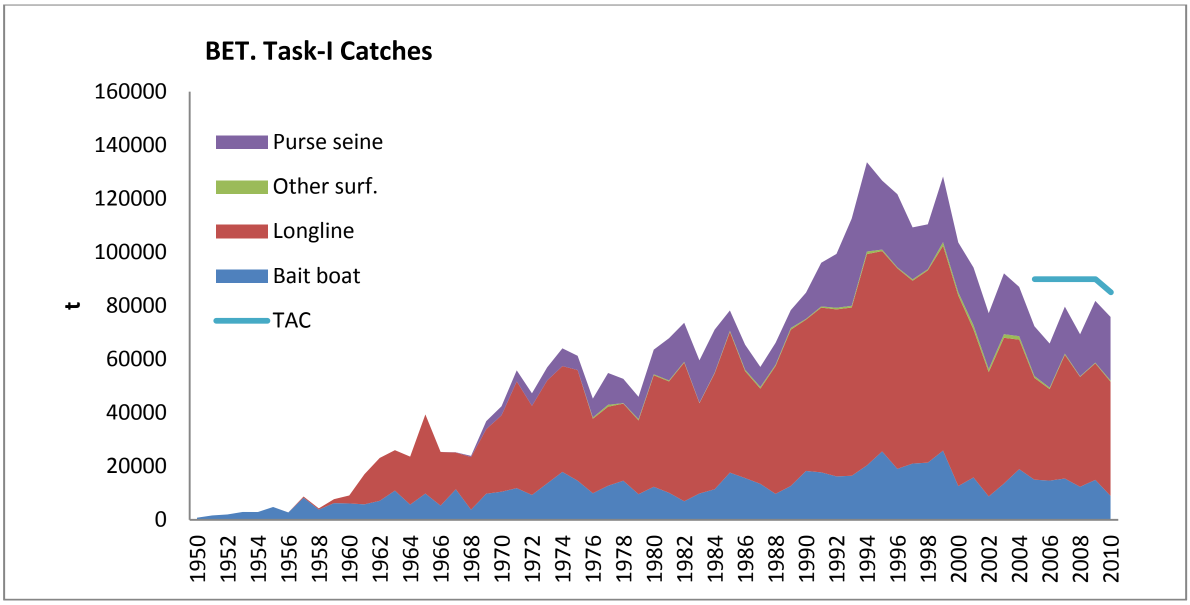
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
S. Tomé e Príncipe	0	0	5	8	6	3	4	4	3	6	4	5	6	5	4	4	4	4	11	6	4	0	92	94	97
Senegal	0	0	0	0	0	15	5	9	126	237	138	258	730	1473	1131	1308	565	474	561	721	1267	805	926	1042	858
Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	0	162	0	0	0	0	0	0	0	
Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	2	0	0	0	0	0	0	0	0	
South Africa	168	200	561	367	296	72	43	88	79	27	7	10	53	55	249	239	341	113	270	221	84	171	226	159	145
St. Vincent and Grenadines	0	0	0	0	0	0	1	3	0	0	4	2	2	1	1216	506	15	103	18	0	114	567	171	292	396
Sta. Lucia	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	2	0	2	0	0	0	0	0
Togo	24	22	7	12	12	6	2	86	23	6	33	33	33	0	0	0	0	0	0	0	0	0	0	0	
Trinidad and Tobago	0	0	1	19	57	263	0	3	29	27	37	36	24	19	5	11	30	6	5	9	12	27	69	56	40
U.S.A.	1085	1074	1127	847	623	975	813	1090	1402	1209	882	1138	929	1263	574	1085	601	482	416	484	991	527	508	515	673
U.S.S.R.	1071	1887	1077	424	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
UK.Sta Helena	0	5	1	1	3	3	10	6	6	10	10	12	17	6	8	5	5	0	0	0	25	18	28	17	11
Uruguay	177	204	120	55	38	20	56	48	37	80	124	69	59	28	25	51	67	59	40	62	83	22	27	201	23
Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	109	52	132	91	34	48
Venezuela	1136	349	332	115	161	476	270	809	457	457	189	274	222	140	226	708	629	516	1060	243	261	318	122	229	85

BET-Table 2. Estimated probabilities of the Atlantic bigeye tuna stock being above B_{MSY} and below F_{MSY} in a given year for TAC level ('000 t), based upon the 2010 assessment outcomes.

	Year									
TAC	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
60	54%	63%	71%	75%	79%	82%	84%	85%	86%	87%
70	54%	61%	67%	71%	74%	76%	77%	79%	80%	81%
80	54%	58%	62%	66%	68%	70%	71%	72%	73%	74%
90	54%	57%	58%	60%	61%	62%	62%	63%	63%	64%
100	53%	54%	54%	54%	54%	54%	54%	54%	55%	55%
110	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%

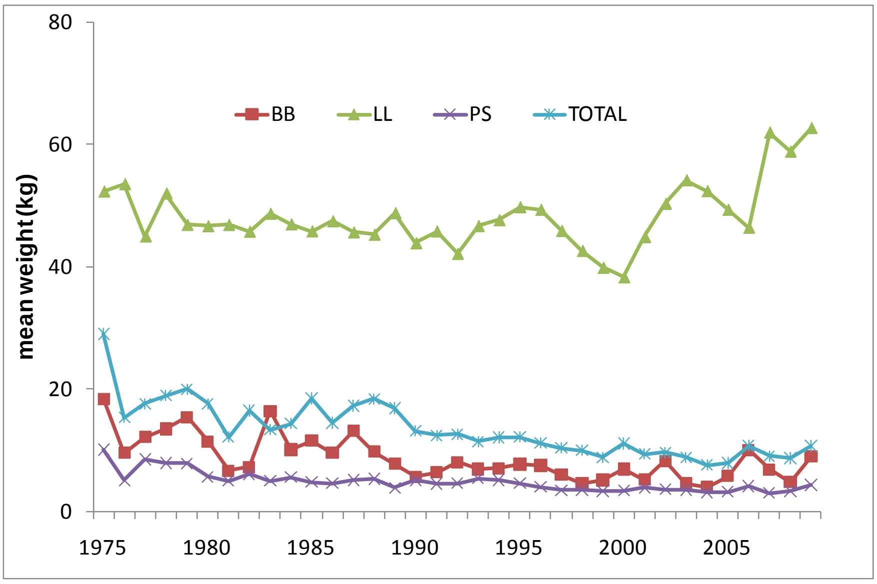


BET-Figure 1 [a-e]. Geographical distribution of the bigeye tuna catch by major gears and decade. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

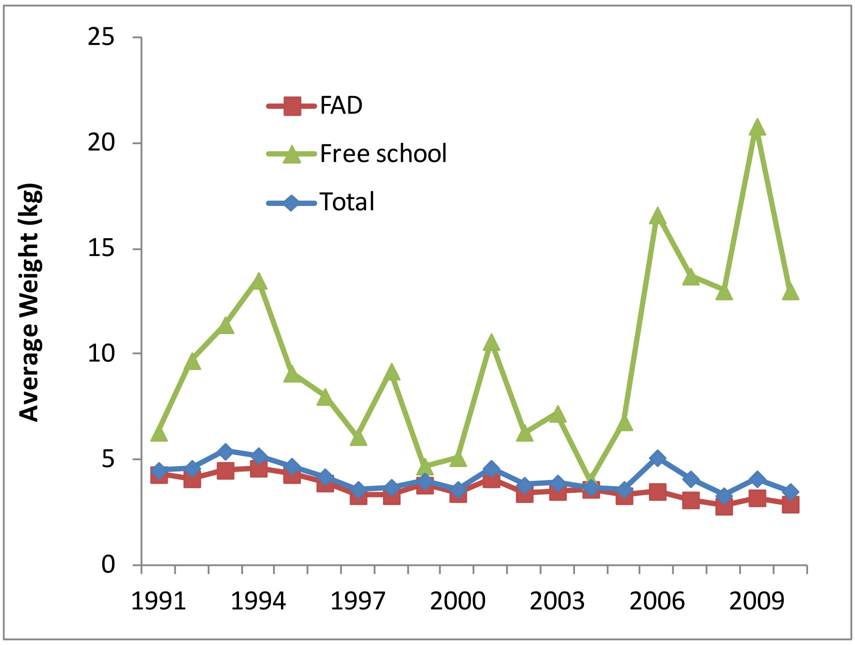


BET-Figure 2. Bigeye Task I catches for all the Atlantic stock, in tonnes. Value for 2010 represents preliminary estimates because some countries have yet to provide data for this year.

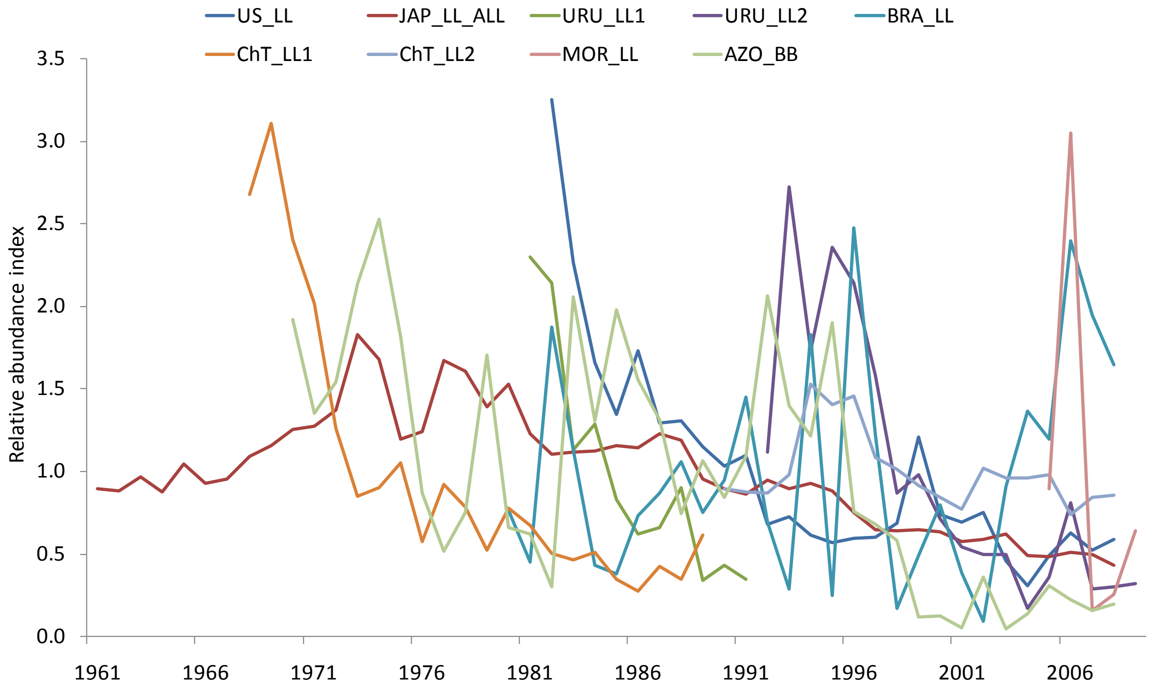
a)



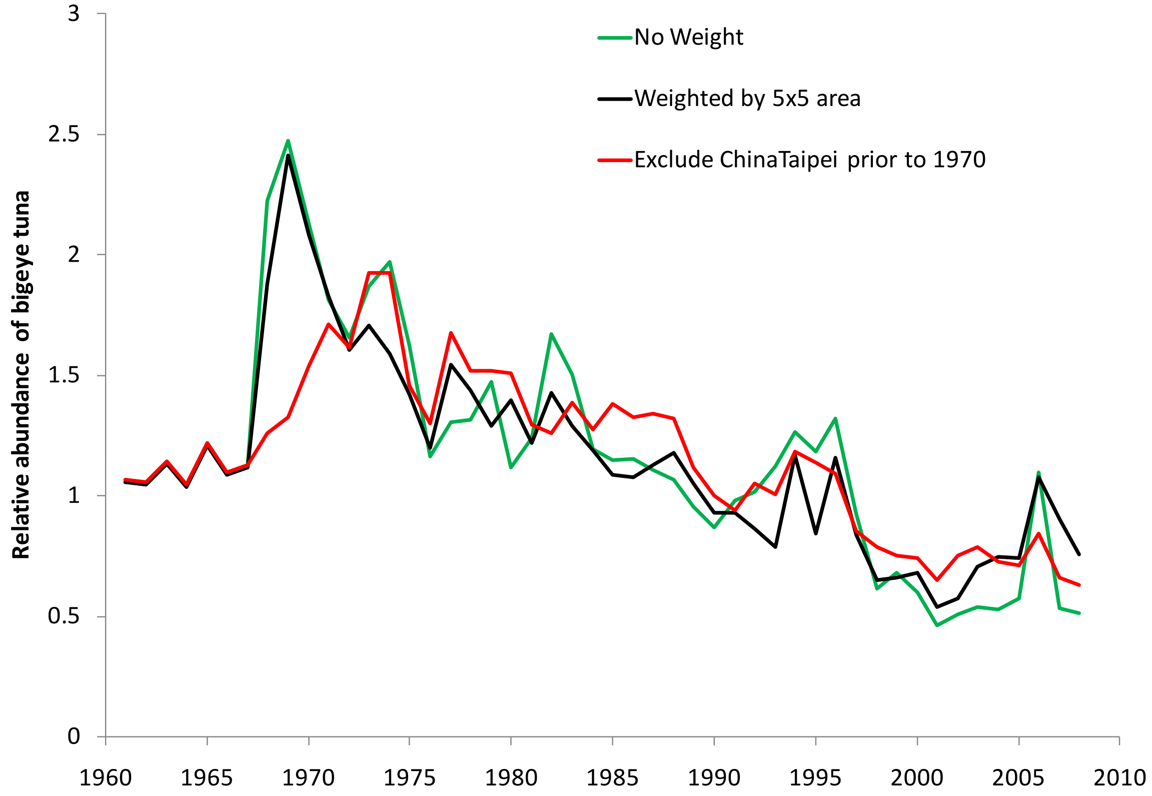
b)



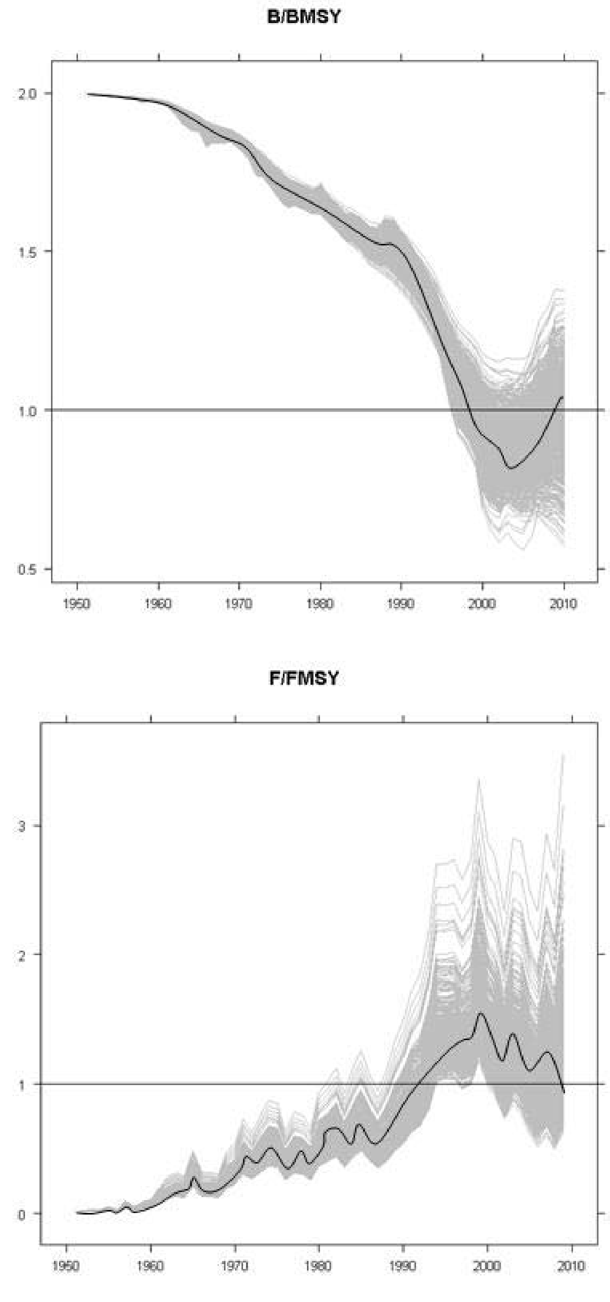
BET-Figure 3. Trend of mean weight for bigeye a) by major fisheries (1975-2009) based on the catch-at-size data, b) for European purse seiners (total) and separated between free schools and FAD associated schools (1991- 2010).



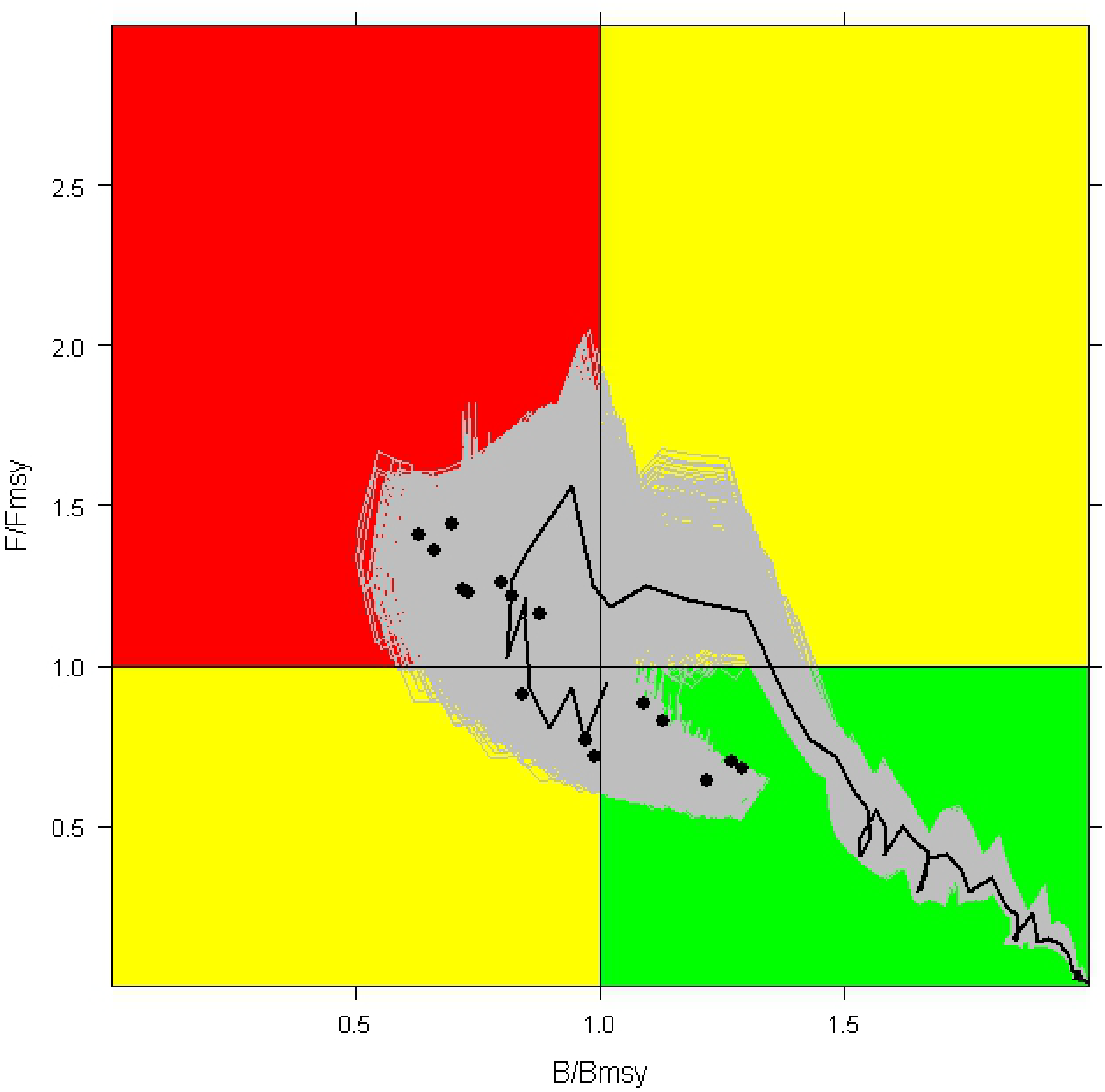
BET-Figure 4. Relative abundance indices for bigeye tuna. AZO_BB Azores Baitboat, BRA_LL, Brazil longline, ChT_LL2, Chinese Taipei longline 1968-1989, ChT_LL2 Chinese Taipei longline 1990-2008, JAP_LL Japanese longline, MOR_LL Morocco longline, UR_LL1 Uruguay longline 1981-1991, UR_LL2 Uruguay longline 1992-2008, US_LL USA longline.



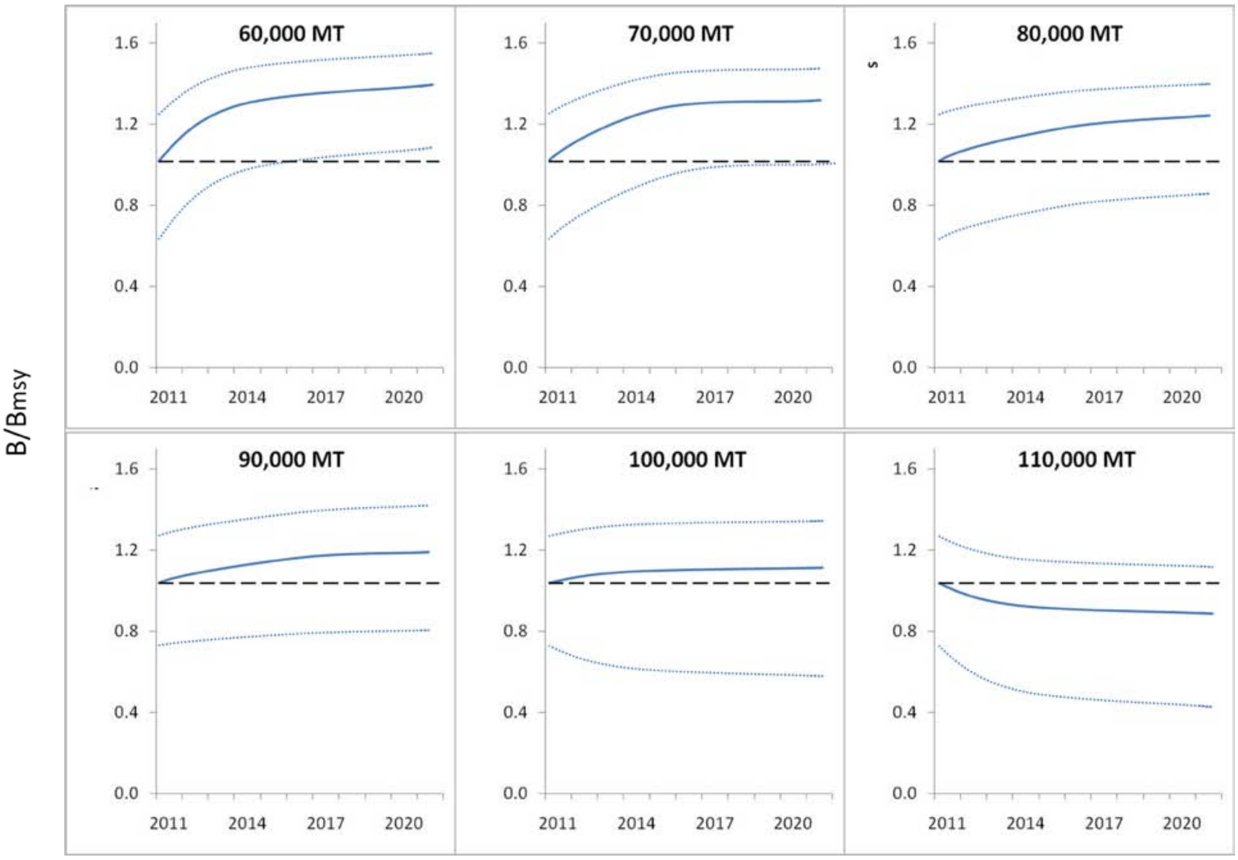
BET-Figure 5. Three alternative combined indices selected for the assessment with logistic non-equilibrium production models.



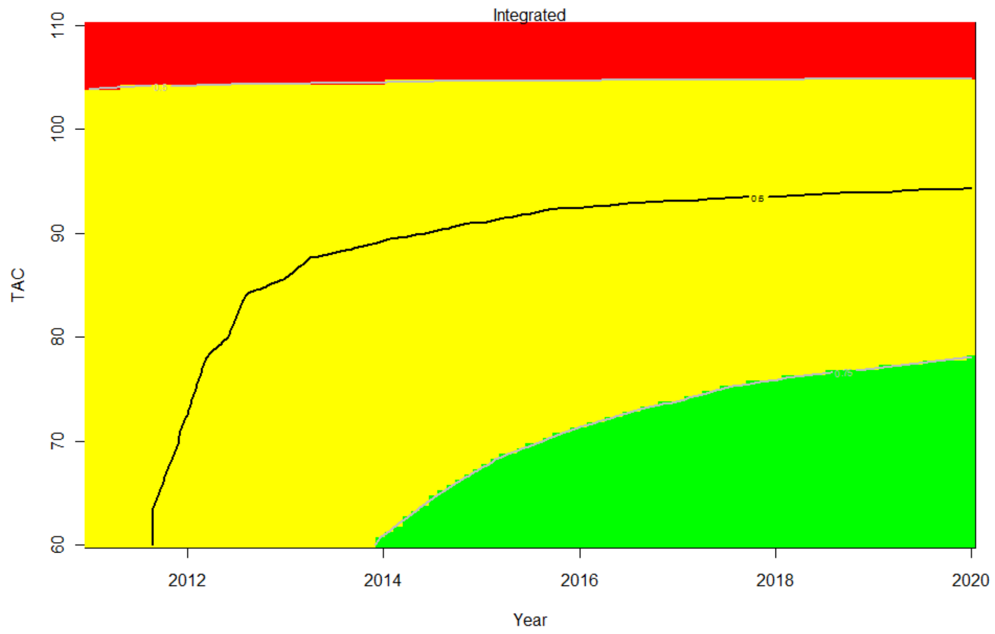
BET-Figure 6. Trajectories of B/B_{MSY} and F/F_{MSY} estimated from the logistic production model. Lines represent the 80 % percentile of bootstrap results and thicker line the median.



BET-Figure 7. Kobe plot from combined examinations of assessment models. Shaded lines shown represent the 80% confidence limits for the historical trajectory (1950-2009) and solid line represents the median estimated from the logistic production model. Points depict uncertainty in current status not considered by the bootstrapping of the logistic production model (estimates of F_{2009}/F_{MSY} and B_{2009}/B_{MSY} for each of the sensitivity trials from the other models considered in the assessment).



BET-Figure 8. Biomass projections (B/B_{MSY}) for bigeye tuna for 2011-2021. Each panel corresponds to a different level of future constant catch from 60,000 to 110,000 tons. Thick lines represent median of all combined runs and thinner lines the 10 and 90 percentiles.



BET-Figure 9. Kobe matrix plot showing probabilities of the stock being above B_{MSY} and fishing at levels below F_{MSY} in a given year for a future constant catch (TAC). Projections were calculated from results of the combination of the three logistic production model runs used as the basis of the assessment. The colors represent modeled probabilities: red, <50%, yellow, 50-75% and green, >75%. The 60% probability isopleth is also shown as a black line.

8.3 SKJ – SKIPJACK TUNA

Stock assessments for eastern and western Atlantic skipjack were conducted in 2008 (Anon. 2009a) using available catches to 2006. Skipjack had only been assessed previously in 1999. Consequently, this report includes the most recent information on the state of the stocks on this species.

SKJ-1. Biology

Skipjack tuna is a gregarious species that is found in schools in the tropical and subtropical waters of the three oceans **(SKJ-Figure 1)**. Skipjack is the predominant species under FADs where it is caught in association with juvenile yellowfin tuna, bigeye tuna and with other species of epipelagic fauna. One of the characteristics of skipjack is that from the age of one it spawns opportunistically throughout the year and in vast sectors of the ocean. A recent analysis of tagging data from the eastern Atlantic confirmed that the growth of skipjack varies according to the latitude. However, this difference in the growth rate is not as great as that which had been previously estimated.

The increasing use of fish aggregation devices (FADs) since the early 1990s, have changed the species composition of free swimming schools. It is noted that, in effect, the free schools of mixed species were considerably more common prior to the introduction of FADs. Furthermore, the association with FADs may also have an impact on the biology (food intake, growth rate, plumpness of the fish) and on the ecology (displacement rate, movement orientation) of skipjack and yellowfin (*ecological trap* concept).

SKJ-2. Fisheries indicators

The total catches obtained in 2010 in the entire Atlantic Ocean (including estimates of skipjack in the *faux-poisson* landed in Côte d'Ivoire by the EU-purse seiners) were at least 183,000 t and could reach around 190 to 195,000 t, if the update of catches for Brazil in 2010 confirms the catch average of those taken in recent years **(SKJ-Table 1**, **SKJ-Figure 2)** which represents a great increase compared to the catch average of the last five years. It is possible however, that the catches of a segment of the Ghanaian purse seine fleet, transshipped at sea on carriers, skip the collection process of fishery statistics.

The numerous changes that have occurred in the skipjack fishery since the early 1990s (such as the progressive use of FADs and the increase of the fishing area towards the west) have brought about an increase in skipjack catchability and in the biomass proportion that is exploited. At present, the major fisheries are the purse seine fisheries, particularly those of EU-Spain, Ghana, Panama, EU-France and Netherlands Antilles, followed by the baitboat fisheries of Ghana, EU-Spain, EU-Portugal and EU-France. The preliminary estimates of catches made in 2010 in the East Atlantic amounted to 164,000 t, that is, an increase of around 35% compared to the average of 2005-2009 **(SKJ-Figure 3)**. In recent years, the seasonal fishing by European purse seiners on free schools, off Senegal, has decreased sharply **(SKJ-Figure 1)** and consequently, the proportion of the catches on floating objects has continued to increase, reaching slightly more than 90% of the catches **(SKJ-Figure 4)**.

The unreported catches of some purse seine catches were estimated by comparing monitored landings in West African ports and cannery data to catches reported to ICCAT. Estimates of the unreported catches of these purse seine catches are larger and increasing since 2006 and now may exceed 20,000 tons for the three main species of tropical tunas. The committee expressed the need for countries and the involved industry in the region to cooperate to estimate and report these catches correctly to ICCAT. These estimates have not been incorporated into assessments and are not included in the catch estimates presented in this report. The magnitudes of these estimates of IUU catch, however, are likely to influence the assessments and the resulting perception of stock status.

The estimate of the average discard rate of skipjack tuna under FADs from data collected since 2001 by observers on-board Spanish purse seiners operating in the East Atlantic has been confirmed by the two new studies conducted on board French purse seiners (estimated at 42 kg per ton of skipjack landed). Furthermore, this last study showed that the amount of small skipjack (average size 37 cm FL) landed in the local market of Abidjan in Côte d'Ivoire as *faux-poisson* is estimated at 235 kg per ton of skipjack landed (i.e. an average of 6,641 t/year between 1988 and 2007 for the European or associated purse seiners, **SKJ-Figure 5**). However, new estimates, on the specific composition in particular, of *faux-poisson*, carried out during the recent Tropical Tuna Species Group Inter-sessional Meeting on the Ghanaian Statistics Analysis, indicate amounts of around 11,000 t/year between 2005 and 2010 for the overall purse seiners operating in the East Atlantic (3,919 t/year for the European purse seiners) .The Committee regularly integrates these estimates in the reported historical catches for the EU-purse seiners since 1981, as well as in the catch-at-size matrix.

In the West Atlantic, the major fishery is the Brazilian baitboat fishery, followed by the Venezuelan purse seine fleet. Preliminary estimates of catches in 2010 in the West Atlantic amounted to 18,000 t, but the complete submission of Brazil's Task I data should bring this amount towards the average catch observed for recent years **(SKJ-Figure 6)**.

It is difficult to estimate effective fishing effort for skipjack tuna in the East Atlantic. Nominal purse seine effort, expressed in terms of carrying capacity, has decreased regularly since the mid-1990s up to 2006. However, due to acts of piracy in the Indian Ocean, many European Union purse seiners have transferred their effort to the East Atlantic. This new situation, which added to the presence of one new purse seine fleet operating from Tema (Ghana), and whereby catches are probably highly underestimated, has considerably increased the carrying capacity of this fishing gear **(SKJ-Figure 7)**. The number of EU purse seiners in the East Atlantic follows this trend but seems to have stabilized in 2010, according to the preliminary estimates. On the other hand, baitboat nominal effort has remained stable for more than 20 years.

It is considered that the increase in fishing power linked to the introduction of innovation technologies on board the vessels as well as to the development of fishing under floating objects has resulted in an increase in the efficiency of the various fleets, since the early 1980s. In addition to the use of an average 3% annual increase in skipjack catchability to account for these changes, a new analysis has been conducted by fixing MSY and K at levels that agree with estimates made during previous stock assessments. This method provides a range of increase in catchability from 1 to 13% per year. It is unclear, however, whether these estimates reflect technological changes only, or also in the availability of the fish (e.g., resulting from an expansion of the surface exploited over the years; **SKJ-Figure 8**). The recent increase in the area explored successfully which corresponds to the extension of the fishery towards the central West Atlantic and off Angola should also be noted.

The significant increase in the estimates of total mortality (Z) between the early 1980s and the end of the 1990s obtained from different methods, such as the tag-recovery model, the catch curves by size and the average size observed in the yearly catches, supports this hypothesis. The change in the selectivity pattern observed for the purse seine fishery suggests that this fleet is mainly targeting juvenile tunas. The comparison of the size distributions of skipjack for the East Atlantic between the periods prior to, and following the use of FADs, also reinforces this interpretation insofar as an increase is observed in the proportion of small fish in the catches, as shown by the change of the average weight over the years (**SKJ-Figure 9**). Generally, it is noted that the average weight observed in the east Atlantic (close to 2 kg) is much lower than the estimates given in the other oceans (closer to 3 kg).

The regular increase in fishing pressure observed for the other indicators is confirmed up to about 1995, then the decline in apparent Z (a trend also observed for yellowfin) could be a consequence of the moratoria on floating objects which has mainly affected skipjack **(SKJ-Figure 10)**.

With respect to the West Atlantic, the fishing effort of the Brazilian baitboats (*i.e.*, the major skipjack fishery in this region) seems to be stable over the last 20 years.

SKJ-3. State of the stocks

In all the oceans and consequently in all the tuna RFMOs, the traditional stock assessment models have been difficult to apply to skipjack because of their particular biological and fishery characteristics (on the one hand, continuous spawning, areal variation in growth and non-directed effort, and on the other, weak identified cohorts). In order to overcome these difficulties, several different assessment methods which accommodate expert opinion and prior knowledge of the fishery and biological characteristics of skipjack have been carried out on the two stocks of Atlantic skipjack. Several fishery indictors were also analyzed to carry out a follow up of the development in the state of the stock over time.

Although the fisheries operating in the east have extended towards the west beyond 30^{o}W longitude, the Committee decided to maintain the hypothesis in favor of two distinct stock units, based on available scientific studies. However, taking into account the state of current knowledge of skipjack tuna migrations and the geographic distances between the various fishing areas **(SKJ-Figure 1** and **SKJ-Figure 11)**, the use of smaller stock units continues to be the envisaged working hypothesis.

Eastern stock

The Committee analyzed two standardized indices from the EU-purse seine fishery: An index accounts for skipjack caught in free school in the Senegalese area during the second quarter of the year and the second index characterizing small fish captured under FADs in the equatorial area (**SKJ-Figure 12**). In previous meetings of the Tropical Tunas Species Group it was confirmed that the increase in CPUE of the European purse seiners in the late 1990s was due, mainly, to the increase in the catches of positive sets under FADS (**SKJ-Figure 13**). Furthermore, the regular increase in the skipjack yields of the baitboats based in Senegal may only have been the result of an increase in catchability linked to the adoption of the so-called "baitboat associated school" fishing towards the mid-1980s (**SKJ Figure 14**) and/or to seasonal changes of fishing zones as suggested by a recent study on this fishery. Furthermore, no marked trend has been observed for the Canary Islands baitboats as well as for a peripheral fishery such as the Azorean baitboat fishery. The fact that a reduction in abundance for a local segment of the stock would have little repercussion on abundance in other areas, leads to suppose that only a minor proportion of skipjack carry out extensive migrations between areas (**SKJ-Figure 11**; *cf.* notion of stock viscosity). This assumption was reinforced by a recent tagging study on growth variability of skipjack between two eastern Atlantic regions divided by 10°N latitude, which were established on the basis of their low amount of mixing (only 0.9% of the tagged fish crossed this latitudinal limit).

A new Bayesian method, using only catch information (under a Schaefer-type model parameterization), estimated the MSY at 143,000-156,000 t, a result which agrees with the estimate obtained by the modified Grainger and Garcia approach: 149,000 t.

In addition, two non-equilibrium surplus biomass production models (a multi-fleets model and a Schaefer-based model) were applied for 8 time series of CPUEs, and for a combined CPUE index weighted by fishing areas. To account for the average increase in catchability of purse seine fisheries, a correction factor of 3% per year was applied to the CPUE series. As for the Bayesian model application that only uses catches, different working hypothesis were tested on the distribution of the priors of the two surplus production models (i.e., the growth rate, the carrying capacity, the catchability coefficient of each fleet, etc.). In general, the range of plausible MSY values estimated from these models (155,000-170,000 t) were larger than in the bayesian model based on catches. The Committee stated the difficulty to estimate MSY under the continuous increasing conditions of the exploitation plot of this fishery (one-way of the trajectory to substantially weaker effort values) and which as a result, the potential range distribution of some priors needs to be constrained (e.g., for growth rate, or for the shape parameter of the generalized model).

While caution is needed as regards to the generalization of the diagnosis on the stock status of the overall spatial components of this stock in the East Atlantic, due to the moderate mixing rates that seem to occur among the different sectors of this region, it is unlikely that skipjack be exploited in the eastern Atlantic **(SKJ-Figure 15)**.

Western stock

The standardized CPUEs of Brazilian baitboats remain stable while that of Venezuelan purse seiners and USA rod and reel decreased in recent years **(SKJ-Figure 16)**. This decrease, also observed in the CPUE time series for Venezuelan purse seine, could be linked to specific environmental conditions (high surface temperatures, lesser accessibility of prey). The average weight of skipjack caught in the western Atlantic is higher than in the east (3 to 4.5 kg vs. 2 to 2.5 kg), at least for the Brazilian baitboat fishery.

The assessment model from catches estimated MSY at around 30,000 t (similar to the estimate provided by the Grainger and Garcia approach) and the Bayesian surplus model (Schaefer formulation) at 34,000 t.

The Group attempted several sensitivity analyses for values of natural mortality with Multifan-CL. For this stock only the three fisheries mentioned above were considered. The final estimate of MSY converges also at about: 31,000-36,000 t. It must be stressed that all of these analyses correspond to the current geographic coverage of this fishery (*i.e*., relatively coastal fishing grounds due to the deepening of the thermocline and of the oxycline to the East).

For the western Atlantic stock, in the light of the information provided by the trajectories of B/B_{MSY} and F/F_{MSY}, it is unlikely that the current catch is larger than the current replacement yield **(SKJ-Figure 17)**.

SKJ-4. Effects of current regulations

There is currently no specific regulation in effect for skipjack tuna.

However, with the aim of protecting juvenile bigeye tuna, the French and the Spanish boat owners voluntarily decided to apply a moratorium for fishing under floating objects between November and the end of January for the 1997-1998 and 1998-1999 periods. The Commission implemented a similar moratorium from 1999 to January 2005. This moratorium has had an effect on skipjack catches made with FADs.

On the basis of a comparison of average catches between 1993-1996, prior to the moratoria, and those between the 1998-2002 period, the average skipjack catches between November and January for the purse seine fleets that applied the moratoria, were reduced by 64%. During that period (1998-2002), the average annual skipjack catches by purse seine fleets that applied the moratoria decreased by 41% (42,000 t per year). However, this decrease is possibly a combined result of the decrease in effort and the impact of the moratoria (the average annual catch per boat decreased only 18% between these two periods).

The repealing in 2006 of Recommendation [Rec. 05-01] on the 3.2 kg minimum size limit on yellowfin tuna [Rec. 72-01] (although it remained in force in 2005) and the establishment of a time/area closure of the surface fishery [Rec. 04-01], which replaces the old strata relative to the moratorium on catches under floating objects, are regulatory measures whose effects were analyzed during the Species Group meeting.

Considering that the new closed area is much smaller in time and surface than the previous moratorium time/area, and is located in an area which historically has lower effort anyway, this regulation is likely to be less effective in reducing the overall catches of small bigeye (the species for which the regulation was applied) by the surface fishery. When the fishing effort for the EU purse seine fleet was at its maximum value (period 1994-1996, *i.e.*, before the implementation of the first moratorium), the skipjack catch from this fleet within the time and area limits defined by Rec. 04-01, was only on average at 7,180 t (*i.e.*, 7.5% of the total skipjack catch from the EU purse seiners).

SKJ-5. Management recommendations

Although the Committee makes no management recommendations in this respect, catches should not be allowed to exceed MSY. The Commission should be aware that increasing harvests and fishing effort for skipjack could lead to involuntary consequences for other species that are harvested in combination with skipjack in certain fisheries.

ATLANTIC SKIPJACK TUNA SUMMARY

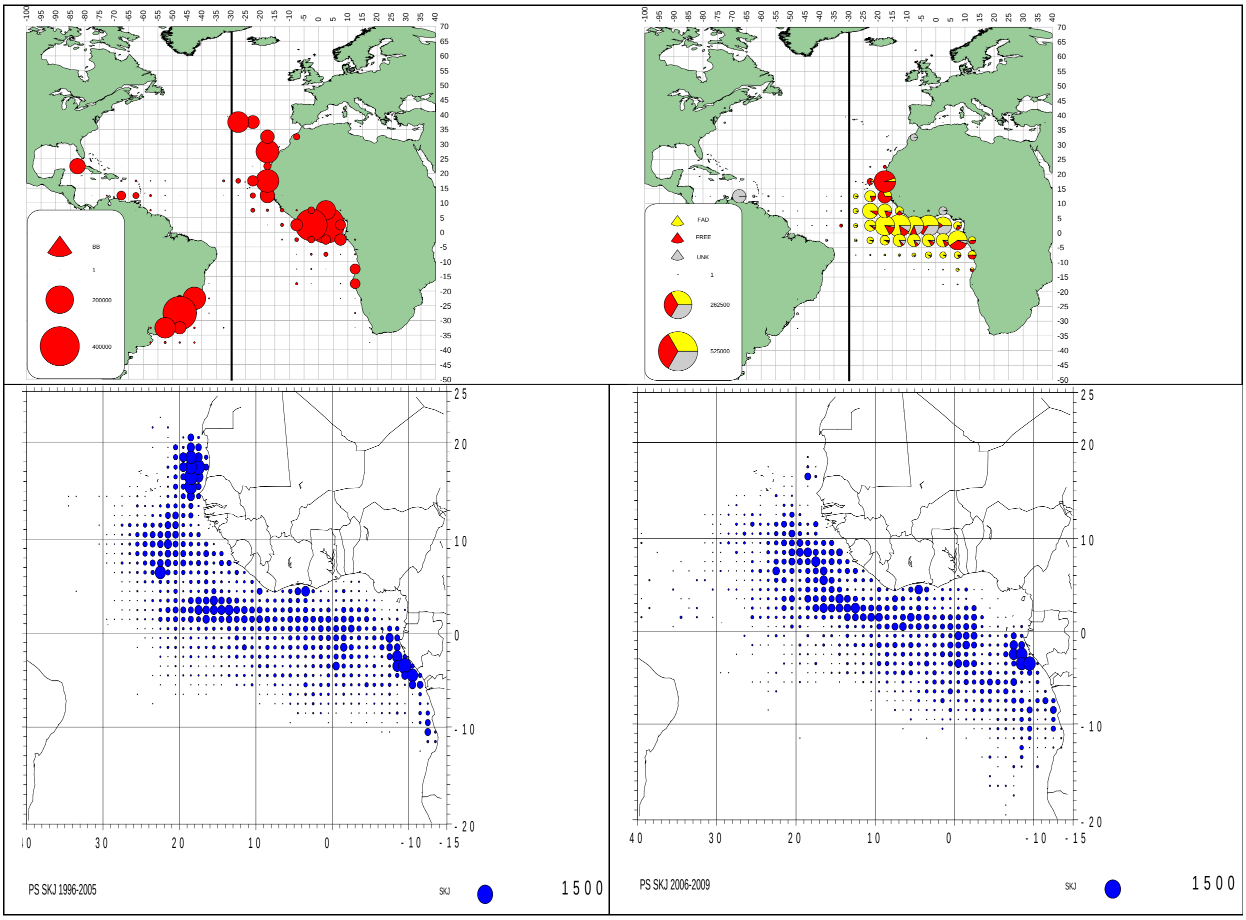
	East Atlantic	**West Atlantic**
Maximum Sustainable Yield (MSY)	Around 143,000-170,000 t	Around 30,000-36,000 t
Current (2010) Yield [1]	164,000 t	18,000 t
Current Replacement Yield	Somewhat higher than 164,000 t	Somewhat higher than 18,000 t
Relative Biomass (B_{2008}/B_{MSY})	Most likely>1	Most likely>1
Relative Fishing Mortality: (F_{2008}/F_{MSY})	Most likely<1	Most likely<1
Management measures in effect	Rec. 04-01 (effective 2005) [2]	None

[1] Reports of catches for 2010 should be considered provisional, particularly for the West Atlantic.
[2] Although this time-area measure was implemented to reduce mortality on bigeye juvenile tuna, a total area closure has the expected effects on all the tropical tuna species.

