NATIONAL MARINE FISHERIES SERVICE (NMFS) REPORT

NMFS Southwest Region will brief the Council on recent regulatory activities and the results of recent regional fishery management organization (RFMO) meetings. Agenda Item E.1.a, Attachment 1, the NMFS Highly Migratory Species Report, provides summary information on these topics, including the Kobe III Joint Tuna RFMO meeting held July 11-15, 2011; recommendations from this meeting are contained in Agenda Item E.1.a, Attachment 2. The Council will also be briefed on the September 6-9, 2011, Western and Central Pacific Fisheries Commission Northern Committee (NC) meeting (NC7). Agenda Item E.1.a, Attachment 3 is the Plenary Report from ISC11 (held in San Francisco, July 20-25, 2011). The International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) provides scientific advice and conservation recommendations to the NC.

NMFS Southwest Fisheries Science Center will present the results of the North Pacific albacore stock assessment adopted by the ISC at their Plenary meeting. Agenda Item E.2.a, Attachment 1, is the North Pacific albacore stock assessment report.

Council Task:

Discussion

Reference Materials:

1. Agenda Item E.1.a, Attachment 1: NMFS HMS Report.
2. Agenda Item E.1.a, Attachment 2: Kobe III Recommendations.
3. Agenda Item E.1.a, Attachment 3: Report of the Eleventh Meeting of the International Scientific Committee For Tuna and Tuna-Like Species in the North Pacific Ocean.
4. Agenda Item E.1.b, Attachment 1: Stock Assessment of Albacore Tuna In The North Pacific Ocean in 2011.

Agenda Order:

a. Regulatory Activities — Mark Helvey
b. Fisheries Science Center Activities — Russ Vetter
c. Reports and Comments of Advisory Bodies and Management Entities
d. Public Comment
e. Council Discussion

PFMC
08/23/11

DRAFT - NATIONAL MARINE FISHERIES SERVICE HIGHLY MIGRATORY SPECIES REPORT

REGULATORY ACTIVITY

Vessel Identification Final Rule

NMFS is revising vessel marking requirements for commercial fishing vessels that fish for HMS off, or land HMS in the States of California, Oregon, and Washington. The rule will affect troll, pole and line, longline, and purse seine vessels, particularly if they operate in the Western and Central Pacific Fisheries Commission (WCPFC) Convention Area. The intent of the proposed action is to bring the existing vessel identification requirements at 50 CFR 660.704 [general HMS fisheries regulations under a fishery management plan] and 300.173 [regulations governing fishing under the U.S.-Canada Albacore Treaty] into conformity with the binding vessel identification requirements adopted by the WCPFC. The final rule is expected to publish in the Federal Register in September 2011 and the regulations will become effective on January 1, 2012, to allow time for the States of Oregon, Washington, and California to amend their regulations accordingly.

HMS FMP Amendment 2 Final Rule

The final rule implementing Amendment 2 to the HMS FMP is scheduled to be published in the Federal Register during the week of August 29, 2011. The rule will become effective 30 days after publication. The final rule will modify the suite of HMS FMP management unit species from the current 13 species to 11 species. The final rule also modifies the process for revising and seeking NMFS approval for numerical estimates of maximum sustainable yield and optimal yield, and to specify status determination criteria.

HMS FMP Swordfish Retention Limits Proposed Rule

The proposed rule to implement Deep-set Longline Swordfish Retention Limits under the HMS FMP will publish in the Federal Register early in September, 2011. The proposed rule would impose a trip limit of 10 swordfish when using J-hooks (tuna hooks) and 25 swordfish when using circle hooks. For trips carrying an observer there would be no retention limit in place regardless of hook type. The proposed rule would modify the current regulation which allows a maximum of 10 swordfish per trip when using authorized deep-set pelagic longline gear regardless of hook type or the presence of an observer on any given trip.

Deep-Set Buoy Fishery Research Project

The Saltonstall-Kennedy funded deep-set swordfish buoy research project, awarded to the Pfleger Institute of Environmental Research (PIER), has commenced in the Southern California Bight. Several swordfish have been captured and tagged to date. A more complete briefing will be made available at the November Council meeting once the project begins fishing in earnest.

Fish & Wildlife Service Proposes to End Southern Sea Otter Translocation Program

The U.S. Fish and Wildlife Service (Service) is proposing to end the 24-year-old southern sea otter translocation program in California following an in-depth evaluation that found that the program is not meeting its objectives for restoring the species. The Service is soliciting public comments, which may be submitted electronically, by U.S. mail, or hand delivery, on the proposed rule, associated Initial Regulatory Flexibility Analysis (IRFA), or Revised Draft SEIS. The SWRO will be submitting comments on the proposal to end the translocation program.

The Service has scheduled public meetings in early October: one in Santa Barbara and one in Santa Cruz. The public meetings are for interested parties to verbally express comments or to submit written comments on the proposed rule, associated IRFA, or the Revised Draft SEIS.

More information on submitting public comment, the dates and location of the public meetings, the Southern Sea Otter Supplemental Environmental Impact Statement, Background information and a Questions and Answers section can be found here: http://www.fws.gov/cno/press/release.cfm?rid=253_

UPCOMING MEETINGS IN 2011

September 28-October 4, Pohnpei, Federated States of Micronesia. Meeting of the WCPFC Technical and Compliance Committee.

October 24-25, La Jolla, CA. Meeting of the Parties to the Agreement on the International Dolphin Conservation Program (AIDCP).

October 26-27, La Jolla, CA. Meeting of the IATTC Permanent Working Group on Capacity.

December 5-9, Koror, Palau. Annual meeting of the WCPFC.

RECENT MEETINGS

Inter-American Tropical Tuna Commission (IATTC)

The IATTC convened in La Jolla, California, from July 4-8, 2011, to discuss conservation and management measures for tuna and tuna-like species in the IATTC Convention Area (i.e., the area bounded by the coast of the Americas, 150° W. longitude, and the 50° N. and S. latitudinal parallels). Many issues were considered but not adopted as resolutions, including but not limited to, conservation and management of Pacific bluefin tuna, fish aggregating device (FAD) management, port state measures, and catch documentation schemes. The following resolutions were adopted by the IATTC in 2011:

Resolution C-11-01 - Resolution on a Multiannual Program for the Conservation of Tuna in the Eastern Pacific Ocean in2011-2013

This measure is very similar to IATTC Resolution C-09-01 which was adopted at the 2009 IATTC meeting. The measure is applicable to purse seine vessels class sizes 4-6 (182 metric tons and greater well volume carrying capacity) and longline vessels greater than 24 meters in length that fish for yellowfin, bigeye, and skipjack tunas in the EPO. The resolution consists of, among other things, a purse seine closure period in the IATTC Convention Area for 62 days from 2011-2013, a time/area closure for purse seine vessels on the high seas to the west of the Galapagos

Islands, a bigeye tuna quota for longline vessels, and a tuna retention program in the purse seine fishery.

Resolution C-11-02 – Resolution to Mitigate the Impact on Seabirds of Fishing for Species Covered by the IATTC

This measure is very similar to the seabird measure adopted by the WCPFC in 2007 (CMM-2007-04). The IATTC measure is applicable to longline vessels greater than 20 meters in length that use hydraulic, mechanical, or electrical systems and fish for species covered by the IATTC in the EPO north of 23°N (except in Mexican national waters) and south of 30°S, plus the area bounded by the coastline at 2°N, west to 2°N-95°W, south to 15°S-95°W, east to 15°S-85°W, and south to 30°S. Applicable vessels must use at least two mitigation measures listed in the table provided in the measure. The current U.S. requirements for seabird mitigation in the longline fisheries operating in the Pacific Ocean satisfy these provisions. There are also other provisions in the measure pertaining to data collection and reporting.

Recommendation C-11-03 – Resolution Prohibiting Fishing on Data Buoys

This measure is different from the measure adopted by the WCPFC in 2009 (CMM-2009-05). This measure, among other things, prohibits all fishing vessels from interacting with data buoys in the IATTC Convention Area and prohibits longline and purse seine fishing vessels from deploying fishing gear within one nautical mile of an anchored data buoy in the IATTC Convention Area. Interactions include, but are not limited to, encircling the buoy with fishing gear, tying up to or attaching the vessel, fishing gear, or any part or portion of the vessel, to a data buoy, or cutting its anchor line.

Resolution C-11-07 – Resolution on the Process for Improved Compliance of Resolutions Adopted by the Commission

This measure establishes a process for improved compliance of resolutions adopted by the IATTC. The measure establishes procedures for improving compliance, including requiring each member to fill out an annual questionnaire regarding compliance with each IATTC resolution, and establishing procedures and timelines for submitting information for consideration in compliance cases. The questionnaire and all supplemental materials will then be reviewed by the IATTC Implementation Committee and the IATTC plenary each year.

Resolution C-11-08 – Resolution on Scientific Observers for Longline Vessels

This measure requires that at least five percent of the fishing effort made by longline fishing vessels greater than 20 meters in length operating in the IATTC Convention Area carry a scientific observer. The measure goes into effect on January 1, 2013 and the results of the observer program will be reviewed in subsequent years to determine whether the five percent coverage rate should be increased.

Resolution C-11-10 – Resolution on the Conservation of Oceanic Whitetip Sharks Caught in Association with Fisheries in the Convention Area

This measure prohibits the retention, sale, landing, transshipment, storing, or offering for sale any part or whole carcass of oceanic whitetip sharks in the fisheries covered by the IATTC. The measure also requires vessels to promptly release unharmed, to the extent practicable, whitetip sharks when brought alongside the vessel.

Resolution C-11-11 – Resolution on the Creation of the Special Sustainable Development Fund for Fisheries for Highly Migratory Species to Strengthen the Institutional Capacity of Developing Countries

This measure establishes a development fund for capacity building, such as creating systems for the collection, processing, and analyzing of data and participation in meetings of the IATTC, in developing countries. An initial USD $50,000 contribution will go into the fund from the annual IATTC budget in 2013. The remainder of the resources of the fund will come from contributions obtained from Members of the IATTC or from national and international bodies or entities interested in strengthening the capacities of developing countries. Contributions may be declared for a specific use, consistent with the nature of the fund.

Resolution C-11-12 – Resolution on the Carrying Capacity of Peru

This measure grants Peru 5,000 cubic meters of additional purse seine carrying capacity per the footnote in Resolution C-02-03, to be utilized by vessels flying the Peruvian flag operating in the marine areas under the jurisdiction of Peru. This capacity cannot be transferred to other flags nor used for the chartering of vessels of other flags.

Other Resolutions and Decisions Adopted by the IATTC in 2011

The IATTC also adopted a resolution on the budget for 2012 (Resolution C-11-04), made several amendments to the Regional Vessel Register Resolution (now Resolution C-11-06), the List of Authorized Large-Scale Longline Vessels (now Resolution C-11-05), and the Transshipment Resolution (now Resolution C-11-09), and agreed to a Memorandum of Cooperation with the WCPFC for the cross endorsement of observers.

Meeting of the Five Tuna Regional Fishery Management Organizations (Kobe III)

A meeting of the five tuna RFMOs (the IATTC, Western and Central Pacific Fisheries Commission, International Commission for the Conservation of Atlantic Tunas, Indian Ocean Tuna Commission, and Commission for the Conservation of Southern Bluefin Tuna) met in La Jolla, California, July 12-14, 2011. The Kobe III participants discussed many cross-cutting issues among the tuna RFMOs and agreed to a suite of recommendations on science, management, and compliance and enforcement (see Document K3-REC-A; Agenda Item E.1.a, Attachment 2).

Thresher Shark Information Sharing Meeting

The meeting was organized in response to the decision by a local supermarket chain to discontinue the sale of all sharks, including federally-managed common thresher shark, (*Alopias vulpinus)*. That decision was fueled in part by a shark meat boycott campaign led by a conservation group. The boycott negatively impacted California fishermen who seasonally harvest thresher shark as well as seafood buyers who sell thresher shark to local retail customers, including the Henry's Farmers Market chain. The meeting was designed to provide a series of short informative presentations surrounding the underlying issues of the boycott and to provide an update on the status of the thresher shark stock and relevant conservation and management measures in place. The presentations fed into a round table discussion facilitated by Dr. Jerry Schubel, President of the Aquarium of the Pacific. The goal of the meeting was to reach a common understanding of the issues and perspectives under consideration and to identify solutions going forward that would satisfactorily address the needs of all involved.

Kobe III, July 2011	Document K3-REC-A

KOBE III RECOMMENDATIONS

I. Science

(1) Recognizing that the five tuna Regional Fisheries Management Organizations (tRFMOs) have different data confidentiality rules, and noting this might curb the exchange of data across tRFMOs, Kobe III participants recommended that tRFMO Secretariats cooperate to develop common data confidentiality rules and a draft protocol for data sharing. The protocol will specify the types of data to be shared, how it can be used, and who can have access to it.

(2) Emphasizing the potential of the Kobe II Strategy Matrix (K2SM) to communicate efficiently among all stakeholders and to assist in the decision-making process according to different levels of risk, but also recognizing that substantial uncertainties still remain in the assessments, Kobe III participants recommended that the Scientific Committees and Bodies of the tRFMOs develop research activities to better quantify the uncertainty and understand how this uncertainty is reflected in the risk assessment inherent in the K2SM.

(3) Recognizing that a Management Strategy Evaluation (MSE) process needs to be widely implemented in the tRFMOs in the line of implementing a precautionary approach for tuna fisheries management, it is recommended that a Joint MSE Technical Working Group be created and that this Joint Working Group work electronically, in the first instance, in order to minimize the cost of its work.

II. Management

Bycatch Working Group

(4) In accordance with the Terms of Reference for the Joint Technical Bycatch Working Group (JTBWG), which were adopted at the Kobe II Bycatch Workshop, Kobe III participants welcomed the report of the first meeting of the JTBWG and recommended that it be transmitted to each tRFMO for its consideration.

Capacity and Allocation

(5) Kobe III participants recommended that each tRFMO Secretariat annually measure existing capacity in tuna fisheries under its jurisdiction and monitor where that capacity is used and by whom. The results of this work should be referred to the respective Commission for its consideration.

(6) In order to assist in the analysis and appropriate management decision-making to reduce overfishing and overcapacity, Kobe III participants recommended that by 2013 each tRFMO establish a record of vessels, by gear type, actively fishing for stocks under its jurisdiction, and that all tRFMO Secretariats coordinate the establishment of a common vessel database linked, to the extent possible, to the existing consolidated list of active vessels, taking into account the requirements of each tRFMO for vessel registration.

(7) Kobe III participants recommend that developed fishing members freeze large-scale purse-seine capacity under their flag. Based on the status of the stocks, each tRFMO should consider a scheme for:

- Reduction of over capacity in a way that does not constrain the access to, development of, and benefit from sustainable tuna fisheries, including on the high seas, by developing coastal States, in particular small island developing States, territories, and States with small and vulnerable economies; and
- Transfer of capacity from developed fishing members to developing coastal fishing members within its area of competence where appropriate.

Decision-Making

(8) Kobe III participants recommended that the decision-making framework guidelines outlined in Annex XX be referred to the respecticve tRFMOs for consideration.

III. Compliance and Enforcement

(9) Kobe III participants noted their appreciation for the work already conducted by the tRFMO Secretariats on the development of a consolidated list of authorized vessels, including the implimentation of unique vessels identifier (UVIs), and recommended that they continue these efforts. Furthermore, the participants recommended that these efforts be coordinated with the Food and Agriculture Organization of United Nation's (FAO) effort to develop and impliment a global record of fishing vessels, refrigerated transport vessels, and supply vessels.

(10) Kobe III participants recommended that tRFMOs cooperate to harmonize illegal, unregulated and unreported (IUU) vessel listing criteria, processes, and procedures, to the maximum extent possible, and move towards adopting principles, criteria, and procedures for cross-listing IUU vessels that are listed on the IUU list of other tRFMOs, taking into account the principles in Annex XX.

(11) Kobe III participants recommended that the tRFMOs establish a common format for assessing compliance with data reporting requirements. Furthermore, to facilitate compliance, participants recommended that all tRFMOs streamline and harmonize their reporting formats, procedures, and timing.

(12) Kobe III participants, reaffirming the recommendations regarding port state measures and catch document schemes (CDS), recommended that tRFMOs, developed States, and NGOs accelerate efforts to provide capacity building assistance through various means, including workshops, to implement CDS, port state measures, and data collection and to participate in the scientific work.

IV. Future of Kobe Process

(13) To support the ongoing importance of meeting the core objective of the Kobe process to harmonize approaches and actions of the five tRFMOs, a Steering Committee will be established, comprised of the Chairs and Vice Chairs of each of the five tRFMOs, supported by the five Executive Directors/Secretaries of those same tRFMOs.

(14) The Steering Committee's mandate will be to review and report to the five tRFMOs, on a regular basis as determined by the Steering Committee, on the implementation of the recommendations agreed to during the Kobe process, including those adopted at Kobe III. The first meeting of the Steering Committee will take place during the FAO Committee on Fisheries (COFI) meeting in Rome, July 2012, and the work of the Steering Committee will be guided by the principle of transparency.

(15) Beginning from the adoption of this recommendation at Kobe III, the Secretariat of each of the five tRFMOs will propose that the agenda of their respective annual meetings include a specific item on the Kobe process, to be introduced and led by the Commission Chair, and focused on a review by the tRFMO members of the Kobe process recommendations requiring action by that tRFMO.

(16) Tuna RFMO members should provide input to the Steering Committee through the Chair(s) of their respective RFMO(s) and during the annual review at the RFMO meeting(s).

Agenda Item E.1.a
Attachment 3
September 2011

REPORT OF THE ELEVENTH MEETING OF THE INTERNATIONAL SCIENTIFIC COMMITTEE FOR TUNA AND TUNA-LIKE SPECIES IN THE NORTH PACIFIC OCEAN

PLENARY SESSION

20-25 July 2011
San Francisco, California
U.S.A

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PLENARY SESSION

20-25 July 2011
San Francisco, CA
U.S.A.

Highlights of the ISC10 Plenary Meeting

The 11th ISC Plenary, held in San Francisco from 20-25 July 2011 was attended by members from Canada, Chinese Taipei, Japan, Korea, Mexico and the United States. The Plenary reviewed results and conclusions, which were based on new data and updated analyses, of the albacore tuna, billfish and Pacific bluefin tuna working groups. The Plenary endorsed the findings that the albacore stock was not experiencing overfishing and that stock is likely not in an overfished condition. It further recommended that the fishing mortality rate on albacore tuna not be increased. Regarding Pacific bluefin tuna, striped marlin and North Pacific stocks of swordfish, the Plenary maintained the conservation advice of ISC10 with minor changes for clarification. The Plenary endorsed the work plan of the shark working group and the prioritized list of ISC shark species of interest, blue and shortfin mako sharks, were ranked high priority. A special seminar on Best Available Scientific Information was held – concepts from which ISC will incorporate into its Operations Manual. The ISC workplan for 2011-2012 includes completing a new stock assessment for striped marlin and Pacific bluefin tuna by ISC12, continuing preparation for a Pacific blue marlin stock assessment in 2012, preparations for an updated blue shark stock assessment in 2012/2013, implementing improved database and website management, and conducting a peer review of its structure. After three years serving as Vice Chairman of ISC, Michel Dreyfus stepped down. The Plenary elected Chi-Lu Sun to serve as Vice Chairman for 2011-2014. The next Plenary will be held in Japan in July 2012.

1 INTRODUCTION AND OPENING OF THE MEETING

1.1 Introduction

The ISC was established in 1995 through an intergovernmental agreement between Japan and the United States (USA). Since its establishment and first meeting in 1996, the ISC has undergone a number of changes to its charter and name (from the Interim Scientific Committee to the International Scientific Committee) and has adopted a number of guidelines for its operations. The two main goals of the ISC are (1) to enhance scientific research and cooperation for conservation and rational utilization of the species of tuna and tuna-like fishes which inhabit the North Pacific Ocean during a part or all of their life cycle; and (2) to establish the scientific groundwork for the conservation and rational utilization of these species in this region. The Committee is made up of voting Members from coastal states and fishing entities of the region as well as coastal states and fishing entities with vessels fishing for highly migratory species in the region, and non-voting members from relevant intergovernmental fishery and marine science organizations, recognized by all voting Members.

The ISC provides scientific advice on the stocks and fisheries of tuna and tuna-like species in the North Pacific Ocean to the Member governments and regional fisheries management organizations. Fishery data tabulated by ISC members and peer-reviewed by the species and statistics Working Groups form the basis for research conducted by the ISC. Although some data for the most recent years are incomplete and provisional, the total amount by ISC Members estimated from available data and information is in excess of 500,000 metric tons (t) annually and dominated by the tropical tuna species. In 2009 the catch of priority species monitored by the ISC was 79,413 t of North Pacific albacore tuna (ALB, *Thunnus alalunga*), 19,928 t of Pacific bluefin tuna (PBF, *T. Orientalis*), 13,930 t of swordfish (SWO, *Xiphias gladius*), and 2,254 t of striped marlin (MLS, *Kajikia audax*). The total estimated catch of these four species is 115,525 t, or an increase of approximately 1.1 % from the 2008 total estimate (estimated to be 100,835 t). Annual catches of priority stocks throughout their ranges are shown in Tables 1-4.

1.2 Opening of the Meeting

The Eleventh Plenary session of the ISC (ISC11) was convened in San Francisco, CA, US at 0900 on 20 July 2011 by the ISC Chairman, G. DiNardo. A role call confirmed the presence of delegates from Canada, Chinese Taipei, Japan, Korea, Mexico and the USA (*Annex* 1). Representatives of the Western and Central Pacific Fisheries Commission (WCPFC) attended as observers. ISC Members China, the Secretariat of the Pacific Community (SPC), the Fisheries and Agriculture Organization of the United Nations (FAO), and the North Pacific Marine Science Organization (PICES), as well as organizations with significant interest including the Inter-American Tropical Tuna Commission (IATTC), did not attend the Plenary.

Dr. Samuel Pooley, Science Center Director, National Marine Fisheries Service, Pacific Islands Fisheries Science Center, delivered the opening address. He welcomed delegates to the Plenary session on behalf of the USA, Dr. Eric Schwaab, Assistant Administrator of National Marine Fisheries Service, and the USA delegation. He affirmed that the USA is committed to ensuring that the management of highly migratory species is based on the best scientific advice, and consistent with recent recommendations from the July 2011 Kobe 3 meeting in La Jolla, CA, USA. Dr. Pooley wished the delegates a successful and productive meeting.

2 ADOPTION OF AGENDA

The proposed agenda for the session was considered and adopted with no changes (*Annex 2*). C. Dahl was assigned lead rapporteur duties. A list of meeting documents is contained in *Annex 3*.

3 DELEGATION REPORTS ON FISHERY MONITORING, DATA COLLECTION AND RESEARCH

The ISC Chairman noted that delegation reports were submitted by Canada, Chinese Taipei, Japan, Korea, Mexico, and the United States.

3.1 Canada

J. Holmes presented a summary of Category I, II, and III data from the Canadian North Pacific albacore troll fishery in 2010 (*ISC/11/PLENARY/08*). The Canadian fleet of 157 vessels operated primarily within the coastal waters of the United States and Canada and in adjacent high seas areas east of 150 °W. Preliminary estimates of North Pacific albacore tuna catch and effort in 2010 are 6,497 t and 7,532 vessel days (v-d), respectively. These figures represent 15% increases in catch and effort relative to 2009. Approximately 51% of the catch and 53% of the effort occurred in the US EEZ, well below the average for 2000-2009 of 79% and 78%, respectively. In contrast, 36% of the catch and 39% of the effort occurred in Canadian waters and 14% of the catch and 8% of the effort occurred in adjacent highseas waters; in both areas 2010 catch and effort were at least double the long-term (2000-2009) averages. Nominal CPUEs in the majority of 1° x 1° spatial blocks north of 48 °N and in offshore waters were above average in 2010, while CPUEs further south in the US EEZ were mostly below average relative to the 2000-2009 period.

Bycatch of other tuna or billfish species, sharks, sea turtles, and sea birds was negligible and they were released alive. In 2009 more than 4,000 skipjack tuna were reported as bycatch. An investigation concluded that these fish were small albacore that were misidentified as skipjack tuna and identification sheets for common tuna, tuna-like species, and pelagic sharks were developed and distributed to the Canadian fleet to prevent reoccurrence.

Thirty-four vessels recorded size frequency data in 2010 and turned in 9,772 fork length measurements, ranging in size from 51 cm (2.65 kg) to 90 cm (15.25 kg). Two modes are present in these data, 64-66 cm and 74-76 cm, corresponding to 2- and 3-yr old fish, respectively. The above average catch rates of North Pacific albacore tuna in northern waters during 2010 (see *ISC/11/PLENARY/11*, Figure 4), changed in the contribution of different areas to total catch, and the equal dominance of 2- and 3-year old fish in the catch (see *ISC/11/PLENARY/*11, Figure 6) point to a northward shift of the albacore population along the west coast of North America in 2010.

Discussion

Several delegations asked if there was information suggesting that the north and westward shift in fishery effort and catch in 2010 could be explained by environmental factors. While there was no definitive explanation it was suggested that a northward bulge in the frontal zone during July and August 2010, along which albacore aggregated, may have contributed to the shift. Canadian scientists are beginning to look at the influence of environmental factors on distribution and impacts on CPUE. It was also noted that fishermen recorded higher catches in cooler waters than in previous years; SSTs were 14-16°C in 2010 compared to 18-19°C in previous years. While many albacore troll vessels also participate in salmon fisheries, and 2010 was a record year for Frasier River salmon runs, the geographic shift in effort observed in the albacore troll fishery was probably not due to economic reasons or declining revenues in the salmon fisheries.

3.2 Chinese Taipei

The delegation report for Chinese Taipei was presented by Z.-Y. Chen (*ISC/11/PLENARY/09*). There are two principal tuna fisheries of Chinese Taipei operating in the North Pacific Ocean, namely tuna longline fisheries and distant water purse seine fisheries; other offshore and coastal fisheries include the harpoon, set net and gill net fisheries, and account for a small proportion of overall tuna and tuna-like species catch. The catches of longline and purse seine fisheries account for 99% of the total tuna and tuna-like species catches in the North Pacific Ocean by Chinese Taipei. Longline fisheries comprise the large-scale tuna longline (LTLL, vessels larger than 100 GRT) and small-scale tuna longline (STLL, vessels less than 100 GRT) fleets. The total catch of tunas and billfish (including swordfish, striped marlin, blue marlin, black marlin, and sailfish) for the longline fishery (both LTLL and STLL) in the North Pacific Ocean was 32,104 t in 2010. The number of active vessels operating in 2010 was 90 and 1,124 for LTLL and STLL respectively. The total Pacific Ocean (North and South combined) catch of tuna and tuna-like species in the 2010 purse seine fishery was 198,851 t caught by 34 vessels. The tuna and tuna-like species catch by other offshore and coastal fisheries was estimated at 1,872t (harpoon: 610 t, set net: 717 t, gill net: 545 t) in 2010.

For the LTLL fishery, Category I data sources include weekly catch reports and commercial data from individual fishing vessels. Categories II and III data are all compiled from logbook data. Fishermen are required to measure the length of the first 30 fish caught in each set. For the STLL fishery, Category I data sources include landings and auction records of local fish markets, reports of market states and monthly catch reports from individual fishing vessels. For the purse seine fishery, Category I and Category II data are obtained from logbooks.

In March 2010 a catch documentation scheme was established in Taiwan requiring small-scale longline fishermen to attach a tag and to take length and weight measurements of each PBF caught. Beginning in 2011 a new Pacific bluefin tuna sampling program was initiated. Length and weight measurements and otolith samples from Pacific bluefin tuna are collected at landing markets by OFDC samplers. Ovaries from Pacific bluefin tuna were also collected. All Pacific bluefin tuna caught in the small-scale longline fishery are measured for length and weight and otoliths are collected from approximately 20% of the fish.

An observer program has been conducted in the Pacific Ocean since 2002. In accordance with the government's policy in establishing an observer program and availability of budgets to support the increase of observers, the observed trips has gradually increased year by year. The number of observed trips was 25 in 2010.

To advance stock assessments of tuna and tuna-like species in the North Pacific Ocean, Chinese Taipei is conducting the following research:

1. Research on the catch at size/age and CPUE standardization of ALB.
2. Research on CPUE standardization of PBF.
3. Studies on CPUE standardization and stock assessment of SWO and blue marlin.
4. Studies on age and growth, reproduction of striped marlin.
5. Research on CPUE of bigeye tuna (BET) and yellowfin tuna (YFT).
6. Cooperative Billfish tagging program.
7. Estimation of historical catches and standardization of CPUEs for dominant sharks.
8. Estimation on the ratio between fins and body weight, and growth parameters for shark bycatch species in Pacific Ocean.

Discussion

A question was raised about the sharp decrease in PBF catch in the STLL fishery. It was noted that this fishery targets YFT with only seasonal targeting of PBF so no clear explanation can be derived. It was pointed out that a similar decline in PBF catch in Taiwan waters has also been observed. For this reason the question was deferred to the PBFWG.

Chinese Taipei elaborated on the geographic shift in fishing effort by the STLL fleet observed in 2010 (displayed in Figure 5, *ISC/11/PLENARY/09*), noting that some of these vessels used to operate in the south-eastern area waters. While the exact reason for the shift is unknown, there was a decrease in total fishing effort in 2010 which likely contributed to the observed shift. Most STLL vessels operate in the North Pacific and land catches in Taiwan ports.

The Chair of the ALBWG noted a discrepancy between catch in the LTLL reported in the National Report and the Working Group catch table. Chinese Taipei verified that the figures in the National Report are correct and should be added to the ALBWG catch tables. It was also noted that effort in this fishery declined in 2008 and 2009 due to high fuel prices but increased slightly in 2010.

Monitoring and management measures for the STLL fishery were discussed. The logbook recovery rate has increased to over 20% in recent years and vessels larger than 20 GRT must carry a vessel monitoring system (VMS). Some smaller vessels also carry a vessel data recorder but it is not mandatory. It was pointed out that the 25 observed LTLL trips in 2010 (Table 5, *ISC/11/PLENARY/09*) represent about 5.5% of the total number of fishing trips in that year.

Chinese Taipei described their PBF otolith collection program, established in 2011, which has a target coverage level of 20% of the total number of fish tagged in the CDS program; currently more than 170 samples have been taken.

3.3 Japan

H. Nakano presented the delegation report for Japan (*ISC/11/PLENARY/10*). Japanese tuna fisheries consist of the three major fisheries, longline, purse seine, and pole-and-line, as well as other miscellaneous fisheries including troll, drift net, and set net fisheries. The total landings of tunas (excluding skipjack) caught by Japanese fisheries in the North Pacific Ocean in 2009 was 115,482 t and 70,060 t in 2010, which was 61% of the 2009 catch. The total landings of billfish (swordfish and marlins) was 10,323 t in 2009 and 8,132 t in 2010, which was 78% of the 2009 catch. Skipjack tuna landings were 172,961 t in 2009 and 177,549 t in 2010, which represents a 3% increase compared to the 2009 catch.

The Fisheries Agency of Japan has been implementing domestic management actions directed at Pacific bluefin tuna which are consistent with announcements in May 2010 by the Ministry of Agriculture, Forestry and Fisheries (MAFF) on actions toward effective conservation and management for Pacific bluefin tuna, as well as conservation and management measures for Pacific bluefin tuna adopted by the Western and Central Pacific Fisheries Commission (WCPFC) in December 2010.

The nationwide port-sampling project for PBF has collected catch, effort, and size data at the major landing ports since the early 1990s. In addition, there are cooperative projects with prefectural fisheries, experimental stations and universities. Several cooperative studies are also ongoing with foreign countries for the same purpose.

Several research cruises were conducted in 2010: (1) Two research cruises in the Nansei islands (Okinawa) and the Sea of Japan were conducted in 2010 for ecological study of larval PBF; (2) one longline research cruise was conducted in October 2010 for SWO and blue shark in the Kuroshio frontal area mainly to investigate catch relating to environmental factors; (3) To explore safe and effective designs of tori-line in the north Pacific, three types of tori-line were compared in a research study. Other research includes tagging studies using conventional, archival, and popup tags for tuna and tuna-like species, including Pacific bluefin, bigeye, yellowfin, and skipjack tunas, as well as sharks, to investigate migration patterns, swimming behavior, population structure, fishing mortality, and life history parameters. In addition, a troll survey on age-0 PBF was conducted in Tosa Bay, Japan, to develop techniques for timely monitoring of recruitment. There also have been several studies of biological parameters of PBF such as reproduction, growth of age-0 fish, sex-specific growth curves, and the diet of young fish.

Following the mega-earthquake on March 11, 2011, a tsunami hit the east coast of Japan, destroying a number of major fishing ports including Kesen-numa, Ishi-nomaki, and Ofunato. Countless fishermen were killed and their boats and fishing gear were also damaged or lost. It is believed that more than 30,000 fishing boats were lost in the tsunami. Most of the set nets in that area, which frequently catch PBF from summer to autumn (approximately 25% of the annual catch by set net), were destroyed. In addition, fishing facilities and processing factories were also heavily damaged. The loss of vessels and gear, as well as damage to the infrastructure is having a significant negative impact on the tuna fisheries in the North Pacific Ocean. It is expected that fishing effort and catch in that area will remain low for years to come.

Discussion

There was discussion and clarification of the research programs described in the National Report. It was clarified that the 2,000 t catch limit for adult Pacific bluefin tuna caught in the purse seine fishery is based on the average recent years' catch in the Sea of Japan. In the Sea of Japan there is a Pacific bluefin tuna catch limit of 4,500 t for fish weighing less than 30 kg and a catch limit of 2,000 t for fish weighing more than 30 kg during the spawning season. It was noted that the SKJ catch has fallen in coastal waters in the western part of Japan, prompting tagging studies to investigate the phenomenon.

The effects of the 2011 earthquake and tsunami on future fishing effort were discussed. While many of the larger vessels were at sea and escaped damage, the loss of shoreside infrastructure and other factors have lead to the bankrupting of many fishing-related companies, which will likely result in a prolonged decline in fishing effort in the northeast region of Japan.

3.4 Korea

J. Lee presented the Korean delegation report (*ISC/11/PLENARY/11*). Two Korean fisheries, distant-water tuna longline and purse seine, engage in fishing for tuna and tuna-like species in the North Pacific Ocean. In the north and south, the number of active longline fishing vessels was 184 in 2002, 122 in 2007, 108 in 2008, 111 in 2009, and 122 in 2010, while the number of active purse seine fishing vessels was 39 in 1990, 28 in 2007, 28 in 2008, 27 in 2009, and 29 in 2010. The main target species of the longliners were bigeye, and yellowfin tunas, and for purse seiners skipjack and yellowfin tunas. The annual catches of bigeye tuna by longline has increased since the 1980s, ranging from 5,411 t in 1982 to 15,425 t in 1998. While the catch of yellowfin tuna by longline was steady at around 4,000 t since the mid 1970s, yellowfin tuna catch gradually decreased after a peak in 1995 at 7,107 t. The average longline catch of North Pacific albacore during the past 5 years was 169 t, and for billfishes in the 2000s catch was 1,633 t. The annual catch of skipjack tuna by purse seiners has steadily increased to reach the peak of 88,654 t in 2003, and then sharply decreased with large fluctuations in recent years. Yellowfin tuna catches by purse seiners showed a steady increase until 1993, but thereafter had a decreasing trend. The main fishing grounds of longliners was between 20^{o}N and 20^{o}S latitude and west of 150°W longitude, and purse seiners operated in the tropical area of the Western and Central Pacific between 10^{o}S and 10^{o}N latitude and between 140^{o}E and 160^{o}W longitude. The annual catch of Pacific bluefin tuna by the Korean domestic purse seiners after 1994 tended to increase with large annual fluctuations, peaking at 2,141 t in 2003. In contrast, the number of offshore purse seiners has gradually decreased to 25 in 2010. More data were collected in order to enhance information on Pacific bluefin tuna catch by domestic purse seiners, for example the number of boxes used in the auction of Pacific bluefin tuna, the actual weight of catch per box, the number of Pacific bluefin tuna by size, detailed data from daily sales slips, etc. Korea revised the purse seine historical Pacific bluefin tuna catch for 2005-2010. The fishing grounds for Pacific bluefin tuna in 2009 and 2010 were mainly around Jeju Island in the spring. The catch level of Pacific bluefin tuna by set net was below 1 t in 2010.

Discussion

The ALBWG Chair noted that North Pacific albacore catch statistics in Table 1 (*ISC/11/PLENARY/11*) for 2006-2009 differ from the ALBWG Report catch table. It was verified that the data in the National Report is the most accurate. It was noted that the apparent reduction in fishing effort in 2010 may be an artefact of the provisional nature of the data.

3.5 Mexico

M. Dreyfus presented the delegation report for Mexico (*ISC/11/PLENARY/12*). The Mexican purse seine fishery is the most important HMS fishery in Mexico. The major development in this fishery that affected catch was the implementation of the EEZ in the late 1970s. Most of the catch is yellowfin tuna, which in 2010 was 100,000 t out the total of 120,000 t of tunas caught in Mexican fisheries (yellowfin, bigeye, skipjack, Pacific bluefin tunas, and others). Onboard observers are required on all purse seiners greater than 363 tons carrying capacity. For smaller vessels (purse seiners and bait boats) monitoring is achieved through logbooks.

Most purse seine sets target yellowfin tuna associated with dolphins. Sets on free-swimming schools of tuna in coastal areas are second in importance; these include Pacific bluefin tuna sets in northern Baja California.

Pacific bluefin tuna started to become a main target for the Mexican fleet with the development of the tuna farming industry in northern Baja California. Catches in the EPO have a long history with record catches in the 1960s by the USA fleet, mainly in the present Mexican EEZ. Mexico had three record catches of PBF, 2004, 2006 and 2010, the latest being 7,745 t. Other catches of Pacific bluefin tuna as well as North Pacific albacore tuna involve the US sport fishery that fishes mainly in Mexican waters under permit. In commercial fisheries North Pacific albacore is considered an opportunistic catch by vessels targeting Pacific bluefin tuna and remains low.

There are 34 vessels located along the Baja California peninsula that catch swordfish; at present all except one vessel uses longline. Almost all of the catch is within the Mexican EEZ and most of the catch (61% of total catch in 2010) is blue shark; swordfish is secondary in importance (13% of the 2010 catch).

With the exception of swordfish, all billfishes are reserved for catch and release by the sport fishery (mainly in La Paz and Los Cabos, Baja California Sur, and Mazatlan, Sinaloa).

Discussion

There was discussion of the status of the tuna-dolphin fishery. The decline in exports to the USA due to the dolphin-safe issue has actually produced some benefits for Mexico. First, a healthy domestic market for tuna has developed. Second the establishment of the International Agreement for Dolphin Conservation Program (IADCP) has resulted in a decline in dolphin mortality related to tuna fisheries to insignificant levels.

3.6 United States

S. Pooley presented the delegation report for the USA (*ISC/11/PLENARY/13*). The two major US fisheries are of interest to the ISC – the Hawaii longline fishery and the albacore troll fishery – were stable in 2010. The longline fishery consists of 125 vessels targeting bigeye tuna (5,242 t in 2010) and swordfish (1,654 t in 2010) both with significant incidental catches of marlins and other pelagic species, and a significant bycatch of sharks. The albacore trolling fishery consists of 653 vessels with a catch primarily of North Pacific albacore tuna (10,130 t in 2010).

The longline fisheries in the US are regulated in terms of landings of some target species, such as bigeye tuna under the Western and Central Pacific Fisheries Convention, and in terms of bycatch of protected species such as loggerhead and leatherback turtles. The Hawaii longline fishery for swordfish has closed several times in the past ten years for exceeding its allowed take of turtles, while the Hawaii longline fishery for bigeye tuna west of 150° W longitude was closed in November 2010 for reaching the WCPFC imposed limit on bigeye tuna. In the latter case, some fishing effort moved to the east of 150° W longitude but some effort was lost and the fresh seafood markets were substantially disrupted. The US is in the midst of considering new regulations on these longline fisheries to reduce the likelihood of interactions with marine mammals, particularly false killer whales.

A variety of pelagic research projects were conducted in the past year which span pelagic research in the areas of fishery monitoring, abundance surveys, socio-economics, life history studies, oceanography, and bycatch mitigation. Most of the USA stock assessment research on pelagic species is conducted in conjunction with the ISC or the IATTC and is thus reported elsewhere. Over 50 manuscripts were published in the past year on studies related to ISC objectives, including studies on CPUE of shark species in the Hawaii longline fishery, North Pacific albacore tuna age and growth and population structure, striped marlin age and growth, and an effort to integrate studies of swordfish and leatherback sea turtles to inform management and conservation efforts, as well as cooperative studies with both the Japan and the USA albacore industry.

Discussion

The Chair of the ALBWG pointed out a discrepancy between the 2009 and 2010 catch data in the National Report and the ALBWG report. It was pointed out that the ALBWG catch table was finalized June 8, 2011 and the National Report catch table finalized the week of July 11, 2011, and that this difference in reporting dates likely attributed to the observed difference. The longline catch of North Pacific albacore in 2010 was 201 t as reported in the US National Report.

A discrepancy in the 2009 and 2010 Pacific bluefin tuna catch data was also identified. It was noted that Pacific bluefin tuna sport catch was updated at the PBFWG meeting, but the update was inadvertently omitted from the National Report. The updated values are 177 t (176 t recreational catch and 1 t "other") for 2009 and 117 t for 2010. Also, the US will not report sport catch estimates for skipjack, yellowfin, and bigeye tunas, as well as billfish, until the best data sources can be determined. It should also be noted that the catch table in the National Report combines some gears (e.g., sport and "other") that are disaggregated in the PBFWG report catch tables.

Responding to queries on bycatch regulations on the longline fishery in the US, it was noted that state and Federal restrictions on the landing and sale of sharks and shark fins and current regulations related to seabird mitigation on domestic longline vessels are currently in place.

4 REPORT OF THE ISC CHAIRMAN

G. DiNardo presented the ISC Chairman's report. The ISC had another busy year since the ISC Plenary met in Victoria, B.C., Canada in July 2010. The year was spent completing a benchmark assessment for North Pacific albacore tuna and working on preparations for new stock assessments for striped marlin and Pacific bluefin tuna in 2012. Preparatory work consisted of collecting fishery and biological data, compiling and analyzing data, testing of hypotheses and stock assessment model assumptions, and exploring new models or variations of standard models for use in the upcoming assessments. Progress was made with investigating striped marlin stock structure issues, compiling a catalogue and inventory of the ISC database, advancing development of the website, and database structure and administration. Three new Working Group Chairs were also elected, Jon Brodziak for Billfish, Suzanne Kohin for Shark, and Ren-fen Wu for Statistics. In addition, the framework for a peer review of the ISC function was developed, which is a requirement of the organization. Six intercessional workshops were held to facilitate collaboration among Member scientists in implementing ISC work plans and coordinating research on the stocks.

At the conclusion of this 11th meeting of the ISC, I will have completed my first year of service as Chairman. While the task on occasion is consuming, your support and patience is appreciated and acknowledged. Achieving the objectives stated in the charter and contributing relevant science-based information for shaping policies that allow for conservation, sustainable fisheries and healthy HMS stocks is paramount to the ISC. Continuation of this direction and especially maintaining relevance, however, will require continued vigilance to avoid diluting the scientific information and interpretation with fishery policy considerations and arguments. Furthermore, all aspects of the organization, especially the operating framework need to be reviewed from time to time and adjustments adopted to promote efficiency and effectiveness in the operations and continued relevance of ISC's advice.

I close this report by thanking all my colleagues who have worked on ISC tasks and who have provided the support to ISC and me in advancing the objectives and purpose of the organization. The service of Michel Dreyfus, Vice Chairman, for support and insightful advice is acknowledged. A special thanks and appreciation is owed to the Chairs of the Working Groups, namely Shui-Kai Chang, Jon Brodziak, John Holmes, Yukio Takeuchi, Ren-fen Wu , and Suzy Kohin, who provided unselfish leadership in guiding the work of the Working Groups. In addition, the leadership role of Hideki Nakano with respect to the Data Administrator and Webmaster is appreciated. The Chairman extends special thanks and appreciation to Chinese Taipei for hosting the ISC Shark Working Group Workshop in April 2011. Initially scheduled for March 2011 in Japan, the workshop was cancelled due to the devastating earthquake and tsunami on 11 March 2011. The Chairman reached out to Chinese Taipei as an alternate host, and without hesitation they graciously accepted. Finally, I acknowledge the professional assistance of Roszella (Rose) Sanford, Sarah Shoffler, and Lyn Wagatsuma for their dedicated service to ISC and for assistance in completing tasks assigned to the Chairman. In that capacity, they served as point of contact for the office of the Chairman, led in organizing the facilities for annual meetings, led in writing and assembling information required for agenda items of meetings and for responding to inquires, and served as advisors to me on aspects of ISC operations. Thanks to all of you for contributing to another successful year for ISC and for the support and service provided.

5 INTERACTION WITH REGIONAL ORGANIZATIONS

5.1 IATTC-ISC Memorandum of Cooperation (MOC)

In introducing this item, the ISC Chairman pointed out that the signed MOC between ISC and IATTC (*ISC/11/Plenary/02*) was circulated to all Members shortly after ISC10. The MOC provides a mechanism to allow IATTC to participate in all of the ISC meetings without having to apply for observer status on a case-by-case basis. Given the IATTC's important role in managing stocks in the North Pacific Ocean the MOC provides a framework for mutual cooperation. In particular the ISC and IATTC will:

- Encourage reciprocal consultations and regular contacts on matters of common interest regarding scientific research on highly migratory tuna and tuna-like fish resources.
- Regularly exchange meeting reports, information, project plans, documents, and publications regarding matters of common interest.
- Cooperate in research and assessment of stocks that occur in the north eastern Pacific Ocean during part or all of their life cycle, as appropriate.
- Routinely exchange fishery data (Category I, II, and III) from the north eastern Pacific Ocean, in accordance with the rules and procedures for data confidentiality adopted by each organization, to minimize duplicative data collection efforts and enhance fishery monitoring and stock assessment; and
- Strive to develop compatible data codes and data standards to facilitate data exchange, to the extent practicable.

It was noted that these collaborations routinely occur, particularly in the ISC species Working Groups.

5.2 PICES

5.2.1 Report from the Executive Secretary of PICES

S. Shoffler provided an oral summary of the PICES Report to ISC (*ISC/11/PLENARY/14*) on behalf of Dr. Alexander Bychkov, Executive Director of PICES.

PICES and ISC have very similar charters and have overlapping membership, making them natural partners. PICES has initiated a new science program called FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems). The purpose of this program is to understand how North Pacific ecosystems respond to climate changes and communicate this information to various constituencies. Multidisciplinary and large-scale activities of FUTURE meld well with ISC activities directed toward understanding the scientific basis for the conservation and management of tuna and tuna-like species, and both organizations would benefit from collaboration within this program. The PICES Rules of Procedure would allow ISC scientists to participate in PICES Technical Committees and subsidiary bodies as ex-officio members and PICES encourages this form of participation. PICES invited the ISC to send an observer to the 2011 Annual Meeting to address PICES on collaborative issues. In addition, Dr. Bychkov invited ISC to co-sponsor a session at the 2nd PICES/ICES/IOC Symposium on Effects of Climate Change on the World's Oceans scheduled for May 14-18, 2012 in Yeosu, Korea. Finally, Dr. Bychkov suggested ISC and PICES explore convening joint topic sessions at future PICES Annual Meetings.

5.2.2 Report of the 2010 PICES meeting

J. Lee reported on the proceedings of the nineteenth annual meeting of PICES (PICES-2010) convened from 22-31 October 2010 in Portland, USA. The theme for PICES-2010 was "North Pacific ecosystems today and challenges in understanding and forecasting change."

J. Lee attended the meeting as an observer on behalf of ISC and prepared a presentation on ISC activities for the meeting. Lee highlighted PICES research activities that might be of interest to ISC, including characterizing changes in oceanographic conditions and understanding causal mechanisms, development of environmental time series, and development of bioeconomic reference points.

Discussion

It was agreed that the ISC should participate in the 2012 PICES/ICES/IOC Symposium and the other forums described in the PICES Report. It was noted that the ecology and oceanography oriented initiatives of PICES would benefit understanding of the dynamics of tuna and tuna-like species stocks. The Chair will work with PICES to explore greater collaboration as outlined in their Report.

5.2.3 Invitation to 2011 PICES meeting

The ISC Chairman noted receipt of an invitation for ISC to participate in the annual meeting of PICES to be held in Khabarovsk, Russia in 14-23 October 2011. In response to the request, the ISC Chairman appointed C.-L. Sun to represent ISC at the 2011 PICES meeting. This nomination was accepted by the Plenary. Sun will attend and report any noteworthy information and opportunities for collaboration back to the Plenary at the ISC12 meeting.

5.3 WCPFC

T. Beeching presented a report on WCPFC activities. From a science perspective a priority is to update the current 5 year Strategic Research Plan, which expires this year, and an increased focus on shark issues will be reflected in the new plan. SPC is conducting stock assessments for yellowfin, bigeye, and skipjack tunas in the WCPO, as well as South Pacific Ocean albacore tuna, and it is anticipated that they will be completed by mid-July. The stock assessors will meet in Pohnpei in early August prior to the SC meeting to agree and finalise presentations to the SC, for approval and comments, and formulate advice for the Commission meeting in Palau in December.

The Commission is proceeding with a peer review of the bigeye tuna stock assessment, bigeye tuna being the only managed tuna species in the WCPFC region that is considered to be experiencing overfishing at this time. Reflecting concerns for the status of bigeye tuna, the West Pacific East Asia Oceanic Fisheries Management Project is delivering technical assistance in stock assessment and gathering of associated data for tuna fisheries in Indonesia, the Philippines, and Vietnam. The project ends in 2012.

In response to relatively high catches of juvenile yellowfin and bigeye tunas on FADs, the purse seine fishery on the permitted high seas areas, and in the EEZs of the WCPFC Convention area bounded by 20ºN and 20ºS latitude, shall be closed to fishing on FADs between 0000 (GMT/UTC) hours from 1 July to 30 September 2011. CMM 2008-01 provides that during this period, a vessel may only engage in fishing operations if the vessel carries an observer from the Regional Observer Programme on board to monitor that at no time does the vessel deploy or service any FAD or associated electronic devices or fish on schools in association with FADs. In December 2010 management and conservation measures were adopted for application to fishing vessels operating in the Eastern High Seas Pocket Special Management Area (SMA). Vessels are required to report fish on board when entering and leaving the SMA, and their movements are tracked with satellite technology.

WCPFC now has a formal agreement with IATTC to exchange data so both organizations will have Pacific-wide databases (http://www.wcpfc.int/node/2684).

GEOEYE (http://www.geoeye.com/CorpSite/) has conducted trials (at no cost to the Commission) for real time observer data entry at sea, with potential benefits including: 1) a panic button for observers, 2) real time data reporting, and c) transmission of GPS position (to enhance scientific data collection and observer safety). Noting that core data is currently verified ashore, a potential result of close-to-real time verification of data is a faster turnaround of observers and real time dialogue to correct observer reporting issues.

Discussion

The recent Center for Independent Experts (CIE) external review of the WCPFC yellowfin tuna assessment was discussed. Because it was a desktop review a number of problems emerged in relation to its timing and the provision of conservation advice. In sum, by the time the results of such a review are available the assessment results are already in use by managers. An interactive review would be superior but it would be costly.

Clarification was provided regarding the external review process for the North Pacific albacore stock assessment. It was pointed out that a table top review of the assessment will be conducted by the CIE shortly after ISC11. Staff at NOAA Fisheries, PIFSC, are working with the ALBWG Chair to develop Terms of Reference for the review.

6 REPORTS OF WORKING GROUPS AND REVIEW OF ASSIGNMENTS

6.1 Albacore

J. Holmes reported on the activities of the ALBWG over the past year (*ISC/11/ANNEX/04, ISC/11/ANNEX/09*). The ALBWG was tasked with completing a full assessment of the current status and future trends of ALB and developing recommendations for conservation. The Working Group met at a data preparation workshop, 11-19 October 2010 in La Jolla, California, USA, and for the stock assessment workshop, 28 May-11 June 2011 in Shimizu, Japan to achieve these objectives. The October 2010 meeting focused on completing fishery spatial/temporal definition work for the upcoming assessment; reviewed input data series (catch, size composition, CPUE) for consistency with the new fishery definitions and conflicts in primary data sources; explored the Stock Synthesis III (SS3) model to assess the impact and develop solutions to parameterization issues; and determined the role of the VPA model in the assessment. The stock assessment workshop developed the base-case model; conducted sensitivity analyses; and developed advice on stock status, future trends, and conservation measures as well as partially updated national fisheries data for 2010.

Accomplishments of the ALBWG over the past year include:

1. The Working Group completed the transition from an age-structured VPA to length-based SS3 assessment model;
2. Developed a consensus base-case assessment model for SS3, which includes new age and growth data;
3. Assessed the current status and future trends in the albacore stock and developed recommendations on status and conservation advice;
4. Updated national fishery statistics through 2010 for member countries attending the stock assessment workshop;
5. Decided to submit the assessment to external desktop review of the methodology, results, interpretation, and conservation advice; and
6. Developed and prioritized a list of research needs to improve future assessments.

The successful completion of this assessment is the result of substantial ongoing collaboration and cooperation among WG members to understand and develop solutions to problems as they arose during the model transition period. Simon Hoyle (SPC) and Alexandre Aires-da-Silva (IATTC) made important contributions to the assessment. The cooperation and hard work of all WG members ensured that the assessment was completed on-time.

The ALBWG brings forward the following issues to the ISC Plenary:

- The need to develop efficient protocols for the archiving of assessment models and datasets used in assessments, including what should be archived (base-case models, sensitivity runs, input data, biological data, etc.), the format in which files should be archived, where they are archived, etc.;
- How the need for external review of assessments can be accomplished; and
- The absence of data submissions directly from China, although ALB catches are minor.

Discussion

The difficulties caused by the lack of 2010 data submission by China were discussed. This is not only a problem for the completion of ALBWG tasks, but for other WGs as well. It was noted that the BILLWG resorted to obtaining catch data from the WCPFC because of the lack of data submission from China. The ISC Chair needs to work with China to encourage full participation in ISC activities, especially in relation to the provision of catch data.

There was discussion of peer review of ISC assessments. It is both expensive and time consuming so that, as noted earlier, the results lag behind the provision of conservation advice. This is a difficult issue and there are no clear solutions right now. However, if peer review results are only considered advisory, and are used to improve future stock assessments this timing problem becomes less of an issue.

The ISC Chairman thanked J. Holmes for his thorough presentation.

6.2 Pacific bluefin tuna

Y. Takeuchi, Chairman of the PBFWG, presented the summary of the activities of the group since ISC10 (*ISC/10/ANNEX/07*). The PBFWG met on 6-9 January 2011 in Shimizu, Japan. At this workshop, 13 working papers and seven oral presentations were made with the participation of 37 scientists from Chinese Taipei, Japan, Korea, USA, and the IATTC. The PBFWG reviewed fishery data for its stock assessment at this meeting. The PBFWG also tested new ideas for its stock assessment model, such as a new stock recruitment relationship and hybrid VPA-SS model.

The PBFWG also met 16 July 2011 in San Francisco, California to update the catch table. Korea revised their historical purse seine Pacific bluefin tuna catch from 2005 to 2010, which was supported by a working paper explaining the rationale for the revisions. The PBFWG reviewed the proposed revision and recognized that the working paper was useful so that it was registered as one of official working paper of January workshop. The USA updated and presented the estimated USA catches of Pacific bluefin tuna for 2009 and 2010 respectively. The USA recreational catches for 2009 and 2010 were estimated to be 176 and 117 mt respectively. Total USA commercial catches for 2009 and 2010 were estimated to be 415 and <1 mt respectively. USA catches of Pacific bluefin tuna in 2009 and 2010 are considered to be provisional. Japan also revised their purse seine catch time series since 2002 because of change to its logbook data. Japan also updated recent Pacific bluefin tuna catch of the other gears. Chinese Taipei and Mexico also presented their recent catch updates.

The PBFWG work plan for 2011 and 2012 was reviewed, including the schedule of the next full stock assessment. The WG plans to hold two workshops in January 2012 and May-June 2012. The objective of the first workshop is to finalize stock assessment input data. The second workshop will conduct a full stock assessment of the stock. The WG may also meet in July 2012 in conjunction with ISC12 Plenary if necessary.

Discussion

The ISC Chairman thanked Y. Takeuchi for his insightful presentation.

6.3 Billfish

J. Brodziak, Chairman of the BILLWG presented the Billfish Working Group report (*ISC/11/ANNEX/07*, *ISC/11/ANNEX/08*). The report provided current information on the status of WG assignments, recent work on billfish fishery and life history research, and the preparation and finalization of data for conducting the WCPO striped marlin stock assessment. The report also described the future work plan for the WG.

Activities of the January 2011 workshop in Honolulu, Hawaii, USA described in detail in Annex 7. The meeting included a review and update of billfish fishery data for the following member countries: Chinese Taipei, Korea, Japan, and the US. The WG also reviewed CPUE standardization analyses for striped marlin conducted by Chinese Taipei, the US, and Japan. The WG agreed to accept CPUE standardizations conducted by Chinese Taipei and the US for use in the WCPO striped marlin stock assessment. The WG also reviewed new research on MLS life history parameters. This included studies of the natural mortality rate (US), the growth rate and expected size at age (Chinese Taipei), the sexual maturity at age (Chinese Taipei), and the weight-specific fecundity (Chinese Taipei) of North Pacific striped marlin (MLS). Overall, the WG adopted the new research on life history parameters as the best available scientific information available for the WCPO striped marlin stock assessment.

The meeting was also attended by a representative of the SPC who provided valuable information on striped marlin catch data submitted to the WCPFC. This was a positive outcome and helped ensure that the WG would have access to the best available catch data of non-ISC countries for the WCPO striped marlin stock assessment.

The WG also considered some recent socioeconomic research on the estimation of the maximum economic yield reference level ofthe Japanese coastal longline fishery for swordfish and received a presentation on the IATTC efforts to assess the Eastern North Pacific striped marlin stock (east of 145° W longitude and north of 5° S latitude). The WG also planned a collaborative review of the IATTC assessment model.

The BILLWG held a meeting in May 2011 in Chinese Taipei. The activities of this meeting are described in detail in Annex 8. The work plan leading up to this meeting included the finalizing of working papers from the January 2011 meeting. The work plan also called for the submission of the late striped marlin data by 15 February 2011, the finalization of data tables for the WCPO striped marlin stock assessment by 28 February 2011, and the updating of the most recent striped marlin data by 15 May 2011. The WG members also continued to submit Category I Data for all billfish to the WG Chair.

The WG accomplishments from the May 2011 meeting included the acquisition of new data for billfishes. In particular, the WG was able to incorporate the non-ISC member countries catch data of striped marlin into the stock assessment data set. The WG also received some new biological information on striped marlin catches from China and updated information on UScatches of billfishes in North Pacific including striped marlin and swordfish. Some striped marlin stock assessment data that were expected to be ready for the May 2011 meeting were not provided on time. As a result, the deadline for the submission of standardized CPUE and quarterly catch and size composition data was rescheduled to be 30 June 2011.

The WG also conducted and reviewed several CPUE standardization analyses for Japanese striped marlin fisheries. These included standardizations for offshore and long-distance longline, coastal large-mesh drift net, high seas large-mesh drift net, and coastal longline fisheries.

The WG also considered some additional life history research for the WCPO striped marlin stock assessment. In particular, the WG reviewed a revised growth study and a natural mortality rate study that used the revised growth information. The WG also considered new research to estimate stock-recruitment steepness of North Pacific striped marlin based on reproductive ecology. The WG adopted the new life history research for use in the WCPO striped marlin stock assessment.

The WG received a presentation on the progress of a multinational Pacific billfish tagging program and reviewed a report on the ISC Billfish WG and IATTC collaboration on sensitivity analyses for the EPO striped marlin stock assessment.

The WG meeting was attended by a representative of the SPC. This representative provided valuable insights and helped the WG review the best available scientific information for the assessment of the WCPO striped marlin stock.

Following the May 2011 meeting, the WG continued work on the compilation of the striped marlin stock assessment data. All late stock assessment data and working papers were received by the WG Chairman by the 30 June 2011 deadline. As a result, the review and completion of the WCPO striped marlin stock assessment was rescheduled for December 2011.

The WG Chairman discussed the issue of data availability for BILLWG stock assessments. In particular, the following problems for recent ISC Billfish WG stock assessments were noted: (1) ISC member countries not providing catch data; (2) data provided late and after the agreed-upon deadline including catch, standardized CPUE, and size composition data; and (3) member countries not participating in WG meetings. It was emphasized that the lack of current data decreases the relevance of stock assessments.

The future work plan of the Billfish WG included two major tasks. These were:

1. Completion of the draft stock assessment of North Pacific WCPO striped marlin by December 2011 for review and adoption at ISC12
2. Preparation of data for the upcoming Pacific blue marlin stock assessment.

<u>Discussion</u>

The BILLWG Chair stressed the need to provide data in a timely fashion. The delay in the provision of data, which delayed completion of the current striped marlin stock assessment, negatively affects the ISC's credibility and relationship with scientific and management organizations. The USA noted that postponing any assessment affects domestic management requirements, as well.

The ISC Chairman thanked J. Brodziak for his comprehensive presentation.

6.4 Shark

S. Kohin, Chairperson of the Shark Working Group presented the SHARKWG report (*ISC/11/ANNEX/06*). At ISC10, the SHARKWG was formed to conduct stock assessments on species of interest as required, similar to the responsibilities of the other existing species WGs of the ISC. The SHARKWG will focus on monitoring shark fisheries particularly for blue, shortfin mako, bigeye thresher, pelagic thresher, silky, oceanic whitetip, hammerhead, and any other shark species for which stock assessments may be needed. The first meeting of the SHARKWG was held 19-21 April 2011 in Keelung, Taiwan. Highlights from the meeting include: (1) reviewing nine working group and ten background documents on shark fisheries and life history studies; (2) development of a work plan for assessing blue and shortfin makos in 2012 and 2013, respectively; and (3) election of Suzanne Kohin as SHARKWG Chair.

The work plan is presented in Annex 6, *Report of the Shark Working Group Workshop* and includes four topics of focus for future work: (1) Fisheries Statistics; (2) Biological Research; (3) Ecological Research; and (4) Shark Stock Assessments. With respect to shark stock assessments, the SHARKWG will first conduct a stock assessment on blue sharks in the North Pacific Ocean. The work will build upon data and modelling efforts from the last blue shark stock assessment in the North Pacific conducted collaboratively by US and Japan scientists, as well as other interested scientists (Kleiber et al., 2009). A data meeting is planned for November 30 - December 6, 2011, in Honolulu, HI USA and the SHARKWG Chair will soon put out a request for National Category I, II and III data for blue and shortfin mako sharks. It is expected that another intercessional meeting in mid-2012 and a final meeting near the end of 2012 will be needed to complete the blue shark assessment. Work on the other species of interest will be conducted collaboratively with other RFMO shark working groups or within the ISC SHARKWG as deemed necessary.

Discussion

It was noted that there is elevated concern among all RFMOs on the status of sharks so the proposed assessments are timely. While timely completion is important, the data need to be reviewed carefully because sharks are a bycatch species and the collection of pertinent data have been treated differently over time. Other organizations are planning to assess sharks so ISC needs to avoid duplication of effort, which was highlighted at the 2010 Shark Task Force meeting and subsequent discussion with SPC and IATTC staff.

In relation to the data issue, Mexico noted that historically their catch data grouped all shark species together, partly because they were caught in artisanal fisheries. Since 2007 there is a regulation requiring the report of catches by species. While this means recent data are more accurate, the shortcomings of historical data will have to be addressed. Given similar issues in other countries a practical comprise on the treatment of historical data will have to be found.

The ISC Chairman thanked S. Kohin for the insightful presentation.

6.5 Seminar

J. Brodziak presented a brief overview of the seminar on the use of the best available scientific information, held during a break in the Plenary on 22 July 2011 (*ISC/10/ANNEX/11*). The seminar covered four topic areas: 1) Information needs for stock assessments; 2) Best available scientific information; 3) Minimal components for a structured stock assessment; and 5) Best practices for management advice. The results of the seminar are captured in five tables included in Annex 11. In particular, Tables 4 and 5 provide guidance to ISC WGs on the components of stock assessment reports and executive summaries for such reports intended to crystallize information on stock status for consideration by managers.

Discussion

The overall objective of this exercise is to encourage a basic level of consistency across ISC documents so as to make them easier to review and be understood by fishery managers. It was clarified that the tables (specifically Tables 4 and 5) are for guidance and not meant to be prescriptive, for example by specifying particular methodologies that should be used. It was noted that the production of reports documenting fisheries exploiting fish stock of interest would be very useful (per Table 2, item 1). There was discussion of the process for incorporating the workshop results into the ISC Operations Manual. It was agreed that the intent of tables in Annex 11 will be incorporated into a revised draft of the ISC Operations Plan, which will be circulated as a formal recommendation for ISC Members to review. The goal is to adopt these additions to the Operations Plan at ISC12.

The topic of "best practices for management advice" (*Annex 11*, Section 4) was discussed at length in light of the ISC's mission to provide scientific information on which management advice may be based, but not making management recommendations per se. This directly relates to Table 5, which lists the proposed contents for stock assessment executive summaries. It was emphasized that ISC would not be making management recommendations in executive summaries; rather, the executive summary should clearly and concisely describe the status of the stock—the basic facts resulting from the stock assessment—for fishery managers to use when developing management proposals. It was agreed that in consultation with the WG Chairs the terminology describing this task would be modified to clarify that ISC's role is to provide scientific information in support of fishery management decision making. At the same time, it was emphasized that the executive summaries are a WG product and should summarize stock status in relation to biological reference points.

A separate issue raised in this discussion was the possibility that the ISC could in the future conduct management strategy evaluations. These exercises evaluate the effectiveness of management measures in light of science-based policy objectives. While dealing with management measures, such exercises would not place ISC in a policy-making role and should be undertaken.

The Chair thanked J. Brodziak for the thorough and insightful presentation.

7 STOCK STATUS AND CONSERVATION ADVICE

7.1 Albacore

J. Holmes presented the recently completed North Pacific albacore stock assessment (*ISC/11/ANNEX/09*). The assessment was completed in June 2011 using fishery data through 2009. The assessment was conducted using a seasonal, length-based, age-structured, forward-simulation population model developed within the Stock Synthesis modelling platform (Version 3.11b) and was based on the assumption that there is a single well-mixed stock of albacore in the north Pacific Ocean (base-case model). The model used quarterly catch-at-length data; 16 age-aggregated fisheries defined by gear, location, season, and catch units (weight or number); a new growth curve estimated within the model; and use of conditional age-at-length (otoliths) data not previously available.

Analyses were carried out to assess the sensitivity of the results to assumptions including data-weighting (both between data types and relative weightings of different sources within a data type), biology (stock-recruitment relationship, natural mortality, growth), and fishery selectivity patterns. Stochastic future projections of the stock were conducted to estimate the probability that future spawning stock biomass (SSB) will fall below the average of the ten historically lowest estimated SSBs (SSB-ATHL) in at least one year of a 25-yr (2010-2035) projection period. The base-case scenario for projections assumed average recruitment and constant F (at the current F level, $F_{2006\text{-}2008}$), but sensitivity of the results to alternative harvest scenarios (constant catch and constant $F_{2002\text{-}2004}$), two recruitment scenarios (high and low levels), and alternative structural assumptions (down-weighting of the length composition data, stock-recruitment relationship, growth) was investigated. Retrospective analyses were conducted to assess the level of bias and uncertainty in terminal year estimates of biomass, recruitment, and fishing mortality. A reference run of the VPA model configured as in the 2006 assessment, but with updated catch-at-age and age-aggregated CPUE indices, was conducted to compare important estimated quantities for model-related changes.

The base-case model estimated that SSB likely fluctuated between 300,000 and 500,000 mt between 1966 and 2009 and that recruitment averaged 48 million fish annually during this period (Figure 7-1C). The pattern of F-at-age showed fishing mortality increasing to its highest level on 3-yr old fish and then declining to a much lower and stable level in mature fish (Figure 7-2). Current F (geometric mean of 2006 to 2008, $F_{2006\text{-}2008}$) is lower than $F_{2002\text{-}2004}$ (current F in the 2006 assessment). Future SSB is expected to fluctuate around the historical median SSB (~400,000 t) assuming F remains constant at $F_{2006\text{-}2008}$ and average historical recruitment levels persist (Figure 7-3A). $F_{2006\text{-}2008}$ is approximately 30% below $F_{SSB\text{-}ATHL\ 50\%}$ and there is about a 1 % risk that future SSB will fall below the SSB-ATHL threshold in at least one year in the projection period assuming average historical recruitment and constant $F_{2006\text{-}2008}$, i.e., current F is well below the 50% probability level. However, if recruitment is about 25% lower than the historical average and F remains constant at $F_{2006\text{-}2008}$, then the risk of future SSB falling below the threshold by the end of the projection period increases to as high as 54%.

Sensitivity and retrospective analyses evaluated the impact of alternative assumptions on the assessment results. These analyses revealed scaling differences in estimated biomass (total and SSB) and, to a lesser extent, recruitment, but few differences in overall trends. Relative F-at-age patterns were not affected by different assumptions, except when the growth curve parameters from the 2006 assessment were used, and $F_{2006\text{-}2008}$ was consistently lower than $F_{2002\text{-}2004}$. Although there was considerable uncertainty in absolute estimates of biomass and fishing mortality, the estimated trends in both quantities were robust and advice based on F_{SSB} was not affected by this uncertainty. Terminal year estimates of biomass and recruitment show no bias, but there was a high level of uncertainty in the most recent recruitment estimates. Given these findings, the WG believes that the current parameterization of the base-case model is appropriate.

Both the SS3 base-case model and the VPA reference run estimated similar historical trends in SSB and recruitment, but with different scaling for biomass. The scaling difference was largely attributable to the different growth curves used in SS3 base-case model and the VPA reference run. A sensitivity run of the base-case model in which growth parameters were fixed to those used in the VPA, reduced the scaling of biomass to the level of the VPA reference run. Sensitivity analyses of future projections showed that stock status and conservation advice is relatively insensitive to these scaling differences (Figure 7-3B). The WG concluded that the growth curve used in the 2006 assessment was not representative of growth in North Pacific albacore. The WG also concluded the SS3 model will replace the VPA as the principal model in future North Pacific albacore assessments.

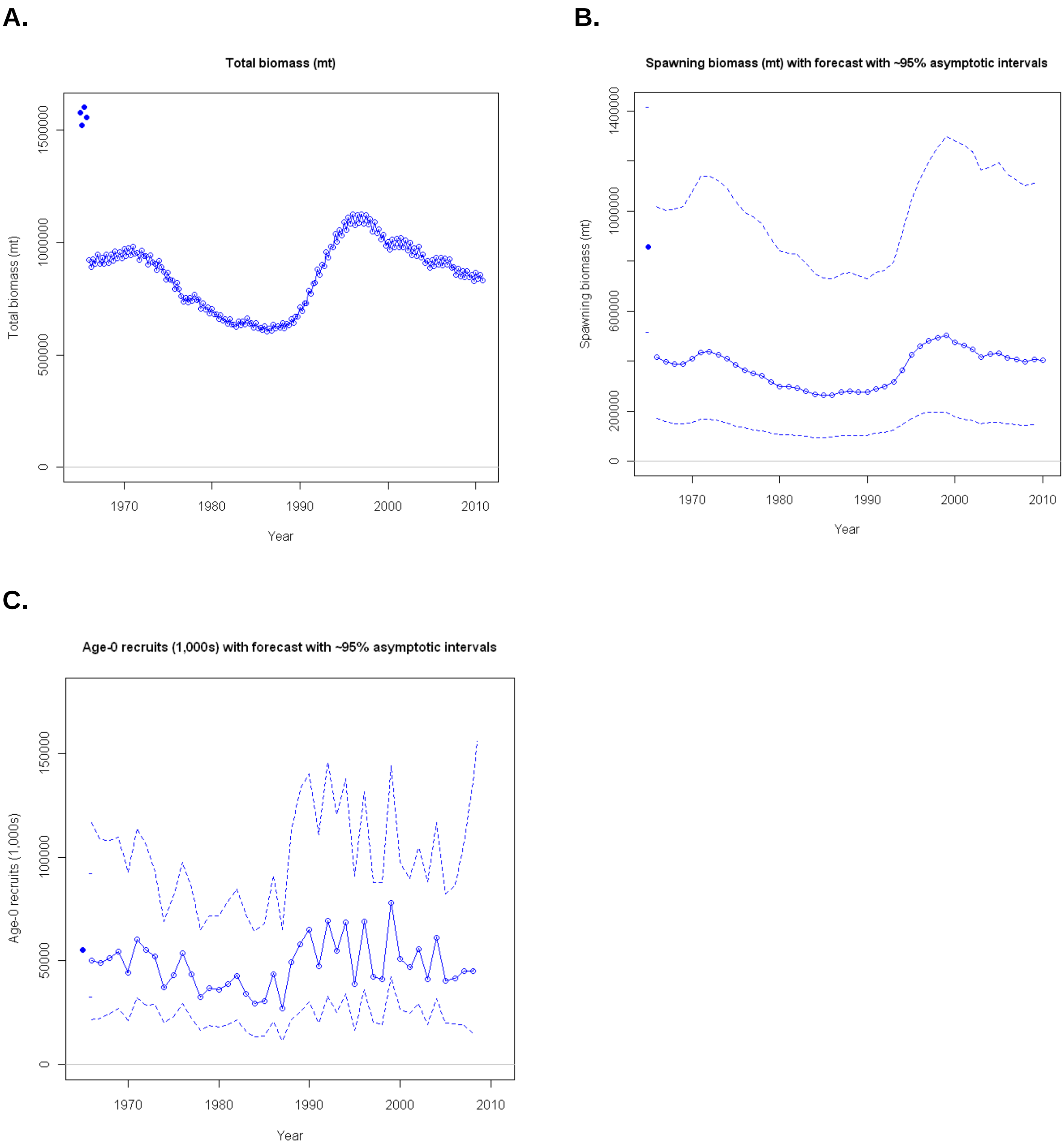

Figure 7-1. Estimated total biomass (A), spawning biomass (B), and age-0 recruitment (C) of albacore tuna in the north Pacific Ocean. The open circles represent the maximum likelihood estimates of each quantity and the dashed lines in the SSB (B) and recruitment (C) plots are the 95% asymptotic intervals of the estimates (± 2 standard deviations) in lognormal (SSB – B) and arithmetic (recruitment – C) space. Since the assessment model represents time on a quarterly basis, there are four estimates of total biomass for each year, but only one annual estimate of spawning biomass and recruitment.

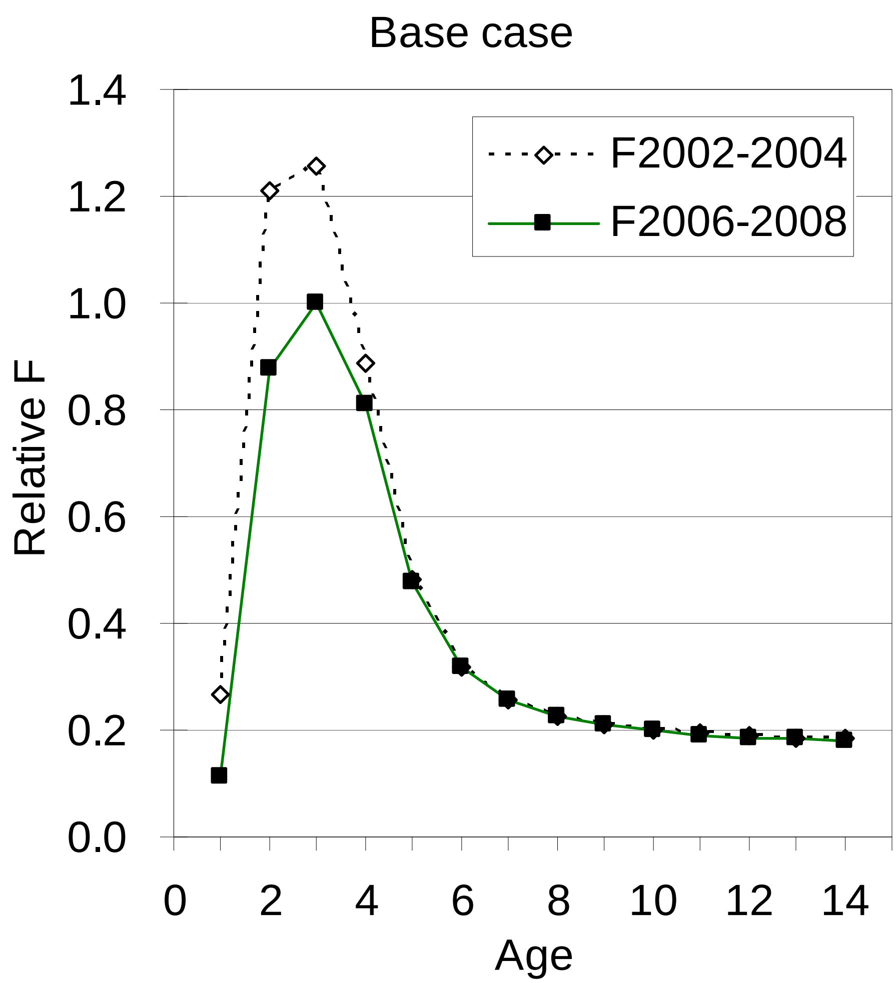

Figure 7-2. Estimated fishing mortality-at-age for the base-case scenario ($F_{2006\text{-}2008}$) and $F_{2002\text{-}2004}$ (current F in the 2006 assessment). Results are scaled to the highest F-at-age in the $F_{2006\text{-}2008}$ series at age-3 (0.16 yr^{-1}).

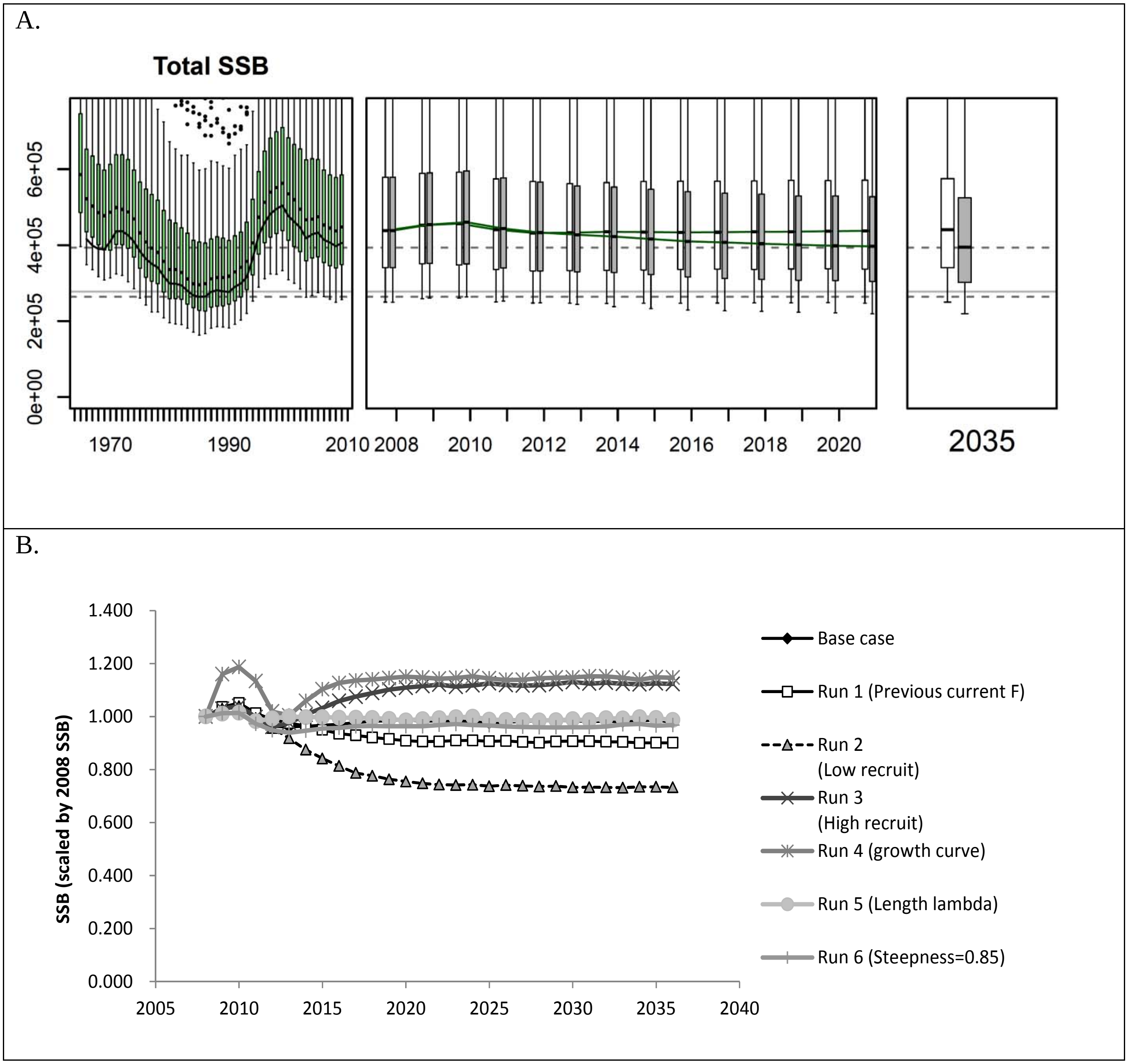

Figure 7-3. A. **- Past (left) and future (right) trajectories of SSB estimated with two harvesting scenarios, base-case ($F_{2006\text{-}2008}$) and $F_{2002\text{-}2004}$. The lines from the boxes represent 90% confidence intervals, and lower and upper end of boxes represent 25th and 75th percentiles. Open circles are extreme values.** B. **- Comparison of SSB trajectories of among 7 future projection runs testing harvesting and recruitment scenarios and assessing structural sensitivities. Results are scaled to SSB_{2008}, which is approximately the long-term median SSB during the modeled period, 1966-2009.**

Working Group Conclusions on Stock Status

Although there is uncertainty in the absolute estimates of biomass (total and SSB) and fishing mortality, the stock status and conservation advice based on the $F_{SSB\text{-}ATHL}$ reference point are relatively insensitive to these uncertainties as trends in SSB and recruitment are robust to the different plausible assumptions tested by the WG (Figure 7-3B). Estimates of $F_{2006\text{-}2008}$ (current F) expressed as a ratio relative to several potential F-based reference points (F_{MAX}, $F_{0.1}$, F_{MED}, $F_{20\text{-}50\%}$) are less than 1.0 (Table 7-1) and SSB is currently around the long-term median of the stock and is expected to fluctuate around the historical median SSB in the future assuming constant $F_{2006\text{-}2008}$ and average historical recruitment. The ratio $F_{2006\text{-}2008}/F_{SSB\text{-}ATHL}$ is 0.71, which means current F is well below the fishing mortality that would lead SSB to fall below the SSB-ATHL threshold. The WG concludes that overfishing is not occurring and that the stock likely is not in an overfished condition, (e.g., $F_{20\text{-}50\%}$ < 1.0), although biomass-based reference points have not been established for this stock.

Table 7-1. . Potential reference points and estimated F-ratio using Fcurrent ($F_{2006\text{-}2008}$), associated spawning biomass and equilibrium yield. $F_{SSB\text{-}ATHL}$ is not an equilibrium concept so SSB and yield are given as median levels.

Reference Point	$F_{2006\text{-}2008}/F_{RP}$	SSB (t)	Equilibrium Yield (t)
$F_{SSB\text{-}ATHL}$	0.71	346,382	101,426
F_{MAX}	0.14	11,186	185,913
$F_{0.1}$	0.29	107,130	170,334
F_{MED}	0.99	452,897	94,080
$F_{20\%}$	0.38	171,427	156,922
$F_{30\%}$	0.52	257,140	138,248
$F_{40\%}$	0.68	342,854	119,094
$F_{50\%}$	0.91	428,567	99,643

Working Group Recommendation on Conservation Advice

The North Pacific albacore stock is considered to be healthy at the average historical recruitment and current fishing mortality ($F_{2006\text{-}2008}$). The sustainability of the stock is not threatened by overfishing as current $F_{2006\text{-}2008}$ is about 71% of $F_{SSB\text{-}ATHL}$ and the stock is expected to fluctuate around the long-term median SSB (~400,000 t) in the short- and long-term future. However, recruitment is a key driver of the dynamics in this stock and a more pessimistic recruitment scenario (25% below average historical recruitment) increases the probability that the stock will not achieve the management objective of remaining above SSB-ATHL threshold in the 25-year projection period to 54%. The impact of $F_{2006\text{-}2008}$ on the stock is unlikely to be sustainable with this lower recruitment. Therefore, the WG recommends maintaining the present management measure (no increase in effort beyond “current” levels (2002-2004).

Discussion

There was a discussion of the reasons for the difference between the previous (2006) assessment, which used a VPA approach, and the current (2011) assessment. Key factors are the replacement of the Suda growth curve, which the WG concluded was not representative of growth in this stock, with a relationship generated by the model based on fishery size composition data and otolith derived conditional age-at-length estimates; and the VPA reference run aggregated fisheries into fewer categories than used in the 2006 assessment. An additional concern is that the use of h=1 in the stock-recruit relationship is implausible. Improving the estimate is a subject for future work.

There was a discussion of the selectivity curves used for various fisheries. It was noted that the size composition of the Chinese Taipei longline fishery was made up mostly of smaller fish (a dome shaped selectivity pattern rather than logistic as assumed in the 2006 assessment).

The ALBWG Chair pointed out that the albacore assessment will be presented at WCPFC-SC7 by Dr. S. Teo. The presentation is being done as a courtesy and does not constitute a review. An independent review of the assessment is scheduled to occur in late 2011 using the CIE process.

Stock Status and Conservation Advice

Concern was raised that the last point in the ALBWG's list of proposed conservation recommendations strayed too closely into management advice, which is not in the competence of ISC, rather than being strictly science-based conservation advice. It was noted that $F_{2006\text{-}2008}$ is significantly below $F_{2002\text{-}2004}$. The ISC accepts the WG recommendation with a modification to bullet 5 as shown below:

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

Research Needs

The ALBWG identified the following research priorities:

1. Age and growth modelling – need sampling of small (<60 cm) and large fish (>120 cm) to advance growth modelling

2. Spatial Pattern Analyses – movement patterns; spatial size patterns to support appropriate selectivity pattern choices
3. CPUE Analyses – investigate discrepancies among indices
4. Maturity – develop length-based maturity schedule
5. Data Issues – size comp anomalies, socio-economic factors affecting fisheries, national sampling programs
6. Model Improvements – weighting of info sources, stock-recruitment relationship, explicit spatial structure, environmental covariates

All of these are considered of high priority but the WG Chair stressed that not all of these projects can be completed in time to be incorporated in the next stock assessment. The discussion in the WG Report includes a prioritization and an indication of which projects will be completed for the next assessment. This represents a *de facto* work plan.

It was noted that the forward projection to estimate the probability of exceeding SSB-ATHL over the next 25 years assumes constant recruitment while historical data show that recruitment for this stock is quite variable. For this reason, developing a better understanding of environmental factors affecting recruitment should also be a research topic. The ISC Chairman noted this would be a fruitful topic for PICES collaboration.

7.2 Pacific Bluefin Tuna

Y. Takeuchi summarized the recent stock assessment work of the PBFWG on Pacific bluefin tuna stock status (*ISC/11/ANNEX/07*). Since ISC10, there was no new stock assessment. The latest stock assessment was conducted in July 2010 (2010 Update). The current conservation advice was adopted at ISC10 based on the 2010 Update.

A summary of latest stock assessment (2010 update) is as follows

1. A number of sensitivity runs were conducted in 2010 to investigate uncertainties in biological assumptions and fishery data. Results indicate that the assumption of adult M is particularly influential on the estimate of absolute spawning biomass and fishing mortality. Although absolute estimates from the stock assessment model were sensitive to different assumptions of M, relative measures were less sensitive.
2. The estimate of spawning biomass in 2008 (at the end of the 2007 fishing year) declined from 2006 and is estimated to be in the range of the 40-60th percentile of the historically observed spawning biomasses.
3. Average Fishing Mortality 2004-2006 ($F_{2004\text{-}2006}$) increased from $F_{2002\text{-}2004}$ by 6% for age-0, approximately 30% for ages 1-4, and 6% for ages 5+.
4. Thirty-year projections predict that at $F_{2004\text{-}2006}$ median spawning biomass is likely to decline to levels around the 25th percentile of historical spawning biomass with approximately 5% of the projections declining to or below the lowest previously observed spawning biomass. At $F_{2002\text{-}2004}$ median spawning biomass is likely to decline in subsequent years but recover to levels near the median of the historically observed levels. In contrast to $F_{2004\text{-}2006}$, $F_{2002\text{-}2004}$ had no projections (0%) declining to the lowest observed spawning biomass. In both projections long-term average yield is expected to be lower than recent levels.

Because no new stock assessment was conducted after ISC10 and also because the next full stock assessment is scheduled in 2012, the PBFWG recommended maintaining the ISC10 conservation advice until ISC12 with necessary editorial changes.

Discussion

The challenge presented by the PBFWG's commitment to use data through June 2011 for the 2012 assessment was noted.

Conservation Advice

ISC11 agreed to maintain the conservation advice from ISC10:

> **Given the conclusions of the July 2010 PBFWG workshop (*ISC/10/ANNEX/07*), the current (2004 -2006) level of F relative to potential biological reference points, and the increasing trend of F, it is important that the level of F is decreased below the 2002-2004 levels, particularly on juvenile age classes.**

7.3 Striped Marlin

J. Brodziak presented the status of striped marlin stocks in the North Pacific and associated conservation advice (*ISC/11/ANNEX/08*). Since there is no new assessment for this species the WG recommends that the stock status and conservation advice from ISC10 be adopted for ISC11. A draft North Pacific striped marlin stock assessment is scheduled to be completed in late 2011and reviewed at ISC12 at which time stock status and conservation advice will be provided.

Discussion

It was reiterated that the striped marlin assessment remains in draft form until review and adoption at ISC12.

Conservation Advice

After reviewing the conservation advice recommended at ISC10 the Plenary adopted modifications to the ISC10 advice to increase clarity, and agreed to the following:

> **A striped marlin stock assessment is scheduled for completion in 2012. Until this time the fishing mortality rate should not be increased above the current reference years (2001-2003) as specified in the latest assessment.**

7.4 Swordfish

J. Brodziak presented the status of the Western and Central North Pacific (WCPO) and Eastern North Pacific (EPO) swordfish stocks as estimated in the 2009 stock assessment and the 2010 stock assessment update. The exploitable biomass of the WCPO stock was estimated to be about 75,000 mt in 2006, roughly 30% above BMSY. The exploitation rate on the WCPO stock in 2006 was estimated to be 14% with a total catch of roughly 9,900 mt or roughly 69% of MSY (MSY=14,400 mt). There was very high probability that B_{2006} was above B_{MSY}, a 93% chance, and there was a 0% chance that the exploitation rate in 2006 exceeded the rate to produce MSY. Stochastic projections of stock status at the recent average fishing mortality rate indicated that the WCPO stock would be projected to be above B_{MSY} in 2010.

Based on the 2010 stock assessment update results for the EPO stock only, the exploitable biomass of the EPO stock was estimated to be about 69,000 t in 2006, over 200% above B_{MSY}. Exploitation rate on the EPO stock in 2006 was estimated to be 6% with a total catch of roughly 3,900 t or roughly 78% of MSY (MSY=5,000 t). There was very high probability that B_{2006} was above B_{MSY}, a 99% chance, and there was a 2% chance that the exploitation rate in 2006 exceeded the rate to produce MSY. Stochastic projections of stock status at the recent average fishing mortality rate indicated that the EPO stock would be projected to be above B_{MSY} in 2010.

Given the projection information, the relative magnitude of recent reported catches (*ISC/11/ANNEX/08*), and the probable decline in WCPO swordfish harvest by Japan, the WG recommends that the conservation advice for swordfish from ISC10 be adopted for ISC11.

Discussion

The involvement of IATTC in the assessment process was discussed and it was pointed out that scientists from IATTC were fully engaged in the swordfish stock assessment process.

Conservation Advice

The conservation advice adopted at ISC10 was reviewed. It was agreed that the advice from ISC10 be adopted for ISC 11.

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

8 REVIEW OF STOCK STATUS OF SECONDARY STOCKS

8.1 Eastern Pacific – Yellowfin, Bigeye and Skipjack Tunas

M. Dreyfus presented summaries of stock status for yellowfin, bigeye, and skipjack tunas in the EPO. The EPO fishery for yellowfin, skipjack, and bigeye tunas is dominated by the purse seine fleets that achieved a maximum fleet capacity in 2007, decreasing slightly afterward. In contrast, the longline fishery has seen decreasing effort (in number of hooks) from a record level in 2002. The most important species component of catch in the EPO in weight is yellowfin and skipjack tunas. For yellowfin tuna, sets associated with dolphins produce the highest catch. For bigeye tuna, the FAD fishery has eclipsed longline as the main gear in terms of catch since 1994. For skipjack tuna both floating objects and unassociated sets in the purse seine fishery account for the majority of the catch.

EPO catches for yellowfin tuna in 2010 in the EPO increased from the average in 2005-2009 (205,000 t) to 251,000 t for purse seiners, and at the same time, skipjack tuna catches decreased to 147,000 t and bigeye tuna to 58,000 t. The total number of purse seine sets is between 25 to 30 thousand in recent years.

IATTC recruitment estimates indicate that yellowfin tuna had a period of high recruitment from 1984 to 2002 and after that, recruitment may have declined to a average levels since 1975. SSB is below the level to obtain MSY and fishing mortality is also below F_{MSY}. Projections assuming the current F indicate that SSB will increase.

Recent recruitment estimates for bigeye tuna are above average, SSB is above SSB_{MSY}, and fishing mortality is also above F_{MSY}. While current F projections into the future show a decrease in SSB levels, the decrease is attenuated by the recent above average recruitment. The highest impact to the resource is produced by the floating object fishery.

The skipjack assessment is based on relative reference points; although several of those variables are at high levels there is no concern for this stock at present.

Discussion

The ISC Chairman thanked M. Dreyfus for the presentation.

8.2 Western and Central Pacific Ocean –Bigeye and Skipjack Tunas

H. Nakano on behalf of N. Miyabe, Chairman of the WCPFC Science Committee (SC) Chairman, presented summaries of tuna stock status in the WCPO based on the 2010 tuna stock assessments for bigeye and skipjack tunas in the WCPO. No assessments for other species were conducted in 2010. The WCPFC relies on the SPC for conducting the stock assessments for these stocks.

Bigeye Tuna Stock Assessment

The 2009 bigeye tuna stock assessment was conducted using Multifan-CL and presented at WCPFC-SC6. This assessment was updated from the 2008 assessment. Stock status estimates for the base case model concluded that overfishing is occurring (with 100% probability), but the stock is not in an overfished state, and that fishing mortality has increased substantially since 2001-2004.

Based on these results, it was concluded by the WCPFC that current levels of catch are unlikely to be sustainable in the long term, even at the recent (high) levels of recruitment estimated for the last decade.

Skipjack Tuna Stock Assessment

The 2010 assessment of skipjack tuna in the WCPO relies on Multifan-CL as the modelling platform and is age (16 quarterly age-classes) and spatially structured. Catch, effort, size composition, and tagging data used in the model are grouped into 17 fisheries (a change from 24 fisheries used in the 2008 assessment) and quarterly time periods from 1952 through 2009. Overall, the main assessment results and conclusions are as follows.

As with other tropical tunas, estimates of natural mortality are strongly age-specific, with higher rates estimated for younger skipjack tuna.

Based on estimates from the base-case model and associated sensitivity grid, it was concluded by the WCPFC that overfishing of skipjack tuna is not occurring in the WCPO, nor is the stock in an overfished state.

Discussion

The content of the current conservation measure (CMM 2008-01) in relation to conservation of bigeye and yellowfin tunas was discussed. It was noted that under this measure longline fisheries are managed by catch limits while purse seine fisheries are principally managed by time-area closures and other effort-based methods, with the objective of reducing F by 30% for 2009-2011. This objective has not been met in part because of various exemptions included in the measure.

The current skipjack tuna assessment incorporated a CPUE index for northern fisheries, which contributed to the declining biomass estimate. This decline is consistent with the low skipjack tuna catches experienced by the Japanese pole-and-line fishery.

9 REVIEW OF STATISTICS AND DATA BASE ISSUES

9.1 STATWG Report

R. Wu reported on the STATWG meeting held 17-19 July 2011 in San Francisco, USA *(ISC/11/ANNEX/12)*. The issues discussed included: (1) Data inventory and metadata; (2) Review of data reporting protocol and member performance; (3) Review of data requirements for stock assessment and fishery monitoring; (4) Review of ISC data management functions and STATWG performance; (5) future work plan; and (6) Recommendations to the Plenary.

The Data Administrator (DA) compared annual catch tables in National Reports, Plenary Reports, and Species Working Group Reports, and identified discrepancies. WG Chairs agreed to address the discrepancies, and together with Member Data Correspondents, assist the DA to resolve catch tables discrepancies by 1 January 2012.

The DA will complete the ISC data inventory and forward it to the WCPFC Secretariat by 31 July 2011. It was recommended that the STATWG do a data inventory exchange with IATTC.

ISC Category I data are staged in the public domain and can be accessed online on the ISC website. It was reiterated that non-ISC member catch data would not be maintained in the ISC database and would not be available on the ISC website. ISC public domain data will consist of ISC member data in the North Pacific only; currently data are posted for Pacific bluefin and albacore tunas, striped marlin, and swordfish.

Data correspondents and species WGs Chairs were requested to provide missing metadata, complete the metadata tables, and submit them to the DA by 31 October 2011.

At the STATWG meeting Chinese Taipei gave a presentation on their PBF otolith sampling program conducted in 2011 and all the members provided updates on the usage of electronic logbook information.

At ISC10, it was recommended that the STATWG revise the data report card to provide information on the completeness and timeliness of members' data submissions. The STATWG Chairman presented the data report card used by the IOTC, which assigns grades for timeliness and completeness for Category I, II, and III data, and recommended incorporating similar matrices into the ISC report card.

Chairpersons of the ALBWG, PBFWG, BILLWG, and SHARKWG were given the opportunity to address specific data needs and concerns, and describe how the STATWG could support their WG. The chairpersons of species WGs expressed concern that China is not providing data according to their obligation as an ISC member.

The STATWG tabled 13 future plans that need to be finished before ISC12 and proposed four recommendations to the Plenary.

Discussion

The STATWG requests to the Plenary were reviewed. With respect to the request for formal arrangements to acquire non-ISC members' catch data from WCPFC and IATTC for stock assessment purposes, it was pointed out that data exchange agreements between the ISC and both the WCPFC and IATTC already exist precluding the need for formal arrangements. When non-ISC members catch data are acquired, it was agreed that these data would not be housed in the ISC database. Species WG chairs will communicate their data requests to the STATWG Chair who will consolidate them into a single request to the appropriate RFMO. This may be an iterative process to ensure the consolidated request is properly formulated. The WGs would then work with the data received. It was suggested that this request be elaborated to include requests for data from ISC members that have not submitted data directly.

With respect to the request for Members to provide Category I, II, and III data for shark species, there was a discussion of prioritizing species for which to request enhanced data reporting. Initially blue shark and shortfin mako are the highest priority, because the SHRKWG is planning stock assessments for these species in the short term. The SHARKWG meeting will be held in December 2011 and will prioritize other species for which enhanced data should be requested in the future. It was emphasized, however, that the initial data request should focus on the two identified high priority species.

With respect to the request for Members to provide observer data to species WGs for scientific purposes, the STATWG Chair noted that there is very little information about sharks in the ISC database so it was thought that observer programs could be a source of additional data. The issue of national data confidentiality requirements was discussed. It was agreed that in cases where confidentiality requirements prohibit the provision of disaggregated data the WGs should work with their members to develop reports or analyses that result in sufficient data summarization while providing results of use to the WG. If additional data analyses are needed, the WGs could work with the data provider to accomplish them. An important step in obtaining observer data would be to document national observer data holdings. This would facilitate appropriately targeted data requests.

With respect to amending the data reporting protocol for discard data it was agreed that the recommendation should be revised to read "Amend the data reporting protocol to add discard data in Category I and II data provision, and if available, include the shark sex information in Category III data, if available." It was noted that the provision of shark sex information was premised on the relative ease of sex determination for these species, but in cases where the fish are immediately discarded fulfilling such a request may be difficult. A poll of members indicated that some discard data may be available from logbook or observer programs.

The future work plan was reviewed. It is viewed as an ambitious set of objectives but the STATWG believes they are achievable.

9.2 Data Administrator and Performance

H. Nakano reported on the performance of the DA, Izumi Yamasaki, for the past year, including data management accomplishments and challenges. It was reported that the activities of the DA from July 2010 – July 2011 were commendable and that all assignments were completed.

Discussion

The Plenary acknowledged the DA's efforts and accomplishments over the past year. It was noted that the WGs need to assist the DA to address inconsistencies in data holdings. The ISC Chairman recommended forming a small Ad hoc Committee that includes the DA, Webmaster, STATWG Chairman, and other key individuals to meet regularly to ensure successfully accomplishing ISC data management objectives. The Plenary agreed this was a sound idea and endorsed the formation of the Ad hoc Committee.

9.3 Data Submission Report Card

R. Wu presented the current data submission report card. He noted that a new report card format is being developed based on what is in use at the IOTC. The new report card format will be discussed further at the first meeting of the STATWG Ad hoc Committee in August 2011.

Discussion

The current data submission report card was adopted as presented. The STATWG Chair suggested reporting on each fishery rather each member in the report card system. There was no agreement on this matter at this time.

9.4 Total Catch Tables

I. Yamasaki, DA, reviewed the current catch tables noting revisions from last year's tables and that there are many years classified as provisional other then 2010. These years will need to be finalized as soon as practical.

Discussion

It was noted that it would be very useful to cross-check reported catch data for ISC species in the ISC database with ISC member countries' catch reported to the WCPFC. To accomplish this task requires use of Category II and III data. The DA verified that the task has already accomplished.

Discrepancies in 2009 catch data between that presented in the ISC10 Plenary Report and the current Report were noted and ascribed to the provisional status of 2009 catch data.

The catch tables lack data from China due to non-reporting. The ISC Chairman was tasked with corresponding with China to resoluve this issue.

9.5 North Pacific-wide catch and bycatch

The Chair noted that with the dissolution of the ISC BYCATCHWG and formation of the SHARKWG there is a question of whether the ISC still considers other, non-shark bycatch within its competence and whether such data should be incorporated into the ISC database. ISC has previously agreed that non-fish bycatch (e.g., sea turtles, seabirds) would not be within its competence since the RFMOs are addressing this issue, but it is not clear whether non-shark finfish bycatch should still be addressed. It was noted that as scientists and managers direct more attention to the ecosystem-related effects of fishing, bycatch becomes an important consideration. While in the short term the ISC may put less emphasis on non-shark finfish it may require more attention in the future. For that reason it was agreed for the time being to focus data acquisitions on the principal species of interest (as indicated by the current species WGs). In the future, once the remaining improvements to the ISC database are completed, attention could be turned to incorporating data on other non-shark finfish species.

9.6 Rescue of historical data

Data have been obtained from WCPFC to fill historical gaps, principally for catches by China. It was noted that a single Mexico flagged vessel historically fished in the Western Pacific and catch data for it can be obtained from WCPFC since they are not reported to Mexico. It was also noted that several South Pacific Island States catch ISC species in the North Pacific and their 2010 catches can be obtained from WCPFC.

10 REVIEW OF MEETING SCHEDULE

10.1 Time and Place of ISC12

Provisional dates and location for the 12th ISC meeting are 18-23 July 2012 in Sapporo, Japan.

10.2 Working Group Intercessional Meetings

The Plenary discussed schedules for WG intercessional meetings and agreed on the tentative schedule presented in Table 10-1

Table 10-1. Tentative schedule of ISC meetings for 2010-2012

Date	Meeting	Contact
2011		
30 Nov – 8 Dec	SHARKWG – Honolulu, HI (Data prep and 2-day ageing workshop)	S. Kohin Suzanne.Kohin@noaa.gov
6 – 16 Dec	BILLWG – Honolulu, HI (Striped marlin assessment)	J. Brodziak Jon.Brodziak@noaa.gov
2012		
31 Jan – 7 Feb	PBFWG – La Jolla, CA (Data prep)	Y. Takeuchi Yukiot@fra.affrc.go.jp
Apr	BILLWG Workshop– TBD (Blue marlin data preparation)	J. Brodziak
Apr	SHARKWG Workshop – TBD (Data preparation)	S. Kohin
May	PBFWG Workshop– Japan (Full stock assessment)	Y. Takeuchi
11 – 12 Jul	STATWG – Sapporo, Japan (Workshop)	R.-F. Wu
13 Jul	SHARKWG – Sapporo, Japan	S. Kohin
14 – 15 Jul	ALBWG Workshop – Sapporo, Japan (Review)	J. Holmes John.Holmes@dfo-mpo.gc.ca
16 – 17 Jul	BILLWG – Sapporo (Results prep workshop)	J. Brodziak
16 – 17 Jul	PBFWG – Sapporo (Results prep workshop)	Y.Takeuchi
18 – 23 Jul	ISC12 – Sapporo (Plenary)	G. DiNardo Gerard.Dinardo@noaa.gov
Nov/Dec	SHARKWG workshop – TBD (Blue shark assessment)	S. Kohin

[BILLWG= Billfish Working Group; PBFWG= Pacific Bluefin Tuna WG; SHARKWG = Shark WG; ALBWG = Albacore WG, STATWG = Statistics WG]

11 ADMINISTRATIVE MATTERS

11.1 Peer review of function and process

The ISC Rules and Procedures require peer review of ISC function and process every 5 years. Based on the outcome of ISC10, a task team composed of ISC Members drafted a framework for the peer review process (*ISC/11/PLENARY/04*). The Framework calls for three members to act as sponsors by nominating candidates for the Peer Review Team and to cover the costs for participation by their selected team member. According to the proposed schedule the Peer Review Team would be formed by October 2011 and the first draft of their report is to be reviewed at ISC12.

To meet this goal, the Plenary needs to (1) review, modify (if necessary), and adopt the framework, (2) idenify three Members to act as sponsors, and (3) develop Terms of Reference (TOR) for the Peer Review. To expedite development of the TOR while at Plenary an ad hoc working group was formed consisting of Yen-Ju Lin (Chinese Taipei), Peter Miyake (Japan), Jae-Bong Lee (Korea), Michel Dreyfus (Mexico), and Cisco Werner (USA).

Discussion

The framework was reviewed and adopted as presented [Plenary document expanding on this section].

Japan, Korea, and the USA agreed to be peer-review sponsors.

Draft TOR were developed by the working group and presented. The discussion focused on the need for the peer reviewers to consider the ISC's relationship with other international organizations outside the scope of those specified in the Operations Manual. It was agreed that consideration of these relationships would be added to the TOR.

11.2 Status of the NC Research Proposals

The ISC Chairman submitted four funding proposals to WCPFC NC5 in September 2009 for: (1) a biological sampling research program, (2) North Pacific albacore sampling program, (3) database administration, and (4) website administration. During ISC10, S.K. Soh (WCPFC) circulated a Commission Circular (2009/16) regarding a "draft administrative arrangement" developed by WCPFC Secretariat to secure financial contributions from NC Members. The document was adopted at WCPFC 6, thus allowing voluntary contributions from NC Members. At this point no voluntary contributions have occurred and the proposals remain unfunded.

11.3 Organizational chart and contact persons

The ISC Organization Chart was considered and updated through discussion with members (Figure 11-1). The participants listed on the Organization Chart serve as the points of contact for the respective WGs. They also serve as points of contact for respective Delegation Leaders in keeping abreast of WG activities and workshop results, and for serving as team leaders of national scientists to intercessional WG workshops.

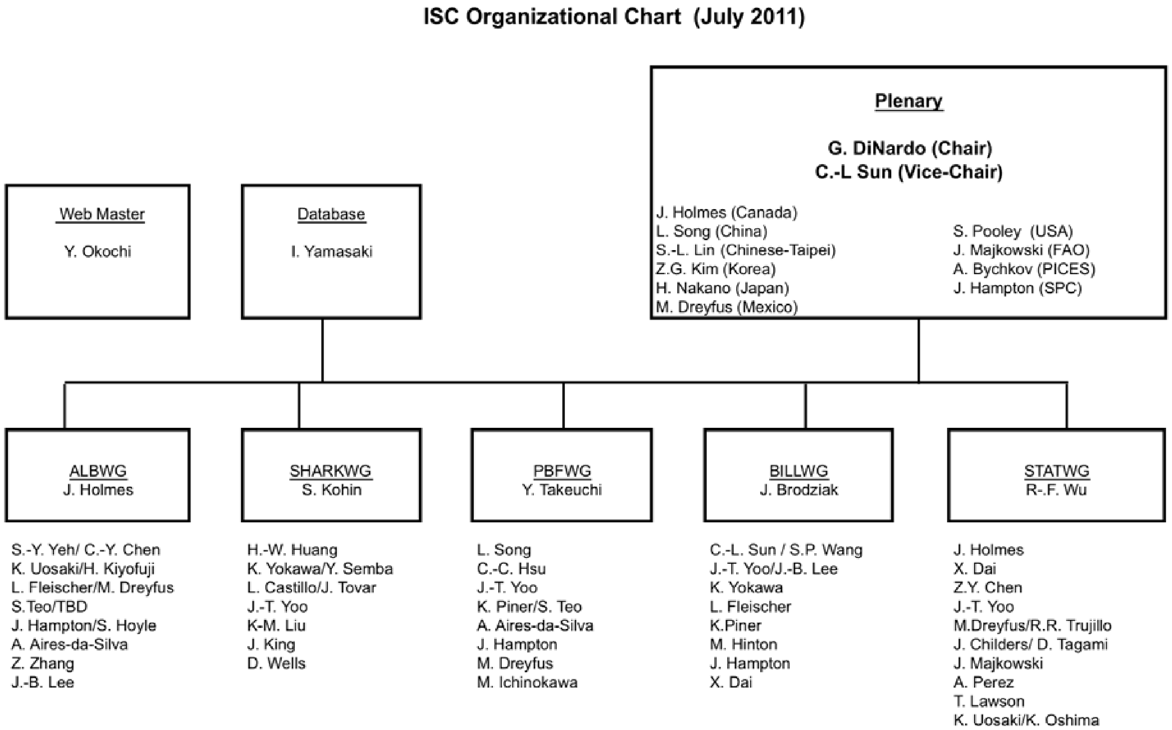

Figure 11-1. ISC Organizational Chart (July 2011).

11.4 Website

Y. Okochi, ISC Webmaster, reviewed recent improvements to the ISC website. These include pages for the public to access WG and Plenary Reports, a fishery statistics page featuring public domain catch data, and a page showing recommendations from past Plenary meetings. She has worked with the Chair of the PBFWG to develop an example template of pages for each of the WGs. The species WGs chairpersons were asked to provide feedback on the WGs' page structure and to provide fish profile and research information for species in which the WG is interested. These pages display the WG's mission statement; stock assessment schedule; information on species' biology distribution, catch, fisheries, etc.; current research topics; and a link to WG reports.

The work plan for the coming year includes a variety of updates to the website based on new information from the plenary, updating public domain catch data, and completing the WG pages.

11.4.1 Webmaster and Performance

H. Nakano reported on the performance of the Webmaster, Y. Okuchi, for the past year, including accomplishments and challenges. It was reported that the activities of the Webmaster from July 2010 – July 2011 were commendable and that all assignments were completed, including access to public domain catch data.

Discussion

The Chair thanked the Webmaster for the substantial progress made over the past year. The ISC has been criticized for its lack of transparency; making reports and other information sources available through the website improves public accessibility to the workings of the organization. It was noted that the fisheries statistics page should make clear that only catch by ISC countries will be available.

11.5 Update of Operations Manual

The ISC Chairman reported that proposed changes to the Operations Manual at ISC10 have been incorporated. Additional changes to the Operations Manuel stemming from the ISC11 seminar on Best Available Scientific Information were proposed. The ISC Chairman will develop potential changes to the manual for review and adoption at ISC12.

R. Wu, STATWG Chair, reviewed proposed revisions to the description of data categoriesin the Operations Manual. Category I and II data would include both retained catch and discards (including bycatch species) to estimate total catch. The description of Category III data would additionally include collection of sex data from shark species.

Discussion

The meaning of “catch” in relation to retained catch and landings was discussed. In addition to landed catch and discards, catch may include transhipments, direct sales, personal consumption, etc. Discard mortality should be recorded or estimated. As part of fishing mortality estimation WGs may come up with a conversion factor for total discards to account for discard mortality. “Catch” should refer to total catch, which is equivalent to fishing mortality but usage should be consistent with definitions used by other organizations and RFMOs. The different meanings of the term “bycatch” were also discussed (e.g., retained non-target catch, discarded catch). It was agreed that the statistics Steering Committee will take up the question of the proper definition of these terms, consistent with their use by other organizations.

It was agreed that the proposed modification of the definition of Category III data should be revised so that the collection of sex data would refer to “billfish and sharks” rather than enumerating only striped and blue marlin and a general category for sharks. However, the SHARKWG should compile a list of species of interest to supplement this description of Category III data. It was recognized that the WCPFC NC (the principal ISC client) has just North Pacific albacore, Pacific bluefin tuna, and swordfish within its competence but that does not mean that ISC is restricted to considering only these species.

After further discussion it was agreed that the Operations Manual would be revised to remove references to the collection of data on sea turtles and seabirds, consistent with previous Plenary discussion, and references to bycatch or discards would be narrowed to finfish species.

11.6 Vice Chair Election

M. Dreyfus indicated he would not run for reelection as ISC Vice Chairman after serving 3 years. An election was held according to ISC rules and procedures (Operations manual pages 12 and 13) and Chi-Lu Sun was elected to a 3-year term, 2012-2014. Sun will assume the role of ISC Vice Chairman after this ISC11 session. The ISC Chair welcomed C. Sun and thanked M. Dreyfus for his service as outgoing Vice Chair.

11.7 Other Administrative Matters

The ISC Chairman stressed the need for timely submission of documents and proposed a July 1 deadline for the submission of National Reports and other documents to be presented at the Plenary. This allows sufficient time for advance distribution via the ISC Website. It was noted that currently the Operations Manual specifies that Workshop Reports and other intercessional documents must be submitted within 30 days of the end of the workshop, and in most cases these reports would be available by July 1.

12 ADOPTION OF REPORT

A draft Report of the Eleventh session of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean was prepared based on input and comment from all participants, and circulated to all participants for review. The report was reviewed in its entirety, section by section and was approved by the ISC11 Plenary, subject to editorial corrections to be made by the ISC Chairman.

13 CLOSE OF MEETING

G. DiNardo thanked NOAA National Marine Fisheries Service for hosting the meeting, especially Roszella Sanford, who has served on the Office of the Chair for 6 years and has informed ISC this will be her last. He wishes her luck in the future. He thanked Michel Dreyfus for his excellent service to ISC and support and advice to the Chairs. He thanked sponsors, including the Monterey Bay Aquarium for hosting receptions and welcomed the new Vice-chair elect, Chi-Lu Sun. G. DiNardo closed the successful 11th meeting of the ISC on 25 July 2011.

14 CATCH TABLES

Table 14-1. [1]**Annual catch of North Pacific albacore (*Thunnus alalunga*) in metric tons for fisheries monitored by ISC for assessments of North Pacific Ocean stocks, 1952-2010.**
Blank indicates no effort. - indicates data not available. 0 indicates less than 1 metric t

Year	Japan							Korea		Chinese-Taipei		
	Purse Seine	Gill Net	Set Net	Pole and Line	Troll	Longline	Other	Gill Net	Longline	Gill Net	Distant Water Longline	Offshore Longline
1952	154		55	41,787	--	26,687	182					
1953	38		88	32,921	--	27,777	44					
1954	23		6	28,069	--	20,958	32					
1955	8		28	24,236	--	16,277	108					
1956			23	42,810	--	14,341	34					
1957	83		13	49,500	--	21,053	138					
1958	8		38	22,175	--	18,432	86					
1959			48	14,252	--	15,802	19					
1960			23	25,156	--	17,369	53					
1961	7		111	18,639	--	17,437	157					
1962	53		20	8,729	--	15,764	171					
1963	59		4	26,420	--	13,464	214					
1964	128		50	23,858	--	15,458	269					
1965	11		70	41,491	--	13,701	51					
1966	111		64	22,830	--	25,050	521					
1967	89		43	30,481	--	28,869	477				330	
1968	267		58	16,597	--	23,961	1,051				216	
1969	521		34	31,912	--	18,006	925				65	
1970	317		19	24,263	--	16,222	498				34	
1971	902		5	52,957	--	11,473	354		0		20	
1972	277	1	6	60,569	--	13,022	638		0		187	
1973	1,353	39	44	68,767	--	16,760	486		3		--	
1974	161	224	13	73,564	--	13,384	891		114		486	
1975	159	166	13	52,152	--	10,303	230		9,575		1,240	
1976	1,109	1,070	15	85,336	--	15,812	270		2,576		686	
1977	669	688	5	31,934	--	15,681	365		459		572	
1978	1,115	4,029	21	59,877	--	13,007	2,073		1,006		6	
1979	125	2,856	16	44,662	--	14,186	1,139	0			81	
1980	329	2,986	10	46,742	--	14,681	1,177	6	402	--	249	
1981	252	10,348	8	27,426	--	17,878	699	16		--	143	
1982	561	12,511	11	29,614	--	16,714	482	113	5,462	--	38	
1983	350	6,852	22	21,098	--	15,094	99	233	911	--	8	
1984	3,380	8,988	24	26,013	--	15,053	494	516	2,490	--	--	
1985	1,533	11,204	68	20,714	--	14,249	339	576	1,188	--	--	
1986	1,542	7,813	15	16,096	--	12,899	640	726	923	--	--	
1987	1,205	6,698	16	19,082	--	14,668	173	817	607	2,514	--	
1988	1,208	9,074	7	6,216	--	14,688	170	1,016	175	7,389	--	
1989	2,521	7,437	33	8,629	--	13,031	433	1,023	27	8,350	40	
1990	1,995	6,064	5	8,532	--	15,785	248	1,016	1	16,701	4	
1991	2,652	3,401	4	7,103	--	17,039	395	852	0	3,398	12	
1992	4,104	2,721	12	13,888	--	19,042	1,522	271	1	7,866	--	
1993	2,889	287	3	12,797	--	29,933	897		21		5	
1994	2,026	263	11	26,389	--	29,565	823		54		83	
1995	1,177	282	28	20,981	856	29,050	78		14		4,280	
1996	581	116	43	20,272	815	32,440	127		158		7,596	
1997	1,068	359	40	32,238	1,585	38,899	135		404		9,119	337
1998	1,554	206	41	22,926	1,190	35,755	104		226		8,617	193
1999	6,872	289	90	50,369	891	33,339	62		99		8,186	207
2000	2,408	67	136	21,550	645	29,995	86		15		7,898	944
2001	974	117	78	29,430	416	28,801	35		64		7,852	832
2002	3,303	332	109	48,454	787	23,585	85		112		7,055	910
2003	627	126	69	36,114	922	20,907	85		146		6,454	712
2004	7,200	61	30	32,255	772	17,341	54		78		4,061	927
2005	850	154	97	16,133	665	20,420	234		420		3,990	483
2006	364	221	55	15,400	460	21,027	42		135		3,848	469
2007	5,682	226	30	37,768	519	22,336	44		93		2,465	451
2008	825	1,531	101	19,060	549	19,092	15		394		2,490	579
2009	2,076	149	33	31,172	410	21,995	43		102		1,866	512
2010	(308)	(149)	(33)	(21,757)	(410)	(22,434)	(43)		(122)		(2,281)	(537)

1 **Data are from the ISC albacore working group July 12 2010, except as noted**

2 **Albacore pole-and-line catches for 2008 and 2009 are estimated from new procedures.**

3 **Albacore troll catches prior to 2008 contain an unknown proportion of pole and line catch.**

4 **Mexico Pole and line catches for 1999 and 2000 include 34 and 4 metric tons, respectively from longline.**

5 **Other troll catches are from vessels registered in Belize, Cook Islands, Tonga, and Ecuador.**

6 **Updates for Other Longline 2004-2009 from Peter Williams, pers. com.**

* Catch of other gears are included in Sport

Blue cell indicate the updated from last year (e.g new data and corrected value)

Table 14-1 (continued)

Year	United States								Mexico		Canada	Other		Grand Total
	Purse Seine	Gill Net	Pole and Line[2]	Albacore Troll[3]	Tropical Troll & Handline	Sport	Longline	Other	Purse Seine	Pole and Line[4]	Troll	Troll[5]	Longline[6]	
1952				23,843		1,373	46				71			94,198
1953				15,740		171	23				5			76,807
1954				12,246		147	13							61,494
1955				13,264		577	9							54,507
1956				18,751		482	6				17			76,464
1957				21,165		304	4				8			92,268
1958				14,855		48	7				74			55,723
1959				20,990		0	5				212			51,328
1960				20,100		557	4				141			63,403
1961			2,837	12,055		1,355	5	1	2	39	4			52,649
1962			1,085	19,752		1,681	7	1	0	0	1			47,264
1963			2,432	25,140		1,161	7		31	0	5			68,937
1964			3,411	18,388		824	4		0		3			62,393
1965			417	16,542		731	3	1	0		15			73,033
1966			1,600	15,333		588	8		0		44			66,149
1967			4,113	17,814		707	12				161			83,096
1968			4,906	20,434		951	11				1,028			69,480
1969			2,996	18,827		358	14		0		1,365			75,023
1970			4,416	21,032		822	9		0		390			68,022
1971			2,071	20,526		1,175	11		0		1,746			91,240
1972			3,750	23,600		637	8		100	0	3,921			106,716
1973			2,236	15,653		84	14		0		1,400			106,839
1974			4,777	20,178		94	9		1	0	1,331			115,227
1975			3,243	18,932		640	33	10	1	0	111			96,808
1976			2,700	15,905		713	23	4	36	5	278			126,538
1977			1,497	9,969		537	37		3	0	53			62,469
1978			950	16,613		810	54	15	1	0	23			99,600
1979			303	6,781		74	--		1	0	521			70,745
1980			382	7,556		168	--		31	0	212			74,931
1981			748	12,637		195	25		8	0	200			70,583
1982			425	6,609		257	105	21	0	0	104			73,027
1983			607	9,359		87	6		0	0	225			54,951
1984	3,728		1,030	9,304		1,427	2		107	6	50			72,612
1985	26	2	1,498	6,415	7	1,176	0		14	35	56			59,100
1986	47	3	432	4,708	5	196			3	0	30			46,078
1987	1	5	158	2,766	6	74	150		7	0	104			49,051
1988	17	15	598	4,212	9	64	307	10	15	0	155			45,345
1989	1	4	54	1,860	36	160	248	23	2	0	140			44,052
1990	71	29	115	2,603	15	24	177	4	2	0	302			53,693
1991	0	17	0	1,845	72	6	312	71	2	0	139			37,320
1992	0	0	0	4,572	54	2	334	72	10	0	363			54,833
1993		0	0	6,254	71	25	438		11	0	494			54,125
1994		38	0	10,978	90	106	544	213	6	0	1,998	158		73,345
1995		52	80	8,045	177	102	882	1	5	0	1,763	94		67,947
1996	11	83	24	16,938	188	88	1,185		21	0	3,316	469	1,735	86,207
1997	2	60	73	14,252	133	1,018	1,653	1	53	0	2,168	336	2,824	106,756
1998	33	80	79	14,410	88	1,208	1,120	2	8	0	4,177	341	5,871	98,229
1999	48	149	60	10,060	331	3,621	1,542	1	0	57	2,734	228	6,307	125,542
2000	4	55	69	9,645	120	1,798	940	3	70	33	4,531	386	3,654	85,052
2001	51	94	139	11,210	194	1,635	1,295		5	18	5,248	230	1,471	90,189
2002	4	30	381	10,387	235	2,357	525		28	0	5,379	466	700	105,224
2003	44	16	59	14,102	85	2,214	524		28	0	6,861	378	(2,400)	92,804
2004	1	12	127	13,346	157	1,506	361		104	0	7,856	--	4,096	90,316
2005		20	66	8,413	175	1,719	296		0	0	4,845	--	4,315	63,199
2006		3	23	12,524	95	385	270		109	0	5,832	--	5,136	66,343
2007		4	21	11,887	98	1,225	250		40	0	6,075	--	3,539	92,753
2008	0	1	1,472	10,289	29	415	353	0	10		5,446		2,812	65,463
2009	39	3	2,218	10,575	100	678	201	0	17		5,643		1,581	79,413
2010	(18)	(3)	(1,874)	(10,130)	(25)	(689)	(409)	(2)	(25)		(6,497)		(1,581)	69,327

Table 14-2. **Annual catch of Pacific bluefin tuna (*Thunnus orientalis*) in metric tons for fisheries monitored by ISC for assessments of North Pacific Ocean stocks, 1952-2010.**
Blank indicates no effort. - indicates data not available. 0 indicates less than 1 metric t

Year	Japan [1]									Korea [3]	
	Purse Seine		Pole and Line	Set Net	Troll [2]	Distant Water & Offshore Longline		Coastal	Others	Purse Seine	Trawl
	Tuna PS	Small PS				NP	SP	Longline			
1952	7,680		2,198	2,145	667	2,694	9		1,700		
1953	5,570		3,052	2,335	1,472	3,040	8		160		
1954	5,366		3,044	5,579	1,656	3,088	28		266		
1955	14,016		2,841	3,256	1,507	2,951	17		1,151		
1956	20,979		4,060	4,170	1,763	2,672	238		385		
1957	18,147		1,795	2,822	2,392	1,685	48		414		
1958	8,586		2,337	1,187	1,497	818	25		215		
1959	9,996		586	1,575	736	3,136	565		167		
1960	10,541		600	2,032	1,885	5,910	193		369		
1961	9,124		662	2,710	3,193	6,364	427		599		
1962	10,657		747	2,545	1,683	5,769	413		293		
1963	9,786		1,256	2,797	2,542	6,077	449		294		
1964	8,973		1,037	1,475	2,784	3,140	114		1,884		
1965	11,496		831	2,121	1,963	2,569	194		1,106		
1966	10,082		613	1,261	1,614	1,370	174		129		
1967	6,462		1,210	2,603	3,273	878	44		302		
1968	9,268		983	3,058	1,568	500	7		217		
1969	3,236		721	2,187	2,219	313	20	565	195		
1970	2,907		723	1,779	1,198	181	11	426	224		
1971	3,721		938	1,555	1,492	280	51	417	317		
1972	4,212		944	1,107	842	107	27	405	197		
1973	2,266		526	2,351	2,108	110	63	728	636		
1974	4,106		1,192	6,019	1,656	108	43	1,069	754		
1975	4,491		1,401	2,433	1,031	215	41	846	808		
1976	2,148		1,082	2,996	830	87	83	233	1,237		
1977	5,110		2,256	2,257	2,166	155	23	183	1,052		
1978	10,427		1,154	2,546	4,517	444	7	204	2,276		
1979	13,881		1,250	4,558	2,655	220	35	509	2,429		
1980	11,327		1,392	2,521	1,531	140	40	671	1,953		
1981	25,422		754	2,129	1,777	313	29	277	2,653		
1982	19,234		1,777	1,667	864	206	20	512	1,709	31	
1983	14,774		356	972	2,028	87	8	130	1,117	13	
1984	4,433		587	2,234	1,874	57	22	85	868	4	
1985	4,154		1,817	2,562	1,850	38	9	67	1,175	1	
1986	7,412		1,086	2,914	1,467	30	14	72	719	344	
1987	8,653		1,565	2,198	880	30	33	181	445	89	
1988	3,583	22	907	843	1,124	51	30	106	498	32	
1989	6,077	113	754	748	903	37	32	172	283	71	
1990	2,834	155	536	716	1,250	42	27	267	455	132	
1991	4,336	5,472	286	1,485	2,069	48	20	170	650	265	
1992	4,255	2,907	166	1,208	915	85	16	428	1,081	288	
1993	5,156	1,444	129	848	546	145	10	667	365	40	
1994	7,345	786	162	1,158	4,111	238	20	968	398	50	
1995	5,334	13,575	270	1,859	4,778	107	10	571	586	821	
1996	5,540	2,104	94	1,149	3,640	123	9	778	570	102	
1997	6,137	7,015	34	803	2,740	142	12	1,158	811	1,054	
1998	2,715	2,676	85	874	2,865	169	10	1,086	700	188	
1999	11,619	4,554	35	1,097	3,387	127	17	1,030	709	256	
2000	8,193	8,293	102	1,125	5,121	121	7	832	689	1,976	0
2001	3,139	4,481	180	1,366	3,329	63	6	728	782	968	10
2002	3,922	4,981	99	1,100	2,427	47	5	794	631	767	1
2003	956	4,812	44	839	1,839	85	12	1,152	446	2,141	0
2004	4,934	3,323	132	896	2,182	231	9	1,616	514	636	0
2005	4,061	8,783	549	2,182	3,406	107	14	1,818	548	1,318	
2006	3,644	5,236	108	1,421	1,544	63	11	1,058	777	1,012	
2007	2,965	3,875	236	1,503	2,385	83	8	2,004	1,209	1,281	
2008	3,029	7,192	64	2,358	2,074	19	8	1,476	1,192	1,866	
2009	2,127	5,950	50	2,236	1,875	8	7	1,304	913	936	
2010	1,122	2,620	83	1,047	1,301	(-)[7]	(-)[7]	(806)	918	1,196	

1 Part of Japanese catch is estimated by the WG from best available source for the stock assessment use.
2 The troll catch for farming estimating 10 - 20 mt since 2000, is excluded.
3 Catch statistics of Korea derived from Japanese Import statistics for 1982-1999.
4 US in 1952-1958 contains catch from other countries - primarily Mexico. Other includes catches from gillnet, troll, pole-and-line, and longline
5 Catches by NZ are derived from the Ministry of Fisheries, Science Group (Compilers) 2006: Report from the Fishery Assessment Plenary, May 2006: stock assessments and yield estimates. 875 p. (Unpublished report held
6 Other countries include AUS, Cooks, Palau and so on. Catches derived from Japanese Imort Statistics as minimum estimates.
7 The catch for Japanese coastal longline in 2008 includes that of the distant water and offshore longliners.
8 Catches in New Zealand and Other countries since 2007 are carry-over of that in 2005
Blue cell indicate the updated from last year (e.g new data and corrected value)

Table 14-2 (continued)

Year	Chinese-Taipei				United States [4]			Mexico		non-ISC members		Grand Total
	Purse Seine	Distant Driftnet	Longline	Others	Purse Seine	Sport	Others	Purse Seine	Others	New Zealand [5]	Others [6]	
1952					2,076	2						19,172
1953					4,433	48						20,117
1954					9,537	11						28,575
1955					6,173	93						32,005
1956					5,727	388						40,383
1957					9,215	73						36,590
1958					13,934	10						28,610
1959					3,506	13	56	171	32			20,539
1960					4,547	1	0					26,079
1961					7,989	23	16	130				31,236
1962					10,769	25	0	294				33,195
1963					11,832	7	28	412				35,481
1964					9,047	7	39	131				28,631
1965			54		6,523	1	77	289				27,224
1966					15,450	20	12	435				31,161
1967			53		5,517	32	0	371				20,745
1968			33		5,773	12	8	195				21,623
1969			23		6,657	15	9	260				16,419
1970					3,873	19	0	92				11,432
1971			1		7,804	8	0	555				17,140
1972			14		11,656	15	45	1,646				21,216
1973			33		9,639	54	21	1,084				19,619
1974			47	15	5,243	58	30	344				20,685
1975			61	5	7,353	34	84	2,145				20,948
1976			17	2	8,652	21	25	1,968				19,381
1977			131	2	3,259	19	13	2,186				18,811
1978			66	2	4,663	5	6	545				26,863
1979			58		5,889	11	6	213				31,715
1980			114	5	2,327	7	24	582				22,634
1981			179		867	9	14	218				34,641
1982		2	207		2,639	11	2	506				29,387
1983	9	2	175		629	33	11	214				20,557
1984	5		477	8	673	49	29	166				11,573
1985	80	11	210		3,320	89	28	676				16,089
1986	16	13	70		4,851	12	57	189				19,266
1987	21	14	365		861	34	20	119				15,507
1988	197	37	108	25	923	6	50	447	1			8,989
1989	259	51	205	3	1,046	112	21	57				10,943
1990	149	299	189	16	1,380	65	92	50				8,653
1991		107	342	12	410	92	6	9		2		15,781
1992	73	3	464	5	1,928	110	61	0		0		13,995
1993	1		471	3	580	298	103			6		10,811
1994			559		906	89	59	63	2	2		16,916
1995			335	2	657	258	49	11		2		29,225
1996			956		4,639	40	70	3,700		4		23,519
1997			1,814		2,240	156	133	367		14		24,632
1998			1,910		1,771	413	281	1	0	20		15,763
1999			3,089		184	441	184	2,369	35	21		29,153
2000			2,780	2	693	342	61	3,019	99	21		33,475
2001			1,839	4	292	356	48	863		50		18,504
2002			1,523	4	50	654	12	1,708	2	55	10	18,794
2003			1,863	21	22	394	18	3,211	43	41	19	17,958
2004			1,714	3		49	11	8,880	14	67	10	25,221
2005			1,368	2	201	79	7	4,542		20	7	29,013
2006			1,149	1		96	2	9,806		21	3	25,952
2007			1,401	10	42	14	2	4,147		(21) [8]	(3) [8]	(21,189)
2008			979	2		93	1	4,392	15	(21) [8]	(3) [8]	(24,784)
2009			877	11	(410)	(176)	(5)	3,019		(21) [8]	(3) [8]	(19,928)
2010			(373)			(117)	(0)	(7,745)		(21) [8]	(3) [8]	(17,352)

Table 14-3. **Annual catch of Swordfish (*Xiphias gladius*) in metric tons for fisheries monitored by ISC for assessments of North Pacific Ocean stocks, 1951-2010. Blank indicates no effort. - indicates data not available. 0 indicates less than 1 metric ton. Provisional**

Year	Japan							Chinese Taipei									
	Distant Water& Offshore Longline [2]	Coastal Longline	Driftnet	Harpoon [3]	Other Bait fishing	Trapnet	Other [4]	Distant Water Longline	Offshore [5] Longline	Offshore Gillnet	Offshore Others	Coastal Harpoon	Coastal Setnet	Coastal Gillnet & Other net	Coastal Longline	Coastal Others	Other
1951	7,246	115	10	4,131	88	78	10	-	-								-
1952	8,890	152	0	2,569	6	68	6	-	-								-
1953	10,796	77	0	1,407	20	21	87	-	-								-
1954	12,563	96	0	813	104	18	17	-	-								-
1955	13,064	29	0	821	119	37	41	-	-								-
1956	14,596	10	0	775	66	31	7	-	-								-
1957	14,268	37	0	858	59	18	11	-	-								-
1958	18,525	42	0	1,069	46	31	21	-	-								-
1959	17,236	66	0	891	34	31	10	-	427								91
1960	20,058	51	1	1,191	23	67	7	-	520								127
1961	19,715	51	2	1,335	19	15	11	-	318								73
1962	10,607	78	0	1,371	26	15	18	-	494								62
1963	10,322	98	0	747	43	17	16	-	343								18
1964	7,669	91	4	1,006	40	16	26	-	358								10
1965	8,742	119	0	1,908	26	14	182	-	331								27
1966	9,866	113	0	1,728	41	11	4	-	489								31
1967	10,883	184	0	891	33	12	5	-	646								35
1968	9,810	236	0	1,539	41	14	9	-	763								12
1969	9,416	296	0	1,557	42	11	14	0	843								7
1970	7,324	427	0	1,748	36	9	3	-	904								5
1971	7,037	350	1	473	17	37	31	-	992								3
1972	6,796	531	55	282	20	1	2	-	862								11
1973	7,123	414	720	121	27	23	2	-	860								119
1974	5,983	654	1,304	190	27	16	2	1	880								136
1975	7,031	620	2,672	205	58	18	2	29	899								153
1976	8,054	750	3,488	313	170	14	12	23	613								194
1977	8,383	880	2,344	201	71	7	2	36	542								141
1978	8,001	1,031	2,475	130	110	22	1	-	546								12
1979	8,602	1,038	983	161	45	15	4	7	661								33
1980	6,005	849	1,746	398	29	15	1	10	603								76
1981	7,039	727	1,848	129	58	9	3	2	656								25
1982	6,064	874	1,257	195	58	7	1	1	855								49
1983	7,692	999	1,033	166	30	9	2	0	783								166
1984	7,177	1,177	1,053	117	98	13	0	-	733								264
1985	9,335	999	1,133	191	69	10	0	-	566								259
1986	8,721	1,037	1,264	123	47	9	0	-	456								211
1987	9,495	860	1,051	87	45	11	0	3	1,328								190
1988	8,574	678	1,234	173	19	8	0	-	777								263
1989	6,690	752	1,596	362	21	10	0	50	1,491								38
1990	5,833	690	1,074	128	13	4	0	143	1,309								154
1991	4,809	807	498	153	20	5	0	40	1,390								180
1992	7,234	1,181	887	381	16	6	0	21	1,473								243
1993	8,298	1,394	292	309	43	4	1	54	1,174								310
1994	7,366	1,357	421	308	37	4	0	-	1,155								219
1995	6,422	1,387	561	423	34	7	0	50	1,135								225
1996	6,916	1,067	428	597	45	4	0	9	701	2	-	19	10	-	-	-	
1997	7,002	1,214	365	346	62	5	0	15	1,358	1	1	27	8	-	24	-	
1998	6,233	1,190	471	476	68	2	0	20	1,178	8	-	17	15	1	-	-	
1999	5,557	1,049	724	416	47	5	0	70	1,385	4	-	51	5	1	-	-	
2000	6,180	1,121	808	497	49	5	0	325	1,531	5	-	74	5	1	1	-	
2001	6,932	908	732	230	30	15	0	1,039	1,691	17	-	64	8	1	1	-	
2002	6,230	965	1,164	201	29	11	0	1,633	1,557	7	1	1	16	1	1	-	
2003	5,376	1,063	1,198	149	28	4	0	1,084	2,196	3	-	-	8	-	-	-	
2004	5,395	1,509	1,062	229	30	4	0	884	1,828	5	-	-	7	1	-	3	
2005	5,359	1,295	956	187	337	3	0	437	1,813	1	-	-	5	2	-	18	
2006	6,181	1,507	796	244	342	5	1	*438*	*3,944*	-	-	-	-	-	-	-	-
2007	6,109	2,016	829	122	367	2	1	*345*	*3,754*	-	-	-	-	-	-	-	-
2008	4402 [1]	1780 [1]	648 [1]	173 [1]	349 [1]	3 [1]	0 [1]	*338*	*3,407*	-	-	-	-	-	-	-	-
2009	4400 [1]	1548 [1]	682 [1]	239 [1]	249 [1]	3 [1]	0 [1]	*373*	*3,177*	-	-	-	-	-	-	-	-
2010	-	-	-	-	-	-	-	*(531)*	*(2,313)*	-	-	-	-	-	-	-	-

[1] Catch data a Philippin and some other countries catching swordfish in the North Pacific.