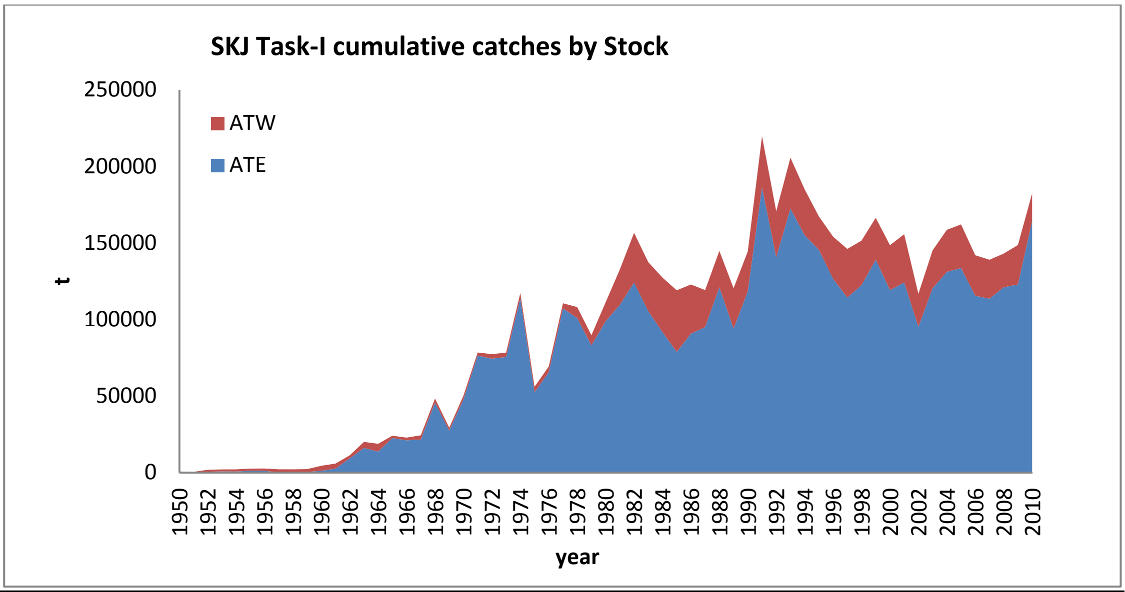
SKJ-Table 1. Estimated catches (t) of skipjack tuna (Katsuwonus pelamis) by area, gear and flag. (v02, 2011-09-30).

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			122865	119229	144796	120419	144471	219733	170708	205685	185014	167381	154127	146082	151699	166488	148605	155767	116781	145293	158707	162240	141973	139127	143114	148653	182429
	ATE		90711	95052	121060	94037	118361	186330	140554	172462	155065	145479	126557	114367	122436	139079	119209	124204	95145	120412	131085	133596	115501	113580	121025	122876	164249
	ATW		32151	24164	23736	26382	26110	33404	30155	33221	29949	21860	27562	31712	29087	27356	29307	31486	21600	24749	27461	28517	26453	25443	22022	25771	18140
	MED		2	13	0	0	0	0	0	2	0	43	9	4	176	53	90	77	37	132	161	127	20	104	67	5	40
Landings	ATE	Bait boat	30009	38803	48015	41000	36922	41611	35660	31656	37817	33691	32047	37293	42045	37696	29974	46281	27591	29847	39539	43603	41175	29720	44106	33580	37157
		Longline	19	6	4	9	0	5	3	2	10	3	7	47	85	42	48	53	56	66	316	458	2958	1599	1154	1556	1050
		Other surf.	1638	1027	1506	1643	1357	2067	1602	1062	501	445	501	304	923	417	2423	764	681	551	816	1897	2402	2172	2763	4879	4719
		Purse seine	59045	55216	71535	51385	80082	142646	103288	139742	116737	111340	94002	76722	79383	100925	86763	77107	66817	89948	90414	87638	68966	80088	73002	82861	121323
	ATW	Bait boat	25278	18675	21057	23292	22246	23972	20852	19697	22645	17744	23741	26797	24724	23881	25754	25142	18737	21990	24082	26028	23749	22865	20617	22770	12902
		Longline	8	6	9	25	23	33	29	20	16	34	19	12	21	58	22	60	349	95	206	207	286	52	49	20	17
		Other surf.	1657	518	355	600	600	872	764	710	1577	2023	452	556	516	481	467	951	398	367	404	316	372	1317	455	950	1086
		Purse seine	5208	4964	2315	2466	3241	8527	8509	12794	5712	2059	3349	4347	3826	2936	3063	5332	2116	2296	2769	1967	2045	1209	901	2032	4136
	MED	Bait boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	17	21	13	8	39	40	1	14
		Other surf.	2	13	0	0	0	0	0	2	0	43	9	4	176	53	90	77	32	12	40	16	12	28	11	3	17
		Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	103	101	99	0	38	16	1	8
Discards	ATW	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landings	ATE	Angola	56	80	30	85	69	66	41	13	7	3	15	52	2	32	14	14	14	14	10	0	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	510
		Benin	11	5	3	7	2	2	2	2	2	2	2	7	3	2	2	0	0	0	0	0	0	0	0	0	
		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cape Verde	877	2076	1456	971	806	1333	864	860	1007	1314	470	591	684	962	789	794	398	343	1097	7504	7930	6026	6010	4767	6032
		Cayman Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	
		Chinese Taipei	0	0	1	3	0	5	3	2	10	3	5	47	73	39	41	24	23	26	16	10	9	14	19	6	7
		Congo	8	8	8	11	12	9	9	10	7	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	569	81	206	331	86	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Curaçao	0	0	0	0	0	0	0	0	0	0	7096	8444	8553	9932	10008	13370	5427	10092	8708	0	3042	1587	6436	9143	9179
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1173	259	292	143	559	1259	1565	1817	2328	2840	2840
		EU.Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	41992	33076	47643	35300	47834	79908	53319	63660	50538	51594	38538	38513	36008	44520	37226	30954	25456	44837	38725	28139	22206	23670	35105	36694	41186
		EU.Estonia	0	0	0	0	0	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.France	13045	17114	16504	15211	17099	33271	21890	33735	32779	25188	23107	17023	18382	20344	18183	16593	16615	19899	21879	14850	7034	4168	4439	7789	14741
		EU.Germany	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	14	0	0	8	6
		EU.Latvia	0	0	0	0	0	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Lithuania	0	0	0	0	0	221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	5446	8420	14257	7725	3987	8059	7477	5651	7528	4996	8297	4399	4544	1810	1302	2167	2958	4315	8504	4735	11158	8995	6057	1084	12974
		Gabon	0	0	0	0	0	0	0	1	11	51	26	0	59	76	21	101	0	0	0	0	0	0	0	0	
		Ghana	22268	24347	26597	22751	24251	25052	18967	20225	21258	18607	19602	26336	34183	40216	28974	42489	30499	24597	25727	44671	30236	34572	37387	36064	53813
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6389	4959	5546	6319	4036	2951
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1224	1224
		Japan	2031	1982	3200	2243	2566	4792	2378	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1
		Korea Rep.	5	6	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		Maroc	1220	1028	428	295	1197	254	559	310	248	4981	675	4509	2481	848	1198	268	280	523	807	1893	3779	1570	1291	2575	2317
		Mixed flags (FR+ES)	692	4663	4660	4125	5280	11101	12273	13750	9492	5862	5831	4905	5621	6845	9461	7137	2995	4959	5262	4666	5313	3275	3128	2969	4163
		NEI (ETRO)	540	791	2994	2263	10869	11335	12409	20291	17418	16235	16211	6161	6748	8893	7127	8087	8550	9688	11137	2873	629	0	0	0	
		Namibia	0	0	0	0	0	0	0	0	2	15	0	1	0	0	0	8	0	0	0	0	0	0	0	71	2
		Norway	0	581	738	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Panama	0	0	0	0	0	8312	8719	13027	12978	14853	5855	1300	572	1308	1559	281	342	0	7126	11490	13468	18821	8253	8518	9590
		Rumania	3	0	0	59	142	349	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	0	0	0	0	1175	1110	540	1471	1450	381	1146	2086	1426	374	0	0	0	0	0	392	1130	313	260	**0**
		S. Tomé e Príncipe	20	20	195	196	204	201	178	212	190	180	187	178	169	181	179	179	179	179	117	166	143	0	229	235	241
		Senegal	0	0	0	47	134	652	260	95	59	18	163	455	1963	1631	1506	1271	1053	733	1333	4874	3534	2278	3661	4573	2447
		South Africa	101	88	157	96	17	15	7	6	4	4	1	6	2	1	7	1	1	2	2	1	0	0	4	4	2

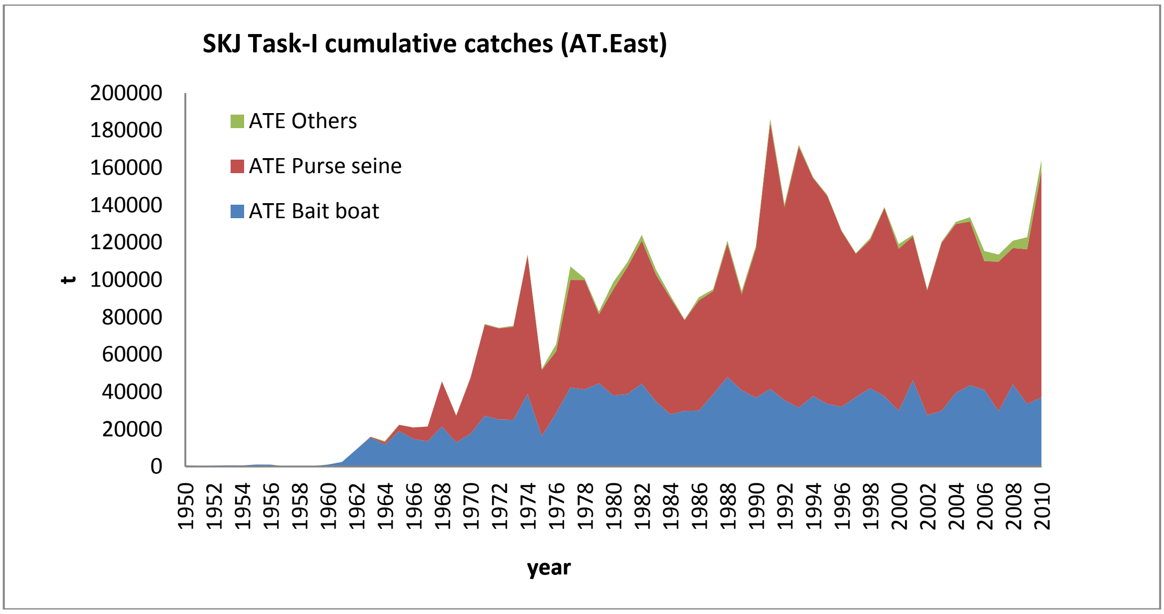
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.S.R.	1688	547	1822	1915	3635	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Sta Helena	139	139	158	397	171	24	16	65	55	115	86	294	298	13	64	205	63	63	63	63	88	110	45	15	25
		Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	Argentina	138	90	7	111	106	272	123	50	1	0	1	0	2	0	1	0	0	0	30	0	0	0	0	0	
		Barbados	33	21	3	9	11	14	5	6	6	6	5	5	10	3	3	0	0	0	0	0	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2204
		Brasil	23155	16286	17316	20750	20130	20548	18535	17771	20588	16560	22528	26564	23789	23188	25164	24146	18338	20416	23037	26388	23270	24191	20846	23307	13550
		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Chinese Taipei	1	2	7	19	0	32	26	9	7	2	10	1	2	1	0	1	16	14	27	28	29	2	8	0	6
		Colombia	0	0	0	0	0	0	0	2074	789	1583	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	1277	1101	1631	1449	1443	1596	1638	1017	1268	886	1000	1000	651	651	651	0	0	624	545	514	536	0	0	0	
		Curaçao	40	40	40	40	40	40	40	45	40	35	30	30	30	30	30	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	60	38	41	24	43	33	33	33	33	85	86	45	55	51	30	20	28	32	45	25	
		Dominican Republic	600	62	63	117	110	156	135	143	257	146	146	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	0	0	0	0	0	1592	1120	397	0	0	0	0	0	1	1	0	0	0	0	0	0	5	11	0	0
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	9	0	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	3	3	5	21	11	0	6	0
		Grenada	9	5	22	11	23	25	30	25	11	12	11	15	23	23	23	15	14	16	21	22	15	26	20	0	
		Jamaica	0	0	0	0	0	0	0	0	0	0	62	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		Korea Rep.	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Mexico	11	13	10	14	4	9	8	1	1	0	2	3	6	51	13	54	71	75	9	7	10	7	8	9	7
		NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	17	28	29	27	20	66	56	53	37	42	57	37	68	97	357	92	251	251	355	90	83	54	46
		Sta. Lucia	76	60	53	38	37	51	39	53	86	72	38	100	263	153	216	151	106	132	137	159	120	89	168	0	153
		Trinidad and Tobago	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	1115	734	57	73	304	858	560	367	99	82	85	84	106	152	44	70	88	79	103	30	61	66	67	119	55
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0
		Venezuela	5690	5750	4509	3723	3813	8146	7834	11172	6697	2387	3574	3834	4114	2981	3003	6870	2554	3247	3270	1093	2008	921	757	2250	2119
	MED	Algerie	0	0	0	0	0	0	0	0	0	0	0	0	171	43	89	77	0	0	0	0	0	0	0	0	
		EU.España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	26	10	15	44	12	0	5
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	8
		EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	99	99	0	0	0	0	
		EU.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	29	34	17	0	0	0	0	
		Maroc	2	13	0	0	0	0	0	2	0	43	9	4	5	10	1	0	1	1	2	1	5	22	18	5	26
		Syria Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	36	0	
Discards	ATW	Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



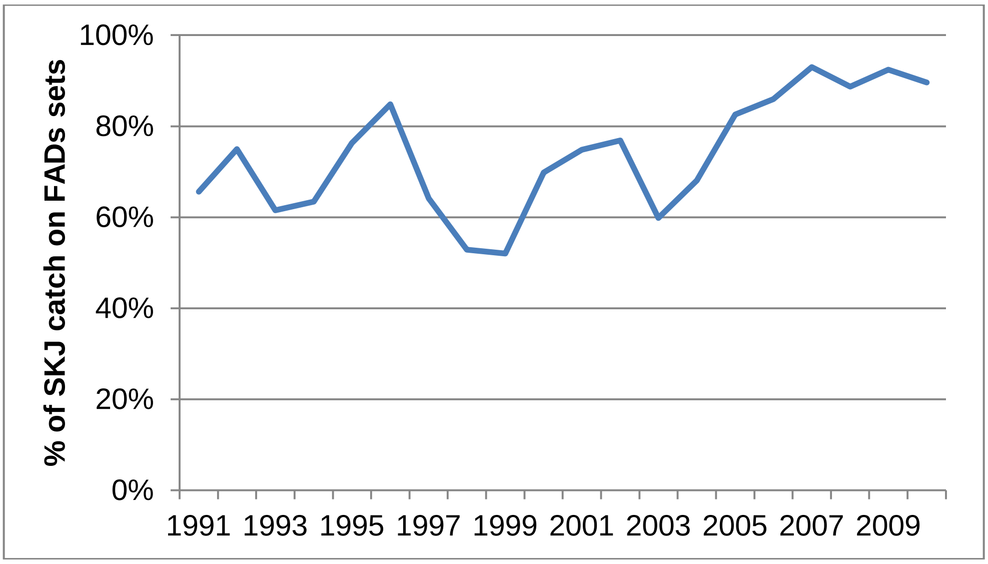
SKJ-Figure 1. (A) Distribution of skipjack catches in the Atlantic for baitboat between 1960 and 2009 (upper left panel) and for purse seiners by fishing mode (free schools vs FADs) between 1991 and 2009. (B) Skipjack catches made by European purse seiners (about 75% of the total catches) 1996-2005 (lower left panel) and 2006-2009 (lower right panel) showing the withdrawal from the Senegal zone due to non-renewal of the fishing agreements.



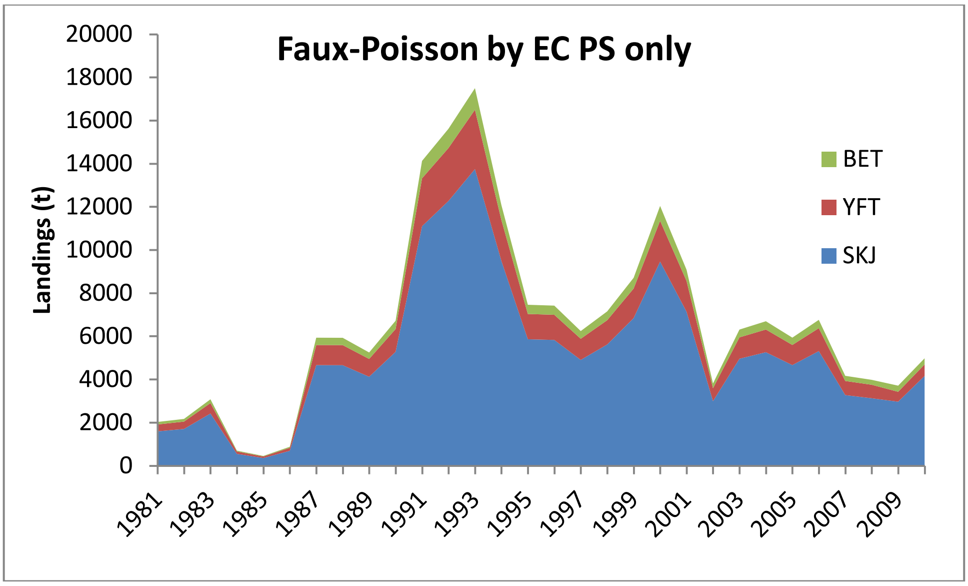
SKJ-Figure 2. Total catch (t) for skipjack tuna in the Atlantic Ocean and by stocks (East and West) between 1950 and 2010. Estimates of skipjack in the "*faux poissons*" landed in Côte d'Ivoire were included in the skipjack trade catches in the eastern Atlantic (only catches to 2006 were considered for the stock assessment). The estimate of total catches in the West Atlantic (and consequently for all the Atlantic), remains preliminary. It is also possible that skipjack catches taken in the eastern Atlantic during recent years were not reported.



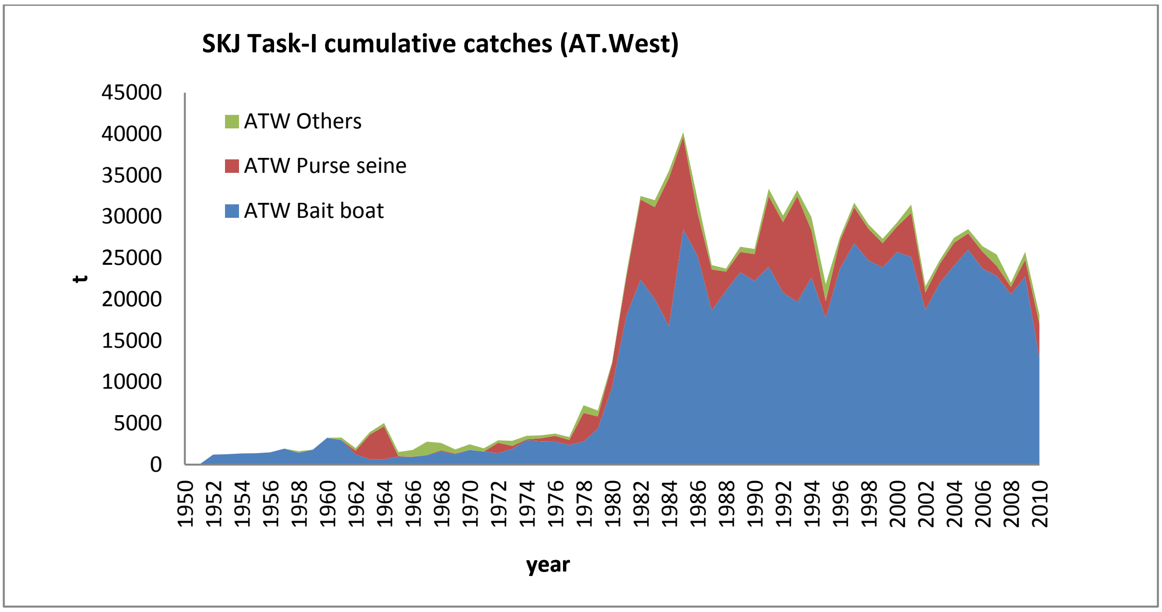
SKJ-Figure 3. Skipjack catches in the eastern Atlantic, by gear (1950-2010). It is possible that skipjack catches taken by purse seiners in the eastern Atlantic during recent years were not reported.



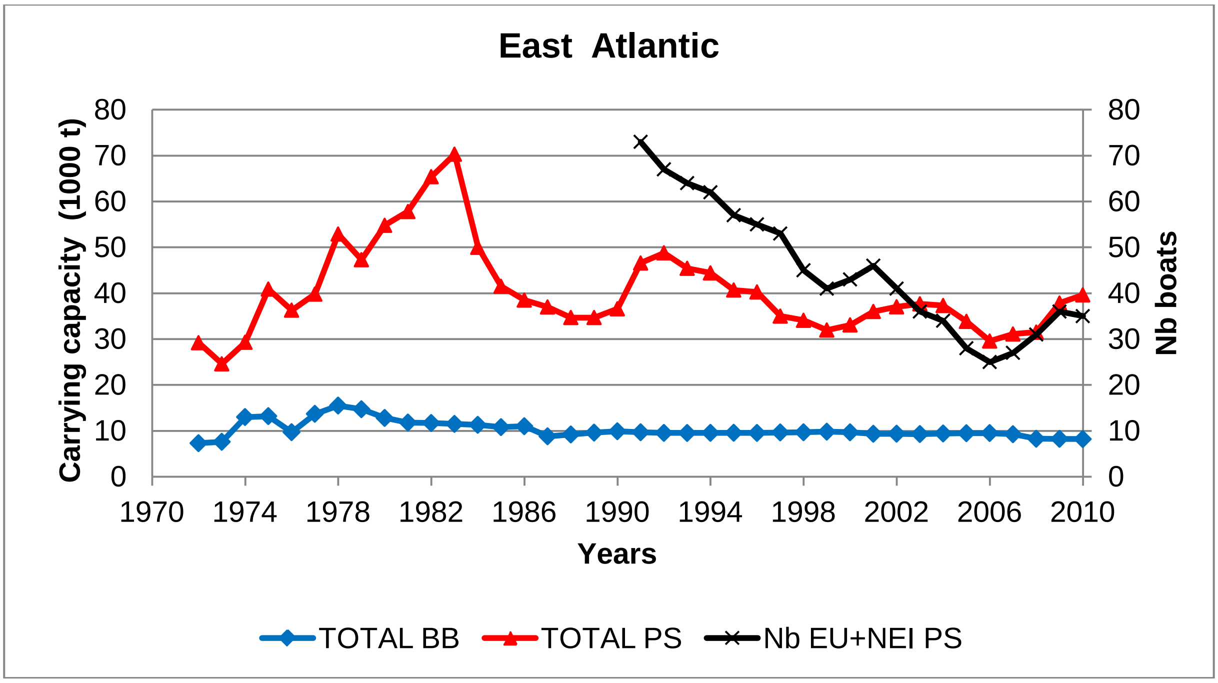
SKJ-Figure 4. Changes in the proportion of skipjack catches made by European purse seiners under FADs (1991-2010).). The increase in the percentage of catches under FADs coincides with the shift from the Senegal area (due to not renewing the fishing agreements); Area known for its seasonal fishing on free schools (see **Figure 1**).



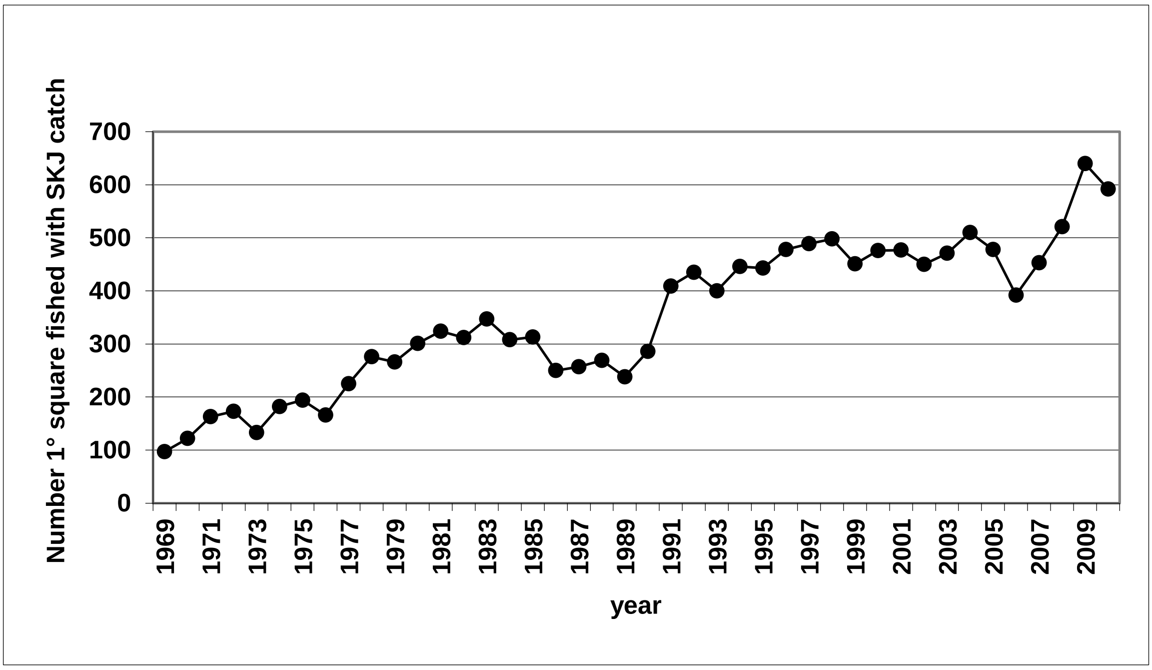
SKJ-Figure 5. Cumulative estimated landings of "*faux poissons*" (1981-2010) for the European or associated purse seiners for the three main species of tropical tunas in the local market of Abidjan (Côte d'Ivoire).



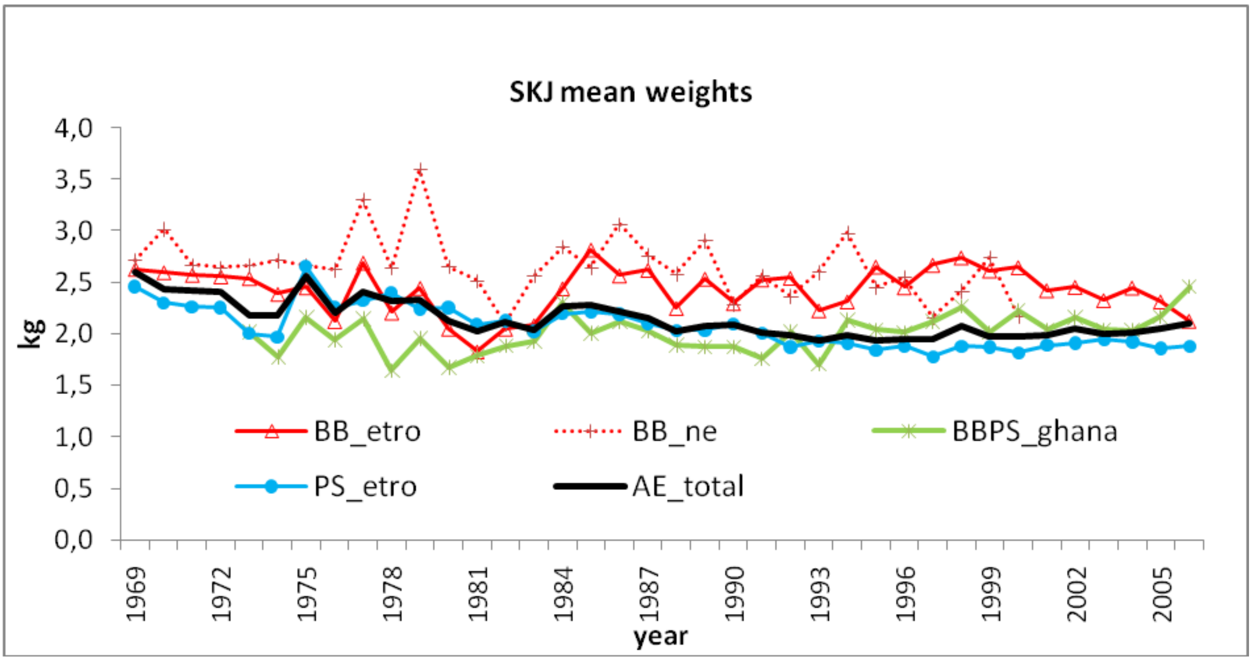
SKJ-Figure 6. Skipjack catches in the western Atlantic, by gear (1950-2010). The estimate for 2010 for baitboat is still preliminary.



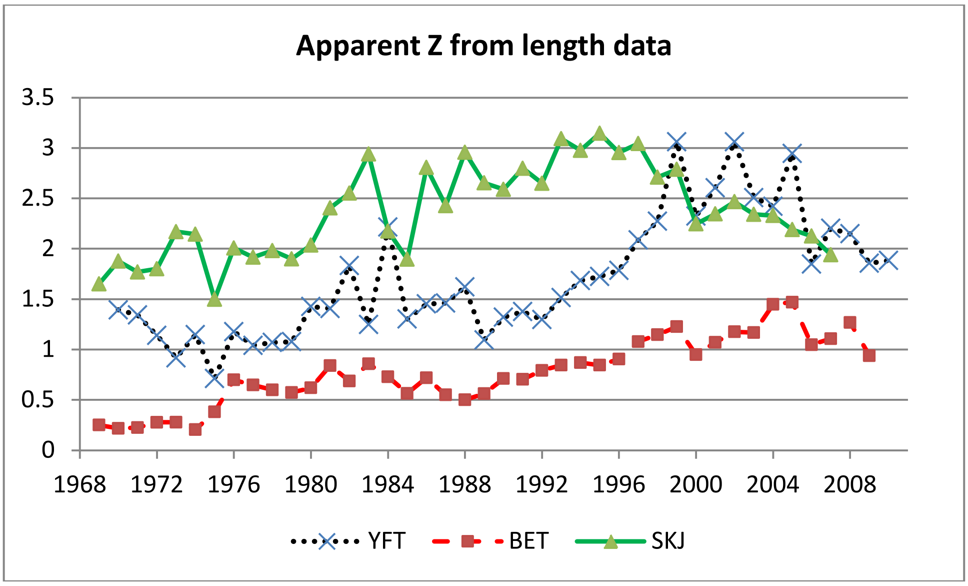
SKJ-Figure 7. Changes over time in the carrying capacity, corrected by time at sea, (left axis) for the overall purse seiners and baitboats operating in the eastern Atlantic (1971-2010) and in number of boats for the European purse seiners (right axis). It is possible that the carrying capacity for some segments of the purse seine fleet was underestimated during recent years.



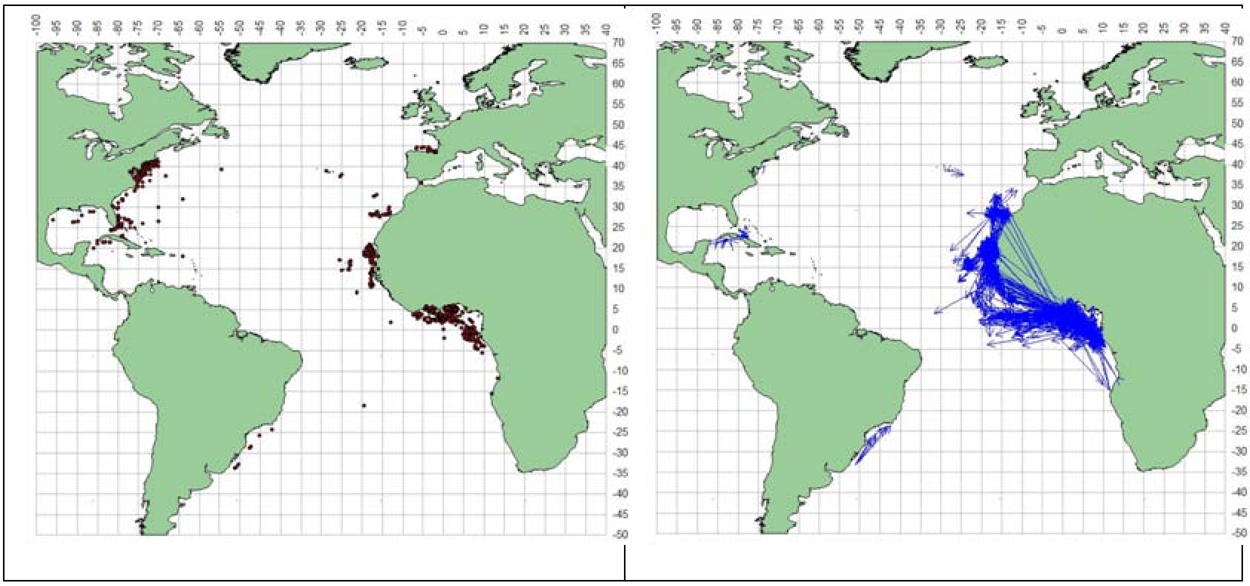
SKJ-Figure 8. Number of 1°x1° squares with catch of skipjack for the purse seiners operating in the eastern Atlantic (1969-2010). The increase observed in 1991 could be due to a modification of the species composition correction procedure of the catches implemented at this date (skipjack catches could have been attributed to squares which were not included until then). On the other hand, the recent increase in the area searched successfully corresponds to the extension of the fishery towards the western central Atlantic and off Angola.



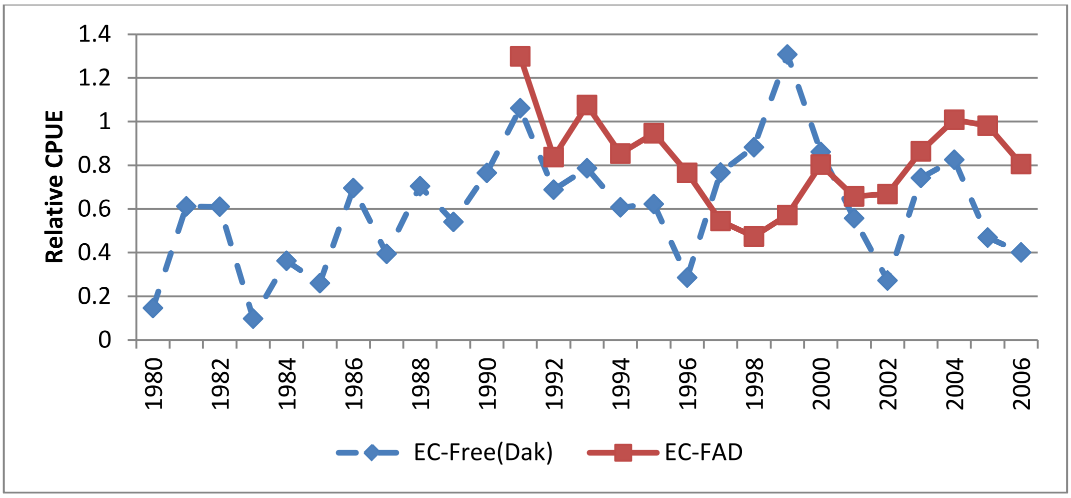
SKJ-Figure 9. Changes in time of the mean weight of the skipjack landed (non standardized) by major fisheries in the eastern Atlantic.



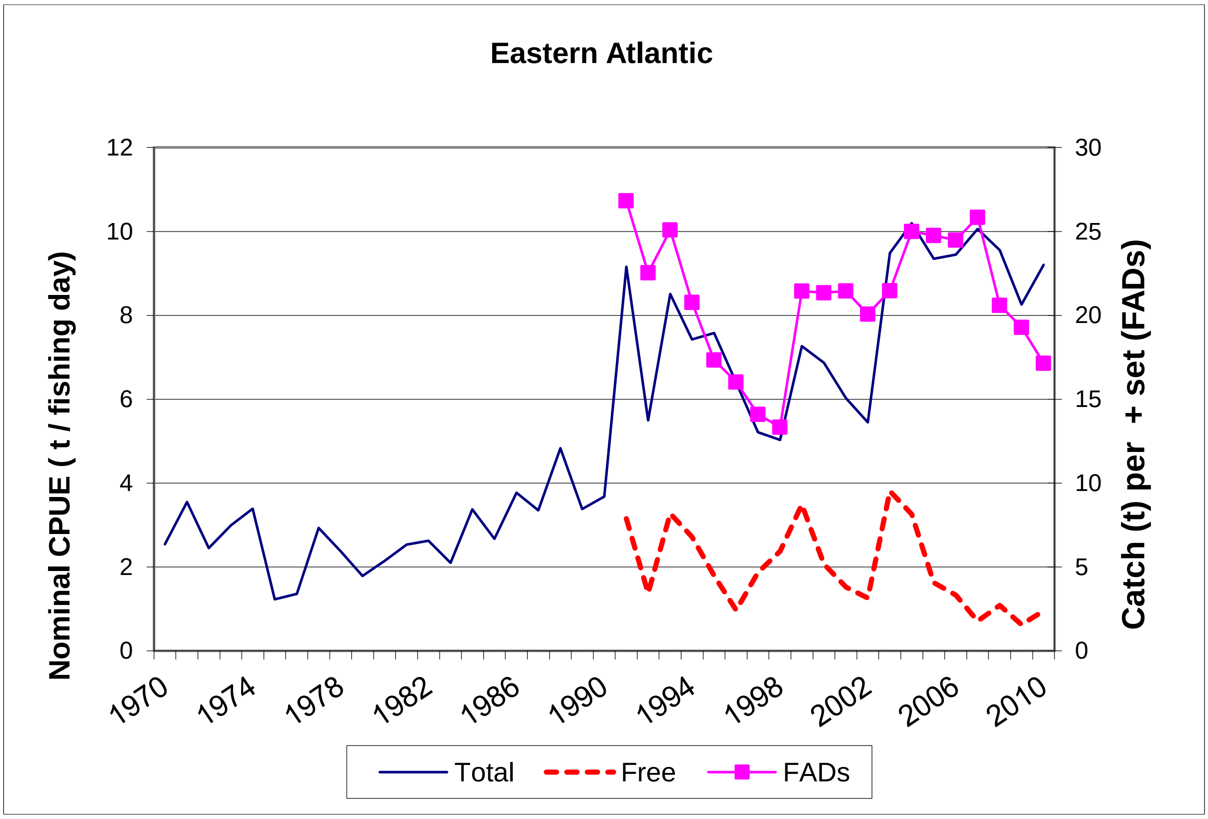
SKJ-Figure 10. Changes over time in the apparent total mortality *Z*, calculated based on Beverton and Holt's equation, for the three main tropical tuna species in the Atlantic Ocean. YFT = yellowfin, BET = bigeye, SKJ = Eastern skipjack. The size at which the fish are fully recruited was fixed at 50 cm (FL).



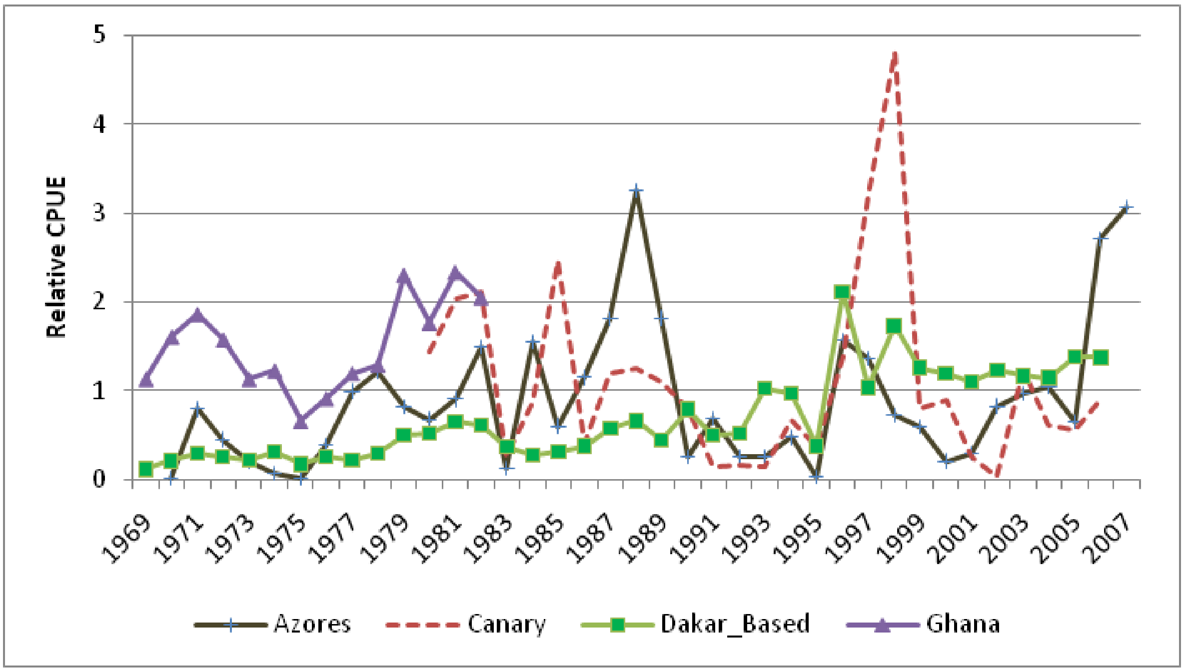
SKJ-Figure 11. Distribution of tagged and released SKJ (left panel) and apparent movements from geographic positions of recaptured fish (right panel).



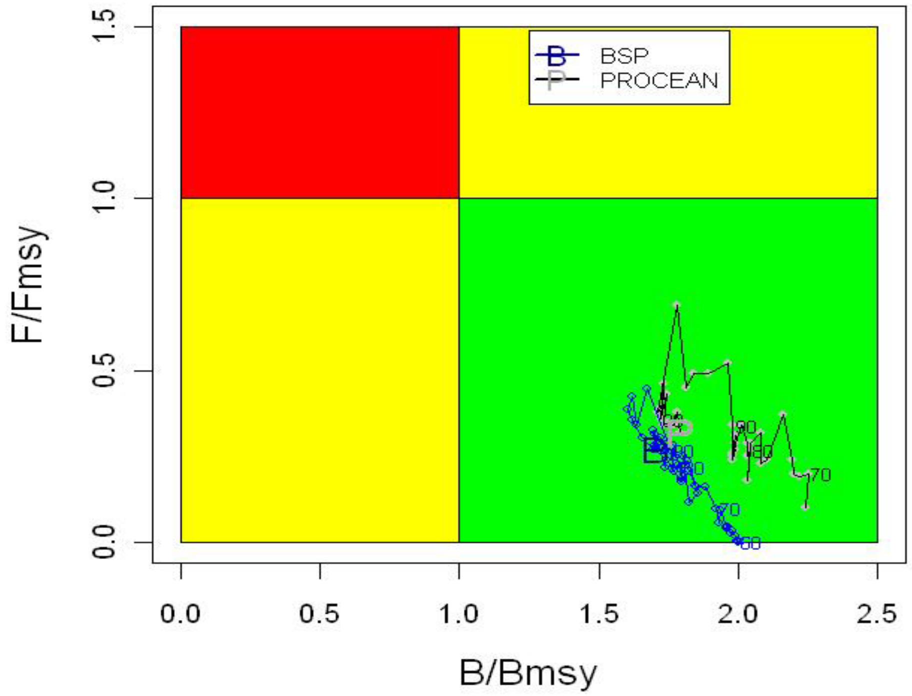
SKJ-Figure 12. Standardized skipjack CPUE for EU purse seiners in the eastern Atlantic Ocean. Free = free school off Senegal; FAD = schools associated with fish aggregating devices in the equatorial areas.