[2] Catches by gear for 1952-1970 were estimated roughly using FAO statistics and other data. Catches for 1971-2002 are more reliably estimated.

[3] Contrains trolling and harpoon but majority of catch obtained by harpoon.

[4] For 1952-1970 "Other" refers to catches by net fishing and various unspecified gears.

[5] Offshore longline category includes some catches from harpoon and other fisheries but does not include catches unloaded in foreign ports.

[6] Estimated round weight of retained catch. Does not include discards.

[7] Unknown in purse sei troll and tro half ring and unspecified gears.

[*] Only one vessel fished so combined with Hawaii lonline

Blue cell indicate the updated from last year (e.g new data and corrected value)

ITALIC There is no data for working group. The value was retlieved from ISC11 national report.

Table 14-3 (continued)

Year	Korea		Mexico	United States					Grand Total
	Longline	Hi-seas Driftnet	All Gears	Hawaii Longline	California Longline	California Gill Net	California Harpoon	California Unknown [7]	
1951	-	-		-	-	-	-	-	11,678
1952	-	-	-	-	-	-	-	-	11,691
1953	-	-	-	-	-	-	-	-	12,408
1954	-	-	-	-	-	-	-	-	13,610
1955	-	-	-	-	-	-	-	-	14,111
1956	-	-	-	-	-	-	-	-	15,486
1957	-	-	-	-	-	-	-	-	15,251
1958	-	-	-	-	-	-	-	-	19,734
1959	-	-	-	-	-	-	-	-	18,785
1960	-	-	-	-	-	-	-	-	22,047
1961	-	-	-	-	-	-	-	-	21,538
1962	-	-	-	-	-	-	-	-	12,671
1963	-	-	-	-	-	-	-	-	11,605
1964	-	-	-	-	-	-	-	-	9,220
1965	-	-	-	-	-	-	-	-	11,349
1966	-	-	-	-	-	-	-	-	12,283
1967	-	-	-	-	-	-	-	-	12,689
1968	-	-	-	-	-	-	-	-	12,424
1969	-	-	-	-	-	-	-	-	12,186
1970	-	-	-	5	-	-	612	10	11,083
1971	0	-	-	1	-	-	99	3	9,044
1972	0	-	2	0	-	-	171	4	8,737
1973	0	-	4	0	-	-	399	4	9,816
1974	0	-	6	0	-	-	406	22	9,627
1975	0	-	-	0	-	-	557	13	12,257
1976	0	-	-	0	-	-	42	13	13,686
1977	219	-	-	17	-	-	318	19	13,180
1978	68	-	-	9	-	-	1,699	13	14,117
1979	-	-	7	7	-	-	329	57	11,949
1980	64	-	380	5	-	160	566	62	10,969
1981	-	-	1,575	3	0	473	271	2	12,820
1982	48	-	1,365	5	0	945	156	10	11,890
1983	11	-	120	5	0	1,693	58	7	12,774
1984	48	-	47	3	12	2,647	104	75	13,568
1985	24	-	18	2	0	2,990	305	104	16,005
1986	9	-	422	2	0	2,069	291	109	14,770
1987	44	-	550	24	0	1,529	235	31	15,483
1988	27	-	613	24	0	1,376	198	64	14,028
1989	40	-	690	218	0	1,243	62	56	13,319
1990	61	-	2,650	2,436	0	1,131	64	43	15,733
1991	5	-	861	4,508	27	944	20	44	14,311
1992	8	-	1,160	5,700	62	1,356	75	47	19,850
1993	15	-	812	5,909	27	1,412	168	161	20,383
1994	66	-	581	3,176	631	792	157	24	16,294
1995	10	-	437	2,713	268	771	97	29	14,569
1996	15	-	439	2,502	346	761	81	15	13,957
1997	100	-	2,365	2,881	512	708	84	11	17,089
1998	153	-	3,603	3,263	418	931	48	19	18,114
1999	132	-	1,136	3,100	1,229	606	81	27	15,625
2000	202	-	2,216	2,949	1,885	646	90	9	18,599
2001	438	-	780	220	1,749	375	52	5	15,287
2002	439	-	465	204	1,320	302	90	3	14,640
2003	381	-	671	147	1,812	216	107	0	14,443
2004	410	-	270	213	898	169	62	37	13,016
2005	434	-	235	1,622	*	220	76	0	13,000
2006	477	-	347	1,211	*	444	71	2	16,010
2007	452	-	383	1,735	*	484	58	0	(12,267)
2008	*(773)*	-	84	1,980	*	280	33	1	(7,441)
2009	*(989)*	-	*250*	1,813	*	172 [1]	34 [1]	1 [1]	(13,930)
2010	*(704)*	-	*(150)*	1,654	*	33 [1]	22 [1]	4 [1]	

Table 14-4. **Annual catch of striped marlin *(Kajikia audax)* in metric tons for fisheries monitored by ISC for assessments of North Pacific Ocean stocks, 1951-2011. Blank indicates no effort. - indicates data not available. 0 indicates less than 1 metric ton. Provision**

Year	Japan						Chinese Taipei										
	Distant Water & Offshore Longline	Coastal Longline	Other Longline	Gill Net Small Mesh	Gill Net Large Mesh	Other [2]	Distant Water Longline	High-sea DriftGillne	Offshore Longline	Offshore Gillnet	Offshore Others	Coastal Harpoon	Coastal Setnet	Coastal Gillnet & Other net	Coastal Longline	Coastal Others	Other
1951	2,494	-	673	-	0	1,281											
1952	2,901	-	722	-	0	1,564											
1953	2,138	-	47	-	0	954											
1954	3,068	-	52	-	0	1,088											
1955	3,082	-	28	-	0	1,038											
1956	3,729	-	59	-	0	1,996											
1957	3,189	-	119	-	0	2,459											
1958	4,106	-	277	-	3	2,914			543								387
1959	4,152	-	156	-	2	3,191			391								354
1960	3,862	-	101	-	4	1,937			398								350
1961	4,420	-	169	-	2	1,797			306								342
1962	5,739	-	110	-	8	1,912			332								211
1963	6,135	-	62	-	17	1,910			560								199
1964	14,304	-	42	-	2	2,344			392								175
1965	11,602	-	19	0	1	2,794			355								157
1966	8,419	-	112	0	2	1,570			370								180
1967	11,698	-	127	0	3	1,551	2		385								204
1968	15,913	-	230	0	0	1,043	1		332								208
1969	8,544	600	3	0	3	2,668	2		571								192
1970	12,996	690	181	0	3	1,032	0		495								189
1971	10,965	667	259	0	10	2,042	0		449								135
1972	7,006	837	145	0	243	993	9		380								126
1973	6,357	632	118	0	3,265	702	1		568								139
1974	6,700	327	49	0	3,112	775	24		650								118
1975	5,281	286	38	0	6,534	686	64		732								96
1976	5,136	244	34	0	3,561	585	32		347								140
1977	3,019	256	15	0	4,424	547	17		524								219
1978	3,957	243	27	0	5,593	546	0		618								78
1979	5,561	366	21	0	2,532	526	26		432								122
1980	6,378	607	5	0	3,467	536	61		223								132
1981	4,106	259	12	0	3,866	542	17		491								95
1982	5,383	270	13	0	2,351	656	7		397								138
1983	3,722	320	10	22	1,845	827	0		555								214
1984	3,506	386	9	76	2,257	719	0		965								330
1985	3,897	711	24	40	2,323	733	0		513								181
1986	6,402	901	33	48	3,536	577	0		179								148
1987	7,538	1,187	6	32	1,856	513	31		383								151
1988	6,271	752	7	54	2,157	668	7		457								169
1989	4,740	1,081	13	102	1,562	537	8		184								157
1990	2,368	1,125	3	19	1,926	545	2		137								256
1991	2,845	1,197	3	27	1,302	507	36		254								286
1992	2,955	1,247	10	35	1,169	303	1		219								197
1993	3,476	1,723	1	-	828	708	5		221								142
1994	2,911	1,284	1	-	1,443	383	1		137								196
1995	3,494	1,840	3	-	970	283	27		83								82
1996	1,951	1,836	4	-	703	152	26		162	8	6	30	3	-	-	-	
1997	2,120	1,400	3	-	813	163	59		290	9	-	33	3	-	2	-	
1998	1,784	1,975	2	-	1,092	304	90		205	15	-	19	6	1	9	-	
1999	1,608	1,551	4	-	1,126	184	66		128	7	-	26	5	1	3	-	
2000	1,152	1,109	8	-	1,062	297	153		161	17	1	29	6	1	1	-	
2001	985	1,326	11	-	1,077	237	121		129	16	-	30	5	-	-	-	
2002	764	796	5	-	1,264	290	251		226	14	-	6	8	1	-	-	
2003	1,013	842	3	-	1,064	203	241		91	26	-	11	5	1	-	-	
2004	699	1,000	2	-	1,339	92	261		95	8	1	7	5	2	-	1	
2005	562	668	1	0	1,214	98	176		76	1	-	5	9	9	-	8	
2006	623	539	1	0	1,190	95	*204*	-	*537*	-	-	-	-	-	-	-	-
2007	306	860	5	-	970	79	*102*	-	*199*	-	-	-	-	-	-	-	-
2008	(390)	(609)	(10)	(-)	(1,302)	(97)	*78*	-	*192*	-	-	-	-	-	-	-	-
2009	(166)	(606)	(21)	-	(821)	(90)	*37*	-	*225*	-	-	-	-	-	-	-	-
2010	-	-	-	-	-	-	*(53)*	-	*(200)*	-	-	-	-	-	-	-	-

[1] Estimated from catch in number of fish

[2] Contrains bait fishing, net fishing, tarpnet, trolling, harpoon, etc

Blue cell indicate the updated from last year (e.g new data and corrected value)

ITALIC The value was retlieved from ISC11 national report. No data for working group.

Table 14-4 (continued)

Year	Costa Rica	Korea		Mexico		United States				Grand Total
	Sport [1]	Longline	Hi-seas DriftGillnet	Longline	Sport [1]	Longline	Troll	Handline	Sport [1]	
1951			-							4,448
1952		-	-						23	5,210
1953		-	-						5	3,144
1954		-	-						16	4,223
1955		-	-						5	4,153
1956		-	-						34	5,819
1957		-	-						42	5,809
1958		-	-						59	8,289
1959		-	-						65	8,311
1960		-	-						30	6,682
1961		-	-						24	7,060
1962		-	-						5	8,317
1963		-	-						68	8,951
1964		-	-						58	17,317
1965		-	-						23	14,951
1966		-	-						36	10,689
1967		-	-						49	14,019
1968		-	-						51	17,778
1969		-	-						30	12,613
1970		-	-						18	15,604
1971		0	-						17	14,544
1972		0	-						21	9,760
1973		0	-						9	11,791
1974		0	-						55	11,810
1975		0	-						27	13,744
1976		0	-						31	10,110
1977		43	-						41	9,105
1978		28	-						37	11,127
1979		-	-						36	9,622
1980		37	-						33	11,479
1981		-	-						60	9,448
1982		39	-						41	9,295
1983		19	-						39	7,573
1984		23	-						36	8,307
1985		16	-				18		42	8,498
1986		61	-	-			19		19	11,923
1987		1	-	-		272	30	1	28	12,029
1988		11	-	-		504	54		30	11,141
1989		26	-	-		612	24	0	52	9,098
1990		315	-	-	181	538	27	0	23	7,465
1991	106	141	-	-	75	663	41	0	12	7,495
1992	281	318	-	-	142	459	38	1	25	7,400
1993	438	388	-	-	159	471	68	1	11	8,640
1994	521	1,045	-	-	179	326	35	0	17	8,479
1995	153	307	-	-	190	543	52	0	14	8,041
1996	122	429	-	-	237	418	54	1	20	6,162
1997	138	1,017	-	-	193	352	38	1	21	6,655
1998	144	635	-	-	345	378	26	0	23	7,053
1999	166	433	-	-	266	364	28	1	12	5,979
2000	97	537	-	-	312	200	14	1	10	5,168
2001	151	254	-	-	237	351	42	2		4,974
2002	76	188	-	-	305	226	30	0		4,450
2003	79	206	-	-	322	552	29	0		4,687
2004	(19)	75	-	-	0	376	34	1		4,017
2005	(-)	141	-	-	0	511	20	0		(3,499)
2006	-	56	-	-	-	611	21	0		(3,877)
2007	-	28	-	-	-	276	13	0		(2,838)
2008	-	*(29)*	-	-	-	426	14	0		(3,147)
2009	-	*(22)*	-	-	-	(256)	(10)	(0)	-	(2,254)
2010	-	*(18)*	-	-	-	(158)	(5)	(0)	-	(434)

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

**Northern Committee
Seventh Regular Session**

**Sapporo, Japan
6-9 September 2011**

PROCESS TO DEVELOP A PRECAUTIONARY MANAGEMENT FRAMEWORK FOR NORTH PACIFIC ALBACORE TUNA

Context

The work plan agreed to at NC6 called for NC7 to: "Review the effectiveness of CMM 2005-03, including members' reports on their interpretation and implementation of fishing effort controls." An important outcome of this exercise is to determine the degree to which total F on the stock is subject to the limits on fishing effort mandated by the management measure. Regular and standardized reporting against CMM 2005-03 by CCMs that fish for NP albacore will allow for NC to assess the extent to which CCMs are adhering to the measure.

Furthermore, Article 6, paragraph 1 (a) of the Convention calls on "the Members of the Commission in applying the precautionary approach to determine, on the basis of the best scientific information available, stock-specific reference points and the action needed to be taken if they are exceeded."

Article 6, paragraph 3 also states that "Members of the Commission shall take measures to ensure that, when reference points are approached, they will not be exceeded. In the event they are exceeded, members of the Commission shall, without delay, take the action determined under paragraph 1(a) to restore the stocks."

Considering that the International Scientific Committee has determined in its 2011 stock assessment for North Pacific Albacore that the stock is not being overfished, or in an overfished state, now is an opportune time for the NC to agree to a process to develop a Precautionary Management Framework for the stock based on biological reference points, that would include management actions should agreed-upon reference points be exceeded.

Taking into consideration the results of the 2011 stock assessment and the review of the effectiveness of CMM 2005-03, the NC should continue its efforts to develop a precautionary approach based management framework, reference points, and associated decision rules. The paper tabled at NC6 (WCPFC-NC6-DP-01 "Developing a precautionary Management Framework for Stocks managed by Northern Committee") should be a basis for this work.

Process

With respect to determining the extent that CCMs are implementing CMM 2005-003, Members will report annually to NC on their implementation of the measure, and their efforts to restrict F to levels observed in 2002-2004. Members will use the template provided in Annex A for this purpose.

Building on the principles outlined in paper WCPFC-NC6-DP-01, a work plan with associated timelines is proposed in Annex B for the NC to develop and recommend a precautionary approach based management framework for North Pacific albacore, including agreed upon biological limit and target reference points and decision rules should those reference points be exceeded. In addition to initiating these actions, it is proposed that NC7 incorporate this work into its Work Program for 2012-2015.

Attachment C, Annex A

Table 1. Average annual catch of North Pacific albacore

CCM	Data pertain to WCPFC Area only or entire N Pacific?	Fisheries with ANY catch of NP albacore	"Fishing for" NP albacore? (Y/N)	2006-2010 average annual catch
Canada	N Pacific total catches	Albacore troll	y	5,899
			Total catches for Canada:	5,899
			Catches in fisheries "fishing for" NP albacore:	5,899
			% of total catch in fisheries "fishing for" NP albacore:	100
China	CA only	Longline	NK	(2007-8) 10272.5
			Total catches for China:	
			Catches in fisheries "fishing for" NP albacore:	
			% of total catch in fisheries "fishing for" NP albacore:	
Cook Islands				
			Total catches for Cook Islands:	
			Catches in fisheries "fishing for" NP albacore:	
			% of total catch in fisheries "fishing for" NP albacore:	
Japan	CA only	LL Coast	Y/N	17,098
		LL DW	Y/N	4,207
		PL Coast	N	80
		PL DW	Y	24,970
		PS Coast	N	11
		PS DW	N	1,840
		GN	N	455
		Troll	N	470
		Set Net	N	50
		Others	N	37
			Total catches for Japan:	49,218
			Catches in fisheries "fishing for" NP albacore:	46,275
			% of total catch in fisheries "fishing for" NP albacore:	94
NOTE: 1) "2006-2010 average annual catch " is preliminary. 2) "Y/N": this category vessels includes two types; " fishes for NP ALB" and "non targeting".				
Korea	N Pacific	LL DW	Y/N	169
			Total catches for korea:	169
			Catches in fisheries "fishing for" NP albacore:	169
			% of total catch in fisheries "fishing for" NP albacore:	100
NOTE: 1) Average annual catch is preliminary (Data will be updated by 30 Sep 2011) 2) "Y/N": this category vessels includes two types; " fishes for NP ALB" and "non targeting".				
Philippines				
			Total catches for Philippines:	
			Catches in fisheries "fishing for" NP albacore:	

% of total catch in fisheries "fishing for" NP albacore:				
Chinese Taipei	N Pacific	albacore LL	Y	2,548
	N Pacific	LL others	N	552
Total catches for Chinese Taipei:				3,100
Catches in fisheries "fishing for" NP albacore:				2,548
% of total catch in fisheries "fishing for" NP albacore:				82
United States	N Pacific	Albacore troll	Y	12,099
		Longline	N	297
		Gillnet	N	3
		Pole and line	N	9
		Purse seine	N	34
		Other	N	505
Total catches for United States:				12,946
Catches in fisheries "fishing for" NP albacore:				12,099
% of total catch in fisheries "fishing for" NP albacore:				93
NOTE: 1) These USA (2006-2010) data may not be confirmed from figures available to the Secretariat. 2) US response: See all our annual reports under CMM 2005-03, the latest of which is dated 8 Jul 2011.				
Vanuatu	CA only	LL	Y	7,591
Total catches for Vanuatu:				10,178
Catches in fisheries "fishing for" NP albacore:				2,587
% of total catch in fisheries "fishing for" NP albacore:				25
Belize	CA only	LL	Y	95
Total catches for Belize:				95
Catches in fisheries "fishing for" NP albacore:				95
% of total catch in fisheries "fishing for" NP albacore:				100
NOTE: catch unsegregated by area				
Federated States of Micronesia	CA only	LL	N	N/A
Total catches for FSM:				
Catches in fisheries "fishing for" NP albacore:				
% of total catch in fisheries "fishing for" NP albacore:				
NOTE: Commenced fishery in 2009				
Marshall Islands	CA only	LL	N	N/A
Total catches for RMI:				
Catches in fisheries "fishing for" NP albacore:				
% of total catch in fisheries "fishing for" NP albacore:				
NOTE: Commenced fishery in 2008				

Table 2. Fishing effort fishing for North Pacific albacore (ALB)

CCM	Area[1]	Fishery[2]	2002-04 Average		2005		2006		2007		2008		2009		2010	
			No. of vessels	Vessel days	No. of vessels	Vessel days	No. of vessels	Vessel days	No. of vessels	Vessel days	No. of vessels	Vessel days	No. of vessels	Vessel days	No. of vessels	Vessel days
Canada[3]	N Pacific	ALB troll		8,898	213	8,565	174	6,243	198	7,113	134	5,907	135	6,589	157	7,532
	CA[4] only	ALB troll		266	1	57	0	0	0	0	0	0	0	0	0	0
	N Pacific	ALB troll		8,898	213	8,565	174	6,243	198	7,113	134	5,907	135	6,589	157	7,532
China																
Cook Islands																
Japan[5]	CA only	LL Coast	296		289		287		273		276		280		286	
		LL DW	633		591		538		494		480		361		342	
		PL DW	141		134		125		106		104		104		101	
Korea[6]	N Pacific	LL	170				130		122		108		111		122	
Chinese Taipei[7]	N Pacific	ALB LL	25		23	2,363	24	4,156	21	3,360	18	2,603	13	2,082	20	2,093
USA	N Pacific	ALB troll		24,994		24,731		22,006		24,000		20,631		24,358		25,224
Vanuatu	N Pacific		32	9,728	28	5,096	29	5,278	33	9,999	15	3,195	14	2,548	12	2,184
Belize[8]													40		49	

[1] Data pertain to WCPFC Area only or entire N Pacific?
[2] Fisheries "fishing for" NP albacore
[3] NOTE: For Canada no fishing inside the CA since 2005
[4] Convention Area
[5] Japanese albacore data are not segregated by north or south pacific with respect to effort or number of vessels
[6] Korean albacore data are not segregated by north or south pacific with respect to effort (number of vessels)
[7] This data just indicates the fishery fishing for NP albacore only
[8] Vessel number and effort was given for all species

Attachment E

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

Northern Committee
Seventh Regular Session

Sapporo, Japan
6-9 September 2011

Work Programme for the Northern Committee

(as revised by the Seventh Regular Session)

Work areas	objectives	1-year tasks			
	2012-2015	2012	2013	2014	2015
.. **Northern stocks**			Consider other management options than the existing management measures, if appropriate.		
a. Monitor status; consider management action	Review status and take action as needed for:[9] **North Pacific albacore** Tasks (A)Review members' reports on their implementation of CMM 2005-03				

[9] In the event that the Commission, in accordance with paragraph 5 of Annex I of the Commission Rules of Procedure, adds additional stocks, such as the northern stock of striped marlin, to the list of stocks understood to be "northern stocks", this work programme will be revised to include periodic status reviews and consideration of management action for such stocks.

Work areas	objectives	1-year tasks			
	2012-2015	2012	2013	2014	2015
	(1)Estimate the proportion of the total catch of albacore in the North Pacific Ocean (in the Convention Area, and/or across the entire North Pacific Ocean, as appropriate) that is effectively subject to the effort limits mandated in the CMM. (2) Determine how total effort across those fisheries has changed from 2002 through 2010 through a review of members' reports of annual fishing effort by their vessels "fishing for" NP albacore fisheries.	Review the compiled members' reports and identify and rectify shortcomings	Review the compiled members' reports and identify and rectify shortcomings	Review the compiled members' reports and identify and rectify shortcomings	Review the compiled members' reports and identify and rectify shortcomings
	(B) Establish a Precautionary Approach based management framework, including: (1) recommend appropriate reference points; (2) agreeing in advance to actions that will be taken in the event each of the particular limit reference points is breached (decision rules); (3) recommend any changes to CMM 2005-03.	Discuss Task (B)(1) and (2)	Finalize Task (B) (1) and (2)	Recommened any changes to CMM 2005-03 (Task(B)(3))	
	Pacific bluefin tuna	Review reports from CCMs on their domestic management measures. Obtain and review a full assessment and consider appropriate management action.	.		
	Swordfish	Consider interim management objective and reference points in light of ISC	Obtain and review a full assessment and consider appropriate management		

SUPPLEMENTAL NMFS REPORT

Proposed Rule to Implement IATTC Resolutions Adopted in 2011

NMFSis drafting a proposed rule under authority of the Tuna Conventions Act of 1950to implement three resolutions adopted by the Inter-American Tropical Tuna Commission (IATTC) in July 2011, including the Resolution on Tuna Conservation 2011-2013 (C-11-01), the Resolution Prohibiting Fishing on Data Buoys (C-11-03), and the Resolution Prohibiting the Retention of Oceanic Whitetip Sharks (C-11-10). The proposed rule would only apply to vessels targeting HMS in the IATTC Convention Area, which includes the waters bounded by the coast of the Americas, the 50° N. and 50° S. parallels, and the 150° W. meridian. The proposed rule is being expedited due to the need to implement the tuna conservation measures by November 18, 2011, which is the date that the purse seine closure is slated to begin, the shark measures need to be implemented by January 1, 2012, and the data buoy measures as soon as possible given that resolutions should be implemented within 45 days of adoption by the IATTC. NMFS expects the proposed rule to publish in early October 2011 for public comment and a public hearing will be held in October 2011.

This rule would amend current tuna conservation measures in the longline and purse seine fisheries operating in the Convention Area by (1) reducing the duration of the purse seine closure period from 73 to 62 days in 2011 and continuing this purse seine closure period in 2012 and 2013; (2) allowing each individual vessel owner to choose between two closure periods each year rather than requiring the entire U.S. fleet to adhere to one closure period; (3) continuing the 500 metric ton bigeye tuna quota for large-scale longline vessels for 2012 and 2013; and (4) renewing the tuna retention program in the purse seine fishery. In addition, this rule would amend regulations for fisheries targeting HMS in the Convention Area by (1) prohibiting fishing vessels from interacting with data buoys; (2) prohibiting longline and purse seine vessels from fishing within one nautical mile of anchored data buoys; (3) prohibiting the retention, transshipment, landing, storing, selling, or offering for sale any part or whole carcass of oceanic whitetip sharks, and (4) requiring vessel owners/operators to release unharmed, to the extent practicable, oceanic whitetip sharks when brought alongside vessels.

Agenda Item E.1.b
Attachment 1
September 2011

7/21/11 ALBWG

Annex 9

STOCK ASSESSMENT OF ALBACORE TUNA IN THE NORTH PACIFIC OCEAN IN 2011

REPORT OF THE ALBACORE WORKING GROUP STOCK ASSESSMENT WORKSHOP

International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean

4-11 June 2011
Shizuoka, Japan
Japan, 424-8633

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Executive Summary

The current assessment of the status and future trends in the north Pacific albacore tuna (*Thunnus alalunga*) stock was completed in June 2011 using fishery data through 2009. This assessment was conducted using the Stock Synthesis modeling platform (Version 3.11b) and is based on the assumption that there is a single well-mixed stock of albacore in the north Pacific Ocean.

The Albacore Working Group (ALBWG) developed a seasonal, length-based, age-structured, forward-simulation population model with a focus on providing reliable estimates of population dynamics and stock abundance. Major changes to model inputs and structure in this assessment relative to the 2006 assessment include the use of catch-at-length data rather than catch-at-age data, 16 age-aggregated fisheries defined by gear, location, season, and catch units (weight or number) rather than 17 age-specific fisheries, a new growth model, and use of conditional age-at-length data not previously available.

The stock assessment required a substantial amount of data including catch, catch-per-unit-effort (CPUE), and catch size compositions. Catch and CPUE for all fisheries have been updated through 2009 for this assessment, i.e., four more years of data were available following the last assessment in 2006. A reference run of the VPA model configured as in the 2006 assessment, but with updated catch-at-age and CPUE indices, was conducted to compare important estimated quantities for model-related changes. Analyses were carried out to assess the sensitivity of the results to assumptions including data-weighting (both between data types and relative weightings of different sources within a data type), biology (stock-recruitment relationship, natural mortality, growth), and fishery selectivity patterns. Stochastic future projections of the stock were conducted to estimate the probability that future SSB will fall below the average of the ten historically lowest estimated SSBs (SSB-ATHL) in at least one year of a 25-yr (2010-2035) projection period. The base-case scenario for projections assumes average recruitment and constant F (at current F level, $F_{2006\text{-}2008}$), but sensitivity of the results to alternative harvest scenarios (constant catch and constant $F_{2002\text{-}2004}$), two recruitment scenarios (high and low levels), and alternative structural assumptions (down-weighting of the length composition data, stock-recruitment relationship, growth) was investigated. Retrospective analysis to assess the level of bias and uncertainty in terminal year estimates of biomass, recruitment and fishing mortality was also conducted.

The SS3 base-case model estimates that SSB has likely fluctuated between 300,000 and 500,000 t between 1966 and 2009 and that recruitment has averaged 48 million fish annually during this period. The pattern of F-at-age shows fishing mortality increasing to its highest level on 3-yr old fish and then declining to a much lower and stable level in mature fish. Current F (geometric mean of 2006 to 2008, $F_{2006\text{-}2008}$) is lower than $F_{2002\text{-}2004}$ (current F in the 2006 assessment). Future SSB is expected to fluctuate around the historical median SSB (~405,000 t) assuming F remains constant at $F_{2006\text{-}2008}$ and average historical recruitment levels persist. $F_{2006\text{-}2008}$ is approximately 30% below $F_{SSB\text{-}ATHL\ 50\%}$ and there is about a 1 % risk that future SSB will fall below the SSB-ATHL threshold in at least one year in the projection period, i.e., current F is well below the 50% probability level. However, if recruitment is lower than the historical average and F remains constant at $F_{2006\text{-}2008}$, then the risk of future SSB falling below the threshold by the end of the projection period increases to as high as 54%.

Sensitivity and retrospective analyses assessed the impact of alternative assumptions on the assessment results. These analyses revealed scaling differences in estimated biomass (total and SSB) and, to a lesser extent, recruitment, but few differences in overall trends. Relative F-at-age patterns were not affected by different assumptions, except when the growth curve parameters from the 2006 assessment were used, and $F_{2006-2008}$ was consistently lower than $F_{2002-2004}$. Although there is considerable uncertainty in absolute estimates of biomass and fishing mortality, the estimated trends in both quantities are robust and advice-based on F_{SSB} is not affected by this uncertainty. Terminal year estimates of biomass and recruitment show no bias, but there is a high level of uncertainty in the most recent recruitment estimates. Given these findings, WG believes that the current parameterization of the base-case model is reasonable.

Both the SS3 base-case model and the VPA reference run estimated similar historical trends in SSB and recruitment, but with different scaling for biomass. The scaling difference is largely attributable to the different growth curves used in SS3 base-case model and the VPA reference run. A sensitivity run of the base-case model in which growth parameters were fixed to those used in the VPA, reduced the scaling of biomass to the level of the VPA reference run. Sensitivity analyses of future projections show that stock status and conservation advice is relatively insensitive to these scaling differences. The WG concluded that the growth curve used in the 2006 assessment is not representative of growth in north Pacific albacore. Based on the agreement in trends of estimated quantities between the VPA and SS3 base-case model, the ability to explain the scaling differences between models, and the robustness of the stock status and conservation advice to these differences, the WG concluded that the SS3 model will replace the VPA as the principal model for north Pacific albacore assessments.

The north Pacific albacore stock is considered to be healthy at current levels of recruitment and fishing mortality. Since current $F_{2006-2008}$ is about 71% of $F_{SSB-ATHL}$ and the stock is expected to fluctuate around the long-term median SSB (~405,000 t) in the foreseeable future given average historical recruitment levels and constant fishing mortality at $F_{2006-2008}$, the WG concluded that overfishing is not occurring and that the stock likely is not in an overfished condition. However, recruitment is a key driver of the dynamics in this stock and a more pessimistic recruitment scenario increases the probability that the stock will not achieve the management objective of remaining above SSB-ATHL threshold with a probability of 50%. Thus, if future recruitment declines about 25% below average historical recruitment levels due either to environmental changes or other reasons, then the impact of $F_{2006-2008}$ on the stock is unlikely to be sustainable. Therefore, the working group recommends maintaining present management measures.

The WG also reviewed fisheries data from 2010 and updated Category I (annual nominal catch and effort), II (spatially stratified monthly catch and effort), and III (size composition sampled from the catch) fishery data. The provisional estimate of total catch in 2010 is 69,364 t, which is 13% lower than the 2009 catch. The majority of this change is accounted for by a reduction in albacore catch by the Japanese pole-and-line fishery. These data are preliminary and subject to change since not all countries catching north Pacific albacore had reported their data to the WG at the time of this review.

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1.0 Introduction

1.1 Welcome and Opening Remarks

The ISC-Albacore Working Group (ALBWG or WG) stock assessment workshop was held at the National Research Institute of Far Seas Fisheries (NRIFSF) in Shizuoka, Japan, 4-11 June 2011. This workshop was originally scheduled for 14-29 March 2011 but was postponed because of a strong earthquake in the sea off northeastern Japan on 11 March 2011. The WG expressed its sympathies to the victims of this event.

Dr. Uozumi, NRIFSF Director, welcomed the participants to the meeting. In his address, Dr. Uozumi expressed his appreciation for the concern of WG members regarding their colleagues and the Japanese people who survived the Tohoku earthquake. He noted the long history of albacore fisheries and that the results of this assessment will be of great concern to many countries. He also reflected on the long history of scientific cooperation on north Pacific albacore and he observed that the ISC Albacore Working Group is an effective forum for exchanging data, presenting research, and developing improvements to provide a more reliable and realistic stock assessment and management advice for albacore. He stressed that Japan recognizes the important scientific contributions the Working Group is making to the understanding of the North Pacific albacore population and in closing, Dr. Uozumi wished participants a valuable and productive session leading to reliable conclusions for the assessment.

John Holmes chaired the workshop and welcomed working group members. In his opening remarks, Holmes noted that substantial progress had been achieved on several modeling issues since the October 2010 workshop in La Jolla, CA, and that this progress was the result of productive discussions of these issues among WG members via email. He reminded working group members that collaboration and cooperation would be important for completing the assessment at this workshop and the importance of doing so as five years have elapsed since the last assessment of this stock. The WG decision-making process is consensus-based, which means obtaining as much agreement as possible among members, but not necessarily 100% unanimity. Working group members will make some important decisions in the absence of perfect understanding and they should continue their collaborative and cooperative approach. Finally, Holmes wished WG members a productive and successful workshop.

The WG reviewed the goals of the stock assessment workshop. The workshop is charged with completing a full assessment of the North Pacific albacore stock using fishery data through 2009, and developing scientific advice and recommendations for fisheries managers on current stock status, future trends, and conservation. The WG also reviewed national fisheries in 2010 and updated Category I, II, and III fishery data.

A total of 23 participants from Canada (CAN), Chinese Taipei (TWN), Japan (JPN), United States of America (USA), the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) Chair, and the Science Committee Chair of the Western and Central Pacific Fisheries Commission (WCPFC) attended the Workshop and introduced themselves (Appendix 1).

The WG Chair discussed the reporting of the stock assessment results and scientific advice. First, a workshop report (this report) capturing discussion, key outputs and conclusions, and advice and recommendations on the assessment will be prepared in accordance with past practice and submitted to the ISC11 Plenary Session in July 2011 for approval and transmittal to both the Inter-American Tropical Tuna Commission (IATTC) and the Western and Central Pacific Fisheries Commission (WCPFC). Second, following discussion at the ISC10 Plenary Session (ISC 2009) and at the Sixth Regular Session of the Northern Committee of the WCPFC (Northern Committee 2010), there may be an opportunity to send the stock assessment document to an independent external peer review. The goals of this review would be to obtain feedback on the adequacy, appropriateness, and application of the modeling and other methods for providing scientific advice to managers and to solicit advice on research to improve the assessment model. This review would require a second document that comprehensively summarizes background information, assumptions and their rationale, the methodology, results, and interpretation of the stock assessment in one document, rather than over a series of workshop reports. Drafting of this document would commence after the ISC11 Plenary session.

The WG recognizes the important contributions to this assessment made by Simon Hoyle (Secretariat of the Pacific Community) and Alex Aires-da-Silva (Inter-American Tropical Tuna Commission), neither of whom was able to attend the stock assessment workshop. Simon was instrumental in addressing growth and selectivity issues and identifying options that ultimately formed the basis for decisions recorded in this document. Much of the discussion on these issues, led by Simon via email, is captured as background material in Appendix 7. Alex attended the Modeling Subgroup meeting (see Appendix 4) and was an influential voice during working sessions that addressed and resolved parameterization and modeling issues with the Stock Synthesis (SS) platform and developed the base-case model, sensitivity runs, and future projection package recommended to the full WG at the assessment workshop that followed.

2.0 Adoption of Agenda and Assignment of Rapporteurs

A provisional agenda circulated by email prior to the workshop received several revisions which were discussed and accepted. The revised agenda shown in Appendix 2 was adopted for this workshop meeting. Sixteen working papers were presented at the workshop (Appendix 3).

Rapporteuring duties for specific sections were assigned to Chiee-Young Chen, Gerard DiNardo, John Holmes, Momoko Ichinokawa, Shigehide Iwata, Hidetada Kiyofuji, Suzy Kohin, Takayuki Matsumoto, Koji Uosaki, Vidar Wespestad, and Zane Zhang.

A Modeling Subgroup meeting was convened at the National Research Institute of Far Seas Fisheries in Shizuoka, Japan, 30 May-03 June 2011. The goals of this meeting were to review model parameterization issues and develop recommendations for the base case model, sensitivity runs, and future projection scenarios to the full assessment workshop. The report of the Subgroup meeting is attached as Appendix 4.

The adopted agenda lists the main topics covered during the assessment workshop. However, this workshop report does not strictly follow the agenda in its organization. Instead, the assessment report is arranged to highlight the assessment methodology, results, conclusions, and scientific advice and the necessary background studies and information needed to understand the assessment. This arrangement of the report means that discussion and work related to the base-case scenario recommended by the Modelling Subgroup (Agenda Item 4), SS and VPA data review (Agenda Item 7), structural and input parameter decisions (Agenda Item 8), choice of sensitivity runs (Agenda Item 9), and input decisions for conducting future projections (Agenda Item 10) were moved from the main report to Appendix 5.

References to working papers presented at this assessment workshop are cited in this report using the working paper number, i.e., ISC/11/ALBWG/01. Full citations are found in Appendix 3. Working papers presented at earlier workshops are cited using the author-year system plus the working paper number, i.e., Teo et al. (2010; ISC/10-3/ALBWG/02) and are included in the literature list at the end of the report.

3.0 Review of 2010 Fisheries Data

3.1 Mexico (ISC/11/ALBWG/01)

Summary — This paper contains the complete historic record of north Pacific Albacore (NPALB) catches for Mexico from 1961 to 2010 and continues the series of yearly reports provided by the INAPESCA-México to the ISC-Albacore Working Group. Catches of NPALB by purse seiners occur sporadically in the Northwest region of México when fishing for juvenile Pacific blue fin tunas; albacore is not a primary target species of commercial fisheries in Mexico. For this reason, albacore catches by the Mexican tuna fleet have been low relative to catches of other tuna species during the last few years. The total reported catch for albacore in 2009 was 17 t and the preliminary figure for 2010 is 25 t. NPALB are also caught incidentally by some small-scale coastal longline fisheries targeting pelagic sharks and swordfish, although the number of albacore caught is low. In addition, there is a USA sport fishery targeting albacore which operates under permits within Mexican waters. Catch data from this fishery for 1998 to 2007 were presented by Mexico for the first time last year; updates for 2008-2010 are not yet available. Size data are not available for albacore caught by Mexican tuna fisheries.

Discussion: It was clarified that catch estimates for purse seine vessels are based on observer data. All Mexican vessels carry logbooks and all of the major tuna seiners (363 t or more) have had scientific observers since 1992. There are no data on the number of vessels or other measures of effort in a given year, although these catches are attributed to 5-7 vessels targeting juvenile Pacific bluefin for pen ranching operations. U.S. sport fishery catches in Mexican waters for 2008-2010 are reported by the U.S and are included in the catch table (Appendix 6).

3.2 Canada (ISC/11/ALBWG/10)

Summary — Total annual catch and effort by the Canadian troll fleet in 2010 were 6,497 tonnes (t) and 7,532 vessel-days, respectively, for 157 vessels actively targeting albacore. These figures represent a 15% increase in catch and effort and a 16% increase in fleet size relative to 2009. The increased fleet size was due to an increase in vessels operating within Canadian coastal waters and the high seas. The Canadian fishery operated within a latitudinal range of 39 to 53°N and from the west coast of North America to 147°W in 2010, continuing the pattern observed since the 2006 fishing season of staying within the eastern Pacific Ocean (east of 150°W). Roughly 51% of the catch and 53% of the effort occurred in the US coastal waters, well below the average for 2000-2009 of 79% and 78%, respectively. In contrast, 36% of the catch and 39% of the effort occurred in Canadian waters and 14% of the catch and 8% of the effort occurred in adjacent high seas waters, double the long-term averages in both areas. Two modes at 64-66 and 74-76 cm were equally dominant in size composition data sampled from the catch (range 51-90 cm), corresponding to 2- and 3-yr old fish. The most common length frequency pattern sampled from the Canadian catch exhibits the first mode at 64-66 cm FL. The two-mode pattern in 2010 is rarer, but together with above average catch rates in northern waters and changes in the contribution of different areas to total catch, is consistent with a northward shift of the albacore population along the west coast of North America in 2010.

Discussion: The number of vessels increased in recent years and no more than 110 Canadian troll vessels operate in US waters between 15 June and 31 October in accordance with treaty conditions. CPUE has levelled off in recent years, after about 15 years of monotonic increases, which were attributed to factors such as the increasing experience of captains in the fishery, improved fish finding technology and changing ocean conditions.

3.3 Chinese Taipei (ISC/11/ALBWG/07)

Summary **—** Taiwanese longline fisheries operating in the North Pacific Ocean were briefly reviewed. Most of the North Pacific albacore catch is contributed by the large-scale tuna longline fishery (LTLL), and only a minor proportion comes from small-scale tuna longline fishery (STLL). Albacore catches by the LTLL fishery are seasonal and occur mainly in the 1st and 4th quarters of the year; Taiwanese longliners rarely fish in the 2nd and 3rd quarters. The annual Taiwanese albacore catch has fluctuated between 1,866 and 3,990 t in recent years (2005-2010), with only 13-24 albacore-targeting vessels actively operating in the North Pacific Ocean during this period. Preliminary data for 2010 are 2,236 t of catch from 19 vessels in the LTLL fishery targeting albacore.

Discussion: It was clarified that the figures presented are catch and effort for the large-scale longline (LTLL) fishery, the small-scale longline fishery (STLL) data were not included in this report. The recovery rate of STLL fishery logbooks is low and the few logbooks available may not provide sufficient or reliable information. The STLL fishery constitutes less than 15% of the total annual TWN albacore catch. It was noted that estimates of the STLL catch are compiled and reported in the national report to the ISC Plenary session and that the WG catch table (Appendix 6) includes both the STLL and LTLL catches for TWN as separate categories.

A question was asked about the absence of quarterly catch maps for 2010 in the working paper since maps for 2007-2009 were provided. The author answered that the 2010 maps were not included because the 2010 data are preliminary and most logbooks were not available when the data for this report were compiled. Those logbooks that were returned are primarily from the first quarter of 2010 and as a result a quarterly map for 2010 would not show all four quarter distributions at this time.

It was noted that the TWN LL fleet likely changed fishing grounds from the south Pacific Ocean (1989-1993) to the north Pacific Ocean around 1993-1994. A question was raised about whether this change in fishing grounds was due to a change in the targeting behaviour of the fleet from bigeye tuna to albacore. There is no clear evidence of a change in targeting practices, but albacore fishing grounds are generally found north of 15 °N and bigeye fishing grounds are further south in tropical waters. Some WG members requested maps showing the spatial distribution of effort for TWN LL fishery.

The WG noted that effort data as either vessel numbers or 1000s of hooks were not provided and asked Chinese Taipei to include these data in its fishery reports in the future.

3.4 Japan (ISC/11/ALBWG/13)

Summary — Japanese albacore catch and effort data in the north Pacific were compiled from the *Annual Report of Catch Statistics* by the Japanese government and logbook data. Albacore is mainly caught by pole-and-line and longline fisheries. Total Japanese catch in 2009 was revised from the figure presented at the July 2010 ALBWG meeting to 55,878 t, which is about 15,000 t higher than the 2008 catch. This increase is largely accounted for by target switching in the pole-and-line fleet from skipjack (whose abundance was low in waters near Japan in 2009) to albacore. The preliminary total Japanese catch in 2010 was 45,134 t, and is about 11,000 t lower than the 2009 catch.

Discussion: The WG noted that the preliminary 2010 catch is 20% less than 2009, mostly due to lower catches in the purse seine (PS) and pole-and-line (PL) fisheries. The lower PL catch in 2010 was due to a change in targeting from albacore to skipjack, especially the middle-sized PL vessels. However, vessels in this fishery will change their target back to albacore if skipjack abundance is low. Albacore is not the main target species for the PS fishery.

The WG noted that aggregated Category I effort data and monthly Category II catch-effort data were not provided and asked Japan to include these data in its fishery reports in the future.

3.5 United States (ISC/11/ALBWG/15)

Summary — In the U.S., north Pacific albacore are targeted commercially by a surface (troll and pole-and-line) fishery and a high seas longline fishery and recreationally by sport fishers. Annual U.S. landings of albacore for the past 10 years (2001-2010) have averaged 13,808 ± 1,704 (mean ± SD) metric tons (t) and represent roughly 17% of the total north Pacific albacore landings. Of the U.S. fisheries operating during this period, the commercial surface fishery (troll and pole-and-line) is the largest averaging 86% of the annual landings, followed by the recreational fishery with roughly 9%, and finally the longline fishery taking just 3% of the annual landings. Other gears that catch albacore in small amounts include pelagic drift gillnets, purse seines and an artisanal troll/handline fishery near Hawaii. Provisional U.S. landings in 2010 totalled 13,145 t, down from 13,813 t in 2009. The surface fishery (troll and pole-and-line) landed 12,004 t and operations were concentrated in a relatively confined area off Oregon and Washington. The number of commercial vessels fishing with troll and pole-and-line gears was

653. Port samplers measured 46,577 fish with a mean size of 72 cm FL landed by the surface fishery. Overall, 2010 catch and effort were down slightly when compared to 2009.

Discussion: It was questioned how sport fishery catches, which are reported in number of fish, were converted to weights. Albacore sport catches are reported by the states through port sampling programs and are converted to weight using the commercial surface fleet sampling data. Although sport catches are sampled for length, the sample size is not large enough to be considered representative of the catch so these data are not used for conversion at present. Slightly larger fish are caught by the sport fleet than the commercial surface fishery so the converted catch data for the sport fishery may be underestimated. The problem of separating catches from troll and pole-and-line gears were discussed and USA scientists noted that it is likely that catches by these gears will not be separated in the future; a final decision will be made by July 2011.

The WG noted that aggregated monthly Category II catch-effort data were not provided and asked the USA to include these data in its fishery reports in the future.

3.6 Updating and Adoption of Catch Table (ISC/11/ALBWG/16)

The WG reviewed a revised version of the north Pacific albacore catch and effort (vessel number) Tables 1 and 2. Updated values were provided during the meeting or extracted from the fishery reports provided by member nations to finalize the catch table for the 2011 Plenary. The updated tables were approved and adopted as ISC/11/ALBWG/16 on 8 June 2011 and are attached to this report as Appendix 6. No updates were received from Korea, China, for the Taiwan offshore longline (STLL) fisheries, or from non-member nations providing data through submissions to the SPC.

A question was asked about whether Chinese longline catch data in the north Pacific for 1988 to 2010, which were obtained via the WCPFC in 2010, were incorporated into the ”Other longline” category. The data manager, John Childers, indicated by email that data from 2004-2009 were incorporated into the “Other Longline” category of the catch table.

The updated catch table (Appendix 6) includes revisions to some 2008 and 2009 catch data, which were generally less than 1,000 t. The 2011 stock assessment is based on an earlier version of the catch table approved 15 December 2010 and so does not use the updated figures for 2008 and 2009 nor the 2010 data.

3.7 Data Issues for the Statistics Working Group (STATWG)

The WG Chair requested that WG members discuss data issues or ISC database issues that should be raised for action by the STATWG. The WG noted that it was important to report effort data as well as catch data in national reports. The WG was concerned with data reporting from China. Last year Chinese catch data for 1988 to 2009 were obtained from the SPC. It is not known if 2010 data are available. Lastly, Korea has not reported 2010 fishery data, despite attempts by the WG Chair to obtain these data.

The WG chair discussed inconsistencies between submitted data and metadata in the ISC database raised in an email to WG Chairs on 17 May 2011 from the database administrator, Izumi Yamasaki. WG members agreed to address the specific questions and comments from the DA as soon as possible.

The procedures for archiving assessment models and data files was raised as issue for the STATWG.

4.0 Work Assignments

The WG defined spatial and temporal fisheries for length-based modeling and reviewed the data to be used in the modeling at a data preparation workshop in October 2010 (ALBWG 2010). The data review identified several issues requiring further attention and resolution prior to commencing the assessment. These issues were assigned to WG members and the results of their work and WG decisions based on these results, are reported in this section.

4.1 Comparison of length compositions from Taiwan longline, Japan pole-and-line, and U.S. longline fisheries (ISC/11/ALBWG/04)

Summary — The objective of this study was to compare the length compositions of the Taiwan longline fishery early (TWN LL-1: 1996-1998) and late periods (TWN LL-2: 2003-2008), Japan pole-and-line (large fish) (JPN PL), and the USA swordfish-targeting longline (USA LL) fisheries. Overall length compositions were derived for these four fisheries from logbook, observer, and port sampling data. As has been previously observed, the length compositions for TWN LL-1 and TWN LL-2 are dissimilar. However, the USA LL had a similar length composition to TWN LL-2, indicating that TWN LL-2 has relatively representative length compositions for that period. However, neither JPN PL nor USA LL length compositions were similar to TWN LL-1. Therefore, mirroring the selectivity of TWN LL-1 to JPN PL or USA LL may not be ideal. If the ALBWG considers the TWN LL-1 length compositions to be approximately representative of the albacore caught by the TWN LL fishery during that period, it may be more appropriate to use the 'super-year' concept to estimate a selectivity curve from the length composition data during the early period.

Discussion: Previous albacore assessments in 2004 and 2005 have struggled with TWN LL size composition data. The problem is that in the early period (1996-1998), size composition sampling is not considered representative of the fishery either spatially or temporally and the available data are qualitatively different than data from the later period. The early period had higher proportions of smaller fish and their length compositions were highly variable whereas the modes during the late period are relatively stationary and the fish are larger.

There was discussion about removing the TWN LL size data entirely for the early period (1996-1998) or conducting a sensitivity analysis in which the length composition data were further down-weighted. The Modeling Subgroup conducted a number of trials using the quarterly size data and recommended the 'super-year' approach (see Appendix 4). One concern raised about this recommendation is that any trends in the quarterly size data for the years aggregated into the 'super-year' would be lost. However, because it is for a short period when the TWN sampling program was ramping up and the sampling involved relatively few fish, the WG agreed to use the 'super-year' approach for the early TWN LL size data in the SS3 base-case model.

4.2 Updated time series associated with albacore fisheries based in the Northeast Pacific Ocean (ISC/11/ALBWG/05)

***Summary* —** During the October 2010 ALBWG meeting, U.S. scientists presented detailed descriptions of the data sources and methods used to develop time series for albacore fisheries in the Northeast Pacific. The ALBWG reviewed these time series, accepted the VPA time series and suggested some changes to the SS3 time series: 1) catch in metric tons rather than number of fish, and 2) changing the gear filter on the size composition database for the U.S. troll fishery to remove large fish that were not part of the troll fishery. Details on updates to the time series are presented in this working paper. All time series have been updated to include data from 2009. Otherwise, all VPA time series remained the same as previously described. However, several changes were made to the SS3 time series. Most importantly, catch time series are now in metric tonnes rather than thousands of fish. Improvements were also made to the U.S. troll length compositions by improving the gear filter on the database. Methods and data sources for the U.S. longline length composition data and all CPUE time series remained the same.

Discussion: It was pointed out that the USA LL CPUE index might be improved by separating the shallow-set and deep-set fisheries. In response, it was noted that the shallow-set swordfish and the deep-set bigeye fisheries, in which albacore are non-target catch, operate in different areas so the inclusion of an area term in the GLM used to standardize CPUE partly accounts for the different fisheries. The total landings for the USA LL fishery are a tiny proportion (< 0.5%) of the overall north Pacific albacore catch, and dividing the fishery further would likely have little effect on the assessment other than increasing the number of estimated parameters.

It was also noted that standardization of the USA/CAN troll fishery should consider calibrating for the change in operational area of this fleet since the late 1990s, i.e., a contraction in the area of operations from the western and central Pacific Ocean back towards the North American coast in the eastern Pacific Ocean (EPO). Simultaneously, the Japanese pole-and-life fishery underwent a similar contraction in operating range towards the Japanese coast at approximately the same time. It was also noted that the CPUE indices of the JPN PL and USA/CAN troll fisheries exhibit similar trends up to 2004, but then diverge for unknown reasons. The Working Group accepted the methods used to prepare the eastern Pacific fishery data for the assessment.

Future research after the assessment will explore separating out the two sectors of the USA LL fishery and standardization of the USA/CAN troll and JPN PL CPUE indices for the changes in operational areas that occurred through the 1990s and 2000s.

4.3 Estimation of alternative growth curve combining Japanese pole-and-line size data and reported growth curves (ISC/11/ALBWG/06)

***Summary* —** A growth curve for north Pacific albacore was estimated based on the modes in length frequency histograms of catch by the Japanese pole-and-line fishery and growth curves reported in other studies. Length data from 997,440 fish, ranging between 26 and 120 cm fork length (FL) in size, were used. Monthly length frequency histograms for each year were created and used to detect modes. Allocation of lengths to age was done based on studies in which a von Bertalanffy growth curve was fitted to the data. In several scenarios, length-at-age for large fish and L_∞ were borrowed from other studies. Estimates of growth curve parameters differed depending on the scenario (assumptions). The value of L_∞ was, if not fixed, close to that of growth curve for other studies whose length-at-age for large fish were used and whose length-at-age was used for allocation of length to age. It seems that L_∞ from the Suda (1966) growth curve is implausibly large.

Discussion: The Working Group noted that the hybrid growth curves estimated in this paper reveal the influence of growth assumptions on estimates of L_∞ and K, especially assumptions concerning the growth of large fish. The WG noted that the results in this working paper are more or less consistent with those in ISC/11/ALBWG/02. The WG was pleased with this work, but concluded that it would not affect the choice of a growth curve for the SS3 base-case model because it was no longer considering the use of fixed growth curve parameterization in the base-case model (see Appendix 4).

4.4 Fork length at 95th percentile of cumulative length frequency as an indicator of maximum length for albacore prior to 1965 (ISC/11/ALBWG/19)

***Summary* —** During the October 2010 workshop in La Jolla, USA, the ALBWG noted that SS3 outputs may be sensitive to the growth curve used in the model and that the L_∞ value in the reference case, 146.46 cm, (from Suda 1966), may be too high. The ALBWG proposed that a more appropriate L_∞ value could be approximated from estimates of the 95th percentile of the cumulative length frequency distributions of both the USA and JPN LL fisheries. In this paper, fork lengths at the 95th and 99th percentiles of annual cumulative length frequencies and maximum fork length for albacore in the Japanese longline fishery in the north Pacific Ocean from 1948 to 1965 are examined to assess suitability of the L_∞ value estimated by Suda (1966). Fork lengths at the 95th and 99th percentiles were between 98 and 115cm and 108 and 119cm, respectively, in 1948–1964. The maximum size measured during this period ranged between 117 and 130cm FL. Based on these results, it was concluded that the size of albacore caught by Japanese longline fisheries prior to 1965 was less than 130 cm FL (consistent with findings for the USA LL fishery), and that these sizes are smaller than the L_∞ value (146.46 cm FL) estimated by Yabuta and Yukinawa (1963).

Discussion: The WG noted that the 95th and 99th percentile values are lower than the asymptotic size of the Suda growth curve (146.46 cm FL) and so support using a smaller maximum size when modeling growth in the base-case model. The dataset that Suda used was compiled when the JPN LL fisheries (larger fish) operated in the western Pacific and mostly captured albacore < 120 cm FL; fish > 120 cm FL are more commonly found in the central Pacific and so were not available to the JPN LL fishery during this period. Thus, differences in estimates of L_∞ (and other growth curve parameters) could be related to a regional bias in sampling or regional differences in growth.

5.0 Biological Studies

5.1 Age and growth of North Pacific albacore (ISC/11/ALBWG/02)

Summary **—** Age and growth of North Pacific albacore (*Thunnus alalunga*) were assessed by examining annual growth increments in sagittal otoliths from 338 fish collected throughout the North Pacific Ocean. A wide size range of albacore (53-128 cm fork length, FL) was collected in the western, central and eastern Pacific Oceans in an attempt to incorporate size-at-age information over juvenile, sub-adult, and adult life history stages. Overall, ages ranged from 1 to 15 years with the majority of fish between 2 to 4 years of age. Growth models fit otolith-based size-at-age well and a bias-corrected form of Akaike's Information Criterion indicated that the specialized von Bertalanffy (VB) model provided the best fit. Biological parameters of the specialized VB model included $L_\infty = 120.0$ cm, $K = 0.184$ yr^{-1}, and $t_0 = -1.945$ yr. Daily ages of several age-1 fish (55-61 cm FL) were also determined and confirmed that annual age class assignments were correct with daily ages ranging from 378 to 505 days. In addition to otolith-based techniques, dorsal fin spines and length frequency (LF) analysis were used to generate estimates of size-at-age. In general, fin spine ages matched otolith-derived ages (85% of samples) and results of the VB growth model generated from LF analysis provided similar size-at-age for the first five age classes, but estimated smaller sizes for fish ages 6 to 9, which may be a product of the limited size distribution from fishery-dependent data. Results from this preliminary age and growth research suggest North Pacific albacore are a relatively long-lived tuna species and provides updated biological parameters that may be useful to future stock assessment models incorporating age-specific life history information.

Discussion: This paper and the postponement of the workshop led to considerable discussion and exploratory analysis among WG members via email concerning albacore age and growth. Appendix 7 documents these results as background information to the Modeling Subgroup recommendation on growth and the decision by the WG to accept this recommendation.

ISC/11/ALBWG/02 provides the first new data on north Pacific albacore age and growth in at least a decade. The WG concluded that the otolith data will be used as conditional age-at-length information in the base-case model.

Fractional ages were assigned to otoliths based on a May 1 birth date in this paper. A question was asked about the birth date used in SS3 and how the model accounts for fractional ages. Rick Methot (the architect of SS) responded by email that SS assumes a January 1 birth date and that the model uses integer ages only. The ages reported in the paper for 20 otoliths collected from the JPN LL fishery between Jan and May were rounded up to the integer year for use in the assessment model. Fractional ages of fish caught from May onwards were rounded down to the integer year for use in the assessment model.

It was noted that the von Bertalanffy growth curve does not fit the pattern of growth in young albacore very well. The aging of young fish in this working paper was validated by daily ring counts up to about age-1 and by annual rings on dorsal fin-rays up to about age-3 and so is considered reasonably reliable. The poor fit to young fish might be caused by regional differences in growth rates. Most of the data for large fish are from the northeastern Pacific, while Suda (1966) is based on samples from the western Pacific, where smaller fish predominate.

5.2 Age and growth of albacore *Thunnus alalunga* in the North Pacific Ocean (ISC/11/ALBWG/IP/01)

Note: This paper was in review for publication in the *Journal of Fish Biology* at the time of this workshop. Although the paper was submitted after the submission deadline, it was accepted because it contains new data concerning age and growth of north Pacific albacore.

Summary — Age and growth of North Pacific albacore (*Thunnus alalunga*) were investigated using obliquely sectioned sagittal otoliths in samples of 126 females and 148 males. The results obtained in otolith edge analysis indicated that the zones composed of relatively compact micro-increments in sectioned otoliths are annual growth marks and are mainly formed during September and February. The results of the age evaluation of first annulus formation indicated that the first annulus does not represent the growth of a complete year. An age estimate (0.75 yr) for first annulus formation is proposed in this study. The oldest fish age observed in this study was 10 years old for females and 14 years old for males. The von Bertalanffy growth parameters [L_∞ (cm FL), K (yr^{-1}), t_0 (yr)] obtained were 103.5, 0.340, −0.53 for females and 114.0, 0.253, −1.01 for males. Sexual size dimorphism between males and females seemed to occur after reaching sexual maturity. A power function for expressing the length-weight relationship obtained by sex-pooled data was $a = 2.964 \times 10^{-5}$ and $b = 2.928$.

Discussion: This working paper used obliquely sectioned otoliths rather than a transverse section, which is the more common technique. The oblique sectioning method was not fully validated in the paper and otoliths were read by one person and as a result the accuracy and precision of ages produced by this technique are not known. The von Bertalanffy growth curve parameter estimates, especially L_∞, differ from those estimated in ISC/11/ALBWG/02 and in preliminary SS3 model runs (see Appendix 7). Furthermore, the estimate of L_∞ is inconsistent with existing size composition data for the TWN LL fishery, in which some fish larger than 130 cm are observed. The WG suggested that these differences may reflect regional bias in sampling since the albacore in this study were sampled from the western Pacific Ocean only. This paper also presents evidence of statistically significant sex-related differences in growth rates after age 6, with males reaching a larger maximum size than females. The WG noted that albacore fishery data are not sex-specific so there was no way to use this finding in the assessment model.

6.0 Stock Assessment Studies

6.1 Probable Values of Stock-Recruitment Steepness for North Pacific Albacore Tuna (ISC/11/ALBWG/11)

Summary — The simulation method of Mangel et al. (2010) was used to estimate probable values of stock-recruitment steepness for a Beverton-Holt stock-recruitment curve for north Pacific albacore (*Thunnus alalunga*). Information on albacore life history parameters including growth, maturity at age, average weight at length, natural mortality rate and reproductive ecology of albacore tuna was used. Mean steepness ranged from 0.84 to 0.95, depending upon the choice of growth curve. Sensitivity analysis to the assumed value of age-0 natural mortality found that increasing the natural mortality rate schedule reduced the estimates of mean steepness, regardless of the assumed growth curve used. The authors conclude that the mean steepness of North Pacific albacore stock-recruitment relationship was less than 1.0, and that assuming a mean steepness of 1.0 (as in the last assessment) is biologically implausible because it implies that there is an infinite amount of compensation in the stock-recruitment relationship.

6.2 Calculation of the steepness for the North Pacific Albacore (ISC/11/ALBWG/18)

Summary — The steepness of the stock-recruitment relationship affects the results of a stock assessment and the stock management strategy. In this working paper, the steepness of the stock recruitment relationship for north Pacific albacore is estimated using the model proposed by Mangel et al. (2010). Mean steepness was estimated to be 0.95, assuming the von Bertalanffy growth curve fitted to otolith data in ISC/11/ALBWG/02. Sensitivity analysis for the assumptions of early life history longevity and maximum age shows that the estimated steepness increases as the length of the early life history period increases and maximum age in the stock increases. Steepness was not sensitive to the assumed age at 50% maturity. Based on the fact that the estimated steepness of the relationship is close to 1.0, environmental forcing is probably an important determinant of recruitment strength in the north Pacific albacore stock.

Discussion: The WG noted that the estimated steepness of the stock-recruitment relationship is related to the length of the early life history period in the analyses in ISC/11/ALBWG/11 and 18 and that there the definition of this period is ambiguous. The growth curves used in both ISC/11/ALBWG/11 and 18 were different shapes than the curve used in the base-case model. A plot of stock size and recruitment estimates is not informative concerning steepness. The WG discussed how to proceed based on these working papers and concluded that it would continue with the assumption of h = 1.0 in the base-case model, but include a sensitivity run assuming h = 0.85. However, the WG recognized that estimating steepness using Mangel et al.'s method is difficult because it depends largely on ambiguously specified parameters of the early life history of the fish. The definition of $F_{SSB\text{-}ATHL}$ implicitly assumes a stock-recruitment relationship since it seeks to prevent recruitment overfishing by maintaining SSB above the SSB-ATHL threshold (ATHL – average of the ten historically lowest estimated SSBs). It was concluded that this reference point would not provide an overly optimistic view of current stock status even with the assumed steepness (h) of 1.0 in base-case model. Further research on plausible steepness values prior to the next assessment is recommended.

7.0 Model Description - Parameterization and Assumptions

A seasonal, length-based, age-structured, forward-simulation population model was used to assess the status of the north Pacific albacore stock. The model was implemented using Stock Synthesis (SS) Version 3.11b (Methot 2011; http://nft.nefsc.noaa.gov/Stock_Synthesis_3.htm). Subcomponents within SS include a population model, an observation model and a statistical model. The population model is used to simulate the size structure of the population and the observation model uses the data inputs and selectivity functions to relate the simulated population to the data. The statistical model estimates best-fit model parameters by maximising a log-likelihood objective function, consisting of both likelihood (data) and prior information components. The base-case model is compared with a VPA reference run in order to understand and explain model-related differences in outputs, but only outputs from the SS model were used to assess current status and develop recommendations on conservation to managers. In this section, the base-case model parameterization, data sources, structural uncertainties, and the context for key sensitivity analyses regarding fishery data, biological parameters, and other modeling assumptions are described.

7.1 Stock Structure

North Pacific albacore tuna is assumed to be one well-mixed stock inhabiting the Pacific Ocean north of the equator from 10°N to 55°N latitude and between 120°E and 120°W longitude. This area includes all of the known catches of albacore in the north Pacific Ocean between 1966 and 2009 (Figure 7.1) and is supported by evidence from genetic, tagging, and seasonal fishing pattern studies (Suzuki et al. 1977; Chow and Ushima 1995; Takagi et al. 2001; Ichinokawa et al. 2008a).

7.2 Movements

North Pacific albacore are highly migratory and these movements are likely influenced by oceanic conditions (e.g., Polovina et al. 2001; Zainuddin et al. 2006, 2008). Details of the migration remain unclear, but seasonal movements have been observed (Ichinokawa et al 2008a), especially among juvenile fish (less than 5 years old; Childers et al. 2011). A portion of the juvenile fish are believed to move into the eastern and western Pacific Ocean in the spring and early summer, returning to the central Pacific Ocean in the late fall and winter where mixing among the eastern and western juveniles probably occurs. Adults tend to be distributed more widely than juveniles and migrate to lower latitudes to spawn. In this assessment, albacore were assumed to be distributed throughout the north Pacific Ocean, and region and season-specific movement rates were not explicitly modeled. However, region and season-specific fishery definitions were used to represent differences in the availability of different-sized fish in different regions and seasons (see Section 7.4).

7.3 Biology

7.3.1 Growth

Preliminary modeling during the October 2010 workshop (ALBWG 2010) demonstrated that there is uncertainty in growth curve parameter estimates and that the SS model outputs may be sensitive to growth curve parameterization, i.e., fixed or estimated, and the form of the curve. The WG established through additional runs and email discussion prior to this workshop (see Appendix 7) that estimating growth within the SS3 model resulted in the best fit to the length data and that the resulting growth parameter estimates were corroborated by independent parameter estimates produced when a von Bertalanffy curve was fitted to the otolith data in ISC/11/ALBWG/02. Based on these findings, the WG used a von Bertalanffy growth function to model the relationship between fork length (cm) and age for north Pacific albacore within the base-case model:

$$L_A = L_\infty + (L_1 - L_\infty)e^{-K(1-A)},$$

where L_A is the length-at-age A, L_∞ is the theoretical maximum length, K is the growth coefficient, and L_1 is the size of the youngest fish (A_1). The asymptotic length, L_∞, is:

$$L_\infty = L_1 + \frac{L_2 - L_1}{1 - e^{-K(A_2 - A_1)}},$$

where L_1 and L_2 are the sizes associated with ages near the youngest A_1 and oldest A_2 ages in the data. In this assessment, L_1 and L_2 were chosen as size at age 1 and L_∞, respectively. The growth parameters K, L_1, L_∞, and CVs for L_1 and L_∞, were estimated in the SS model to account for the variability in size-at-age distributions. Conditional age-at-length data from ISC/11/ALBWG/02 (see Section 5.1) were used to help with the estimation of these growth parameters since preliminary modeling results also showed that they stabilize the growth curve parameter estimates with respect to different model configurations.

The 2006 assessment (ALBWG 2007) used a hybrid growth curve in which mean length-at-age of juvenile albacore was estimated from surface fishery data and the mean length-at-age of adult albacore was approximated using the Suda (1966) growth curve. Suda's parameter estimates were 40.2 cm for L_1, 146.46 cm for L_∞, and 0.149 yr^{-1} for K. The WG concluded that Suda's (1966) estimated growth curve was not representative of the relationship between length and age in north Pacific albacore (see Section 5). However, a sensitivity run was performed in which the growth curve parameters in the SS3 base-case model were fixed to Suda's (1966) estimates for comparison with the 2006 assessment.

Although there is evidence of sexually dimorphic growth in the western Pacific Ocean (ISC/11/ALBWG/IP/01), the available fishery data are not sex-specific so both sexes are combined in the assessment model.

7.3.2 Weight-at-Length

Weight-length relationships are used to convert catch-at-length to weight-at-length data. A previous study (Watanabe et al. 2006; ISC/06/ALBWG/14) reported that there were seasonal differences in the relationship between weight (kg) and fork length (cm) of north Pacific albacore. The seasonal weight-at-length relationships used in this assessment are:

Quarter 1 (Q1): $W_L(kg) = 8.7 \times 10^{-5} L(cm)^{2.67}$,

Quarter 2 (Q2): $W_L(kg) = 3.9 \times 10^{-5} L(cm)^{2.84}$,

Quarter 3 (Q3): $W_L(kg) = 2.1 \times 10^{-5} L(cm)^{2.99}$,

Quarter 4 (Q4): $W_L(kg) = 2.8 \times 10^{-5} L(cm)^{2.92}$,

where W_L is weight at length L. These seasonal weight-at-length relationships were applied as fixed parameters in the SS model.

7.3.3 Maturity

Following Ueyanagi (1957), 50% of the albacore at age-5 and all fish age-6 and older are assumed to be mature. This maturity ogive was also used in the 2006 assessment (see Uosaki et al. 2006; ISC/06/ALBWG/19). However, since the 2011 assessment employs a length-based model, a sensitivity run using a length-based maturity schedule was conducted.

7.3.4 Spawning and Recruitment

North Pacific albacore probably spawn over an extended period from March through September in the western and central Pacific Ocean. Recent evidence based on a histological assessment of gonadal status and maturity (Chen et al. 2010a) shows that spawning in the western Pacific Ocean peaks between March-April, which is consistent with evidence from larval sampling surveys in the same region (Nishikawa et al. 1985). In contrast, studies of albacore reproductive biology in the central Pacific have concluded that there was a probable peak spawning period between June and August (Ueyanagi 1957; Otsu and Uchida 1959). Although albacore spawning may occur over an extended period, the WG assumed that there is one spawning and recruitment period in the second quarter of the year (Q2) based on the evidence from Nishikawa et al. (1985) and Chen et al. (2010a).

A standard Beverton and Holt stock-recruitment model was used in this assessment, with steepness (*h*) fixed at 1.0 (see section 6.0), because the likelihood profile on h shows minimum total likelihood occurs at h = 1.0 with the base-case model. The standard deviation of log-recruitment (sigmaR) was fixed at 0.6. The log of the virgin recruitment level, R_0, and annual recruitment deviates were estimated by the SS3 model. The offset for the initial recruitment relative to virgin recruitment, R_1, was assumed to be negligible and fixed at 0. Based on preliminary runs during the Modeling Subgroup meeting (Appendix 4), three eras are assumed for recruitment: early (1954-1968), main (1969-2007), and late (2008-09). Bias adjustment for recruitment was performed during the main era, but not during the early or late eras. A sensitivity analysis was performed in which steepness (*h*) was assumed to be 0.85 based on the findings in ISC/11/ALBWG/11 and ISC/11/ALBWG/18.

7.3.5 Natural Mortality

The natural mortality rate (M) was assumed to be 0.3 yr^{-1} across all ages, which is the same assumption used in the 2006 assessment (Uosaki et al. 2006; ISC/06/ALBWG/19) as no new data or analyses that support a change in this assumption are available. A sensitivity analysis assuming an M of 0.4 yr^{-1} (average M of the mortality vector assumed for south Pacific albacore; see Hoyle and Davies 2009) was performed.

7.3.6 Maximum Age

In this assessment, the maximum age of north Pacific albacore was assumed to be 15 years, which is the age of the oldest fish reported in ISC/11/ALBWG/02.

7.4 Fisheries

More than 50% of the albacore harvested in the north Pacific Ocean since 1952 have been taken in surface fisheries that catch smaller, predominately juvenile albacore. The major surface fisheries are the CAN troll, USA troll and pole-and-line fisheries, and the JPN PL fisheries. Longline fisheries tend to catch less than 50% of north Pacific albacore by weight and generally catch larger and older albacore. The major longline fisheries are the JPN and TWN LL fisheries. Total annual catches of albacore in the north Pacific Ocean peaked in 1976 at about 126,000 t, declined to the lowest level in 1991 at about 37,000 t, then increased to a second peak in 1999 at about 125,000 t (Figure 7.2).

Sixteen fisheries were defined on the basis of gear, location, season, and the unit of catch (numbers or weight) (Table 7.1). The aim was to define fisheries so that temporal changes in size distributions were relatively limited over the time series, especially seasonal differences. Preliminary analysis revealed strong seasonal differences in the size of fish caught (and hence temporally varying selectivity) in two fisheries (F6 and F7), which resulted in the decision to split these fisheries further into seasonal fisheries (F6s1, F6s2, F7s1 and F7s2) (see Appendix 4 for details). The operational areas of all defined fisheries are shown in Figure 7.3.

7.5 Data

Data used in this assessment included fishery-specific catches, length compositions, abundance indices, and conditional age-at-length data. These data were compiled and frozen for the assessment as of 15 December 2010. Data sources (fisheries) and temporal coverage of the available datasets are summarized in Figure 7.4.

The time period modeled in this assessment is 1966−2009. Within this period, catch and size composition data were compiled into quarters (Jan−Mar, Apr−Jun, Jul−Sep, Oct−Dec). Although some fisheries have catch data time series extending back to at least 1952, size composition sampling programs were either inconsistent or non-existent prior to 1966 and effort and location information are not always reliable.

7.5.1 Catch

This assessment used quarterly catch data from 1966 to 2009. Time series of quarterly catch were developed using logbook data so that the annual catch was consistent with the Category I data archived in the ISC-ALBWG database catalogue. Catch was reported in metric tons (t) for most fisheries, except for catches from the JPN OLLF1 and OLLF2 (F6s1, F6s2, and F8) and TWN LL (F12) fisheries, which were reported in 1,000s of fish. Catch was treated as known with negligible error. The historical catches used in this assessment are shown in Figure 7.2.

7.5.2 Abundance Indices

Annual indices of relative abundance were developed for eight fisheries (Table 7.2, Figure 8.1). Estimated annual values and CVs for each index are shown in Table 7.3. A season was assigned to each index based on the annual quarter in which the majority of catch was recorded. Visual inspection of all CPUE indices grouped by fishery type (surface or longline) showed that they exhibit similar trend patterns. Correlations between all surface indices and all longline indices were reasonably positive, which the WG interpreted as indicative of consistency among CPUE series, i.e., they do not exhibit major conflicts. However, a discrepancy in recent trends since 2000 between S2 (USA LL) and the other longline indices was noted. This discrepancy may be due to the relatively small area of operation of fishery F2 (USA LL) and is considered a signal that the reliability of this index as an indicator of overall abundance is low relative to other indices. Details of the methods and sources of data used to derive these indices can be found in references shown in Table 7.2. The coefficients of variation (CVs) of these indices were fixed in the base-case model based on the WG's judgement concerning the reliability of each index as an indicator of overall albacore abundance (see Section 7.7 for details).

Seasonally separated and annual CPUE indices for F6 were examined during the Modeling Subgroup meeting (Appendix 4). The S6 annual index is largely driven by the first quarter (Q1) CPUE index in this fishery and it was noted that catch in Q1 of F6 is the largest component of the JPN LL catch and therefore it was important to include in the model. The S6 index is the annual CPUE index for F6 rather than a true Q1 index. The WG agreed to this approach because there was no working paper supporting the development of the quarterly index at the workshop and because it was not possible to calculate a quarterly index once the data were frozen for the assessment as per ISC policy. Further research to document the methods used to develop a quarterly index for F6s1 and the characteristics of that index is a high priority recommendation for the next assessment.

7.5.3 Length Composition Data

This assessment used quarterly length composition data from 1966 to 2009. Length frequency data were available for eight fisheries (Figure 7.5) and were compiled using 1-cm size bins for 26-90 cm, 2-cm size bins for 90-100 cm, and 4-cm size bins for 100-140 cm, where the labels mark the lower boundary of each bin as required by SS. Each length frequency observation consisted of the actual number of albacore measured for most fisheries and catch-at-size data for JPN PL and JPN LL fisheries. Most of these fisheries exhibit clear and relatively stationary modes for a given quarter throughout the time series (Figure 7.5).

Fork lengths of albacore for JPN LL (F6s1, F6s2, and F8, 1966-2009), and JPN PL fisheries (F4 and F5, 1968-2009) were measured to the nearest cm at the landing ports or onboard fishing vessels. Catch-at-size data were derived from the actual size data by the National Research Institute of Far Seas Fisheries (NRIFSF) (see ISC/11/ALBWG/08).

Fork lengths of albacore (to the nearest cm) for the UCLTN and pole-and-line fishery (F1, 1966-2009), and USA LL fishery (F2, 1994-2008) were collected through port sampling and longline observer programs, respectively, and were compiled by the Southwest Fisheries Science Center (SWFSC) (Teo et al. 2010; ISC/10-3/ALBWG/02). Length composition data from the CAN component of the UCLTN fishery were not used in this assessment because the WG considered the data from the USA component to be representative of the entire fishery. Length compositions for the USA LL fishery in 2009 were not used in this assessment due to errors in the database for that year.

Fork lengths of albacore (to the nearest cm) for the TWN LL fishery (F12, 1995-2009) were measured onboard fishing vessels and compiled by the Overseas Fisheries Development Council (OFDC), Taiwan (Chen et al. 2010; ISC/10-3/ALBWG/08). The WG previously concluded that length composition data from several years (1995, 1999, 2000, 2002) were not representative of the TWN LL fishery in terms of spatial and temporal scope. In addition, length composition data were not available for 2001 nor during the historical period from 1966 to 1994. Previous analysis demonstrated that length compositions from 1996-1998 were substantially different from the length compositions from 2003-2009 due to changes in the fishing operations of this fishery (Chen et al. 2010b, ISC/10-3/ALBWG/08; ISC/11/ALBWG/04).

Length composition data from the early period of the TWN LL fishery (1996-1998) were combined into a single 'super-year' in order to reduce the influence of observed inconsistencies during this period (ISC/11/ALBWG/04). A super-year blends size data across multiple years and causes the model to calculate an expected length composition for each time period in the super year sequence. All of these expected compositions will have equal weight in the calculation of the expected super-year value.

Effective sample sizes for length composition data of all fisheries were scaled to the average number of trips for the UCLTN fishery (N ~ 113.65), such that the average effective sample size for each fishery is equal to 113.65.

7.5.4 Conditional Age-at-Length

Otolith-based ages and fish sizes (fork length, cm) from ISC/11/ALBWG/02 were used to construct conditional age-at-length data for four fisheries (F1, F2, F6s1, and F8). The ages assume a birth date of 01 May and as a result fractional ages of fish sampled prior to 01 May were rounded up while those sampled after 01 May were rounded down since the base-case model assumes integer ages. Otolith-based ages from this study are assumed to have standard errors of ±2 years for fish older than 5 years and ± 1 years for fish 5 years and younger.

7.6 Initial Conditions

Initial fishing mortality was estimated for two surface (F1, F4) and one longline fishery (F7) and the initial equilibrium catch was calculated as the 14 year average of total catch (1952-1965) in these fisheries. The average catch in F1, F4, and F7 was 19,499, 28,575, and 18,180 t, respectively.

7.7 Data Weighting

Two types of weighting were used in the model: (1) weighting of the different data types (sources of information, e.g., length compositions, abundance indices, and conditional age-at-length) relative to each other, and (2) relative weighting among CPUE indices. Length composition and conditional age-at-length data from all fisheries were down-weighted by using lambda values of 0.01 and 0.1 respectively, relative to the abundance indices with a lambda of 1.0. A sensitivity run was conducted in which the length composition data were up-weighted relative to the base-case using a lambda of 0.025. An additional sensitivity run was conducted to assess the impacts when conditional age-at-length data are not down-weighted (lambda = 1.0).

There is no objective method of establishing weightings (lambda) for different information sources in the SS model. The WG compared SSB estimates from preliminary base-case model runs with values reported for other tuna stocks, particularly south Pacific albacore (Table 7.4) and on this basis down-weighted the length composition data (lambda = 0.01) so that the scaling of the estimated quantities was considered biologically plausible and consistent with productivity reported in other assessments.

The WG considered S6 (CPUE index of F6s1) to be the most reliable indicator of albacore abundance and tuned the base-case model to S6 by assuming a fixed CV of 0.2. The CV is a measure of the weighting of these data in the model, with a lower CV (higher weighting) forcing the model to fit the index more tightly than an index with a higher CV value (lower weighting). The relative weightings (CVs) used for the other CPUE indices in this assessment, based on the WG's judgement of their reliability as indicators of albacore abundance, were:

1. S1 = 0.4 (1966-1999), 0.5 (2000-2009);
2. S2 = 0.5;
3. S3 = 0.3;
4. S4 = 0.3;
5. S5 = 0.4 (1985-2003), 0.5 (2004-2009);
6. S7 = 0.4; and
7. S8 = 0.5.

Both S1 (from F1 – UCLTN) and S5 (from F5 – JPN PLSF) have two weightings, depending on the time block. Both of these indices are surface fishery indices and the down-weighting of these indices in recent years (CV = 0.5) relative to the earlier periods (CV = 0.4) reflects a change in the operational area of each fishery from broad areas of the Pacific Ocean early in the time series towards the coasts of North America and Japan, respectively, in recent years. A sensitivity analysis was performed to check these weightings by fixing the CV of S6 at 0.2 and estimating the CVs of the other indices in the model, i.e., allow the data to determine the weightings.

7.8 Selectivity

Selectivity in the assessment model is fishery-specific and is assumed to be length-based. Selectivity affects the size distribution of the fish removed from the population and the expected length-frequency distribution and is, therefore, an influential component of the model given the relative importance of length-frequency data in the total log-likelihood function. Selectivity patterns were estimated for all fisheries with length composition data.

Selectivity patterns for all surface fisheries (F1, F4, F5) were assumed to be dome-shaped and constant over time. In order to improve the robustness of the F4 selectivity pattern, the width between the ascending and descending limbs (the top) was fixed at a value of -4. The initial and final parameters of the dome-shaped selectivity patterns were not estimated by the model; all other selectivity parameters were estimated.

Selectivity patterns for the longline fisheries were either asymptotic (flat-topped) or dome-shaped, depending on the size of fish encountered by the fishery. Since the largest albacore were caught by F2 and F8, asymptotic selectivity was assumed for F2 and F8. However, dome-shaped selectivity was assumed for F6 and F12 because inspection of the length composition data demonstrated that these fisheries caught smaller fish than F2 and F8. Two time-periods were implemented for selectivity in F2 (2001-2004, other years), F6s1 (1966-1992, 1993-2009), and F12 (1995-2002, 2003-2009) to account for time-varying length composition data observed in these fisheries. Sensitivity runs for selectivity assumptions were conducted in which the selectivity of F6s1 was assumed to be asymptotic and time blocks were removed one-by-one from the F2, F6s1, and F12 selectivity patterns.

Selectivity patterns of fisheries without length composition data were mirrored to the selectivity patterns of fisheries with similar operations, area, and season for which a selectivity pattern was estimated. Mirrored selectivity patterns were as follows:

1. F3 mirrored F1;
2. F7s1 and F13 mirrored F6s1;
3. F7s2 mirrored F6s2;
4. F9 mirrored F8; and
5. F10 , F11 and F14 mirrored F5.

7.9 Catchability

Catchability (Q) is estimated using the assumption that survey indices are proportional to vulnerable biomass with a scaling factor of Q and is assumed to be constant over time for all indices.

8.0 Results

8.1 Model Fit Diagnostics

Model fits to the data and likelihood components were systematically checked by the WG. Total likelihood for the base-case model was approximately 67.4 units.

8.1.1 Abundance Indices

Model fits to CPUE indices were considered acceptable given the relative weightings (CVs) on these indices (Figure 8.1). The fit to S1 (F1 - UCLTN) was poor from 2005-2009 when trends in this index conflict with trends in S4 (F5 - JPN PLSF). The model does not fit S2 (F2 – USA LL) well, exhibiting positive residuals early in the series and negative residuals in recent years. This poor fit may be related to the limited area of this index relative to the area of the stock and standardization may not have accounted for changes in catchability related to regulatory changes experienced by this fishery (e.g., a 2001-2004 closure of the shallow-set swordfish component of this fishery).

8.1.2 Length Composition

Model fits to length composition data aggregated by fleet were good (Figure 8.2) considering that the length composition data were down-weighted in the model with lambda = 0.01 (see Section 7.6.2). These fits may be the result of the clear and relatively stationary modes in the data (Figure 7.5). Pearson residual plots of length composition fits show positive residual patterns, especially for large fish in F6s1 (mid-1980s to early 1990s) and F8 (1980s to mid-1990s) (Figure 8.3). The WG considered these fits acceptable given the time blocking applied to selectivity patterns of some fisheries and the down-weighting of the length composition data.

8.1.3 Conditional Age-at-Length

The estimated growth model fit the conditional age-at-length data relatively well, especially older fish from F1, F2, and F10 (Figure 8.4). However, estimated length-at-age was slightly higher than expected for data from F6 and lower than expected for age-1 and age-2 fish from F1. These poor fits to the data may be indicative of regional differences in growth that are assumed to be negligible in this model, but will be investigated in the period between assessments.

8.2 Model Parameter Estimates

8.2.1 Growth

The estimated parameters values for the von Bertalanffy growth model in this assessment were L_1 = 44.4 cm, L_∞ = 118.0 cm, K = 0.2495 yr^{-1}, CV_1 = 0.0599, and CV_2 = 0.0339. These estimates are similar to estimates of these parameters when a von Bertalanffy model was fitted to otolith data independently (ISC/11/ALBWG/02 - see Section 5.1). However, the growth model in this assessment is substantially different from the growth model based on Suda (1966) parameter estimates used in the 2006 assessment (Figure 8.4). The most noticeable differences are that the Suda growth model estimates a substantially larger L_∞ (146.46 cm) than this assessment and the Suda growth model does not fit the conditional age-at-length data for fish less the age-3 or older than age-6 well.

8.2.2 Selectivity

All selectivity parameters were relatively well estimated and within their boundaries, although the selectivity curve for F5 had a wider and flatter top than expected. After examining the estimated selectivity curves (Figure 8.5) and their associated length composition data fits, the WG concluded that the estimated selectivity curves were reasonable.

8.3 Stock Assessment Results

8.3.1 Total and Spawning Stock Biomass

Total stock biomass estimated by the base-case model exhibits different trends at the beginning, middle and end of the model period (Figure 8.6A). Biomass declines from approximately 1.0 million tonnes around 1971 to about 500,000 t by the late 1980s, followed by a steady increase to the highest estimated level (1.2 million tonnes) by 1996. Since the mid-1990s, stock biomass has been steadily declining to around 800,000 t by 2009 (Figure 8.6A).

Spawning stock biomass (SSB) estimated by the base-case model has gone through three phases during the modeled time period (Figure 8.6B): (1) an early phase from the 1966 to the mid-1970’s when estimated SSB was relatively high around 400,000 t, (2) a middle phase during 1980’s in which SSB declined to approximately 300,000 t, and (3) a recent period of higher SSB from the 1990’s to 2009. During this recent phase, estimated SSB increased and reached its highest level in 1999 (about 504,000 t). The estimated SSB in 2009 is near the historical median of about 405,000 t (Table 8.1).

8.3.2 Recruitment

Average estimated recruitment was approximately 48 million fish annually and the CV of the recruitment time series was 0.24 (Table 8.1). Three periods were apparent in the estimated recruitment time series (Figure 8.6C): (1) a low recruitment period (1978-1987), and (2) two high recruitment periods (1966-1977, 1988-2009). These recruitment periods may reflect the influence of changing ocean conditions on stock dynamics, but existing research supporting this hypothesis is limited at present.

8.3.3 Fishing Mortality

Since retrospective analysis of the assessment model did not reveal any specific bias in estimates of terminal year fishing mortality (see Section 8.5), current fishing mortality for this assessment was defined as the age-specific geometric mean of the estimated annual instantaneous rate of fishing mortality from 2006 to 2008, ($F_{2006\text{-}2008}$). Juvenile albacore experience the highest fishing mortality while adult albacore experience a lower, but relatively stable level of fishing mortality (Figure 8.7). $F_{2006\text{-}2008}$ increases to a maximum at age-3 and then declines to a relatively low, but stable level through ages 7 to 15 (Figure 8.7). In addition, $F_{2006\text{-}2008}$ is consistently lower than $F_{2002\text{-}2004}$ (current fishing mortality in the 2006 assessment) up to age-6, after which both measures of F are similar.

8.4 Convergence (Jitter analysis)

Jitter analysis is a quality control procedure used to ensure that the model is not converging on a local minimum. Jitter values of 0.1, 0.2, and 0.3 were randomly added to all parameters and 50 trials were run for each jitter value (Figure 8.8). Five of 50 trials failed to converge when jitter values of 0.2 and 0.3 were added. Visual inspection of SSB plots shows that trends and levels are consistent with the base case, regardless of the jitter value applied. However, as jitter values increase, confidence intervals increased, perhaps due to changes in selectivity curves, but total model likelihood did not change, remaining at approximately 67 units. Based on these results, the WG concluded that the assessment model is relatively stable and is probably converging on a global minimum.

8.5 Retrospective Analysis

Retrospective analysis was conducted to assess the consistency of stock assessment results by sequentially eliminating one year of data while using the same base-case model parameterization. In this analysis, the WG removed up to four years of data and examined changes in SSB and recruitment as more data are removed from the model. The results of this analysis are useful in assessing bias and uncertainty in terminal year estimates.

Retrospective analyses were conducted by removing one year (2009), two years (2009 and 2008), three years (2009, 2008, and 2007) and four years (2009, 2008, 2007, and 2006) of data (Figure 8.9). The retrospective analyses show the same relative trends in the estimates of SSB, i.e., there is no pattern of differences consistent with bias in terminal estimates of SSB. Some uncertainty is present in terminal year point estimates of SSB, but the magnitude of this uncertainty is minimal relative to the confidence intervals around SSB estimates. In contrast, the retrospective analyses show that recent recruitment estimates tend to exhibit much higher uncertainty than SSB, but are not biased. Based on these results, the WG did not use recruitment estimates for 2008 and 2009 in the future projection analysis (see Section 8.8).

8.6 Sensitivity to Alternative Assumptions

Sensitivity analyses examine the effects of plausible alternative assumptions on the base-case model results. The sensitivity analyses conducted in this assessment (Table 8.2) are categorized into three themes, including (1) data weighting, (2) biology, and (3) selectivity. For each sensitivity run, comparisons of spawning stock biomass and recruitment trajectories, as well as F-at-age for two temporal periods (2002-2004 and 2006-2008) and likelihood profiles, were completed.

8.6.1 Dropping Each CPUE Index

This set of sensitivity runs was conducted to assess which CPUE indices were most influential in determining the scaling, trends and trajectories of estimated quantities in the base-case model. Dropping individual indices (setting lambda = 0 for that index) revealed that S7 was the most influential index for scaling and trends in SSB and recruitment (Figure 8.10). When other indices are removed, the scaling of SSB and to a lesser degree, recruitment, change, but the pattern of trends or trajectory remained consistent with the base-case model. Dropping S1 and S2 scaled SSB up relative to the base-case while dropping all other indices, including S7, scaled SSB down relative to the base-case. S7 had the largest scaling effect of all indices.

8.6.2 Changing Length Composition Data Weighting

Up-weighting the length composition data (lambda = 0.025) relative to the base-case weighting (lambda = 0.01) scales SSB and recruitment up, while down-weighting length composition data (lambda = 0.001) relative to the base-case scales SSB and recruitment down (Figure 8.11). Changing lambda does not alter trends or trajectories in either quantity. In addition, the F-at-age pattern scales up and down with lambda, but $F_{2006\text{-}2008}$ is consistently lower than $F_{2002\text{-}2004}$.

8.6.3 Estimating CVs for CPUE indices

In this run the CV for S6 was fixed = 0.2 because the WG considers this index to be the most reliable indicator of north Pacific albacore abundance, and the CVs for all other indices were estimated by the model. Although estimating the CVs resulted in more pessimistic SSB and recruitment scenarios than the base-case model, the trends and trajectory of these quantities did not change (Figure 8.12). The estimated CVs are:

S1 – 0.387,
S2 – 0.827,
S3 – 0.282,
S4 – 0.309,
S5 – 0.453,
S6 – 0.2 (fixed),
S7 – 0.200, and
S8 – 0.305.

Most of the estimated CVs are similar to the CVs used in the base-case scenario (see Section 7.7), except for S2, which was much greater than assumed in the base-case model. The F-at-age pattern from this run was relatively stable and $F_{2006\text{-}2008}$ was consistently lower than $F_{2002\text{-}2004}$.

8.6.4 Growth Parameters Fixed to Suda Estimates

When the growth parameters were fixed to the Suda (1966) estimates, SSB and recruitment decreased relative to the base-case model and F-at-age was much higher for all age classes, with a different pattern and substantially higher F at older ages than in the base-case model (Figure 8.13). Total likelihood of the base-case model was more than 100 units better than the Suda sensitivity run (Figure 8.13E). Since the 2006 assessment used the Suda growth curve parameters, this sensitivity run was also conducted as a future projection scenario (see Section 8.8) to assess the robustness of management advice to this important change in the assessment model. Despite the different F-at-age pattern, $F_{2006\text{-}2008}$ was consistently lower than $F_{2002\text{-}2004}$.

8.6.5 Steepness (h) = 0.85

Reducing steepness (h) from 1.0 (base case) to 0.85 increased the scaling of SSB and recruitment, but decreased F-at-age relative to the base-case model (Figure 8.14). Total likelihood of the base-case model is slightly better than the total likelihood for h = 0.85 (Figure 8.14E). The increases in SSB and recruitment are likely related to the model increasing recruitment to compensate for catches removed from the stock since model has relatively little information on virgin biomass and recruitment to anchor the stock-recruitment relationship (Figure 8.15).

8.6.6 Up-weighting Conditional Age-at-Length Data

Up-weighting the conditional age-at-length data (increasing lambda from 0.1 in the base-case to 1.0) results in slightly higher SSB and recruitment estimates, but the general trends remain the same (Figure 8.16). F-at-age patterns are consistent with the base-case, as is the finding that $F_{2006\text{-}2008}$ is lower than $F_{2002\text{-}2004}$.

8.6.7 Natural Mortality = 0.4 yr^{-1}

Changing the assumed natural mortality (M) for all ages from 0.3 yr^{-1} (base case) to 0.4 yr^{-1} led to higher scaling of SSB and recruitment and a decrease in F-at-age, although $F_{2006\text{-}2008}$ was consistently lower than $F_{2002\text{-}2004}$ (Figure 8.17). Total likelihood favours the base-case model.

8.6.8 Length-based Maturity Schedule

The WG considered a sensitivity run assuming a length-based maturity schedule important because the base-case model is length-based, rather than age-based. Using a length-based maturity schedule (length of 50% maturity was 85 cm FL) rather than the age-based maturity schedule in the base case model resulted in a higher scaling of SSB relative to the base-case estimates, but no change in recruitment levels or trends (Figure 8.18). The WG interpreted these results as an indication that the maturity schedule is influential in scaling SSB because the length-based schedule used in this sensitivity run caused age 4 to be included in SSB estimates, contrary to the age-based schedule (age-5 and older). Further research is needed between assessments to develop an appropriate length-based maturity schedule.

8.6.9 Asymptotic Selectivity for F6

Assuming asymptotic or flat-topped selectivity for F6 rather than the dome-shaped selectivity pattern applied in the base-case model results in substantially lower SSB and recruitment relative to the base-case, but no changes in the trend patterns for either quantity (Figure 8.19). F-at-age is higher and importantly, F-at-age for large fish caught by longline is higher relative to F-at-age of younger fish caught by surface fisheries. The impact on total likelihood is substantial, increasing likelihood by more than 10 units relative to the base-case, i.e., the assumption of asymptotic selectivity for F6 leads to a poorer fitting model.

8.6.10 Removal of Selectivity Time-blocks

Removing time blocks one-by-one for selectivity on fisheries F2, F6, and F14 lowered the scaling of SSB relative to the base-case for all time blocks removed, but did not have much impact on recruitment levels or trends (Figure 8.20). F-at-age patterns were identical to the base-case model and $F_{2006\text{-}2008}$ was consistently lower than $F_{2002\text{-}2004}$, regardless of which time-block was removed. Selectivity patterns in other fisheries did not change (Figure 8.21) and the WG concluded that the use of time blocks in base-case model is consistent with the available data.

8.6.11 Summary of Sensitivity Analyses

The scaling of SSB estimated by the base-case model is substantially affected by (1) the relative weighting of abundance indices and length composition data; (2) the selectivity assumption for fishery F6; (3) a length-based maturity schedule; and (4) the growth curve. Recruitment estimates were also affected by these alternative assumptions, but the magnitude of change was less than observed for SSB estimates. The pattern of F-at-age was affected only by fixing the growth curve to the Suda (1966) parameter estimates and selectivity assumption for fishery F6 and for both runs F-at-age for adult fish (age-5 and older) was higher relative to F-at-age in other sensitivity runs. All sensitivity runs show that $F_{2006\text{-}2008}$ is consistently lower than $F_{2002\text{-}2004}$ and that the SSB and recruitment trajectories remain relatively consistent. Sensitivity runs examining the impacts of higher natural mortality and up-weighting conditional age-at-length data had relatively little impact on model estimated quantities. Although there is uncertainty in absolute estimates of SSB and recruitment, F_{SSB} calculations are likely unaffected because the pattern of trends in SSB and recruitment were robust to alternative assumptions.

8.7 Fishery Impact Analysis

The impact of each fishery category on the spawning stock biomass was evaluated. The analyses were conducted using the base-case model and dropping the annual (1966-2009) and initial equilibrium catches for longline (USA, JPN, TWN, KO), surface (UCLTN and JPN PL), and "other" miscellaneous fisheries (fisheries other than those in the longline and surface categories) from the SS3 base-case data file one-by-one and calculating the SSB trajectory for each scenario. The magnitude of differences in the simulated spawning biomass trajectories with and without fishing indicates the impact of the major fishery types on the spawning biomass of north Pacific albacore (Figure 8.22). Surface fisheries, which harvest the smaller immature juvenile fish, had the largest impact for almost the entire modeled period, especially during 1970s and 1980s. The impact of longline fisheries on the stock increased after the mid-1990s and in recent years is close to the impact of surface fisheries. The increased longline impact may be related to a concurrent decline in surface fishery effort at the same time. The impact of "other" fisheries was usually minimal relative to the surface and longline categories. However, the impact of these fisheries became larger during late 1980s and 1990s when high seas driftnet fishing was occurring prior to the implementation of a ban in 1993, although their overall influence on SSB was apparently small relative to the impact of surface and longline fisheries.

9.0 Future Projections

Stock projections were used to estimate the probability that future SSB will fall below a threshold defined as the average of the ten historically lowest SSB estimates (SSB-ATHL) in at least one year of a 25-yr (2010-2035) projection period (see ISC/11/ALBWG/14). These projections were made in response to a request from Northern Committee (NC) of Western and Central Pacific Fisheries Commission (WCPFC). The base-case configuration assumes current fishing mortality ($F_{2006-2008}$) and random resampling of historically estimated recruitment (1966-2007) during the stock assessment period.

The stochastic future projections are based on an age-structured population dynamics model identical to SS in principle, and are implemented in R with coding that was used in the assessment of Pacific bluefin tuna (see Ichinokawa et al. 2008b; ISC/08/PBFWG-1/15). The projections were conducted based on results of the base-case model configuration and each projection is based on 200 bootstrap replicates to estimate parameter uncertainty followed by 10 stochastic simulations of future trends. Detailed algorithms for conducting the projections with options for future scenarios, and reference points, including F_{SSB}, are described in Ichinokawa (2011), which is available electronically at: http://cse.fra.affrc.go.jp/ichimomo/

A constant F scenario using current fishing mortality ($F_{2006-2008}$) was used as the base-case of the future projection analysis. Projections with $F_{2002-2004}$ were also conducted for comparative purposes because the 2006 assessment defined current fishing mortality as the geometric mean of apical F for 2002-2004, $F_{2002-2004}$. Although a constant catch scenario was conducted, the WG considered it unrealistic for this stock because catch is largely dependent on annual recruitment, and hence, this scenario is treated as a sensitivity run. The constant catch sensitivity run was based on average quarterly catches between 2006 and 2008, assuming that total quarterly catch weights are constant in the future, but not partial catches by fleet. The total catch in weight assumed in the constant catch scenario is 75,224 t (average for 2006-2008). Because the total weights are derived from SS estimates, they are not exactly equal to the officially reported catch weights.

Recruitment for future projections was randomly resampled from the historical recruitment time series estimated by the base-case model (Figure 9.1). Retrospective analysis of the base-case (Figure 8.9) indicated that there was relatively large uncertainty in recruitment estimates (although these estimates were not biased) in the final two terminal years (2008 and 2009) so the WG dropped these years from the time series for future projections. In addition, based on the historical trend of estimated recruitment in the base-case, a low recruitment phase (1978-1987) and high recruitment phase (1988-2004) were identified and used for independent sensitivity runs. Recruitment scenarios and average recruitment levels for those periods are:

1. Base-case: estimated from 1966 to 2007: average R = 47,895,000, CV; 0.24;
2. Run 2: low recruitment phase from 1978 to1987: average R = 35,171,000, CV; 0.16; and
3. Run 3: high recruitment phase from 1988-2004: average R = 54,373,000, CV; 0.22.

Structural sensitivity runs of the base-case scenario included future projections in which: (1) growth curve parameters were fixed to the Suda growth curve; (2) length composition data were down-weighted using lambda = 0.001; and (3) steepness of the stock-recruitment (h) was assumed to be 0.85. All future projection scenarios and associated sensitivity runs are summarized in Table 9.1.

The $F_{SSB\text{-}ATHL\text{-}50\%}$ reference point was estimated for several recruitment scenarios and structural sensitivity runs to assess the robustness of scientific advice stemming from the base-case model to plausible alternative assumptions. Important runs requiring reference point calculations included:

- base-case;
- low recruitment;
- replacing the growth curve with the Suda curve;
- down-weighting the length composition data with lambda = 0.001;
- high recruitment;
- steepness; h = 0.85; and
- current F from the 2006 assessment ($F_{2002\text{-}2004}$).

The projections begin 1 January 2008 for consistency with the base-case recruitment scenario. Sensitivity runs conducted with projections beginning 1 January 2009 and 1 January 2007 (ISC/11/ALBWG/14) confirmed that the starting year is not influential to short- and long- term future projection results. Known catches for 2008, 2009 and 2010 were used for future projections. Total catch weights for 2008 and 2009 were derived from estimates by SS, while total catch in 2010 was based on preliminary catch weights in the WG catch table (Appendix 6). Note that catch weights used for the future projections (shown in Table 9.2) differ slightly from those reported in the updated catch table in Appendix 6 because they were taken from an incompletely updated catch table.

9.1 Base-case Scenario Results

Box plots of projected recruitment, SSB, and total catch for the base-case scenario using $F_{2006\text{-}2008}$, and $F_{2002\text{-}2004}$ are shown in Figure 9.2. Under the base-case scenario ($F_{2006\text{-}2008}$), SSB is expected to fluctuate around the historical median SSB, while $F_{2002\text{-}2004}$ would result in a decrease of future median SSB to below the base-case scenario. Because $F_{2006\text{-}2008}$, is lower than $F_{2002\text{-}2004}$ (Figure 8.7), future SSB is higher than expected compared to the $F_{2002\text{-}2004}$ harvesting scenario. The median SSB in the constant catch scenario increases relative to the constant F2006-2008 scenario (Figure 9.3), but the increase is moderate.

9.2 Alternative Recruitment Scenarios

Alternative recruitment scenarios and structural sensitivity runs produced future median SSB trajectories, after scaling the results to SSB_{2008}, that were similar to the base-case (Figure 9.4). SSB_{2008} was used to scale these results because it is estimated to be approximately equal to the historically observed median SSB level in the base-case model. Low recruitment resulted in future median SSB stabilizing at about 70% of SSB_{2008}. Sensitivity runs with Suda growth parameters or high recruitment both resulted in future SSB about 15% above SSB_{2008}. Only the low recruitment scenario increased the probability that future median SSB would fall below SSB-ATHL by the end of the projection period to greater than 50% (Table 9.3). Future SSB levels relative to current SSB in 2008 were relatively insensitive to the other assumptions that were tested.

Based on these results, the WG concluded that the future SSB projection results were robust to alternative structural assumptions and recruitment scenarios. If the current average historical recruitment level and fishing mortality ($F_{2006\text{-}2008}$) do not change, then SSB is expected to fluctuate around the historical median level in the short-term and over the 25-yr projection period.

9.3 Biological Reference Points

The Northern Committee of the Western and Central Pacific Fisheries Commission established an interim management objective for north Pacific albacore in 2008. The objective is to maintain the spawning stock biomass (SSB) above the average of the ten historically lowest estimated points (ATHL) with a probability greater than 50% (Northern Committee 2008). The NC requested that the ALBWG evaluate the status of the north Pacific albacore stock against $F_{SSB\text{-}ATHL\ 50\%}$ for a 25-yr projection period. $F_{SSB\text{-}ATHL\ 50\%}$ is the fishing mortality, F, that will lead to future minimum SSB falling below the SSB-ATHL threshold level at least once during the projection period (2010-2035).

The F-based reference point $F_{SSB\text{-}ATHL}$ is one of a group of simulation-based biological reference points (BRP) using spawning biomass thresholds proposed for north Pacific albacore (Conser et al. 2005; ISC/05/ALBWG/06). Unlike other BRPs used in fisheries management, F_{SSB} is not an equilibrium concept and therefore does not assume that future SSB or yield will remain constant at some specified level. As a simulation-based BRP, $F_{SSB\text{-}ATHL}$ can incorporate non-equilibrium dynamics, uncertainty in the stock size estimates, and other parameters from the assessment as well as uncertainty in recruitment in future years.

The SSB-ATHL threshold can be derived from point estimates of SSB or bootstrap estimates of ATHL. Uncertainty in the estimated SSB time series was evaluated with parametric bootstrap analysis (Figure 9.5), which demonstrated that point estimates of SSB are subject to high uncertainty and are negatively biased relative to the median of the bootstrap estimates throughout the time series. An SSB-ATHL threshold level was estimated in each bootstrap iteration and these estimates were used in calculating $F_{SSB\text{-}ATHL}$ since using point estimation of SSB-ATHL did not properly reflect the effect of future harvesting strategies (ISC/11/ALBWG/14). Using the bootstrap estimates of SSB-ATHL captures some of the uncertainty in the historical spawning biomass estimates and may, therefore, be a conservative estimate of this quantity.

9.3.1 $F_{SSB\text{-}ATHL\text{-}50\%}$ Reference Point

The sensitivity of $F_{SSB\text{-}ATHL}$ estimates to different recruitment scenarios and structural assumptions described in Section 9.1 is shown in Table 9.4 using the ratio of $F_{2006\text{-}2008}/F_{SSB\text{-}ATHL}$ (F-ratio). The F-ratio in the base-case projection is estimated to be 0.71, which means that current F ($F_{2006\text{-}2008}$) is about 30% lower than the F that will result in future SSB falling below the

SSB-ATHL threshold level at least once during the 2010-2035 projection period. Although the estimated $F_{SSB\text{-}ATHL}$ depends on future projection scenarios, the F-ratios of most $F_{SSB\text{-}ATHL}$ estimates are well below 1.0, except for the low recruitment and Suda growth curve runs, where the ratio is approximately 1.0. However, since the Suda growth curve is not representative of growth in this stock (see Section 5.0), the estimation of the F-ratio from the Suda growth curve run is not considered a plausible future scenario. Consequently, the WG concluded that $F_{SSB\text{-}ATHL}$ and the resulting advice based on this reference point is probably robust to different plausible structural assumptions in the base-case model. However, if future recruitment is lower than the historical average level, then the risk that future SSB falls below SSB-ATHL will increase to 54% (Table 9.3).

9.3.2 Other Candidate Reference Points

No other reference points are currently used in north Pacific albacore management. A suite of candidate reference points and their associated estimates from the base case scenario are presented when discussing stock status (Section 11.1).

10.0 VPA Reference Run

The ALBWG switched from the virtual population analysis (VPA) model used in the 2006 assessment to a statistical catch-at-length model in the present assessment. VPA assumes that the observed catch-at-age data are known without error and that the fishing selectivity pattern varies from year to year, whereas the statistical catch-at-length model assumes that the selectivity pattern is fixed over time and that differences between observed and model-predicted catch-at-length data reflect errors associated with age reading and other sources of error.

10.1 Data

The VPA-2BOX platform uses a ‘one zone’ hypothesis which requires a single catch-at-age (CAA) matrix. This matrix was developed by combining the various fishery-specific matrices constructed by the individual nations with fishery data updated through 2009. Whereas the 2006 assessment defined 17 age-specific fisheries, the VPA reference run at this Workshop used six age-aggregated fisheries (Table 10.1). Six CPUE indices were prepared from five fisheries (UCLTN, JPN PL (1972-1984, 1985-2009), JPN LL, USA LL and TWN LL) by individual nations (Table 10.2 and Figure 10.1). Partial catch vectors were used to estimate selectivity-at-age for each index.

10.2 Parameterization

The VPA reference run used the same parameterization as the previous assessment in 2006, with updated catch-at-age and new abundance indices between 1966 and 2009. Natural mortality was assumed to be constant over time and across all ages (M = 0.3). Recruitment was defined as total number of age-1 fish. Based on results from Ueyanagi (1957), this VPA run assumed that the median age of maturity of north Pacific albacore was age-5 and that fish at age-6 or older are fully mature. The growth model from Suda (1966) was applied, which differs from the growth model used in the SS3 base-case, but is consistent with parameterization in the 2006 assessment.

10.3 Results

The SSB estimates for recent years were at relatively high levels, averaging approximately 115,000 t. The estimated SSB in 2009 (about 143,500 t) was 40% above the overall time series average (102,300 t) (Figure 10.2A). Recruitment declined from 1970 to 1988 and has remained between 20 and 45 million fish since 1994 (Figure 10.2B).

Overall trends in F-at-age were similar for all ages in the reference run and the 2006 assessment (Figure 10.3). One important difference is that F-at-age for the oldest fish has decreased while F-at-age 4 has increased since 2005 in the reference run, relative to the 2006 assessment results. Overall, $F_{2006\text{-}2008}$ is lower than $F_{2002\text{-}2004}$, which is consistent with the SS3 base-case model results.

10.4 Conclusions

Recent biomass trends in the VPA reference run have changed with respect to the 2006 assessment results. In general, SSB estimates in this VPA were relatively flat after 2003 rather than declining as in the 2006 assessment. This more optimistic result was probably due to the addition of 4 more years of catch data. Recruitment has remained between 20 and 45 million fish since 1994, near the middle of the range for the entire time series

11.0 Current Stock Status and Conservation Advice

11.1 Stock Status

The SS3 base-case model estimates that SSB has fluctuated between 300,000 and 500,000 t between 1966 and 2009 and that recruitment has averaged 47.9 million fish annually during this period. A comparison of these figures with SSB estimated in the VPA reference run shows that both the SS3 base-case model and the VPA reference run estimated similar historical trends in SSB and recruitment with different scaling, especially for biomass, and lower current $F_{2006\text{-}2008}$ relative to $F_{2002\text{-}2004}$. The scaling difference is largely attributable to the use of the Suda growth curve in the VPA reference run while the SS3 base-case model estimated the growth parameters. A sensitivity run in which growth parameters were fixed to Suda parameter estimates used in the VPA model, reduced the scaling of biomass to the level of the VPA reference run (Figure 8.13), although the F-at-age pattern differs substantially from all other runs (highest F occurs at ages older than 7 years) and total likelihood strongly favours the base-case model configuration by approximately 100 likelihood units. Evidence derived from recent sampling of the stock (ISC/11/ALBWG/02, ISC/11/ALBWG/IP/01; see Figure 8.4) supports the WG conclusion that the Suda growth curve used in the 2006 assessment is not representative of growth in north Pacific albacore. Although the sensitivity analyses reveal considerable uncertainty in absolute estimates of biomass and fishing mortality, stock status and conservation advice are relatively insensitive to these uncertainties because since the trends in SSB are recruitment are robust to the different plausible assumptions tested by the WG.

Based on the agreement in trends of estimated quantities between the VPA and SS3 base-case model, the ability to explain the scaling differences between models, and the robustness of the stock status and conservation advice to these differences, the WG unanimously concluded (with no dissenting opinions) that the SS3 base-case model is representative of the population dynamics and abundance of north Pacific albacore and that this model will replace the VPA as the principal model for north Pacific albacore assessments. All of the control, starter, and forecast files for the consensus base-case scenario are shown in Appendix 8.

Sensitivity and retrospective analyses (Sections 8.4-8.6) assessed the impact of many uncertainties and alternative assumptions on the assessment results. Given the model fits to the data and sensitivity analyses based on conservative parameters, the base-case model is stable and produces a reasonable representation of the history of stock abundance. Actual stock parameters may be higher so estimated quantities such as total biomass and SSB probably are not over estimates of true abundance.

Estimates of $F_{2006\text{-}2008}$ (current F) relative to several F-based reference points used in contemporary fisheries management are presented in Table 11.1. The estimates are expressed as the ratio of $F_{2006\text{-}2008}/F_{ref\ point}$, which means that when the ratio is less than 1.0, $F_{2006\text{-}2008}$ is below the reference point estimate. The F_{MAX}, F_{MED} and $F_{0.1}$ reference points are based on yield-per-recruit analysis while the $F_{20\text{-}50\%}$ reference points are spawning biomass-based proxies of F_{MSY}. Since $F_{2006\text{-}2008}$ is close to F_{MED} and well below the MSY proxy rates, the WG infers that overfishing of the north Pacific albacore stock is unlikely at present.

Yield-per-recruit calculations resulted in a flat yield curve (Figure 11.2), with the ratio of $F_{SSB\text{-}ATHL}/F_{2006\text{-}2008}$ at 1.41. Based on the spawning biomass per recruit (SPR) calculations (relative to F = 0) $F_{2006\text{-}2008}$ is approximately equivalent to $F_{50\%}$, which is much higher than $F_{17\%}$ estimated in the 2006 assessment (ALBWG 2007). Increasing $F_{2006\text{-}2008}$ by 41% to $F_{SSB\text{-}ATHL}$ results in a 24% increase in yield and 23% decrease in SPR. However, these increases in F and yield would require an even higher increase in fishing effort. Very little of the increased yield is achievable for longline fisheries, most of the increase would occur in the surface fisheries (Figure 11.2)

Although biomass-based reference points have not been established for north Pacific albacore, SSB is currently around the long-term median of the stock and is expected to fluctuate around the historical median SSB in the future, assuming average recruitment levels continue and fishing mortality remains at $F_{2006\text{-}2008}$ levels. Current $F_{2006\text{-}2008}$ is about 71% of $F_{SSB\text{-}ATHL}$ using the same assumptions of F and recruitment, the probability that SSB will fall below the SSB-ATHL threshold at least once during the projection period (2010-2035) is about 1 % (Table 9.3). The WG concludes that overfishing is not occurring and that the stock likely is not in an overfished condition. However, the risk that SSB will fall below the SSB-ATHL threshold by the end of the projection period increases to 54% if recruitment declines substantially (about 25%) below the current average historical recruitment level (Table 9.3).

11.2 Conservation Advice

The north Pacific albacore stock is considered to be healthy at current levels of recruitment and fishing mortality. The sustainability of the stock is not threatened by overfishing as current $F_{2006-2008}$ is about 71% of $F_{SSB-ATHL}$ and the stock is expected to fluctuate around the long-term median SSB (~405,000 t) in the short- and long-term future given average historical recruitment levels and constant fishing mortality at $F_{2006-2008}$ (Figure 9.2). However, a more pessimistic recruitment scenario increases the probability that the stock will not achieve the management objective of remaining above the SSB-ATHL threshold with a probability of 50%. Thus, if future recruitment declines about 25% below average historical recruitment levels due either to environmental changes or other reasons, then the impact of $F_{2006-2008}$ (current F) on the stock is unlikely to be sustainable. Increasing F beyond current levels will not result in proportional increases in yield as a result of the population dynamics of this stock (Figure 11.2). Therefore, the working group recommends maintaining the present management measures.

12.0 Research Recommendations

The 2011 assessment of north Pacific albacore is based on the best available biology, fishery data, and modeling techniques at this time. Nevertheless, the WG identified several research recommendations during the assessment process that could improve the assessment model. These recommendations are categorized into six areas and for each recommendation priorities and achievability by the next assessment were assigned by the WG. The recommendations for future research are:

1. Age and growth modeling
    - i. Improved sampling from all regions, particularly focusing on fish < 60 cm and fish greater than 85 cm FL (**high, achievable by next assessment**)
    - ii. Validation of aging procedures (annulus) and comparison of aging by multiple readers (**high, achievable by the next assessment**)
    - iii. Daily growth ring analysis of otoliths from young albacore to validate aging, especially time of annulus formation, and investigate growth patterns in young fish (**high, achievable**)
    - iv. Further investigation into regional differences in growth rates in central, eastern and western Pacific (**high, achievability uncertain**)
    - v. Combine results of ISC/11/ALBWG/IP/01 with ISC/11/ALBWG/02 (**high, achievability uncertain**)
    - vi. Further investigation into the appropriate growth model for albacore (Richards, von Bertalanffy, Gompertz, etc.) after enhanced sampling (**high, achievability uncertain for next assessment since depends on sampling time frame**)
    - vii. Document currently available samples on sampling plan to determine where further effort is needed (**low, achievable**)

2. Spatial patterns Analyses
    - i. Explore existing tagging data to determine if further effort is needed and design statistically justified program, e.g., to estimate natural mortality, estimate growth in different regions, ground-truth abundance estimates (**high, achievability is uncertain**)

ii. Investigate spatial and temporal distribution by size to assist in fishery definitions (**high, achievable by next assessment)**
iii. Investigate spatial and temporal changes in size composition of JPN LL fisheries to support the use of appropriate selectivity (**high, achievable for next assessment)**
iv. Investigate spatial and temporal changes in size composition of TWN LL fisheries to support the use of appropriate selectivity
v. Cooperative tagging (pop-up satellite, archival) of large albacore to understand movement patterns of mature fish and bring movement into the model **(high, achievability long-term beyond next assessment)**
vi. Cooperative tagging (pop-up, archival) of young albacore in the western Pacific to understand their movement patterns and bring movement into the model **(high, achievability long-term beyond next assessment)**
vii. Cooperative sampling for otolith microchemistry (stable isotopes, trace elements) across regions **(high, achievability long-term beyond next assessment)**

3. CPUE Analyses
   i. F8 (JPN LL south) increases and decreases in 1990s, the model cannot explain these trends so further exploration is needed (**high, uncertain if complete resolution achievable for next assessment**)
   ii. Document the development and trends of the F6s1 quarterly CPUE index (**high, achievable by next assessment)**
   iii. Split the USA LL fishery into shallow-set and deep-set fisheries (**high, achievable by next assessment)**
   iv. Investigate different CPUE trends in surface fisheries in EPO (UCLTN) and WPO (JPN PL) since 2005 (**high, achievable for next assessment**)
   v. Investigate CPUE standardization procedures, GLM vs. Delta log-normal, etc. to improve indices. Should take advice developed at ISC11 plenary session, into account (**low, achievable for next assessment**)

4. Maturity
   i. Samples of maturity by length are required to determine length at which 50% are mature (**medium, achievability uncertain for next assessment**)
   ii. Improved sampling of large fish in central and eastern Pacific is needed to determine if spawning occurs, when it occurs, and fecundity by length (**low, long-term beyond next assessment**)

5. Data Issues
   i. Investigate length composition anomalies in USA LL fishery with respect to very large fish (**high, achievable by next assessment)**
   ii. Document historical socio-economic factors of fisheries to understand changes in fishing grounds, fishing strategies, market developments that may influence CPUE (**high, achievable for next assessment)**
   iii. Provide information on targeting practices and effort in all fisheries (**high, achievable for next assessment**)
   iv. Document existing national sampling programs (**high, achievable for next assessment)**

6. Model Improvements
   i. Explore scaling in the model, including weighting of different information sources (**high, achievability uncertain for next assessment)**
   ii. Explore the stock-recruitment relationship, especially steepness estimate **(high, achievable for next assessment)**
   iii. Explore the incorporation of explicit spatial structure and sex-specific growth in the model (**medium, long-term beyond the next assessment**)
   iv. Incorporate existing conventional tagging data into the model (**high, achievable for next assessment**)
   v. Explore the impact of environmental covariates on abundance indices, movement patterns, etc. (**medium, achievable for next assessment**)

13.0 Administrative Matters

13.1 Workplan for 2011-12

The WG discussed workplans for 2011-12. The WG Chair noted that an informal two-day slot was available July 14-15 for the WG in advance of the ISC11 Plenary session in San Francisco, USA. This time will be used to prepare the stock assessment presentation, but is not a formal meeting and no formal report will be made.

The WG Chair indicated that the next meeting of the WG would be scheduled in July 2012, in advance of the ISC12 Plenary meeting. The WG agreed to request 2 days. This meeting will be used to update national fisheries, respond to CIE reviews of the assessment, and report on progress against the high priority and achievable research items listed in Section 12.0.

13.2 National Contacts

National contacts for the ALBWG were confirmed as:

Canada – John Holmes and Zane Zhang
Japan – Koji Uosaki
Mexico – Luis Fleischer
Korea – Jae Bong Lee
Chinese Taipei – Shean-ya Yeh, Chiee-Young Chen
USA – Steve Teo, Suzy Kohin
SPC – Simon Hoyle
IATTC – Alexandre Aires-da-Silva

13.3 Next Meeting

The next meeting of the ALBWG will be two days in length and will be held in July 2012, exact dates and location to be determined at the ISC11 Plenary Session.

13.4 Other Matters

The WG discussed contracting the Center of Independent Expertise (CIE) to conduct an external review of the assessment. There is an opportunity to submit the assessment for a "desktop" review since a planned review of the striped marlin assessment has been postponed. WG members agreed that it was desirable to get an external appraisal as a way to improve the assessment. It was noted that the Terms of Reference for the reviewers was critical to the success of this process and that the Terms of Reference should specify a review of the process and findings, but not the data. In response to an inquiry by the ISC Chair during the workshop, the CIE indicated that it could conduct an albacore review provided the assessment report and relevant supporting documents were submitted in a timely fashion. As this is a U.S. process, USA scientists (Steve Teo and Hui-hua Lee) will be listed as contacts on the Statement of Work. The WG discussed an 01 October 2011 submission date and January 2012 review reporting deadline. The WG Chair was tasked with drafting the Terms of Reference and the assessment report for the CIE. The WG agreed to go forward with this process.

14.0 Clearing of Report

A draft of the report was reviewed by the WG prior to adjournment of the assessment workshop. After the workshop, the WG Chair distributed a second draft of the report via email for review, comment, and approval by the participants. Subsequently, the WG Chair evaluated suggested revisions, made final decisions on content and style, and provided the report for the ISC11 Plenary to review.

15.0 Adjournment

The Chair expressed his appreciation to WG members for their cooperation and hard work, which ensured a successful workshop. He also thanked the hosts (NRIFSF, Japan) for their hospitality and overall meeting arrangements.

The 2011 north Pacific albacore stock assessment workshop of the ISC-ALBWG was adjourned at 15:50 on 11 June 2011.

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Table 7.1. Descriptions and numbers of fisheries defined for the SS3 base-case assessment model.

Fishery	Fishery Description	Boundaries and Seasonal Coverage
F1	USA/Canada troll & pole-and-line (UCLTN)	• 10-55°N latitude by 160°E-120°W longitude
F2	USA longline (USA LL)	• 10-45°N latitude by 170°E-130°E longitude
F3	EPO miscellaneous (EPOM)	• EEZ waters along the coasts of USA, Canada and Mexico
F4	Japan pole-and-line (south) – large average-sized fish (JPN PLLF)	• 25-35°N latitude by 130°E-180° longitude in Q2
F5	Japan pole-and-line (north) – small average-sized fish (JPN PLSF)	• 35-45°N latitude by 140°E-180° longitude in Q2 and Q3
F6s1	Japan offshore longline (north / season 1 / numbers of fish) – smaller average-sized fish (JPN OLLF1	• 25-40°N latitude by 120°W-180° longitude in Q1
F6s2	Japan offshore longline (north / season 2 / numbers of fish) – smaller average-sized fish (JPN OLLF1)	• 25-40°N latitude by 120°E-180° longitude in Q2
F7s1	Japan coastal longline (north / season 1 / weight) – smaller average-sized fish (JPN CLLF1)	• 25-40°N latitude by 120°E-180° longitude in Q1
F7s2	Japan coastal longline (north / season 2 / weight) – smaller average-sized fish (JPN CLLF1)	• 25-40°N latitude by 120°E-180° longitude in Q1
F8	Japan offshore longline (south / north s3-4 / numbers of fish) – larger average-sized fish (JPN OLLF2)	• 25-40°N latitude by 120°E-180° longitude in Q3 and Q4 • 25-40°N latitude by 120°W-180° longitude in Q2-Q4 • 10-25°N latitude by 120°E-120°W longitude all year round
F9	Japan coastal longline (south / north s3-4 / weight) – larger average-sized fish (JPN CLLF2)	• 25-40°N latitude by 120°E-180° longitude in Q3 and Q4 • 10-25°N latitude by 120°E-120°W longitude all year round
F10	Japan gill net (JPN GN)	• 20-55°N latitude by 120°E-160°E longitude
F11	Japan miscellaneous (JPN M)	• E.E.Z. along Japan coasts
F12	Taiwan longline (TWN LL)	• 10-55°N latitude by 120°E-120°W longitude
F13	Korea and Others longline (KO LL)	• 10-55°N latitude by 120°E-120°W longitude
F14	Taiwan and Korea gill net (TK GN)	• 20-55°N latitude by 120°E-180° longitude

Table 7.2. CPUE indices used in the SS3 base-case assessment model.

Index	Fishery description	Time series	Reference
S1	USA/CAN troll (F1 - UCLTN)	1966-2009	Teo et al. (2010; ISC/10/ALBWG-3/02)
S2	USA longline (F2 - USA LL)	1991-2009	
S3	Japan pole-and-line (F4 - JPN PLLF)	1972-2009	Kiyofuji and Uosaki (2010; ISC/10/ALBWG-3/07)
S4	Japan pole-and-line (F5 - JPN PLSF)	1972-1984	
S5	Japan pole-and-line (F5 - JPN PLSF)	1985-2009	
S6	Japan longline (F6 - JPN OLLF1 and F7 - JPN CLLF1)	1972-2009	Matsumoto (2010; ISC/10/ALBWG-3/04)
S7	Japan longline (F8 - JPN OLLF2 and F9 - JPN CLLF2)	1972-2009	
S8	Taiwan longline (F12 – TWN LL)	1995-2009	Chen et al. (2010; ISC/10/ALBWG-3/08)

Table 7.3. North Pacific albacore abundance indices developed for the SS3 base-case model. Units are weight (JPN PL fisheries) and number of fish (all other indices). Main season refers to annual quarters where 1 = Jan-Mar, 2 = Apr-June, 3 = July-Sept, and 4 = Oct-Dec.