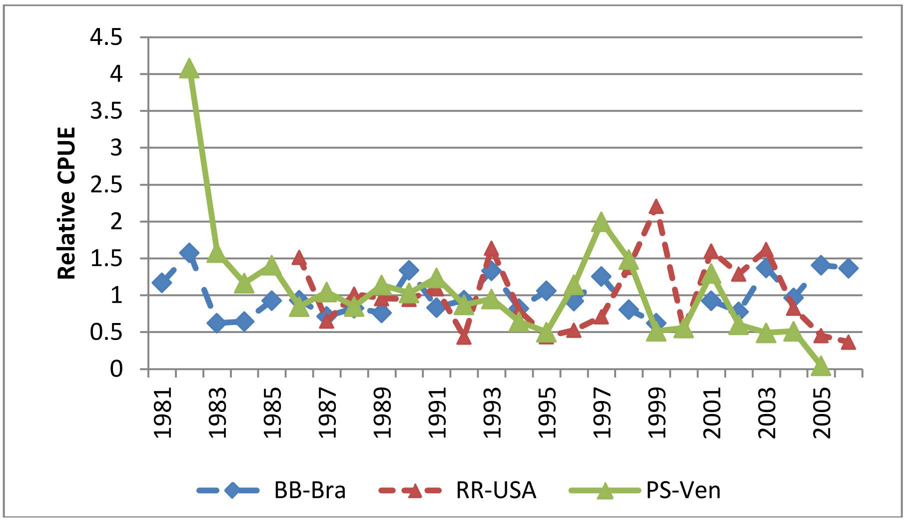
SKJ-Figure 13. Changes in nominal CPUE for the European purse seiners in the eastern Atlantic (1970-2010). Free = free schools (t / f. day) off Senegal; FADs = schools associated with fish aggregating devices (t / successful set) in the equatorial area.



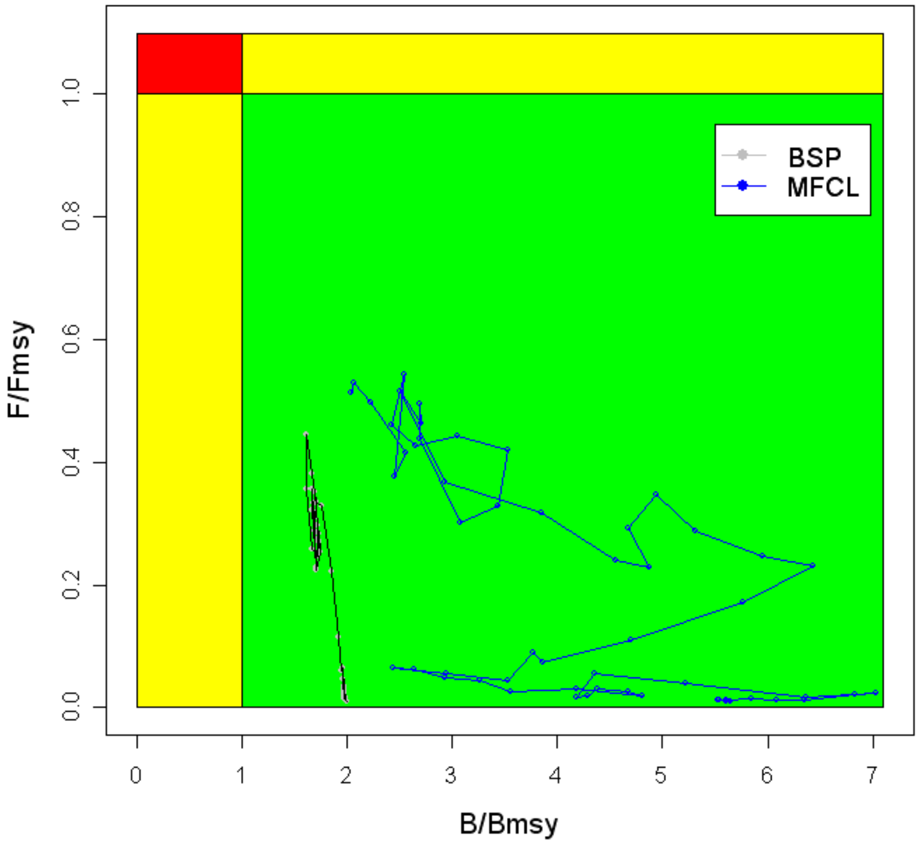
SKJ-Figure 14. Standardized CPUE for the main baitboat fleets operating in the eastern Atlantic Ocean: Azores, Canary islands (non standardized), Dakar and Ghana-based baitboats.



SKJ-Figure 15. Eastern skipjack stock status: trajectories of B/B_{MSY} and F/F_{MSY} from the Bayesian surplus production model (Schaefer type), and from the generalized multi-fleets dynamic model.



SKJ-Figure 16. Standardized CPUEs of Brazilian baitboats, U.S. rod and reel recreational fleets and non-standardized CPUE of the Venezuelan purse seiners in the western Atlantic Ocean.



SKJ-Figure 17. Western skipjack stock status: trajectories of B/B_{MSY} and F/F_{MSY} from the Bayesian surplus production model (Schaefer type) and from Multifan-CL.

8.4 ALB – ALBACORE

The status of the North Atlantic albacore stock is based on the most recent analyses conducted in July 2009 by means of applying statistical modelling to the available data up to 2007. Complete information on the assessment can be found in the Report of the 2009 ICCAT Albacore Stock Assessment Session.

The status of the South Atlantic and Mediterranean albacore stocks is based on the 2011 assessment using available data up to 2009 and 2010, respectively. Complete information is found in the Report of the 2011 ICCAT Albacore Stock Assessment Session.

ALB-1. Biology

Albacore is a temperate tuna widely distributed throughout the Atlantic Ocean and Mediterranean Sea. On the basis of the biological information available for assessment purposes, the existence of three stocks is assumed: northern and southern Atlantic stocks (separated at 5ºN) and Mediterranean stock (**ALB-Figure 1)**. However, some studies support the hypothesis that various sub populations of albacore exist in the North Atlantic and Mediterranean. Likewise, there is likely intermingling of Indian Ocean and South Atlantic immature albacore which needs further research.

Scientific studies on albacore stocks, in the North Atlantic, North Pacific and the Mediterranean, suggest that environmental variability may have a serious potential impact on albacore stocks, affecting fisheries by changing the fishing grounds, as well as productivity levels and potential MSY of the stocks. Those unexplored aspects might explain recently observed changes in fisheries, such as the lack of availability of the resource in the Bay of Biscay in recent years, or the apparent decline in the estimated recruitment which are demanding focussed research.

The expected life-span for albacore is around 15 years. While albacore is a temperate species, spawning occurs in tropical waters. Present available knowledge on habitat, distribution, spawning areas and maturity of Atlantic albacore is based on limited studies, mostly from past decades. In the Mediterranean, there is a need to integrate different available studies so as to better characterize growth of Mediterranean albacore. Besides some additional recent studies on maturity, in general, there is poor knowledge about Mediterranean albacore biology and ecology.

More information on albacore biology and ecology is published in the *ICCAT Manual*.

ALB-2. Description of fisheries or fisheries indicators

North Atlantic

The northern stock is exploited by surface fisheries targeting mainly immature and sub-adult fish (50 cm to 90 cm FL) and longline fisheries targeting immature and adult albacore (60 cm to 130 cm FL). The main surface fisheries are carried out by EU fleets (Ireland, France, Portugal and Spain) in the Bay of Biscay, in the adjacent waters of the northeast Atlantic and in the vicinity of the Canary and Azores Islands in summer and autumn. The main longline fleet is the Chinese Taipei fleet which operates in the central and western North Atlantic year round. However, Chinese Taipei fishing effort decreased in late 1980s due to a shift towards targeting on tropical tuna, then continued at this lower level to the present. Over time, the relative contribution of different fleets to the total catch of North Atlantic albacore has changed, which resulted in differential effects on the age structure of the stock.

The historical time series of catch was extended back to 1930 for the troll fishery after revision of data for the assessment. Total reported landings for the North Atlantic generally began to decline after 1986, largely due to a reduction of fishing effort by the traditional surface (troll and baitboat) and longline fisheries (**ALB-Table 1**; **ALB-Figure 2a**). Some stabilization was observed in the 1990s, mainly due to increased effort and catch by new surface fisheries (driftnet and mid-water pair pelagic trawl), with a maximum catch in 2006 at 36,989 t and, since then, a decreasing trend of catch is observed in the North Atlantic.

The total catch in 2010 was 19,649 t, representing an increase of 25% compared to the 2009 yield, which was the lowest recorded in the time series since 1950.

The surface fisheries accounted for the bulk of the total catch with 15,621 t reported in 2010 (81%) **(ALB-Table 1)**. The reported catch for EU-France in 2010 was 1,298 t, similar to 2009. The reported catch for EU-Spain in 2010 was 12,989 t, mainly from the troll fleet and baitboat fleets. This represents a 34% increase from the 2009 catch to a level similar to that in 2008. In contrast, EU-Ireland 2010 reported catches had decreased by 60% compared to 2009, reaching similar levels to those in the early 2000s.

Standardized catch rates of the Spanish troll fleet were updated to 2009. Albacore age 1 showed an increasing trend peaking in 2005 and 2006, fluctuating since then and a decrease in 2009. Age 2 albacore showed an increasing trend over the last years with a recent peak in 2008 and a decreasing trend in 2009. In the case of age 3, there is a continued upward trend from 2007 to 2009. Catch rates of the Irish mid-water pelagic trawl fleet showed a steep decline in 2007 compared to the higher estimates for 2005 and 2006.

In total, the 2010 longline catches increased compared to the last three years. The Chinese Taipei preliminary catch in 2010 was 1,587 t, an increase as compared to that of 2009, which was a low catch year stemming mainly from a reduction in fishing effort. Japan takes albacore as by-catch with longline gear. The Japanese longline preliminary catch reached 515 t in 2010, which represented an increase from 2009 in spite of the reducing fishing effort during the last decades. The catch fluctuated from around 300 t to 1,300 t in the last decade. Recent catch rates from the Chinese Taipei longline fishery in 2008 showed the same level as in 2007.

The trend in mean weight for all surface fleets (baitboat, troll, mid-water, pair pelagic and other surface) from 1975 to 2007 showed a stable trend with an average of 7 kg (range:4-10). For longline fleets from 1975 to 2005 the mean weight was also relatively stable with an average of 18.8 kg (range: 13.4-25.7 kg) (**ALB-Figure 3a)**.

South Atlantic

The recent total annual South Atlantic albacore landings were largely attributed to four fisheries, namely the surface baitboat fleets of South Africa and Namibia, and the longline fleets of Brazil and Chinese Taipei (**ALB-Table 1**; **ALB-Figure 2b**). The surface fleets are entirely albacore directed and mainly catch juvenile and sub-adult fish (70 cm to 90 cm FL). These surface fisheries operate seasonally, from October to May, when albacore are available in coastal waters. Brazilian longliners target albacore during the first and fourth quarters of the year, when an important concentration of adult fish (> 90 cm) is observed off the northeast coast off Brazil, between 5ºS and 20ºS, being likely related to favorable environmental conditions for spawning, particularly of sea surface temperature. The longline Chinese Taipei fleet operates over a larger area and throughout the year, and consists of vessels that target albacore and vessels that take albacore as by-catch, in bigeye directed fishing operations. On average, the longline vessels catch larger albacore (60 cm to 120 cm FL) than the surface fleets.

Total reported albacore landings for 2010 were 18,900 t, a decrease of about 19% from 2009 catch. The Chinese Taipei preliminary catch in 2010 was 10,975 t, an increase of 2,297 t as compared to that of 2009. However, the Chinese Taipei catch in the last years has decreased mainly due to a decrease in fishing effort targeting albacore. Chinese Taipei longliners (including boats flagged in Belize and St. Vincent and the Grenadines) stopped fishing for Brazil in 2003, which resulted in albacore only being caught as by-catch in tropical tuna-directed longline fisheries. Albacore is only caught as by-catch in Brazilian tropical tuna-directed longline and baitboat fisheries. In 2010, the catch of the Brazilian fishery was 271 t, showing an increase of about 35% compared to 2009. The average catch of about 4,287 t during the period 2000-2003 was obtained by the Brazilian longline fleet when albacore was a target species. In 2009, Uruguay reported 685 t, which represent an extremely high increase from previous reported years. Reported catch in 2010 (24 t) was, however, on the order of magnitude of earlier years.

In 2010, the estimated South African catch was 4,147 t (mainly baitboat), which represented a decrease of about 18% from 2009. In addition, in 2010 the Namibian total reported catch was 1,320 t (mainly baitboat), a decrease of 74% from 2009. Japan takes albacore as by-catch using longline gear. In 2010, the Japanese longline preliminary catch was 1,007 t, an increase of 9% from 2009. The relatively large increase from 238 t in 2007 was due to an increase in fishing effort in the waters off southern Africa (20-40˚S).

The trend in mean weight from the 1975 to 2009 period is shown in **ALB-Figure 3b.** Surface fleets showed a stable trend from 1981 onwards with an average of 12.7 kg and a maximum and minimum weight of 16.5 kg and 10 kg, respectively. While the trend in mean weight for longline fisheries showed an increase after 1996.

Mediterranean

The catch series was revisited and compared to additional sources of information. This allowed identifying some catches that were not included in the ICCAT database, which requires further revisions. In 2010, the reported landings were 2,123 t, a 47% decrease from 4,021 t taken in 2009 (**ALB-Table 1** and **ALB-Figure 2c**). The majority of the catch came from longline fisheries. EU-Italy is the main producer of Mediterranean albacore and in 2010 the Italian catch was 1,109 t, a 60% reduction from its 2009 catch.

ALB-3. State of stocks

North Atlantic

A thorough revision of North Atlantic Task I and Task II data was conducted and a more robust method for catch-at-size analyses was implemented for the 2009 assessment session similar to that used in the 2007 assessment. In addition, catch rate analyses were improved and updated with new information for the northern albacore fisheries and substantial effort was undertaken to implement assessment methods which do not assume that catch-at-age is perfectly known. The analyses were also conducted to incorporate longer time-series of catch, effort and size information into the assessment to guide the evaluation. The approach provided the opportunity to evaluate a range of hypothesis about how the fisheries operated over time and their impact on the population. The results of these efforts are reflected in the following summaries of stock status that analyzed data through 2007.

The CPUE trends for the various surface fleets, based upon the most recent available 2007 data showed somewhat different patterns from each other. This was also the case for the different longline fleets (**ALB-Figure 4**). The Spanish age two troll CPUE series showed evidence of a relatively strong 2003 year class entering the fishery. For the Spanish age three troll CPUE series, the age signal is not as strong, leading to uncertainty about the possibility of a good year class. For the longline fleets, the general trend in CPUE indices is a decline over time, with varying rates. Given the variability associated with these catch rate estimates, definitive conclusions about recent trends could not be reached just by examining the CPUE trends alone which represent different parts of the population.

The data sets used for the analyses from 1930 to 2007 were compiled during the July 2009 stock assessment meeting. The data was classified into 10 fishery units using the same definitions as those used in the 2007 stock assessment. The basic input data, catch, effort and catch-at-size were revised due to updates in the ICCAT Task I (**Table 1**) and Task II database. Model specification for the base case was identical to the 2007 assessment. However, the model was run using the latest version of the software. Different hypothesis on the dynamics of the northern albacore stock were tested and those with clearly unrealistic outputs were discarded.

Based on the present assessment which considers catch and effort since the 1930s and size frequency since 1959, the view of the northern albacore resource status is that spawning stock size has declined and in 2007 was about one third of the peak levels estimated for the late-1940s. Estimates of recruitment to the fishery, although variable, have shown generally higher levels in the 1960s and earlier periods with a declining trend thereafter until 2007. The most recent recruitment is estimated to be the lowest for all the years of the evaluation although the magnitude of this year-class is highly uncertain in the latest year (**ALB-Figure 5**). The 2009 current assessment indicated that the stock has remained below B_{MSY} (current SSB_{2007} is approximately 62% of SSB at MSY) (**ALB-Figure 5**) since the late 1960. Corresponding fishing mortality rates have been above F_{MSY} (current F_{2007}/F_{MSY} ratio is 1.05 which is only slightly higher than F_{MSY}, **ALB-Figure 6**).

The trajectory of fishing mortality and spawning stock biomass relative to MSY reference points, from the assessment model is shown in **ALB-Figure 6**. As the majority of the time series is in the top left quadrant ($F/F_{MSY} > 1$ and, $SSB/SSB_{MSY} < 1$) this could indicate the northern albacore stock has been overfished ($SSB/SSB_{MSY} < 1$) since the mid-1980s. Uncertainty around the estimates of current F_{2007}/F_{MSY} and SSB_{2007}/SSB_{MSY} is shown in **ALB-Figure 7**.

South Atlantic

In 2011, a stock assessment of the southern Atlantic albacore was conducted including catch, effort and size data up until 2009, and considering a broader range of methods than in the previous assessment.

The southern standardized CPUE trends are mainly for longline fisheries, which harvest mostly mature albacore. The longest time series (those of Japan and Taiwan), showed a strong declining trend in the early part of the time series, and less steep decline over the past decade. However, the Brazilian and Uruguayan longline CPUE series showed significant decreases in the late 1990's. The CPUE from the recent South African baitboat fishery, harvesting mostly juvenile albacore, shows no apparent trend (**ALB-Figure 8**).

In the 2011 assessment, eight scenarios were considered. Stock status results varied significantly among them (**ALB-Figure 9**). In general, two different production model forms were considered. One showed more optimistic results than the other. However, the Committee lacked enough objective information to identify the most plausible scenarios. Considering the whole range of scenarios, the median MSY value was 27,964 t (ranging between 23,296 t and 98,371 t), the median estimate of current B/B_{MSY} was 0.88 (ranging between 0.55 and 1.59) and the median estimate of current F/F_{MSY} was 1.07 (ranging between 0.44 and 1.95). The wide confidence intervals reflect the large uncertainty around the estimates of stock status. Considering all scenarios, there is 54% probability for the stock to be both overfished and experiencing overfishing, 10% probability for the stock to be either overfished or experiencing overfishing, and 36% probability that biomass is above and fishing mortality is below the Convention objectives.

Mediterranean

In 2011, the first stock assessment for Mediterranean albacore was conducted, using data up until 2010. The methods used were adapted to the "data poor" category of this stock. The more data-demanding methods applied, such as a production model, gave unrealistic results.

Some CPUE series for Mediterranean fisheries became available (**ALB-Figure 10**). However, these series were discontinuous and highly variable, with no clear trend over the last couple of decades. Since they are mostly very short, and there is little overlap between time series, they may or may not accurately characterize biomass dynamics in Mediterranean albacore.

The results of the 2011 assessment, based on the limited information available and in simple analyses, point to a relatively stable pattern for albacore biomass in the recent past. Recent fishing mortality levels appear to have been reduced from those of the early 2000s, which were likely in excess of FMSY, and might now be at about or lower that level (**ALB-Figure 11**).

ALB-4. Outlook

North Atlantic

Using the reference points calculated by the current base case assessment model done in 2009, projections indicate that constant catches above 28,000 t will not result in stock rebuilding to Convention standards by 2020 (**ALB-Figure 12**). Since 2008 catches have been lower than 28,000 t.

South Atlantic

The projection results differ between the base case scenarios. Since there is not objective information with which to select which scenario is more plausible, the group considered the entire range of scenarios, thus characterizing the range of possible responses, for part of the stock, to the distinct catch levels projected, depending on the scenario. Projections showed that harvesting at the current TAC level (29,900 t) would further decline the stock. However, if catches continue at the level of those experienced in the last few years, there is more than 50% probability to recover the stock in 5 years, and more than a 60% probability to do so in 10 years (**ALB-Figure 13**).

Mediterranean

Due to the fact that the management advice for the Mediterranean stock was based on catch curve analysis and due to the limited quantitative information available to the SCRS, projections for this stock were not conducted. As a result, future stock status in response to management actions could not be simulated. The outlook for this stock is thus unknown.

ALB-5. Effects of current regulations

North Atlantic

In 2009, the Commission established a new TAC for 2010 and 2011 of 28,000 t [Rec. 09-05], but included several provisions that allow the catch to exceed this level.

Furthermore, a 1998 recommendation that limits fishing capacity to the average of 1993-1995, remains in force.

The Committee noted that, since 2008, the reported catches were below the recommended TACs **(ALB-Table 1)**.

South Atlantic

In 2007 the Commission established a new TAC from 2008 to 2011 of 29,900 t [Rec. 07-03]. The Committee noted that reported catches in 2009 and 2010 were well below the TAC **(ALB-Table 1)**.

Mediterranean

There are no ICCAT regulations directly aimed at managing the Mediterranean albacore stock.

ALB-6. Management recommendations

North Atlantic

In 2007, the Commission implemented [Rec. 07-02], intended to reduce the TAC to 30,200 t in 2008 and 2009 and allow the rebuilding of the northern albacore stock from the overfished condition. However, it was reiterated that the fishing opportunities provided in [Rec. 07-02] allow the potential catch to exceed the TAC (**ALB-Figure 2a**). In view of the 2009 assessment, in order to achieve the Commission management objective by 2020, a level of catch of no more than 28,000 t will be required. The Commission recommended the establishment of a Total Allowable Catch (TAC) of 28,000 t for 2010 and 2011 [Rec. 09-05].

South Atlantic

There is considerable uncertainty about the current stock status, as well as on the effect of alternative catch limits on the rebuilding probabilities of the southern stock. Results indicate that, most probably, the south Atlantic albacore stock is both overfished and experiencing overfishing. Projections showed that harvesting at the current TAC level (29,900 t) would further decline the stock. However, if catches continue at the level of those experienced in the last few years (around 20,000 t), there is more than 50% probability to recover the stock in 5 years, and more than a 60% probability to do so in 10 years. Further reductions in catches would increase the probability of recovery in those timeframes. And likewise, increases would reduce rebuilding probabilities and extend the timeframes. Catches over 24,000 t will not permit the rebuilding of the stock with at least 50% probability over the projection timeframe (**ALB-Table 2**).

Mediterranean

The available information on Mediterranean albacore stock status indicates a relatively stable pattern for albacore biomass over the recent past. Unfortunately, very little quantitative information is available to SCRS for use in conducting a robust quantitative characterization on biomass status relative to Convention Objectives. While additional data to address this issue might exist at CPC levels, our ability to provide quantitative management advice will be seriously impeded until such data become available either through recovery of historical data or institution of adequate fishery monitoring data collection programs. Recent fishing mortality levels appear to have been reduced from those of the early 2000s, which were likely in excess of F_{MSY}, and might now be at about or lower than that level. However, there is considerable uncertainty about this and for this reason, the Commission should institute management measures designed to limit increases in catch and effort directed at Mediterranean albacore.

ATLANTIC AND MEDITERRANEAN ALBACORE SUMMARY

	North Atlantic	South Atlantic	Mediterranean
Current (2010) Yield	19,649 t	18,900 t	2,123 t
Maximum Sustainable Yield	29,000 t	27,964 (23,296-98,371) t[1]	Unknown
Replacement Yield (2009)	Not estimated	Not estimated	Not estimated
SSB_{2007}/SSB_{MSY} [2]	0.62 (0.45-0.79)[2]		Not estimated
SSB_{2009}/SSB_{MSY} [1]		0.88 (0.55-1.59)[1]	
Relative Fishing Mortality			
F_{2007}/F_{MSY} [2]	1.045 (0.85-1.23) [2]		<=1 [3]
F_{2009}/F_{MSY} [1]		1.07 (0.44-1.95)[1]	
Management measures in effect	[Rec. 98-08]: Limit No. of vessels to 1993-1995 average TAC: 28,000 t [Rec. 09-05] for 2010 and 2011.	[Rec. 07-03]: Limit Catches to 29,900 t until 2011	None

[1] Reference points estimates based on 2011 assessment. Median range and 80% CI calculated for the whole range of the 8 base cases.
[2] Reference points estimates based on 2009 assessment. 95% CI around the reference points were based on estimated 2007 standard errors in the North stock.
[3] Estimated with length converted catch curve analysis, taking M as a proxy for F_{MSY}.

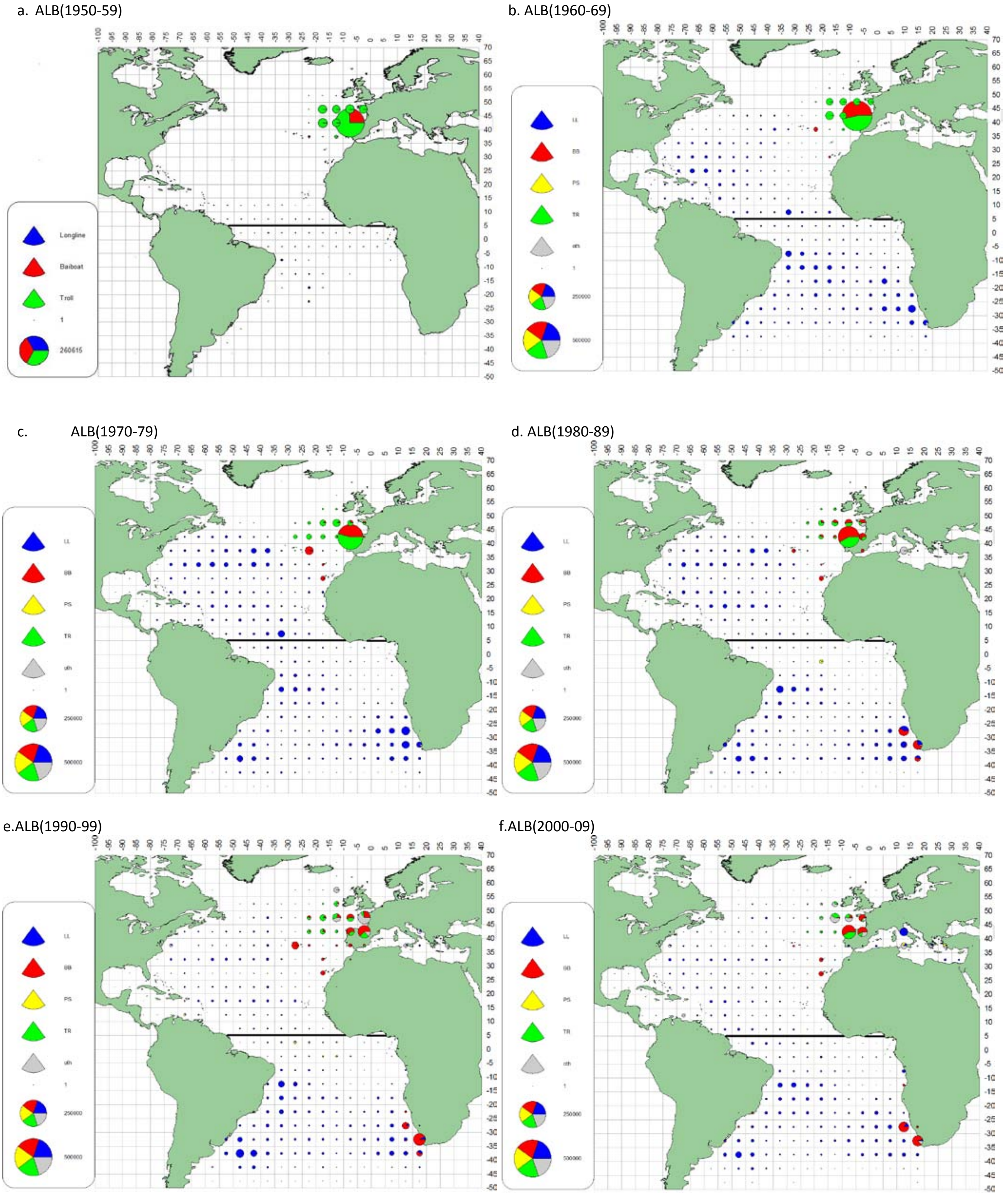
ALB-Table 1. Estimated catches (t) of albacore (Thunnus alalunga) by area, gear and flag. (v02, 2011-09-30).

		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL		88568	82778	67295	63342	67492	56344	69627	73086	71812	67517	60379	59585	59039	67058	71165	69916	60094	61539	53378	57728	67389	48827	42310	42235	40673
ATN		47568	38153	33059	32071	36882	27949	30863	38135	35163	38377	28803	29023	25746	34551	34200	26254	22741	25644	25960	35318	36989	21991	20483	15386	19649
ATS		37288	40630	30173	27212	28714	26016	36562	32813	35300	27552	28426	28022	30595	27656	31387	38796	31746	28002	22543	18881	24453	20269	18857	22828	18900
MED		3712	3996	4063	4060	1896	2379	2202	2138	1349	1587	3150	2541	2698	4851	5577	4866	5608	7893	4874	3529	5947	6566	2970	4021	2123
ATN	Bait boat	15217	18794	15933	15374	18625	8985	12448	15646	11967	16411	11338	9821	7562	8780	12148	6104	6638	7918	8128	10458	14273	8497	7932	4994	6026
	Longline	21232	7296	3013	2239	2683	5315	3152	7093	7309	4859	4641	4051	4035	6710	7321	7372	6180	7699	6917	6911	5223	3237	2647	2625	4028
	Other surf.	213	343	994	1652	3865	3999	5173	7279	7506	3555	3337	4378	6846	6817	5971	2828	422	551	697	624	625	525	274	427	325
	Purse seine	60	1	97	12	1	222	139	229	292	278	263	26	91	56	191	264	118	211	348	99	188	198	70	89	99
	Trawl	0	262	1693	2240	1033	469	2603	1779	2131	3049	2571	2877	1318	5343	3547	5374	5376	3846	2369	7001	6385	3429	4321	2811	2026
	Troll	10847	11457	11329	10554	10675	8959	7348	6109	5959	10226	6652	7870	5894	6845	5023	4312	4007	5419	7501	10224	10296	6105	5239	4440	7146
ATS	Bait boat	6829	8181	7696	7393	5981	3454	6490	7379	8947	7091	6960	8110	10353	6709	6873	10355	9712	6973	7475	5084	5876	3374	4346	9777	5271
	Longline	29815	30964	21894	19407	21590	22008	27162	23947	24806	20040	21000	19547	19799	20640	24398	28039	21671	20626	14735	12977	17740	15087	13218	12695	13392
	Other surf.	400	537	398	411	1139	137	393	39	483	10	209	127	0	73	58	377	323	82	299	288	395	1762	1219	211	122
	Purse seine	244	948	185	0	4	416	2517	1448	1064	412	257	117	434	183	58	25	39	309	16	533	441	45	75	145	114
	Trawl	0	0	0	0	0	0	0	0	0	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	
MED	Bait boat	0	0	0	0	83	499	171	231	81	163	205	0	33	96	88	77	29	0	0	0	0	0	0	0	
	Longline	324	164	168	165	624	524	442	410	350	87	391	348	194	417	2800	2597	3706	4248	2345	2012	3010	4119	2695	1580	1717
	Other surf.	3068	3782	3879	3879	1098	1198	1533	879	766	1031	2435	1991	2426	4265	2689	2193	1755	3166	2176	1200	134	1401	250	2414	406
	Purse seine	10	50	16	16	91	110	6	559	23	0	0	0	0	0	0	0	1	478	353	317	2803	1046	24	25	
	Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Troll	310	0	0	0	0	48	50	59	129	306	119	202	45	73	0	0	117	0	0	0	0	0	0	1	0
ATN	Barbados	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	2	5	8	10	13	9	7	7	4	6
	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	26	39	416
	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	**0**
	Canada	1	21	47	22	6	5	1	9	32	12	24	31	23	38	122	51	113	56	27	52	27	25	33	11	14
	Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	**0**
	China P.R.	0	0	0	0	0	0	0	0	14	8	20	0	0	21	16	57	196	155	32	112	202	59	24	27	142
	Chinese Taipei	19646	6636	2117	1294	3005	4318	2209	6300	6409	3977	3905	3330	3098	5785	5299	4399	4330	4557	4278	2540	2357	1297	1107	863	1587
	Cuba	31	15	4	1	2	0	0	0	0	0	0	0	0	0	0	0	1	322	435	424	527	0	0	0	
	Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	53
	Dominican Republic	0	0	0	0	0	0	0	0	0	0	0	323	121	73	95	0	0	0	0	0	0	0	0	0	
	EU.España	24387	28206	26738	25424	25792	17233	18175	18380	16998	20197	16324	17295	13285	15363	16000	9177	8952	12530	15379	20447	24538	14582	12725	9617	12989
	EU.France	1200	1921	2805	4050	3625	4123	6924	6293	5934	5304	4694	4618	3711	6888	5718	6006	4345	3456	2448	7266	6585	3179	3009	1122	1298
	EU.Ireland	0	0	0	0	40	60	451	1946	2534	918	874	1913	3750	4858	3464	2093	1100	755	175	306	521	596	1517	1997	788
	EU.Portugal	498	433	184	169	3185	709	1638	3385	974	6470	1634	395	91	324	278	1175	1953	553	513	556	119	184	614	108	202
	EU.United Kingdom	0	0	0	0	0	0	59	499	613	196	49	33	117	343	15	0	0	0	0	6	19	30	50	67	118
	FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	7	2	0	3	0	0	0
	Grenada	0	0	0	0	0	0	0	0	0	2	1	6	7	6	12	21	23	46	25	29	19	20	15	18	18
	Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	Japan	470	494	723	764	737	691	466	485	505	386	466	414	446	425	688	1126	711	680	893	1336	781	288	402	288	515
	Korea Rep.	373	18	16	53	34	1	0	8	0	2	2	1	0	0	0	0	0	0	0	59	45	12	59	82	201
	Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	81	120	178	98	96	99	130	**0**
	Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	NEI (Flag related)	0	0	0	0	0	11	19	13	10	8	11	3	8	12	0	0	0	0	0	0	0	0	0	0	
	Panama	525	44	0	0	0	0	29	60	117	73	11	5	0	0	0	0	0	0	0	0	96	298	113	51	154
	Philippines	0	0	0	0	0	0	0	0	0	0	0	0	151	4	0	0	0	0	0	9	0	8	19	54	22
	Sierra Leone	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	91	0	0	0	0	0	0	0	0	
	St. Vincent and Grenadines	0	0	0	0	0	0	0	2	0	0	0	0	0	1	704	1370	300	1555	89	802	76	263	130	135	177
	Sta. Lucia	0	0	0	0	0	0	1	1	0	1	1	0	0	0	1	3	2	10	0	2	2	2	2	0	130
	Trinidad and Tobago	0	0	0	0	4	0	247	0	0	0	0	2	1	1	2	11	9	12	12	9	12	18	32	17	17
	U.S.A.	251	301	288	243	357	479	438	509	741	545	472	577	829	315	406	322	480	444	646	488	400	532	257	189	329
	U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	1	0	2	2	2	0	0	1	1	0	0	0	0	0
	Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	414	507	235	95	20	140	185
	Venezuela	187	64	137	41	95	319	205	246	282	279	315	75	107	91	1375	349	162	424	457	175	321	375	222	398	288
ATS	Argentina	356	469	344	354	151	60	306	0	2	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	

		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	Belize	0	0	0	0	0	0	0	0	0	2	0	0	0	8	2	0	0	0	0	0	54	32	31	213	303
	Brasil	520	395	421	435	514	1113	2710	3613	1227	923	819	652	3418	1872	4411	6862	3228	2647	522	556	361	535	487	202	271
	Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	
	China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	39	89	26	30	26	112	95	100	35	25	89	97
	Chinese Taipei	27592	28790	20746	18386	21369	19883	23063	19400	22573	18351	18956	18165	16106	17377	17221	15833	17321	17351	13288	10730	12293	13146	9966	8678	10975
	Cuba	24	10	2	1	2	17	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Curaçao	0	0	0	0	0	0	0	0	0	0	0	9	192	0	2	0	0	0	0	0	0	0	0	21	4
	Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	43
	EU.España	200	807	185	0	0	280	1943	783	831	457	184	256	193	1027	288	573	836	376	81	285	367	758	933	1061	266
	EU.France	35	100	0	0	0	50	449	564	129	82	190	38	40	13	23	11	18	63	16	478	347	12	50	60	109
	EU.Portugal	1029	899	1153	557	732	81	184	483	1185	655	494	256	124	232	486	41	433	415	9	43	8	13	49	254	84
	EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	
	Honduras	0	0	0	0	0	0	29	0	0	2	0	7	1	6	0	0	0	0	0	0	0	0	0	0	
	Japan	739	357	405	450	587	654	583	467	651	389	435	424	418	601	554	341	231	322	509	312	316	238	1370	921	1007
	Korea Rep.	321	383	180	54	19	31	5	20	3	3	18	4	7	14	18	1	0	5	37	42	66	56	88	374	39
	Maroc	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	NEI (ETRO)	0	0	0	0	4	8	122	68	55	63	41	5	27	0	0	10	14	53	0	15	46	15	0	0	
	NEI (Flag related)	0	0	0	0	0	149	262	146	123	102	169	47	42	38	0	0	0	0	0	0	0	0	0	0	
	Namibia	0	0	0	0	0	0	0	0	1111	950	982	1199	1429	1162	2418	3419	2962	3152	3328	2344	5100	1196	1958	4936	1320
	Panama	280	924	0	0	0	240	482	318	458	228	380	53	60	14	0	0	0	0	0	17	0	87	5	0	1
	Philippines	0	0	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	52	0	13	79	45	73
	Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	South Africa	5930	7275	6636	6890	5280	3410	6360	6881	6931	5214	5634	6708	8412	5101	3610	7236	6507	3469	4502	3198	3735	3797	3468	5043	4147
	St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2116	4292	44	0	0	0	65	160	71	51	31
	U.S.A.	0	0	0	0	0	0	0	0	0	0	1	5	1	1	1	2	8	2	1	0	0	0	0	0	0
	U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	UK.Sta Helena	0	2	1	1	1	5	28	38	5	82	47	18	1	1	58	12	2	0	0	0	62	46	94	81	3
	Uruguay	262	178	100	83	55	34	31	28	16	49	75	56	110	90	90	135	111	108	120	32	93	34	53	685	24
	Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	684	1400	96	131	64	104
MED	Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	EU.Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	12	30	255	425	507	712	209	223	206
	EU.España	0	3	3	0	84	548	227	298	218	475	429	380	126	284	152	200	209	1	138	189	382	516	238	204	277
	EU.France	20	60	31	31	121	140	11	64	23	3	0	5	5	0	0	0	1	0	0	0	0	2	1	0	0
	EU.Greece	484	500	500	500	500	500	500	1	1	0	952	741	1152	2005	1786	1840	1352	950	773	623	402	448	191	116	125
	EU.Italy	3208	3433	3529	3529	1191	1191	1464	1275	1107	1109	1769	1414	1414	2561	3630	2826	4032	6912	3671	2248	4584	4017	2104	2724	1109
	EU.Malta	0	0	0	0	0	0	0	0	0	0	0	1	1	1	4	0	2	0	10	15	0	1	5	1	2
	EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
	Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	**0**
	NEI (MED)	0	0	0	0	0	0	0	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Syria Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	14	0	
	Turkey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	30	73	852	208	631	402
	Yugoslavia Fed.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

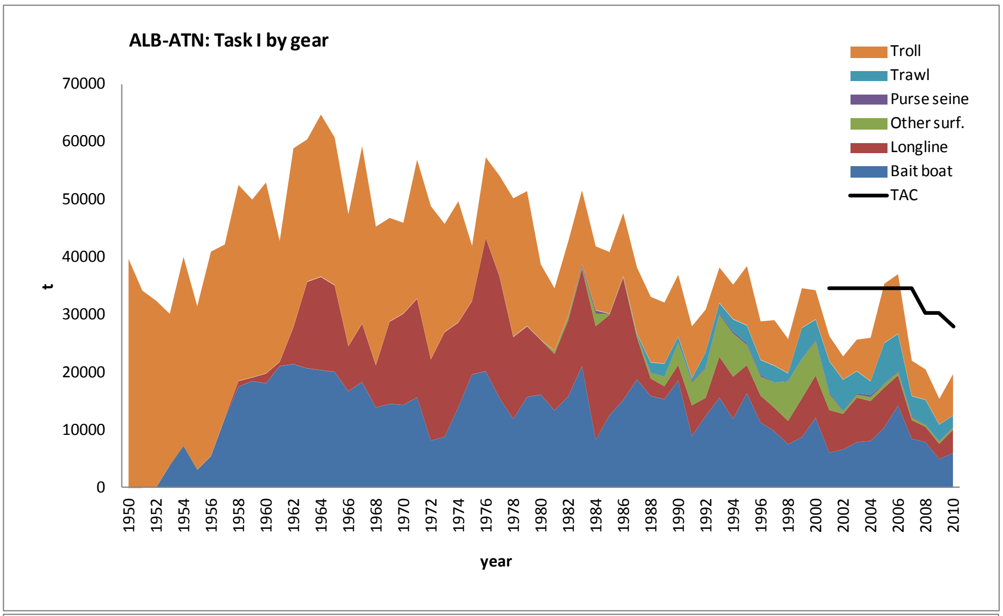
ALB-Table 2. South Atlantic albacore estimated probabilities (in%) that the South Atlantic albacore stock is above B_{MSY} and below F_{MSY} in a specific year for various TAC levels, based on the results of the 2011 assessment.