	UCLTN		**USA LL**		**JPN PL2 - larger fish**		**JPN PLL3 - smaller fish (early period)**		**JPN PL3 - smaller fish (late period)**		**JPN LL (Fishery I- smaller fish)**		**JPN LL (Fishery II- larger fish)**		**TWN LL**	
Index	S1		S2		S3		S4		S5		S6		S7		S8	
Main season	3		3		2		3		3		1		1		1	
Year	CPUE	CV	CPUE	CV	CPUE	CV	CPUE	CV	CPUE	CV	CPUE	CV	CPUE	CV	CPUE	CV
1966	90.8459	0.0763											1.4360	0.0567		
1967	138.7865	0.0816											1.3868	0.0498		
1968	112.9091	0.0712											1.2618	0.0515		
1969	99.6598	0.0783											1.0029	0.0524		
1970	127.4874	0.0647											1.1782	0.0482		
1971	95.9675	0.0734											0.8721	0.0526		
1972	80.0587	0.0635			0.0370	0.0729	0.0528	0.1063			4.1144	0.0511	1.1120	0.0570		
1973	86.6313	0.0672			0.0394	0.0335	0.0499	0.0693			4.6954	0.0488	1.5249	0.0391		
1974	108.1492	0.0549			0.0453	0.0482	0.0553	0.0632			4.9615	0.0585	1.6459	0.0378		
1975	116.1248	0.0631			0.0471	0.0451	0.0447	0.1841			3.1809	0.0478	1.6475	0.0343		
1976	77.8496	0.0582			0.0381	0.0337	0.0485	0.0665			3.8288	0.0412	1.5381	0.0292		
1977	55.8463	0.0557			0.0298	0.0358	0.0236	0.1204			3.1139	0.0422	1.7913	0.0265		
1978	82.3323	0.0706			0.0286	0.0615	0.0531	0.0680			2.9052	0.0400	1.1290	0.0273		
1979	54.7658	0.0831			0.0393	0.0261	0.0464	0.0567			2.8797	0.0418	1.1446	0.0279		
1980	42.1214	0.0808			0.0408	0.0348	0.0504	0.0579			2.6038	0.0477	1.0934	0.0271		
1981	59.3827	0.0693			0.0325	0.0480	0.0152	0.2421			2.7981	0.0354	1.0418	0.0261		
1982	49.3858	0.0569			0.0345	0.0627	0.0388	0.0579			3.1905	0.0369	1.5286	0.0249		
1983	60.3264	0.0563			0.0324	0.0544	0.0313	0.1026			2.8958	0.0376	1.6136	0.0269		
1984	64.5650	0.0557			0.0389	0.1063	0.0362	0.0694			3.1064	0.0412	1.2419	0.0278		
1985	79.0365	0.0704			0.0404	0.0720			0.0172	0.1391	2.7365	0.0427	1.1721	0.0273		
1986	47.0426	0.1002			0.0352	0.0619			0.0287	0.0755	2.8996	0.0390	1.2760	0.0300		
1987	34.0500	0.1065			0.0316	0.1275			0.0179	0.1969	2.5192	0.0400	1.1635	0.0270		
1988	71.1995	0.1779			0.0428	0.0738			0.0093	0.1427	2.7794	0.0417	1.0149	0.0272		
1989	32.5861	0.1247			0.0432	0.0549			0.0152	0.2617	3.0032	0.0462	1.0240	0.0289		
1990	46.2233	0.1040			0.0436	0.0736			0.0342	0.0618	3.9338	0.0431	1.0364	0.0315		
1991	44.0167	0.0843	1.7392	0.0475	0.0385	0.4018			0.0555	0.0731	3.3750	0.0477	1.2123	0.0337		
1992	69.1531	0.0786	2.1348	0.0509	0.0678	0.1101			0.0365	0.1706	3.0558	0.0498	1.0655	0.0283		
1993	58.7956	0.0636	2.4073	0.0537	0.0333	0.2600			0.0259	0.1538	5.1161	0.0437	1.4425	0.0324		
1994	94.5308	0.0727	3.0313	0.0611	0.0411	0.1920			0.0714	0.1113	4.7830	0.0377	1.6906	0.0283		
1995	55.5957	0.0713	4.3978	0.0488	0.0868	0.3305			0.0519	0.0737	4.0916	0.0360	2.3395	0.0200	29.4674	0.0263
1996	85.5895	0.0626	5.8160	0.0494	0.0420	0.2191			0.0289	0.1825	5.1974	0.0337	2.6887	0.0202	49.8742	0.0217
1997	49.1973	0.0656	6.5153	0.0524	0.0658	0.3152			0.0746	0.0434	5.6403	0.0325	3.5928	0.0212	45.7498	0.0224
1998	146.1602	0.0583	4.4589	0.0474	0.0374	0.1982			0.0709	0.0542	5.3485	0.0322	4.3474	0.0214	21.2906	0.0334
1999	54.2124	0.0438	5.8205	0.0476	0.0616	0.1671			0.0473	0.0617	4.0164	0.0296	4.0053	0.0211	20.3758	0.0255
2000	65.5909	0.0591	2.3632	0.0578	0.0416	0.1355			0.0386	0.0659	4.0671	0.0362	4.3854	0.0212	21.4379	0.0341
2001	95.8247	0.0507	3.3225	0.0563	0.0336	0.1458			0.0506	0.0441	3.5976	0.0311	3.9174	0.0211	12.9967	0.0465
2002	145.2481	0.0613	1.0681	0.0546	0.0599	0.1353			0.0918	0.0480	4.3971	0.0298	3.4494	0.0208	12.3165	0.0388
2003	134.3242	0.0701	0.8901	0.0577	0.0426	0.3033			0.0450	0.2265	3.4019	0.0295	2.4393	0.0228	13.7703	0.0306
2004	166.2718	0.0696	0.9744	0.0504	0.1051	0.0390			0.0253	0.1312	2.4395	0.0301	1.8594	0.0217	8.2501	0.0170
2005	82.6032	0.0579	0.6818	0.0462	0.0463	0.0628			0.0381	0.0564	4.3689	0.0299	1.7994	0.0225	8.7805	0.0191
2006	180.3983	0.0608	0.5378	0.0469	0.0436	0.2149			0.0352	0.0801	3.9390	0.0318	2.3460	0.0237	13.5438	0.0163
2007	106.0199	0.0756	0.4105	0.0549	0.0705	0.0720			0.0409	0.1166	3.3796	0.0311	2.4588	0.0231	13.8258	0.0170
2008	110.3124	0.0827	0.6077	0.0550	0.0352	0.2817			0.0134	0.3451	3.3634	0.0311	2.0355	0.0230	16.4724	0.0207
2009	122.7863	0.0675	0.4537	0.0560	0.0440	0.3122			0.0296	0.1356	3.1821	0.0336	2.0127	0.0244	14.0754	0.0237

Table 7.4. Estimated spawning stock biomass for several tuna species and stocks at the beginning and end of the assessment time period used to determine a down-weighting value (lambda) for length composition data in the 2011 assessment of north Pacific albacore.

Species	Stock	Assessment Year	Assessment period	Reference	Spawning biomass estimates (x 1000's t)			
					Start	High	Low	End
albacore	North Pacific	2006	1966-2005	ALBWG (2007)	60	160	60	115
albacore	North Pacific	2004	1975-2003	Stocker (2005)	60	120	50	110
albacore	South Pacific	2006	1960-2005	Langley and Hampton (2006)	390	500	270	270
albacore	South Pacific	2009	1960-2008	Hoyle and Davies (2009)	460	506	253	274
albacore	North Atlantic	2009	1930-2007	ICCAT (2010)	150	170	20	40
albacore	South Atlantic	2007	1956-2005	ICCAT (2008)	290	290	70	80
Pacific bluefin	Pacific	2006	1952-2005	PBFWG (2006)	100	170	20	80
Atlantic bluefin	Eastern Atlantic	2008	1970-2006	ICCAT (2009)	250	300	100	100
Atlantic bluefin	Western Atlantic	2008	1970-2007	ICCAT (2009)	45	45	7	8
Southern bluefin	Southern bluefin	2009	1931-2009	CCSBT (2009)	1,000	1,000	45	45
bigeye	WCPO	2009	1952-2007	Harley et al. (2009)	600	600	100	100
bigeye	EPO	2010	1975-2009	Aires-da-Silva and Maunder (2011)	210	230	80	100
yellowfin	WCPO	2009	1952-2008	Langley et al. (2009)	5,000	7,500	1,500	1,500

Table 8.1. Spawning stock biomass and recruitment time-series estimated by the base-case model for the 2011 north Pacific albacore assessment

Year	Spawning biomass (t)	Recruitment (x1000 fish)
Virgin	857,138	55,381.1
1966	416,016	50,133.3
1967	398,986	49,155.9
1968	389,813	51,323.5
1969	389,303	54,464.1
1970	409,518	44,200.7
1971	436,472	60,480.4
1972	436,742	55,089.0
1973	426,010	52,093.3
1974	408,849	37,136.4
1975	383,956	43,313.2
1976	363,717	53,538.9
1977	350,553	43,672.4
1978	341,099	32,625.9
1979	317,859	36,766.9
1980	298,930	35,993.5
1981	298,225	38,812.7
1982	293,942	42,563.6
1983	279,693	34,156.1
1984	267,377	29,383.4
1985	263,935	30,581.1
1986	264,530	43,678.8
1987	277,001	27,152.4
1988	281,203	49,385.9
1989	278,347	58,132.8
1990	276,500	65,216.3
1991	290,250	47,235.2
1992	298,809	69,277.8
1993	315,771	54,879.0
1994	364,731	68,726.6
1995	425,450	38,831.3
1996	459,003	68,999.6
1997	482,592	42,322.1
1998	495,364	41,296.7
1999	504,284	78,060.9
2000	476,738	51,007.6
2001	461,486	46,990.1
2002	446,178	55,507.1
2003	417,903	41,311.2
2004	428,487	61,036.6
2005	432,963	40,499.7
2006	413,820	41,381.5
2007	406,885	45,194.6
2008	397,088	44,970.5
2009	405,644	55,381.1

Table 8.2. Sensitivity analyses of the north Pacific albacore base-case model in 2011.

Data weighting

- Dropping each CPUE one-by-one by setting lambda = 0
- Up-weight and down-weight length composition data relative to the base-case model with lambda = 0.025 and 0.001, respectively
- Fix CV for S6 = 0.2, estimate CVs for all other CPUE indices

Biological assumptions

- Replace estimated growth curve with fixed Suda growth curve (continue to use ageing data)
- Reduce steepness (h) from 1.0 (base case) to 0.85
- Increase weighting of conditional age-at-length data from lambda = 0.1 (base-case) to lambda = 1.0
- M = 0.4 for all ages
- Use length-based maturity schedule in place of age-based schedule in the base-case

Selectivity

- Assume F6 selectivity is asymptotic using logistic form (flat-topped)
- Remove time blocks for selectivity one-by-on on fisheries F2, F6, and F14

Table 9.1. Summary of future projections for the base-case, low and high recruitment scenarios, and sensitivity runs.

	Fssb scenario							Sensitivity scenarios			
	Base case	Run 1 (Previous current F)	Run 2 (Low recruit)	Run 3 (High recruit)	Run 4 (growth curve)	Run 5 (Length lambda)	Run 6 (Steepness=0.85)	Starting year = 2009	Starting year =2007	Current F definition	CC scenario
SS scenario	Base case				Using suda's growth	Length lambda= 0.001	Steepness=0.85				
Recruitment	Random sampling from 1966-2007		Random sampling from 1978-1987	Random sampling from 1988-2004							
Harvesting scenario	constant F with current F										constant catch with current average catch
Starting year	1st Jan, 2008							1st Jan, 2009	1st Jan, 2007		
Current F definition	2006-2008	2002-2004								2005-2007	
Fssb need	yes	yes	yes	yes	yes	yes	yes	no	no	no	no

Table 9.2. Assumed quarterly catch weights from 2008-2010 used for future projections. Quarterly catch in 2010 is estimated from the average quarterly catch ratio and an earlier version of the catch table shown in Appendix 6, while total quarterly catches for 2008 and 2009 are derived from estimates in the assessment model and are not identical to the quarterly totals calculated from the catch table in Appendix 6.

Quarter	Quarterly Catch Ratio (2000-2010)	2008	2009	2010
Qt1	0.14	13,178	9,901	9,839
Qt2	0.33	23,393	37,359	22,804
Qt3	0.40	21,100	21,928	27,469
Qt4	0.13	7,594	8,474	8,943
Total		**65,265**	**77,662**	**69,056**

Table 9.3. Probability of future spawning stock biomass falling below the bootstrap estimate of SSB-ATHL in future projection scenarios and structural sensitivity runs.

	Base case	Run 1 ($F_{2002-2004}$)	Run 2 (Low recruit)	Run 3 (High recruit)	Run 4 (growth curve)	Run 5 (Length lambda)	Run 6 (Steepness=0.85)
2012	0.0	0.0	0.0	0.0	10.8	0.0	0.0
2013	0.0	0.0	0.0	0.0	25.1	0.0	0.0
2014	0.0	0.0	0.0	0.0	29.8	0.1	0.0
2015	0.1	0.3	0.8	0.0	30.9	0.2	0.3
2016	0.3	0.5	1.9	0.0	31.8	0.4	0.9
2017	0.4	0.9	3.8	0.0	32.7	0.7	1.5
2018	0.5	1.5	8.3	0.0	33.4	1.1	2.1
2019	0.5	2.0	12.7	0.0	34.4	1.2	2.6
2020	0.6	2.6	16.7	0.0	35.2	1.2	3.3
2021	0.7	3.1	20.9	0.0	36.0	1.4	4.1
2022	0.7	3.6	24.7	0.0	37.0	1.5	5.3
2023	0.8	4.2	27.6	0.0	38.0	1.6	5.7
2024	0.9	4.8	30.6	0.0	38.8	1.6	6.3
2025	0.9	5.3	33.6	0.0	39.6	1.9	6.8
2026	0.9	5.8	36.0	0.0	40.3	2.0	7.3
2027	0.9	6.5	38.9	0.0	41.0	2.2	8.1
2028	1.0	7.0	41.3	0.0	41.9	2.4	8.9
2029	1.0	7.4	43.4	0.0	42.4	2.5	9.5
2030	1.1	7.9	45.5	0.1	43.4	2.8	10.1
2031	1.1	8.4	47.0	0.1	43.8	3.0	10.9
2032	1.2	8.9	48.8	0.1	44.3	3.1	11.6
2033	1.2	9.2	50.1	0.1	44.6	3.1	12.2
2034	1.3	9.8	51.6	0.1	44.8	3.2	12.5
2035	1.3	10.3	52.9	0.1	45.2	3.5	13.2
2036	1.3	10.7	53.9	0.1	45.7	3.5	14.2

Table 9.4. Estimates of $F_{SSB\text{-}ATHL}$ 50% for a 25-yr projection period (2010-2035) under two harvest scenarios ($F_{2006\text{-}2008}$, $F_{2002\text{-}2004}$), three recruitment scenarios, and three alternate structural assumptions. Relative estimates of F as the F-ratio are shown rather than absolute estimates. F-ratio = $F_{2006\text{-}2008}/F_{SSB\text{-}ATHL}$ run estimate.

Projection Run	F-ratio
Base case	0.71
Run 1 (F2002-2004)	0.83
(Current F in 2006 assessment)	
Run 2 (Low recruit)	1.01
Run 3 (High recruit)	0.60
Run 4 (growth curve)	0.99
Run 5 (Length lambda)	0.77
Run 6 (Steepness=0.85)	0.71

Table 10.1. Age-aggregated fishery definitions developed for the VPA reference run.

Japan pole-and-line (1972 – 1984)
Japan pole-and-line (1985 – 2009)
Japan longline (1972 – 2009)
USA/Canada troll (1966 – 2009)
USA longline (1991 – 2009)
Taiwan longline (1995 – 2009)

Table 10.2. Age-aggregated abundance indices developed for the VPA reference run. Units are weight (JPN PL fisheries) and number of fish (all other indices).

	JPN PLSF-A	JPN PLSF-B	JPNLL	UCLTN	USALL	TWNLL
1966				90.8		
1967				138.8		
1968				112.9		
1969				99.7		
1970				127.5		
1971				96.0		
1972	0.0449		2.09	80.1		
1973	0.0446		2.31	86.6		
1974	0.0503		2.37	108.1		
1975	0.0459		1.90	116.1		
1976	0.0433		2.24	77.8		
1977	0.0267		1.56	55.8		
1978	0.0408		1.53	82.3		
1979	0.0429		1.48	54.8		
1980	0.0456		1.38	42.1		
1981	0.0239		1.81	59.4		
1982	0.0367		1.96	49.4		
1983	0.0319		1.60	60.3		
1984	0.0376		1.60	64.6		
1985		0.0288	1.60	79.0		
1986		0.0319	1.54	47.0		
1987		0.0247	1.34	34.1		
1988		0.0260	1.41	71.2		
1989		0.0292	1.47	32.6		
1990		0.0389	1.81	46.2		
1991		0.0470	1.57	44.0	1.74	
1992		0.0522	1.80	69.2	2.13	
1993		0.0296	2.44	58.8	2.41	
1994		0.0562	2.87	94.5	3.03	
1995		0.0694	3.00	55.6	4.40	29.5
1996		0.0354	3.94	85.6	5.82	49.9
1997		0.0702	4.63	49.2	6.52	45.7
1998		0.0542	4.30	146.2	4.46	21.3
1999		0.0544	4.30	54.2	5.82	20.4
2000		0.0401	3.95	65.6	2.36	21.4
2001		0.0421	3.48	95.8	3.32	13.0
2002		0.0759	2.87	145.2	1.07	12.3
2003		0.0438	2.20	134.3	0.89	13.8
2004		0.0652	1.94	166.3	0.97	8.3
2005		0.0422	2.79	82.6	0.68	8.8
2006		0.0394	2.78	180.4	0.54	13.5
2007		0.0557	2.33	106.0	0.41	13.8
2008		0.0243	2.31	110.3	0.61	16.5
2009		0.0368	2.97	122.8	0.45	14.1

Table 11.1. Potential reference points and estimated F-ratio using Fcurrent ($F_{2006\text{-}2008}$), associated spawning biomass and equilibrium yield. $F_{SSB\text{-}ATHL}$ is not equilibrium concept so SSB and yield are given as median levels.

Reference Point	$F_{2006\text{-}2008}/F_{RP}$	SSB (t)	Equilibrium Yield (t)
$F_{SSB\text{-}ATHL}$	0.71	346,382	101,426
F_{MAX}	0.14	11,186	185,913
$F_{0.1}$	0.29	107,130	170,334
F_{MED}	0.99	452,897	94,080
$F_{20\%}$	0.38	171,427	156,922
$F_{30\%}$	0.52	257,140	138,248
$F_{40\%}$	0.68	342,854	119,094
$F_{50\%}$	0.91	428,567	99,643

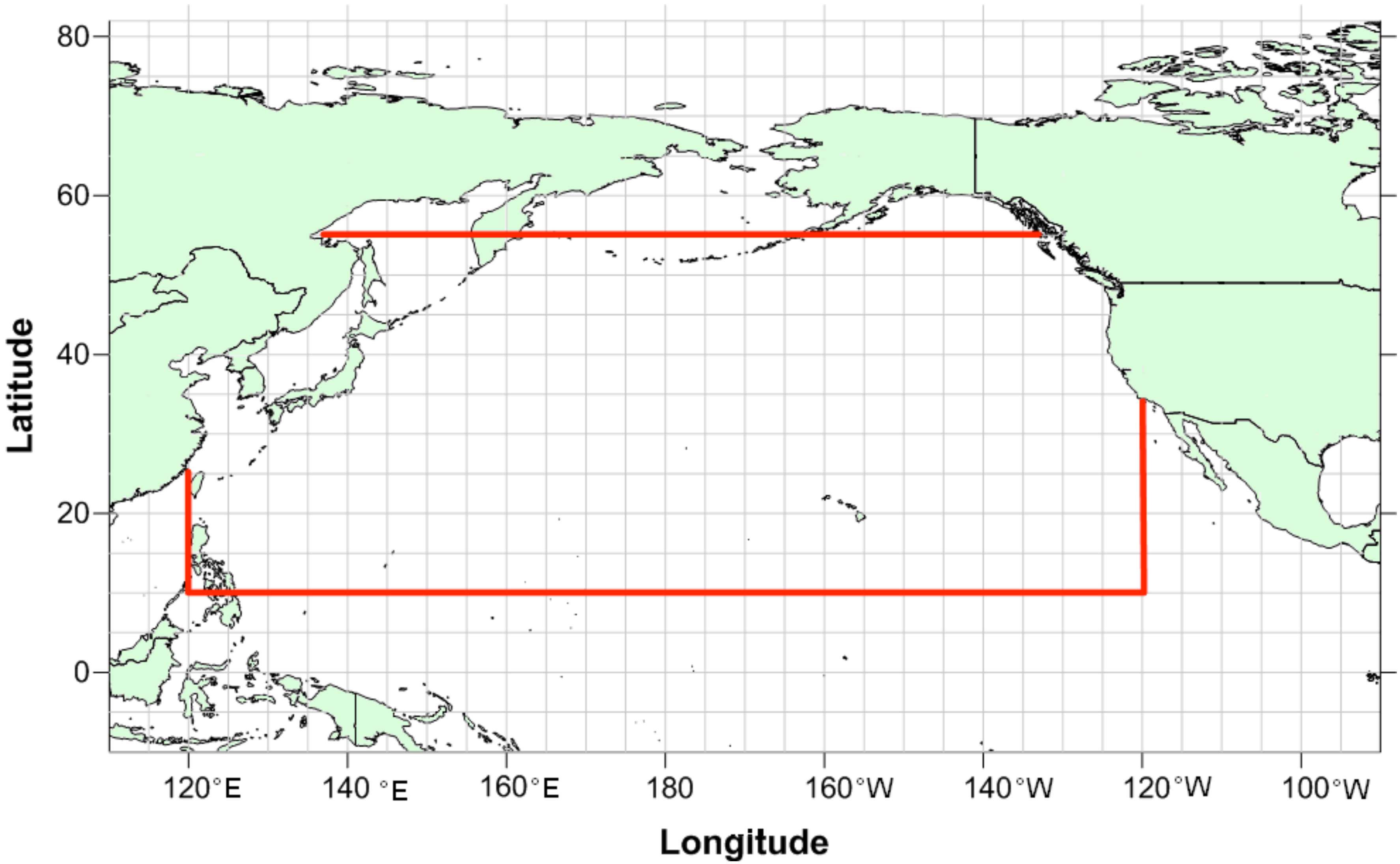


Figure 7.1. Spatial domain (red box) of the north Pacific albacore stock (*Thunnus alalunga*) and the 2011 stock assessment.

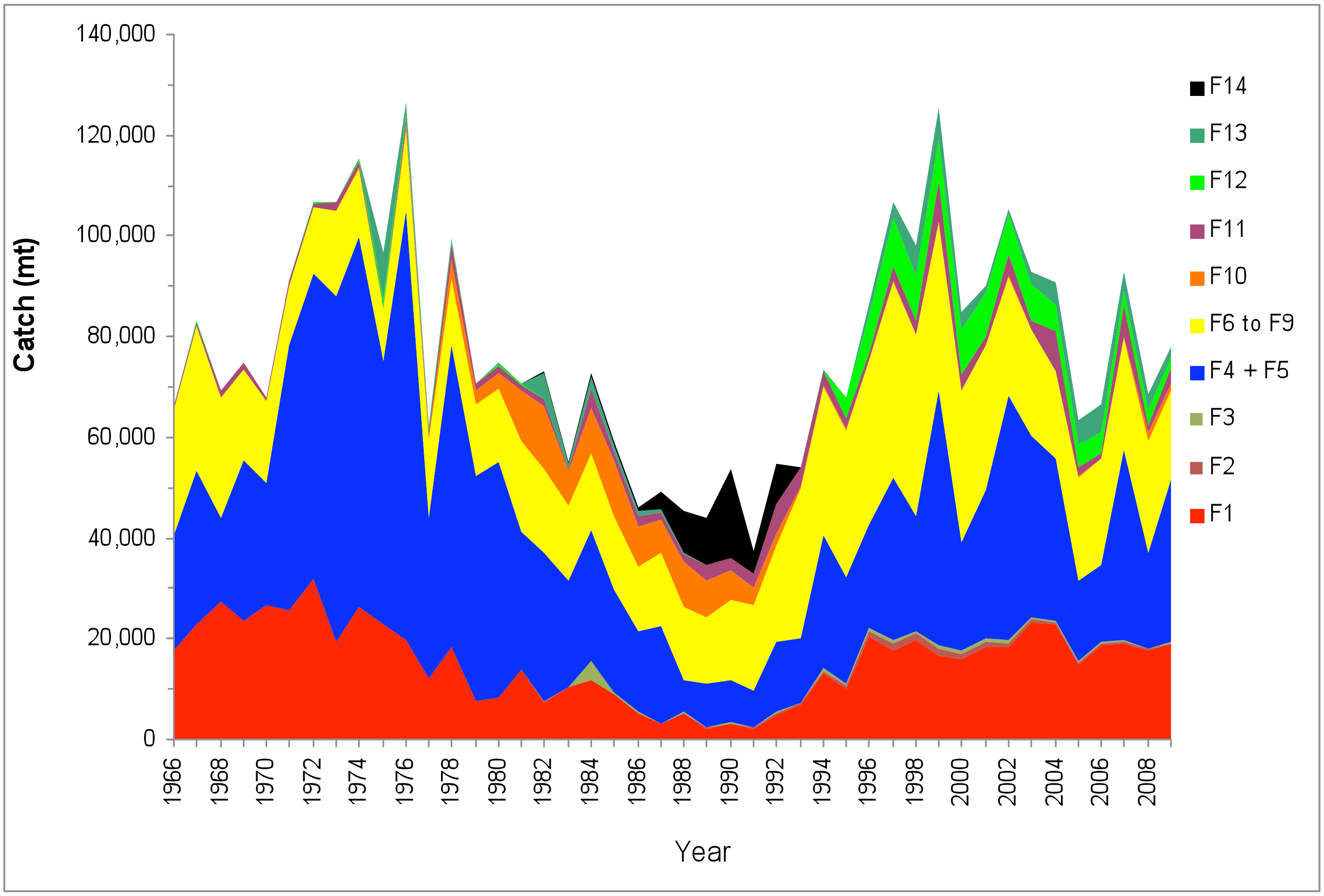


Figure 7.2. Catch history (t) of north Pacific albacore by fisheries used in the assessment model during the modeled period, 1966-2009. See Table 7.1 and Figure 7.2 for fishery definitions and the spatial and temporal boundaries of these fisheries.

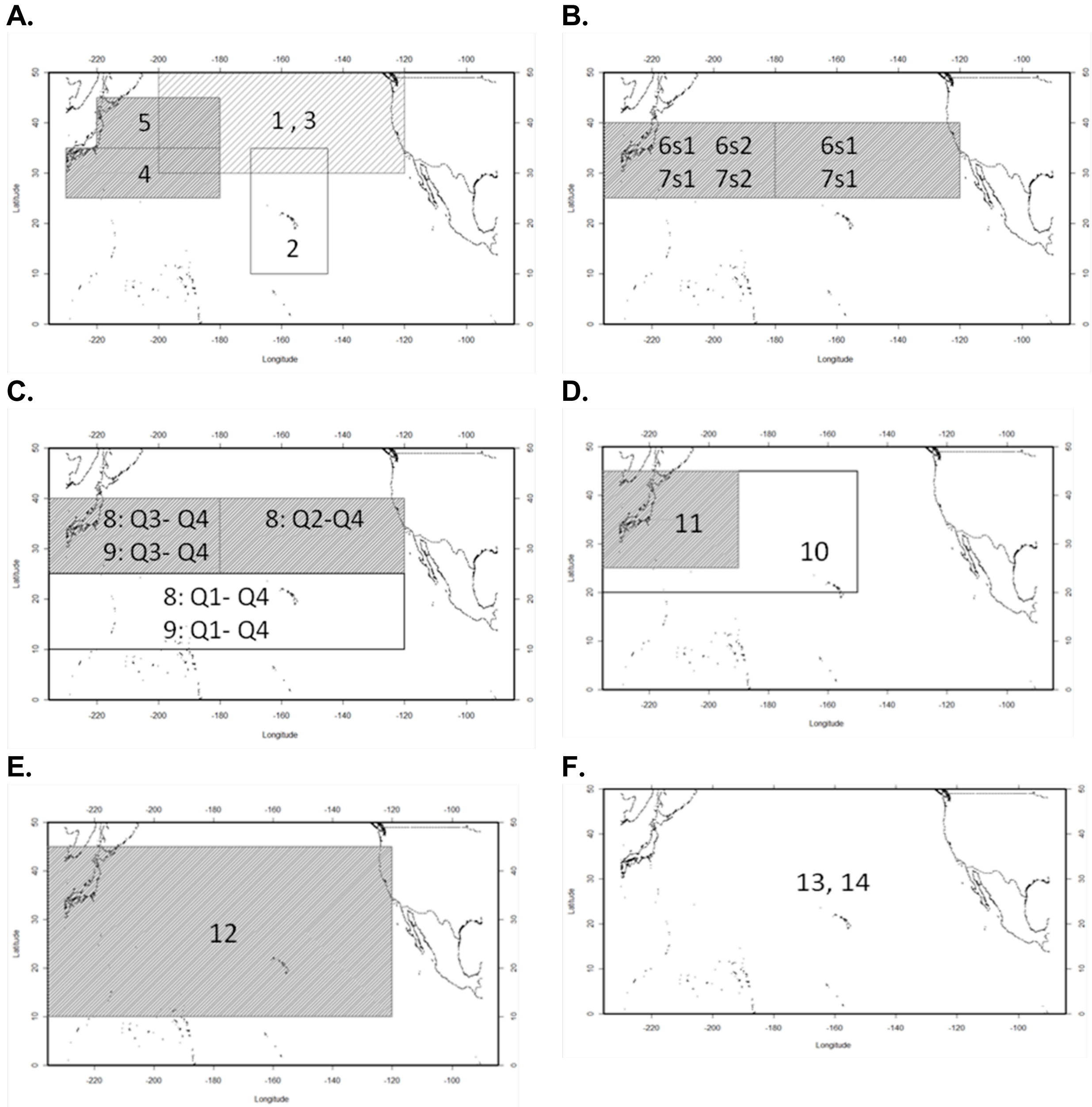


Figure 7.3. Maps showing main seasons and areas of operation of (A) EPO surface fisheries (F1 & F3), JPN PL fisheries (F4 and F5) and USA LL fishery (F2); (B) JPN OLLF1 and CLLF1 fisheries (F6s1, F6s2, F7s1, F7s2), where F6s1 and F7s1 operate during the first quarter and F6s2 and F7s2 operates in the second quarter; (C) JPN OLLF2 and CLLF2 fisheries (F8 & F9); (D) JPN GN (F10) and JPN M (F11) fisheries; (E) TWN LL fishery (F12); and (F) the KO longline fishery (F13) and TWN and KOR GN fishery (F14).

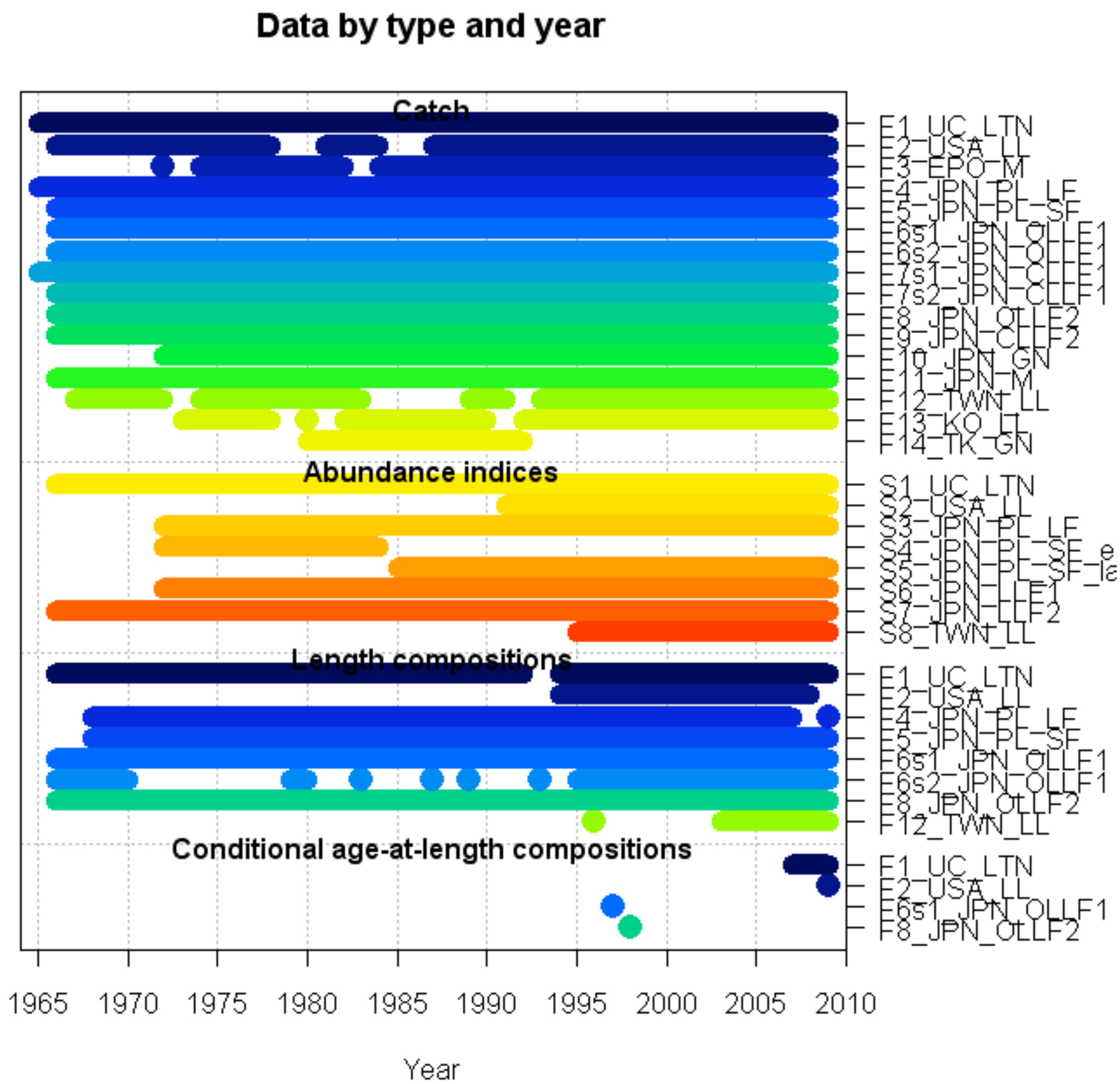


Figure 7.4. Temporal coverage and sources of catch, CPUE, length composition and ageing data used in the 2011 assessment of north Pacific albacore.

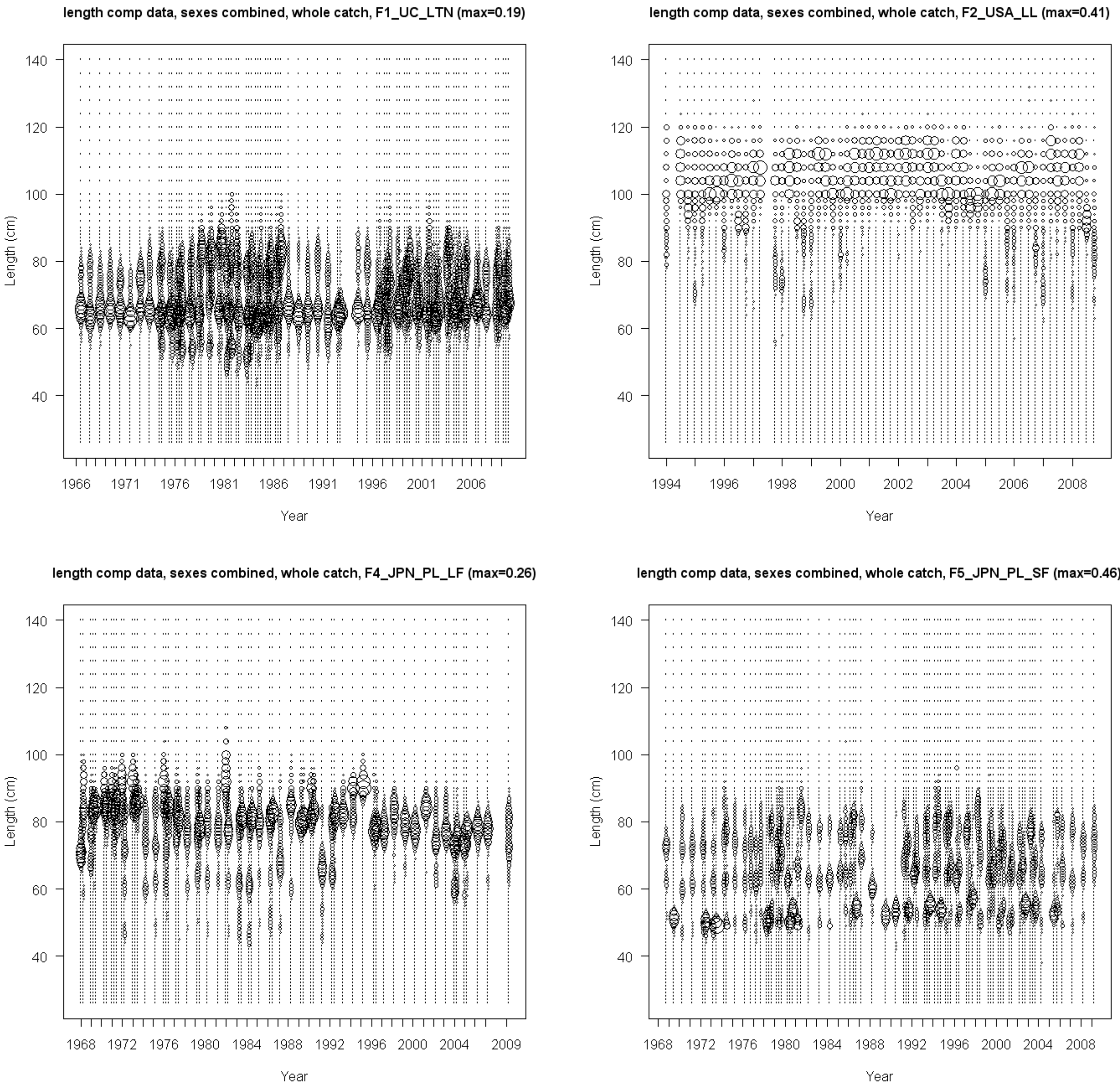
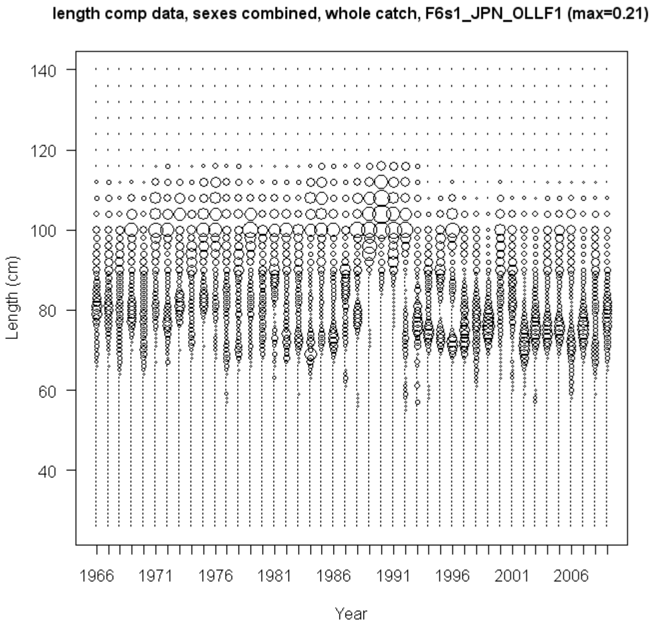
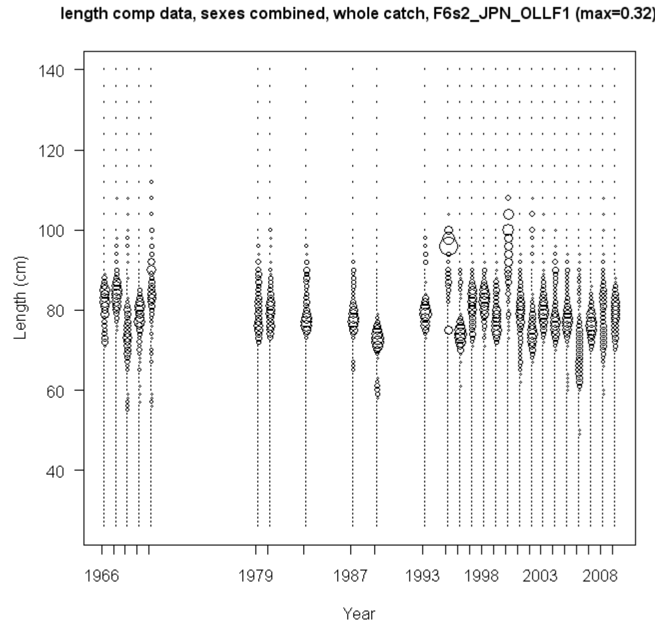
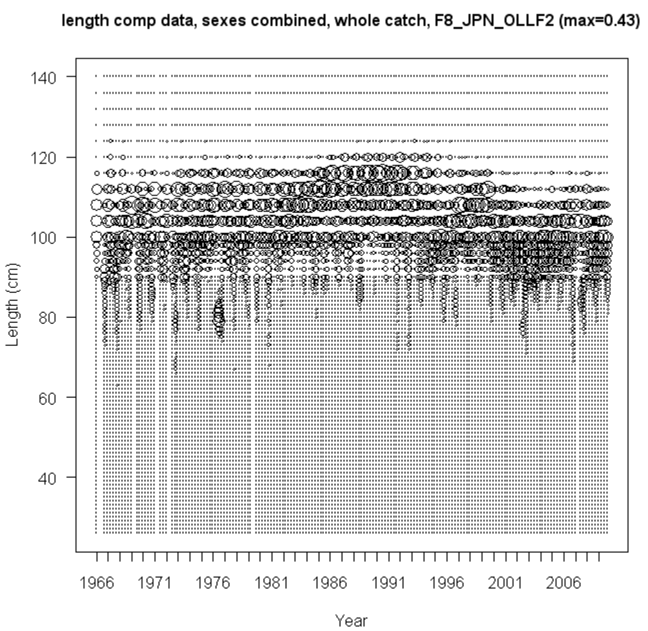


Figure 7.5. Annual length compositions of fisheries used in the assessment (F1, F2, F4, F5, F6s1, F6s2, F8, and F12 – see Table 7.1). Size of circles is proportional to the number of observations. Length composition data from other fisheries are not available for the assessment and selectivity patterns for these fisheries are mirrored to fisheries with length composition data.







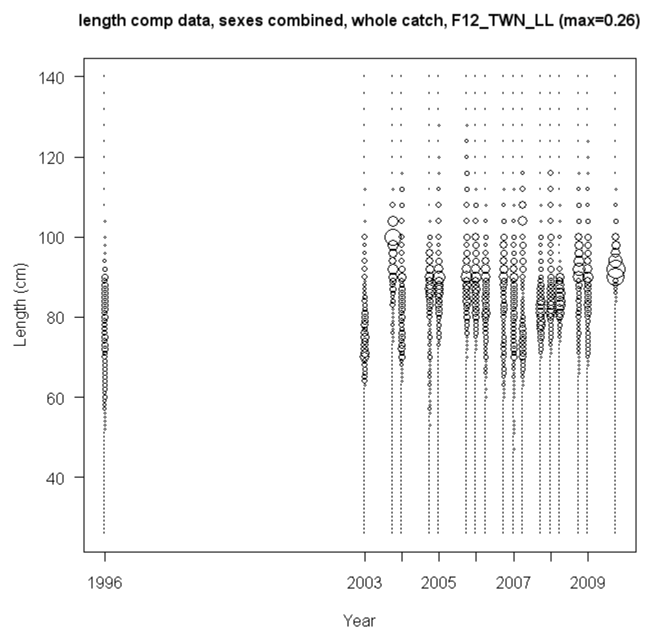


Figure 7.5. Continued.

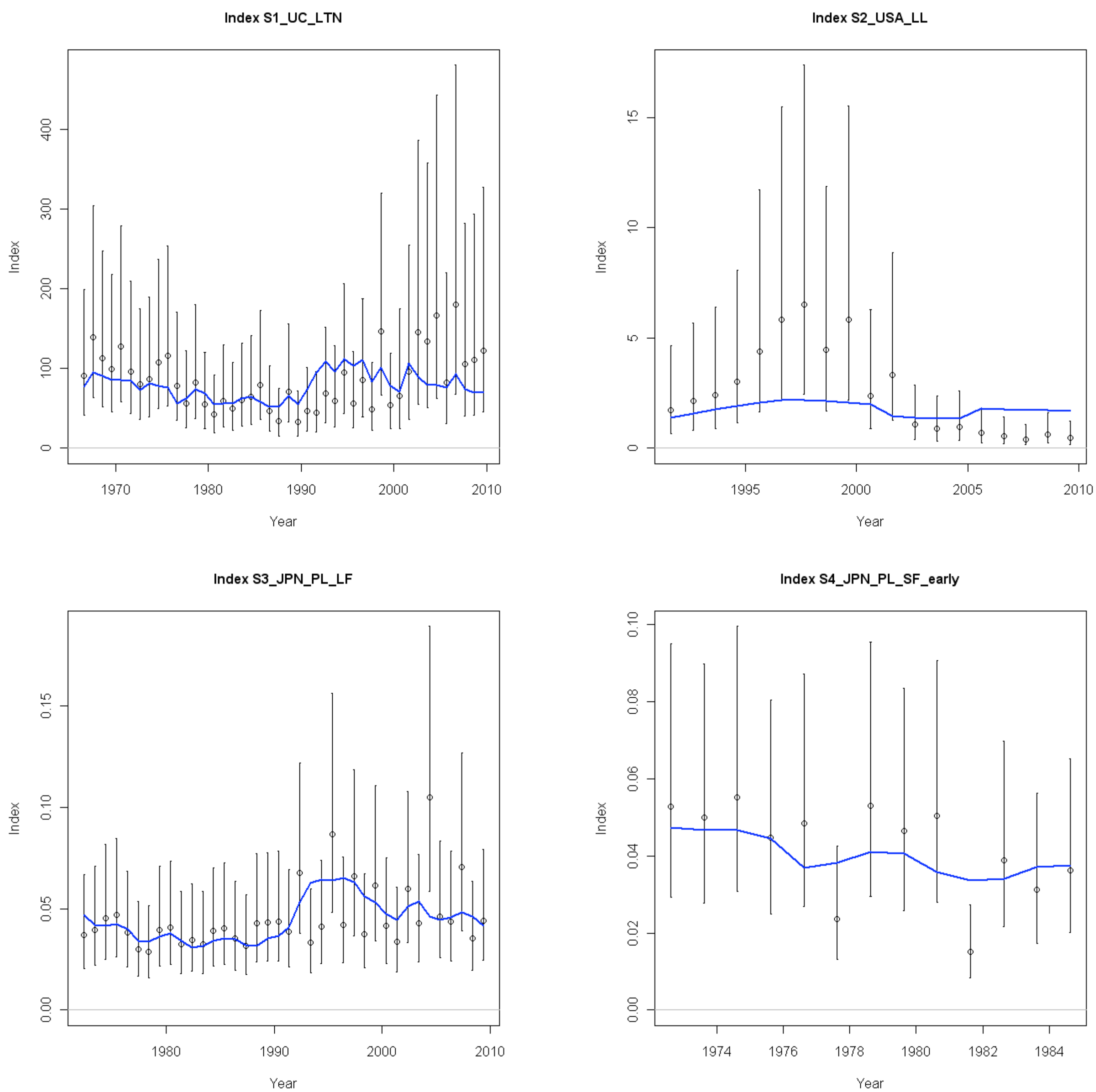


Figure 8.1. Model fits to the standardized CPUE data from different fisheries used in the assessment. The blue line is the model predicted value and the open circles are observed (data) values. The vertical lines represent the estimated confidence intervals (± 2 standard deviations) around the CPUE values. The numbers in the panels correspond to the index numbers in Table 7.2.

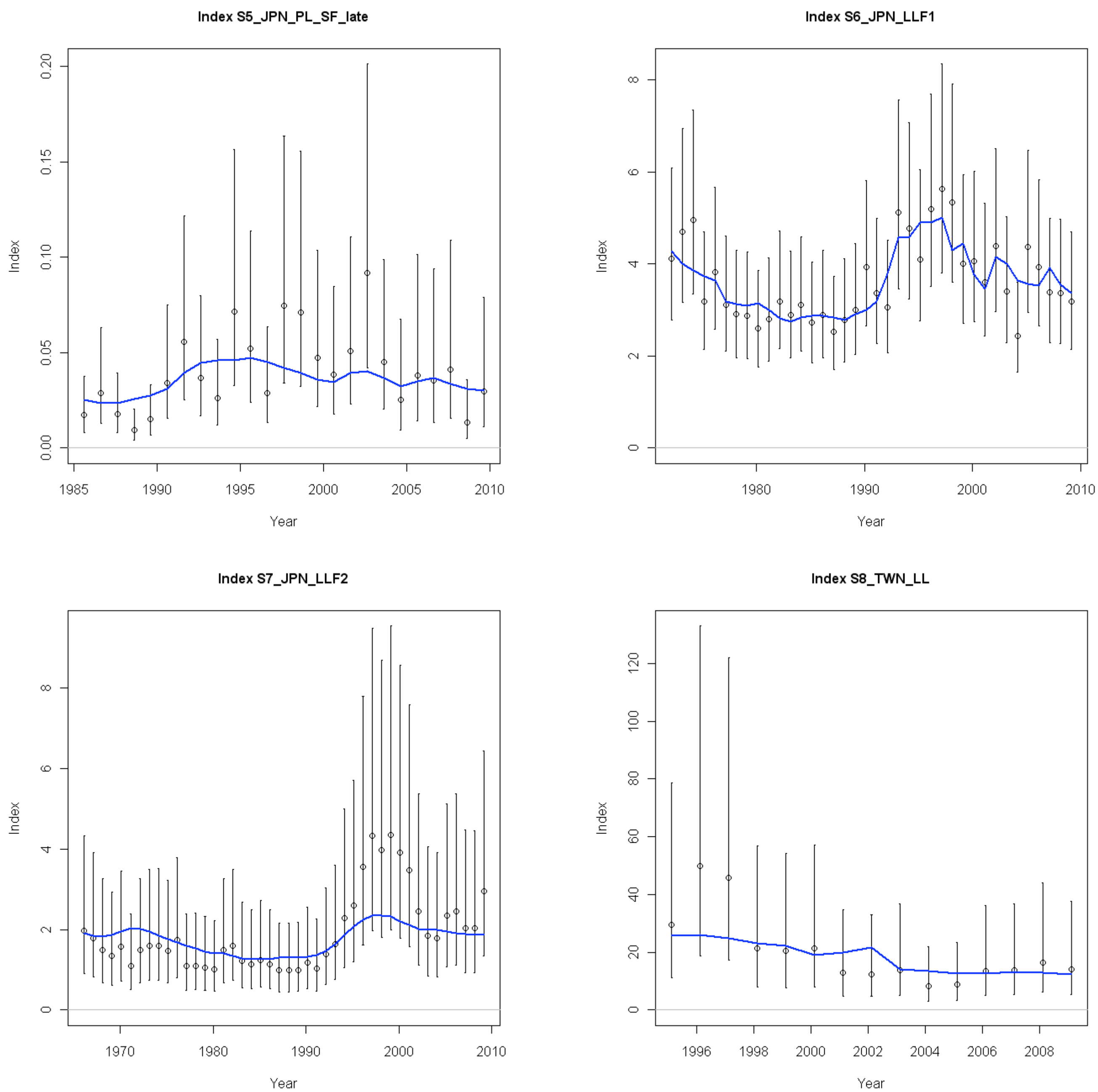


Figure 8.1. Continued.

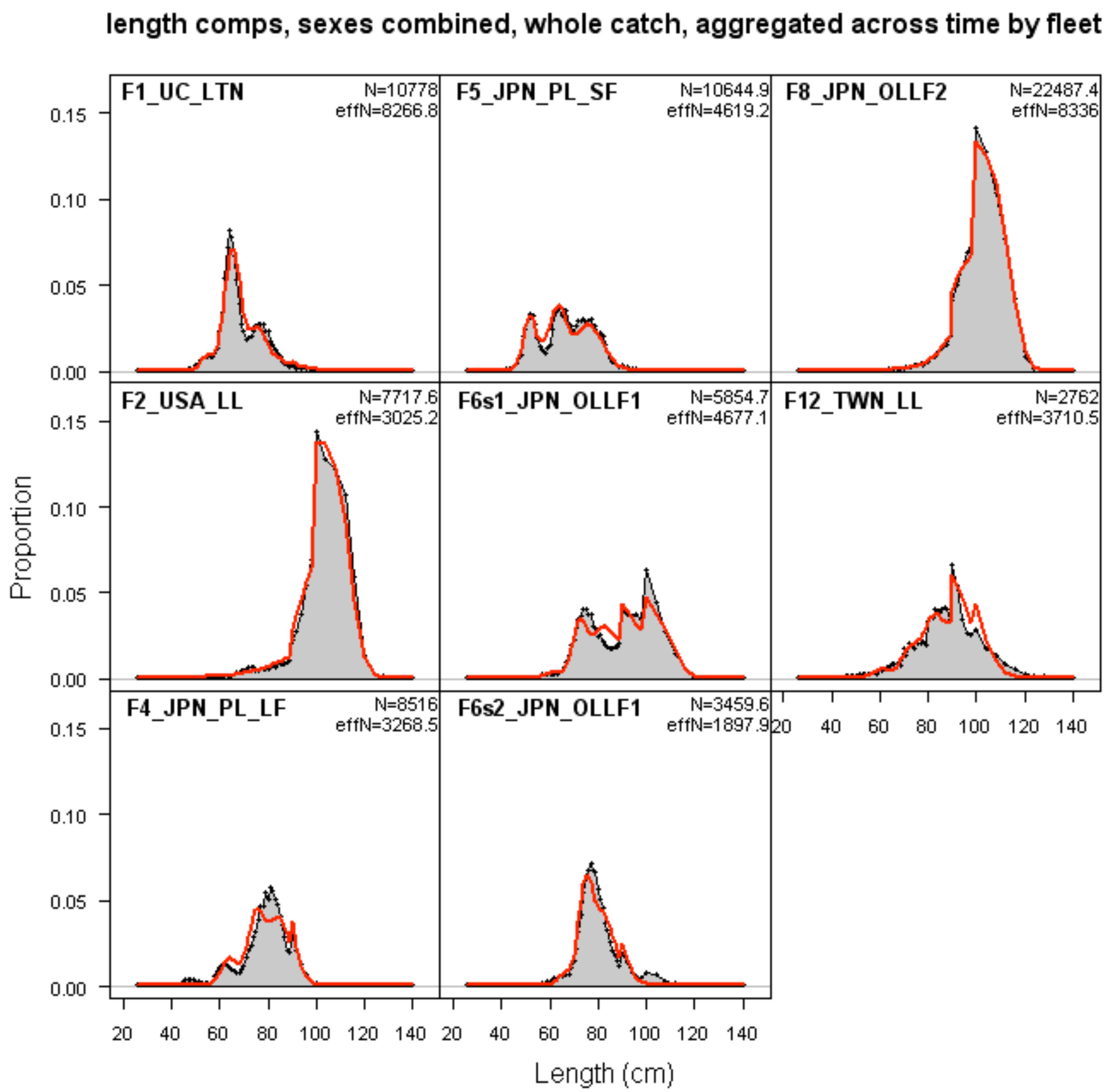


Figure 8.2. Comparison of observed (gray shaded area) and model predicted (red line) length compositions for fisheries used in the north Pacific albacore stock assessment (F1, F2, F4, F5, F6s1, F6s2, F8, and F12 – see Table 7.1 and Figure 7.2 for spatial and temporal boundaries of these fisheries).

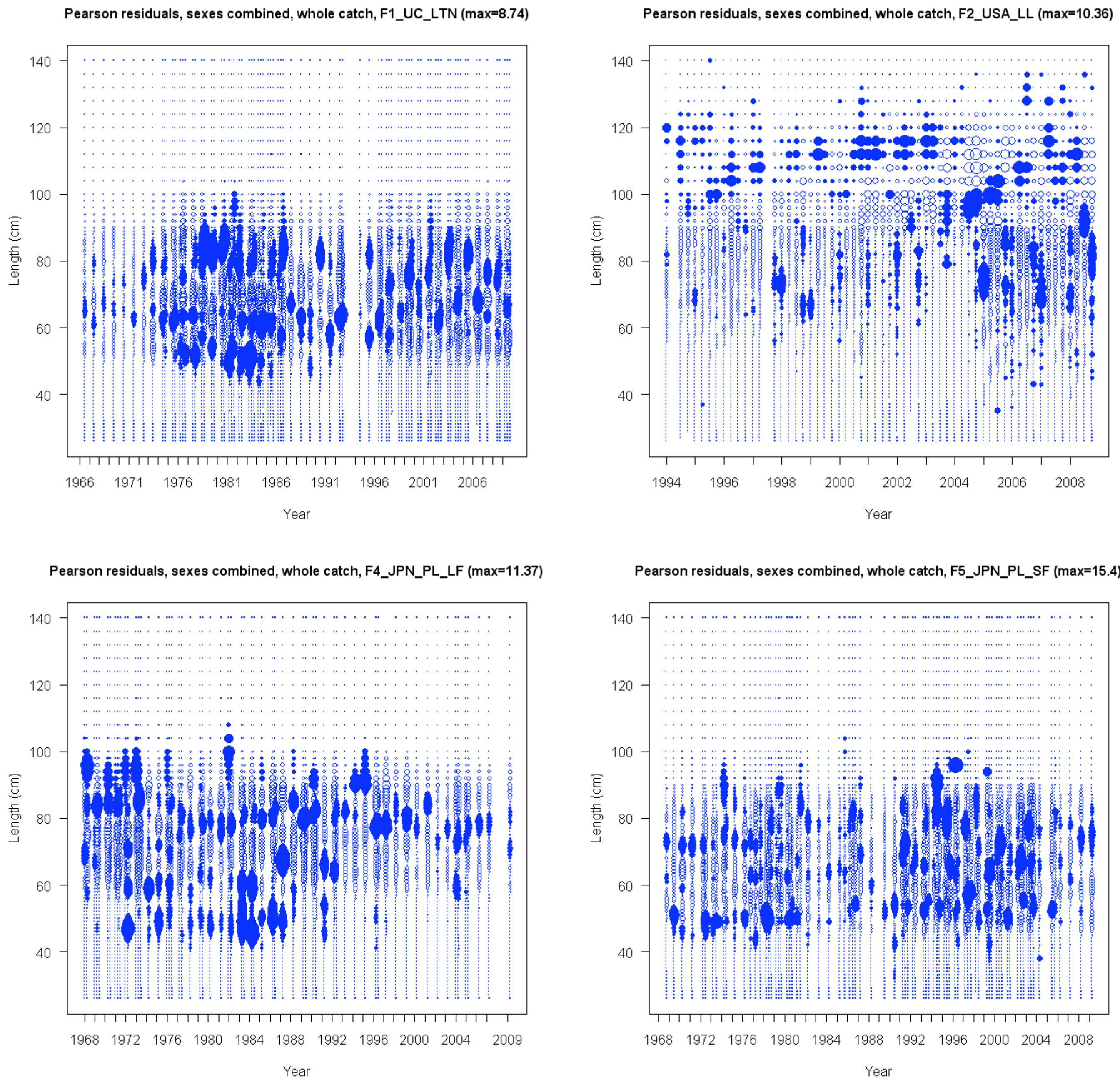


Figure 8.3. Pearson residual plots of model fits to the length-composition data for the albacore fisheries used in the assessment model (F1, F2, F4, F5, F6s1, F6s2, F8, and F12 – see Table 7.1 and Figure 7.2 for spatial and temporal boundaries of these fisheries). The filled and hollow blue circles represent observations that are higher and lower than the model predictions, respectively. The areas of the circles are proportional to the absolute values of the residuals.

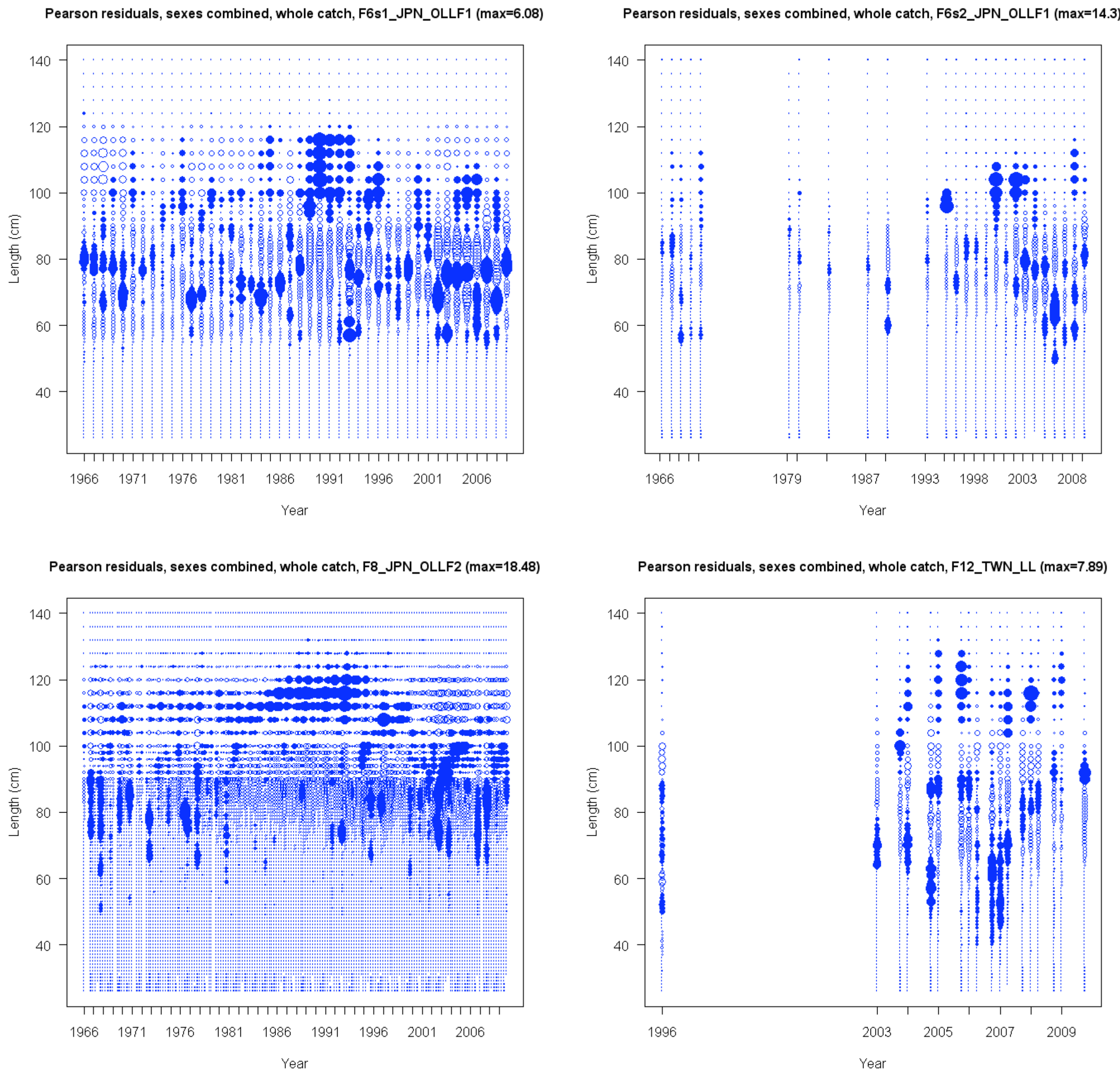


Figure 8.3. Continued.

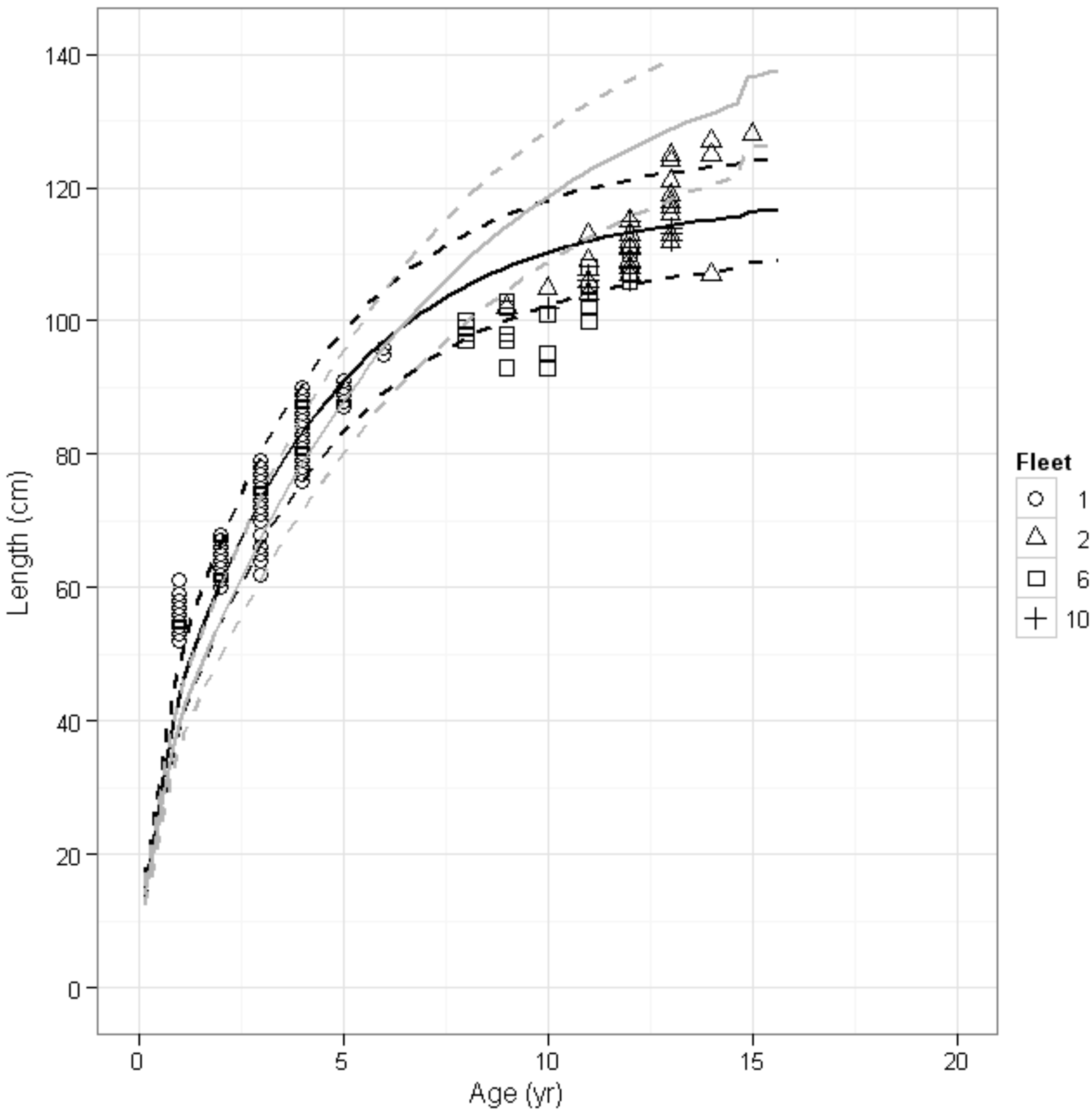


Figure 8.4. Comparison of the Suda growth curve used in the 2006 assessment of north Pacific albacore (grey) with the estimated growth curve in the 2011 assessment model. Points represent observed ages by fleet reported in ISC/11/ALBWG/02.

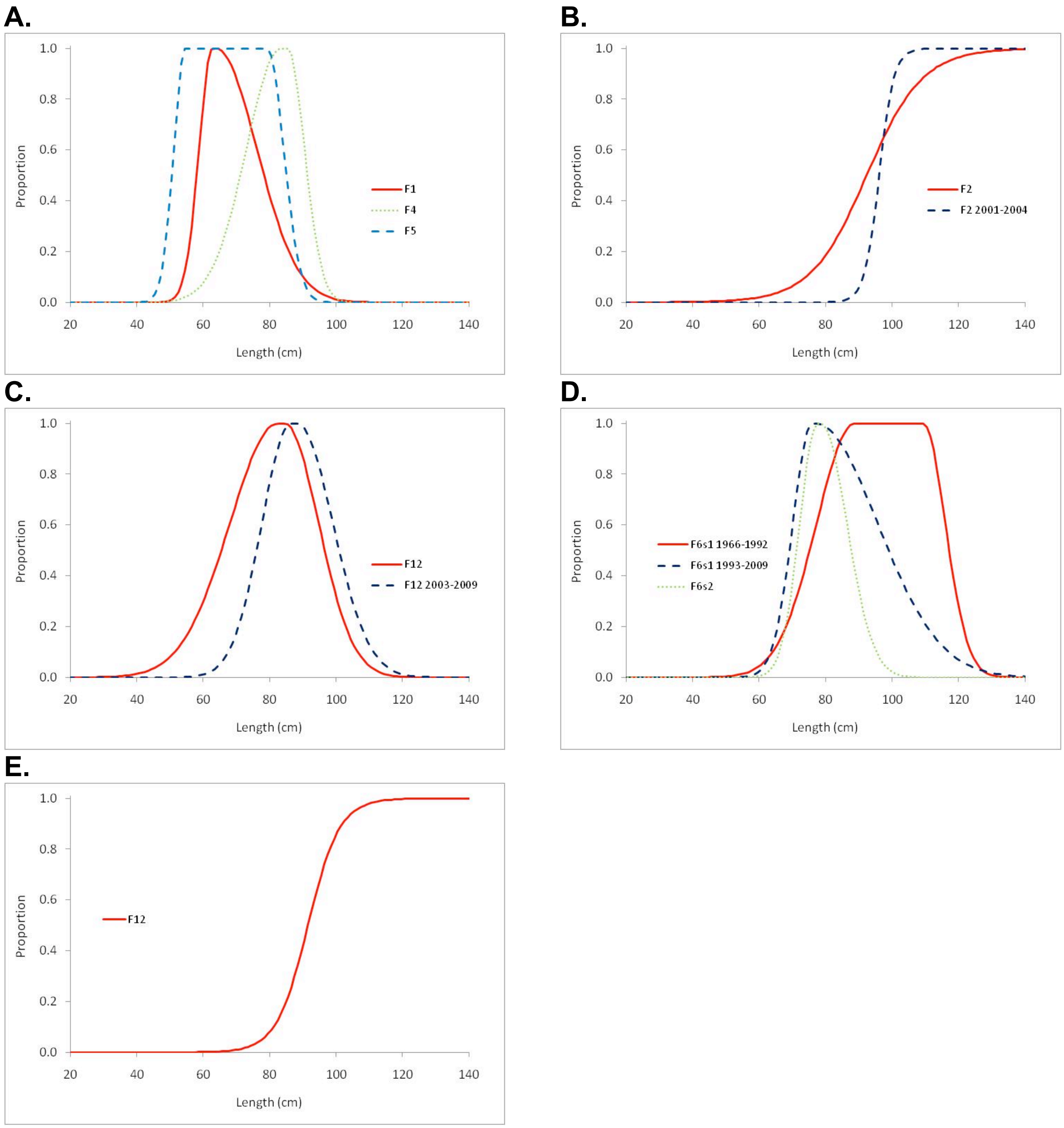


Figure 8.5. Length selectivity of fisheries estimated by the north Pacific albacore assessment model: (A) surface fisheries - F1 (red solid line), F4 (green dotted line), and F5 (blue dashed line); (B) US longline fishery (F2) during 2001-2004 (blue dashed line) and the remaining period (red solid line); (C) TWN LL fishery (F12) 1995-2002 (red solid line) and 2003-2009 (blue dashed line); (D) JPN OLLF1 and CLLF1 fisheries: F6s1 during 1966-1992 (red solid line) and 1993-2009 (blue dashed line), and F6s2 (green dotted line); and (E) JPN OLLF2 and CLLF2 fisheries (F8).

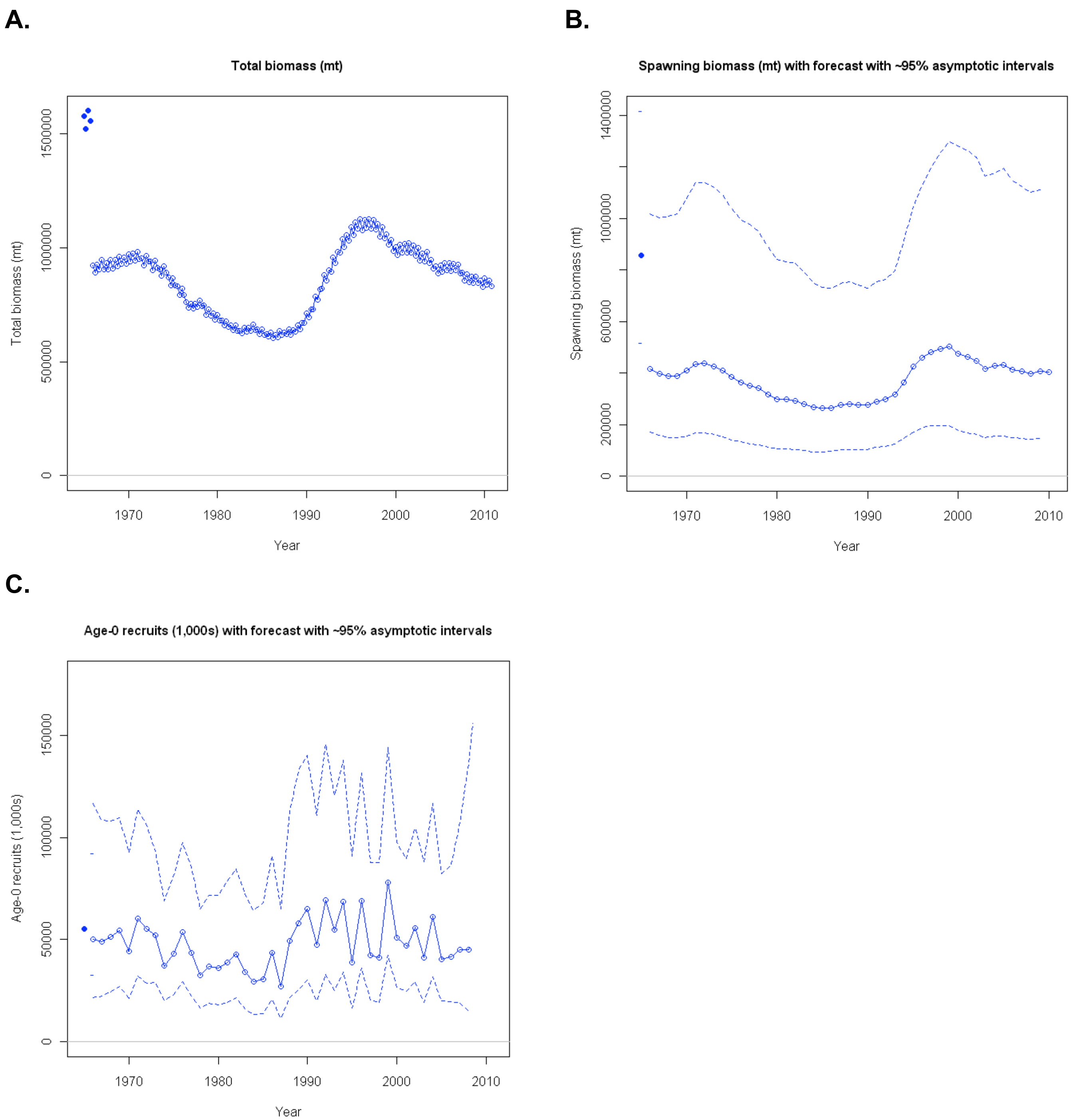


Figure 8.6. Estimated total biomass (A), spawning biomass (B), and age-0 recruitment (C) of albacore tuna in the north Pacific Ocean. The open circles represent the maximum likelihood estimates of each quantity and the dashed lines in the SSB (B) and recruitment (C) plots are the 95% asymptotic intervals of the estimates (± 2 standard deviations) in lognormal (SSB – B) and arithmetic (recruitment – C) space. Since the assessment model represents time on a quarterly basis, there are four estimates of total biomass for each year, but only one annual estimate of spawning biomass and recruitment.

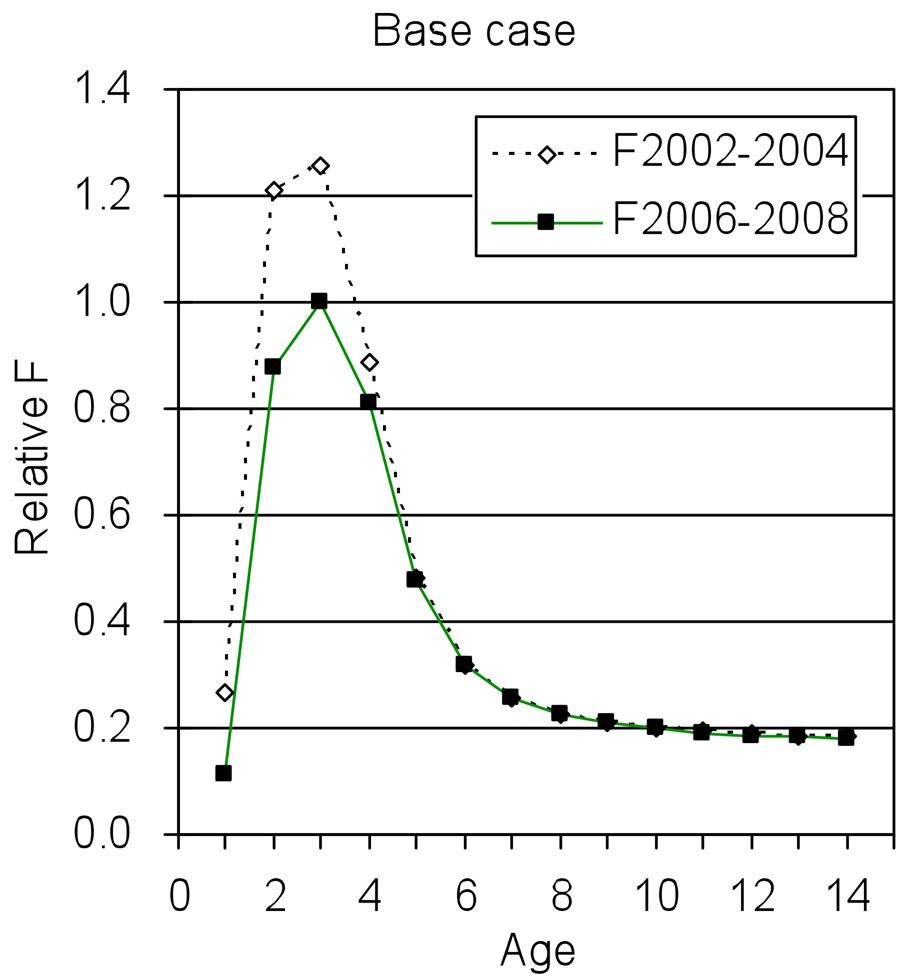


Figure 8.7. Estimated fishing mortality-at-age for the base-case scenario ($F_{2006\text{-}2008}$) and $F_{2002\text{-}2004}$ (current F in the 2006 assessment). Results are scaled to the highest F-at-age in the $F_{2006\text{-}2008}$ series.

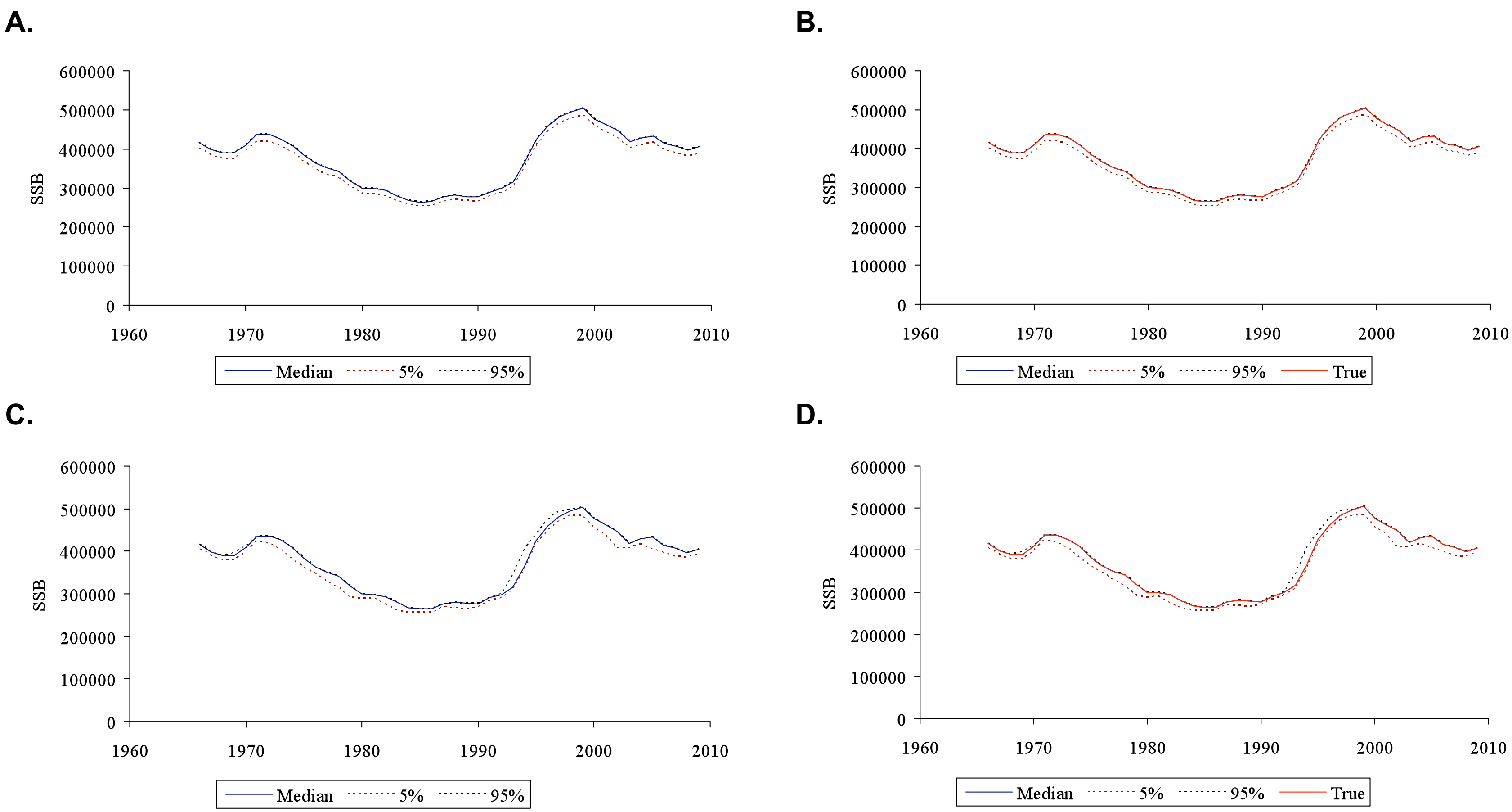
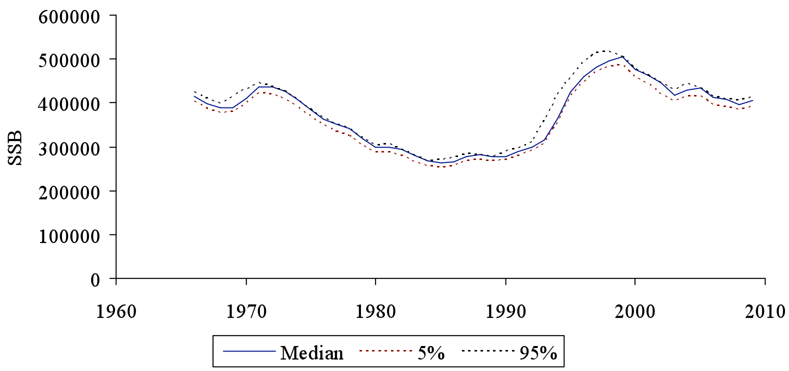


Figure 8.8. Spawning biomass time series estimated when jitter values of 0.1 (A) and 0.2 (B) were randomly added to parameters (blue lines) and base-case estimates of the SSB time series (C,D – red lines). Dotted lines are 5% and 95% confidence limits.

E.



F.

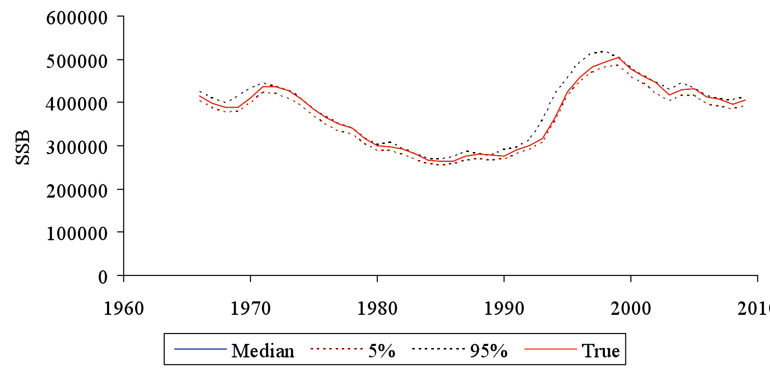


Figure 8.8. Continued. Spawning biomass time series estimated when jitter values of 0.3 (E) were randomly added to parameters (blue lines) and base-case estimates of the SSB time series (F – red lines). Dotted lines are 5% and 95% confidence limits.

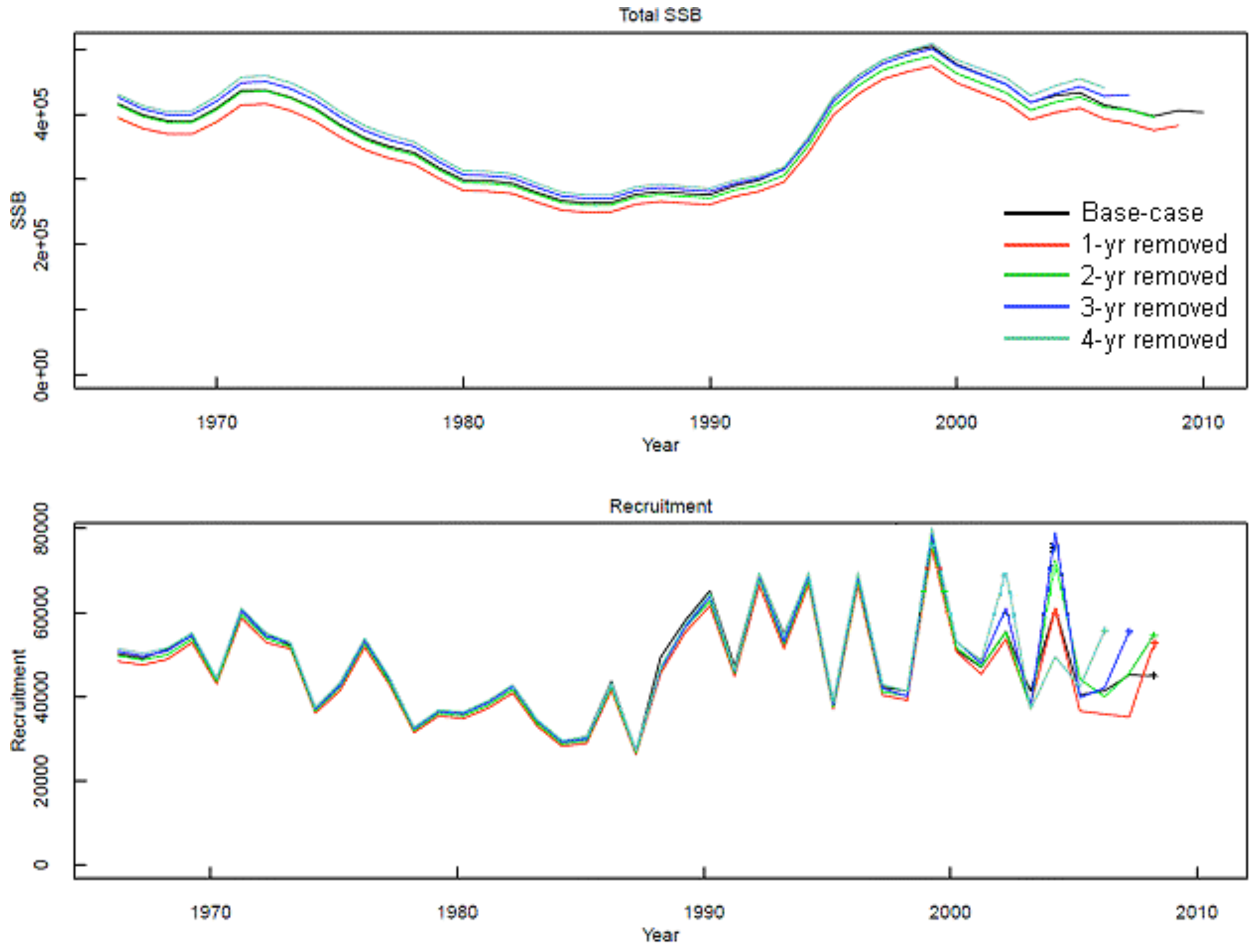


Figure 8.9. Retrospective analysis results showing spawning stock biomass (top) and recruitment (bottom) estimate trajectories when 1 to 4 years of data (2009 – 2006) are removed from the base-case model.

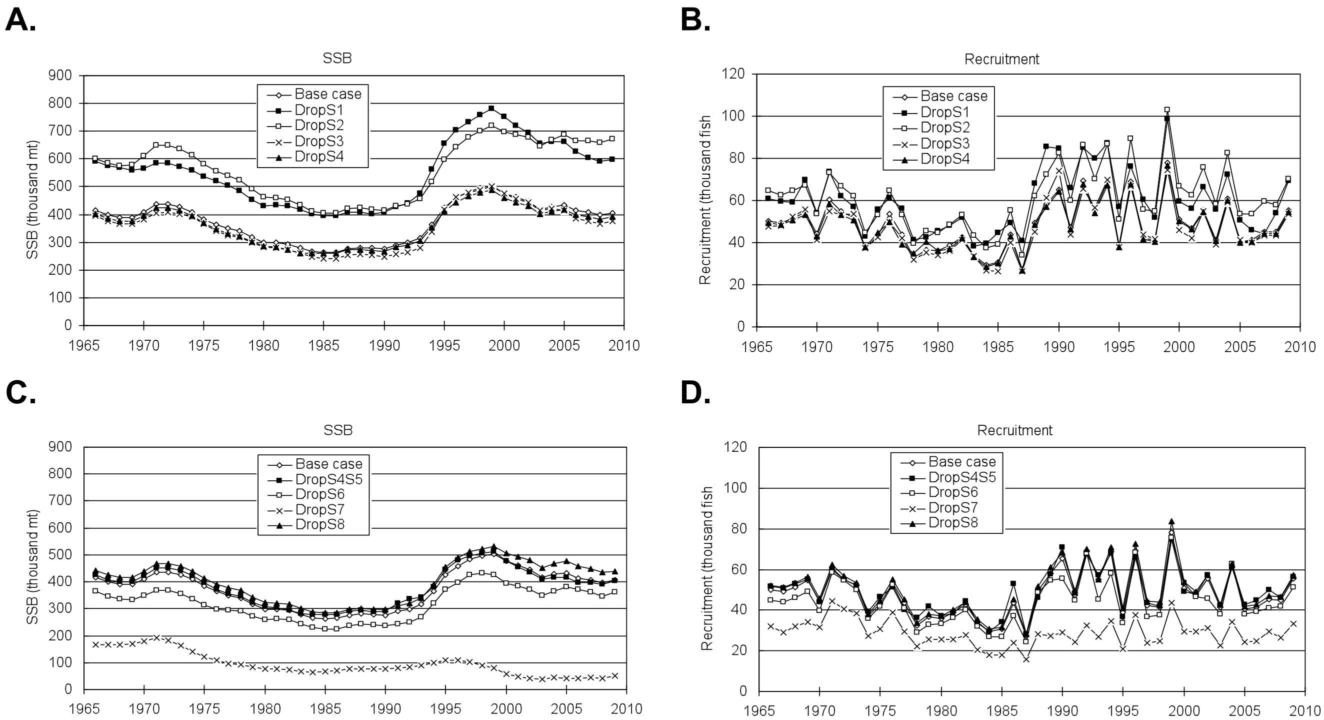


Figure 8.10. Estimates of spawning stock biomass (A,C) and recruitment (B,D) when individual CPUEs indices are dropped from the base-case model.

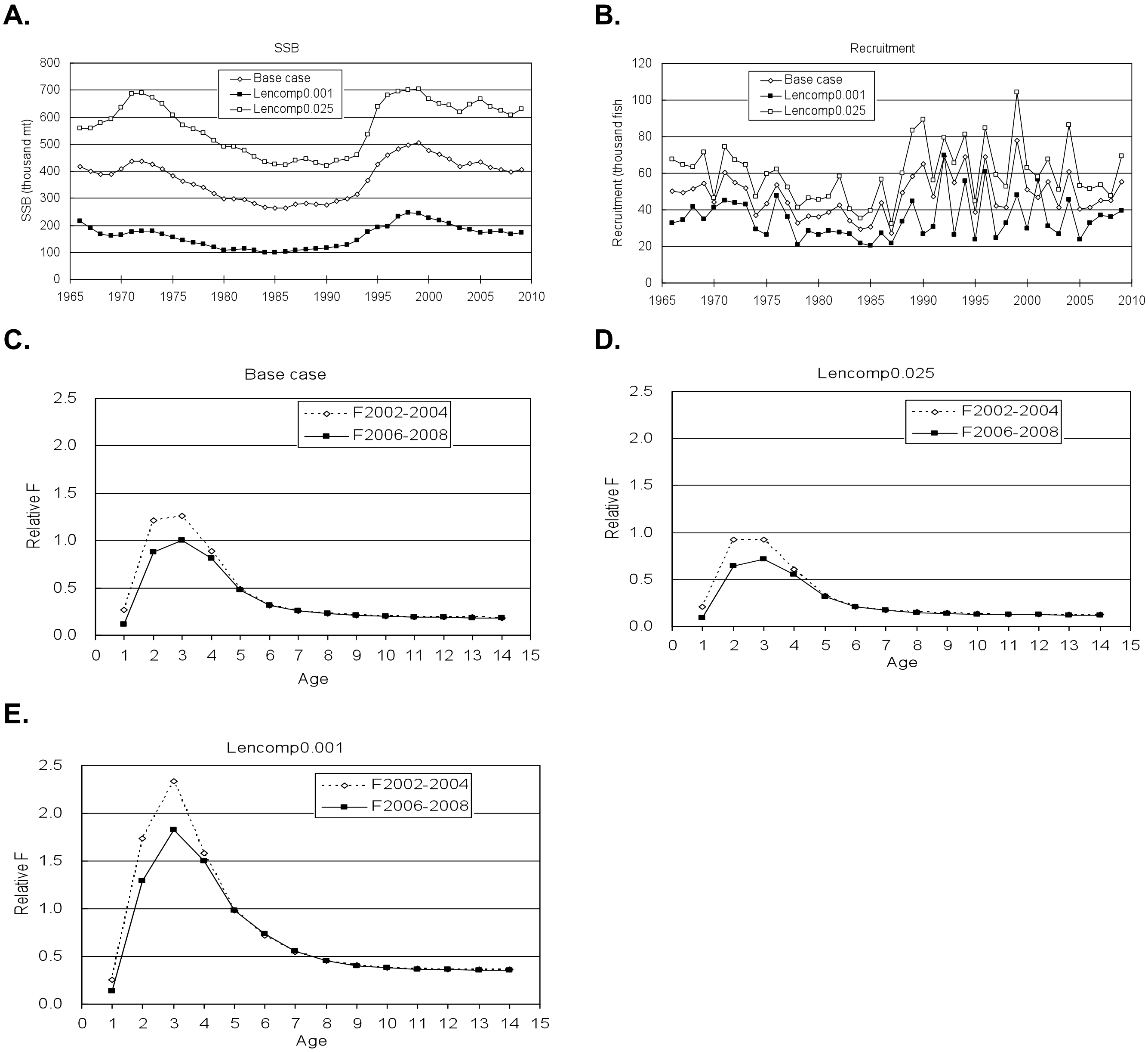


Figure 8.11. Estimates of spawning stock biomass (A), recruitment (B), and F-at-age (C,D,E) for the base-case and sensitivity runs assuming length composition lambdas = 0.025 and =0.001. F-at-age plots are scaled to the highest age-specific $F_{2006-2008}$ (= 1.0) on the base-case plot (C).

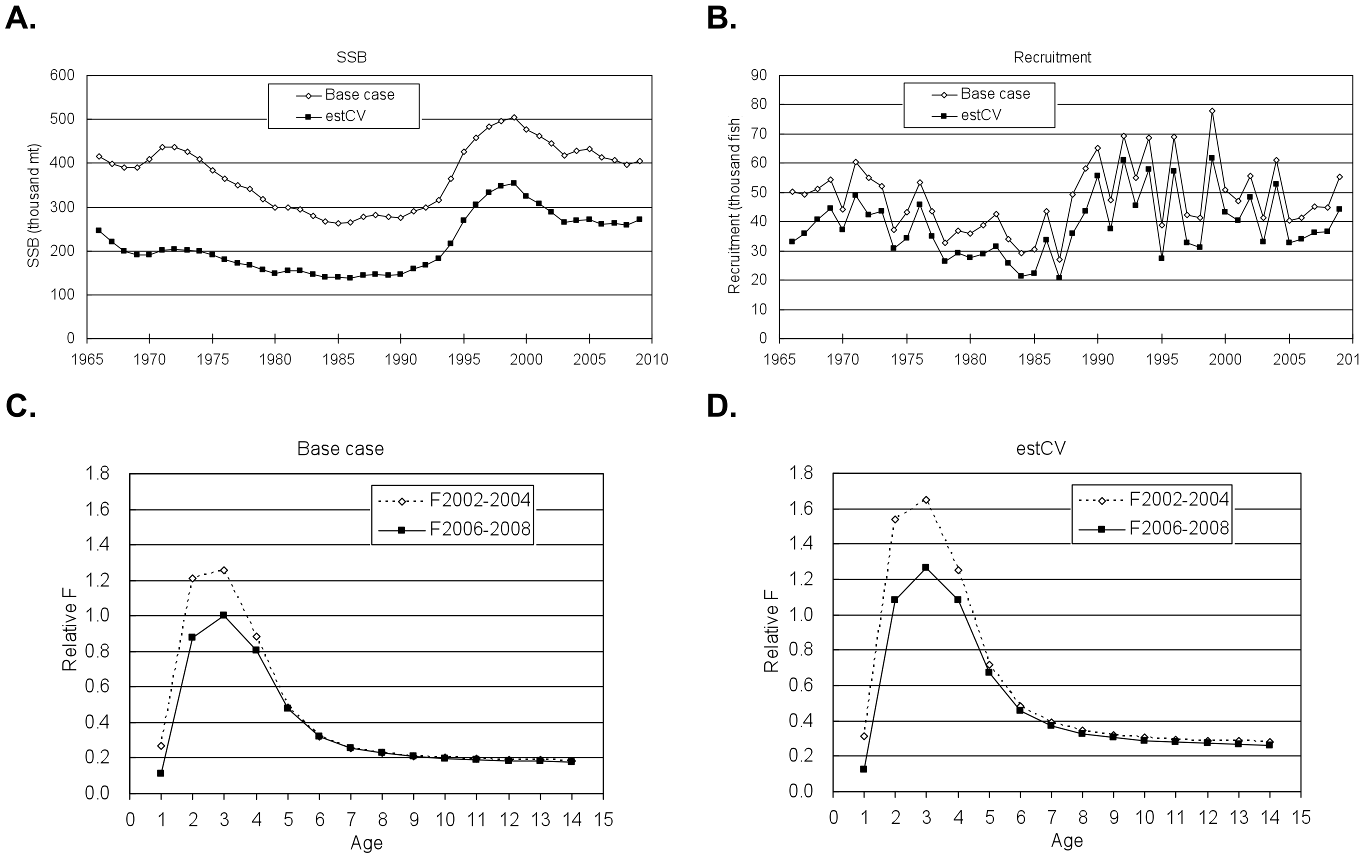


Figure 8.12. Estimates of spawning biomass (A), recruitment (B), and F-at-age (C,D) for the base case and the sensitivity run in which CV for S6 is fixed = 0.2 and all other CPUE index CVs are estimated. F-at-age plots are scaled to the highest age-specific $F_{2006\text{-}2008}$ (= 1.0) on the base-case plot (C).

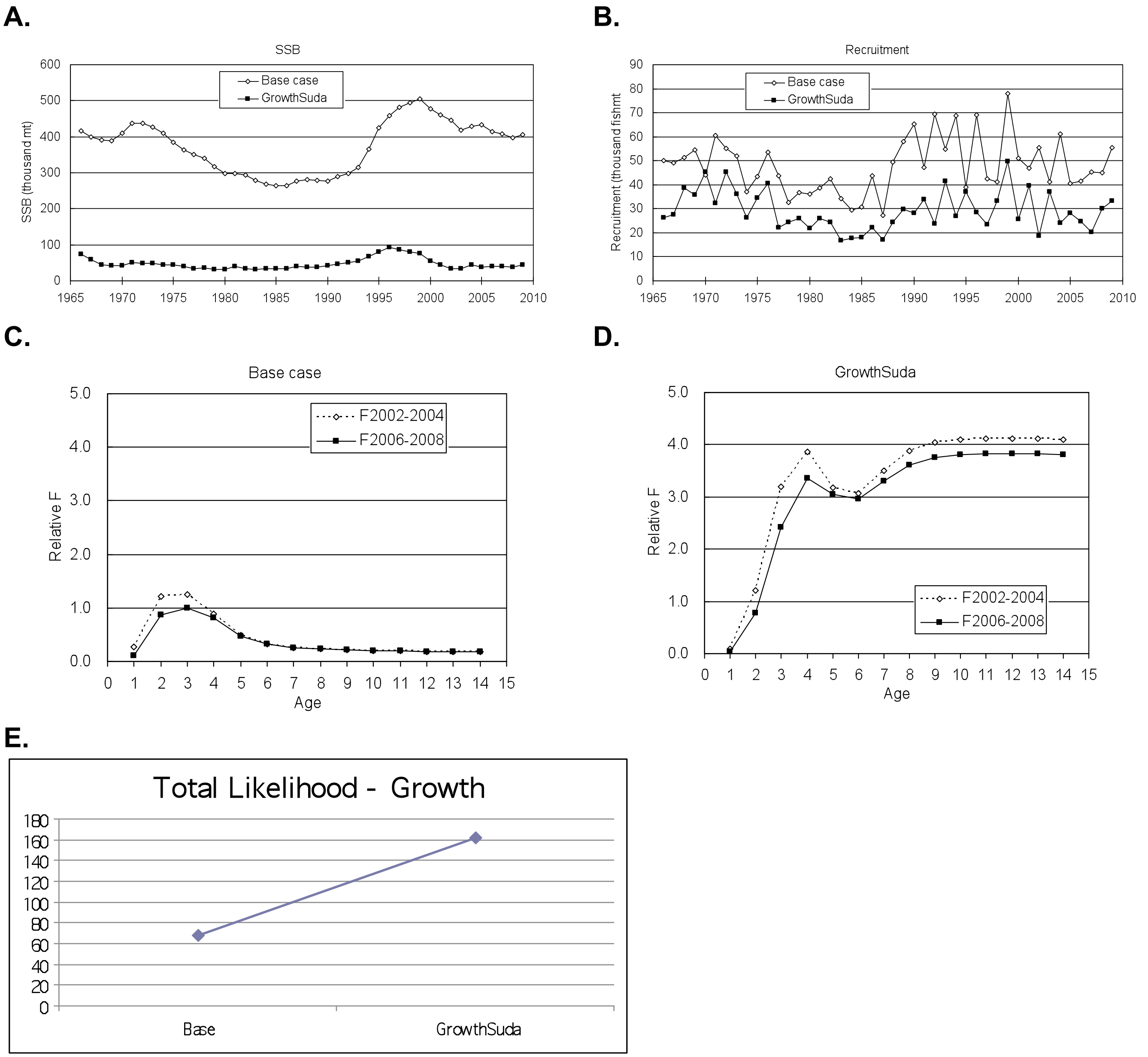


Figure 8.13. Estimates of spawning biomass (A), recruitment (B), and F-at-age (C – Base-case; D-Suda estimates) and total model likelihood (E) for the base case and sensitivity run in which growth curve parameters are fixed to Suda's (1966) estimates. F-at-age plots are scaled to the highest age-specific $F_{2006\text{-}2008}$ (= 1.0) on the base-case plot (C).

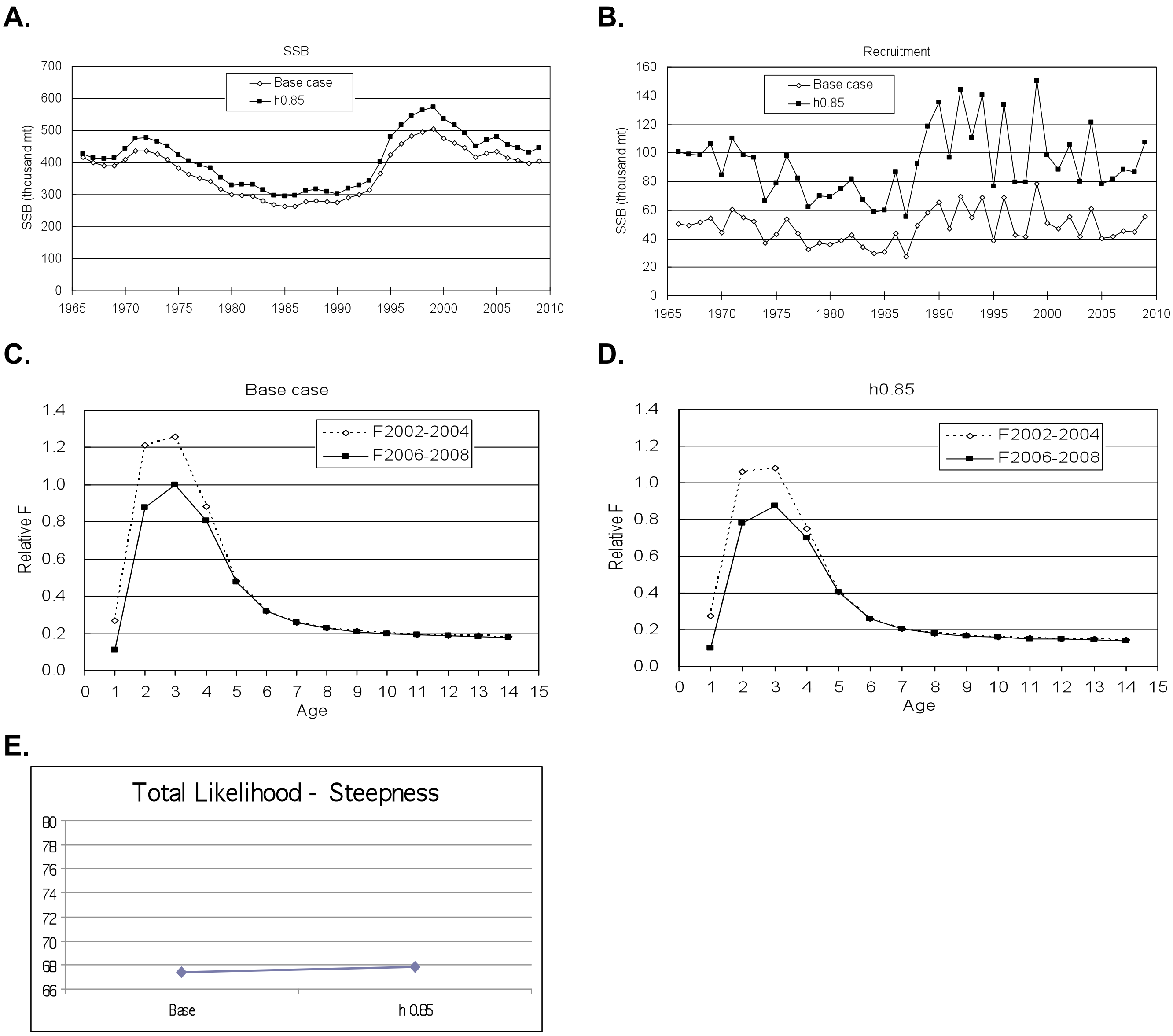


Figure 8.14. Estimates of spawning biomass (A), recruitment (B), F-at-age (C,D), and total likelihood (E) for the base-case and steepness (h) = 0.85. F-at-age plots are scaled to the highest age-specific $F_{2006\text{-}2008}$ (= 1.0) on the base-case plot (C).

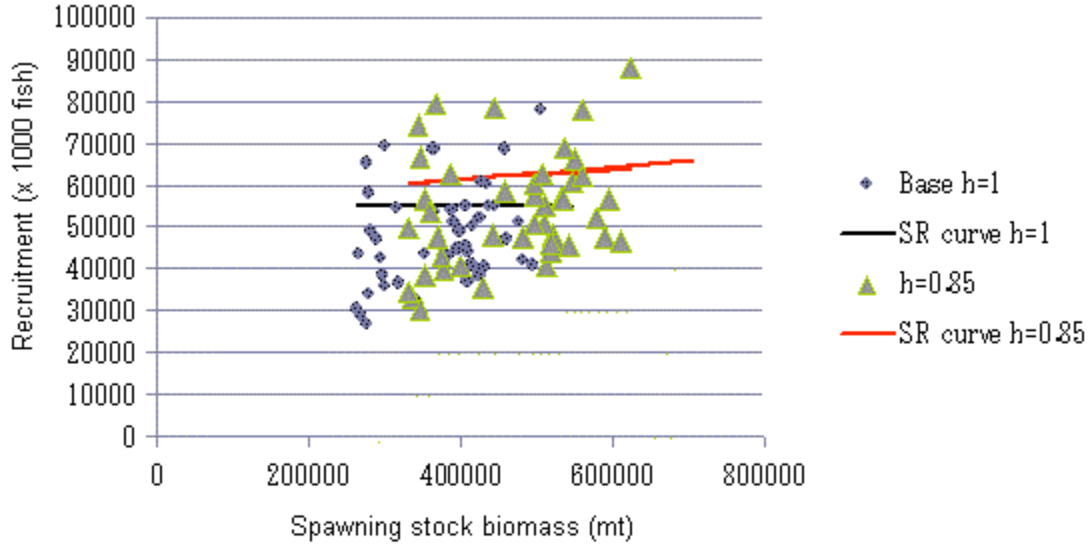


Figure 8.15. Spawning stock biomass and recruitment in the base-case model using two steepness assumptions: h = 1.0 (base-case) and h = 0.85 (sensitivity run.

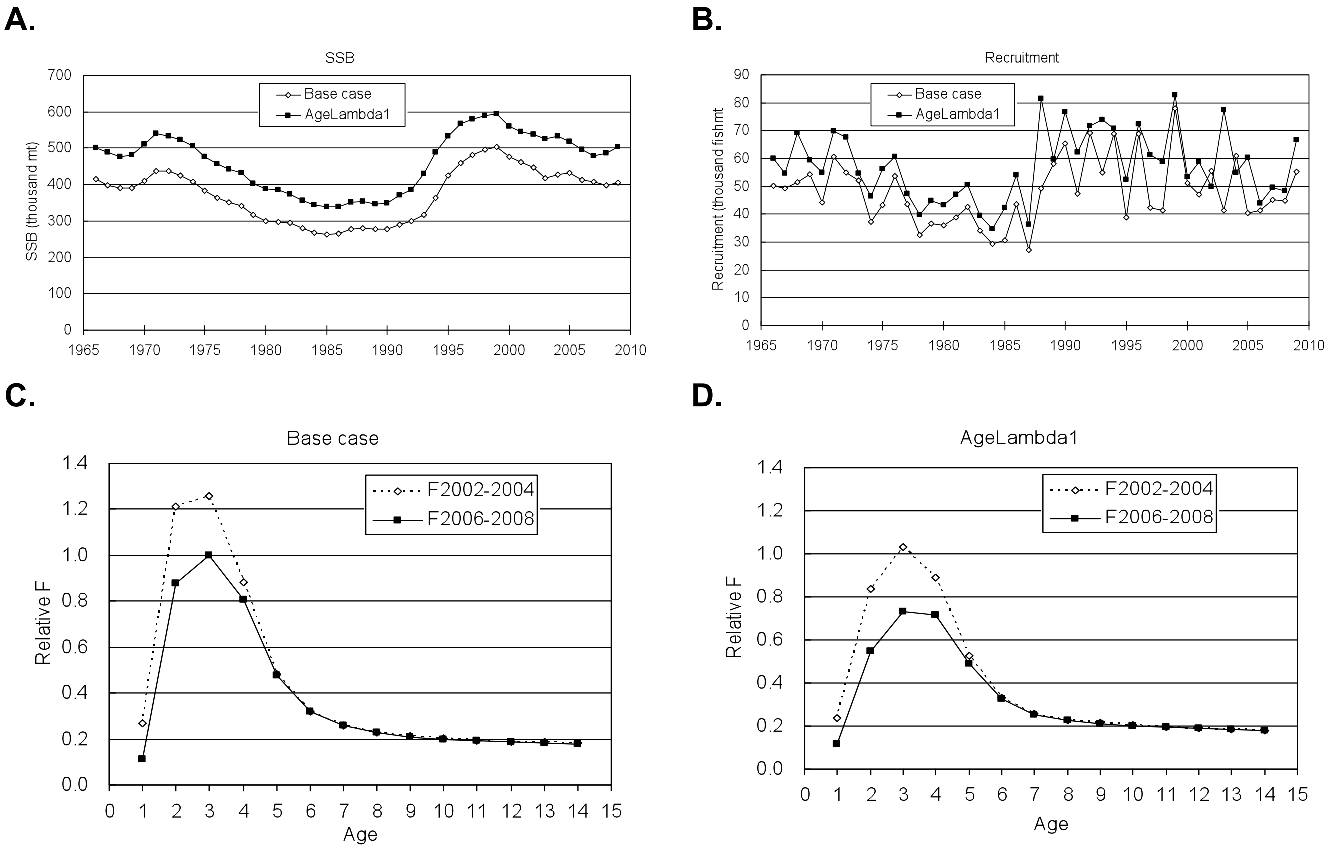


Figure 8.16. Estimates of spawning biomass (A), recruitment (B), and F-at-age (C – Base-case; D-aging lambda = 1) for the base case and sensitivity run assuming aging lambda = 1.0. F-at-age plots are scaled to the highest age-specific $F_{2006\text{-}2008}$ (= 1.0) on the base-case plot (C).

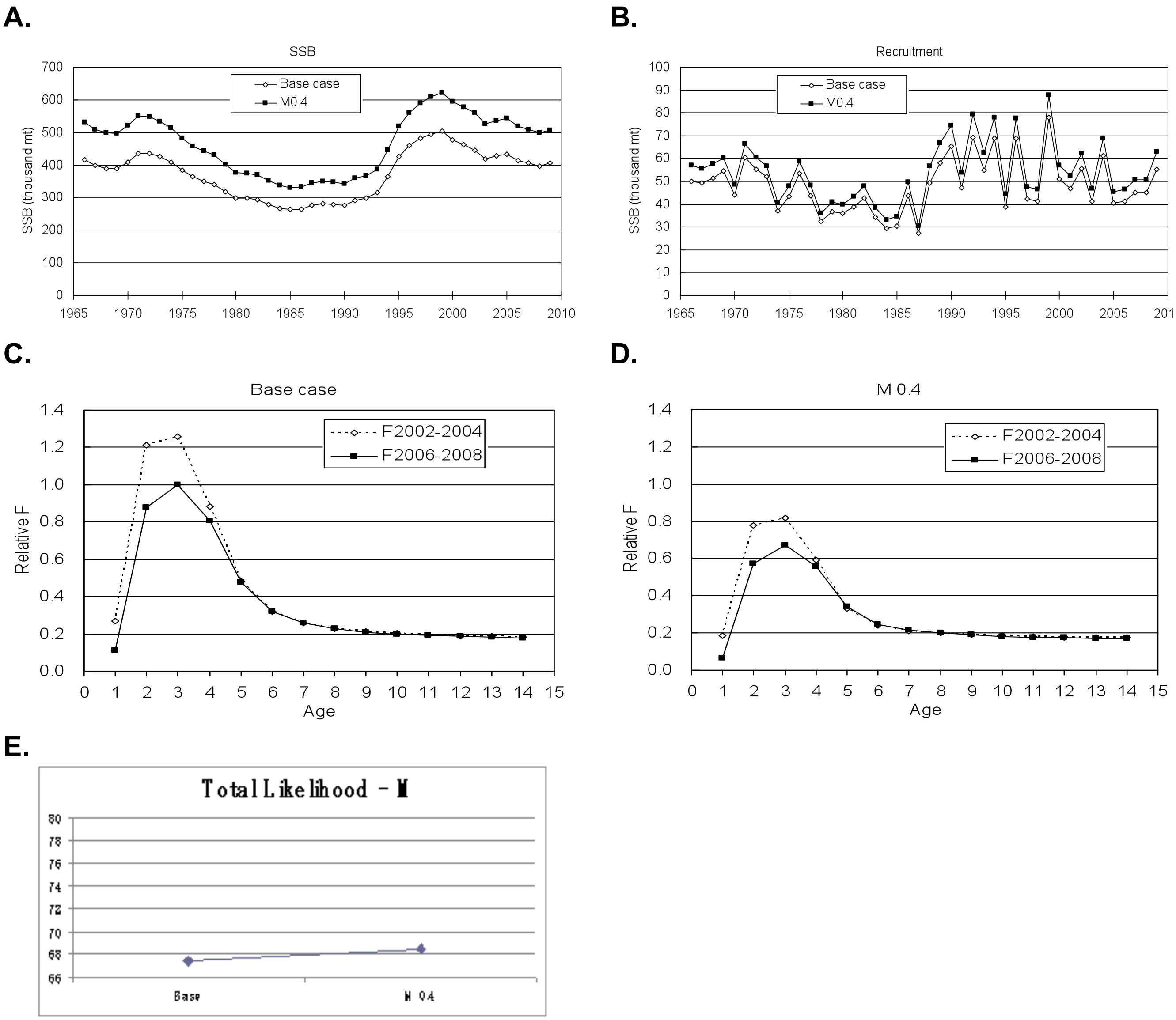


Figure 8.17. Estimates of spawning biomass (A), recruitment (B), F-at-age (C,D), and total likelihood for the base-case model and sensitivity run assuming M = 0.4 yr^{-1} for all ages. F-at-age plots are scaled to the highest age-specific $F_{2006\text{-}2008}$ (= 1.0) on the base-case plot (C).

A. B.

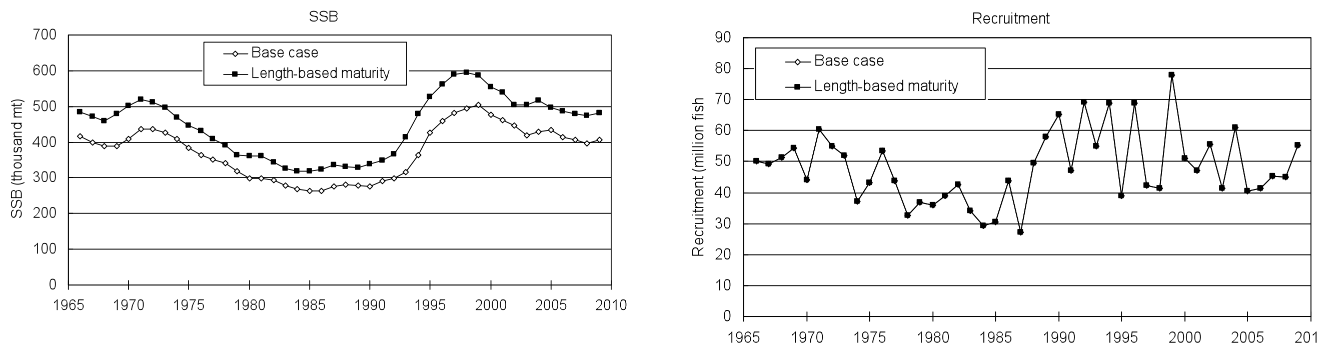


Figure 8.18. Estimates of spawning stock biomass (A) and recruitment (B) for the base-case (age-based maturity) and a sensitivity run using a length-based maturity schedule. Note that recruitment levels and trajectories are identical in the base-case and sensitivity run.

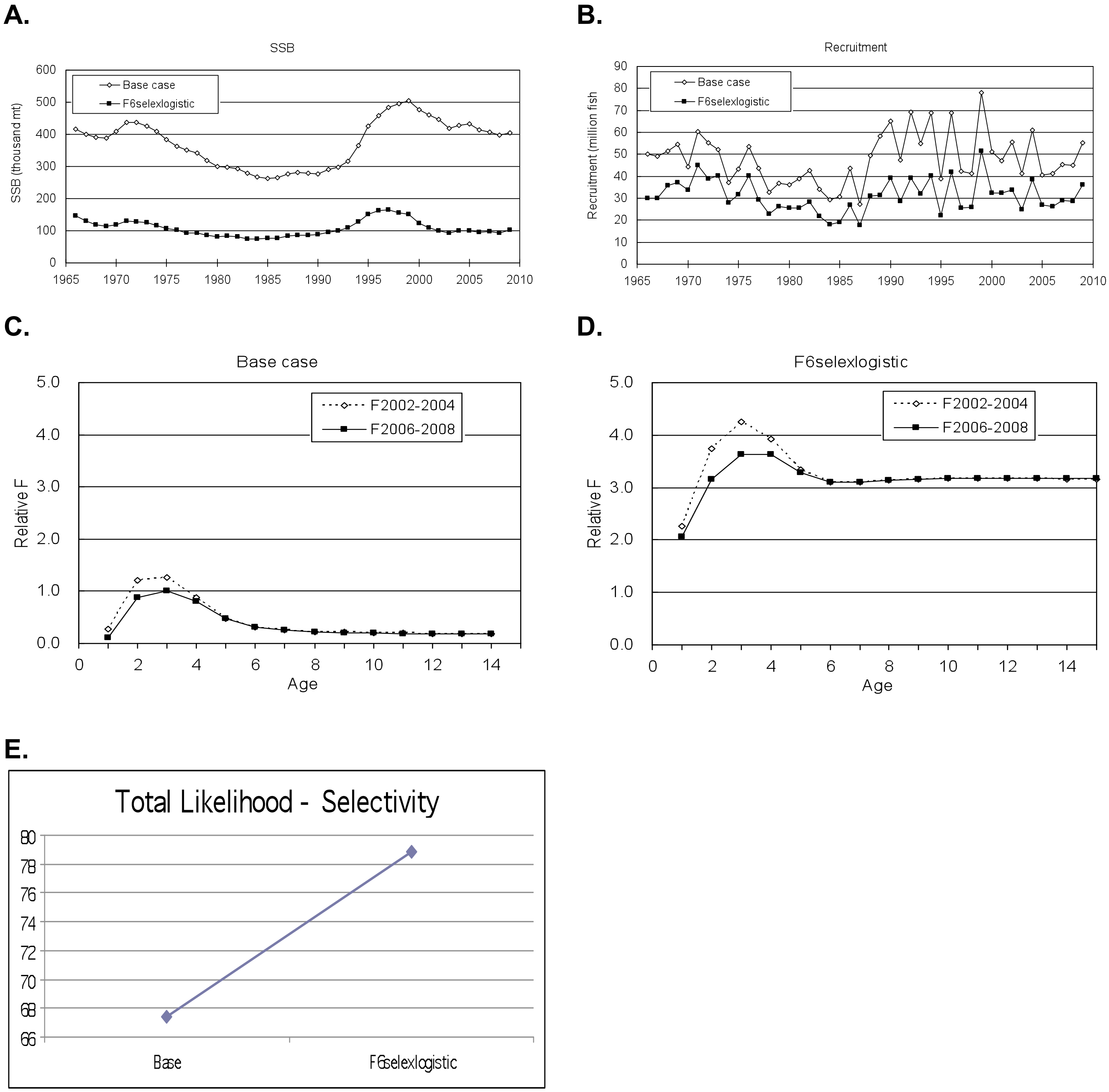


Figure 8.19. Estimates of spawning biomass (A), recruitment (B), F-at-age (C,D), and total likelihood (E) for the base-case model and a sensitivity run assuming that selectivity for fishery F6 is asymptotic rather than dome-shaped. F-at-age plots are scaled to the highest age-specific $F_{2006\text{-}2008}$ (= 1.0) on the base-case plot (C).

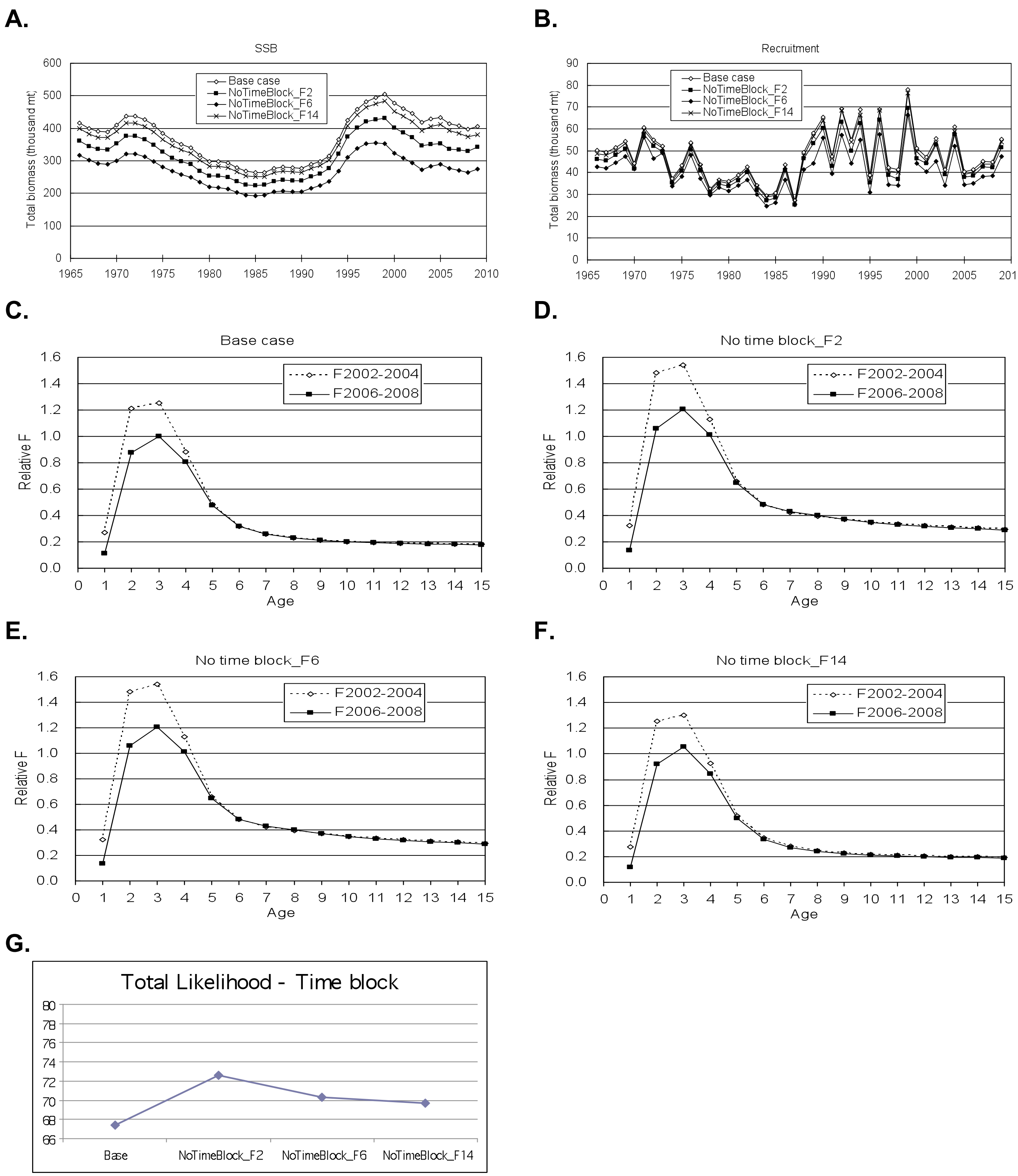


Figure 8.20. Estimates of spawning biomass (A), recruitment (B), F-at-age (C-F), and total model likelihood (G) for the base case scenario and sensitivity runs in which time blocks on selectivities for fisheries F2, F6, and F14 were removed. F-at-age plots are scaled to the highest age-specific $F_{2006\text{-}2008}$ (= 1.0) on the base-case plot (C).

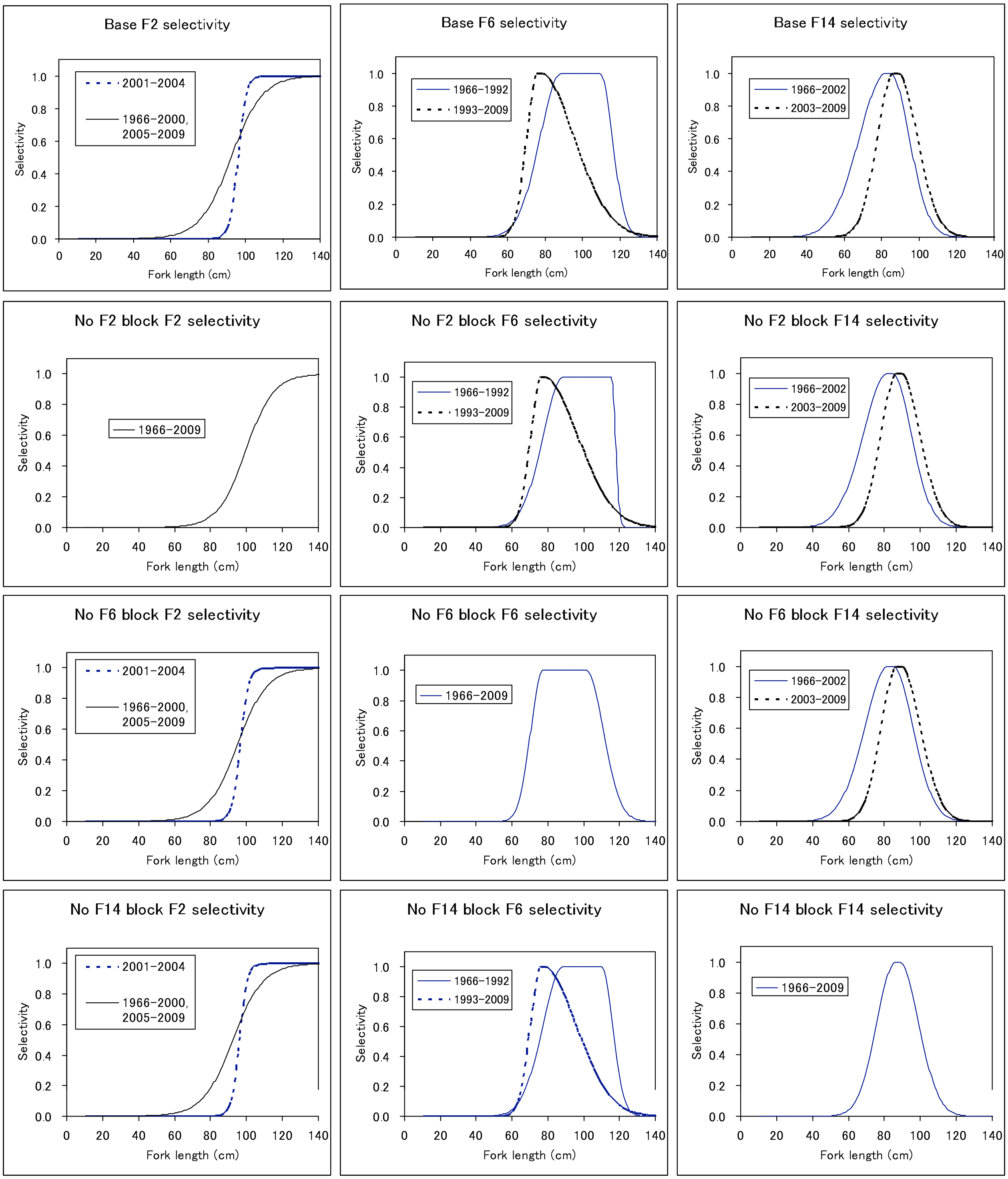


Figure 8.21. Estimated fishery selectivity patterns for the base case and sensitivity run when time blocks were sequentially removed from fisheries F2, F6, and F14.

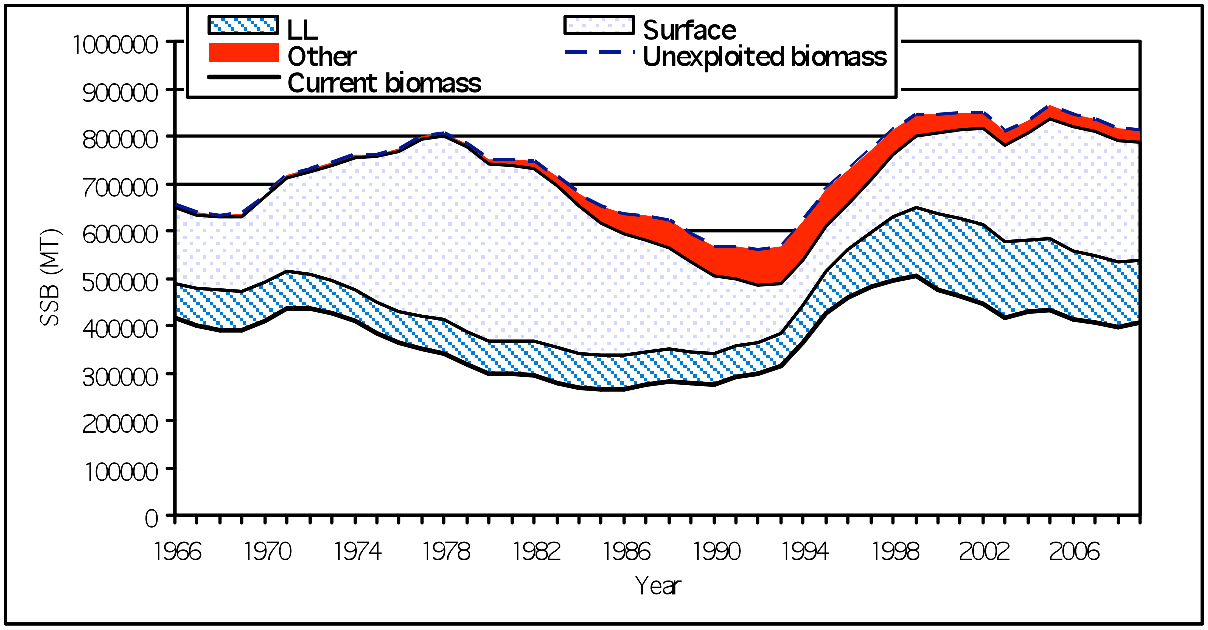


Figure 8.22. Trend of spawning stock biomass of a simulated population of north Pacific albacore that was unexploited (top dashed line) and predicted (solid line) by the base case model. The shaded areas show the portions of the impact attributed to each major fishing method. LL: longline (USA, JPN, TWN, KOR and others), surface: UCLTN and JPN PL, Other: miscellaneous fisheries not included in the longline and surface categories.

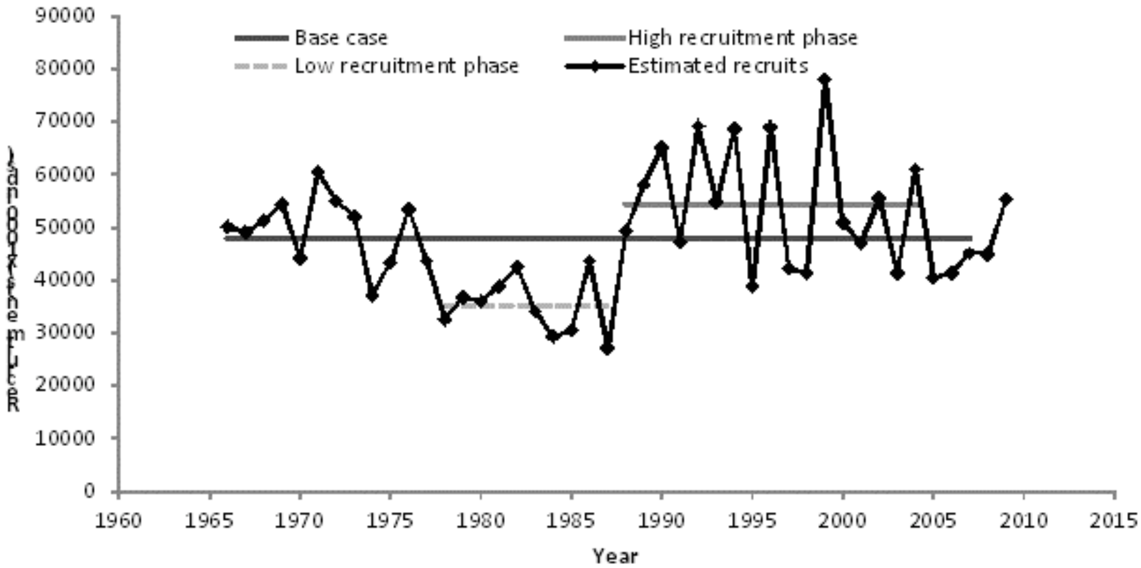


Figure 9.1. Historical trends in recruitment of north Pacific albacore (age-0) estimated by the SS3 base-case model and the assumed periods of low and high recruitments used for future projection scenarios.