	TAC				
Year	15000	20000	25000	30000	35000
2010	37	37	37	37	37
2011	38	38	38	38	38
2012	42	41	38	27	17
2013	49	45	39	25	16
2014	55	48	40	24	15
2015	60	51	41	23	14
2016	64	54	41	22	14
2017	68	56	42	21	13
2018	70	58	42	20	13
2019	72	60	42	19	12
2020	74	62	43	19	12
2021	76	63	43	18	12
2022	77	64	43	18	12
2023	78	65	43	17	11

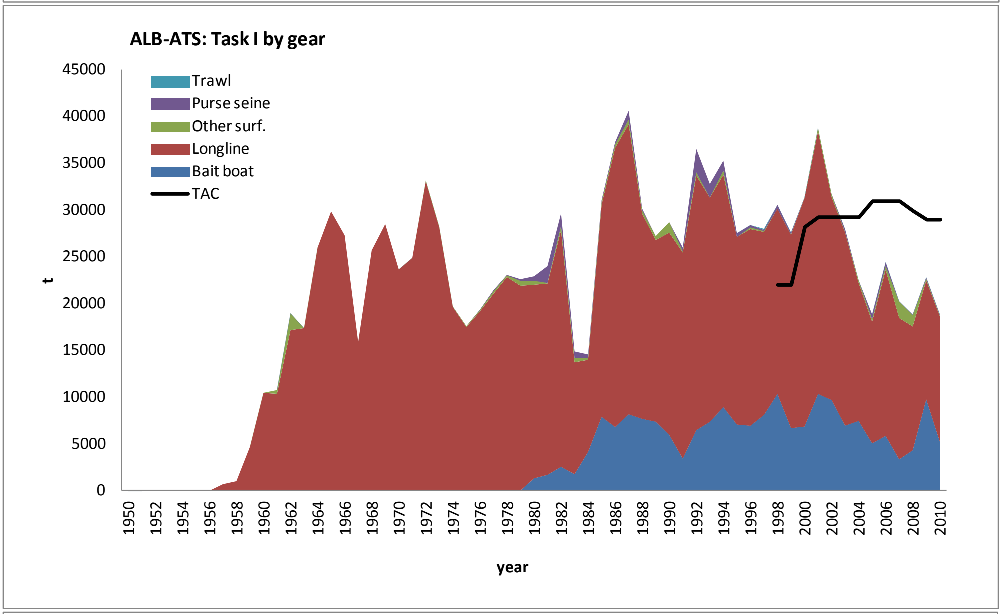


ALB-Figure 1. Geographic distribution of albacore accumulated catch by major gears and decade (1960-2009). Baitboat and troll catches are aggregated by 5ºx5º degrees in the Bay of Biscay thus the spatial representation of catch is concentrated on this area. (See Figures 2a,b and c for total catch values by gear). The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

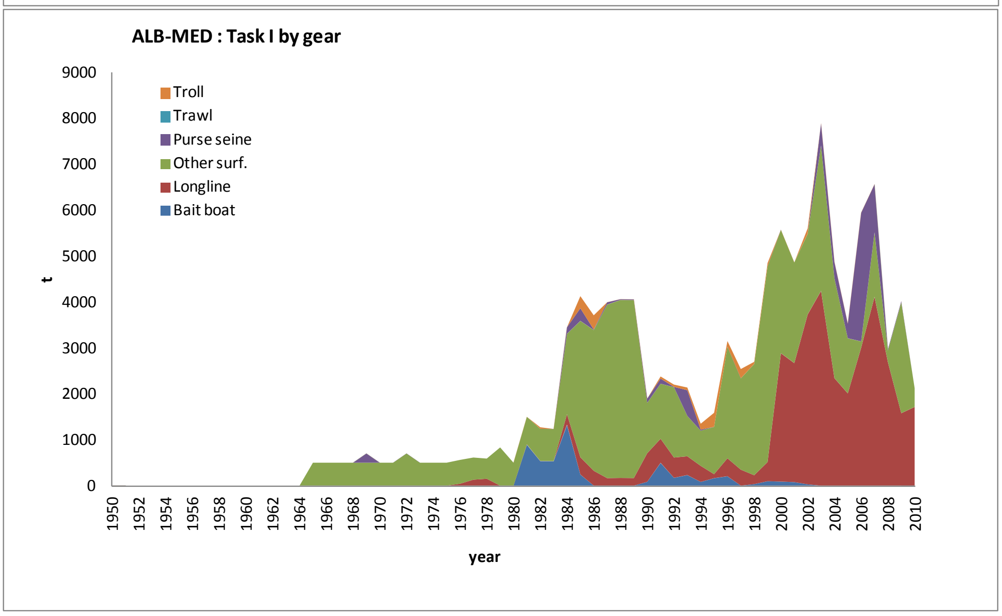
a)



b)

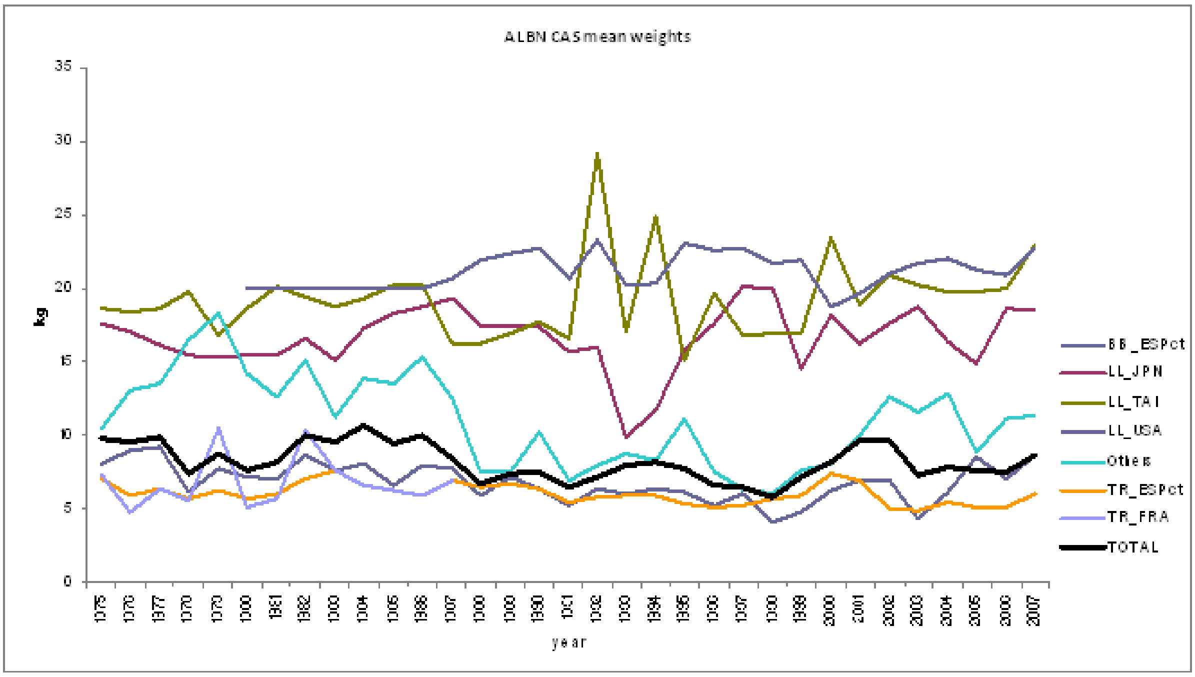


c)

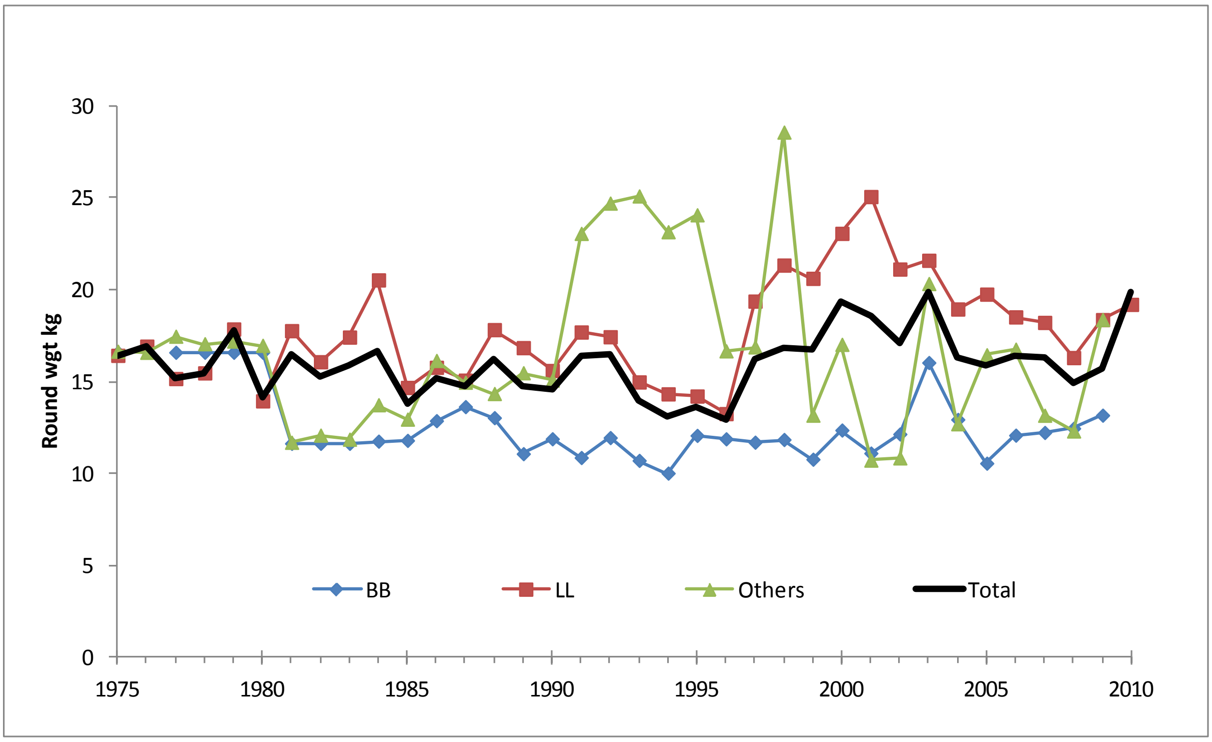


ALB-Figure 2a, b, c. Total albacore catches reported to ICCAT (Task I) by gear for the northern, southern Atlantic stocks including TAC, and the Mediterranean stock.

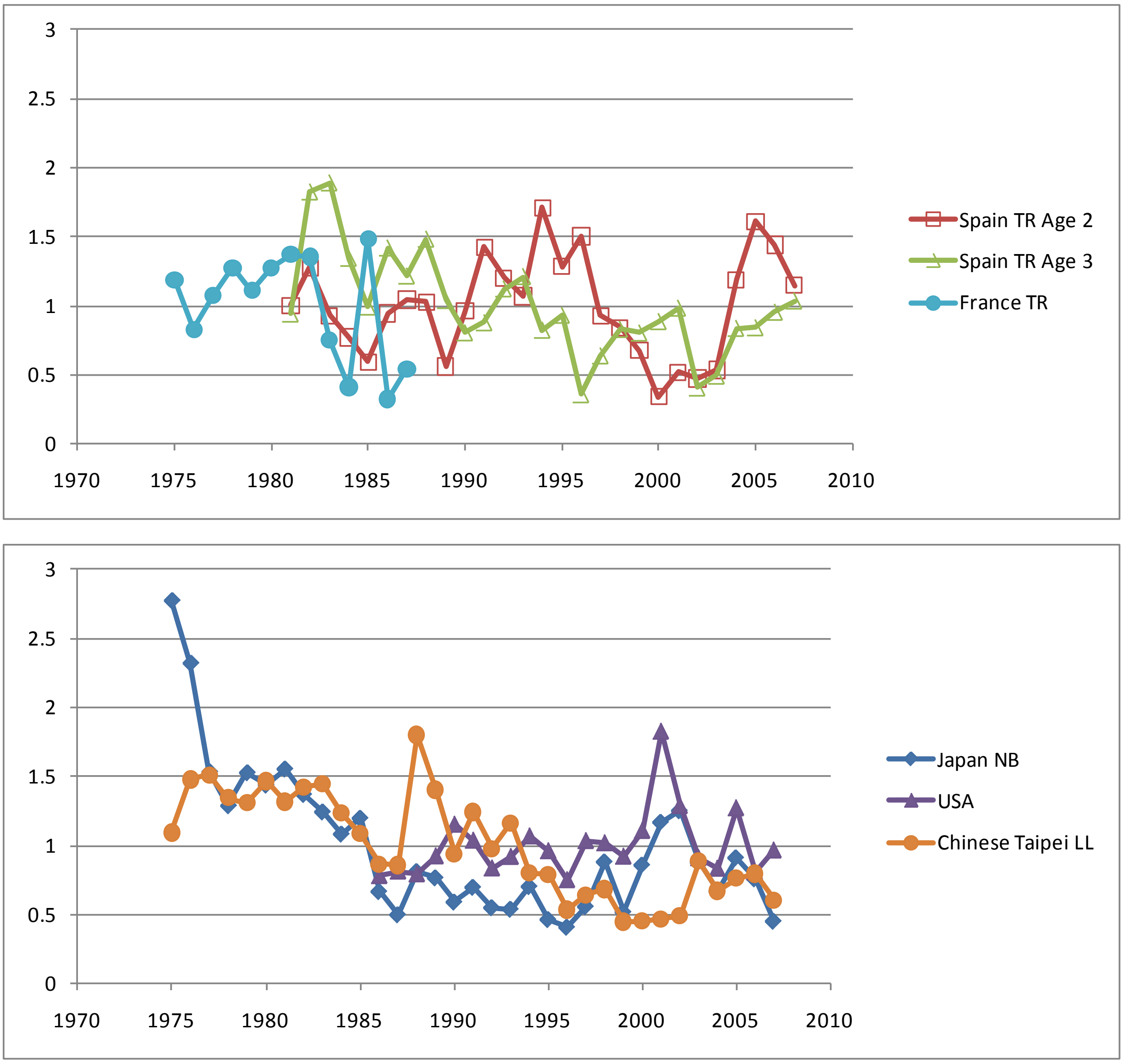
a)



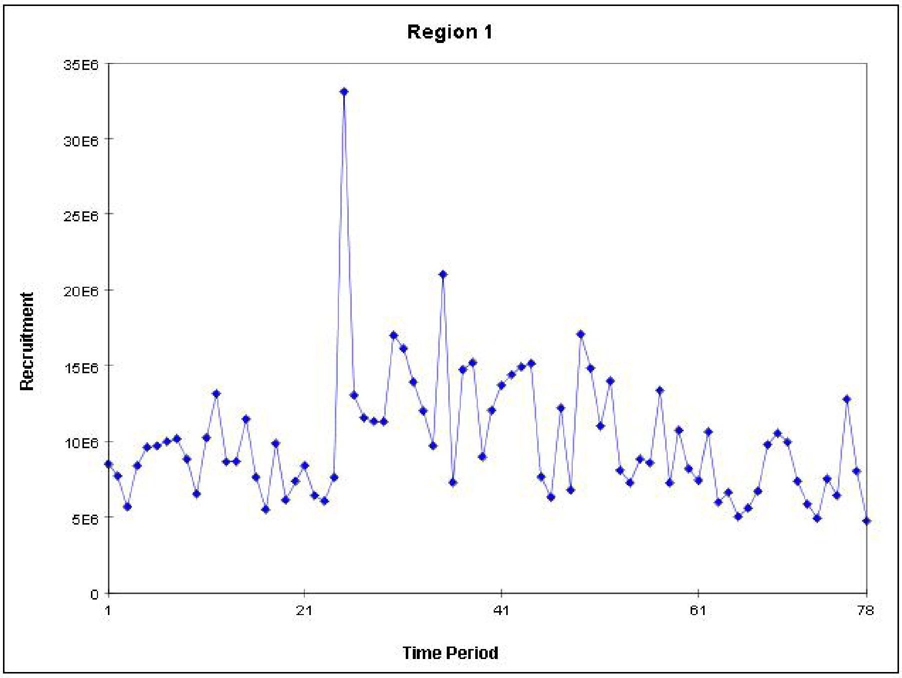
b)

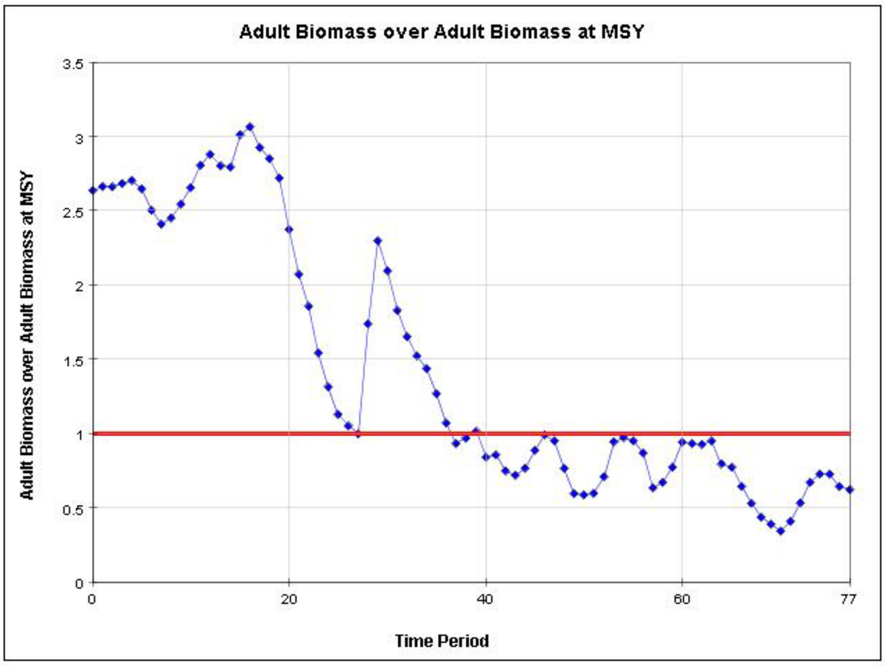


ALB-Figure 3a, b. North Atlantic and South Atlantic albacore. Mean weight trend by surface and longline fisheries in North Atlantic (a) and South Atlantic (b) stocks.

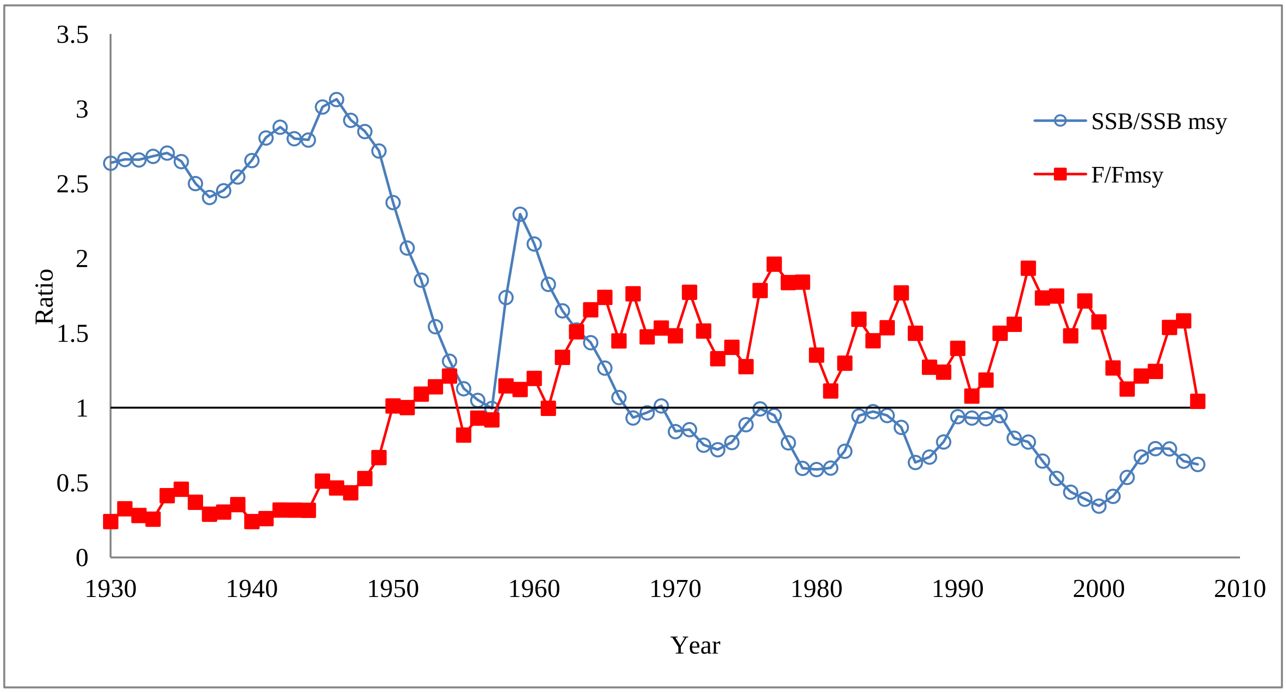


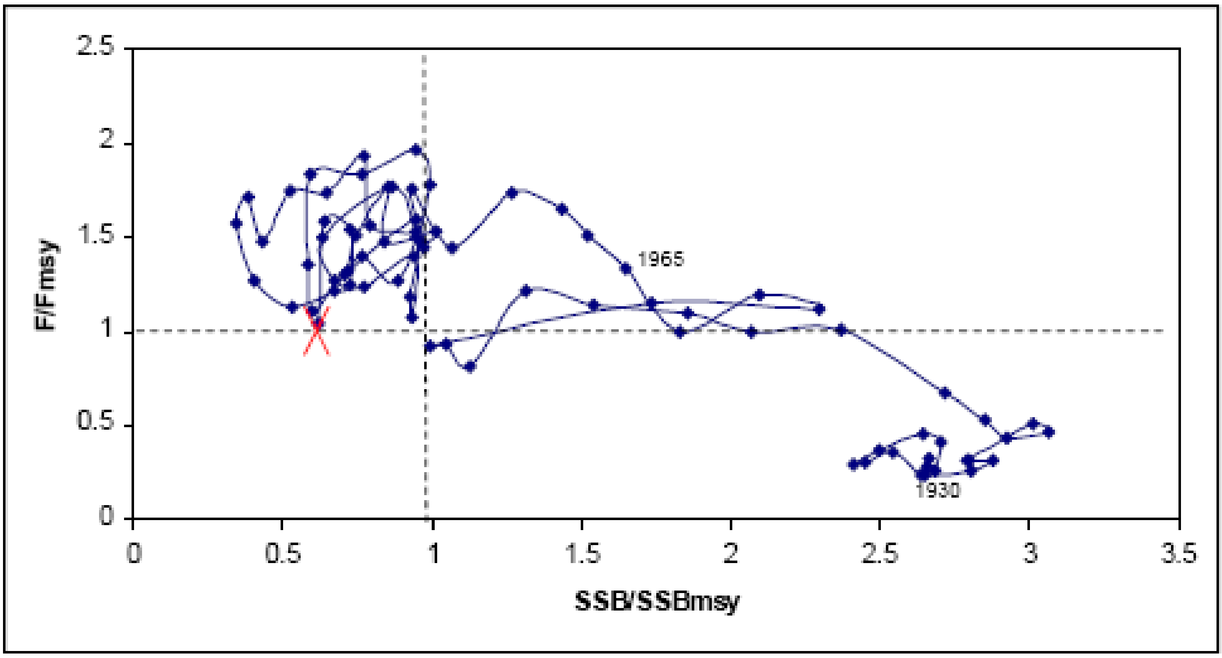
ALB-Figure 4. North Atlantic albacore. Standardized catch rate indices used in the 2009 northern albacore stock assessment from the surface fisheries (upper panel), which take mostly juvenile fish, and from the longline fisheries (lower panel), which take mostly adult fish.



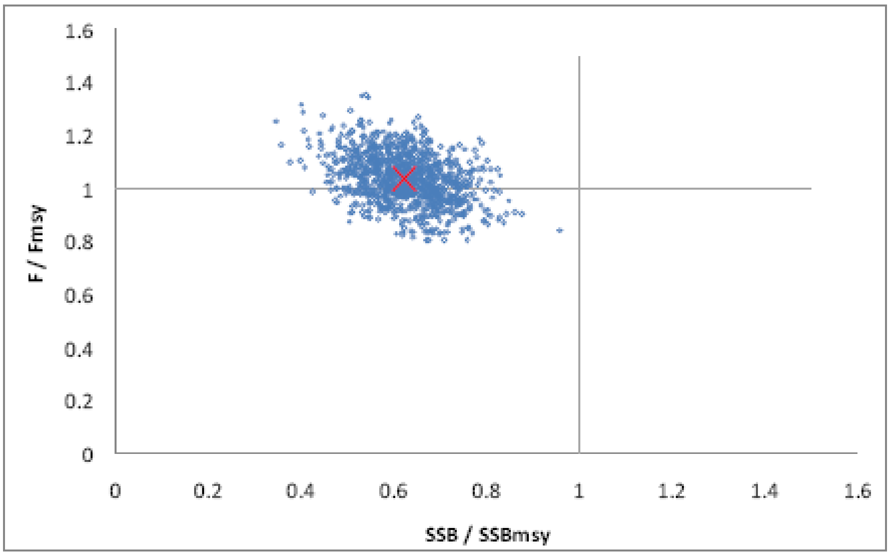


ALB-Figure 5. North Atlantic albacore. Estimates of northern Atlantic albacore recruitment (age 1) and spawning stock size from 1930-2007 from Multifan-CL model assessment. Uncertainty in the estimates has not been characterized, but the uncertainty in recent recruitment levels is considered to be higher than in the past.

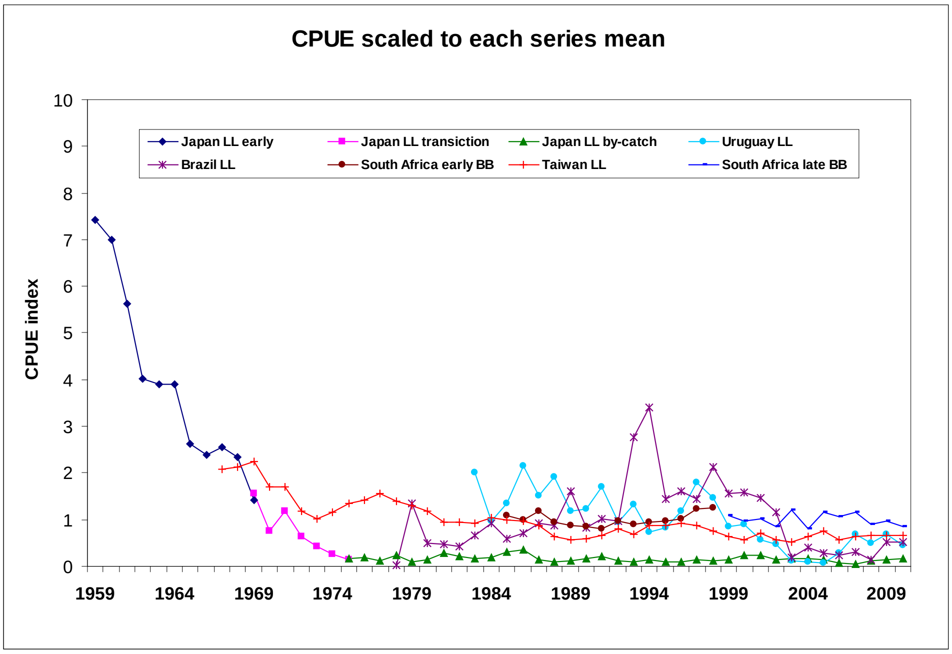




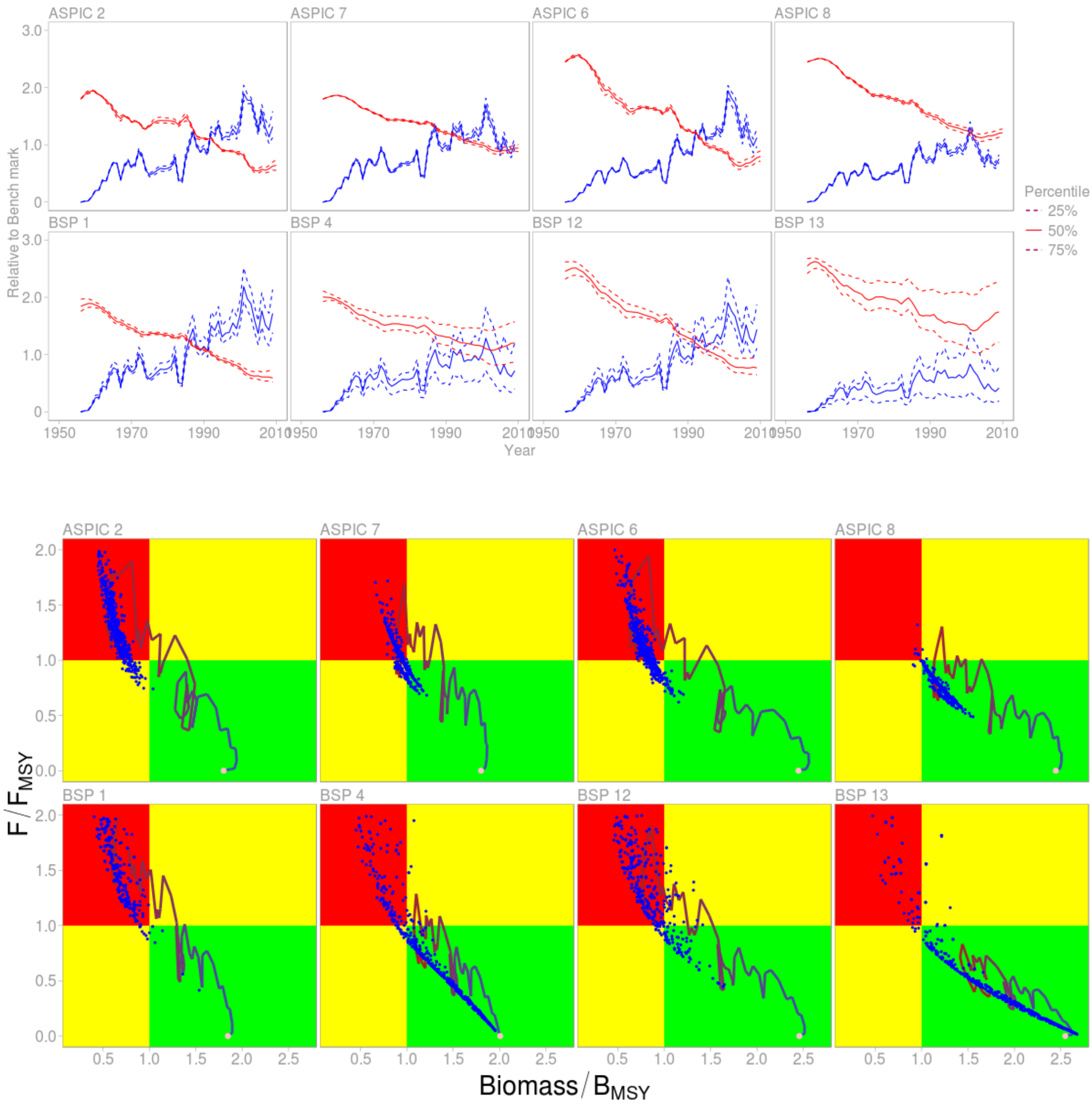
ALB-Figure 6. North Atlantic albacore. Stock status of northern albacore, estimated with Multifan-CL. Top: Relative biomass (SSB/SSB_{MSY}) and relative fishing mortality (F/F_{MSY}) trajectories over time. Bottom: joint trajectories of SSB/SSB_{MSY} and F/F_{MSY}. The red X cross in the lower panel represents the stock status in 2007.



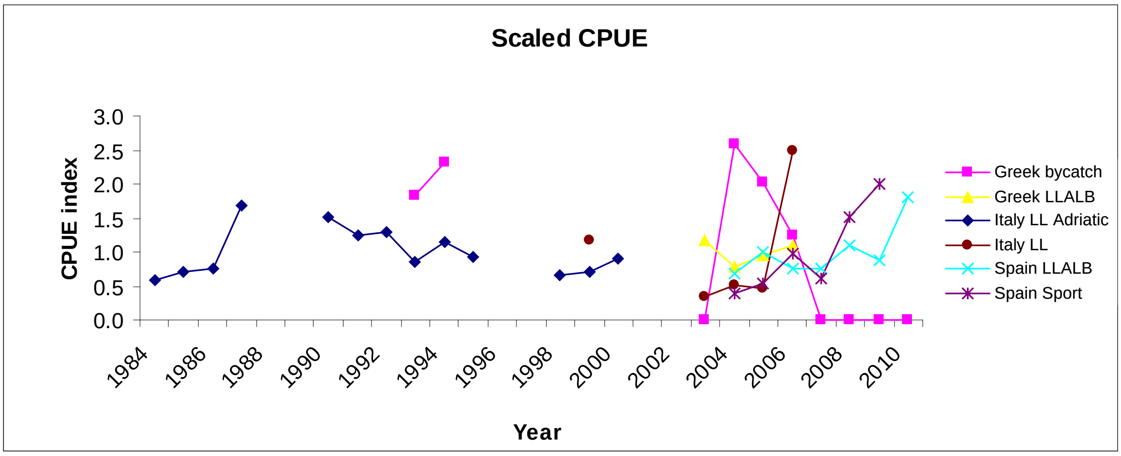
ALB-Figure 7. North Atlantic albacore. Uncertainty in current stock status for northern albacore, as estimated from the Multifan base case model. The X represents the current (2007) estimates of fishing mortality and spawning biomass ratios, and the scatter of points depicts uncertainty in that estimate.



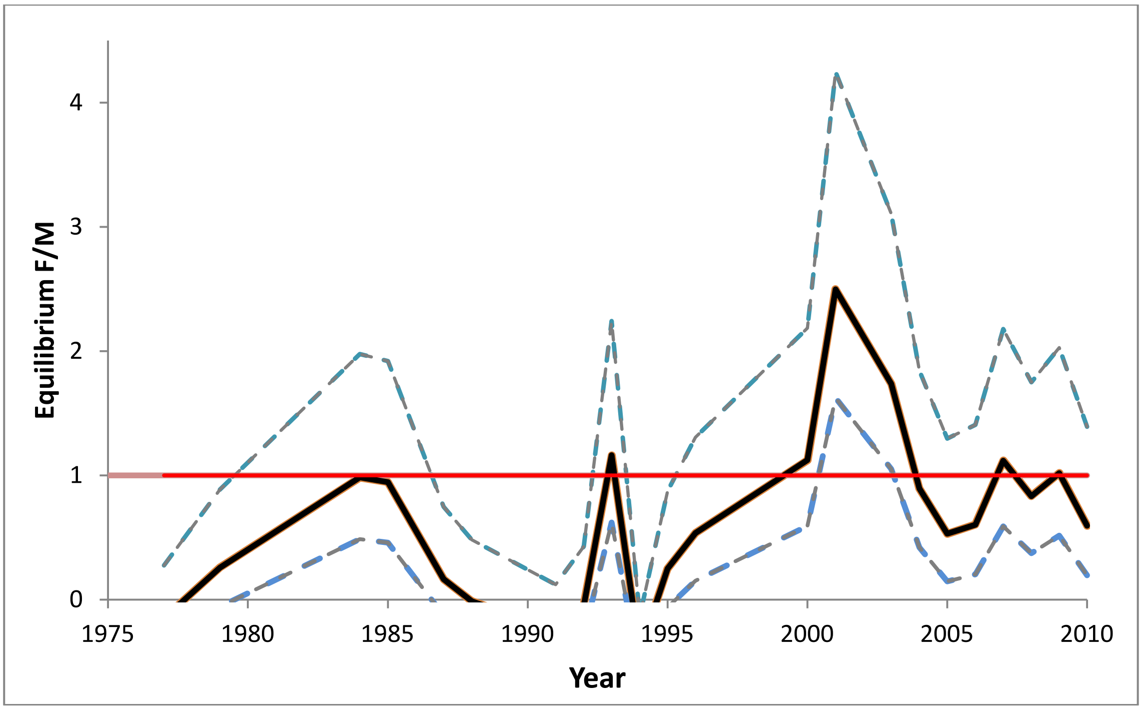
ALB-Figure 8. South Atlantic albacore. Standardized catch rates indices used in the 2011 southern albacore stock assessment from the longline fisheries, which take mostly mature fish, and from the surface fisheries (South African baitboat), which take mostly juvenile fish.



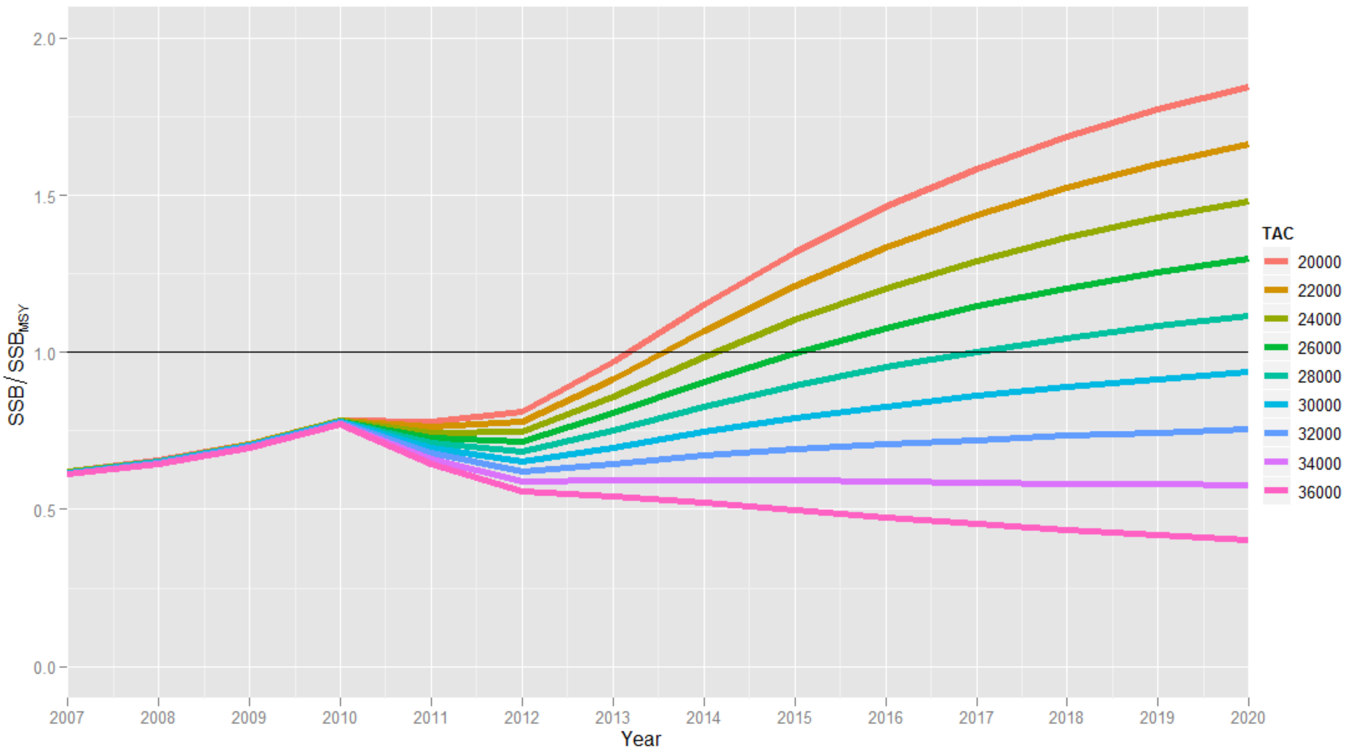
ALB-Figure 9. South Atlantic albacore. **Upper panel**: Median biomass and fishing mortality rates relative to MSY levels, with 50% credibility intervals, from the 4 base case Bayesian Surplus Production (BSP) models and the point estimate biomass and 50% credibility intervals for the 4 base case ASPIC Production models**. Lower panel**: Stock status trajectories of B/B_{MSY} and F/F_{MSY}, as well as uncertainty around the current estimate (Kobe plots) for the base case ASPIC models (Runs 2, 6, 7 and 8) alongside those from the base case BSP runs (1, 4, 12 and 13).



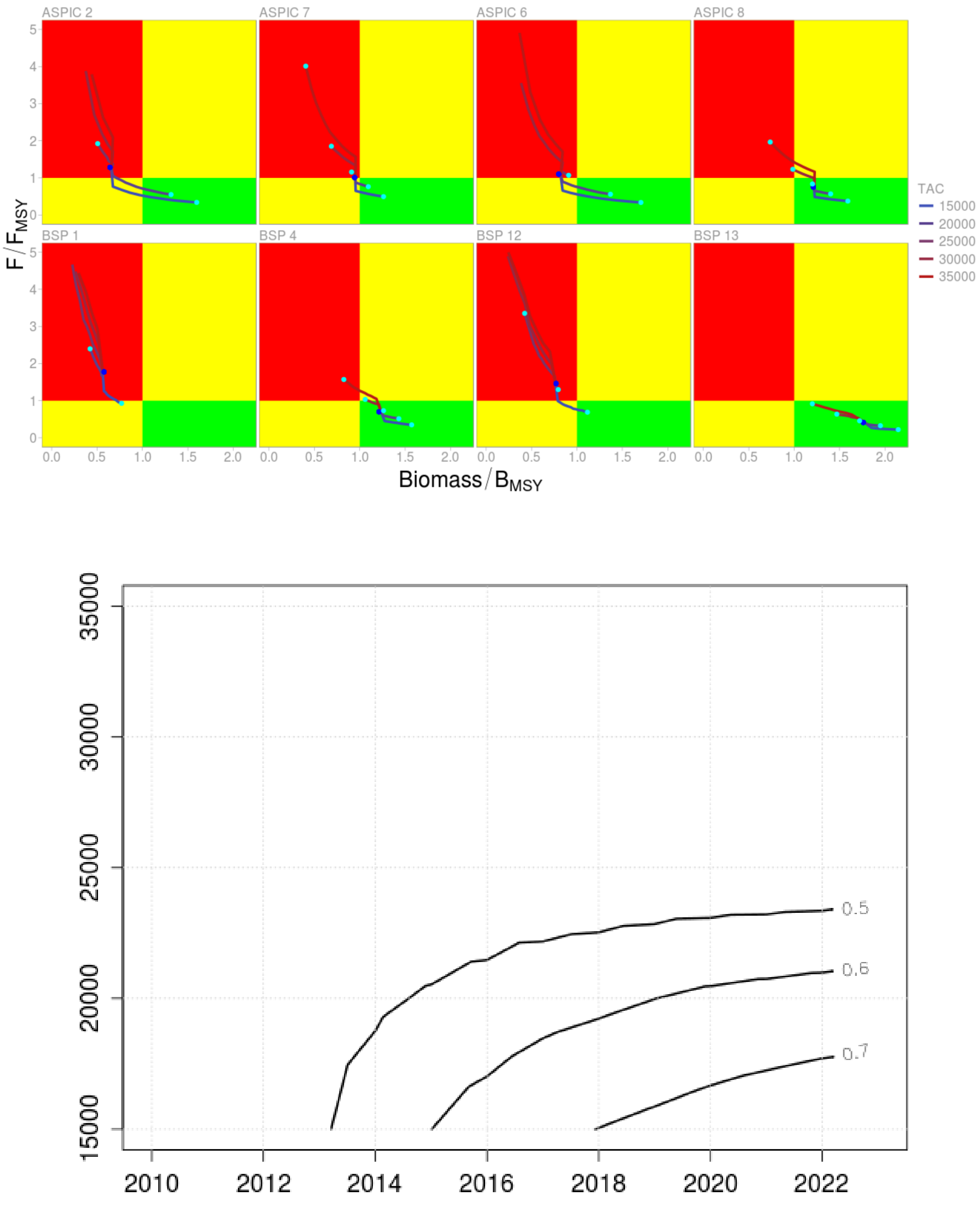
ALB-Figure 10. Mediterranean albacore. Set of standardized and nominal CPUEs used in the assessment of the Mediterranean albacore stock. The "Greek by-catch" indicates the probability of albacore by-catch in the swordfish fishery, practically null in some years. This series is the only one that is not included in the base case Bayesian production model.



ALB-Figure 11. Mediterranean albacore. Estimates of equilibrium fishing mortality rate relative to M (as a proxy for $F_{MSY)}$ based on length-converted catch curve analysis. The central solid line represents an M assumption of 0.3 with patterns resulting from an assumed M of 0.4 (lower dashed) and 0.2 (upper dashed) also depicted.



ALB-Figure 12. North Atlantic albacore. Estimated projections of relative SSB (SSB/SSB_{MSY}) for different scenarios of constant catch (20,000-36,000 t) assuming average recent year-class strengths for the North Atlantic albacore stock. Projections assumed a catch of 30,200 t in 2008 and 2009.



ALB-Figure 13. South Atlantic albacore. **Upper panel:** "Kobe plots" by Run for TAC projections; lines are the median stock trajectories. Quadrants are defined for the stock biomass and fishing mortality relative to B_{MSY} and F_{MSY}; i.e. red if SSB<B_{MSY} and F>F_{MSY}, green if SSB≥B_{MSY} and F≤$F_{MSY,}$ and yellow otherwise. **Lower panel:** Kobe strategy matrix (K2SM) advice plot. Contours correspond to the probability of being in the Kobe quadrant corresponding to SSB≥B_{MSY} and F≤F_{MSY} by year for each of the TAC levels, integrated over all runs with equal probability.

8.5 BFT – ATLANTIC BLUEFIN TUNA

The SCRS conducted a comprehensive assessment of bluefin tuna in the Atlantic and the Mediterranean in 2010. In the assessment, the available data included catch, effort and size statistics through 2009. As previously discussed, there are considerable data limitations for the eastern stock up to 2007. While data reporting for the eastern and Mediterranean fisheries have substantially improved since 2008 and some historical statistical data have been recovered, nonetheless, most of the data limitations that have plagued previous assessments remain and will require new approaches in order to improve the scientific advice the Committee can offer.

The Atlantic-wide Research Programme on Bluefin Tuna (GBYP) research plan outlined the research necessary for improving the scientific advice that the Committee provides to the Commission. This plan was presented to and approved by the Commission and the GBYP was started in 2010. The Committee continues to strongly and unanimously support the GBYP, and welcomes the Commission's continued commitment to the Program. In the absence of such a significant and sustained effort, it remains highly unlikely that the Committee will improve its scientific diagnosis and management advice in the foreseeable future.

In 2011, the SCRS updated the fisheries statistics and some CPUE indices up to 2010 and reviewed new information on the biology, spatial dynamics and various approaches to survey the catch. The SCRS also discussed progress done by the GBYP and the BFT US research program about the aerial survey, tagging, data mining, biological sampling, stock mixing and new modeling approaches. These new documents are summarized in SCRS/2011/203.

BFT-1. Biology

Atlantic bluefin tuna (BFT) mainly live in the pelagic ecosystem of the entire North Atlantic and its adjacent seas, primarily the Mediterranean Sea. Bluefin tuna has a wide geographical distribution living mostly in temperate Atlantic waters and adjacent seas (**BFT-Figure 1**). Archival tagging and tracking information confirmed that bluefin tuna can sustain cold as well as warm temperatures while maintaining stable internal body temperature. Until recently, it was assumed that bluefin tuna preferentially occupy the surface and subsurface waters of the coastal and open-sea areas, but archival tagging and ultrasonic telemetry data indicate that bluefin tuna frequently dive to depths of 500m to 1,000m. Bluefin tuna is also a highly migratory species that seems to display a homing behavior and spawning site fidelity in both the Mediterranean Sea and Gulf of Mexico, which constitute the two main spawning areas being clearly identified today. Less is known about feeding migrations within the Mediterranean and the North Atlantic, but results from electronic tagging indicated that bluefin tuna movement patterns vary considerably between individuals, years and areas. The appearance and disappearance of important past fisheries further suggest that important changes in the spatial dynamics of bluefin tuna may also have resulted from interactions between biological factors, environmental variations and fishing. Although the Atlantic bluefin tuna population is managed as two stocks, conventionally separated by the 45°W meridian, its population structure remains poorly understood and needs to be further investigated. Recent genetic and microchemistry studies as well as work based on historical fisheries tend to indicate that the bluefin tuna population structure is complex.

Currently, bluefin tuna is assumed to mature at approximately 25 kg (age 4) in the Mediterranean and at approximately 145 kg (age 9) in the Gulf of Mexico. Juvenile and adult bluefin tuna are opportunistic feeders (as are most predators). However, in general, juveniles feed on crustaceans, fish and cephalopods, while adults primarily feed on fish such as herring, anchovy, sand lance, sardine, sprat, bluefish and mackerel. Juvenile growth is rapid for a teleost fish (about 30cm/year), but slower than other tuna and billfish species. Fish born in June attain a length of about 30-40 cm long and a weight of about 1 kg by October. After one year, fish reach about 4 kg and 60cm long. Growth in length tends to be lower for adults than juveniles, but growth in weight increases. At 10 years old, a bluefin tuna is about 200 cm and 170 kg and reaches about 270 cm and 400 kg at 20 years. Bluefin tuna is a long lived species, with a lifespan of about 40 years, as indicated by recent studies from radiocarbon deposition.