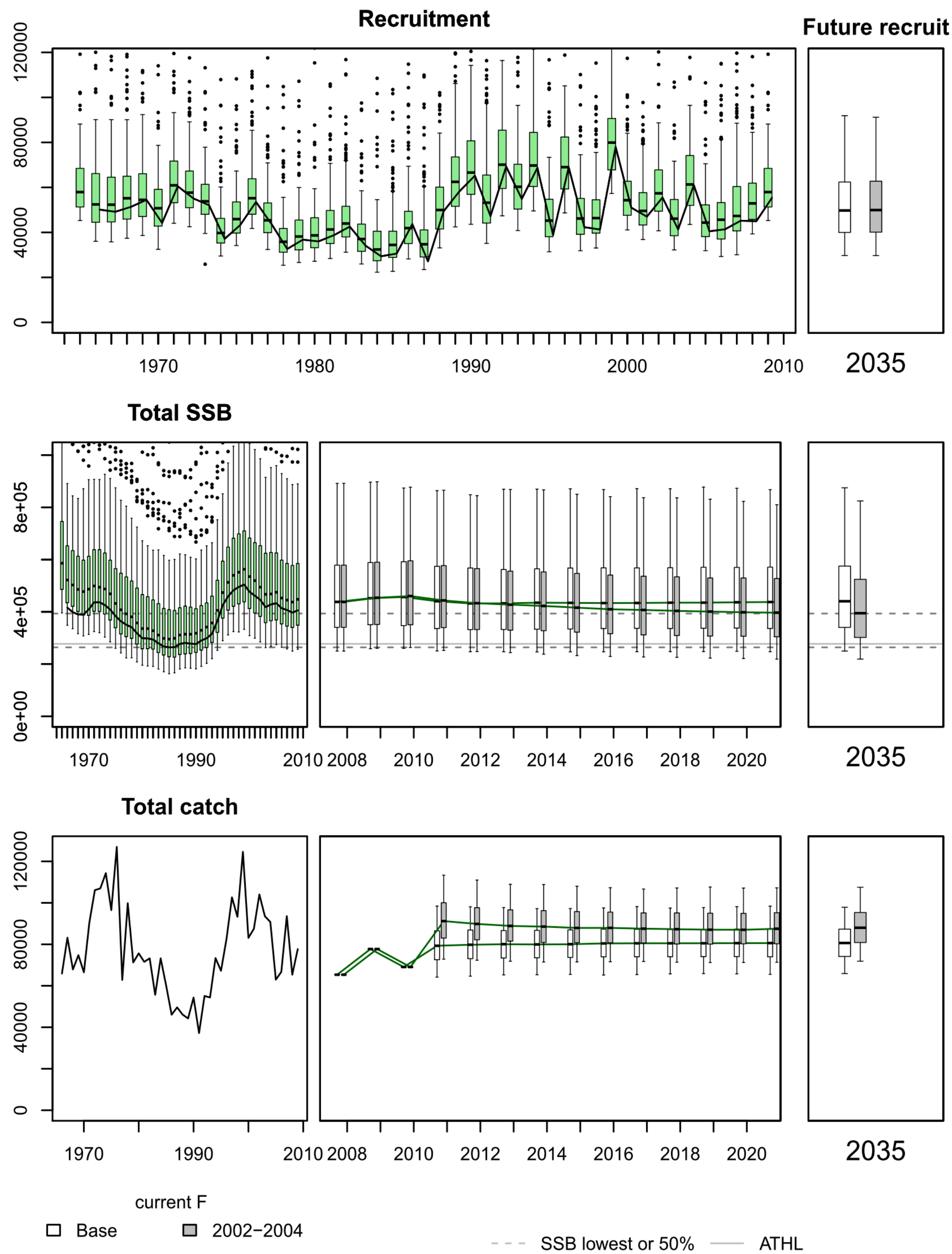


Figure 9.2. Past and future trajectories on recruitment (top), SSB (middle) and total catch (bottom), estimated with 2 harvesting scenarios of base case ($F_{2006\text{-}2008}$) and $F_{2002\text{-}2004}$. The lines from the boxes represent 90% confidence intervals, and lower and upper end of boxes represent 25th and 75th percentiles. Open circles are extreme values.

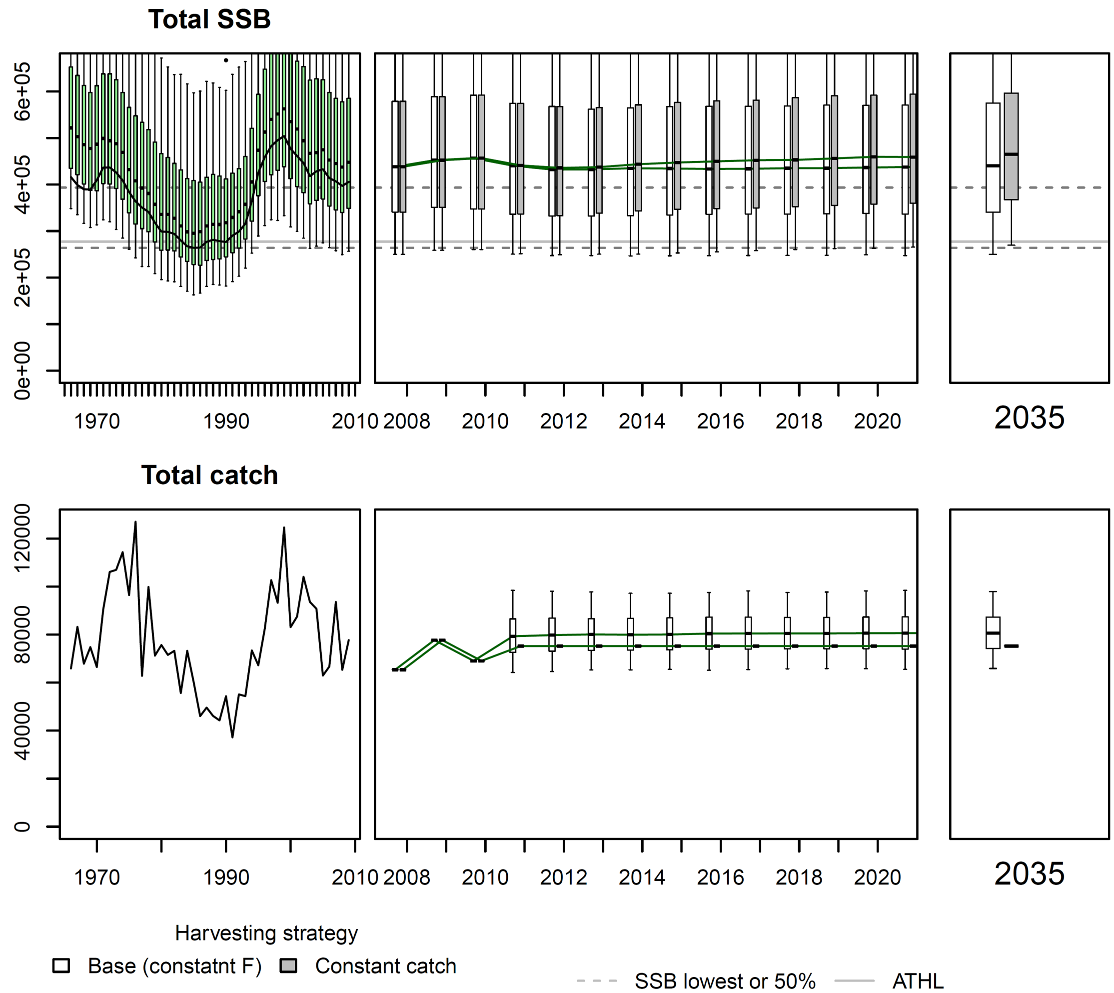


Figure 9.3. Past and future trajectories on SSB estimated with two harvesting scenarios (constant $F_{2006\text{-}2008}$) and constant catch (average catch from 2005 to 2007).

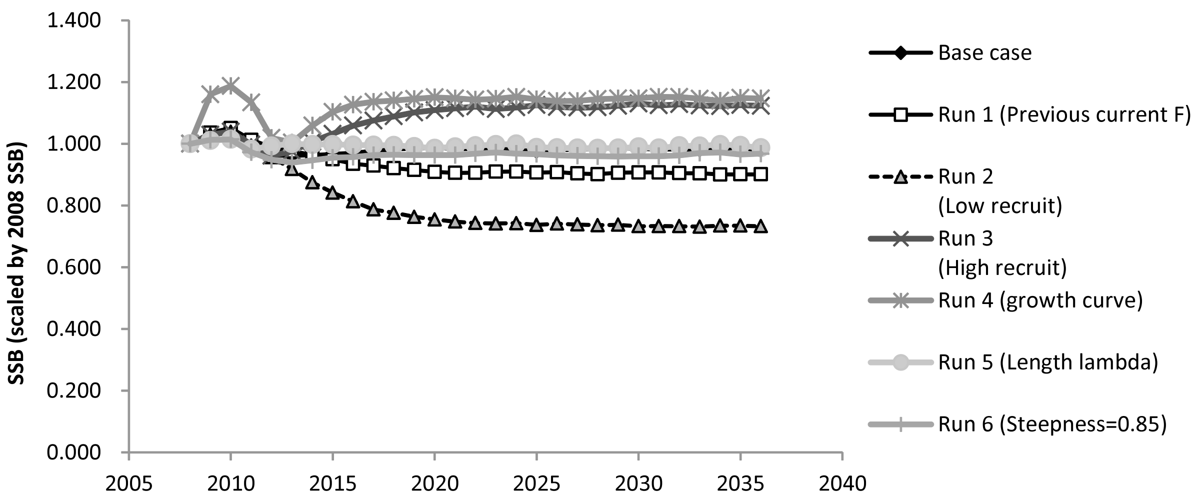


Figure 9.4. Comparison of SSB trajectories of among 7 future projection runs testing harvesting and recruitment scenarios and assessing structural sensitivities. Results are scaled to SSB_{2008}, which is approximately the long-term median SSB during the modeled period, 1966-2009.

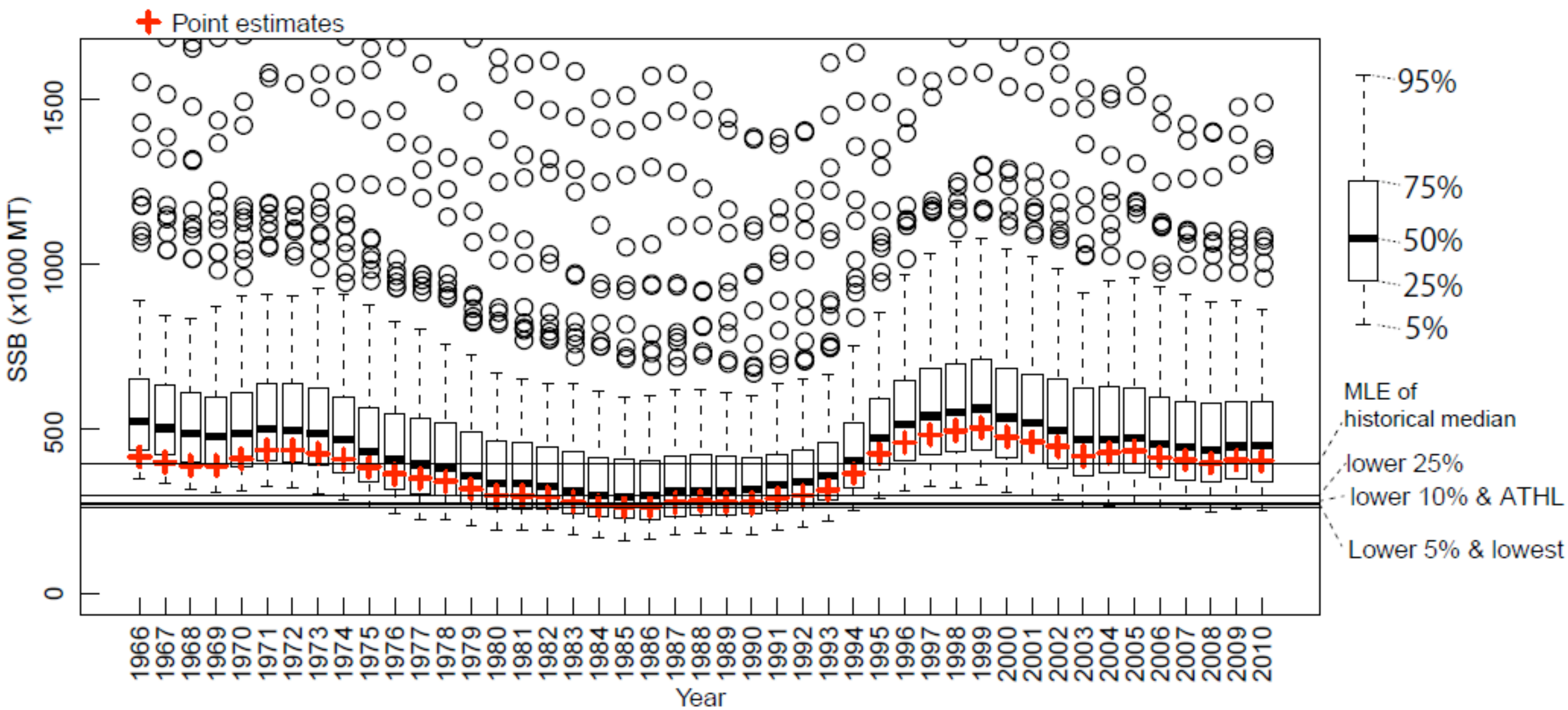


Figure 9.5. Historical SSB time series and confidence intervals estimated from 200 bootstrap results. The lines from the boxes represent 90% confidence intervals, and lower and upper end of boxes represent 25th and 75th percentiles. Open circles are extreme values. The figure also shows horizontal lines representing the maximum likelihood estimate of the historical median spawning biomass, the lower 5th, 10th and 25th percentiles, and the ATHL. The red crosses are the point estimates of spawning biomass from the base-case assessment model.

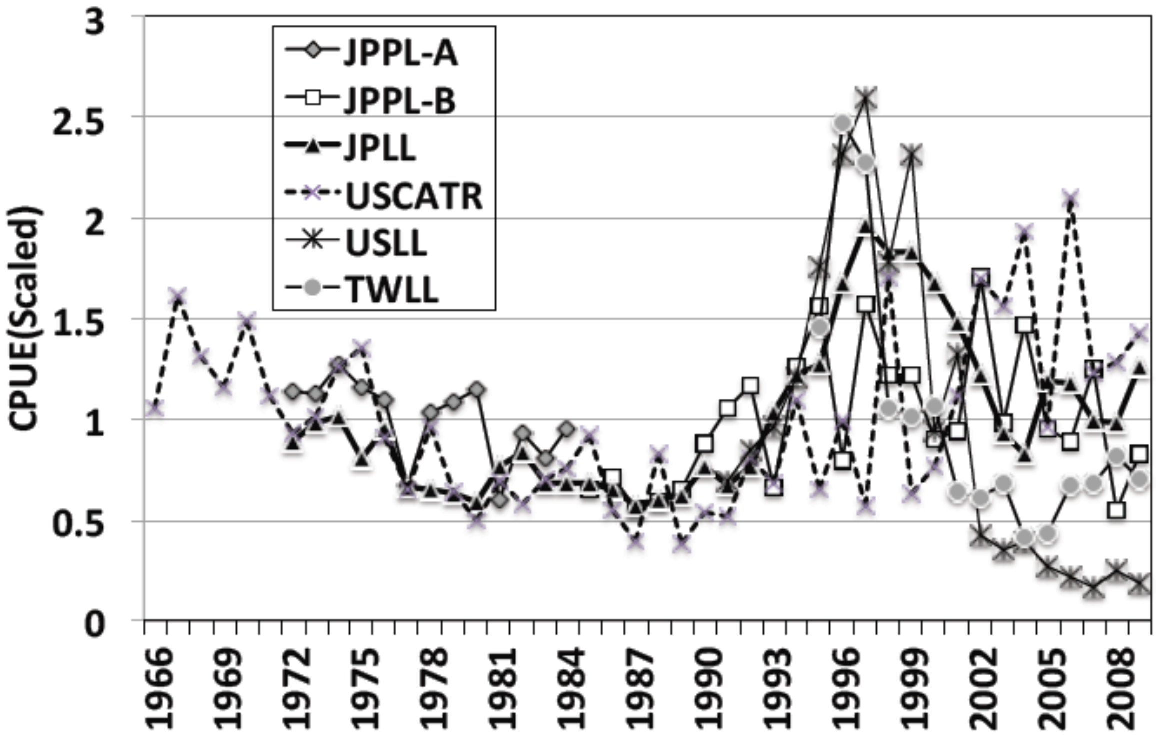


Figure 10.1. CPUE indices for north Pacific albacore used in the VPA reference run. JPN PL fishery A-1972-1984 and B-1985-2009, JPN LL fishery (1966-2008), USA LL (1991-2009), UCLTN fishery (1966-2009) and TWN LL fishery (1995-2008).

A.

B.

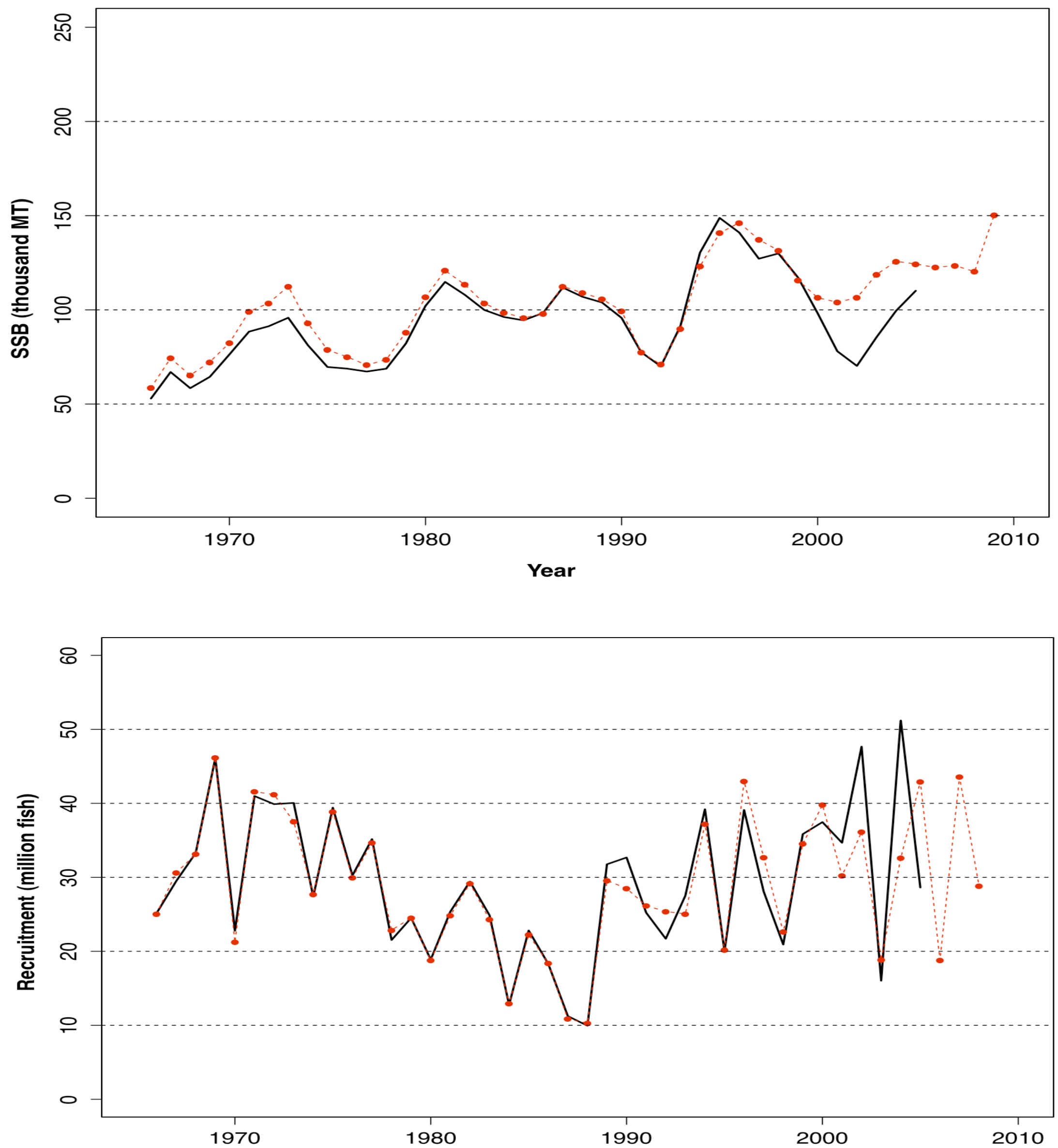


Figure 10.2. Estimated spawning stock biomass (A) and recruitment at age-1 (B) time series in the VPA reference run (red) and from the 2006 stock assessment (black).

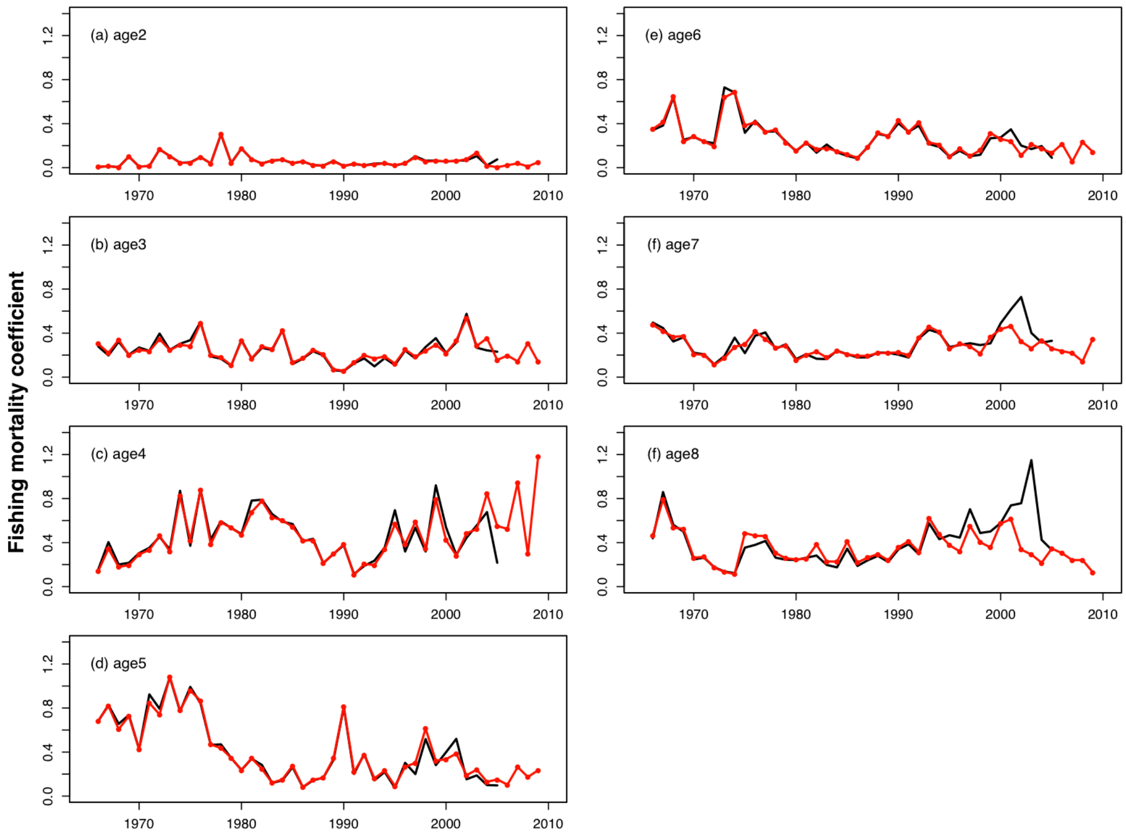


Figure 10.3. Fishing mortality coefficients for each age estimated in the VPA reference run (red) and the 2006 stock assessment (black).

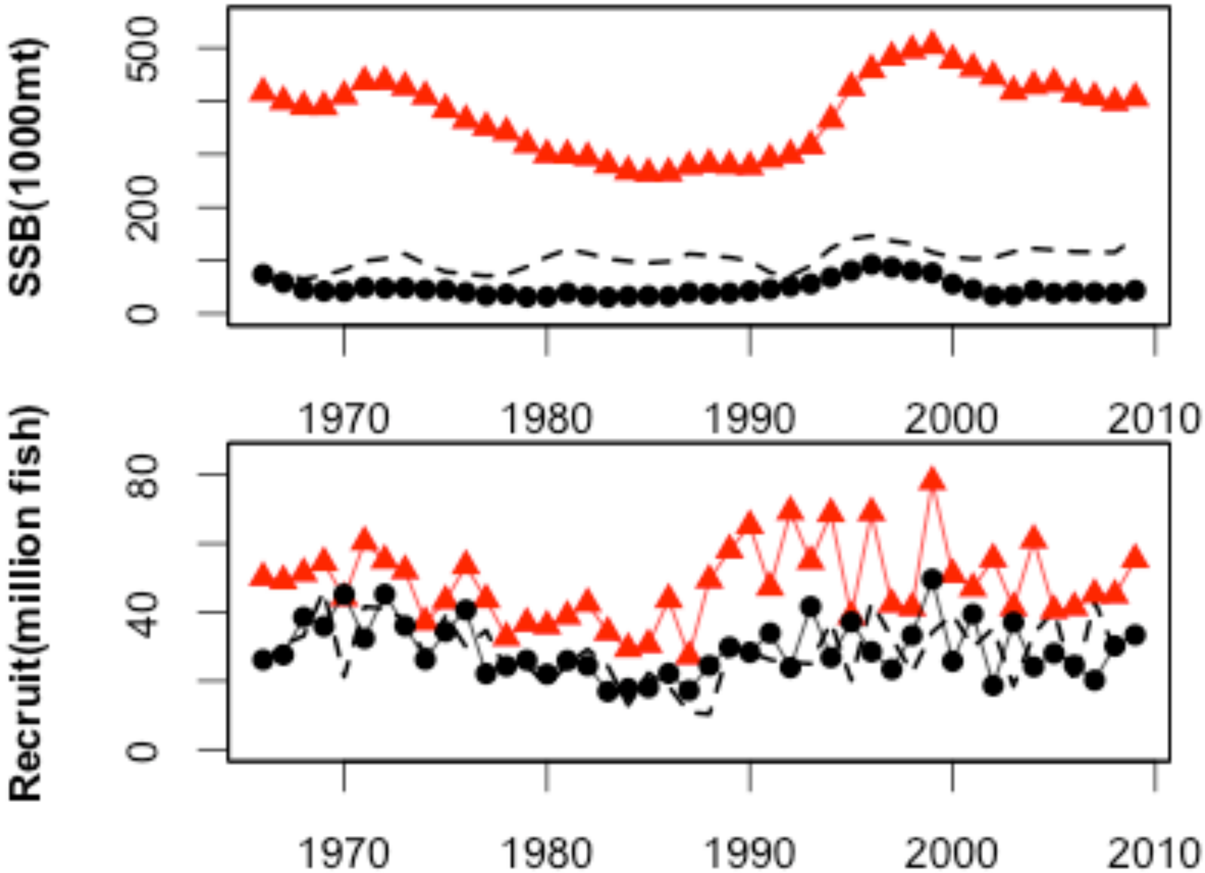


Figure 11.1. Spawning stock biomass (top) and recruitment (bottom) estimated in the VPA reference run (black dashed line) and SS3 base-case model (red triangles). Black circles are estimates of SSB and recruitment when growth curve parameters were fixed to Suda (1966) estimates as a sensitivity run of the SS3 base-case model. Recruitment is estimated at age-1 in the VPA reference run and at age-0 in SS3 base-case model so trends may be offset by one year.

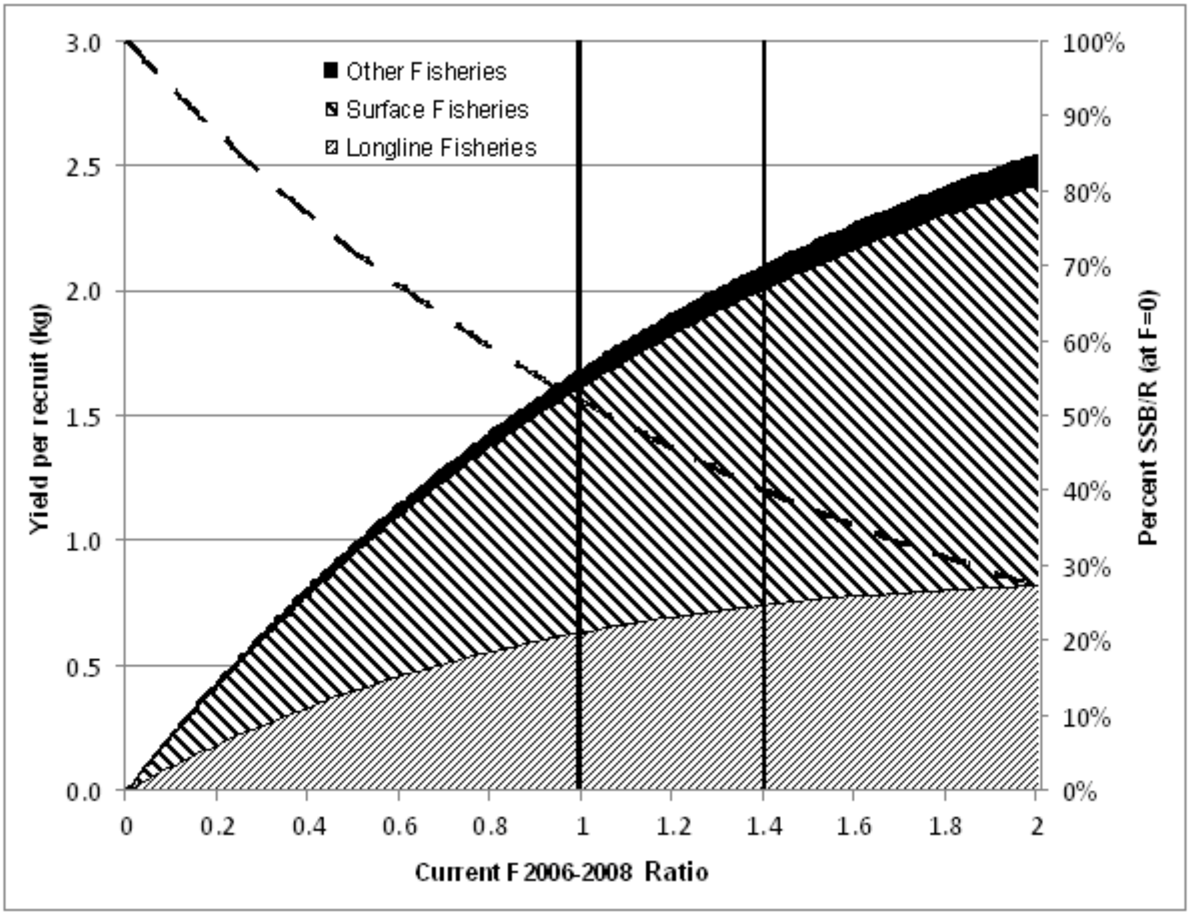


Figure 11.2. Equilibrium yield-per-recruit (shaded areas) for major fishery type and SPR (percent of SSB/R relative to F = 0) (dashed line) as a function of fishing mortality rate (F) for north Pacific albacore associated with the base-case model. The current fishing mortality rate multiplier (F = 1.0 at F = $F_{2006\text{-}2008}$) is based on the fully-selected F observed from the geometric mean of F-at-age estimates from 2006-08. Vertical lines show $F_{2006\text{-}2008}$ (F-multiplier = 1.0) and $F_{SSB\text{-}ATHL}$ (F-multiplier = 1.41).

APPENDIX 1

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APPENDIX 2

ISC-ALBWG Stock Assessment Workshop

4-11 June 2011

Adopted Agenda

1. Opening of Albacore Working Group (ALBWG) Stock Assessment Workshop
    i. Welcoming remarks
    ii. Introductions
    iii. Scheduling
2. Adoption of Agenda and Assignment of Rapporteurs
3. Reporting on work assignments from last meeting **(WP 04, 05, 06, 19)**
4. Report and recommendations from the modeling subgroup meeting
5. Review of Biological Studies (**WP 02, IP 01**)
6. Review of Stock Assessment Studies (**WP 03, 09, 11, 12, 18**)
7. Review of data (SS and VPA)
8. Model structure and input parameters (SS3 & VPA reference-case)
    a. Fisheries
    b. effective sample size
    c. growth
    d. stock-recruitment relationship (h)
    e. data weighting (CPUE)
9. Define sensitivity analysis runs
10. Future projections **(WP 14)**
    a. Refine initial conditions for projections
    b. Definition of current F (F2005-2007, F2006-2008)
    c. Constant F and constant catch scenarios
    d. Future recruitment – random resampling of historical recruitment, others?
    e. Initial projection year – 2008 (base), 2009 or 2007 (sensitivity)
    f. Catch in final years – use known 2009 catch; what about 2010 catch?
    g. F_{SSB} calculation
11. Review SS3 base-case runs for north Pacific albacore assessment
12. Review VPA reference-case run
13. Review sensitivity analysis results
14. Biological reference points for stock status (IATTC and WCPFC)
15. Review stock projection results
16. Determine current status and develop conservation advice
    a. Compare results of SS3 and VPA-2BOX reference runs
    b. Conclusions on current condition relative to reference points and uncertainty
    c. Projection estimates
    d. Develop conservation advice
17. Research Recommendations
18. Review Catch/Effort Data (Category I, II, & III data)
    a. Review of data for 2010 **(mostly via email: WP 01, 07, 10, 13, 15)**

   b. Update and Adopt Catch Table **(WP 16)**
   c. Issues for STATWG
19. Administrative Matters
   a. Workplan for 2011-12
   b. Update national contacts for ALBWG
   c. Time and place of next meeting
   d. Other matters
20. Rapporteurs and participants complete assigned sections of workshop report
21. Draft of workshop report circulated for review
22. Clearing of Report
23. Adjournment

APPENDIX 3

List of Working Papers

		Availability
ISC/11/ALBWG/01:	Mexican progress report on the albacore tuna fishery. Luis A. Fleischer and Michel Dreyfus	Contact details only
ISC/11/ALBWG/02:	Age and growth of North Pacific albacore (*Thunnus alalunga*). R. J. David Wells, Suzanne Kohin, Steven L.H. Teo, Owyn E. Snodgrass, and Koji Uosaki	Contact details only
ISC/11/ALBWG/03:		**Withdrawn**
ISC/11/ALBWG/04:	Comparison of length compositions from Taiwan longline, Japan pole-and-line, and U.S. longline fisheries. Steven L. H. Teo, Chiee-Young Chen, and Takayuki Matsumoto	Full paper on ISC website
ISC/11/ALBWG/05:	Updated time series associated with albacore fisheries based in the Northeast Pacific Ocean. Steven L. H. Teo	Full paper on ISC website
ISC/11/ALBWG/06:	Estimation of alternative growth curve of north Pacific albacore based on Japanese pole-and-line size data and reported growth curves. Takayuki Matsumoto	Contact details – checking for full availability
ISC/11/ALBWG/07:	Recent Aspects of Taiwanese Albacore-targeting Longline Fisheries in the North Pacific Ocean, 2011. Wu Ren-Fen, Hung-I Liu, and Chiee-Young Chen	Contact details – checking for full availability
ISC/11/ALBWG/08:	Review of developing Japanese albacore fishery data to apply to stock synthesis model. Takayuki Matsumoto and Koji Uosaki	Contact details – checking for full availability
ISC/11/ALBWG/09:		**Withdrawn**
ISC/11/ALBWG/10:	The Canadian Troll Fishery for North Pacific Albacore Tuna in 2010. John Holmes	Full paper on ISC website
ISC/11/ALBWG/11:	Probable Values of Stock - Recruitment Steepness for North Pacific Albacore Tuna. Jon Brodziak, Hui-Hua Lee, and Marc Mangel	Full paper on ISC website
ISC/11/ALBWG/12:	Preliminary North Pacific albacore population analysis using VPA-2BOX and future	Contact details –

	projection using PRO-2BOX for 1966-2009. Kiyofuji, H., Iwata, S., Kai, M., Ichinokawa, M., Matsumoto, T., Uosaki, K. and Takeuchi, Y.	checking for full availability
ISC/11/ALBWG/13:	Review of Japanese albacore fisheries as of 2011. K. Uosaki, H. Kiyofuji and T. Matsumoto	Contact details – checking for full availability
ISC/11/ALBWG/14:	Future projection for the North Pacific albacore, based on stock assessment conducted in 2011. Momoko Ichinokawa et al.	Contact details – checking for full availability
ISC/11/ALBWG/15:	Review of the U.S. albacore surface fishery in the north Pacific in 2010. John Childers, Suzy Kohin, and Amy Betcher.	Full paper on ISC website
ISC/11/ALBWG/16:	North Pacific albacore catches and number of vessels fishing for albacore in the north Pacific Ocean. John Childers	Full paper on ISC website
ISC/11/ALBWG/17:		**Withdrawn**
ISC/11/ALBWG/18:	Calculation of the steepness for the North Pacific Albacore. By Shigehide Iwata, Hiroshi Sugimoto and Yukio Takeuchi	Contact details – checking for full availability
ISC/11/ALBWG/19:	Fork length at 95th percentile of cumulative length frequency as an indicator of maximum length for albacore *Thunnus alalunga* in the Pacific Ocean prior to 1965. Hiroshi Ashida, Masashi Okada and Koji Uosaki	Contact details – checking for full availability
Information Papers		
ISC/11/ALBWG/IP/01	Age and growth of albacore *Thunnus alalunga* in the North Pacific Ocean. K.-S. Chen, T. Shimose, T. Tanabe, C.-Y. Chen, and C.-C. Hsu	Contact details only

APPENDIX 4

ISC-ALBWG Model Subgroup Meeting, 30 May-3 June 2011

Report to the Assessment Workshop

The model subgroup of the ISC-ALBWG met 30 May – 3 June 2011, at the National Research Institute for Far Seas Fisheries in Shizuoka, Japan. Fifteen scientists from Canada, the IATTC, Japan and the United States participated in the meeting (Attachment 1).

John Holmes chaired the meeting and briefly welcomed participants to the meeting. He noted that the goals of the meeting were: (1) to develop recommendations to the full working group concerning all of the major modeling issues that have been identified, and (2) to produce base case scenario for recommendation to the full ALBWG.

A draft agenda was circulated prior to the meeting, but was very loosely organized. The group developed a checklist of modeling issues for discussion and organized an agenda based on these issues. Additional input was received via an email to the Chair. The agenda adopted for the meeting is shown in Attachment 2.

Rapporteurs were not assigned to specific sections of the agenda. John Holmes captured the major points of discussion and recommendations for reporting to the full ALBWG.

Three working papers, ISC/11/ALBWG/03, ISC/11/ALBWG/08, and ISC/11/ALBWG/12, were reviewed by the Modeling Subgroup and used as the basis for discussion and formulation of recommendations for the base-case model. These working papers were not reviewed or subsequently discussed directly by at the assessment workshop.

1.0 Data Issues/Overview

Catch-at-length, length composition, CPUE, and catch-at-size data were reviewed for all fisheries during the Modeling Subgroup meeting. This review was necessary because a conflict was detected between some of the size composition data and CPUEs in the some of the JPN LL fisheries after the fishery definitions were finalized at the October 2010 workshop and there was concern that the problem may not be restricted to these fisheries alone. The problem with the JPN LL fishery data, seasonal variability in length composition, was documented and the impact of splitting JPN LL fisheries into seasonal fisheries was assessed (Matsumoto and Uosaki 2011; ISC/11/ALBWG/08). This working paper demonstrated that the problems with these fisheries are of sufficient magnitude that the only viable option was to split the JPN LL fisheries (F6 and F7) into two seasonal fisheries. After much discussion this course of action was recommended by the Subgroup to the full WG. At the same time, USA scientists recommended deleting size composition data from 2009 in the USA LL fishery (F2) from the assessment dataset because errors were found in that database for that year (see Lee et al. 2011; ISC/11/ALBWG/03). Since the data were frozen for the assessment, the recommendation to delete them rather than substituting new data was made by the Modeling Subgroup.

1.1 Review of Japan Data Files for SS3

Several data files, each correcting the previous file, were submitted by Japan after the data were frozen for the assessment on 15 December 2010. All of the corrections were to the size data for the pole-and-line and longline fisheries. Three problems were found and corrected in succession:

1. Use of the wrong length bin definition – SS defines length bins using the lower limit whereas in the Japan size database, length bins are defined by the upper limit. This error was corrected in file distributed to ALBWG members on 27 Feb 2011;
2. Substitution error or inappropriate procedure was used when the number of size measurements in a 5° x 10° spatial block did not meet minimum criteria of 500 fish measured for pole-and-line and 200 fish for longline fisheries. This error was corrected in the file distributed on 27 Feb 2011.
3. Use of the wrong size data. Between the time when data were extracted for compiling the assessment data file, the Japanese database size database was updated. As a result, the 2001 and 2005 size composition data for the pole-and-line and longline fisheries were incomplete in the original data file. This error was corrected in a file dated 10 Mar 2011 and distributed to the ALBWG on 01 Apr 2011.

The Modeling Subgroup recommends using the updated data file distributed on 01 Apr 2011.

1.2 United States Longline Data

US scientists noted that there was a problem with the 2009 longline size composition data related to an error in the database from which the data were extracted. They recommended using the US data distributed to the ALBWG in Jan 2011, but deleting the 2009 size composition data.

The subgroup discussed the SS size composition data in general and recommended a review of the size composition data for the USA, TWN, and JPN longline fisheries. The goal of the review is to look at the very large fish, e.g., > 130 cm, which appear fairly regularly in the USA LL data. Some WG members believe these fish are less common and so there is concern that some of these measurements could be from other species wrongly identified as albacore.

2.0 VPA Reference Run and Preliminary SS3 Modeling

2.1 Preliminary North Pacific albacore population analysis using VPA-2BOX and future projection using PRO-2BOX for 1966 – 2009 (ISC/11/ALBWG/12)

Summary — Virtual population analysis (VPA) was conducted to estimate spawning biomass (SSB), recruitment, and fishing mortality coefficients (F) with fishery data updated to 2009 and to compare these results to the findings of the 2006 stock assessment. Future projections were also conducted using a similar configuration to the last assessment and potential biological reference points were calculated. Changes in recent SSB were small and SSB has remained at a relatively high-level averaging about 115,000 t. Recruitment in recent years also exhibits small variability. The most obvious difference between the current and last assessment results is that F estimated for the oldest (plus) age-group(s) has decreased substantially in recent years. This reduction in F is reflected in the estimate of current F and biological reference points. Based on the results of the future projections, it is recommended that current F should be defined as the geometric mean of age 4 for 2005-2007. However, in the constant F projection scenario, SSB could not be maintained above the average of 10th historical lowest observations with 50% probability.

Discussion: The VPA parameterization was essentially identical to the 2006 assessment, but major differences between this reference run and the 2006 assessment was the fishery definitions (from 17 age-specific fisheries to 6 age-aggregated fisheries) and updated catch-at-age data through 2009. Spawning biomass exhibits similar trends to the 2006 assessment, fluctuating between 50,000mt and 150,000mt, averaging 102,339 t. One difference was that SSB did not decrease after 2000 as it did in the 2006 assessment . Recruitment also exhibit the same trends as in the 2006 assessment, declining between 1970 and 1988 and then increasing. Recruitment fluctuated between 20 and 40 (million fish).

The author noted that the JPN LL CPUE index was standardized for 1966-2009 in the data submitted before the meeting rather than 1972-2009 as agreed by the WG, and the latter was used for the analyses in the document. The author showed figures for the revised index, which changed little from the original. The WG accepted the revised figures.

The Modeling Subgroup discussed how the VPA run results were going to be used in the assessment. It was noted that the intent was not to provide two different assessments. Rather the intent was to compare important model outputs (SSB, recruitment, Fcurrent, F-at-age matrix) from the VPA reference and SS3 base-case models to assess and explain model-related changes. The future projections and reference point information in this working paper will not be needed to accomplish this objective. The subgroup also discussed how Fcurrent is calculated in VPA2Box. Fcurrent is defined as the apical (highest observed) F. In 2006, this occurred at age 8, but in the run reviewed it occurred for age 4. Current F decreased from 0.75 (age 8) in 2006 assessment to 0.60 (age 4) in this run. The Modeling Subgroup does not recommend rerunning the VPA at the full assessment workshop as most of the issues under discussion are not likely to result in changes that affect VPA calculations

The Modeling Subgroup agreed that future projections and reference point calculations from the VPA model will not be used in this assessment – the reference run will only be used as a tool to assess and understand model-related changes through comparisons of the SSB and recruitment time series and F-at-age matrices of the reference run and the SS3 base-case scenario. Stock status and conservation advice are based on the SS3 base-case model and future projections.

2.2 Preliminary Population Analysis of North Pacific Albacore Based on the Stock Assessment Program *Stock Synthesis* 3 (ISC/11/ALBWG/03)

Summary — The last albacore stock assessment was conducted in 2006 using a Virtual Population Analysis model (VPA-2BOX) (Uosaki et al., 2006a, ISC/06/ALBWG/19). At that time updated modeling was performed using an alternative modeling platform (Stock Synthesis, SS) based on similar parameterization to the VPA model (Anon., 2008a, ISC/08/ALBWG/06). Although the age-based SS model presented similar results, it was believed that a length-based SS model would better reflect the nature of fisheries catching albacore without outside process error. This paper presents a preliminary model for north Pacific albacore (*Thunnus alalunga*) using Stock Synthesis (Methot 2011, http://nft.nefsc.noaa.gov/Stock_Synthesis_3.htm). SS is a software program that implements a length-based/age-structured, forward-simulation population model with great flexibility to address parameterization (such as selectivity, catchability, stock-recruitment relationship, biological parameters, etc.) and uncertainty within the overall model. This paper is intended to 1) present general descriptions of data sources and methods used in the length-based SS model, 2) present uncertainties in regards to current data and auxiliary information, and 3) perform key sensitivity analyses regarding fishery and biological data/parameters and critical modeling assumptions. The overall objectives of the assessment are to estimate population parameters, such as time series of recruitment, biomass and fishing mortality, which are used to determine current stock status.

Discussion: This working paper describes the model configuration and parameterization used for early exploratory analyses with SS3. The paper formed the basis for the consensus base-case scenario developed by the Modeling Subgroup and described in detail in Sections 7, 8, and 9 of the assessment workshop report. This paper was not reviewed by the full WG during the assessment workshop because it is superseded by the base-case scenario that was recommended by the Modeling Subgroup. This paper also generated considerable comment on some aspects of the configuration and parameterization of the SS3 model, which is captured in Appendix 5.
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3.0 Review of Japanese SS Data

3.1 Review of developing Japanese albacore fishery data to apply to stock synthesis model (ISC/11/ALBWG/08)

***Summary* —** This paper summarizes methods used to compile Japanese albacore fisheries data for analysis in the SS3 stock assessment model. Quarterly catch and size (catch-at-size) data for each fishery and CPUE indices for longline and pole-and-line fisheries were created and submitted. Catch by quarter and area was calculated with logbook data, but logbook data (temporal and spatial information on catch) are either not available for several fisheries or a portion of the modeled period. When logbook data were missing, the quarterly and spatial composition of catch was assumed to be the same as that estimated from landings data and/or different years or fishery. Catch-at-size was calculated by substituting size data only from the same time/area stratum when size samples were inadequate. Standardized CPUEs for longline and pole-and-line fisheries were created. After data distribution, several errors were found in longline and pole-and-line catch-at-size data due to the use of incorrect program codes, inappropriate assumptions, or an older (less precise) version of the size database. These deficiencies were subsequently corrected.

Discussion: This working paper describes the catch estimation method for the coastal LL fishery (< 10 GRT) and the reasons behind the data distributed to the WG on Feb 1, 2011 and the subsequent correction in the March 22, 2011, data distribution. The procedures used to estimate catch, catch-at-size, and CPUE for Japanese fisheries were briefly reviewed. The Subgroup did not have many questions as the procedures were well described and straightforward.

3.2 Selectivity of Japanese Longline Fishery

At the October 2010 data preparation workshop, the ALBWG decided that selectivity for the USA and JPN LL fisheries would be asymptotic or flat-topped in shape (modeled with a logistic curve) and that selectivity for all other fisheries would be dome-shaped. Preliminary SS3 model runs with this configuration found that SSB tended to be low and F for older fish tended to be high relative to VPA results in the 2006 assessment. Examination of the spatial distribution of size data showed that fish ≥ 120 cm tended to be measured more often south of 25°N in the central and eastern Pacific and less often north of 25°N. Large fish tend to be more abundant in the central and eastern Pacific whereas the JPN LL operates largely in the western Pacific. Thus, large fish may not be fully available to the LL fishery and as a result dome-shaped selectivity for this fishery may be reasonable.

3.3 Japanese Longline Length Composition

The subgroup reviewed the length composition data for F6 and F8 (JPN LL fisheries) because preliminary SS3 runs had shown misfits to the length composition data from these fisheries. The definition of F6 included catches from Q1 and Q2, but the review found substantial differences in length compositions between Q1 (fish ranging from 70 to 120 cm) and Q2 (only small fish 70-90 cm). Review of the F8 data showed that in Q1 and Q2 there was a higher ratio of large fish and lower ratio of small fish than in Q3 and Q4. Seasonal plots of USA LL and JPN LL (F8) length composition data were examined and showed that the data in these fisheries were quite similar. The Modeling Subgroup concluded that the F6 data show clear evidence of a seasonal problem but that it was not clear that such a problem is evident in the F8 data.

The Subgroup recommended using the same shaped selectivity for the USA LL (F2) and JPN LL (F8 – large-sized fish) by season.

4.0 Growth

Much debate on growth occurred among ALBWG members via email prior to this meeting and this debate is captured in Appendix 7. The primary problem seems to be fitting the growth model at the younger ages and the large-sized Hawaiian fish. The Subgroup noted that there may be regional differences in size-at-age and suspects that there may be regional differences in growth rates. For example, temperatures in the EPO are warmer than in the WPO and fish in the EPO may grow faster and reach larger sizes than fish in the WPO. Most of the age data in Wells et al. (2011, ISC/11/ALBWG/02) are from EPO samples. If there are regional differences in growth, then there is no simple way to deal with area-growth interactions in the present assessment. The Subgroup concluded that L_∞ is less than 146.46 cm estimated by Suda (1966).

The Subgroup recommends estimating growth within the model using a von Bertalanffy curve (because it seems to be a better shape for the data than Richards), conditional age-at-length, and estimating size-at-age variability (CVs). Because the size composition data seem to be driving growth parameter estimates, the Subgroup recommends a sensitivity run down weighting the size composition data and using a Richards curve which in theory should fit better than a von Bertalanffy growth model.

5.0 Length Composition Data

The Subgroup reviewed the raw length composition data and Pearson residual bubble plots for the surface and longline fisheries aggregated by fleet and season. Surface fishery data do not appear to exhibit seasonal patterns in length compositions, but longline data exhibit several problems.

Since different length composition data were found in Q1 and Q2 of fishery F6 (JPN offshore longline), the Subgroup recommends separating this fishery into two seasonal fisheries. If the model is fitted to the CPUE data, then the existing annual CPUE index should be applied to the Q1 fishery since most of the catch-effort data in F6 occurs during this period. Although time blocks might improve fits, especially for Q2 of F6, it was suggested that this not be attempted until after fine tuning of the selectivity parameters has been completed.

6.0 Effective Sample Size

There is a need to weight fisheries relative to each other and to weight length composition data relative to CPUE data. Three ways are available for weighting: (1) effective sample size in the data file, (2) the variance adjustment factor in the model, and (3) lambda. Methods 1 and 2 directly change sample size, which affects the relative weights and variance assumed by the model likelihood components. These changes can be influential in bootstrapping results, which is important for this assessment since bootstrapping is used to assess $F_{SSB\text{-}ATHL}$. The third method changes only the relative weighting.

US scientists briefly explained the procedure used to estimate effective sample size in ISC/11/ALBW/03 because it differed from the procedure the ALBWG adopted at the data preparation workshop in October 2010. Effective sample sizes were assumed to be the number of trips for the UCLTN and USA LL fisheries, assuming each trip is an independent sample. The fishery-specific ratios defined as sum of trips divided by total number of fish measured for the UCLTN and USALL fisheries were calculated to scale the effective sample sizes of the other fisheries by multiplying the number of fish measured in each quarter by the appropriate fishery ratio. In addition, the assumed maximum effective sample size was 500.

The Subgroup identified two issues: (1) appropriate sample size depending on the uncertainty in the length composition data, which can be done in the data file with sample size or variance adjustment, and (2) relative weighting of length data vs. CPUE through lambda – instead of a large effective sample size, use a smaller lambda such as 0.05.

The Subgroup recommended the UCLTN fishery as a reference, using the number of trips as the input sample size and then rescaling other fisheries so the average is the same as the average for the UCLTN fishery (137 trips). No recommendations were put forward with respect to the relative weight of length data vs. CPUE.

7.0 Batch 1 - Sensitivity Run Review

An SS reference case was established with the following parameterization (run by USA May 26): disaggregated seasonal fisheries, CPUE for F6 not fitted, growth estimated with internally assuming a von Bertalanffy model, CV F8 was fixed at 0.2, length composition lambda was fixed at 0.05, the catchability of F1 was estimated with random walk. This parameterization represents a reference case that the Subgroup agreed to use to explore alternate model runs. The Subgroup requested the following runs:

1. Sample size – rescale other fisheries to average of US troll (133) number of trips;
2. Remove random walk for F1 catchability;
3. Repeat fitting to F6 CPUE to season 1;
4. Repeat fitting with Richards curve;
5. Repeat with VB, increase aging error; and
6. Time block for season 1 of F6.

7.1 Rescale sample size to average number of trips for US troll

The Subgroup review various output plots including SSB and recruitment time series, fishery selectivity, and growth curve plots. These plots did not appear to have substantial changes relative to the same plots from the reference case run. Growth curve (von Bertalanffy) appeared to fit better; the Subgroup was interested in this issue because there is an increasing trend in growth at maximum age that seems driven by the selectivity of the US LL fishery, which continues to increase beyond the maximum size, which appears to be about 120 cm. This trend is driven by the appearance of a few large fish (>120 cm) in the US LL length composition data in recent years. The Subgroup talked about fixing the upper bound of the selectivity curve and estimating the ascending portion. The subgroup also discussed ageing error and how to parameterize it and suggested using an ageing error of ± 1 yr (SD) across all age groups.

The Subgroup recommends fixing the peak of the selectivity curve for the US LL fishery to be the same as during the 2001-04 period when only the deep-set fishery was operating and estimating the width of the ascending limb of the curve. If this approach is not satisfactory because estimates hit the upper bound, then all parameters for this selectivity function could be fixed.

It was noted that the problem with the selectivity function for F6s2 (width peak, steep descending arm) was related to the initial value of the width of the selectivity peak. Changing to a smaller initial value produce a more acceptable curve. However, the robustness of the new function to changes in starting values is not clear. The Subgroup recommended constructing a likelihood profile to assess local vs. global minima.

7.2 Rescaled sample size and random walk catchability for F1 removed

These changes appear to scale SSB output a little higher than the original scenario, but exhibiting the same temporal trends. Recruitment trends between scenarios are also similar up to about 1990, after which recruitment is higher in this new scenario. The Subgroup thought that this difference was possibly related to a change in catchability of the surface fisheries. It was noted that trends in JPN PL and USA troll were similar to 2005, then begin diverging. F1 catchability influences recent recruitment in the model.

7.3 Rescaled sample size, random walk removed, fitting to F6 CPUE

These changes appear to highlight a conflict in the data because component likelihoods in this run were worse than the reference scenario. The Subgroup noted that this poorer performance is related to the selectivity for F6s2 (JPN OLLF1).

The Subgroup agreed that its first priority is to resolve selectivity issues, especially for F6 and then revisit F1 catchability (Q). There are two options for F1 catchability: time blocks or fix early Q up to 1990, then use random walk thereafter.

There was a brief discussion of a point raised previously – the use of a small constant (0.001) added to length composition data to avoid 0 length bins. The Subgroup recommends a sensitivity run with a different constant to assess the potential impact on fit, especially the growth curve. It is thought that the constant might be important with respect to fit of the oldest age groups in the growth curve.

8.0 Fishery Selectivity

Selectivity problems were noted for fisheries F2, F6 and possibly F8. At least one fishery selectivity needs to be modeled logistically in order to stabilize the model, otherwise the model exhibits some arbitrary changes in outputs, usually related to what it believes is a large "cryptic biomass" in the population.

The Subgroup noted that the estimated selectivity of F2 increases at large sizes (> 120 cm) rather than reaching an asymptote. This selectivity is influenced by a few large fish in the recent length composition data. The Subgroup recommends fixing the peak to about 120 cm FL and then reviewing the data after the assessment because the peak should not change between runs.

Asymptotic selectivity for F8 seems to be acceptable based on Pearson residual plot of length composition fits, but some time blocks may be needed.

A likelihood profile of the width of the peak of the F6s2 selectivity curve shows that the model prefers lower values. Starting values need to be below 0. An examination of the component likelihoods supported the conclusion that this behaviour is driven by the length composition data. If the starting value is sufficiently low, then the selectivity curve behaves well.

The Subgroup recommends that further runs be conducted using negative initial values for the starting peak width of the F6s2 selectivity curve to ensure that the model is converging on a global minimum. A run using an initial value of -2 was completed and the results showed that the model converged on a value of about -8.8, with a nicely dome-shaped selectivity curve. The Subgroup concluded that selectivity for F6s2 can be estimated provided that an initial value for peak width of less than 0 is used. The model converges on an even lower value around -8.8 and this appears to be a global minimum.

The Subgroup then examined the length composition fits for F6s1 and noted that the model does not fit large fish well. It was recommended that two time blocks for selectivity be used: 1966-1993 (positive residuals for large fish) and 1994-2009 (negative residuals for small fish). A run was conducted with two time blocks and the Subgroup noted that the blocking improved the fit in the early time period and made the residual pattern more uniform across the whole time series. However, large positive residuals for large fish remain apparent for 1989-1992. The Subgroup recommend three time blocks: 1966-1988, 1989-1992, 1993-2009.

9.0 CPUE Indices

CPUE indices for F6 and F8 are the biggest challenges. The Subgroup examined seasonally separated and annual indices for F6 and F8 prepared by Japan. The F6 annual index is largely driven by the Q1 index. It was noted that catch in Q1 of F6 is the largest component of the JPN longline catch and therefore important to include in the model. The Subgroup recommends further runs with the new F6 selectivity (time blocks) fitting to CPUE for season 1 and not fitting to F6s1 and afterwards a final recommendation on seasonal CPUE will be made.

The annual CPUE index for F8 is largely driven by the Q3-4 CPUE. The model tends not to fit to the annual index between the mid 1990s and 2000s and this lack of fit is believed to be due to poor fit to the length composition data.

The Subgroup reviewed runs in which the model was fitted to F6s1 and not fitted to F6s1 CPUE. SSB trends were nearly identical and there was little difference in total likelihood. Two potential explanations were offered: something else such as size composition is driving the dynamics or the index is not informative. The Subgroup believes that the former explanation – size composition – is the source of the problem. Fits to the F6 and F8 indices revealed consistent signals, but the fit to F8 could be improved

There are two options for resolving the seasonal fishery issue: (1) apply the annual index for F6 to the Q1 fishery, respecting the ISC data policy and revise the index after the assessment to be truly seasonal, or (2) make an exception and open the "frozen" data to recalculate a truly seasonal index for F6s1.

The Subgroup reviewed model fits to other CPUE indices. The fit to the USA LL index shows a temporal change in residual pattern from negative residuals early to positive residual later. Fits to S2 – S5 were considered acceptable and fit to S6 was fine and S7 fit (F8 index) was improved. The fit to S8 (TWN LL) is not as bad as the fit to S2 (USA LL), but this index may need to be down-weighted or a catchability trend allowing large variability may need to be introduced. The Subgroup recommends either dropping S2 (USA LL CPUE index) or allowing temporally changing catchability.

The Subgroup then reviewed the spatial-temporal coverage of the three longline indices. The JPN LL fishery is 25X larger than the other two in terms of catch-effort and is much broader spatial in the western and central Pacific. The TWN and USA LL fisheries are largely restricted to the central Pacific and much shorter temporally. There is a clear need to down weight both the USA and TWN LL indices relative to the JPN LL index. The Subgroup recommends using random walk for the Q of the USA LL (S2). This effectively down weights this index. For S8 (TWN LL), the Subgroup also recommends using a random walk for Q to see if the residual pattern improves. This issue will be revisited after reviewing these results. One explanation for the declining Q in S8 is because the TWN LL has continuously changed its targeting from ALB to tropical tunas.

Pearson residual plots show large positive residuals at large size up to 1996 in fishery F8 and then negative residuals that coincide with the peak that is hard to fit in this index. The Subgroup suggested that time blocking 1966-1998 and modeling with logistic selectivity and 1998-2009 and letting the model estimate a dome-shaped selectivity pattern would work for this fishery..

A point was raised about time blocking. If time blocks are used for selectivity, then we also need to consider doing the same thing for catchability (Q). SS doesn't allow the user to do this without creating new fisheries. This approach will be considered in the period between assessments.

10.0 Batch 2 – Sensitivity Run Review

The Subgroup updated the reference case model from May 30 to include the following (May 31 reference case): New effective sample size, time block for size comp for F6 (3 blocks: 1965-1988, 1989-1992, 1993-2009), initial value for the selectivity P2 parameter for F6s2 as -2 (or smaller), and fitting to CPUE F6 (S? - Japan LL). The following exploratory runs were requested:

1. Fix Peak for F2
2. Random Q after 1991 for S1
3. Random Q for S2
4. Random Q for S8
5. Drop S2 (weight = 0)
6. Drop S8 (weight = 0)
7. Time block for size comp for F8 (1965-1997 logistic, 1998-2009 dome)
8. Fit to first season of index for F6

It was noted that David Wells (SWFSC, NOAA) believes that ageing error in ISC/11/ALBWG/02 is ± 1 year up to age 5 and ± 2 years ages 6-15.

10.1 Three time periods for F6s1 Selectivity

This run is part of the updated reference case, but was not reviewed earlier. The results show that three blocks do not improve selectivity estimates or model fits to individual components. A sharp descending limb is still evident for the early period selectivity and the residual pattern in the length composition data remains. The Subgroup recommends using one time block (2 time periods) to estimate selectivity for F6s1 as opposed to no blocks because 1 block improves the total likelihood relative to no block or two blocks (three periods).

As the runs requested above were based on using three time periods to estimate F6s1 selectivity, they were redone using one block (two time periods) during the workshop.

Catchability is estimated as a free parameter and is dependent on selectivity. Realized catchability will reflect changes in selectivity. Based on this argument, the Subgroup did not consider time blocking of Q to be necessary.

10.2 Fixed peak for S2 to 2001-2004 period
Fixing the peak did not improve model fits. Since the CPUE from F2 may not be used in the model, the Subgroup recommends mirroring F8 selectivity for F2 and that US scientists investigate the data for this fishery after the assessment.

10.3 No Time Block versus one block for F6s1 selectivity
One block (two time periods) improves the residual pattern relative to no block and length likelihood improved, especially for F6 with one block.

The Subgroup recommends using 1 block (two time periods) when estimating selectivity for F6s1. The length composition data for F6 should be reviewed after the assessment.

The Subgroup examined the selectivity curves for 1 block F6s1 and concluded that allowing the model to estimate the descending limb of the early period was not possible – the 6th parameter should be fixed. There is no simple way to proceed, but the Subgroup implemented an exploratory non-parametric run to estimate early period selectivity and ascertain if it was dome-shaped. The result of this run indicates that the selectivity curve is likely dome-shaped for the early period of F6s1. The Subgroup recommends fixing the location of the top of the dome to around 100 cm and fixing the width of top to a low value.

10.4 Drop S8 (TWN LL index)
The results of this run did not change any of the major model outputs. The Subgroup concluded that this index is not informative in the model and recommends dropping it from the base case, but including it in at least one sensitivity run.

10.5 F6s1 CPUE
A run was conducted in which the annual index for F6 was replaced with the true Q1 index estimated by Japan. The results do not appear to change SSB, recruitment or other important management quantities and the fit to F6s1 is good, as expected.

10.6 Time varying selectivity for S7 (JPN LLF2 (F8)
Two time periods have been used: the first, early period is modeled logistically and the second late period is modeled with a dome shape. This run improved the maximum residual and residual pattern for the length composition fit as well as the maximum likelihood, but there was still an issue with fitting to the peak of the CPUE (S7) and the fit is strange with a sudden jump plus a scaling issue in SSB was revealed. The Subgroup reviewed a run in which separate Qs were estimated for the late and early periods of S7. The difference in estimated Qs was not large and results were not good – scaling issue remains. One explanation for the scaling issue is that now there is no logistic selectivity for any of the longline fisheries in recent years so this destabilizes the model and results in declining SSB. There is a need to consider whether logistic selectivity in both the early and late periods for S7 is the appropriate way to proceed.

11.0 Batch 3 – Sensitivity Run Review

The Subgroup updated the reference case, based on the results of the previous runs, to include one block for selectivity in F6s1, no block for selectivity in F8 and model selectivity logistically, Q for S1 - estimate base parameter at first phase, estimate random Q at last phase, seasonal (true) CPUE S6. The following additional runs were requested based on the updated reference case:

1. Aging error
2. Drop CPUE S2, mirror selectivity to F8
3. CV for S6: 0.2; CV for S7: 0.4
4. One block for selectivity for F8
5. Random Q for S8
6. Random Q for S2

Work on these runs revealed a scaling issue in model output. There was considerable discussion to diagnose the underlying causation. The Subgroup identified two potential issues: (1) weighting of CPUE and length composition information through the length lambda, and (2) relative weighting among the CPUE indices (CV). The reference case up to this point has used a fixed length lambda of 0.05. Higher values result in a poorer fit to CPUE (since model interprets this has higher weight being given to length composition data), lower values result in a better fit – but outputs such as SSB are also scaled by this change. There appears to be a conflict between the length composition and CPUE information. The Subgroup believes that length composition data are less reliable so down-weighting them is probably the best approach, but there is no objective way to determine the appropriate lambda for length composition data. Two suggestions were made regarding the relative weighting among CPUE indices: (1) construct likelihood profiles of R_0 (average recruitment) to determine the influence of individual CPUEs on it, and (2) evaluate the CPUE time series for changes in Q and reassess assigned CVs, essentially deciding which CPUE series are believable and which series are less believable.