The information on natal origin derived from otolith microchemistry received by the SCRS indicated that there is, based on samples covering a limited number of years, a greater contribution of eastern origin fish to the western fisheries with decreasing average size of the fish in the catch (i.e. up to 62% for fish in the 69-119 cm size class). In contrast, other western fisheries supported by the largest size classes had minimal or no eastern component in the catch. However, there remains considerable uncertainty and therefore additional samples are needed to improve our understanding of the relative contribution of the two stocks to the different fisheries over time --an issue that can hardly be resolved without better understanding of Atlantic bluefin tuna population structure.

The SCRS had extensive discussions concerning the choice of maturity schedules for both the eastern and western stocks. Uncertainty in age at maturity remained a significant issue for the stock assessment, and obliged the Group to consider alternative scenarios during their modeling work. Improving current understanding of the maturity schedules for bluefin tuna should be a priority area for research within the GBYP and other collaborative research programs with the SCRS.

The SCRS implemented a new growth curve for western stock that was derived from advanced analytical techniques. The adoption of the new growth curve that is nearly identical to that for the eastern stock has resulted in significant changes to some of the benchmark for the western stock and consequently management advice. For the eastern Atlantic and Mediterranean stock, new information indicated that for farming operations, when applying the weight gain rates adopted by SCRS in 2009, the back calculated fish weights at initial capture seemed to show unrealistic size distributions, in that more fish of a smaller size are calculated as having been caught than would be expected given existing controls. In 2011, the SCRS had extensive discussion about the growth curve for the eastern stock and concluded that the considerable amount of new information on hard parts from national programs and the GBYP will help in reducing uncertainties in catch-at-age matrix in the near future.

The SCRS also received several contributions related to electronic tagging within the Eastern Atlantic and Mediterranean stock. While most of the new studies are reporting work in progress, the new information appears to indicate a greater level of complexity in the migratory patterns of the eastern fish than was previously understood, as a significant fraction of the eastern fish (juveniles and spawners) seem to stay within the Mediterranean all year long.

BLUEFIN TUNA – EAST

BFTE-2. Fishery trends and indicators – East Atlantic and Mediterranean

It is very well known that introduction of fattening and farming activities into the Mediterranean in 1997 and good market conditions resulted in rapid changes in the Mediterranean fisheries for bluefin tuna mainly due to increasing purse seine catches. In the last few years, nearly all of the declared Mediterranean bluefin fishery production was exported overseas. Declared catches in the East Atlantic and Mediterranean reached a peak of over 50,000 t in 1996 and, then decreased substantially, stabilizing around TAC levels established by ICCAT for the most recent period **(BFT-Table 1** and **BFTE-Figure 1)**. Both the increase and the subsequent decrease in declared production occurred mainly for the Mediterranean **(BFTE-Figure 1)**. For 2006-2010, declared catch was, at the time of the meeting, 30,689 t, 34,516 t, 23,849 t, 19,701 t and 11,294 t for the East Atlantic and Mediterranean, of which 23,154 t, 26,479 t, 16,205 t, 13,016 t and 6,949 t were declared for the Mediterranean for those same years **(BFT-Table 1)**.

Information available has demonstrated that catches of bluefin tuna from the East Atlantic and Mediterranean were seriously under-reported between the mid-1990s through 2007. The Committee views this lack of compliance with TAC and underreporting of the catch as having undermined conservation of the stock. The Committee has estimated that realized catches during this period could have been on the order of 50,000 t to 61,000 t per year based on the number of vessels operating in the Mediterranean Sea and their respective catch rates. Estimates for 2008 and 2009 using updated vessel capacity and performance statistics from the various reports submitted to ICCAT under [Rec. 08-05] results in estimates that are significantly lower than the corresponding reported Task I data (see Report of the Bluefin Tuna Data Preparatory Meeting). Although care is needed considering estimates of catch using these capacity measures, the Committee's interpretation is that a substantial decrease in the catch occurred in the eastern Atlantic and Mediterranean Sea in 2008 and 2009. Declared catches in 2010 were significantly below the 2010 TAC of 13500 t. However, some CPCs did not report their 2010 catch. To complete this lacking information, the SCRS used the information from the BCD that were still largely incomplete at the time of the meeting.

Available indicators from small fish fisheries in the Bay of Biscay did not show any clear trend since the mid-1970s (**BFTE-Figure 2**). This result is not particularly surprising because of strong inter-annual variation in year class strength. However, aerial survey results conducted in 2009 indicated a higher abundance or higher concentration of small bluefin in the northwestern Mediterranean than found in surveys conducted in 2000-2003.

Indicators from Japanese longliners and Spanish and Moroccan traps targeting large fish (spawners) in the East Atlantic and the Mediterranean Sea displayed a recent increase after a general decline since the mid-1970s (**BFTE-Figure 2**)**.** Indicators from longliners targeting medium to large fish in the northeast Atlantic were available since 1990 and showed an increasing trend in the recent years (**BFTE Figure 2**). This index becomes more valuable since the major part of Japanese catch come from this fishing ground in recent years**,** while the activities of longliners in the East Atlantic (south of 40N) and Mediterranean Sea were reduced**.** The preliminary updates of the CPUE indices and aerial surveys until 2010 confirm these positive trends in recent years.Two historical indicators before 1980 in the Bay of Biscay were also available. The SCRS recognized that the recent compliance to the regulatory measures affect significantly the CPUE values (e.g. Spanish baitboat and Japanese longline indices) through the change of operational pattern and target sizes. Recent tendency in indicators are likely to reflect positive outcomes from recent management measures. However, the Committee found it difficult to derive any clear conclusion from fisheries indicators over such a short period after the implementation of new regulations and in the absence of more precise information about the catch composition, effort and spatial distribution of the purse seine fisheries. Fisheries-independent indicators (scientific surveys) and a large scale tagging program are needed to provide more reliable stock status indicators. The Committee reaffirmed the importance of pursuing these research elements under the now-funded GBYP.

BFTE-3. State of the stock

In spite of improvements in the data quantity and quality for the past few years, there remain considerable data limitations for the 2010 assessment of the stock. These included poor temporal and spatial coverage for detailed size and catch-effort statistics for many fisheries, especially in the Mediterranean. Substantial under-reporting of total catches was also evident, especially during the years 1998-2007. Nevertheless, the Committee assessed the stock in 2010 as requested by the Commission mainly applying the methodologies and hypotheses adopted by the Committee in previous assessments and further tried alternative approaches. The Committee believes that while substantial improvements can be made for in catch and effort statistics into the future, it appears unlikely that such substantial improvements can be made regarding historical fishery performance. Because of this, the Committee believes that assessment methodologies applied in the past must be modified to better accommodate the substantial uncertainties in the historical total catch, catch-at-age and effort data from the main fleets harvesting bluefin. This process has been initiated, but will require at least 3 years to complete in terms of robustness testing of the methodologies envisioned. The Commission should take this into account in establishing management controls. Furthermore, any change in exploitation or management will take several years to have a detectable effect on the biomass because bluefin tuna is a long lived species and our ability to quantify recent management impacts on stock status are limited due to variability in stock status indicators in the most recent years.

The assessment results upon which the Committee's main advice is provided indicated that the spawning stock biomass (SSB) had been mostly declining since the 1970s. The recent SSB tendency has shown signs of increase/stabilization in some runs while it continues to decline for others, depending on the models specifications and data used (see Bluefin Tuna Detailed Report, **BFTE-Figure 3)**. Trend in fishing mortality (F) displayed a continuous increase over the time period for the younger ages (ages 2-5) while for oldest fish (ages 10+) it had been decreasing during the first 2 decades and then rapidly increased during the 1990s. Fishing mortalities have declined on the oldest fish in recent years, but these for younger (ages 2-5) are more uncertain and display higher variability (**BFTE-Figure 3**). General trends in F or N were not strongly affected by the historical catches assumptions (i.e. reported *versus* inflated), except in recent years. These analyses indicated that recent (2007-2009) SSB is about 57% of the highest estimated SSB levels (1957-1959). Recent recruitment levels remain very uncertain due to the lack of information about incoming year class strength and high variability in the indicators used to track recruitment and the low recent catches of fish less than the minimum size. The absolute values estimated for F and SSB remained sensitive to the assumptions of the analysis and could lead to a different perception in the whole trend in SSB. However, it is noteworthy that the historical Fs for older fish were consistent between different types of models which made use of different assumptions. For the period 1995-2007, Fs for older fish are also consistent with a shift in targeting towards larger individuals destined for fattening and/or farming.

Estimates of current stock status relative to MSY benchmarks are uncertain, but lead to the conclusion that although the recent Fs have probably declined, these values remain too high and recent SSB too low to be consistent with the Convention objectives. Depending on different assumed levels of resource productivity current F show signs of decline reflecting recent catch reductions, but remained larger than that which would result in MSY and SSB remained most likely to be about 35% (from 19% to 51% depending on the recruitment levels) than the level needed to support MSY **(BFTE-Figure 4)**.

BFTE- 4. Outlook

During the last decade, there has been an overall shift in targeting towards large bluefin tuna, mostly in the Mediterranean. As the majority of these fish are destined for fattening and/or farming operations, it is crucial to get precise information about the total catch, the size composition, the area and flag of capture. Progress has been made over the last years, but current information that consists in individual weight after fattening remain too uncertain to be used within stock assessment models. Therefore, real size samples at time of the catch are still required. Pilot studies using dual camera systems have been presented at the SCRS in 2011 (see SCRS/2011/173 and SCRS/2011/191). The results are encouraging and the SCRS strongly encourages the CPCs to finalize these studies, so that stereoscopic camera systems became operational as soon as possible.

The shift towards larger fish should result in improved yield-per-recruit levels in the long-term if F were reduced to $F_{0.1}$. However, such changes would take several years to translate into gains in yield due to the longevity of the species. Realization of higher long-term yields would further depend on future recruitment levels.

Even considering uncertainties in the analyses, the outlook derived from the 2010 assessment has improved in comparison to previous assessments, as F for older fish seem to have significantly declined during the last two years. However, estimates in the last years are known to be more uncertain and this decline (as the Fs for younger ages which remains more variable) needs to be confirmed in future analyses. Nonetheless, F_{2009} still remains largely above the reference target $F_{0.1}$ (a reference point more robust to uncertainties than F_{MAX}, as used in the past) while SSB is only about 35% of the biomass that is expected under a MSY strategy (**BFTE-Figure 4)**.

The Committee also evaluated the potential effects of [Rec. 09-06]. Acknowledging that there is insufficient scientific information to determine precisely the productivity of the stock (i.e. the steepness of the stock-recruitment relationship), the Committee agreed to perform the projections with three recruitment levels while taking into account for year-to-year variations. These levels correspond to the 'low' and 'high' scenarios as defined in the 2008 assessment plus a 'Medium' scenario that corresponds to the geometric mean of the recruitment over the 1950-2006 years. For the projections, the group investigated 24 scenarios (see Bluefin Tuna Detailed Report). The results indicated that the stock is increasing in all the cases, but the probability to achieve $SSB_{F0.1}$ (i.e. the equilibrium SSB resulting in fishing at $F_{0.1}$) by the end of 2022 depend on the scenarios (run 13 leads to slower rebuilding than run 15 while the recruitment levels affect both the speed of rebuilding and the level of depletion, see Bluefin Tuna Detailed Report). Overall, the SSB would be equal or greater than $SSB_{F0.1}$ by the end of 2022 for a catch = 0 to 13,500 t, but not when the catch is greater than 14,000 t (**BFTE-Table 1, BFTE-Figure 5**). It is finally worth noting that a $F_{0.1}$ strategy would not allow the rebuilding of the stock to $SSB_{F0.1}$ by 2022, but later on.

Projections are known to be impaired by various sources of uncertainties that have not yet been quantified. Although the situation has improved regarding recent catch, there are still uncertainties about stock status in 2009, population structure and migratory rates as well as a lack of knowledge about the level of IUU catch and key modeling parameters on bluefin tuna productivity. Acknowledging these limitations, the overall evaluation of [Rec. 09-06] indicated that the rebuilding of eastern bluefin tuna at $SSB_{F0.1}$ level with a probability of at least 60% could be achieved by 2019 with zero catch and by 2022 with catch equal to current TAC (i.e. 13,500 t). However, this 60% probability level is unlikely to be attained by the end of 2022 with a catch greater than 14,000 t. Finally, it should be noted that the incorporation of additional uncertainties into the overall analysis could change the estimates of rebuilding probability.

BFTE-5. Effect of current regulations

Catch limits have been in place for the eastern Atlantic and Mediterranean management unit since 1998. In 2002, the Commission fixed the Total Allowable Catch (TAC) for the East Atlantic and Mediterranean bluefin tuna at 32,000 t for the years 2003 to 2006 [Rec. 02-08] and at 29,500 t and 28,500 t for 2007 and 2008, respectively [Rec. 06-05]. Subsequently, [Rec. 08-05] established TACs for 2009, 2010, and 2011 at 22,000 t, 19,950 t, and 18,500 t, respectively. However, the 2010 TAC was revised to 13,500 t by [Rec. 09-06] which also established a framework to set future (2011 and beyond) TAC at levels sufficient to rebuild the stock to B_{MSY} by 2022 with at least 60% probability. The 2011 TAC was set at 12,900 t by [Rec 10.04].

The reported catches for 2003, 2004 and 2006 were about TAC levels, but those for 2005 (35,845 t) and 2007 (34,516 t) were notably higher than TAC. However, the Committee strongly believes, based on the knowledge of the fisheries and trade statistics, that substantial under-reporting was occurring and that actual catches up to 2007 were well above TAC. The SCRS estimates since the late-1990s, catches were close to the levels reported in the mid-1990s, but for 2007, the estimates were higher *i.e.* about 61,000 t in 2007 for both the East Atlantic and Mediterranean Sea. As noted, reported catch levels for 2008 (24,057 t), 2009 (20,228 t) and 2010 (11,294 t) appear to largely reflect the removals from the stock when comparing estimates of catch using vessel capacity measures, although the utility of this method has diminished for estimating catch. The reported catches for 2008, 2009 and 2010 are 10,000 t to 25,000 t lower than the 2003-2007 reported catches (**BFT-Table 1, BFTE-Figure 1**). Although care is needed considering estimates of catch using capacity measures, the Committee's interpretation is that a substantial decrease in the catch occurred in the eastern Atlantic and Mediterranean Sea through implementation of the rebuilding plan and through monitoring and enforcement controls. While current controls appear sufficient to constrain the fleet to harvests at or below TAC, the Committee remains concerned about substantial excess capacity remains which could easily harvest catch volumes well in excess of the rebuilding strategy adopted by the Commission.

Recent analyses from the reported catch-at-size and catch-at-age displayed important changes in selectivity patterns over the last three years for several fleets operating in the Mediterranean Sea or the East Atlantic. This partly results from the enforcement of minimum size regulations under Rec.[06.05] which led to much lower reported catch of younger fish and subsequently a steep increase in the annual mean-weight in the catch-at-size since 2007 (**BFTE-Figure 5**). Additionally, higher abundance or higher concentration of small bluefin tuna in the northwestern Mediterranean detected from aerial surveys could also reflect positive outcomes from increase minimum size regulation.

While several fishery indicators have shown some positive tendency in the most recent fishing seasons, the available catch effort statistics are not yet sufficient to permit the Committee to quantify the extent of impact of the recent regulations on the overall stock with precision. The Committee's view is that it will take additional years under constrained fishing before to measure it more precisely.

BFTE-6. Management Recommendations

In [Rec. 09-06] the Commission established a total allowable catch for eastern Atlantic and Mediterranean bluefin tuna at 13,500 t in 2010. Additionally, in [Rec. 09-06] the Commission required that the SCRS provide the scientific basis for the Commission to establish a three-year recovery plan for 2011-2013 with the goal of achieving B_{MSY} through 2022 with at least 60% of probability.

A Kobe II strategy matrix reflecting recovery scenarios of eastern Atlantic and Mediterranean bluefin tuna in accordance with the multiannual recovery plan is given in **BFTE-Table 1** and **BFTE-Figure 6.**

The implementation of recent regulations through [Rec. 09-06, and previous recommendations] has clearly resulted in reductions in catch and fishing mortality rates. But, since the fishery is currently adapting to these new management measures, the Committee is unable to fully understand the implications of the measures on the stock. However, the Committee notes that maintaining catches at the current TAC (13,500 t) under the current management scheme, for 2011-2013, will likely allow the stock to increase during that period and is consistent with the goal of achieving F_{MSY} and B_{MSY} through 2022 with at least 60% of probability, given the quantified uncertainties. The 2010 SCRS suggested that the commission might consider more precautionary approach considering the unquantified uncertainties. In 2010, the commission set a TAC at 12,900 t for 2011 and thereafter. Not having completed an updated assessment in 2011 and not having detected any evidence of collapse, the SCRS has no basis to change the 2010 management advice.

EAST ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA SUMMARY	
Current (2010) Yield	Reported: 11,294 t
Short-term sustainable yield according to Rec.[09-06]	13,500 t or less
Long-term potential yield[1]	about 50,000 t
$SSB_{2009}/SSB_{F0.1}$[2] (SSB_{2009}/SSB_{FMAX})[3]	
Medium recruitment scenario (1950-2006)	0.35 (0.62)
Low recruitment scenario (1970s)	0.51 (0.88)
High recruitment scenario (1990s)	0.19 (0.33)
$F_{2009}/F_{0.1}$[4]	
Reported and inflated catches	2.9 (1.53)
TAC (2009 - 2011)	19,950 t - 13,500 t – 12, 900 t

[1] Approximated as the average of long-term yield at $F_{0.1}$ that was calculated over a broad range of scenarios including contrasting recruitment levels and different selectivity patterns (estimates from these scenarios ranged between 29,000 t and 91,000 t).

[2] The Committee decided, on the basis of current published literature, to adopt $F_{0.1}$ as the proxy for F_{MSY} instead of F_{MAX}. $F_{0.1}$ has been indeed shown to be more robust to uncertainty about the true dynamics of the stock and observation errors than $F_{MAX.}$

[3] References to F_{MAX} are given for the same ratios in parentheses for comparison purposes.

[4] The recruitment levels do not impact $F_{2009}/F_{0.1}$.

BLUEFIN TUNA - WEST

BFTW-2. Fishery indicators

The total catch for the West Atlantic peaked at 18,671 t in 1964, mostly due to the Japanese longline fishery for large fish off Brazil and the U.S. purse seine fishery for juvenile fish **(BFT-Table 1, BFTW-Figure1)**. Catches dropped sharply thereafter with the collapse of the bluefin tuna by-catch longline fishery off Brazil in 1967 and decline in purse seine catches, but increased again to average over 5,000 t in the 1970s due to the expansion of the Japanese longline fleet into the northwest Atlantic and Gulf of Mexico and an increase in purse seine effort targeting larger fish for the sashimi market. The total catch for the West Atlantic including discards has generally been relatively stable since 1982 due to the imposition of quotas. However, since a total catch level of 3,319 t in 2002 (the highest since 1981, with all three major fishing nations indicating higher catches), total catch in the West Atlantic declined steadily to a low of 1,638 t in 2007 and then increased in 2008 and 2009 to 2,000 t and 1,980 t, respectively. The catch in 2010 was 1,830 t **(BFTW-Figure 1).** The decline through 2007 was primarily due to considerable reductions in catch levels for U.S. fisheries. Since 2002, the Canadian annual catches have been relatively stable at about 500-600 t (733 t in 2006); the 2006 catch was the highest recorded since 1977. The 2010 Canadian catch (including dead discards) was 530 t. Japanese catches have generally fluctuated between 300-500 t, with the exception of 2003 (57 t), which was low for regulatory reasons, and 2009 (162 t). Japanese landings for 2010 were 353 t.

The average weight of bluefin tuna taken by the combined fisheries in the West Atlantic were historically low during the 1960s and 1970s **(BFTW-Figure 2)**, for instance showing an average weight of only 33 kg during the 1965-1975 period. However, since 1980 they have been showing a quite stable trend and at a quite high average weight of 93 kg.

The overall number of Japanese vessels engaged in bluefin fishing has declined from more than 100 vessels to currently less than 10 vessels in the West Atlantic. After reaching 2,014 t in 2002 (the highest level since 1979), the catches (landings and discards) of U.S. vessels fishing in the northwest Atlantic (including the Gulf of Mexico) declined precipitously during 2003-2007. The United States did not catch its quota in 2004-2008 with catches of 1,066, 848, 615, 858 and 922 t, respectively. However, in 2009 the United States fully realized its base quota with total catches (landings including dead discards) of 1,272 t and in 2010 the U.S. catches totaled 925 t and were only slightly below the quota partly owing to a reduction in dead discards.

The indices of abundance used in last year's assessment were updated through 2010 **(BFTW-Figure 3)**. The catch rates of juvenile bluefin tuna in the U.S. rod and reel fishery fluctuate with little apparent long-term trend, but exhibit a pattern that is consistent with the strong year-class estimated for 2003 and show small increases in 2010. The catch rates of adults in the U.S. rod and reel fishery remain low, but increased in 2010 to the highest level since 2002. The catch rates of the Japanese longline fishery north of 30°N increased markedly in 2007, decreased in 2008 back to the levels observed in 2005 and 2006 and increased once again in 2009 (the index does not cover 2010 because effort shifted south of 30°N, but preliminary nominal catch rates in 2010 were similar to 2008) The catch rates from the U.S. Gulf of Mexico longline fishery showed a gradual increasing trend through 2009 (the index has not yet been updated to include 2010 as careful consideration must be given to how to account for the major reductions in effort during that year). The Gulf of Mexico larval survey continues to fluctuate around the low levels observed since the 1980s. The catch rates in the Gulf of St. Lawrence have increased rapidly since 2004 and the catch rates in 2010 were the highest in the time series. The catch rates in southwest Nova Scotia have continued to follow a slightly increasing trend since 2000, with catch rates in 2010 being amongst the highest since the early 1990s.

BFTW-3. State of the stock

The most recent assessment was conducted in 2010 and included information through 2009. The most influential change since the 2008 assessment was the use of a new growth curve that assigns fish above 120 cm to older ages than did the previous growth curve. As a result, the base model estimates lower fishing mortality rates and higher biomasses for spawners, but also less potential in terms of the maximum sustainable yield. The trends estimated during the 2010 assessment are consistent with previous analyses in that spawning stock biomass (SSB) declined steadily from 1970 to 1992 and has since fluctuated between 21% and 29% of the 1970 level (**BFTW-Figure 4**). In recent years, however, there appears to have been a gradual increase in SSB from the low of 21% in 2003 to an estimated 29% in 2009. The stock has experienced different levels of fishing mortality (F) over time, depending on the size of fish targeted by various fleets (**BFTW-Figure 4**). Fishing mortality on spawners (ages 9 and older) declined markedly after 2003.

Estimates of recruitment were very high in the early 1970s (**BFTW-Figure 4**), and additional analyses involving longer catch and index series suggest that recruitment was also high during the 1960s. Since 1977, recruitment has varied from year to year without trend with the exception of a strong year-class in 2003. The 2003 year-class is estimated to be the largest since 1974, but not quite as large as those prior to 1974. The 2003 year class is expected to begin to contribute to an increase in spawning biomass after several years. The Committee expressed concern that the year-class estimates subsequent to 2003 while less reliable, are the lowest on record.

A key factor in estimating MSY-related benchmarks is the highest level of recruitment that can be achieved in the long term. Assuming that average recruitment cannot reach the high levels from the early 1970s, recent F (2006-2008) is 70% of the MSY level and SSB_{2009} is about 10% higher than the MSY level (**BFTW-Figure 5**). Estimates of stock status are more pessimistic if a high recruitment scenario is considered (F/F_{MSY}=1.9, B/B_{MSY}=0.15).

One important factor in the recent decline of fishing mortality on large bluefin is that the TAC had not been taken during this time period until 2009, due primarily to a shortfall by the United States fisheries (until 2009). Two plausible explanations for the shortfall were put forward previously by the Committee: (1) that availability of fish to the United States fishery has been abnormally low, and/or (2) the overall size of the population in the Western Atlantic declined substantially from the level of recent years. While there is no overwhelming evidence to favor either explanation over the other, the 2010 base case assessment implicitly favors the first hypothesis (regional changes in availability) by virtue of the estimated increase in SSB. The increase indicated by the U.S. catch rate of large fish is matched by an increase in several other large fish indices (**BFTW-Figure 3**). Nevertheless, the Committee notes that there remains substantial uncertainty on this issue and more research needs to be done.

The SCRS cautions that the conclusions of the 2010 assessment do not capture the full degree of uncertainty in the assessments and projections. An important factor contributing to uncertainty is mixing between fish of eastern and western origin. Limited analyses were conducted of the two stocks with mixing in 2008, but little new information was available in 2010. Based on earlier work, the estimates of stock status can be expected to vary considerably depending on the type of data used to estimate mixing (conventional tagging or isotope signature samples) and modeling assumptions made. More research needs to be done before mixing models can be used operationally for management advice. Another important source of uncertainty is recruitment, both in terms of recent levels (which are estimated with low precision in the assessment), and potential future levels (the "low" vs. "high" recruitment hypotheses which affect management benchmarks). Improved knowledge of maturity at age will also affect the perception of changes in stock size. Finally, the lack of representative samples of otoliths requires determining the catch at age from length samples, which is imprecise for larger bluefin tuna.

BFTW-4. Outlook

A medium-term (10-year) outlook evaluation of changes in spawning stock size and yield over the remaining rebuilding period under various management options was conducted in 2010. Future recruitment was assumed to fluctuate around two alternative scenarios: (i) average levels observed for 1976-2006 (85,000 recruits, the low recruitment scenario) and (ii) levels that increase as the stock rebuilds (MSY level of 270,000 recruits, the high recruitment scenario). The Committee has no strong evidence to favor either scenario over the other and notes that both are reasonable (but not extreme) lower and upper bounds on rebuilding potential.

The outlook for bluefin tuna in the West Atlantic with the low recruitment scenario (**BFTW-Figure 6**) is more optimistic with respect to current stock status than that from the 2008 assessment (owing to the use of improved information on the growth of bluefin tuna). A total catch of 2,500 t is predicted to have at least a 50% chance of achieving the convention objectives of preventing overfishing and maintaining the stock above the MSY level. The outlook under the high recruitment scenario (**BFTW-Figure 6**) is more pessimistic than the low recruitment scenario since the rebuilding target would be higher; a total catch of less than 1,250 t is predicted to maintain F below F_{MSY}, but the stock would not be expected to rebuild by 2019 even with no fishing.

BFTW-Table 1 summarizes the estimated chance that various constant catch policies will allow rebuilding under the high and low recruitment scenarios for the base-case. The low recruitment scenario suggests the stock is above the MSY level with greater than 60% probability and catches of 2,500 t or lower will maintain it above the MSY level. If the high recruitment scenario is correct, then the western stock will not rebuild by 2019 even with no catch, although catches of 1,100 t or less are predicted to have a 60% chance to immediately end overfishing and initiate rebuilding.

The Committee reiterates that considerable uncertainties remain for the outlook of the western stock, including the effects of mixing and management measures on the eastern stock.

BFTW-5. Effects of current regulations

The Committee previously noted that Recommendations 06-06 and 08-04 were expected to result in a rebuilding of the stock towards the convention objective, but also noted that there has not yet been enough time to detect with confidence the population response to the measure. This statement is also true for Recommendation 10-03, which was implemented this year. However, the available fishery indicators **(BFTW-Figure 3)** continue to suggest the spawning biomass of western bluefin tuna may be slowly rebuilding.

BFTW-6. Management recommendations

In 1998, the Commission initiated a 20-year rebuilding plan designed to achieve B_{MSY} with at least 50% probability. In response to recent assessments, in 2008 the Commission recommended a total allowable catch (TAC) of 1,900 t in 2009, 1,800 t in 2010 [Rec. 08-04], and 1,750 t in 2011 [Rec. 10-03].

The latest (2010) assessment indicates similar historical trends in abundance as in previous assessments. The strong 2003 year class has contributed to stock productivity such that biomass has been increasing in recent years.

Future stock productivity, as with prior assessments, is based upon two hypotheses about future recruitment: a 'high recruitment scenario" in which future recruitment has the potential to achieve levels that occurred in the early 1970's and a "low recruitment scenario" in which future recruitment is expected to remain near present levels. Results in previous assessments have shown that long term implications of future biomass are different between the two hypotheses and this research question remains unresolved. However, the 2010 assessment was also based on new information on western bluefin growth rates that has modified the Committee's perception of the ages at which spawning and maturity occur. Maturity schedules remain very uncertain, and, thus, the application of the new information in the 2010 assessment accentuates the differences between the two recruitment hypotheses.

Probabilities of achieving B_{MSY} within the Commission rebuilding period were projected for alternative catch levels **(BFTW-Table 1, BFTW-Figure 7)**. The "low recruitment scenario" suggests that biomass is currently sufficient to produce MSY, whereas the "high recruitment scenario" suggests that B_{MSY} has a very low probability of being achieved within the rebuilding period. Despite this large uncertainty about the long term future productivity of the stock, under either recruitment scenario current catches (1,800 t) should allow the biomass to continue to increase. Also, catches in excess of 2,500 t will prevent the possibility of the 2003 year class elevating the productivity potential of the stock in the future.

The SCRS notes that the 2010 assessment is the first time that this strong 2003 year-class has been clearly demonstrated, likely as a result of age assignment refinements resulting from the growth curve and additional years of data; more observations from the fishery are required to confirm its relative strength. A further concern is that subsequent year-classes, although even less well estimated, are the lowest observed values in the time series. The Commission may wish to protect the 2003 year class until it reaches maturity and can contribute to spawning. Maintaining TAC at current levels (1,750 t) may offer some protection.

As noted previously by the Committee, both the productivity of western Atlantic bluefin and western Atlantic bluefin fisheries are linked to the eastern Atlantic and Mediterranean stock. Therefore, management actions taken in the eastern Atlantic and Mediterranean are likely to influence the recovery in the western Atlantic, because even small rates of mixing from East to West can have significant effects on the West due to the fact that Eastern plus Mediterranean resource is much larger than that of the West.

WEST ATLANTIC BLUEFIN TUNA SUMMARY
(Catches and Biomass in t)

Current (2010) Catch (including discards)	1,830 t
Assuming Low Potential Recruitment	
Maximum Sustainable Yield (MSY)	2,585 (2,409-2,766)[1]
Relative Spawning Stock Biomass:	
B_{2009}/B_{MSY}	1.1 (0.89-1.35)[1]
Relative Fishing Mortality[2]:	
$F_{2006-2008}/F_{MSY}$	0.73 (0.59-0.91)[1]
$F_{2006-2008}/F_{0.1}$	1.11 (0.91-1.31)[1]
$F_{2006-2008}/F_{max}$	0.57 (0.48-0.68)[1]
Assuming High Potential Recruitment	
Maximum Sustainable Yield (MSY)	6,329 (5,769-7,074)[1]
Relative Spawning Stock Biomass:	
B_{2009}/B_{MSY}	0.15 (0.10-0.22)[1]
Relative Fishing Mortality[2]:	
$F_{2006-2008}/F_{MSY}$	1.88 (1.49-2.35)[1]
$F_{2006-2008}/F_{0.1}$	1.11 (0.91-1.31)[1]
$F_{2006-2008}/F_{max}$	0.57 (0.48-0.68)[1]
Management Measures:	[Rec. 08-04] TAC of 1,900 t in 2009 and 1,800 t in 2010, including dead discards. [Rec. 10-03] TAC of 1,750 t in 2011 and 2012, including dead discards.

[1] Median and approximate 80% confidence interval from bootstrapping from the assessment.
[2] $F_{2006-2008}$ refers to the geometric mean of the estimates for 2006-2008 (a proxy for recent F levels).

BFT-Table 1. Estimated Catches (t) of bluefin tuna (Thunnus thynnus) by major Area, Gear and Flag (v03, 2011-10-03)

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			21570	20723	27016	23819	26027	29350	34131	36636	48853	49714	53320	49489	42375	35228	36541	37390	37089	33469	33505	37602	32501	36154	25849	21680	13124
	ATE+MED		19247	18220	24118	21061	23247	26429	31849	34268	46740	47291	50807	47155	39718	32456	33766	34605	33770	31163	31381	35845	30689	34516	23849	19701	11294
	ATE		4687	4456	6951	5433	6040	6556	7619	9367	6930	9650	12663	13539	11376	9628	10528	10086	10347	7362	7410	9036	7535	8037	7645	6684	4345
	MED		14560	13764	17167	15628	17207	19872	24230	24901	39810	37640	38144	33616	28342	22828	23238	24519	23424	23801	23971	26810	23154	26479	16205	13016	6949
	ATW		2322	2503	2898	2759	2780	2921	2282	2368	2113	2423	2514	2334	2657	2772	2775	2784	3319	2306	2125	1756	1811	1638	2000	1980	1830
Landings	ATE	Bait boat	1414	1821	1936	1971	1693	1445	1141	3447	1980	2601	4985	3521	2550	1492	1822	2275	2567	1371	1790	2018	1116	2032	1794	1260	725
		Longline	967	924	1169	962	1496	3197	3817	2717	2176	4392	4788	4534	4300	4020	3736	3303	2896	2750	2074	2713	2448	1706	2491	1960	1159
		Other surf.	972	668	1221	1020	562	347	834	1548	932	1047	646	511	621	498	703	712	701	560	402	1014	1047	502	187	298	143
		Purse seine	276	0	0	0	54	46	462	24	213	458	323	828	692	726	1147	150	884	490	1078	871	332	0	0	0	1
		Sport (HL+RR)	1	3	1	2	1	0	0	0	0	0	0	162	28	33	126	61	63	109	87	11	4	10	6	2	25
		Traps	1057	1040	2624	1478	2234	1522	1365	1631	1630	1152	1921	3982	3185	2859	2996	3585	3235	2082	1978	2408	2588	3788	3166	3164	2292
	MED	Bait boat	0	0	0	0	25	148	158	48	0	206	5	4	11	4	0	0	1	9	17	5	0	0	0	0	
		Longline	678	799	1227	1121	1026	2869	2599	2342	7048	8475	8171	5672	2749	2463	3317	3750	2614	2476	2564	3101	2202	2656	2254	1213	922
		Other surf.	3544	2762	2870	3289	1212	1401	1894	1607	3218	1043	1197	1037	1880	2976	1067	1096	990	2536	1106	480	301	699	1022	169	411
		Purse seine	9333	8857	11198	9450	11250	13245	17807	19297	26083	23588	26021	24178	21291	14910	16195	17174	17656	17167	18785	22475	20020	22952	12641	11345	4984
		Sport (HL+RR)	322	433	838	457	1552	738	951	1237	2257	3556	2149	2340	1336	1622	1921	1321	1647	1392	1340	634	503	78	137	146	351
		Traps	683	913	1034	1311	2142	1471	821	370	1204	772	601	385	1074	852	739	1177	515	221	159	115	129	95	152	144	281
	ATW	Longline	764	1138	1373	698	739	895	674	696	539	466	547	382	764	914	858	610	730	186	644	425	565	420	606	366	529
		Other surf.	166	156	425	755	536	578	509	406	307	384	432	293	342	281	284	202	108	140	97	89	85	63	82	121	107
		Purse seine	360	367	383	385	384	237	300	295	301	249	245	250	249	248	275	196	208	265	32	178	4	28	0	11	
		Sport (HL+RR)	518	726	601	786	1004	1083	586	854	804	1114	1029	1181	1108	1124	1120	1649	2035	1398	1139	924	1005	1023	1130	1251	1009
		Traps	0	17	14	1	2	0	1	29	79	72	90	59	68	44	16	16	28	84	32	8	3	4	23	23	39
Discards	ATW	Longline	514	99	102	119	115	128	211	88	83	138	167	155	123	160	222	105	211	232	181	131	149	100	159	207	147
		Other surf.	0	0	0	14	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Sport (HL+RR)	0	0	0	0	0	0	0	0	0	0	0	14	3	0	0	6	0	0	0	0	0	0	0	0	
Landings	ATE	Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	85	103	80	68	39	19	41	24	42	72	119	42	4
		Chinese Taipei	197	20	0	109	0	0	0	6	20	8	61	226	350	222	144	304	158	0	0	10	4	0	0	0	**0**
		EU.Denmark	0	0	1	0	0	0	0	37	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	2876	2479	4567	3565	3557	2272	2319	5078	3137	3819	6174	6201	3800	3360	3474	3633	4089	2138	2801	3102	2033	3276	2938	2409	1550
		EU.France	348	533	724	460	510	565	894	1099	336	725	563	269	613	588	542	629	755	648	561	818	1218	629	253	366	228
		EU.Germany	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	14	21	52	22	8	15	3	1	1	2	1	1	1	2
		EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	193	163	48	3	27	117	38	25	240	35	199	712	323	411	441	404	186	61	27	79	97	29	36	53	58
		EU.Sweden	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	1	0	1	1	12	0	0	0	0	0	0	0	0	0	1	
		Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	67	104	118	0	0	0	0	0	0	0	0	0	
		Guinée Conakry	0	0	0	0	0	0	0	0	330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Iceland	0	0	0	0	0	0	0	0	0	0	0	0	2	27	0	0	1	0	0	0	0	0	0	0	**0**
		Japan	739	900	1169	838	1464	2981	3350	2484	2075	3971	3341	2905	3195	2690	2895	2425	2536	2695	2015	2598	1896	1612	2351	1904	1155
		Korea Rep.	0	0	0	0	0	0	0	0	4	205	92	203	0	0	6	1	0	0	3	0	1	0	0	0	
		Libya	0	0	0	0	0	0	312	0	0	0	576	477	511	450	487	0	0	0	0	0	47	0	0	0	
		Maroc	288	356	437	451	408	531	562	415	720	678	1035	2068	2341	1591	2228	2497	2565	1797	1961	2405	2196	2418	1947	1909	1348
		NEI (ETRO)	4	0	5	6	74	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (Flag related)	0	0	0	0	0	85	144	223	68	189	71	208	66	0	0	0	0	0	0	0	0	0	0	0	
		Norway	31	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	**0**
		Panama	11	4	0	0	0	0	0	0	1	19	550	255	0	13	0	0	0	0	0	0	0	0	0	0	
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
		Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93	118	0	0	0	0	0	0	0	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MED	Algerie	566	420	677	820	782	800	1104	1097	1560	156	156	157	1947	2142	2330	2012	1710	1586	1208	1530	1038	1511	1311	0	

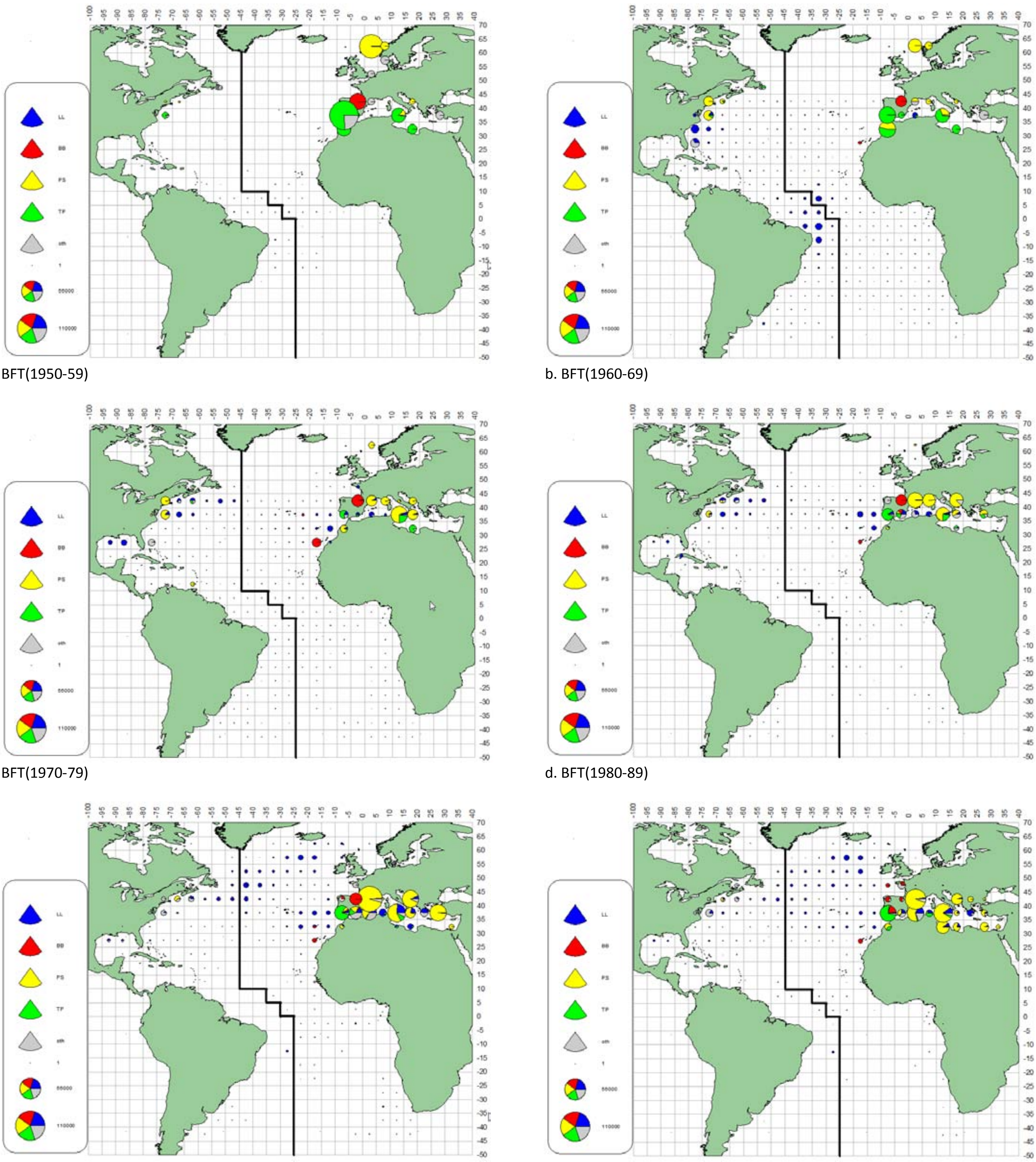
		China P.R.	0	0	0	0	0	0	0	0	97	137	93	49	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Chinese Taipei	0	0	0	0	0	0	0	328	709	494	411	278	106	27	169	329	508	445	51	267	5	0	0	0	**0**
		Croatia	0	0	0	0	0	1418	1076	1058	1410	1220	1360	1105	906	970	930	903	977	1139	828	1017	1022	825	834	619	389
		EU.Cyprus	10	10	10	10	10	10	10	14	10	10	10	10	21	31	61	85	91	79	105	149	110	1	132	2	3
		EU.España	701	1178	1428	1645	1822	1392	2165	2018	2741	4607	2588	2209	2000	2003	2772	2234	2215	2512	2353	2758	2689	2414	2465	1769	1056
		EU.France	3490	4330	5780	4434	4713	4620	7376	6995	11843	9604	9171	8235	7122	6156	6794	6167	5832	5859	6471	8638	7663	10157	2670	3087	1754
		EU.Greece	131	156	159	182	201	175	447	439	886	1004	874	1217	286	248	622	361	438	422	389	318	255	285	350	373	224
		EU.Italy	7576	4607	4201	4317	4110	3783	5005	5328	6882	7062	10006	9548	4059	3279	3845	4377	4628	4973	4686	4841	4695	4621	2234	2735	1053
		EU.Malta	41	36	24	29	81	105	80	251	572	587	399	393	407	447	376	219	240	255	264	346	263	334	296	263	136
		EU.Portugal	0	0	0	0	0	278	320	183	428	446	274	37	54	76	61	64	0	2	0	0	11	0	0	0	
		Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	**0**
		Israel	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	341	280	258	127	172	85	123	793	536	813	765	185	361	381	136	152	390	316	638	378	556	466	80	18	**0**
		Korea Rep.	0	0	0	0	0	0	0	0	684	458	591	410	66	0	0	0	0	0	700	1145	26	276	335	102	**0**
		Libya	300	300	300	84	328	370	425	635	1422	1540	812	552	820	745	1063	1941	638	752	1300	1091	1280	1358	1318	1082	645
		Maroc	56	116	140	295	1149	925	205	79	1092	1035	586	535	687	636	695	511	421	760	819	92	190	641	531	369	205
		NEI (Flag related)	0	0	0	0	0	0	0	0	427	639	171	1066	825	140	17	0	0	0	0	0	0	0	0	0	
		NEI (MED)	168	183	633	757	360	1799	1398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (combined)	0	0	0	0	0	0	0	0	773	211	0	101	1030	1995	109	571	508	610	709	0	0	0	0	0	
		Panama	0	72	67	0	74	287	484	467	1499	1498	2850	236	0	0	0	0	0	0	0	0	0	0	0	0	
		Serbia & Montenegro	0	0	0	0	0	0	0	0	0	2	4	0	0	0	4	0	0	0	0	0	0	0	0	0	
		Syria Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	41	0	34
		Tunisie	315	456	624	661	406	1366	1195	2132	2773	1897	2393	2200	1745	2352	2184	2493	2528	791	2376	3249	2545	2622	2679	1932	1042
		Turkey	69	972	1343	1707	2059	2459	2817	3084	3466	4220	4616	5093	5899	1200	1070	2100	2300	3300	1075	990	806	918	879	665	409
		Yugoslavia Fed.	796	648	1523	560	940	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	Argentina	0	2	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Brasil	0	2	0	2	1	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	**0**
		Canada	73	83	393	619	438	485	443	459	392	576	597	503	595	576	549	524	604	557	537	600	733	491	575	530	505
		Chinese Taipei	3	4	0	20	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Cuba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	11	19	27	19	0	0	0	
		EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	1	10	5	0	4	3	2	8
		Japan	584	960	1109	468	550	688	512	581	427	387	436	322	691	365	492	506	575	57	470	265	376	277	492	162	353
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	52	0	0	0	
		Mexico	0	0	0	0	0	0	0	0	4	0	19	2	8	14	29	10	12	22	9	10	14	7	7	10	14
		NEI (ETRO)	0	0	0	30	24	23	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (Flag related)	0	0	0	0	0	0	0	0	0	0	2	0	0	429	270	49	0	0	0	0	0	0	0	0	
		Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Sta. Lucia	0	1	3	2	14	14	14	2	43	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	1142	1352	1289	1483	1636	1582	1085	1237	1163	1311	1285	1334	1235	1213	1212	1583	1840	1426	899	717	468	758	764	1068	803
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	1	2	2	1	1	1	1	0	0	0	0	0	0	0	
		Uruguay	6	0	2	0	0	1	0	1	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
Discards	ATW	Canada	0	0	0	14	0	0	0	0	0	0	0	6	16	11	46	13	37	14	15	0	2	0	1	3	25
		Japan	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	514	99	102	119	115	128	211	88	83	138	171	155	110	149	176	98	174	218	167	131	147	100	158	204	122

Canada discards in 2010 (25 t) includes an estimated post-release mortality of 7.5 t from catch and release fisheries and scientific tagging.

China P.R. 2010 catches will change to 38. t (mistakenly reported as 3.8 t).

BFTE-Table 1. Probabilities of stock rebuilding at $SSB_{F0.1}$ by years and TAC levels (the probabilities combined the results obtained from the stochastic runs over the 24 scenarios being investigated). The difference in grey colour underlines the catch (TAC) at which the 60% probability would not be anymore achieved.

TAC	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	0%	0%	0%	2%	6%	14%	25%	38%	52%	69%	89%	98%	99%
2000	0%	0%	0%	1%	5%	12%	21%	33%	46%	62%	83%	97%	99%
4000	0%	0%	0%	1%	4%	9%	18%	28%	40%	55%	75%	93%	99%
6000	0%	0%	0%	1%	3%	7%	14%	23%	34%	47%	66%	86%	97%
8000	0%	0%	0%	0%	2%	6%	11%	19%	29%	40%	56%	77%	92%
10000	0%	0%	0%	0%	2%	4%	9%	15%	23%	33%	46%	65%	84%
12000	0%	0%	0%	0%	1%	3%	6%	11%	18%	26%	37%	53%	73%
13500	0%	0%	0%	0%	1%	2%	5%	9%	14%	21%	30%	45%	63%
14000	0%	0%	0%	0%	1%	2%	4%	8%	13%	20%	28%	42%	59%
16000	0%	0%	0%	0%	0%	1%	3%	6%	9%	14%	20%	31%	46%
18000	0%	0%	0%	0%	0%	1%	2%	4%	6%	10%	15%	22%	34%
20000	0%	0%	0%	0%	0%	0%	1%	2%	4%	6%	10%	15%	24%



a. BFT(1950-59)

b. BFT(1960-69)

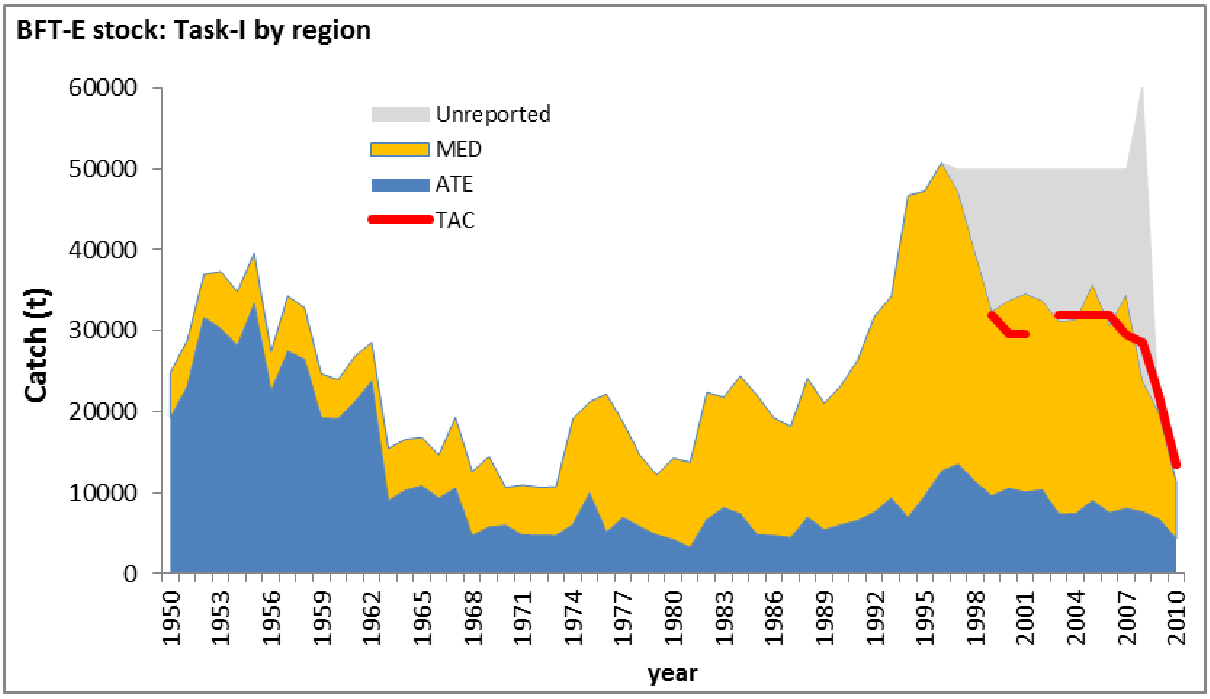
c. BFT(1970-79)

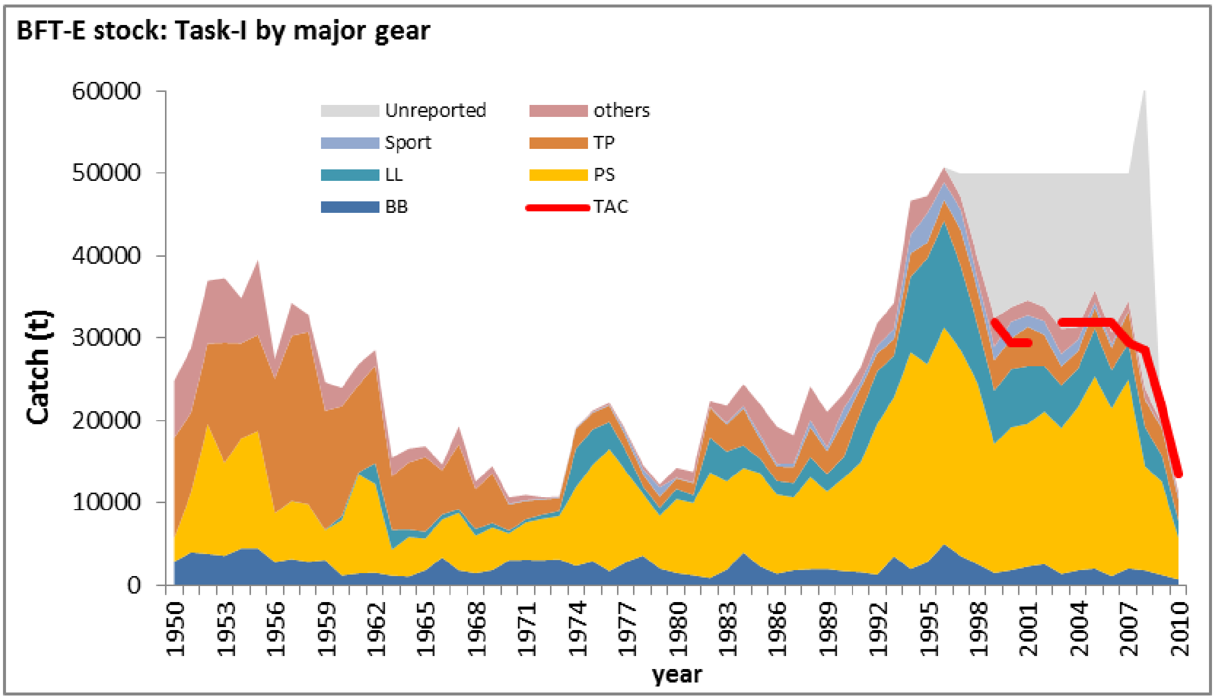
d. BFT(1980-89)

e. BFT (1990-99)

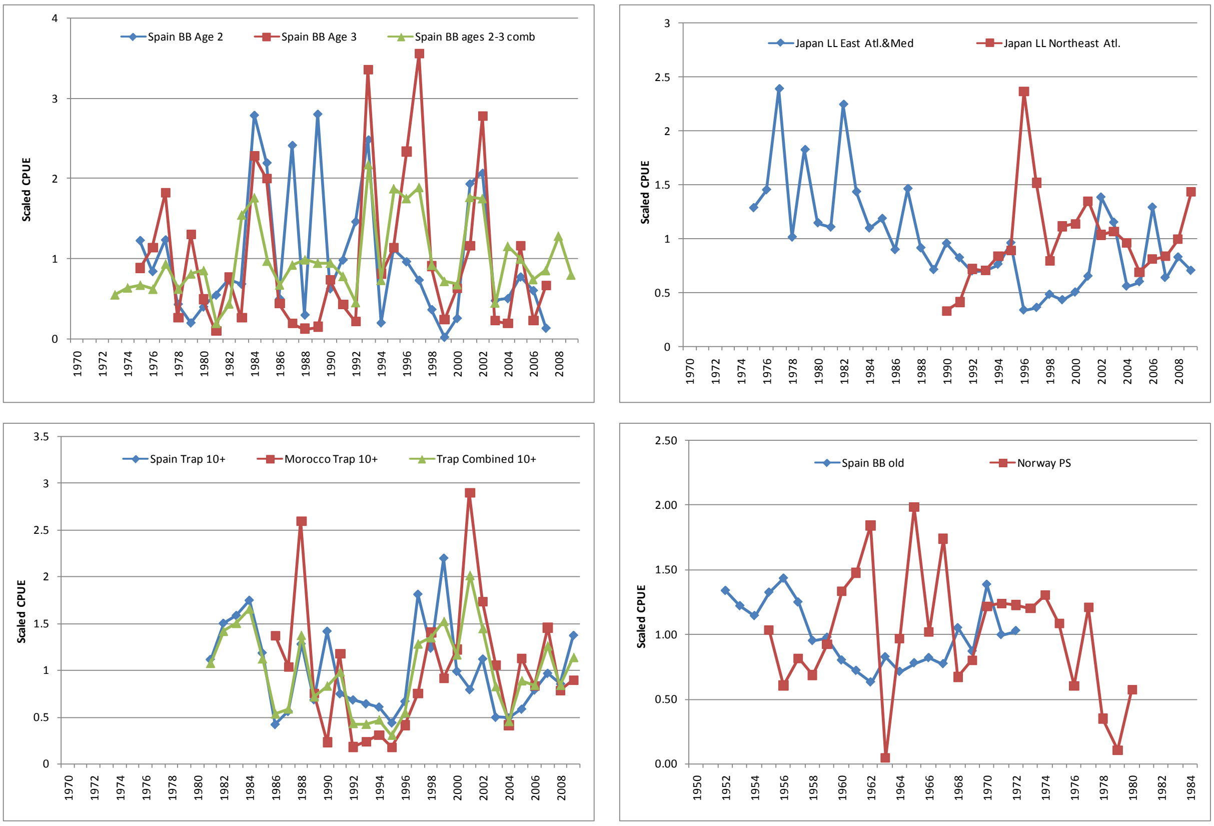
f. BFT (2000-09)

BFT-Figure 1. Geographic distribution of bluefin tuna catches per 5x5 degrees and per main gears.

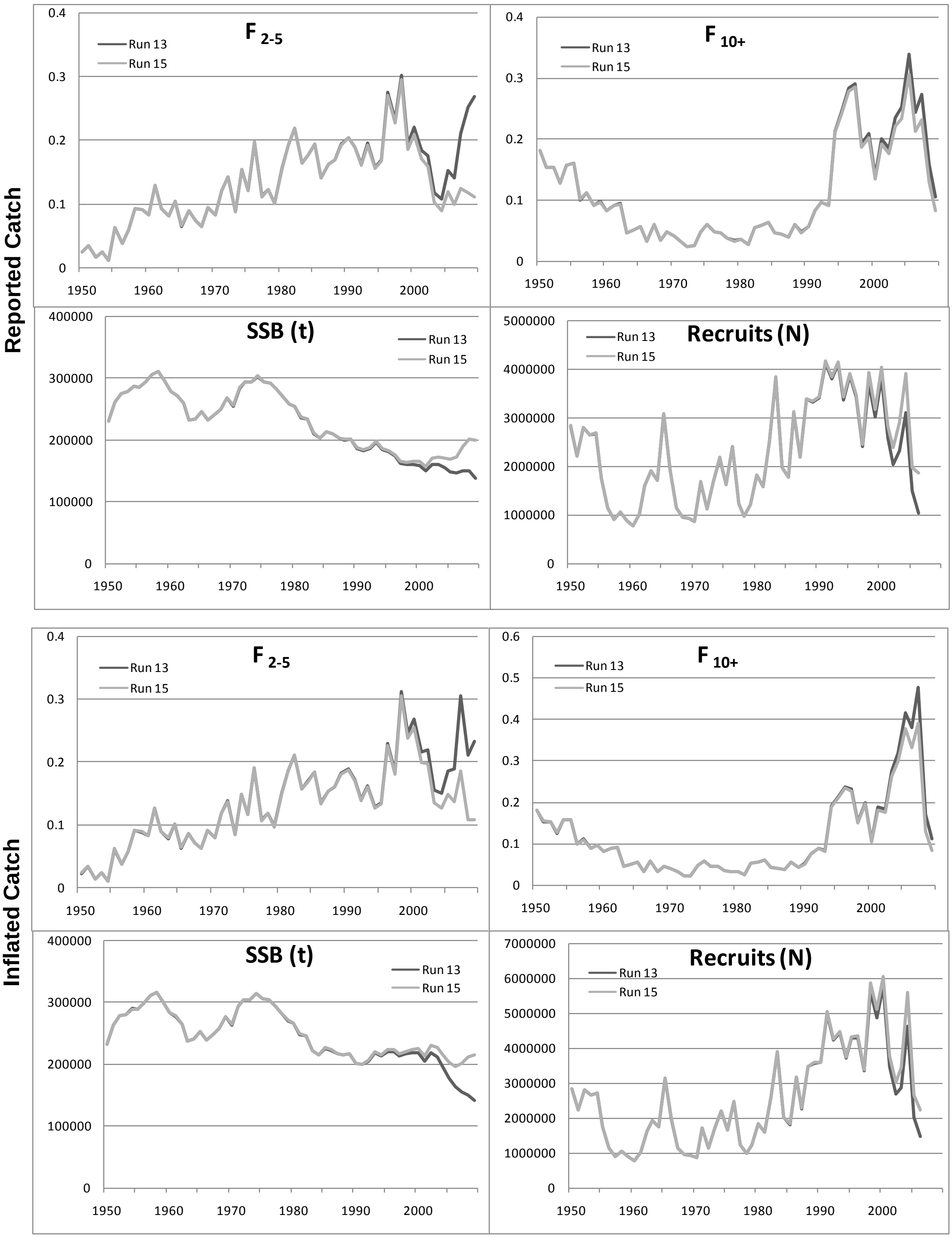




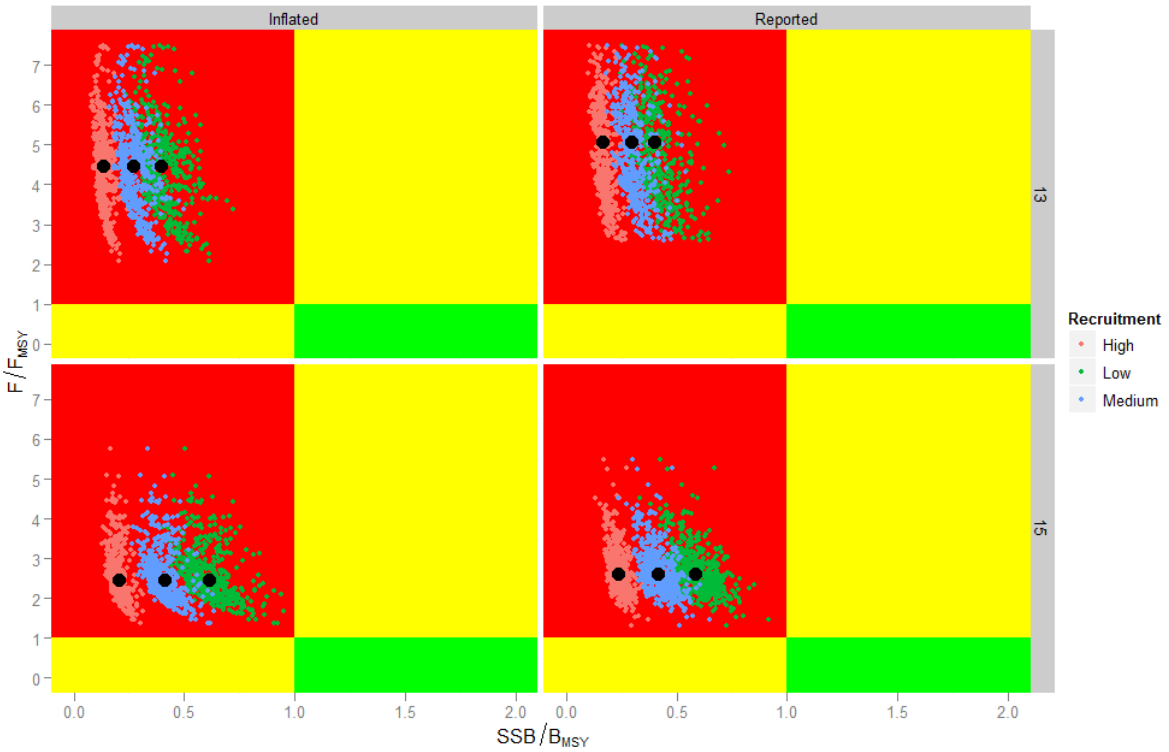
BFTE-Figure 1. Reported catch for the East Atlantic and Mediterranean from Task I data from 1950 to 2010 split by main geographic areas (top panel) and by gears (bottom panel) together with unreported catch estimated by the Committee (using from fishing capacity and mean catch rates over the last decade) and TAC levels since 1999.



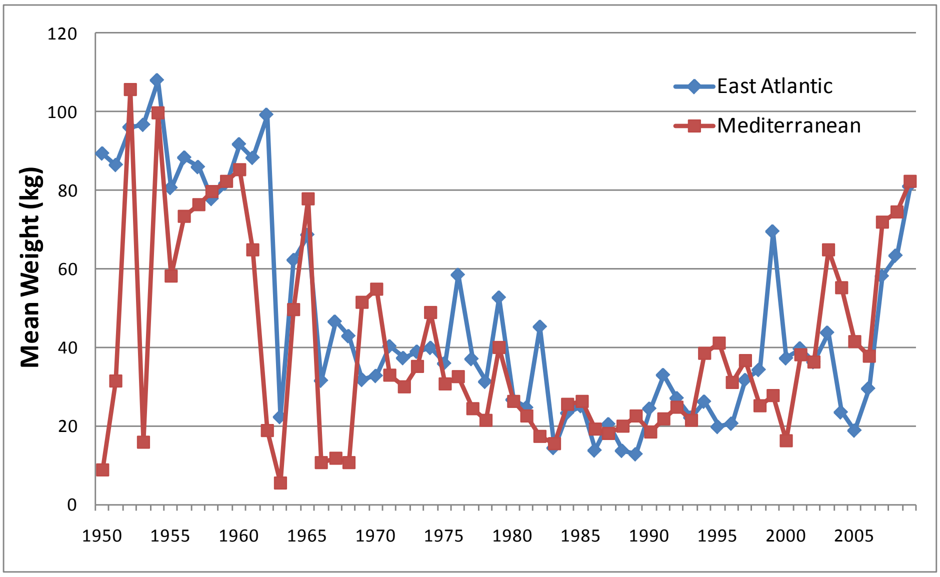
BFTE-Figure 2. Plots of the CPUE time series fishery indicators for the East Atlantic and Mediterranean bluefin tuna stock used in the 2010 stock assessment. All the CPUE series are standardized series except the nominal Norway PS index.



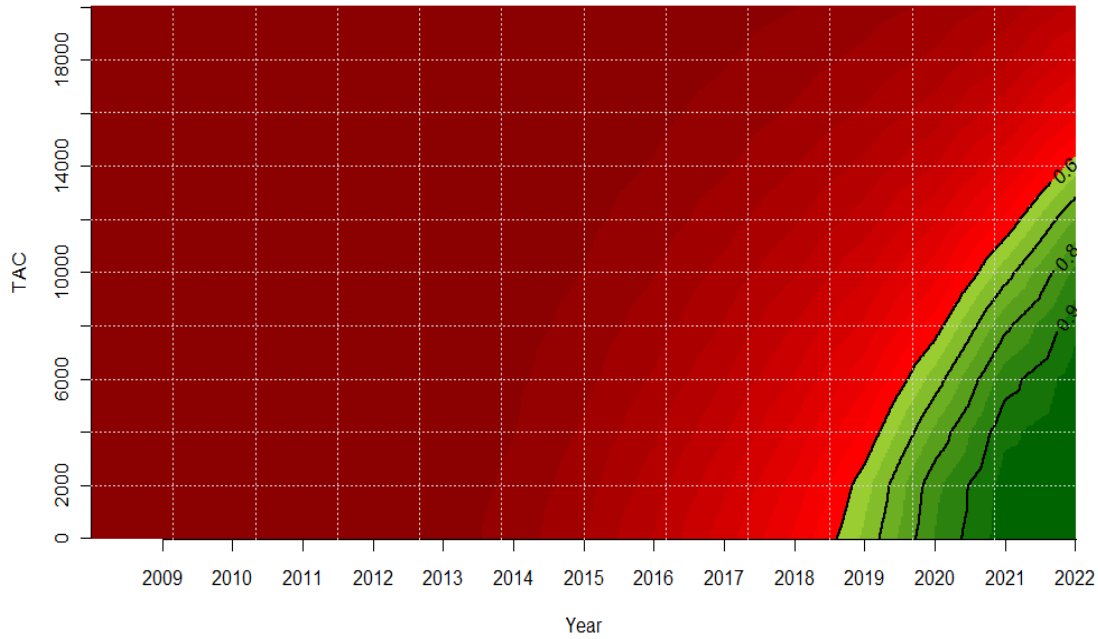
BFTE-Figure 3. Fishing mortality (for ages 2 to 5 and 10+), spawning stock biomass (in tonnes) and recruitment (in number of fish) estimates from VPA runs 13 and 15. Top panel: reported catch; bottom panel: inflated catch.



BFTE-Figure 4. Stock status in the terminal year (2009) estimated from VPA runs 13 and 15 with reported and inflated catch and considering low, medium and high recruitment levels. White dots represent the distribution of the terminal year obtained through bootstrapping.



BFTE-Figure 5. Plots of the annual Mean Weight from the Catch-at-size data per main area from 1950 to 2009.



BFTE-Figure 6. Probabilities plot of stock rebuilding at $SSB_{F0.1}$ by years and TAC levels (the probabilities combined the results obtained from the stochastic runs over the 24 scenarios being investigated). According to Rec.[09.06], red area corresponds to probabilities < 60% while green area corresponds to probabilities > 60%. Contours for 60%, 70%, 80% and 90% probabilities are further displayed by black lines.

BFTW-Table 1. Kobe II matrices giving the probability that the spawning stock biomass (SSB) will exceed the level that will produce MSY in any given year for various constant catch levels under the low recruitment, high recruitment, and combined scenarios.

Low recruitment scenario (two-line)

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	67.8%	98.4%	99.4%	99.4%	99.8%	100.0%	100.0%	100.0%	100.0%
250 mt	66.8%	98.2%	98.8%	98.8%	99.8%	99.8%	100.0%	100.0%	100.0%
500 mt	66.0%	98.0%	98.8%	98.8%	99.0%	99.8%	99.8%	100.0%	100.0%
750 mt	65.6%	97.4%	98.4%	98.0%	98.8%	99.0%	99.4%	99.6%	100.0%
1000 mt	64.6%	97.0%	97.6%	97.0%	98.2%	98.8%	99.0%	99.0%	99.4%
1250 mt	63.8%	96.4%	97.0%	96.2%	97.8%	98.2%	98.4%	98.4%	98.8%
1500 mt	63.2%	96.2%	96.4%	95.2%	95.8%	97.0%	97.6%	97.4%	97.6%
1750 mt	61.6%	95.2%	95.4%	93.2%	93.6%	94.0%	94.4%	95.0%	95.8%
2000 mt	60.6%	94.8%	94.6%	90.4%	91.0%	91.8%	92.0%	92.4%	92.6%
2250 mt	59.6%	94.4%	93.2%	87.4%	87.8%	86.8%	86.4%	86.6%	86.2%
2500 mt	58.8%	93.2%	91.4%	84.2%	81.8%	81.2%	81.2%	78.6%	78.2%
2750 mt	57.6%	92.8%	88.6%	78.4%	76.4%	74.0%	73.4%	69.6%	68.0%
3000 mt	56.4%	91.2%	86.4%	74.0%	69.0%	66.2%	62.4%	59.8%	56.8%
3250 mt	54.6%	89.6%	83.2%	68.2%	62.2%	57.4%	53.0%	48.2%	44.0%
3500 mt	54.2%	87.2%	79.0%	61.4%	55.4%	49.0%	43.6%	38.2%	34.0%

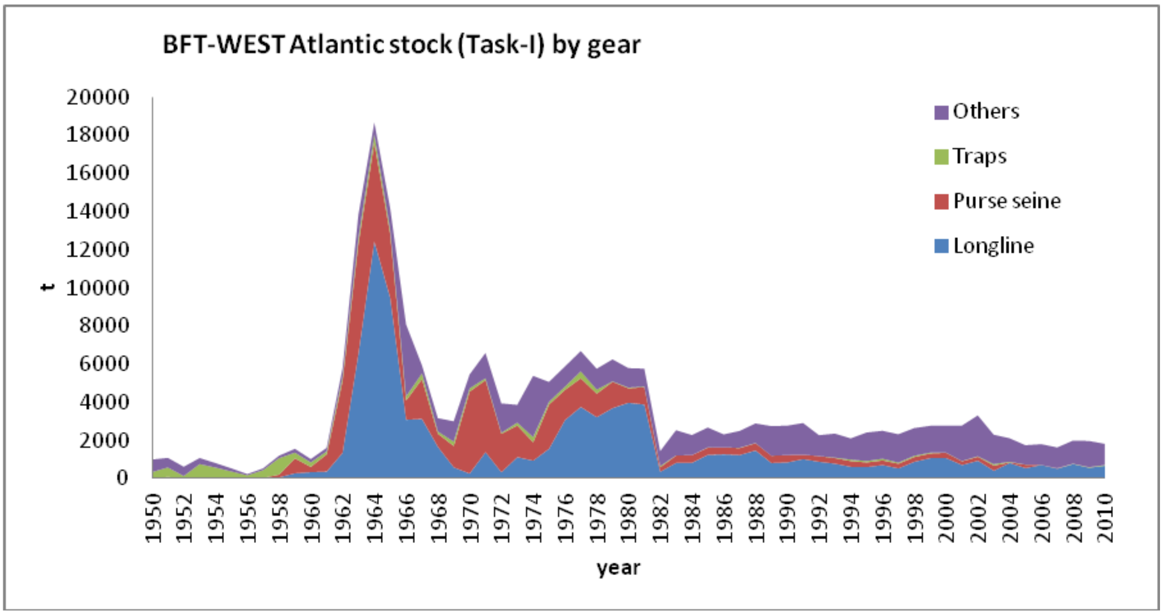
High recruitment scenario (Beverton-Holt)

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
750 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1000 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1750 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2000 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2750 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3000 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

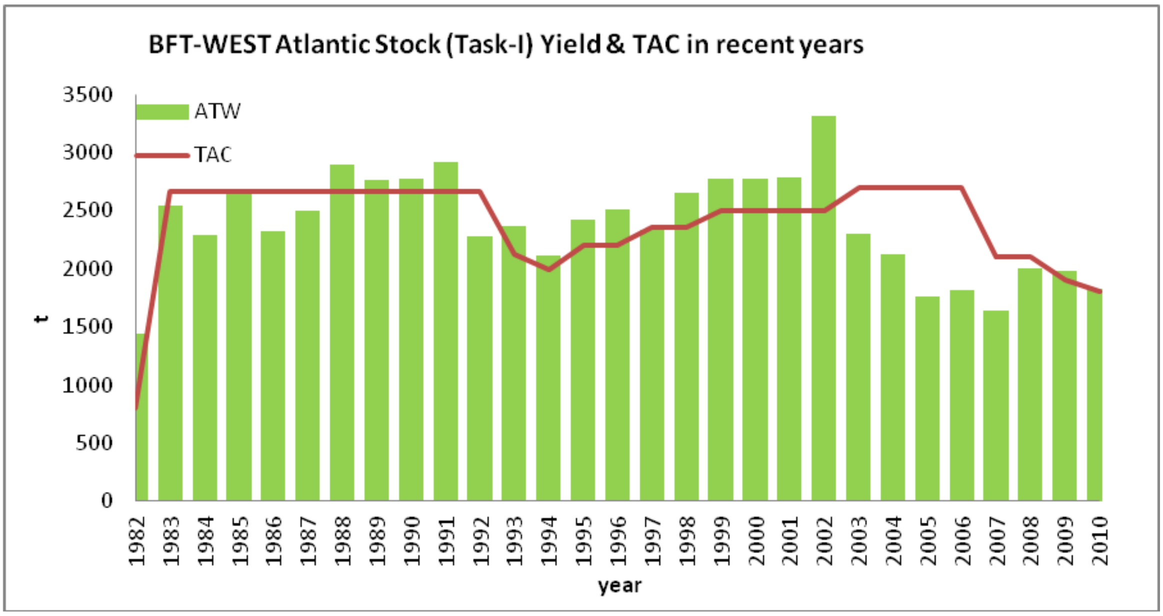
Combined recruitment scenarios (low and high equally probable)

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	33.9%	49.2%	49.7%	49.7%	49.9%	50.0%	50.0%	50.0%	50.0%
250 mt	33.4%	49.1%	49.4%	49.4%	49.9%	49.9%	50.0%	50.0%	50.0%
500 mt	33.0%	49.0%	49.4%	49.4%	49.5%	49.9%	49.9%	50.0%	50.0%
750 mt	32.8%	48.7%	49.2%	49.0%	49.4%	49.5%	49.7%	49.8%	50.0%
1000 mt	32.3%	48.5%	48.8%	48.5%	49.1%	49.4%	49.5%	49.5%	49.7%
1250 mt	31.9%	48.2%	48.5%	48.1%	48.9%	49.1%	49.2%	49.2%	49.4%
1500 mt	31.6%	48.1%	48.2%	47.6%	47.9%	48.5%	48.8%	48.7%	48.8%
1750 mt	30.8%	47.6%	47.7%	46.6%	46.8%	47.0%	47.2%	47.5%	47.9%
2000 mt	30.3%	47.4%	47.3%	45.2%	45.5%	45.9%	46.0%	46.2%	46.3%
2250 mt	29.8%	47.2%	46.6%	43.7%	43.9%	43.4%	43.2%	43.3%	43.1%
2500 mt	29.4%	46.6%	45.7%	42.1%	40.9%	40.6%	40.6%	39.3%	39.1%
2750 mt	28.8%	46.4%	44.3%	39.2%	38.2%	37.0%	36.7%	34.8%	34.0%
3000 mt	28.2%	45.6%	43.2%	37.0%	34.5%	33.1%	31.2%	29.9%	28.4%
3250 mt	27.3%	44.8%	41.6%	34.1%	31.1%	28.7%	26.5%	24.1%	22.0%
3500 mt	27.1%	43.6%	39.5%	30.7%	27.7%	24.5%	21.8%	19.1%	17.0%

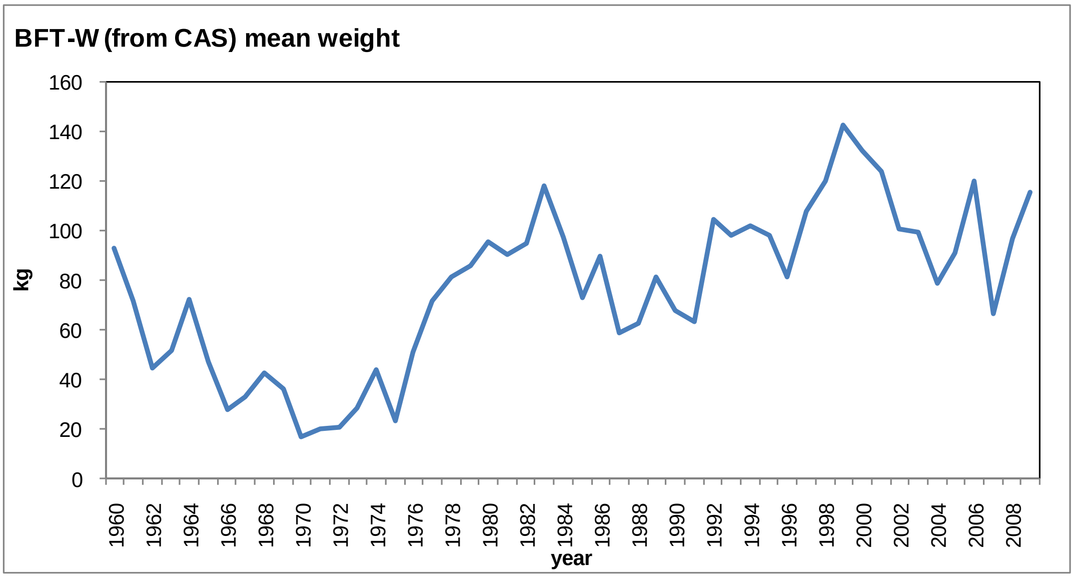
(a)



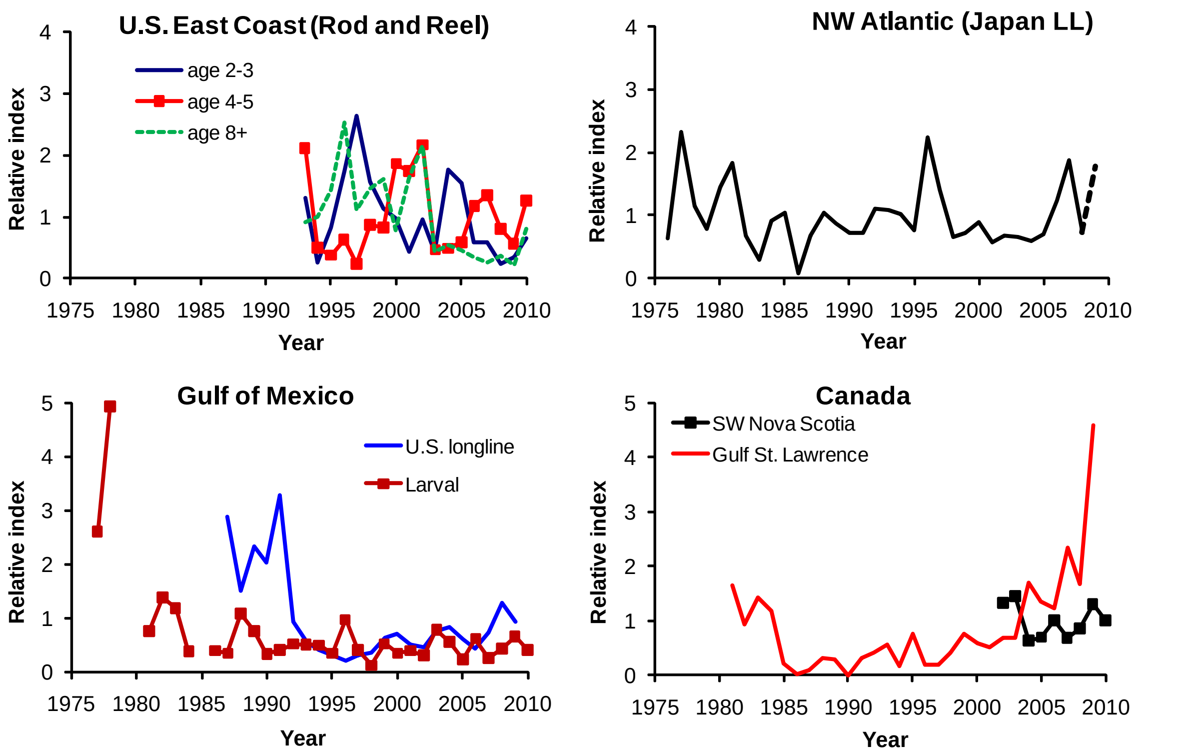
(b)



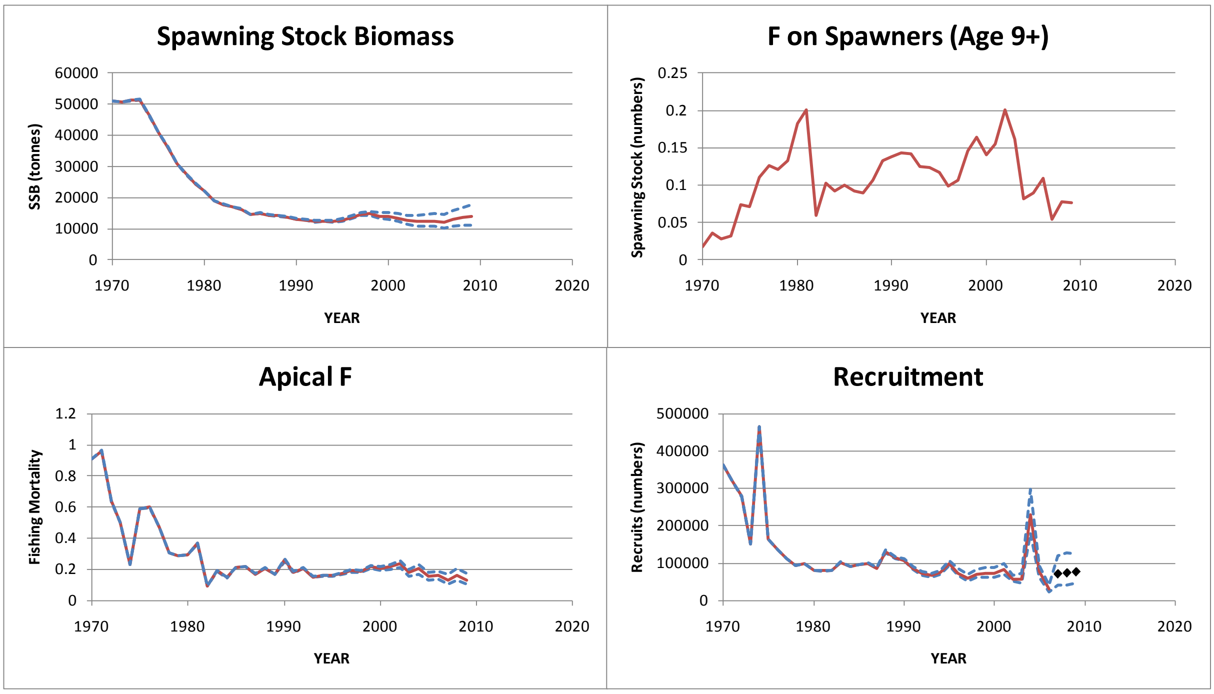
BFTW-Figure 1. Historical catches of western bluefin tuna: (a) by gear type and (b) in comparison to TAC levels agreed by the Commission.



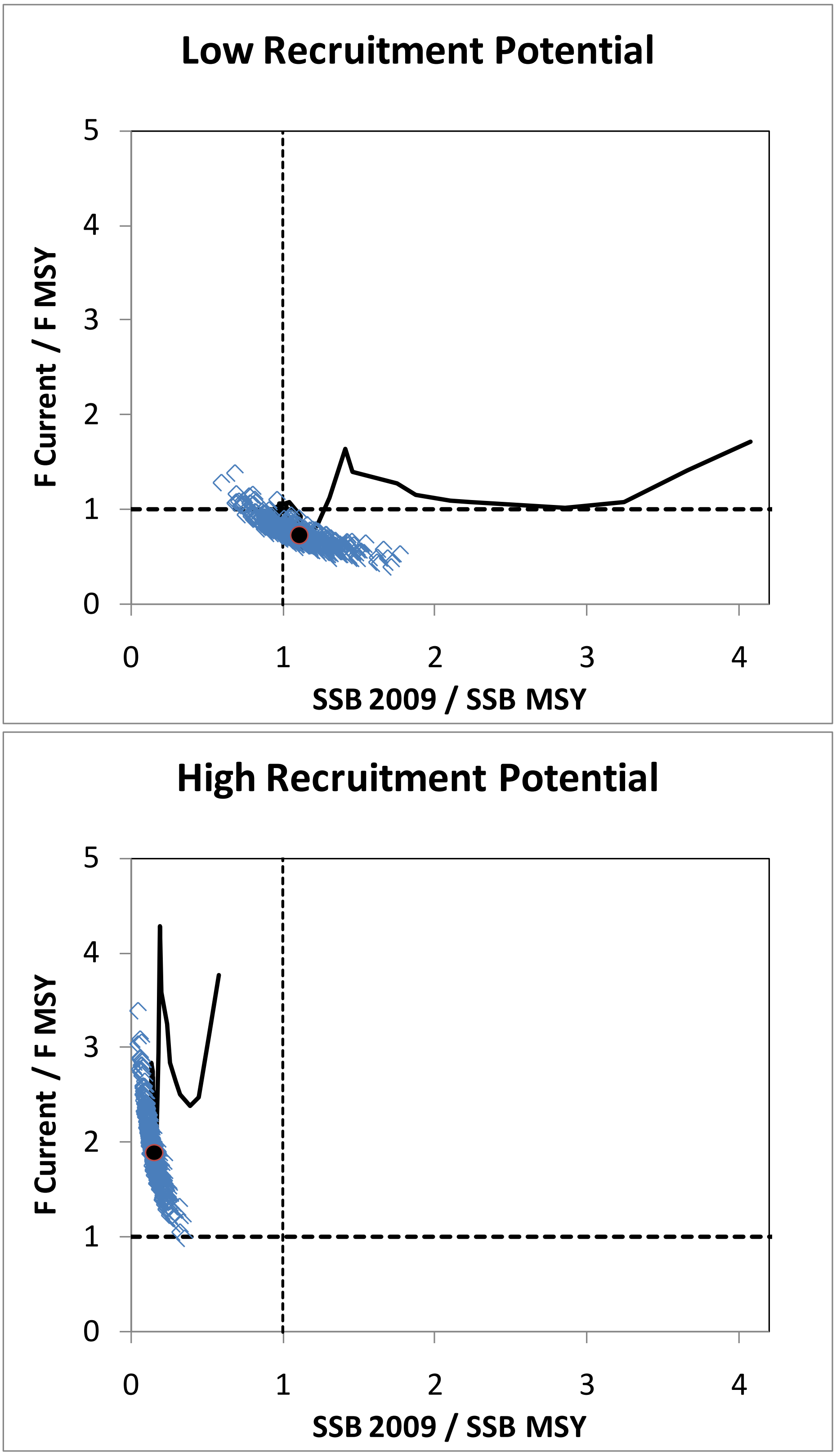
BFTW-Figure 2. Historical average weight of bluefin tuna caught by fisheries operating in the western management area.



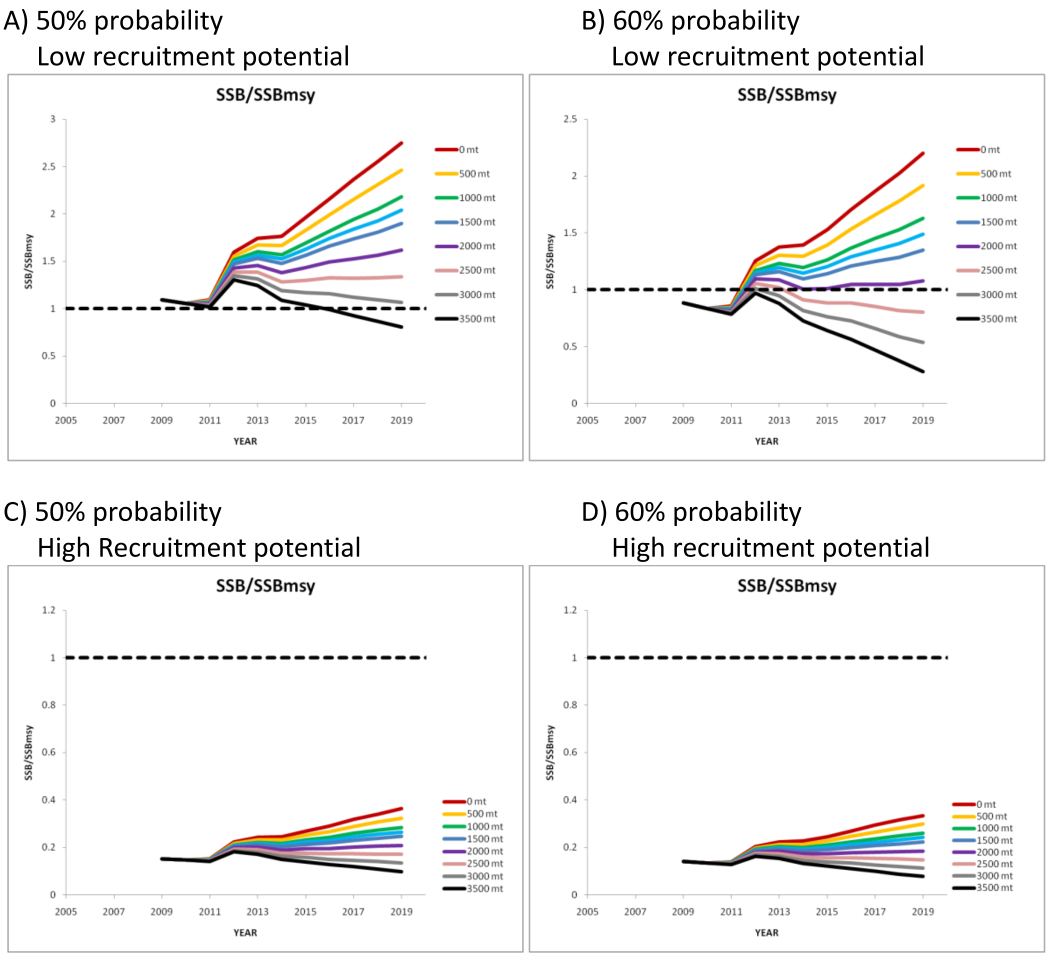
BFTW-Figure 3. Updated indices of abundance for western bluefin tuna. The dashed portion of the Japanese longline series represents the trend estimated in 2009, which was considered unreliable by the 2010 SCRS. The values for 2010 were considered too preliminary to be shown for the series representing Japanese longline, U.S. longline (Gulf of Mexico), and Canada Gulf of St. Lawrence.



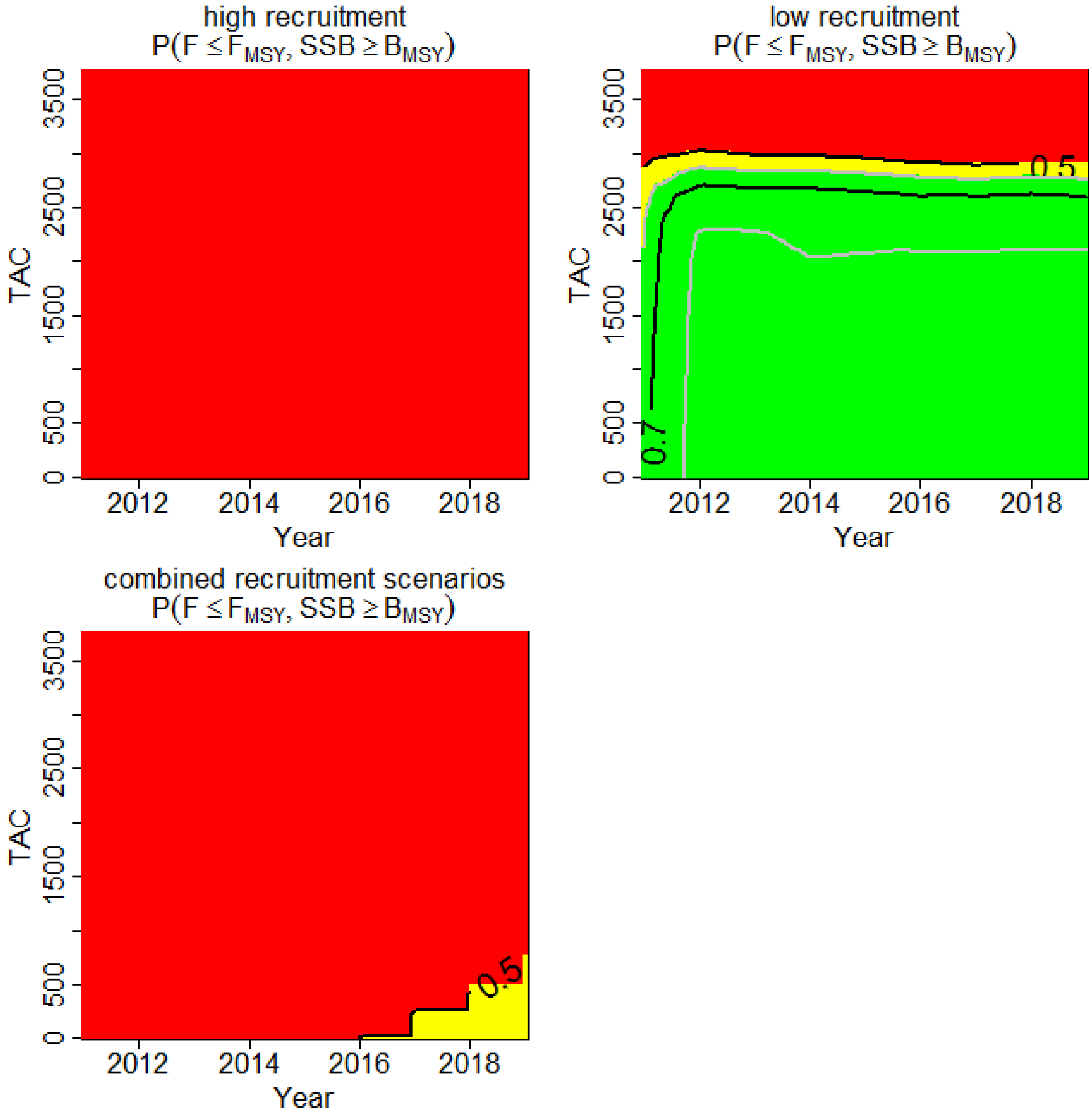
BFTW-Figure 4. Median estimates of spawning biomass (age 9+), fishing mortality on spawners, apical fishing mortality (F on the most vulnerable age class) and recruitment for the base VPA model. The 80% confidence intervals are indicated with dotted lines. The recruitment estimates for the last three years of the VPA are considered unreliable and have been replaced by the median levels corresponding to the low recruitment scenario.



BFTW-Figure 5. Estimated status of stock relative to the Convention objectives (MSY) by year (1970 to 2009). The lines give the time series of point estimates for each recruitment scenario and the cloud of symbols depicts the corresponding bootstrap estimates of uncertainty for the most recent year. The large black circle represents the status estimated for 2009.



BFTW-Figure 6. Projections of spawning stock biomass (SSB) for the Base Case assessment under low recruitment potential (top panels) and high recruitment potential (bottom panels) and various levels of constant catch. The labels "50%" and "60%" refer to the probability that the SSB will be greater than or equal to the values indicated by each curve. The curves corresponding to each catch level are arranged sequentially in the same order as the legends. A given catch level is projected to have a 50% or 60% probability of meeting the convention objective (SSB greater than or equal to the level that will produce the MSY) in the year that the corresponding curve meets the dashed horizontal line.



BFTW-Figure 7. Kobe II matrices giving the chance that the spawning stock biomass (SSB) will exceed the level that will produce MSY in any given year under various constant catch levels for the Base Case assessment under the low recruitment, high recruitment, and combined scenarios. The red, yellow and green regions represent chances of less than 50%, 50-59% and 60% or better, respectively.

8.6 BLUE MARLIN AND WHITE MARLIN

The most recent assessment for blue marlin was conducted in 2011 through a process that included a data preparatory meeting in April 2010 (Anon. 2011) and an assessment meeting in April (SCRS/2011/013). The last year of fishery data used in the assessment was 2009.

BUM/WHM-1. Biology

The central and northern Caribbean Sea and northern Bahamas have historically been known as the primary spawning area for blue marlin in the western North Atlantic. Recent reports show that blue marlin spawning can also occur north of the Bahamas in an offshore area near Bermuda at about 32º-34º North. Ovaries of female blue marlin caught by artisanal vessel in Côte d'Ivoire show evidence of pre-spawning and post-spawning, but not of spawning. In this area females are more abundant than males (4:1 female/male ratio). Coastal areas off West Africa have strong seasonal upwelling, and may be feeding areas for blue marlin.

Previous reports have mentioned spawning of white marlin off southeast Brazil (25º to 26ºS and 45º to 45ºW) in the same area where blue marlin spawn. In this area blue marlin spawn from April to June and white marlin spawn from December to March. In the northwest Atlantic white marlin have been reported spawning in the Gulf of Mexico in June. Recent reports confirm that white marlin also spawns offshore and north of the Antilles (19º to 23ºN and 60º to 70ºW) between April and July.

Atlantic blue marlin inhabit the upper parts of the open ocean. Although they spend much of the time on the upper mixed layer they dive regularly to maximum depths of around 300 m, with some vertical excursions down to 800m. They do not confine themselves to a narrow range of temperatures but most tend to be found in waters warmer than 17°C. The distributions of times at depth are significantly different between day and night. At night, the fish spent most of their time at or very close to the surface. During daylight hours, they are typically below the surface, often at 40 to 100+ m. These patterns, however, can be highly variable between individuals and also vary depending on the temperature and dissolved oxygen of the surface mixed layer. This variability in the use of habitat by marlins indicates that simplistic assumptions about habitat usage made during the standardization of CPUE data may be inappropriate.

All biological material sampled to date from white marlin, prior to the confirmation of the existence of roundscale spearfish (*T. georgii*) in 2006, contains unknown mixture of the roundscale spearfish and white marlin. Therefore reproductive parameters, growth curves and other biological studies previously thought to describe white marlin may not exclusively represent this species.

BUM/WHM-2. Fishery indicators

It has now been confirmed that white marlin landings reported to ICCAT include roundscale spearfish in significant numbers, so that historical statistics of white marlin include a mixture of both species. Studies of white marlin/roundscale spearfish ratios have been conducted, with overall estimated ratios between 23-27%. Previously, these were thought to represent only white marlin. In some areas, however, only one species is present in these samples.

The decadal geographic distribution of the catches is given in **BUM/WHM-Figure 1**. The Committee used Task I catches as the basis for the estimation of total removals **(BUM/WHM-Figure 2)**. Total removals for the period 1990-2009 were obtained during the 2011 Blue Marlin Stock Assessment Session and the White Marlin Data Preparatory Meeting by modifying Task I values with the addition of blue marlin and white marlin that the Committee estimated from catches reported as billfish unclassified. Additionally the reporting gaps were filled with estimated values for some fleets.

During the 2011 blue marlin assessment (Anon. 2012) it was noted that catches continued to decline through 2009, while catches of white marlin seemed to be stabilizing. Over the last 20 years, Antillean artisanal fleets have increased the use of Moored Fish Aggregating Devices (MFADs) to capture pelagic fish. Catches of blue marlin caught around MFADs are known to be significant and increasing in some areas, however reports to ICCAT on these catches are incomplete. Even though catches from the Antillean artisanal fleets were included in the stock assessment, additional documentation of past and present Task I catches from these fisheries is required. Recent reports from purse seine fleets in West Africa suggest that blue marlin are more commonly caught with tuna schools associated with FADs than with free tuna schools. Task I catches of blue marlin (**BUM/WHM-Table 1)** in 2010 were 3,160 t, compared to 3,240 t reported for 2009. Task I catches of white marlin in 2009 and 2010 were 644 t and 372 t, respectively (**BUM/WHM-Table 2)**. Task I catches of white marlin and blue marlin for 2010 are preliminary. Due to the work conducted by the Committee and improved reporting by CPCs the amount of unclassified billfish in the Task I table has been minimized.

A number of relative abundance indices were estimated during the blue marlin 2011 assessment and white marlin data preparatory meeting. However, given the apparent shift in landings from industrial to non-industrial fleets in recent times, it is imperative that CPUE indices are developed for all fleets that have substantial landings.

During the 2011 assessment, an estimated standardized combined CPUE index for blue marlin showed a sharp decline during the period 1960-1975, followed by a period of stabilization from about 1976 to 1995 and further decline thereafter (**BUM/WHM-Figure 3**).

A series of indices of abundance for white marlin were presented and discussed during the 2011 meetings. In general, the indices showed no discerning trend during the latter part of the time series examined (**BUM/WHM-Figure 4**).

BUM/WHM-3. State of the stocks

Blue marlin

Unlike the partial assessment of 2006 assessment, the Committee conducted a full assessment in 2011, which included estimations of management benchmarks. The results of the 2011 assessment indicated that the stock remains overfished and undergoing overfishing (**BUM/WHM-Figure 5**). This is in contrast to the results of the 2006 assessment which indicated that even though the stock was likely overfished, the declining trend had partially stabilized. Current status of the blue marlin stock is presented in **BUM-WHM Figure 6.** However, the Committee recognizes the high uncertainty with regard to data and the productivity of the stock.

White marlin

No new information on stock status has been provided since the 2006 assessment (Anon. 2007). The biomass for 2000-2004 most likely remained well below the B_{MSY} estimated in the 2002 assessment (Anon. 2003). During the last assessment, it was estimated that F 2004 was probably smaller than $F_{replacement}$ and also probably larger than the F_{MSY} estimated in the 2002 assessment. Over the period 2001-2004, combined longline indices and some individual fleet indices suggest that the decline has been at least partially reversed, while other individual fleet indices suggest that abundance has continued to decline. The next stock assessment (2012) may confirm if these recent apparent changes in trend have continued. During the 2011 data preparatory meeting, the Committee reviewed available information and concluded that the separation of historical landings of white marlin and roundscale spearfish can not be conducted. In addition, all historical indices of abundance of white marlin most likely included roundscale spearfish.

BUM/WHM-4. Outlook

Although uncertain, the results of the 2011 stock assessement indicated that if the recent catch levels of blue marlin (3,240 t in 2009) are not substantially reduced, the stock will continue to decline further (**BUM/WHM-Figure 7**). The current management plan does not have the potential of recovering the blue marlin stock to the B_{MSY} level.

No new information on the recovery/outlook for white marlin has been provided since the 2006 assessment (Anon. 2007). Based on the results of the 2006 stock assessment, the Committee noted that the Commission's current management plan has the potential of recovering the white marlin stock. However, this conclusion requires further confirmation based on the 2012 white marlin stock assessment.

Most recent catch per unit effort data for white marlin lacked any discernable trend.

The presence of unknown quantities of roundscale spearfish in the biological parameters, historical landings and relative abundance estimates of white marlin increase the uncertainty for the stock status and outlook for this species.

BUM/WHM-5. Effect of current regulations

Recommendations [Rec. 00-13], [Rec. 01-10] and [Rec. 02-13] placed additional catch restrictions for blue marlin and white marlin. The latter established that "*the annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing must be no more than 33% for white marlin and 50% for blue marlin of the 1996 or 1999 landing levels, whichever is greater*". That recommendation established that: "All blue marlin and white marlin brought to pelagic longline and purse seine vessels alive shall be released in a manner that maximizes their survival. The provision of this paragraph does not apply to marlins that are dead when brought along the side of the vessel and that are not sold or entered into commerce". The Committee estimated the catch of pelagic longline vessels for a subset of fleets that the Committee thought would be expected to be affected by Recommendations [Rec. 00-13] and [Rec. 02-13]. Catches of these fleets represent 97% of all longline caught blue marlin, and 93% of all longline caught white marlin for the period 1990-2007. Catches of both species have declined since 1996-99, the period selected as the reference period by the recommendations. Since 2002, the year of implementation of the last of these two recommendations, the catch of blue marlin has been below the 50% value recommended by the Commission. Specifically, the 2011 longline landings were 51% of the baseline established by the Commission. Similarly, the catch of white marlin since 2002 has been at about the 33% value recommended by the Commission. This analysis represents only longline caught marlin even though the recommendations referred to the combined catch of pelagic longline and purse seine, because the catch estimates of billfish bycatch from purse seine vessels are more uncertain than those from longline. Over the period considered, purse seine caught marlin represent 2% of the total catch reported by the combination of purse seine and pelagic longline.

The Committee notes that the management plan developed by the Commission was based on the fact that at that time most blue marlin and white marlin originated from industrial fisheries. Since then, the Committee noted a significant increase in the contribution from non-industrial fisheries to the total blue marlin and white marlin harvest and that these fisheries are not fully accounted for in the current management plan.

Some fisheries/fleets are using circle hooks, which can minimize deep hooking and increase the survival of marlins hooked on longlines and recreational gear. More countries have started reporting data on live releases in 2006. Additional information has come about, for some fleets, regarding the potential for modifying gears to reduce the by-catch and increase the survival of marlins. Such studies have also provided information on the rates of live releases for those fleets. However there is not enough information on the proportion of fish being released alive for all fleets, to evaluate the effectiveness of the ICCAT recommendation relating to the live release of marlins.

BUM/WHM-6. Management recommendations

The current blue marlin stock assessment, considering all the uncertainties in the assessment, indicates that the stock is below B_{MSY} and that fishing mortality is above F_{MSY} (2009). Unless the recent catch levels (3,240 t, 2009) are substantially reduced, the stock will likely continue to decline. The Commission should adopt a rebuilding plan for the stock of Atlantic blue marlin.

The Commission should implement management measures to immediately reduce fishing mortality on blue marlin stock by adopting a TAC that allow the stock to increase (2,000 t or less, including dead discards; **BUM/WHM-Table 2**):

1. To facilitate the implementation of the TAC, the commission may consider the adoption of measures such as, but not limited to:
   a) Total prohibition of landings of blue marlin from pelagic longline and purse seine fisheries to improve the effectiveness of current management measures.
   b) Encouraging the use of alternative gear configurations that reduce the likelihood of deep hooking therefore increasing the post-release survival (for example, circle hooks) and/or reduce catchability (e.g., reducing the number of shallowhooks in a longline set, etc).
   c) Implementation of time-area closures.
   d) Reduce fishing mortality of blue marlin from non-industrial fisheries.
2. Noting the misidentification problems between white marlin and spearfishes, the Group recommended that management recommendations combine these species as a mixed stock until more accurate species identification and differentiation of species catches are available.
3. The Commission should encourage the reporting of catches of white marlin and roundscale spearfish separated.

ATLANTIC BLUE MARLIN SUMMARY

	BUM
Maximum Sustainable Yield	2,837 t (2,343 – 3,331 t)[1]
Current (2010) Yield	3,160 t[2]
Relative Biomass (SSB_{2009}/SSB_{MSY})	0.67 (0.53 – 0.81)[1]
Relative Fishing Mortality (F_{2009}/F_{MSY})	1.63 (1.11 – 2.16)[1]
Conservation and Management Measure in Effect	Recommendation [Rec. 06-09]. The annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing must be no more than 33% for white marlin and 50% for blue marlin of the 1996 or 1999 landing levels, whichever is greater.

[1] Stock Synthesis version 3.2.0.b model results. Values correspond to median estimates, 95% confidence interval values are provided in parenthesis.
[2] 2010 yield should be considered provisional. 2009 yield corresponded to 3,240 t. The 2009 yield used in the 2011 assessment was 3,341 t.

ATLANTIC WHITE MARLIN SUMMARY

	WHM
[1]MSY	[5] 600-1,320 t
Current (2010) Yield	372 t [2]
B_{2004} / [1]B_{MSY}	< 1.0
Recent Abundance Trend (2001-2004)	Slightly upward
$F_{2004} > F_{replacement}$	No
F_{2004} > [1]F_{MSY}	Possibly > 1.0
[3]$Catch_{recent}/Catch_{1996}$ Longline and Purse seine	0.47
[4]$Catch_{2004}$	610 t
Rebuilding to B_{MSY}	Potential to rebuild under current management plan, but needs verification.
Conservation and Management Measure in Effect	Recommendation [Rec. 06-09]. The annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing must be no more than 33% for white marlin and 50% for blue marlin of the 1996 or 1999 landing levels, whichever is greater

[1] As estimated during the 2000 (Anon. 2001) and 2002 (Anon. 2003) assessments.
[2] 2010 yield should be considered provisional.
[3] Catch $_{recent}$ is the average longline catch for 2000-2004.
[4] Estimate of total removals obtained by the Committee.
[5] Range of estimates were obtained in the previous assessments, but recent analyses suggest that the lower bound for white marlin should be at least 600 t.

BUM-Table 1. Estimated catches (t) of Atlantic blue marlin (Makaira nigricans) by area, gear and flag. (v02, 2011-09-30)

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			2086	2237	2882	4325	4565	4171	3027	3044	4127	4063	5199	5488	5458	5086	4912	3867	3159	3729	2234	3454	2341	3382	4505	3240	3160
	ATN		1162	1020	1027	1632	1970	1430	1122	1071	1537	1560	1961	2011	2494	2017	2122	1236	1047	1161	730	1555	803	1035	2101	1571	1644
	ATS		924	1217	1855	2693	2595	2741	1905	1974	2590	2503	3238	3478	2963	3069	2790	2631	2112	2568	1503	1899	1538	2346	2404	1669	1516
Landings	ATN	Longline	720	418	459	995	1607	982	625	613	1088	991	1339	1413	1300	1078	971	492	477	533	518	561	512	600	912	825	864
		Other surf.	228	284	258	300	155	245	261	217	220	343	363	440	1088	820	1056	622	431	587	146	951	193	273	954	611	652
		Sport (HL+RR)	214	181	186	147	49	62	90	113	118	73	64	60	56	38	36	97	90	22	31	18	62	120	197	92	110
	ATS	Longline	661	964	1530	2017	1958	2286	1490	1419	1767	1679	2194	2545	2068	1977	1776	1465	901	1234	909	1010	807	1400	1050	944	804
		Other surf.	262	253	324	675	634	453	414	553	821	822	1041	863	893	1090	1014	1165	1212	1334	595	887	728	938	1351	722	706
		Sport (HL+RR)	1	0	1	1	2	1	0	1	2	2	2	28	0	0	0	0	0	0	0	2	1	9	3	3	6
Discards	ATN	Longline	0	138	124	191	159	142	146	127	111	153	196	97	49	81	60	22	37	19	34	24	36	42	37	40	17
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	11	0	1	1	0	0	1	2	0
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	1	42	2	2	0	0	0	0	0	0	2	0	0	0	
Landings	ATN	Barbados	14	13	46	3	18	12	18	21	19	31	25	30	25	19	19	18	11	11	0	0	25	0	0	0	9
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	**0**
		Canada	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		China P.R.	0	0	0	0	0	0	0	0	41	48	41	51	79	133	9	31	15	17	10	49	0	4	2	26	47
		Chinese Taipei	117	52	26	11	937	716	336	281	272	187	170	355	80	44	64	65	48	66	104	38	35	30	16	25	14
		Cuba	103	68	94	74	112	127	135	69	39	85	43	53	12	38	55	56	34	3	4	7	7	0	0	0	
		Curaçao	50	50	50	50	50	40	40	40	40	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	69	75	36	44	55	58	106	76	76
		Dominican Republic	0	0	0	0	0	0	0	0	0	0	0	41	71	29	19	23	0	207	0	0	0	0	0	0	
		EU.España	1	0	8	7	5	1	6	7	6	2	25	5	36	15	25	8	1	6	27	12	23	14	23	6	14
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	776	0	0	753	434	498
		EU.Portugal	12	8	2	5	1	4	2	15	11	10	7	3	47	8	20	17	2	31	27	24	36	56	56	25	32
		Grenada	36	33	34	40	52	64	52	58	52	50	26	47	60	100	87	104	69	72	45	42	33	49	54	45	45
		Jamaica	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	174	78	206	593	250	145	193	207	532	496	798	625	656	427	442	155	125	148	174	251	199	221	489	477	490
		Korea Rep.	36	13	14	252	240	34	11	2	16	16	41	16	0	0	0	0	0	0	0	3	14	30	43	0	40
		Liberia	0	0	0	0	0	0	0	0	0	87	148	148	701	420	712	235	158	115	0	0	0	0	0	0	
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	**0**
		Mexico	0	0	0	0	0	0	0	3	13	13	13	13	27	35	68	37	50	70	90	86	64	91	81	93	89
		NEI (BIL)	68	94	74	103	18	20	38	0	0	0	0	0	0	0	52	164	254	151	28	0	49	68	82	45	
		NEI (ETRO)	0	0	0	0	0	0	0	71	134	149	178	225	330	312	202	112	7	6	0	0	0	0	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	5	38	38	0	0	0	0	0	0	0	1	0	
		Senegal	0	0	0	1	1	4	8	0	9	0	2	5	0	0	0	11	24	32	11	1	5	91	114	61	41
		St. Vincent and Grenadines	0	0	0	1	0	0	1	2	2	2	0	1	0	0	0	0	19	0	0	0	0	1	3	2	1
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	4	1	0	10	5	0	18	17	21	53	46	70	72	58
		Trinidad and Tobago	43	93	45	13	11	6	1	2	16	28	14	49	15	20	51	17	16	9	11	7	14	16	34	26	22
		U.S.A.	273	291	221	124	29	33	51	80	88	43	43	46	50	37	24	16	17	19	26	16	17	9	13	6	4
		U.S.S.R.	7	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		UK.Bermuda	11	6	8	15	17	18	19	11	15	15	15	3	5	1	2	2	2	2	2	2	2	2	2	2	1
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	
		Ukraine	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	8
		Venezuela	218	60	76	149	70	49	66	74	122	106	137	130	205	220	108	72	76	84	83	138	131	206	120	107	136
	ATS	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	2
		Benin	7	4	12	0	6	6	6	6	5	5	5	5	5	5	5	0	0	0	0	0	0	0	0	0	
		Brasil	46	51	74	60	52	61	125	147	81	180	331	193	486	509	452	780	387	577	195	612	298	262	160	149	130
		China P.R.	0	0	0	0	0	0	0	0	21	25	21	27	41	68	15	61	73	72	49	47	0	61	11	51	54
		Chinese Taipei	98	265	266	462	767	956	488	404	391	280	490	1123	498	442	421	175	246	253	211	113	64	203	132	170	139
		Cuba	111	137	191	77	90	62	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	100	100	130	82	88	105	79	139	212	177	157	222	182	275	206	196	78	109	115	107	178	150	991	463	450
		EU.España	0	0	0	15	0	12	40	37	49	38	133	117	159	110	115	86	27	6	24	12	68	25	32	54	151
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	6	1	0	24	69	79	102	81	72
		Gabon	0	0	0	0	0	0	0	1	2	0	304	5	0	0	0	1	0	3	0	0	0	0	0	0	
		Ghana	16	5	7	430	324	126	123	236	441	471	422	491	447	624	639	795	999	415	470	759	405	683	191	140	116
		Japan	335	362	617	962	967	755	824	719	991	913	881	724	529	363	441	180	142	294	366	191	290	699	539	345	289
		Korea Rep.	60	139	361	437	84	503	13	11	40	40	103	40	2	3	1	1	0	0	1	4	19	33	47	8	15
		Mixed flags (FR+ES)	135	132	137	144	199	137	116	146	133	126	96	82	80	83	79	0	0	0	0	0	0	0	0	0	

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20	4	16	61	7	110	141	123	133	
		NEI (ETRO)	0	0	0	0	0	0	0	103	192	214	256	323	474	449	290	162	10	8	0	0	0	0	0	0	
		Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	2	33	0	0	0	0	0	0	0	0	7	0	
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**0**
		S. Tomé e Príncipe	0	0	28	19	17	18	21	25	28	33	36	35	33	30	32	32	32	32	9	21	26	0	68	70	72
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	2	0	0	1
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
		Togo	0	0	0	0	0	0	0	0	0	0	0	23	0	73	53	141	103	775	0	0	0	0	0	0	
		U.S.S.R.	16	22	32	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Sta Helena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
		Uruguay	0	0	0	0	0	0	0	0	3	1	1	26	23	0	0	0	1	5	3	2	8	5	0	6	**0**
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Discards	ATN	Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		U.S.A.	0	138	124	191	159	142	146	127	111	153	196	97	50	81	60	25	49	19	35	25	36	42	38	42	17
	ATS	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	1	42	2	2	0	0	0	0	0	0	0	0	0	0	

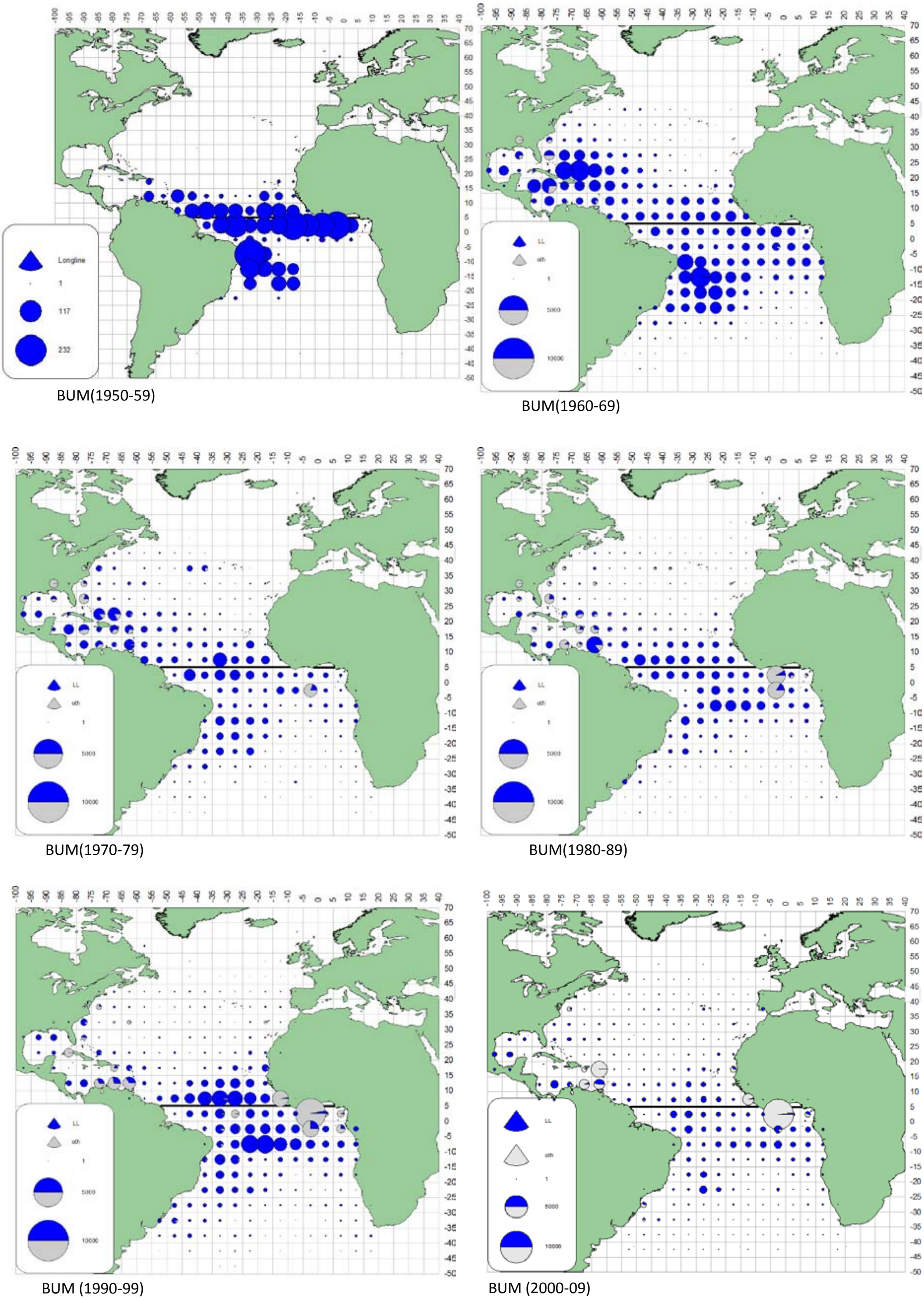
WHM-Table 1. Estimated catches (t) of Atlantic white marlin (Tetrapturus albidus) by area, gear and flag. (v02, 2011-09-30).

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			1639	1552	1396	1829	1659	1627	1462	1544	2114	1761	1573	1430	1682	1569	1363	965	894	719	730	645	436	591	615	644	372
	ATN		933	648	436	376	407	239	610	543	660	639	669	483	529	492	482	426	290	250	252	284	194	160	134	200	196
	ATS		705	904	960	1453	1252	1388	853	1002	1454	1122	905	947	1152	1077	881	539	604	469	478	360	243	432	481	444	176
Landings	ATN	Longline	840	494	196	241	266	108	466	413	531	473	554	431	475	399	408	381	230	204	204	252	161	123	105	164	174
		Other surf.	61	54	150	11	40	21	35	34	57	48	31	10	17	29	31	24	22	28	20	14	21	28	17	20	9
		Sport (HL+RR)	32	38	29	16	21	19	21	30	30	18	20	9	6	6	2	4	6	1	1	1	2	1	2	2	6
	ATS	Longline	654	870	832	1333	1152	1328	805	950	1420	1086	860	853	979	1021	827	475	497	425	454	325	202	404	417	380	130
		Other surf.	51	34	128	119	96	60	48	52	33	31	40	57	173	55	54	63	107	44	23	35	40	9	64	63	44
		Sport (HL+RR)	0	0	0	0	4	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	ATN	Longline	0	62	60	107	81	90	88	66	42	100	64	33	31	57	41	16	29	17	27	17	9	8	9	13	8
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4	0	0	0	0	0	0	2	0
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	0	37	1	0	0	1	0	0	0	0	2	19	1	0	2
Landings	ATN	Barbados	0	0	117	11	39	17	24	29	26	43	15	41	33	25	25	24	15	15	0	0	33	0	0	0	6
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**0**
		Canada	0	1	0	0	0	0	0	0	4	4	8	8	8	5	5	3	2	1	2	5	3	2	2	1	2
		China P.R.	0	0	0	0	0	0	0	0	6	7	6	7	10	20	1	7	4	2	1	4	1	0	1	3	4
		Chinese Taipei	319	153	0	4	85	13	92	123	270	181	146	62	105	80	59	68	61	15	45	19	16	1	0	1	1
		Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	3	14	0	0	1	0	0	0	0	0	0	
		Cuba	225	30	13	21	14	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	
		EU.España	0	0	61	12	12	9	18	15	25	17	97	89	91	74	118	43	4	19	19	48	28	32	10	8	50
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	11	30	3	2	0	1	1
		Grenada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	15	8	14	33	10	12	11	17	14	
		Japan	56	60	68	73	34	45	180	33	41	31	80	29	39	25	66	15	10	21	23	28	27	10	22	27	34
		Korea Rep.	37	2	2	82	39	1	9	4	23	3	7	5	0	0	0	0	0	0	0	4	0	0	0	8	
		Liberia	0	0	0	0	0	0	0	0	0	0	1	1	3	8	4	3	4	3	0	0	0	0	0	0	
		Mexico	0	0	0	0	0	0	0	2	8	8	3	5	6	11	18	44	15	15	28	25	16	13	14	19	20
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	72	4	8	0	26	9	14	18	20	
		NEI (ETRO)	0	0	0	0	0	0	0	23	43	47	57	72	105	100	64	36	2	2	0	0	0	0	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	1	0	
		St. Vincent and Grenadines	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	44	0	0	0	0	0	0	0
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Trinidad and Tobago	28	61	29	7	6	3	0	1	11	18	8	32	10	13	4	2	5	12	6	6	5	12	10	11	15
		U.S.A.	116	124	42	10	17	13	11	19	13	7	12	8	5	5	1	3	6	1	1	1	1	0	2	2	2
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Bermuda	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Venezuela	151	154	42	47	79	47	187	226	148	171	164	90	80	61	25	72	110	55	55	60	26	52	26	70	54
	ATS	Argentina	4	0	0	8	9	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	
		Brasil	143	93	149	204	205	377	211	301	91	105	75	105	217	158	105	172	407	266	80	244	90	52	47	52	35
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	3	4	3	4	5	10	1	13	19	6	6	4	5	10	3	5	4
		Chinese Taipei	196	613	565	979	810	790	506	493	1080	726	420	379	401	385	378	84	117	89	127	37	28	53	38	27	19
		Cuba	192	62	24	22	6	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	1	2	1	5	1	2	2	3	1	1	1	1	3	2	
		EU.España	0	0	1	1	0	17	6	12	2	19	54	4	10	45	68	18	2	3	45	10	23	14	21	8	62
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	19	0	35	39	6
		Gabon	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	22	6	88	68	31	17	14	22	1	2	1	3	7	6	8	21	2	1	1	1	0	0	4	4	**0**
		Honduras	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

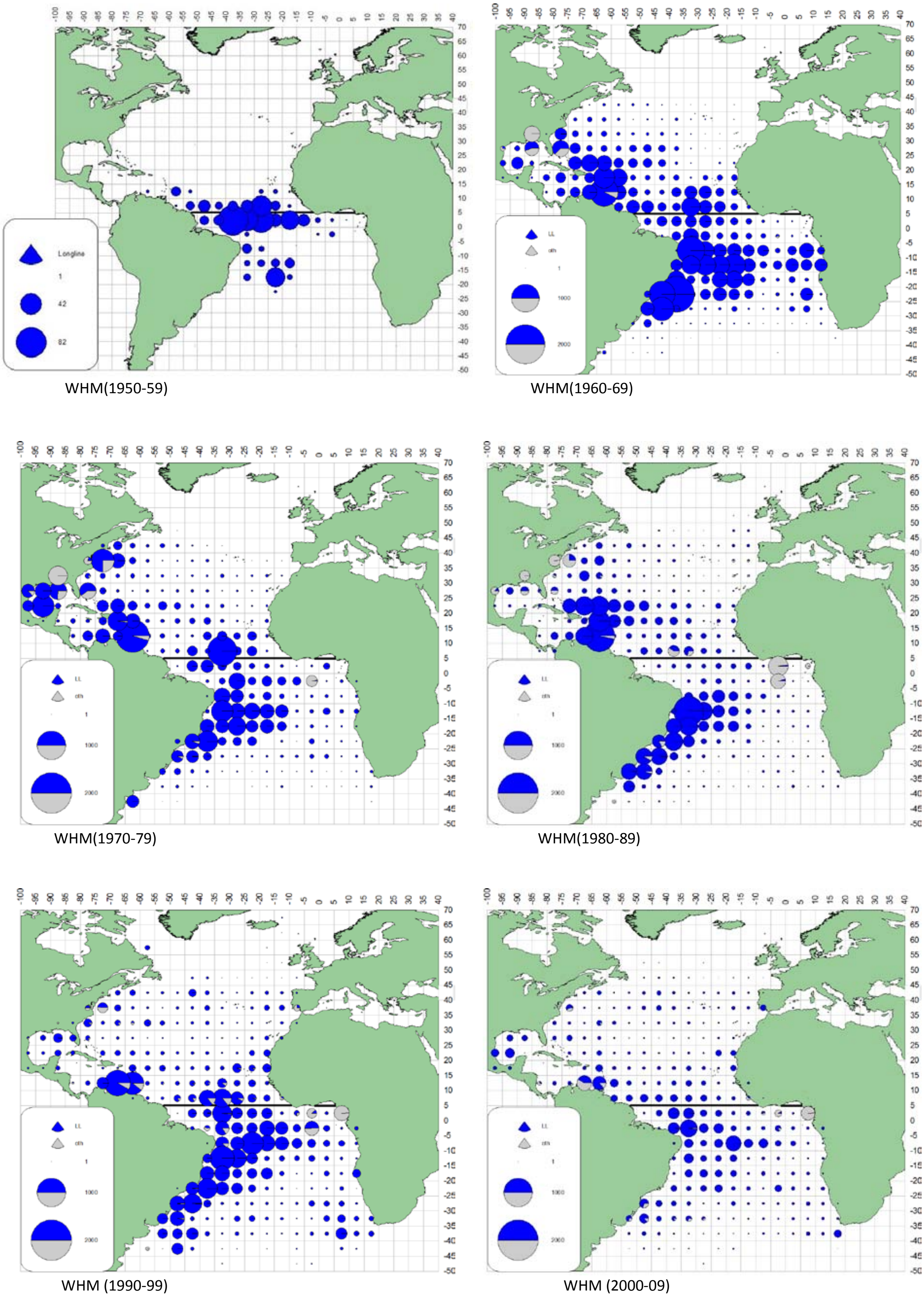
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Japan	73	74	76	73	92	77	68	49	51	26	32	29	17	15	17	41	5	12	13	6	11	11	12	16	10
		Korea Rep.	34	25	17	53	42	56	1	4	20	20	52	18	0	0	0	0	0	11	40	3	0	113	96	70	
		Mixed flags (FR+ES)	25	25	25	27	37	11	10	12	11	9	7	7	9	8	7	0	0	0	0	0	0	0	0	0	
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	21	134	16	27	156	186	179	
		NEI (ETRO)	0	0	0	0	0	0	0	91	171	190	228	288	421	399	258	144	9	7	0	0	0	0	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	1	8	0	0	0	0	0	0	0	0	1	0	
		S. Tomé e Príncipe	0	0	14	16	19	26	24	17	21	21	30	45	40	36	37	37	37	37	21	33	29	0	36	37	38
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
		Togo	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	2	0	0	0	0	0	0	
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Uruguay	16	6	1	1	1	1	3	0	3	0	1	24	22	0	0	0	1	9	2	5	9	3	0	5	
Discards	ATN	Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		U.S.A.	0	62	60	107	81	90	88	66	42	100	64	33	32	57	41	17	33	17	27	17	10	8	10	14	8
	ATS	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	19	1	0	
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	37	1	0	0	1	0	0	0	0	0	0	0	0	

BUM-WHM Table 2. Kobe II Strategy Matrix (K2SM). Percent values indicate the probability of achieving the goal of $SSB_{yr} >= SSB_{MSY}$ and $F_{yr} < F_{MSY}$ for each year (yr) under different constant catch scenarios (TAC tons). Red corresponds to 0-39%, yellow 40-60%, green >60%.

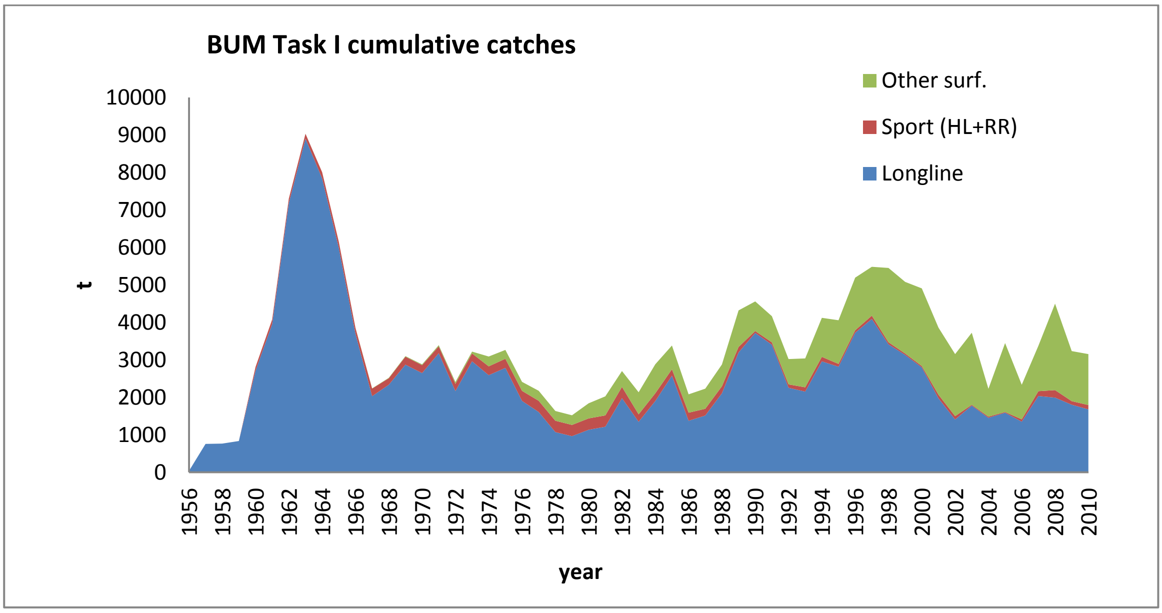
	TAC								
Year	**0**	**500**	**1000**	**1500**	**2000**	**2500**	**3000**	**3500**	**4000**
2012	0%	0%	0%	0%	0%	0%	0%	0%	0%
2013	2%	2%	1%	1%	1%	1%	0%	0%	0%
2014	9%	6%	4%	3%	2%	1%	1%	0%	0%
2015	19%	13%	9%	6%	3%	2%	1%	0%	0%
2016	33%	23%	15%	9%	5%	3%	1%	0%	0%
2017	49%	35%	22%	13%	7%	3%	2%	0%	0%
2018	63%	47%	31%	18%	10%	4%	2%	0%	0%
2019	74%	58%	40%	24%	12%	5%	2%	1%	0%
2020	81%	67%	49%	30%	16%	6%	2%	1%	0%
2021	87%	74%	56%	36%	18%	7%	2%	0%	0%
2022	92%	80%	63%	41%	21%	8%	3%	0%	0%
2023	94%	84%	68%	46%	24%	9%	3%	0%	0%
2024	96%	88%	73%	50%	27%	10%	3%	0%	0%
2025	97%	91%	77%	55%	29%	11%	3%	0%	0%
2026	98%	93%	81%	58%	32%	12%	3%	0%	0%

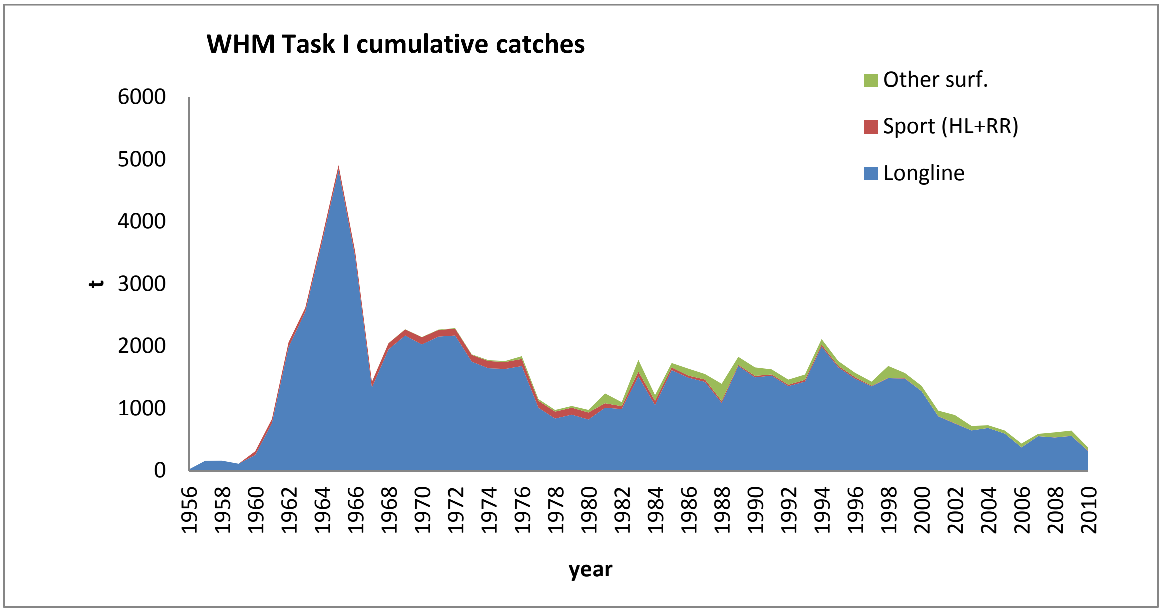


BUM-WHM Figure 1a. Geographic distribution of mean blue marlin catch by major gears and decade. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

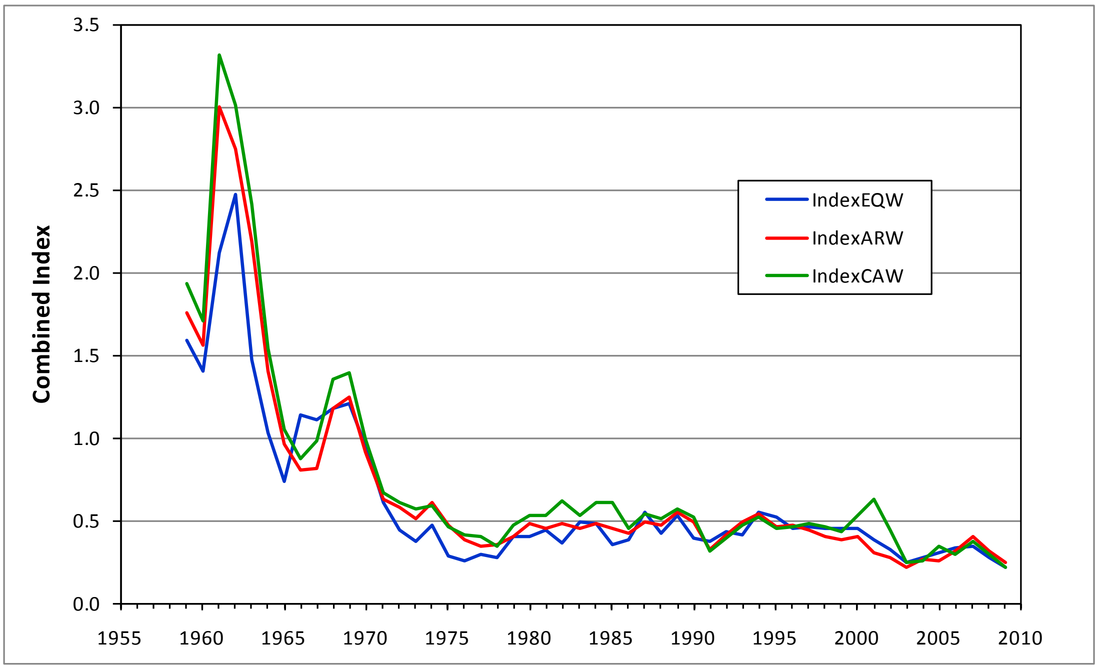


BUM-WHM Figure 1b. Geographic distribution of mean white marlin catch by major gears and decade. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

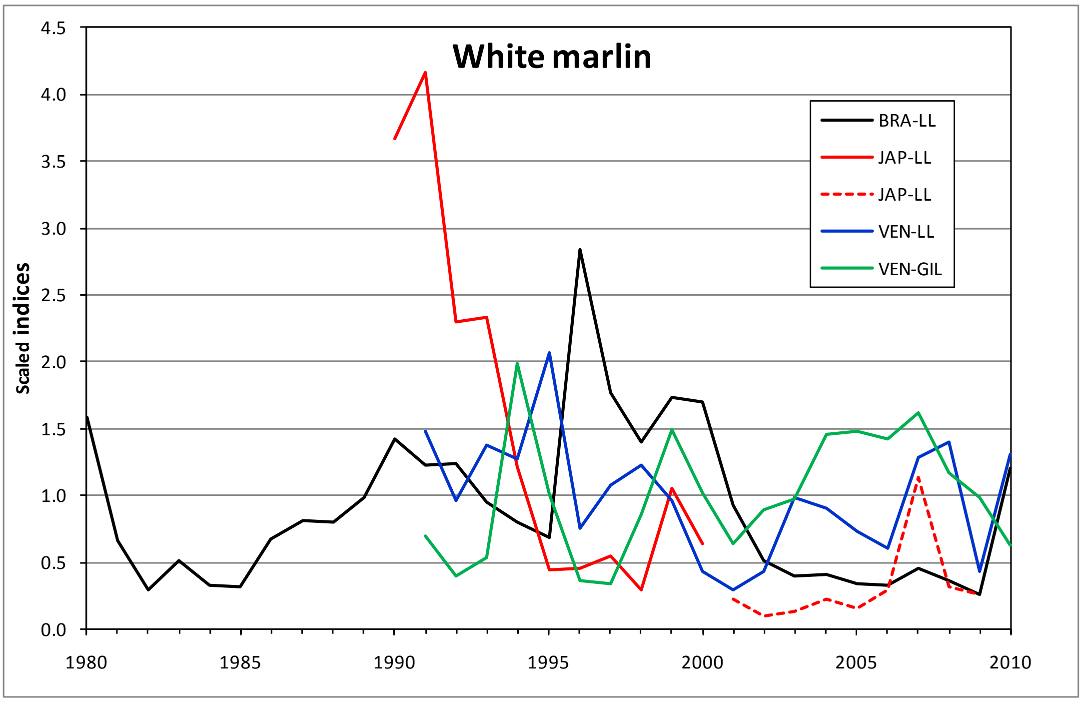




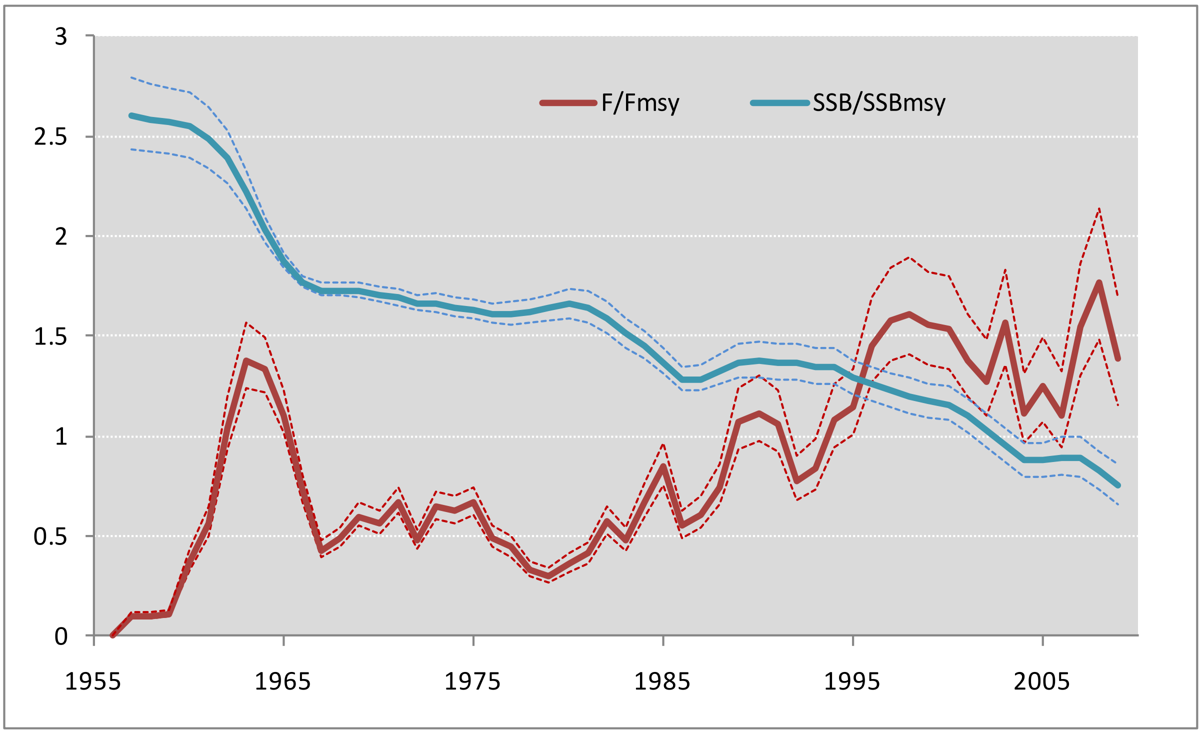
BUM-WHM-Figure 2. Total catch of blue marlin and white marlin reported in Task I.



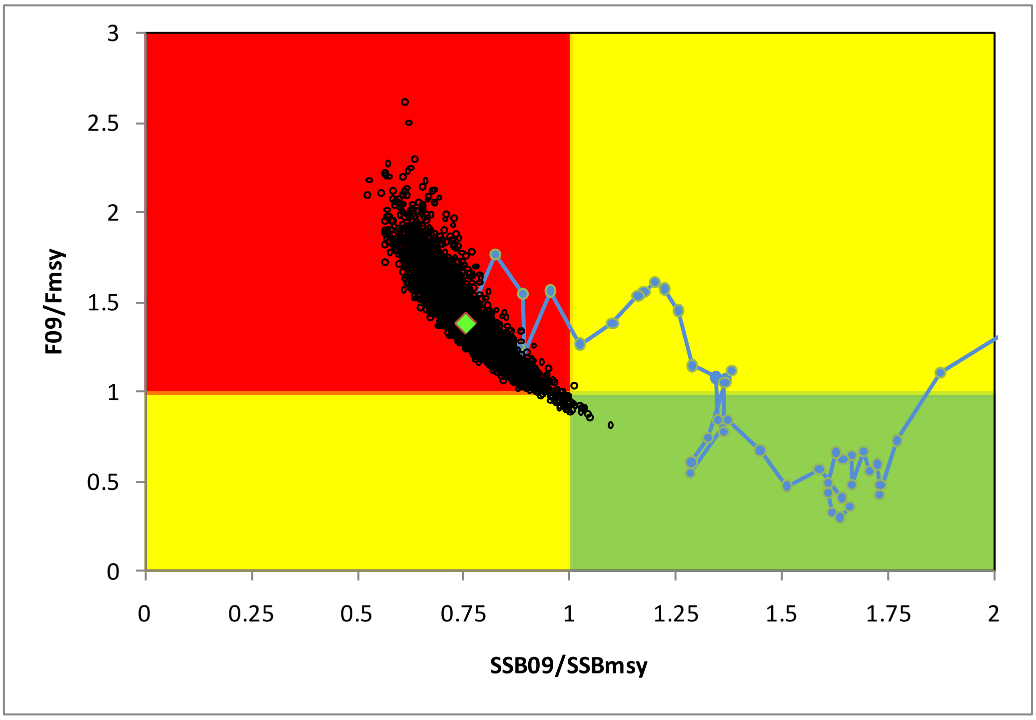
BUM-WHM-Figure 3. Blue marlin standardized combined CPUE indices estimated using equal weighting for all CPUE series (EQW), weighting the CPUE series by area (ARW) and by catch (CAW).



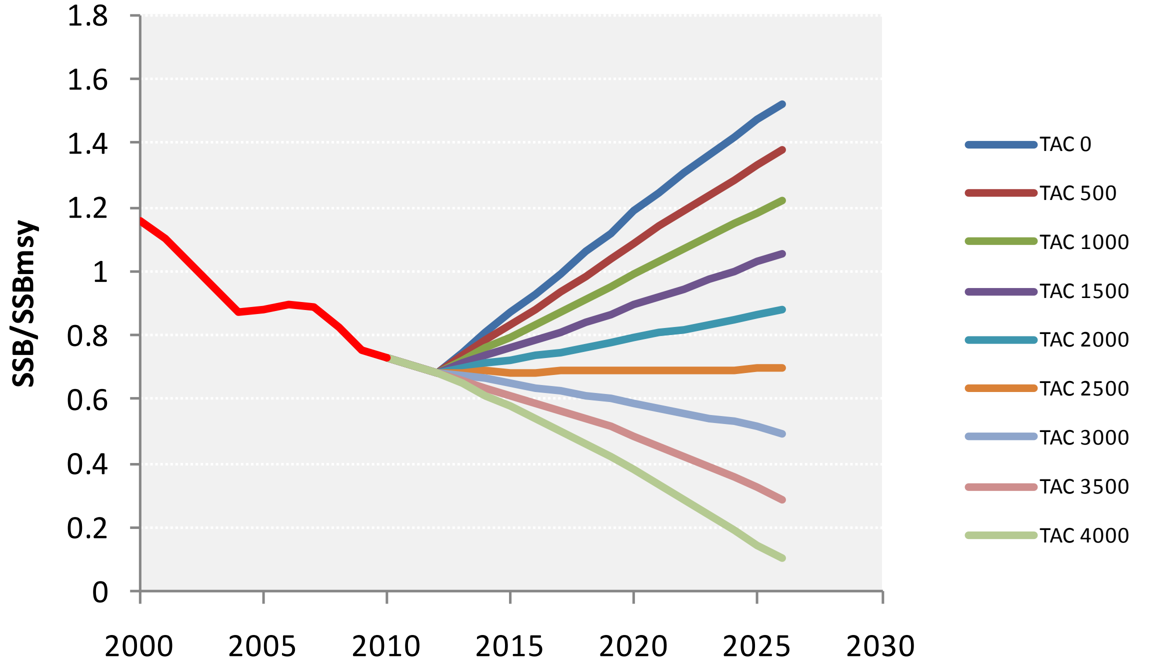
BUM-WHM-Figure 4. White marlin indices of abundance presented during the meeting. For graphing purposes the indices were scaled to their respective mean value for the period 1990-2010.



BUM-WHM Figure 5. Trends of F/F_{MSY} and SSB/SSB_{MSY} ratios for blue marlin from the base model (SS3). Solid lines represent median from MCMC runs, and broken lines the 10% and 90% percentiles, respectively.



BUM-WHM Figure 6. Phase plot for blue marlin from the base model in final year model assessment (2009). Individual points represent MCMC iterations, large diamond the median of the series. Blue circles with line represent the historic trend of the median F/F_{MSY} *vs* SSB/SSB_{MSY} 1965-2008.



BUM-WHM Figure 7. Trends of SSB/SSB_{MSY} ratios under different scenarios of constant catch projections (TAC tons) for blue marlin from the base model. Projections start in 2010, for 2010/11 it was assumed a catch of 3,341 t.

8.7 SAI - SAILFISH

Sailfish *(Istiophorus platypterus)* has a pan-tropical distribution. ICCAT has established, based on life history information on migration rates and geographic distribution of catch, that there are two management units for Atlantic sailfish, eastern and western **(SAI-Figure 1)**. The first successful assessment that estimated reference points for eastern and western sailfish stocks was conducted in 2009 (Anon. 2010c).

SAI-1. Biology

Larval sailfish are voracious feeders initially feeding on crustaceans from the zooplankton but soon switching to a diet of fish larvae. Temperature preferences for adult sailfish appear to be in the range of 25-28°C. A study undertaken in the Strait of Florida and the southern Gulf of Mexico indicated that habitat preferences from satellite tagged sailfish were primarily within the upper 20~50 m of the water column. The tag data also indicated common short-term movements to depths in excess of 100 m, with some dives as deep as 350 m. Sailfish is the most coastal of all billfish species and conventional tagging data suggest that they move shorter distances than the other billfish (**SAI-Figure 2**). Sailfish grow rapidly and reach a maximum size of 160 cm for males and 220 cm for females, with females reaching maturity at 155 cm. Sailfish reach a maximum age of at least 17 years.

Sailfish spawn over a wide area and year around. In the North, evidence of spawning has been detected in the Straits of Florida, and off the Venezuelan, Guyanese and Surinamese coasts. In the southwest Atlantic, spawning occurs off the southern coast of Brazil between 20° and 27°S, and in the east Atlantic, off Senegal and Côte d'Ivoire. Timing of spawning can differ between regions. From the Florida Straits to the areas off Guyana sailfish spawn in the second semester of the year, whist in the southwestern Atlantic and the tropical eastern Atlantic they spawn late and early in the year.

SAI-2. Description of the fisheries

Sailfish are targeted by coastal artisanal and recreational fleets and, to a less extent, are caught as by-catch in longline and purse seine fisheries **(SAI-Figure 1)**. Historically, catches of sailfish were reported together with spearfish by many longline fleets. In 2009 these catches were separated by the Species Group **(SAI-Table 1)**. Historical catches of unclassified billfish continue to be reported to the Committee making the estimation of sailfish catch difficult. Catch reports from countries that have historically been known to land sailfish continue to suffer from gaps and there is increasing ad-hoc evidence of un-reported landings in some other countries. These considerations provide support to the idea that the historical catch of sailfish has been under-reported, especially in recent times where more and more fleets encounter sailfish as by-catch or target them.

Reports to ICCAT estimate that the Task I catch for 2010 was 2,771 t and 625 t for the east and west stocks, respectively **(SAI-Figure 3)**. Task I catches of sailfish for 2010 are preliminary because they do not include reports from all fleets.

SAI-3. State of the stocks

ICCAT recognizes the presence of two stocks of sailfish in the Atlantic, the eastern and western stocks. There is increasing evidence that an alternative stock structure with a north western stock and a south/eastern stock should be considered. Assessments of stocks based on the alternative stock structure option have not been done to date, however, conducting them should be a priority for future assessments.

In 2009 ICCAT conducted a full assessment of both Atlantic sailfish stocks (Anon. 2010c) through a range of production models and by using different combinations of relative abundance indices **(SAI-Figure 4)**. It is clear that there remains considerable uncertainty regarding the stock status of these two stocks, however, many assessment model results present evidence of overfishing and evidence that the stocks are overfished, more so in the east than in the west. Although some of the results suggest a healthy stock in the west, few suggest the same for the east. The eastern stock is also assessed to be more productive than the western stock, and probably able to provide a greater MSY. The eastern stock is likely to be suffering stronger overfishing and most probably has been reduced further below the level that would produce the MSY than the western stock. Reference points obtained with other methods reach similar conclusions.

Examination of recent trends in abundance suggests that both the eastern and western stocks suffered their greatest declines in abundance prior to 1990. Since 1990, trends in relative abundance conflict between different indices, with some indices suggesting declines, other increases and others not showing a trend **(SAI-Figure 4)**. Examination of available length frequencies for a range of fleets show that average length and length distributions do not show clear trends during the period where there are observations. A similar result was obtained in the past for marlins. Although it is possible that, like in the case of the marlins, this reflects the fact that mean length is not a good indicator of fishing pressure for billfish it could also reflect a pattern of high fishing pressure over the period of observation.

SAI-4. Outlook

Both the eastern and western stocks of sailfish may have been reduced to stock sizes below B_{MSY}. There is considerable uncertainty on the level of reduction, particularly for the west, as various production model fits indicated the biomass ratio B_{2007}/B_{MSY} both above and below 1.0. The results for the eastern stock were more pessimistic than those for the western stock in that more of the results indicated recent stock biomass below B_{MSY}. Therefore there is particular concern over the outlook for the eastern stock.

SAI-5. Effect of current regulations

No ICCAT regulations for sailfish are in effect, however, some countries have established domestic regulations to limit the catch of sailfish. Among these regulations are: requirement of releasing all billfish from longline vessels, minimum size restrictions, circle hooks and catch and release strategies in sport fisheries.

SAI-6. Management recommendations

The Committee recommends that catches for the eastern stock should be reduced from current levels. It should be noted, however, that artisanal fishermen harvest a large part of the sailfish catch along the African coast.

The Committee recommends that catches of the western stock of sailfish should not exceed current levels. Any reduction in catch in the West Atlantic is likely to help stock re-growth and reduce the likelihood that the stock is overfished. It should be noted, however, that artisanal fishermen harvest a large part of the sailfish catch of the western sailfish stock.

The Committee is concerned about the incomplete reporting of sailfish catches, particularly for the most recent years, because it increases uncertainty in stock status determination. The Committee recommends all countries landing or having dead discards of sailfish, report these data to the ICCAT Secretariat.

ATLANTIC SAILFISH SUMMARY

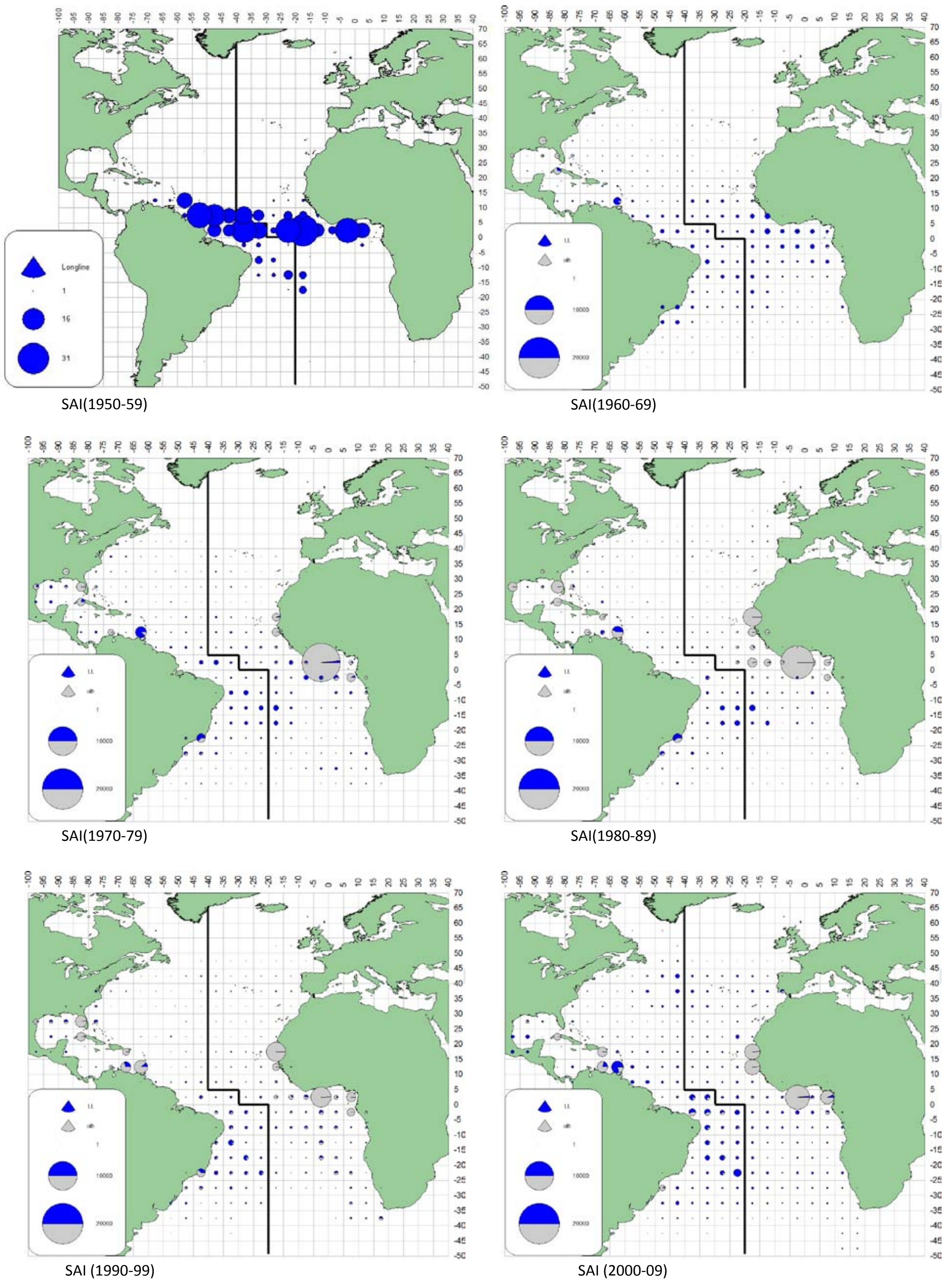
	West Atlantic	**East Atlantic**
Maximum Sustainable Yield (MSY)	600-1,100[1] t	1,250-1,950[1] t
2010 Catches (Provisional)	625 t	2,771[3] t
B_{2007}/B_{MSY}	Possibly < 1.0	Likely < 1.0
F_{2007}/F_{MSY}	Possibly > 1.0	Likely > 1.0
2008 Replacement Yield	not estimated	not estimated
Management Measures in Effect	None[2]	None[2]

[1] Results from Bayesian production model with informative priors. These results represent only the uncertainty in the production model fit. This range underestimates the total uncertainty in the estimates of MSY.
[2] Some countries have domestic regulations.
[3] Provisional estimate. The final figure, after discounting 1,100 t of Maroc (see footnote in SAI-Table 1) would be 1,671 t.

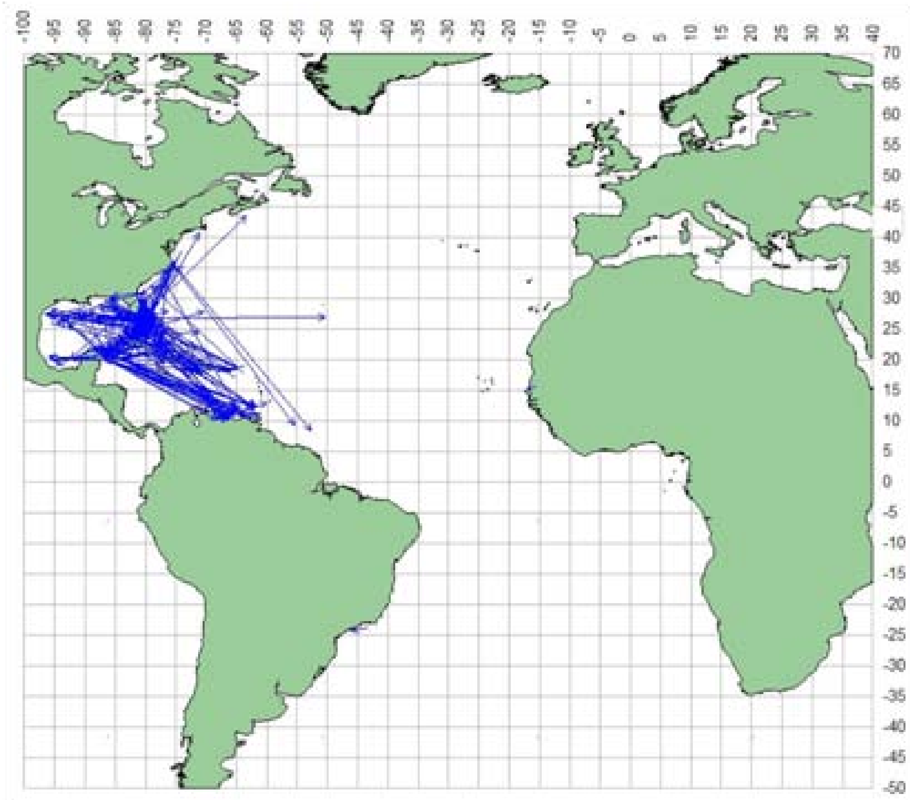
SAI-Table 1. Estimated catches (t) of Atlantic sailfish (Istiophorus albicans) by area, gear and flag. (v02, 2011-09-30).

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			3276	3699	3180	2673	3475	2591	3105	3093	2231	2358	2923	2500	2709	2724	3543	4124	3968	3574	3688	3400	2754	3668	3437	3187	3396
	ATE		2065	2553	2109	1710	2315	1476	1780	1815	1172	1234	1881	1337	1362	1342	1722	2405	1987	2256	2292	1965	1658	2438	1945	1752	2771
	ATW		1212	1146	1071	963	1160	1115	1325	1278	1059	1124	1041	1163	1346	1382	1820	1719	1981	1318	1397	1435	1096	1230	1492	1435	625
Landings	ATE	Longline	99	99	93	112	109	47	104	256	151	189	196	206	275	273	195	269	354	322	261	294	566	620	596	553	1722
		Other surf.	1394	1870	1479	1153	1249	1000	983	1111	954	910	1504	644	859	883	976	1369	1535	1653	1811	1527	1047	1629	1237	619	606
		Sport (HL+RR)	571	584	537	445	957	429	692	448	67	135	182	488	228	186	551	767	98	282	219	143	46	189	113	580	443
	ATW	Longline	420	425	334	316	316	159	357	484	346	338	260	323	499	533	1097	1245	1265	873	747	1062	646	765	1015	963	523
		Other surf.	295	187	208	238	514	521	599	498	468	410	482	433	553	615	602	402	603	440	642	368	442	452	459	457	92
		Sport (HL+RR)	496	491	472	352	267	371	333	233	217	348	230	350	267	163	76	60	106	0	0	0	2	6	7	4	5
Discards	ATW	Longline	0	42	57	57	62	64	36	63	28	29	69	57	27	72	45	11	7	5	7	3	5	8	9	10	4
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Landings	ATE	Benin	25	32	40	8	21	20	21	20	20	20	19	6	4	5	5	12	2	2	5	3	3	4	0	0	
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	3	3	3	3	5	9	4	5	11	4	4	8	16	8	1	4	5
		Chinese Taipei	0	1	2	3	5	4	80	157	38	58	24	56	44	66	45	50	62	49	15	25	36	109	121	78	30
		Cuba	55	50	22	53	61	184	200	77	83	72	533	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	40	40	66	55	58	38	69	40	54	66	91	65	35	80	45	47	65	121	73	93	78	52	448	74	
		EU.España	9	19	28	14	0	13	3	42	8	13	42	38	15	20	8	150	210	183	148	177	200	257	206	280	327
		EU.Portugal	0	0	0	0	0	0	1	2	1	2	1	2	27	53	11	3	8	13	19	31	136	43	49	103	151
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Gabon	0	0	0	0	0	0	0	3	3	110	218	2	0	0	0	0	0	4	0	0	0	0	0	0	
		Ghana	925	1392	837	465	395	463	297	693	450	353	303	196	351	305	275	568	592	566	521	542	282	420	342	358	417
		Honduras	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	32	16	26	26	31	6	15	27	45	52	47	19	58	16	26	6	20	22	70	50	62	144	199	94	136
		Korea Rep.	2	8	11	12	12	22	2	2	5	5	11	4	0	0	0	0	0	0	0	0	0	0	0	1	
		Liberia	0	0	0	0	0	0	0	0	0	33	85	43	136	122	154	56	133	127	106	122	118	115	0	0	
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	1100
		Mixed flags (FR+ES)	403	394	408	432	595	174	150	182	160	128	97	110	138	131	98	44	39	44	41	35	32	36	0	0	
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	269	408	213	55	1	105	43	20	11	
		NEI (ETRO)	0	0	0	0	0	0	0	27	51	57	69	86	127	120	77	43	3	2	16	7	8	10	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**0**
		S. Tomé e Príncipe	0	0	78	86	97	84	78	81	88	92	96	139	141	141	136	136	136	136	515	346	292	384	114	119	121
		Senegal	572	596	587	552	1040	466	860	462	162	167	240	560	260	238	786	953	240	673	567	463	256	737	446	630	484
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	1	5	0	0	
		Togo	0	0	0	0	0	0	0	0	0	0	0	9	22	36	23	62	55	95	135	47	31	71	0	0	
		U.S.A.	0	0	0	0	0	2	4	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.S.R.	2	5	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	Aruba	30	23	20	16	13	9	5	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0	0	
		Barbados	0	0	0	69	45	29	42	50	46	74	25	71	58	44	44	42	26	27	26	42	58	42	0	0	18
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	12	0	0	76
		Brasil	292	174	152	147	301	90	351	243	129	245	310	137	184	356	598	412	547	585	534	416	139	123	222	432	71
		China P.R.	0	0	0	0	0	0	0	0	3	3	3	3	3	9	4	3	1	0	1	0	0	0	1	2	1
		Chinese Taipei	20	9	92	86	42	37	17	112	117	19	19	2	65	17	11	33	31	13	8	21	5	14	10	10	7
		Cuba	50	171	78	55	126	83	70	42	46	37	37	40	28	196	208	68	32	18	50	72	47	56	0	0	
		Curaçao	10	10	10	10	10	10	10	15	15	15	15	15	15	15	15	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	0	1	0	3	3	4	2	
		Dominican Republic	18	40	44	44	40	31	98	50	90	40	40	101	89	27	67	81	260	91	144	165	133	147	0	0	
		EU.España	0	0	0	0	0	8	13	13	19	36	5	30	42	7	14	354	449	196	181	113	148	184	393	451	154
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	2	12	12	110	19	53	101	48	15
		Grenada	211	104	114	98	218	316	310	246	151	119	56	83	151	148	164	187	151	171	112	147	159	174	216	183	
		Japan	8	2	5	12	12	27	0	1	8	2	4	17	3	10	12	3	3	10	5	22	4	1	33	43	40
		Korea Rep.	10	1	1	12	16	1	2	3	4	4	12	4	0	0	0	0	0	0	0	0	0	0	0	1	
		Mexico	0	0	0	0	0	0	0	2	19	19	10	9	65	40	118	36	34	45	51	55	41	46	45	48	34
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	297	268	0	0	0	0	68	81	252	17	
		NEI (ETRO)	0	0	0	0	0	0	0	15	27	30	36	46	67	64	41	23	1	1	9	4	4	6	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	0	2	1	4	4	4	2	1	3	0	1	0	2	164	3	86	73	59	18	13	8	7
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2
		Trinidad and Tobago	25	35	24	10	7	3	3	1	2	1	4	10	25	37	3	7	6	8	10	9	17	13	32	16	16
		U.S.A.	462	454	451	324	242	343	294	202	179	345	231	349	267	163	76	58	103	0	0	0	0	0	3	3	4
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Venezuela	77	80	22	24	24	65	71	206	162	93	155	175	248	169	83	126	159	133	158	178	184	248	154	162	178
Discards	ATW	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		U.S.A.	0	42	57	57	62	64	36	63	28	29	69	57	27	72	45	11	7	5	7	4	5	7	10	10	4

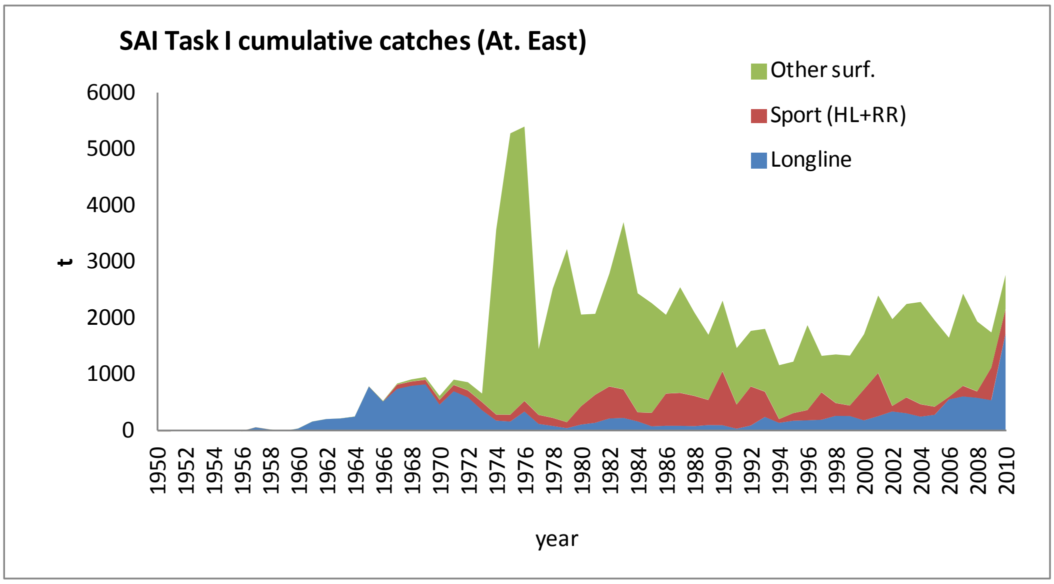
Maroc 2010 catches of 1.100 t (reported by mistake as SAI) will be revised to 0 t.

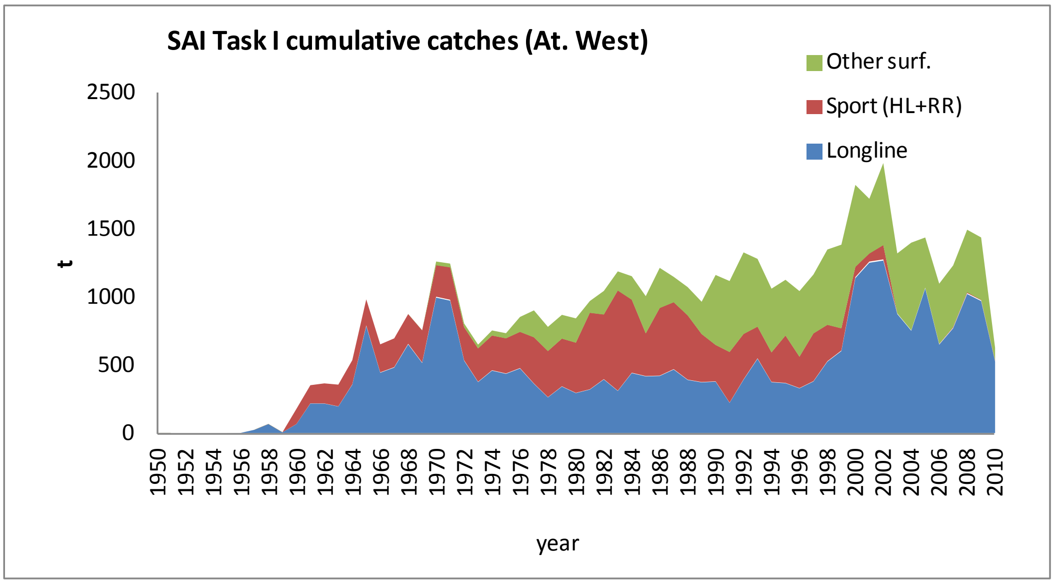


SAI-Figure 1. Geographic distribution of mean sailfish catch by major gears and by decade. The dark line denotes the separation between stocks. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

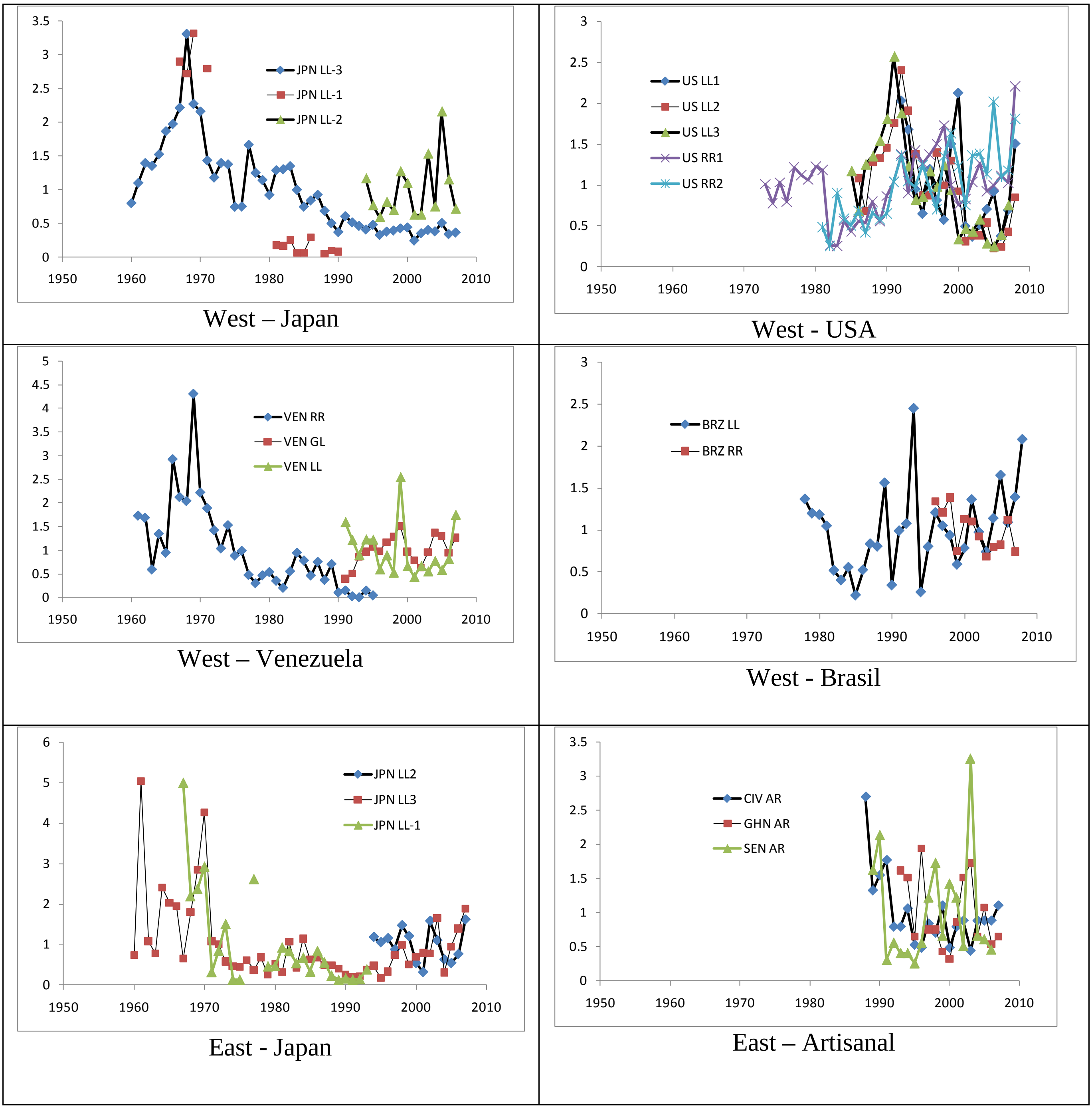


SAI-Figure 2. Conventional tag returns for Atlantic sailfish. Lines join the locations of release and recapture.





SAI-Figure 3. Task I catches of sailfish for each of the two Atlantic stocks, East and West.



SAI-Figure 4. Relative abundance indices obtained by standardizing CPUE data for various fleets. All indices were scaled to the mean of each series prior to graphing.