Based on a review of the CPUE time series the Subgroup makes the following recommendations:

- S1 (USA/CAN Troll) and S5 (JPN PL (north)) – CVs 0.4 up to 2004, 0.5 from 2005 to present. Both fisheries have contracted back to their respective coastlines since about 2000 (which may change Q) and they exhibit different trends in CPUE since 2005;
- S3 (JPN PL (south), S4 (JPN PL north – short time series) – CV remains 0.4;
- S6 (JPN LL (north)) – this fishery is considered the most important fishery by JPN scientists. CV was decreased from 0.25 to 0.2. The model will be tuned to this CPUE index because it is considered the most reliable indicator of abundance;
- S7 (JPN LL (south)) – CV increased from 0.2 to 0.4; there has been a shifting in targeting from ALB in recent years;
- S2 (USA LL) – this index is problematic and will be dropped; and
- S8 (TWN LL) – this index is also problematic and will be dropped.

Likelihood profiles of all CPUE indexes with respect to R_0 show inconsistencies among the indices. The reference case used an R_0 of 10.5 and S1 favoured that value. But S6 (considered the most reliable index) favours a value of 11.5. These inconsistencies or differences contribute to the scaling problem. If an R_0 of 11.5 is used in the model, it increases the scaling of recruitment and SSB.

It was noted that previous stable versions of the model used a fixed Q for S1. Fixed Q is not considered a defensible parameterization so when Q was estimated model instability began.

Several runs varying lambda and CPUE CVs pointed to the need to down-weight the length composition data via lambda. The Subgroup recommends a lambda of 0.01. This value seems to bring the scaling of SSB to a range that the group considers to be biologically plausible.

11.1 Updated Reference Configuration

The Subgroup review a run in which the reference case was updated with the agreed ageing error matrix (± 1 yr, 0-5 yr; ± 2 yr ≥ 6 years). Fits to the CPUE indices were very good, but a problem remains with an estimated selectivity parameter for F6s1 hitting a boundary. Some length composition fits were poorer than before, largely because lambda is lower (0.01) so it can't fit to the indices or remove the residual pattern. This result is the trade-off for lowering lambda. Aggregated length composition fits by fleet were very good.

12.0 Future Projections

The Subgroup discussed future projection scenarios. Management advice is based on the projections. Certain issues were identified including the definition of current F – the ALBWG tentatively accepted the geometric mean of 2006-2008, but preliminary retrospective analysis show a tendency to underestimate F in the terminal year. This retrospective pattern needs to be checked after the base case scenario has been established and run. However, the Subgroup recommends defining current F as the geometric mean of 2005-2007 based on this analysis. The Subgroup recommends runs using both $F_{2005\text{-}20007}$ and $F_{2006\text{-}2008}$ and for continuity with the previous assessment $F_{2002\text{-}2004}$.

Four projection scenarios were briefly discussed: constant F (using estimated current F), constant quarterly catch, low and high recruitment periods. The constant catch scenario will use average quarterly catches for the same period used to estimate current F for consistency.

The minimum reference point information that must be provided (for NC) is $F_{SSB\text{-}ATHL}$ 50% for a 25-yr projection period.

Future projections will begin in 2008 and will use 2008-2010 catches.

Initially 300 bootstrap runs and 20 stochastic simulations per run (6,000 replicates) were considered necessary to accurately estimate future trajectories of SSB. However, results of preliminary analysis in which the number of simulations was varied from 5 to 20 and bootstrap replicates ranged from 5 to 300 (Figure 1) show that future SSB trajectories stabilize at approximately 200 bootstraps and 10 simulations. The Subgroup recommended 200 bootstraps and 10 simulations of each bootstrap result (2000 replicates) for estimating F_{SSB} in all future projection analyses for this assessment.

13.0 Batch 4 – Sensitivity Run Review

The reference case was updated (June 2) to include the following: one block selectivity for F6, no block selectivity for F8, seasonal CPUE for S6, weight for size comps 0.01 (lambda); CV for S1: 0.04 (1965-1999), 0.5 (2000-2009); S2: 0.05; S5: 0.4 (1966-2003), 0.5 (2004-2009); S6: 0.2;

S7: 0.4; and S8: 0.5; updated ageing error matrix (±1 0-5, ± 2 ≥ 6) . The Subgroup requested the following runs:

1. Selectivity for F6S1 needs to be explored (early period)
2. Drop each index at once (one by one)
3. Weight for size comp for all fleets: 0.025
4. Drop CPUE S2, mirror selectivity F8
5. Likelihood profile on steepness

13.1 F6s1 Selectivity

The early period selectivity was hitting the boundary of the width parameter of the descending limb because the top became too wide. When the width parameter (P2) was relaxed, a much better curve with a reasonable descending limb was estimated and no boundary issues. There were slight improvements to the length comp residual patterns and selectivity is now clearly dome-shaped. The SSB trajectory did not change. The Subgroup concluded that this solution would be acceptable and recommended to the WG as long as it is robust. . Several runs fixing P2 at different values showed little change in the SSB trajectory but a likelihood profile for P2 is needed to confirm this finding.

A review of the likelihood plot for P2 shows that minimum likelihood occurs between -1 and 1. The estimated value in SS was -0.23. The conclusion is that this solution for F6s1 selectivity is acceptable and will be recommended to the Working Group.

13.2 Length Composition lambda = 0.025

This change tends to improve the fit to length composition data slightly. No issues were observed with selectivity curves. Biomass (SSB) was scaled up slightly relative to the reference case with lambda = 0.01.

The Subgroup concluded that the length composition lambda value controls the scale of model output for north Pacific albacore. However, overall trends do not change so the relative scale of important management quantities should remain the same regardless of the lambda choice.

Stock size appears to be much larger than estimated in 2006 with the VPA. One important reason for this is the Suda growth curve. An important sensitivity run will be to replace existing growth curve in SS with the Suda curve parameters; this should reduce stock size and will be done as a sensitivity run.

13.3 Mirror F8 Selectivity for S2

Dropping the CPUE for S2 and mirroring F8 selectivity scales SSB up beyond the effect of changing lambda to 0.025.

13.4 Dropping CPUE indices one-by-one

SSB and recruitment trends were similar with some scaling differences. Dropping S7 (JPN LL south) changed trends.

The Subgroup reviewed the base case parameterization, which is based on decisions made at the meeting, and the data file. It was noted that two base case scenarios will be presented to the full working group: a scenario using the annual F6 index for F6s1, and a scenario using the seasonal Q1 index for F6s1. The WG will decide the appropriate base case.

13.5 Retrospective Analysis
Retrospective analysis sequentially removes one year of data and then reruns the model to examine estimated quantities (SSB, recruitment for bias or uncertainty.. This analysis showed that there is a tendency to overestimate SSB, but there is no difference in trends at least for SSB and total B. Recent recruitment trends tend to vary depending on the year removed and recent recruitment seems to be overestimated in the terminal year, but this is uncertain anyway. Pattern is not clear but there appears to be a need to drop at least the last 2 years of estimated recruitment (2008 and 2009).

The Subgroup recommends the following recruitment scenarios: (1) resampling the 1966-2007 recruitment time series for future projections; (2) resampling a low recruitment regime (1978-1987); and (3) resampling a high recruitment regime (1988-2007). The starting year for future projections is tentatively 2008, but checks will be made starting at 2007 and 2009.

Stock-recruitment relationship – there is no strong evidence in the SSB and recruitment scatter plot of a relationship. But a sensitivity run assuming a relationship may be needed for future projections. A model sensitivity run with h = 0.85 is recommended..

A look at preliminary projections using current F defined as 2006-2008 suggests stock will stabilize around the median biomass of the time series.

14.0 Sensitivity Analyses

The Modeling Subgroup recommended the following sensitivity runs to evaluate model parameterization issues and sensitivities:

1. Jackknife each fishery – set lambda = 0 for CPUE, small for size comps (determine if 0.001, 0.0001, 0.00001, 0.000001 etc. etc?)
2. Length comp lambda = 0.025
3. Fix growth model parameters to Suda (1966 estimates, do not use ageing data)
4. Steepness: h=0.9
5. CV of L_∞ = 0.04 (current estimate is 0.015, which may be low)
6. M = 0.4 (ages 0-5), 0.3 (ages 6-15)
7. Likelihood profile of P2 for F6s1 selectivity
8. Reduce CV for S1 and S4&S5 CPUE to 0.2 (more informative than assumed in base-case)
9. Fix CV for S6, estimate for all other CPUEs
10. Assume F6 selectivity is flat-topped (logistic)
11. No time blocks for selectivity on 3 fisheries (one-by-one)
12. Maximum age = 20
13. Block catchability of CPUE anywhere time block is used – if Q can be estimated
14. Multiple recruitment periods (try to estimate proportions recruiting, if fails then fix)
15. Length-based maturity (may give different SSB than age-based maturity currently used)
16. Add constant for size comp = 0.0001
17. Use length multiplier (to sample size) to down weight length comps (after workshop)

It was noted that the ISC had requested that Working Groups conduct fishery impact analysis and that this will be necessary for albacore

The model subgroup meeting adjourned at 14:30 on 3 June 2011.

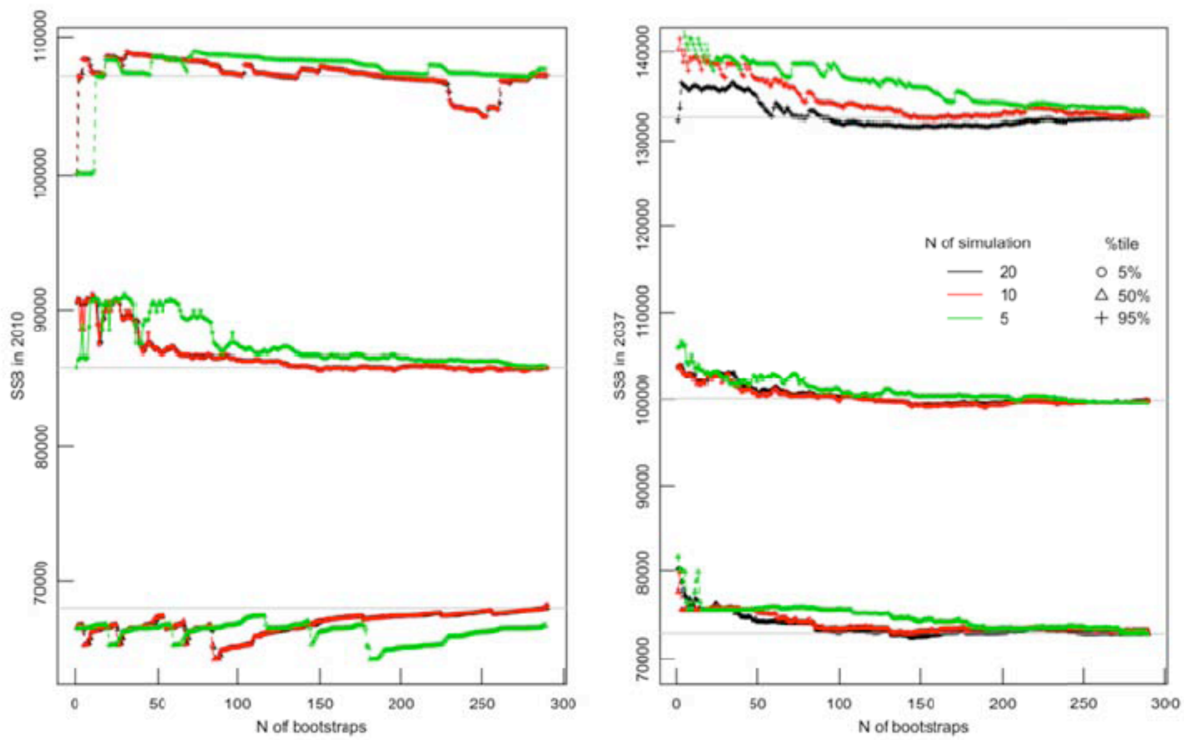

Figure 1. Percentiles of future SSB from 2010 to 2037 by N bootstrap replicates. These results are derived from preliminary future projection analysis based on a preliminary assessment that differs from the current base-case. Simulations are repeated 20 (black), 10 (red), and 5 (green) times in each bootstrap run.

ATTACHMENT 1

Table 1. List of Participants

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ATTACHMENT 2

Modelling Subgroup Meeting

30 May – 3 June 2011

Agenda

1. Data overview/check (JPN data submissions/US LL size comp 2009)
2. VPA – continuity with last assessment
3. Review of JPN SS data submission
4. Growth
5. Length comps
6. Effective sample size
7. F6 in general, F8, F9 (seasonal selectivity change)
8. CPUE indices
9. Taiwan size comps
10. Time blocks/random walk if necessary (catchability)
11. Steepness
12. Diagnostics for base case scenario
13. Future projections
14. Sensitivity runs

APPENDIX 5

This Appendix contains the results of discussion and recommendations related to the base-case scenario recommended by the Modelling Subgroup (Agenda Item 4), SS and VPA data review (Agenda Item 7), structural and input parameter decisions (Agenda Item 8), choice of sensitivity runs (Agenda Item 9), and input decisions for conducting future projections (Agenda Item 10).

1.0 Report and recommendations from the modeling subgroup meeting

The Modeling Subgroup met 30 May – 3 June at NRIFSF to: (1) develop recommendations to the full working group concerning all of the major modeling issues that have been identified, and (2) to produce base case scenario for recommendation to the full WG. The full report of the Modeling Subgroup meeting is attached in Appendix 4. In this section, the recommended model parameterization and configuration for the consensus base-case scenario of the SS3 model are described along with recommendations on model diagnostics (residual plots, model fits, retrospective analysis) and sensitivity runs. The base case scenario and sensitivity runs presentation included a review of the data and model structure recommended by the modeling subgroup.

John Holmes provided a summary of the Modeling Subgroup Meeting, highlighting the agenda and major findings/recommendations to the WG. These recommendations are discussed more fully in the next sections.

1.1 Recommended Base-case Configuration for SS3

The 2011 assessment of the north Pacific albacore tuna stock will be conducted using Stock Synthesis ver. 3.11b (SS3). A reference run of the VPA model was made with VPA2Box software and updated fishery data through 2009 for continuity with the last assessment. Output from this run (SSB and recruitment trajectories, F-at-age, Fcurrent) will be compared with similar output from SS3 to assess model-related changes in the assessment.

Two versions of the SS3 base-case and sensitivity runs were presented: a version using a quarterly CPUE index for F6s1 and a version using the annual index for F6 and applying it to F6s1.

Two types of weighting were used in the model: (1) weighting of the different sources of information (length composition and CPUE) relative to each other, and (2) relative weighting among CPUEs. The modeling subgroup recommended down-weighting the length composition data from all fisheries using a lambda of 0.01 and a sensitivity run of lambda = 0.025. The model subgroup concluded that index S6 (JPN offshore longline fishery north - F6s1) is the most reliable indicator of albacore abundance and chose to tune the model to this index with a CV of 0.2. The model includes 7 other CPUE indices with the following relative weightings: S1 (USA/Can troll) CV = 0.4 (1966-1999), = 0.5 (2000-2009), S2 (USA LL) CV = 0.4; S3 (JPN PL south) CV = 0.4; S4 (JPN PL north) CV = 0.4; S5 (JPN PL north) CV=0.4 (1985-2003), = 0.5 (2004-2009), S7 (JPN LL south) CV=0.4; S8 (TWN LL) CV = 0.4 (2003-2009).

Effective sample sizes for length composition data for all fisheries were scaled to the average number of trips for the USA/CAN troll fishery (N ~ 113.65).

Biologically, the Subgroup recommends using the following assumptions because no new data or analyses have been presented since the last stock assessment that support changes to these assumptions: spawning and recruitment occur annually in the second quarter, only one recruitment period in the second quarter, natural mortality 0.3 yr^{-1} across all ages, and 50% maturity occurs at age 5, 100% maturity at age 6 and older. The Subgroup also recommends the use of seasonal weight-length relationships in Watanabe et al. (2006, ISC/06/ALBWG/14**)**

The growth assumption recommended by the Subgroup is a major departure from the previous assessment: for this assessment growth should be estimated within the model using a von Bertalanffy curve and conditional age-at-length data from Wells et al. (2011: ISC/11/ALBWG/02). Four parameters of the von Bertalanffy curve are estimated: L1 (L_{age-1}), L2 (L_{∞}), K, and CV of L2. The previous assessment fixed the growth curve to the Suda parameter estimates (L1 = 40.2 cm; L2 = 146.46 cm).

The maximum age recommended is 15 years, with early (1966-1968), main (1969-2007), and late (2008-09) eras for recruitment . Bias adjustment for recruitment is not recommended.

Initial fishing mortality was estimated for two surface (F1-USA/CAN troll; F4-JPN PL) and one longline fishery (F7 - JPN LL) and the initial equilibrium catch was calculated as the 14 year average of total catch (1952-1965) for F1, F4 and F7. These average catches were 19499, 28575, and 18180 t, respectively. Catchability (Q) for all fisheries and surveys was used as a scaling factor such that the estimate is median unbiased F.

A standard Beverton and Holt stock-recruitment model is recommended, allowing the model to estimate R_0, steepness (h) fixed at 1.0, and the standard deviation of the log-recruitment (sigmaR) fixed at 0.6. No R_1 offset is recommended.

Selectivity patterns for all surface fisheries (F1, F4, F5) were assumed to be dome-shaped and constant over time. It is recommended that the width between the ascending and descending limbs of the F4 selectivity (the top) be fixed at a value of -4. The initial and final parameters of the selectivity patterns should also be fixed at -999 and the other parameters estimated for these patterns.

The recommended selectivity patterns for the longline fisheries are either flat-topped (asymptotic) or dome-shaped. Flat-topped selectivity is recommended for F2 and F8 dome-shaped selectivity patterns are recommended for F6 and F12. Two time-periods were implemented for selectivity in F2, F6s1, and F12 to account for time-varying selectivity patterns observed in these fisheries. Selectivity in F3 (EPO miscellaneous) was mirrored to F1, F7s1 and F13 (KOR and other LL) were mirrored to F6s1, F7s2 was mirrored to F6s2, F9 was mirrored to F10, and F11 and F14 were mirrored to F5 selectivity.

The WG reviewed the recommended base-case model. The model fits well to the S6 and S7 indices, but less so to other indices. The former is expected as the model was tuned to this index.

Overall, fits to aggregated length composition data by fleet were considered acceptable. Some residual patterns remain in the length composition fits by year and fleet, particularly positive residuals for F6s1 and F8, but this is expected considering the down-weighting of the length composition data with lambda (λ). Total biomass and spawning biomass trends show two peaks in the early 1970s and 2000s. Spawning biomass fluctuates between 250,000 and 500,000 t. Recruitment shows a declining trend to 1989 followed by a higher recruitment period for 1990 onwards. Biomass and recruitment trajectories were identical regardless of the CPUE index used for F6s1, although applying the annual index to F6s1 tended to scale the absolute biomass up relative to the runs using the quarterly index.

1.2Sensitivity Runs

A total of 17 sensitivity runs were recommended by the Subgroup, but only the results of the first 11 runs were reviewed by the WG due to time constraints:

1. Jackknife each fishery – set lambda = 0 for CPUE, small for size comps (0.0001
2. Length comp lambda = 0.025
3. Replace growth curve with Suda curve (fix growth parameters to Suda and use ageing data)
4. Steepness: h=0.9
5. CV of L_∞ = 0.04 (current estimate is 0.015, which may be low)
6. M = 0.4 (ages 0-5), 0.3 (ages 6-15)
7. Likelihood profile of the P2 parameter for estimating F6s1 selectivity
8. Reduce CV for S1 and S4&S5 CPUE to 0.2 (more informative than assumed in base-case)
9. Fix CV for S6, estimate for all other CPUEs
10. Assume F6 selectivity is flat-topped (logistic)
11. No time blocks for selectivity on 3 fisheries (one-by-one)
12. Maximum age = 20
13. Block catchability of CPUE anywhere time block is used – if Q can be estimated
14. Multiple recruitment periods (try to estimate proportions recruiting, if fails then fix)
15. Length-based maturity (may give different SSB than age-based maturity currently used)
16. Add constant for size comp = 0.0001
17. Use length multiplier (to sample size) to down-weight length comps (after workshop)

The results of the first 11 sensitivity runs were reviewed by the WG. In general, changes to model configuration or parameterization scaled absolute biomass and recruitment up or down relative to the base case but did not change the temporal trends in the output for either parameter. Discussion of the sensitivity runs noted that estimated CPUE CVs were generally consistent with those recommended by the Subgroup with two exceptions: the model estimates a CV of 0.8 for S2 (USA LL) and 0.27 for S3 and S4 (JPN PL). The WG decided to leave the CV = 0.4 for S2 and change the CV for S3 and S4 to 0.3 for 1966-1999 and 0.4 for 2000-2009.

Retrospective analysis shows no specific trends in the either SSB or recruitment estimates. Although there is a tendency to overestimate SSB, there is no evidence of systematic bias. Recruitment estimates exhibit high uncertainty in recent years, with a tendency to overestimate terminal year recruitment. The WG concluded that the final 2 years of recruitment estimates should not be used for future projections, i.e., the sample period will be 1966-2007, and that for recruitment, future projections should begin with 2008. Although terminal year estimates of fishing mortality exhibit considerable uncertainty, these estimates are not consistently biased. The WG decided to use the geometric mean of 2006-2008 as its estimate of current F because the statistical uncertainty (95% confidence interval) in the estimated F_{2007} and F_{2008} were identical.

It was noted that fishery impact analysis was desirable in this assessment. This analysis compares biomass trends with fishing and the trends predicted in the absence of fishing assuming only that the impact of fishing on recruitment is through the stock-recruitment relationship. The WG briefly discussed the mechanics of conducting the analysis and initially concluded that there was insufficient time at the workshop to complete the analysis and review it. However, this analysis was subsequently completed and reviewed and will be included in the assessment.

The WG also discussed the sensitivity run in which growth was fixed to the Suda growth curve. In this run, the conditional age-at-length data (otolith data) were also dropped when they should have remained in the model. A question was asked about the birth date used for otolith aging (May 1) and in SS3 and how fractional ages are handled in SS3. Rick Methot (SS architect) was contacted to respond to this issue..

APPENDIX 6

Table 1. [1] North Pacific albacore catches (in metric tons) by fisheries, 1952-2010. Blank indicates no effort.
-- indicates data not available. 0 indicates less than 1 metric ton. Provisional estimates in ().

Year	Japan							Korea		Chinese-Taipei		
	Purse Seine	Gill Net	Set Net	Pole and Line	Troll	Longline	Other	Gill Net	Longline	Gill Net	Distant Water Longline	Offshore Longline
1952	154		55	41,787	--	26,687	182					
1953	38		88	32,921	--	27,777	44					
1954	23		6	28,069	--	20,958	32					
1955	8		28	24,236	--	16,277	108					
1956			23	42,810	--	14,341	34					
1957	83		13	49,500	--	21,053	138					
1958	8		38	22,175	--	18,432	86					
1959			48	14,252	--	15,802	19					
1960			23	25,156	--	17,369	53					
1961	7		111	18,639	--	17,437	157					
1962	53		20	8,729	--	15,764	171					
1963	59		4	26,420	--	13,464	214					
1964	128		50	23,858	--	15,458	269					
1965	11		70	41,491	--	13,701	51					
1966	111		64	22,830	--	25,050	521					
1967	89		43	30,481	--	28,869	477				330	
1968	267		58	16,597	--	23,961	1,051				216	
1969	521		34	31,912	--	18,006	925				65	
1970	317		19	24,263	--	16,222	498				34	
1971	902		5	52,957	--	11,473	354		0		20	
1972	277	1	6	60,569	--	13,022	638		0		187	
1973	1,353	39	44	68,767	--	16,760	486		3		--	
1974	161	224	13	73,564	--	13,384	891		114		486	
1975	159	166	13	52,152	--	10,303	230		9,575		1,240	
1976	1,109	1,070	15	85,336	--	15,812	270		2,576		686	
1977	669	688	5	31,934	--	15,681	365		459		572	
1978	1,115	4,029	21	59,877	--	13,007	2,073		1,006		6	
1979	125	2,856	16	44,662	--	14,186	1,139	0			81	
1980	329	2,986	10	46,742	--	14,681	1,177	6	402	--	249	
1981	252	10,348	8	27,426	--	17,878	699	16		--	143	
1982	561	12,511	11	29,614	--	16,714	482	113	5,462	--	38	
1983	350	6,852	22	21,098	--	15,094	99	233	911	--	8	
1984	3,380	8,988	24	26,013	--	15,053	494	516	2,490	--	--	
1985	1,533	11,204	68	20,714	--	14,249	339	576	1,188	--	--	
1986	1,542	7,813	15	16,096	--	12,899	640	726	923	--	--	
1987	1,205	6,698	16	19,082	--	14,668	173	817	607	2,514	--	
1988	1,208	9,074	7	6,216	--	14,688	170	1,016	175	7,389	--	
1989	2,521	7,437	33	8,629	--	13,031	433	1,023	27	8,350	40	
1990	1,995	6,064	5	8,532	--	15,785	248	1,016	1	16,701	4	
1991	2,652	3,401	4	7,103	--	17,039	395	852	0	3,398	12	
1992	4,104	2,721	12	13,888	--	19,042	1,522	271	1	7,866	--	
1993	2,889	287	3	12,797	--	29,933	897		21		5	
1994	2,026	263	11	26,389	--	29,565	823		54		83	
1995	1,177	282	28	20,981	856	29,050	78		14		4,280	
1996	581	116	43	20,272	815	32,440	127		158		7,596	
1997	1,068	359	40	32,238	1,585	38,899	135		404		9,119	337
1998	1,554	206	41	22,926	1,190	35,755	104		226		8,617	193
1999	6,872	289	90	50,369	891	33,339	62		99		8,186	207
2000	2,408	67	136	21,550	645	29,995	86		15		7,898	944
2001	974	117	78	29,430	416	28,801	35		64		7,852	832
2002	3,303	332	109	48,454	787	23,585	85		112		7,055	910
2003	627	126	69	36,114	922	20,907	85		146		6,454	712
2004	7,200	61	30	32,255	772	17,341	54		78		4,061	927
2005	850	154	97	16,133	665	20,420	234		420		3,990	483
2006	364	221	55	15,400	460	21,027	42		138		3,848	469
2007	5,682	226	30	37,768	519	22,336	44		56		2,465	451
2008	825	1,531	101	19,060	549	19,092	15		365		2,490	579
2009	2,076	149	33	31,172	410	21,995	43		(365)		1,866	(512)
2010	(308)	(149)	(33)	(21,757)	(410)	(22,434)	(43)		(365)		(2,236)	(512)

1 Data are from the ISC Albacore Working Group, June 8, 2011.

APPENDIX 6

Table 1. (Continued)

Year	United States								Mexico		Canada	Other		Grand Total
	Purse Seine	Gill Net	Pole and Line [2]	Albacore Troll [3]	Tropical Troll & Handline	Sport	Longline	Other	Purse Seine	Pole and Line [4]	Troll	Troll [5]	Longline [6]	
1952				23,843		1,373	46				71			94,198
1953				15,740		171	23				5			76,807
1954				12,246		147	13							61,494
1955				13,264		577	9							54,507
1956				18,751		482	6				17			76,464
1957				21,165		304	4				8			92,268
1958				14,855		48	7				74			55,723
1959				20,990		0	5				212			51,328
1960				20,100		557	4				141			63,403
1961			2,837	12,055		1,355	5	1	2	39	4			52,649
1962			1,085	19,752		1,681	7	1	0	0	1			47,264
1963			2,432	25,140		1,161	7		31	0	5			68,937
1964			3,411	18,388		824	4		0		3			62,393
1965			417	16,542		731	3	1	0		15			73,033
1966			1,600	15,333		588	8		0		44			66,149
1967			4,113	17,814		707	12				161			83,096
1968			4,906	20,434		951	11				1,028			69,480
1969			2,996	18,827		358	14		0		1,365			75,023
1970			4,416	21,032		822	9		0		390			68,022
1971			2,071	20,526		1,175	11		0		1,746			91,240
1972			3,750	23,600		637	8		100	0	3,921			106,716
1973			2,236	15,653		84	14		0		1,400			106,839
1974			4,777	20,178		94	9		1	0	1,331			115,227
1975			3,243	18,932		640	33	10	1	0	111			96,808
1976			2,700	15,905		713	23	4	36	5	278			126,538
1977			1,497	9,969		537	37		3	0	53			62,469
1978			950	16,613		810	54	15	1	0	23			99,600
1979			303	6,781		74	–		1	0	521			70,745
1980			382	7,556		168	–		31	0	212			74,931
1981			748	12,637		195	25		8	0	200			70,583
1982			425	6,609		257	105	21	0	0	104			73,027
1983			607	9,359		87	6		0	0	225			54,951
1984	3,728		1,030	9,304		1,427	2		107	6	50			72,612
1985	26	2	1,498	6,415	7	1,176	0		14	35	56			59,100
1986	47	3	432	4,708	5	196			3	0	30			46,078
1987	1	5	158	2,766	6	74	150		7	0	104			49,051
1988	17	15	598	4,212	9	64	307	10	15	0	155			45,345
1989	1	4	54	1,860	36	160	248	23	2	0	140			44,052
1990	71	29	115	2,603	15	24	177	4	2	0	302			53,693
1991	0	17	0	1,845	72	6	312	71	2	0	139			37,320
1992	0	0	0	4,572	54	2	334	72	10	0	363			54,833
1993		0	0	6,254	71	25	438		11	0	494			54,125
1994		38	0	10,978	90	106	544	213	6	0	1,998	158		73,345
1995		52	80	8,045	177	102	882	1	5	0	1,763	94		67,947
1996	11	83	24	16,938	188	88	1185		21	0	3,316	469	1,735	86,207
1997	2	60	73	14,252	133	1,018	1653	1	53	0	2,168	336	2,824	106,756
1998	33	80	79	14,410	88	1,208	1120	2	8	0	4,177	341	5,871	98,229
1999	48	149	60	10,060	331	3,621	1542	1	0	57	2,734	228	6,307	125,542
2000	4	55	69	9,645	120	1,798	940	3	70	33	4,531	386	3,654	85,052
2001	51	94	139	11,210	194	1,635	1295		5	18	5,248	230	1,471	90,189
2002	4	30	381	10,387	235	2,357	525		28	0	5,379	466	700	105,224
2003	44	16	59	14,102	85	2,214	524		28	0	6,861	378	(2,400)	92,873
2004	1	12	127	13,346	157	1,506	361		104	0	7,856	--	4,375	90,625
2005		20	66	8,413	175	1,719	296		0	0	4,845	--	4,315	63,295
2006		3	23	12,524	95	385	270		109	0	5,832	--	5,136	66,400
2007		4	21	11,887	98	1,225	250		40	0	6,075	--	3,539	92,717
2008	0	1	1,472	10,289	29	415	353	0	10		5,446		2,812	65,435
2009	39	3	2,218	10,575	99	677	203	0	17		5,643		1,581	79,677
2010	(18)	(3)	(1,874)	(10,130)	(99)	(685)	(203)	(2)	(25)		(6,497)		(1,581)	(69,364)

2 Albacore Pole-and-line catches for 2008 - 2010 are estimated from new procedures.
3 Albacore Troll catches prior to 2008 contain an unknown proportion of pole and line catch.
4 Mexico Pole-and-line catches for 1999 and 2000 include 34 and 4 metric tons, respectively, from longline.
5 Other Troll catches are from vessels registered in Belize, Cook Islands, Tonga, and Ecuador.
6 Other Longline data for 2004-2009 are from Peter Williams, SPC, for non-member nations. Other Longline also includes data provided by China.

APPENDIX 7

The ALBWG (or WG) stock assessment workshop was originally scheduled for 11-29 March 2011, but was postponed due to the Great East Japan earthquake and tsunami. During the period leading up to the reschedule workshop, considerable discussion occurred via email between WG members focusing on two topics: (1) age and growth of albacore, and (2) preliminary parameterization of the SS3 base-case model. The major points and conclusions drawn from these discussion are captured in this Appendix.

Age and Growth of North Pacific Albacore

Email discussion and comments on) ISC/11/ALBWG/02 prior to the workshop focused on two areas: (1) the mechanics of producing the age estimates, and (2) how to use these data to model growth in the assessment. The WG identified three issues with the ageing data including the lack of validation of annual increment formation (annuli), the fact that all of the ages were determined by one person so no precision estimates are available, and the very small sample sizes for ages > 4 years. It was noted that it would be useful to examine these data for any indications of regional or gear specific biases in the length at age of fish. The authors were asked to provide scatter plots by sampling area or gear (e.g. NWPO vs. EPO, or PL vs. Troll) in addition to Figure 3 and Table 2 because it appears that smaller-sized albacore were found in the EPO compared to NWPO. Table 2 shows CVs by age and for age classes with sample sizes >30, CV is around 0.04, which is much lower than values currently used in preliminary SS modeling. It was pointed out that in the current configuration of the SS model, age 1 is assigned to fish at the beginning of 2nd quarter, i.e., birth date in the model is April 1, whereas in the paper May 1 is defined as the birth date and was used to parameterize the growth curves. Thus, if the otolith-based growth curve is used, an adjustment of L_{min} or t_0 (age at L_{min}) will be necessary since the model uses the mean length in the middle of each season when fitting to length frequency data.

Several growth models were fitted to these data in ISC/11/ALBWG/02, with the specialized von Bertalanffy model exhibiting the best fit (based on AIC) and the Gompertz model a close second best. The WG noted that a comparison of mean sizes and CVs by age of aged samples and expected length- at-age revealed a tendency for the growth curves to underestimate length-at-age of younger (<= 7)and older (>=13) fish and overestimate length-at-age for fish aged 8-12. It was thought that this phenomenon might be affected by the timing of sampling. Since sample sizes for ages 7 to 9 are low, it was proposed that additional fits to the growth curve excluding these samples would aid the ALBWG in understanding the uncertainties of the current estimates conditional on these samples.

An important consideration is whether growth in the SS model should be fixed equal to an ageing-based growth curve (or some other growth model), or estimated within SS. The otolith-based growth curve and the SS estimated growth curve may not, even in principle, be the same since the assumptions behind them differ. A birth date is assumed when ageing (or measured from daily rings) and assumptions are made about the first annulus and the growth pattern at young ages. Stock assessment models usually make different implicit assumptions about the processes involved in fish growth. The growth curve is used to infer an approximate age for the fish first observed in the length-frequency data, but the age in quarters or months is unlikely to line up exactly between the two approaches, i.e., the average size of fish when they first appear in the model often fails to correspond to what is expected based on the growth curve. Modeling assumptions are internally consistent, but combining two incompatible assumptions will introduce bias. For example, using a growth curve estimated independently of the model reduces the number of parameters the model has to estimate, but it assumes that there is no error in the age-based growth curve. Given the amount of data in the model and the fact that estimating the growth curve within the model adds only a few parameters to a model that has hundreds of parameters, the bias-variance trade-off probably favours reducing bias by estimating the extra parameters.

There are other reasons to assume error in the ageing-based growth curve since it is not usually feasible to sample otoliths in a fully representative way across the entire population. The use of non-representative data matters because growth rates can vary with environmental conditions or other factors, spatially or through time. As a result, although the otolith based growth curve is a good way to observe the general pattern of albacore growth, it may differ slightly from the average pattern for the whole stock. The length frequency samples in the model have far larger sample size and are a more comprehensive information source through space and time, and so can be more informative about the average growth pattern of the stock. The main sources of growth information in these data are the sizes of the large fish (L_∞), and the way the size modes of small fish increase (growth rate at length, i.e., K and t_0).

Potential problems with the model-based growth parameter estimates, such as bias or lack of precision, also need to be considered. For example, K can be affected by length-frequency samples collected from an area with an unrepresentative growth rate - an issue that must be addressed whichever growth curve is used. Size modes may hard to observe or to follow through the data. Longline selectivity assumptions may be invalid, or selectivity may change through time and not be accounted for in the model. In these cases the key issue is to reduce conflicting information in the model. Alternative hypotheses concerning growth should be addressed in separate models.

Further modeling work was performed after the October 2010 meeting with updated catch-at-length data and parameterization of the model. The results of this work show that estimating growth within the SS3 model provides relatively robust and plausible estimates of growth parameters that are similar to those estimated from otoliths in ISC/11/ALBWG/02. This modeling work also showed that estimating growth within the model resulted in the best fit to the length data. This latter point is considered an important criterion to meet for a length-based model.

Three options for using the new ageing information within SS were considered: (1) fix the growth curve using externally estimated-parameters, (2) fitting these data as conditional age-at-length in which length and age observations are analogous to entries in an age-length matrix, and 3) using the externally estimated growth curve parameters as priors for internal estimation of the growth curve within SS. Based on the discussion summarized above, the ALBWG rejected the fixed growth curve option and supported the estimation of the growth curve within SS using conditional age-at-length data from the ISC/11/ALBWG/02 otolith paper. Letting the model estimate growth avoids introducing bias when the model tries to fit the size data in other ways.

Growth Curve Recommendations

During the October workshop at La Jolla, the ALBWG noted that the scaling of SS3 output may be driven by sensitivity to the growth curve used in the model. If the growth parameters were estimated in the model, then there was a tendency to estimate higher K and lower L_∞ than Suda (1966), which were used in the reference case runs. Three options were identified:

1. fit mean length-at-age for surface fisheries in the VPA and approximate mean length-at-age of adult albacore from the Suda growth curve as was assumed in the 2005 stock assessment;
2. construct a hybrid growth curve based on slicing and the Suda growth curve (see ISC/11/ALBWG/06); and
3. a growth curve based on new information from otoliths collected and aged by US scientists.

At the October 2010 workshop in La Jolla, the ALBWG noted that option 1 was included as a fall-back in case all other approaches failed and that option 2 was most likely to be considered as a sensitivity run. Thus, most effort has been expended exploring option 3 .

The ALBWG spent considerable time and effort on the growth curve because the model fit to the length data is an important problem to solve, given that the model appears to be highly sensitive to the estimated growth parameters, particularly L_∞. Several preliminary runs demonstrated that model outputs used to assess status, especially the scaling of absolute biomass and the resulting MSY-based reference points, are influenced by the growth curve. A fixed growth curve that doesn't fit the data can lead to problems elsewhere in the assessment because the model will try to reduce the likelihood by shifting some other parameter. It was suggested that if the ALBWG concluded that the growth curve had to be fixed in the short term (i.e., for this assessment), then it might be also necessary to reduce the effective sample size for the small fish fisheries, or at least catches of 60-80 cm fish, so that the lack of fit at this size range is less of a problem for the model.

Much of the modeling on which this preliminary decision was based assumed a von Bertalanffy growth curve for albacore. Further modeling of growth gradually built support for the idea that the von Bertalanffy curve may not be not suitable for north Pacific albacore. Non-von Bertalanffy growth patterns were found to fit the data better in many current tuna assessments, including those for south Pacific albacore (Hoyle and Davies 2009), WCPO bigeye (Harley et al. 2010) and yellowfin tune (Langley et al. 2009), and EPO bigeye and yellowfin tuna (Aires da Silva and Maunder 2011a,b), because the growth of young fish in these stocks tends to be more linear than predicted by the von Bertalanffy curve. When growth is forced to follow a von Bertalanffy curve, the model tries to fit the smaller fish by reducing K, which results in higher L_∞ since these parameters are strongly correlated. The model can still fit to the large observed fish by reducing the biomass, but it needs to adjust the growth curve to fit to the small fish. Since the mean lengths-at-age estimated in ISC/11/ALBWG/02) and ISC/11/ALBWG/06 are not inconsistent with more linear growth for smaller north Pacific albacore, the WG considered estimating growth internally within SS using a more flexible growth curve. At present, SS only has two growth curve options: von Bertalanffy and the Schnute-Richards generalized growth curve, which estimates one parameter more than the von Bertalanffy curve. Although the Schnute-Richards curve has more flexibility than the von Bertalanffy curve, it was considered worthwhile to run both models and do likelihood comparisons to evaluate which fits best to the north Pacific albacore data.

An alternative approach is to use conditional age-at-size data from the otolith-based ageing (ISC/11/ALBWG/02), which would allow some flexibility in terms of the growth curve that is not available when the parameters are fixed and stabilizes the curve as well. Some preliminary modeling results tended to show that using conditional age-at-size data reduces the sensitivity of estimated growth curve parameters to different model configurations. If this preliminary result can be confirmed, then the practical importance of this finding is that trivial or implausible model configurations are less likely to be influential in the determination of stock status.

Additional modeling work was conducted prior to the workshop examining the effect of using the Richards growth curve and conditional age-at-size data from the otolith work on model fits to the albacore length data and the sensitivity of parameter estimates to different configurations. The results of these runs show that the use of conditional age-at-size data from the otolith ageing helped to stabilize L_∞ for the growth model, although there remain some fitting problems, with smaller expected sizes-at-age for young fish resulting in larger sizes-at-age for old fish. One possibility to explain this lack of fit is that the implementation of the Richards curve in SS doesn't have enough flexibility at small sizes. However, the difference in L_∞ between configurations is smaller when the otolith data are used.

Since the lack of fit is most noticeable at younger ages, it was suggested that using fractional ages for the aged fish, based on an assumed birth date and date of capture, might improve the growth modeling, especially for the youngest fish. . Ages in the model do not have to line up exactly with true ages from the otoliths, although including age at length data from otoliths in the model will introduce a data conflict if the offset between the two ages is relatively large. Some offset from 'reality' is expected and shouldn't affect the estimated population parameters. The key issue is to ensure that the average expected length when fish are first observed in the model and the length increments between ages are correct. It was also suggested that removing otolith data for the young fish might improve the growth curve modeling, since the older, larger fish are more influential in stabilizing the L_∞ estimate.

Several more runs of the model exploring different suggestions for growth curve estimation to reduce the data conflict between young and old fish given the different growth assumptions for these ages and improve length composition fits pointed to the following combination of approaches as the most plausible:

- estimate variability of size-at-age (CV) within SS,
- Remove age 3 and younger otolith data to avoid the lack of fit to the fast growth period. Some WG members have suggested that up to age 8 or 9 otolith data could be removed;
- Include aging bias in the aging error matrix. Bias was +0.25 and +0.5 for season 3 and 4, respectively. Only otoliths from fishery 1 (US/CA troll) included an aging bias (i.e., the younger fish). Otoliths from USLL and JPLL did not have aging bias. The inclusion of

ageing bias substantially improved the fit to length composition data based on a reduction in likelihood; and
- extending the age structure to 20 yr. Extending the age structure did not impose much of a computational penalty, but it may affect SSB estimates.

It is also likely that some lack of fit to the length composition data is caused by insufficient flexibility in the selectivity curves, which use functional forms rather than a non-parametric spline-based approach.

2.0 Preliminary Population Analysis of North Pacific Albacore Based on the Stock Assessment Program *Stock Synthesis* 3 (ISC/11/ALBWG/03)

The ALBWG engaged in considerable discussion about this working paper via email prior to the workshop. This discussion focused on three primary topics related to parameterization of the model: (1) the methodology for estimating effective sample size, (2) the use of multiple spawning and recruitment periods, and (3) the use of time-varying selectivity.

2.1 Effective Sample Size

The WG agreed to estimate effective sample size outside of SS using the procedure described in Lee et al. (2010: ISC/10/ALBWG-3/03) for USA longline and troll fisheries. The WG noted that quarterly differences in sample size were not considered in this analysis and requested an update of effective sample size estimates to reflect these differences so that less precise quarterly data be down weighted. The ALBWG also suggested scaling of Japanese fisheries to average sample size from USA longline or troll fishery, depending on whether it was deep or surface fishery that was being scaled. However, in the working paper submitted to the present workshop (ISC/11/ALBWG/03) the number of trips as was used for effective sample size, assuming that each trip is an independent sample. Thus, the number of trips for the USA troll (UCLTN) and USA longline (USA LL) fisheries were used and ratios (defined as sum of trips divided by sum of number of fish measured for the USA troll and USA longline fisheries) were calculated to scale the input sample sizes of other fisheries without the actual number of trips information. This new procedure was substituted because during an internal NOAA workshop concerns were raised about the original methodology, including the lack of difference in samples size in Q3 and Q4 of the US troll length compositions, even though the number of trips and fish measured were very different. Using the number of trips was suggested as a more robust approach that would improve the contrast in sample size within each fishery, especially the USA troll and longline fisheries. As the ALBWG had not reviewed the number method for calculating effective sample size, concerns were raised about this substitution and it was concluded that the ALBWG would need to review and agree to the new procedure at the stock assessment workshop. There remain some concerns about the scaling, namely that using the average sample size from USA troll and longline fisheries may not be correct. In addition, some iterative tuning of the effective sample size will likely occur during the workshop.

2.2 Multiple vs. Single Spawning and Recruitment Periods

The SS working paper (ISC/11/ALWBWG/03) assumed multiple annual recruitment periods for albacore with 75% occurring in quarter 2 and 25% in quarter 3. Multiple recruitment periods were assumed for the preliminary modeling because recent NOAA research surveys have captured albacore larvae near Hawaii in August-September and because this assumption helped stabilize the growth curve and improve the fits to the length composition data. The WG noted that it has never discussed the multiple recruitment assumption and that the allocation of recruitment to different periods was done arbitrarily as there is no evidence in the literature (or the size composition data sampled in any of the fisheries) of more than one cohort per year in the north Pacific albacore stock. It was observed that the choice of single or multiple recruitment periods affects the estimated growth curve, especially $_{Lmax}$, which is influential in scaling SSB. More importantly, the software used for future projections is not compatible at present with the assumption of multiple recruitment periods – extensive recoding and testing would be required to achieve stable output if the decision was made to assume two recruitment periods.

A review of the reproductive biology of north Pacific albacore was conducted by the ALBWG. The literature generally indicates that albacore spawn over an extended period from March through September in tropical waters west of Hawaii. The most recent work on albacore reproduction (Chen et al. 2010) found that albacore spawning in waters off the east coast of Taiwan and the Philippines peaked in March-April, whereas the older literature (Ueyanagi 1957, 1969; Otsu and Uchida 1959) concludes that spawning activity was likely greatest in June-August in the central Pacific and north of Hawaii. Chen et al (2010) based their findings on histological analyses of male and female gonads which allowed them to accurately determine the level of gonadal maturation and whether a fish had spawned by the time it was sampled. In contrast, the methods used by Ueyanagi (1957) and Otsu (1959), which are based on gonad weight and egg diameter, respectively, are either not able to fully detect spawning fish in the population or are based on small sample sizes and are therefore less accurate than Chen et al. (2010). Ueyanagi (1969) reported the seasonal distribution of albacore larvae based on larvae sampling implemented by Japanese research vessels and training vessels during the 1960s, and found that larvae was sampled most frequently in May-June, and secondarily in July and August. A follow-up study by Nishikawa et. al. (1985), which analyzed three decades of (1950s-1970) of larvae sampling surveys, concluded that spawning likely occurs all year round, but that there was a probable peak spawning season in April-June in the western Pacific Ocean. Although the report of "peak of spawning" in March-April by Chen et al. (2010) is probably more reliable than conclusions in the older literature, these results are based on a sample of 74 females from a spatially-restricted area (Taiwan, Philippine) that may not be representative of entire spawning grounds in the north Pacific Ocean.

The ALBWG concluded that although albacore spawning may occur all year round or over an extended period, the strongest evidence from Chen et al. (2010) and Nishikawa et al. (there is one peak spawning period occurring sometime in the 2nd quarter of the year. Thus, the WG recommended assuming a single recruitment period in the 2nd quarter for the assessment.

2.3 Time-varying Selectivity Patterns

The third topic of email discussion was the occurrence of seasonal size patterns in the Japanese longline data. In the preliminary modeling, there appeared to be a conflict between the size composition data of the Japanese longline fisheries (F6 and F8) and their respective CPUE indices which drove the population dynamics away from the observed CPUEs. Since the size composition data are influential in driving the population dynamics in the SS model, achieving good fits to these data is important in a length-based model. Two options were considered to address this problem: (1) down-weighting the size composition data for both F6 and F8 fisheries, as suggested by Lee et al. (2011: ISC/11/ALBWG/03), and (2) setting up seasonal selectivity. The first option is probably not ideal and is considered a fall-back option in the event that other approaches fail. However, the version of SS used in this assessment (3.11b) does not implement seasonal selectivity, therefore the ALBWG considered using time blocks or establishing separate seasonal fisheries from fisheries currently defined as single fisheries as ways to capture the seasonality in size patterns. It was pointed out the current fishery definitions accepted at the October 2010 workshop are based on the size of fish caught, but also capture seasonality. For example, the F6 longline fishery is uses Q1 and Q2 data and F8 is based mostly on Q3 and Q4 data with Q1 and Q2 from the southern North Pacific. Although splitting size composition data from F6 into two fisheries based on quarter is a simple procedure, it creates a problem for the CPUE associated with F6 because these data are linked and the splitting would have to occur at the raw data or GLM standardization stages. It was suggested that it might be possible to assign the current CPUE (made with data from two seasons) to one of the new seasonal fisheries, but this was not considered ideal as it assumes that data compiled in two seasons are equivalent to data from one season. There is an additional problem with this procedure in that criteria used to establish which fisheries should be split are not clear. For example, the preliminary model provided reasonable fits to the size composition data, but a closer examination reveals that there could be some misfit in season 2 for F2_USA, season 1 and season 3 for F4_JPN_PL_LF, season 2 for F6_JPN_LLF1, and season 1 and season 2 for F8_JPN_LLF2.

The Super-year concept could also be used to model seasonal selectivity in SS3. For example, enter a pseudo-observation for season 1, put the actual annual data in a season 2 observation and put a pseudo-observation in season 3 in the super season sequence. This usage could be preferred if: fish are growing rapidly within the year so their effective age selectivity is changing within year as they grow; fish are growing within the year so fishery data collected year round have a broader size-at-age modes than a mid-year model approximation can produce; and it could be useful in situations with very high fishing mortality (but note that all seasons get equal weight in the super-season combination process).

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APPENDIX 8

SS3 starter file used in the North Pacific albacore assessment for the base case.

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#Starter file for North Pacific albacore assessment in 2011.
NPalb2011_data.dat # Data file
NPalb2011.ctl # Control file
0 # 0=use init values in control file; 1=use ss3.par
1 # run display detail (0,1,2)
1 # detailed age-structured reports in REPORT.SSO (0,1)
0 # write detailed checkup.sso file (0,1)
0 # write parm values to ParmTrace.sso (0=no,1=good,active; 2=good,all; 3=every_iter,all_parms; 4=every,active)
1 # write to cumreport.sso (0=no,1=like&timeseries; 2=add survey fits)
0 # Include prior_like for non-estimated parameters (0,1)
1 # Use Soft Boundaries to aid convergence (0,1) (recommended)
1 # Number of bootstrap datafiles to produce
10 # Turn off estimation for parameters entering after this phase
10 # MCeval burn interval
2 # MCeval thin interval
0 # jitter initial parm value by this fraction
-1 # min yr for sdreport outputs (-1 for styr)
-1 # max yr for sdreport outputs (-1 for endyr; -2 for endyr+Nforecastyrs
0 # N individual STD years
#vector of year values

0.0001 # final convergence criteria (e.g. 1.0e-04)
0 # retrospective year relative to end year (e.g. -4)
1 # min age for calc of summary biomass
1 # Depletion basis:  denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1 # Fraction (X) for Depletion denominator (e.g. 0.4)
4 # SPR_report_basis:  0=skip; 1=(1-SPR)/(1-SPR_tgt); 2=(1-SPR)/(1-SPR_MSY); 3=(1-SPR)/(1-SPR_Btarget);
4=rawSPR
1 # F_report_units: 0=skip; 1=exploitation(Bio); 2=exploitation(Num); 3=sum(Frates)
0 # F_report_basis: 0=raw; 1=F/Fspr; 2=F/Fmsy ; 3=F/Fbtgt
999 # check value for end of file
```

APPENDIX 8

SS3 forecast file used in the North Pacific albacore assessment for the base case.

```
#Forecast file for North Pacific albacore assessment in 2011.
4 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=F(endyr); 5=Ave F (enter yrs); 6=read Fmult
# -4  # first year for recent ave F for option 5 (not yet implemented)
# -1  # last year for recent ave F for option 5 (not yet implemented)
# 0.74  # F multiplier for option 6 (not yet implemented
-3 # first year to use for averaging selex to use in forecast (e.g. 2004; or use -x to be rel endyr)
0 # last year to use for averaging selex to use in forecast
1 # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
2 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.4 # SPR target (e.g. 0.40)
0.4 # Biomass target (e.g. 0.40)
1 # N forecast years
0 # read 10 advanced options
#0 # Do West Coast gfish rebuilder output (0/1)
#2008 # Rebuilder:  first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
#2010 # Rebuilder:  year for current age structure (Yinit) (-1 to set to endyear+1)
#1 # Control rule method (1=west coast adjust catch; 2=adjust F)
#0.4 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40)
#0.1 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
#1 # Control rule fraction of Flimit (e.g. 0.75)
#0 # basis for max forecast catch by seas and area (0=none; 1=deadbio; 2=retainbio; 3=deadnum; 4=retainnum)
#0 # 0= no implementation error; 1=use implementation error in forecast (not coded yet)
#0.1 # stddev of log(realized F/target F) in forecast (not coded yet)
# end of advanced options
# placeholder for max forecast catch by season and area
1 # fleet allocation (in terms of F) (1=use endyr pattern, no read; 2=read below)
0 # Number of forecast catch levels to input (rest calc catch from forecast F
# 1 # basis for input forecatch:  1=retained catch; 2=total dead catch; 3=input Hrate(F)
#Year Seas Fleet Catch


999 # verify end of input
```

APPENDIX 8

SS3 control file used in the North Pacific albacore assessment for the base case.

```
# Control file for North Pacific albacore assessment in 2011.
#_data_and_control_files: NPalb2011_data.dat // NPalb2011.ctl
#_SS-V3.11b-opt;_09/23/2010;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB
1  #_N_Growth_Patterns
1 #_N_Morphs_Within_GrowthPattern
#_Cond 1 #_Morph_between/within_stdev_ratio (no read if N_morphs=1)
#_Cond  1 #vector_Morphdist_(-1_in_first_val_gives_normal_approx)
#
1 #  number of recruitment assignments (overrides GP*area*seas parameter values)
0 # recruitment interaction requested
#GP seas area for each recruitment assignment
 1 2 1
#
#_Cond 0 # N_movement_definitions goes here if N_areas > 1
#_Cond 1.0 # first age that moves (real age at begin of season, not integer) also cond on do_migration>0
#_Cond 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10
#
3 #_Nblock_Patterns
 1 1 1 #_blocks_per_pattern
# begin and end years of blocks
 2001 2004
 1993 2009
 2003 2009
#
0.5 #_fracfemale
0 #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
  #_no additional input for selected M option; read 1P per morph
1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=not implemented; 4=not implemented
1 #_Growth_Age_for_L1
999 #_Growth_Age_for_L2 (999 to use as Linf)
0 #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
0 #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A)
3 #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-
fecundity; 5=read fec and wt from wtatage.ss
#_Age_Maturity by growth pattern
 0 0 0 0 0 0.5 1 1 1 1 1 1 1 1 1 1
5 #_First_Mature_Age
1 #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0 #_hermaphroditism option:  0=none; 1=age-specific fxn
1 #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
1 #_env/block/dev_adjust_method (1=standard; 2=logistic transform keeps in base parm bounds; 3=standard w/ no
bound check)
#
#_growth_parms
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
 0.1 0.8 0.3 0.3 -1 99 -1 0 0 0 0 0 0 0 # NatM_p_1_Fem_GP_1
 10 60 44.4038 40.2 -1 99 5 0 0 0 0 0 0 0 # L_at_Amin_Fem_GP_1
 100 160 118.029 146.46 -1 99 5 0 0 0 0 0 0 0 # L_at_Amax_Fem_GP_1
 0.01 0.4 0.249518 0.149 -1 99 5 0 0 0 0 0 0 0 # VonBert_K_Fem_GP_1
 0.01 0.3 0.0599166 0.1 -1 99 5 0 0 0 0 0 0 0 # CV_young_Fem_GP_1
 0.01 0.3 0.033914 0.08 -1 99 5 0 0 0 0 0 0 0 # CV_old_Fem_GP_1
```

```
 -2 2 8.7e-005 8.7e-005 -1 99 -3 0 0 0 0 0 0 0 # Wtlen_1_Fem
 -2 4 2.67 2.67 -1 99 -3 0 0 0 0 0 0 0 # Wtlen_2_Fem
 1 10 5 5 -1 99 -3 0 0 0 0 0 0 0 # Mat50%_Fem
 -5 5 -3.746 -3.746 -1 99 -3 0 0 0 0 0 0 0 # Mat_slope_Fem
 0 3 1 1 -1 99 -3 0 0 0 0 0 0 0 # Eggs/kg_inter_Fem
 0 3 0 0 -1 99 -3 0 0 0 0 0 0 0 # Eggs/kg_slope_wt_Fem
 -4 4 0 1 -1 99 -3 0 0 0 0 0 0 0 # RecrDist_GP_1
 -4 4 0 1 -1 99 -3 0 0 0 0 0 0 0 # RecrDist_Area_1
 -4 4 -4 1 -1 99 -3 0 0 0 0 0 0 0 # RecrDist_Seas_1
 -4 4 0 1 -1 99 -3 0 0 0 0 0 0 0 # RecrDist_Seas_2
 -4 4 -4 1 -1 99 -3 0 0 0 0 0 0 0 # RecrDist_Seas_3
 -4 4 -4 1 -1 99 -3 0 0 0 0 0 0 0 # RecrDist_Seas_4
 -4 4 1 1 -1 99 -3 0 0 0 0 0 0 0 # CohortGrowDev
#
#_seasonal_effects_on_biology_parms
 19 23 0 0 0 0 0 0 0 0 #_femwtlen1,femwtlen2,mat1,mat2,fec1,fec2,Malewtlen1,malewtlen2,L1,K
 -2 2 0 0 -1 99 -2 # F-WL1_seas_1
 -2 2 -0.80235 -0.80235 -1 99 -2 # F-WL1_seas_2
 -2 2 -1.42139 -1.42139 -1 99 -2 # F-WL1_seas_3
 -2 2 -1.1337 -1.1337 -1 99 -2 # F-WL1_seas_4
 -2 2 0 0 -1 99 -2 # F-WL2_seas_1
 -2 2 0.061726 0.061726 -1 99 -2 # F-WL2_seas_2
 -2 2 0.113195 0.113195 -1 99 -2 # F-WL2_seas_3
 -2 2 0.089505 0.09505 -1 99 -2 # F-WL2_seas_4
#
#_Cond -4 #_MGparm_Dev_Phase
#
#_Spawner-Recruitment
3 #_SR_function
#_LO HI INIT PRIOR PR_type SD PHASE
 5 15 10.922 11.4 -1 99 1 # SR_R0
 0.2 1 1 0.75 -1 99 -4 # SR_steep
 0 2 0.6 0.6 -1 99 -1 # SR_sigmaR
 -5 5 0 0 -1 99 -1 # SR_envlink
 -10 10 0 0 -1 99 -1 # SR_R1_offset
 0 0 0 0 -1 99 -1 # SR_autocorr
0 #_SR_env_link
0 #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness
1 #do_recdev:  0=none; 1=devvector; 2=simple deviations
1969 # first year of main recr_devs; early devs can preceed this era
2007 # last year of main recr_devs; forecast devs start in following year
2 #_recdev phase
1 # (0/1) to read 13 advanced options
 1954 #_recdev_early_start (0=none; neg value makes relative to recdev_start)
 4 #_recdev_early_phase
 0 #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
 1 #_lambda for fore_recr_like occurring before endyr+1
 1954 #_last_early_yr_nobias_adj_in_MPD
 1969 #_first_yr_fullbias_adj_in_MPD
 2007 #_last_yr_fullbias_adj_in_MPD
 2009 #_first_recent_yr_nobias_adj_in_MPD
 1 #_max_bias_adj_in_MPD (-1 to override ramp and set biasadj=1.0 for all estimated recdevs)
 0 #_period of cycles in recruitment (N parms read below)
 -5 #min rec_dev
 5 #max rec_dev
 0 #_read_recdevs
```

```
#_end of advanced SR options
#
#_placeholder for full parameter lines for recruitment cycles
# read specified recr devs
#_Yr Input_value
#
#Fishing Mortality info
0.1 # F ballpark for tuning early phases
-2008 # F ballpark year (neg value to disable)
3 # F_Method:  1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
4 # max F or harvest rate, depends on F_Method
# no additional F input needed for Fmethod 1
# if Fmethod=2; read overall start F value; overall phase; N detailed inputs to read
# if Fmethod=3; read N iterations for tuning for Fmethod 3
5  # N iterations for tuning F in hybrid method (recommend 3 to 7)
#
#_initial_F_parms
#_LO HI INIT PRIOR PR_type SD PHASE
 0 3 0.268363 0.5 -1 99 1 # InitF_1F1_UC_LTN
 0 1 0 0 -1 99 -2 # InitF_2F2_USA_LL
 0 1 0 0 -1 99 -2 # InitF_3F3_EPO_M
 0 3 0.322517 0.2 -1 99 1 # InitF_4F4_JPN_PL_LF
 0 1 0 0 -1 99 -2 # InitF_5F5_JPN_PL_SF
 0 1 0 0 -1 99 -2 # InitF_6F6s1_JPN_OLLF1
 0 1 0 0 -1 99 -2 # InitF_7F6s2_JPN_OLLF1
 0 3 0.0918992 0.2 -1 99 1 # InitF_8F7s1_JPN_CLLF1
 0 1 0 0 -1 99 -2 # InitF_9F7s2_JPN_CLLF1
 0 1 0 0 -1 99 -2 # InitF_10F8_JPN_OLLF2
 0 1 0 0 -1 99 -2 # InitF_11F9_JPN_CLLF2
 0 1 0 0 -1 99 -2 # InitF_12F10_JPN_GN
 0 1 0 0 -1 99 -2 # InitF_13F11_JPN_M
 0 1 0 0 -1 99 -2 # InitF_14F12_TWN_LL
 0 1 0 0 -1 99 -2 # InitF_15F13_KO_LL
 0 1 0 0 -1 99 -2 # InitF_16F14_TK_GN
#
#_Q_setup
 # A=do power, B=env-var, C=extra SD, D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk);
E:0=num/1=bio/2=F, F:-1=norm/0=lognorm/>0=T
 #_A  B  C  D  E  F
 0 0 0 0 0 0 # 1 F1_UC_LTN
 0 0 0 0 0 0 # 2 F2_USA_LL
 0 0 0 0 0 0 # 3 F3_EPO_M
 0 0 0 0 0 0 # 4 F4_JPN_PL_LF
 0 0 0 0 0 0 # 5 F5_JPN_PL_SF
 0 0 0 0 0 0 # 6 F6s1_JPN_OLLF1
 0 0 0 0 0 0 # 7 F6s2_JPN_OLLF1
 0 0 0 0 0 0 # 8 F7s1_JPN_CLLF1
 0 0 0 0 0 0 # 9 F7s2_JPN_CLLF1
 0 0 0 0 0 0 # 10 F8_JPN_OLLF2
 0 0 0 0 0 0 # 11 F9_JPN_CLLF2
 0 0 0 0 0 0 # 12 F10_JPN_GN
 0 0 0 0 0 0 # 13 F11_JPN_M
 0 0 0 0 0 0 # 14 F12_TWN_LL
 0 0 0 0 0 0 # 15 F13_KO_LL
 0 0 0 0 0 0 # 16 F14_TK_GN
 0 0 0 0 0 0 # 17 S1_UC_LTN
```

0 0 0 0 0 0 # 18 S2_USA_LL
0 0 0 0 1 0 # 19 S3_JPN_PL_LF
0 0 0 0 1 0 # 20 S4_JPN_PL_SF_early
0 0 0 0 1 0 # 21 S5_JPN_PL_SF_late
0 0 0 0 0 0 # 22 S6_JPN_LLF1
0 0 0 0 0 0 # 23 S7_JPN_LLF2
0 0 0 0 0 0 # 24 S8_TWN_LL
#
#_Cond 0 #_If q has random component, then 0=read one parm for each fleet with random q; 1=read a parm for each year of index
#_Q_parms(if_any)
#
#_size_selex_types
#_Pattern Discard Male Special
24 0 0 0 # 1 F1_UC_LTN
1 0 0 0 # 2 F2_USA_LL
5 0 0 1 # 3 F3_EPO_M
24 0 0 0 # 4 F4_JPN_PL_LF
24 0 0 0 # 5 F5_JPN_PL_SF
24 0 0 0 # 6 F6s1_JPN_OLLF1
24 0 0 0 # 7 F6s2_JPN_OLLF1
5 0 0 6 # 8 F7s1_JPN_CLLF1
5 0 0 7 # 9 F7s2_JPN_CLLF1
1 0 0 0 # 10 F8_JPN_OLLF2
5 0 0 10 # 11 F9_JPN_CLLF2
5 0 0 5 # 12 F10_JPN_GN
5 0 0 5 # 13 F11_JPN_M
24 0 0 0 # 14 F12_TWN_LL
5 0 0 6 # 15 F13_KO_LL
5 0 0 5 # 16 F14_TK_GN
5 0 0 1 # 17 S1_UC_LTN
5 0 0 2 # 18 S2_USA_LL
5 0 0 4 # 19 S3_JPN_PL_LF
5 0 0 5 # 20 S4_JPN_PL_SF_early
5 0 0 5 # 21 S5_JPN_PL_SF_late
5 0 0 6 # 22 S6_JPN_LLF1
5 0 0 10 # 23 S7_JPN_LLF2
5 0 0 14 # 24 S8_TWN_LL
#
#_age_selex_types
#_Pattern ___ Male Special
10 0 0 0 # 1 F1_UC_LTN
10 0 0 0 # 2 F2_USA_LL
10 0 0 0 # 3 F3_EPO_M
10 0 0 0 # 4 F4_JPN_PL_LF
10 0 0 0 # 5 F5_JPN_PL_SF
10 0 0 0 # 6 F6s1_JPN_OLLF1
10 0 0 0 # 7 F6s2_JPN_OLLF1
10 0 0 0 # 8 F7s1_JPN_CLLF1
10 0 0 0 # 9 F7s2_JPN_CLLF1
10 0 0 0 # 10 F8_JPN_OLLF2
10 0 0 0 # 11 F9_JPN_CLLF2
10 0 0 0 # 12 F10_JPN_GN
10 0 0 0 # 13 F11_JPN_M
10 0 0 0 # 14 F12_TWN_LL
10 0 0 0 # 15 F13_KO_LL

```
 10 0 0 0 # 16 F14_TK_GN
 10 0 0 0 # 17 S1_UC_LTN
 10 0 0 0 # 18 S2_USA_LL
 10 0 0 0 # 19 S3_JPN_PL_LF
 10 0 0 0 # 20 S4_JPN_PL_SF_early
 10 0 0 0 # 21 S5_JPN_PL_SF_late
 10 0 0 0 # 22 S6_JPN_LLF1
 10 0 0 0 # 23 S7_JPN_LLF2
 10 0 0 0 # 24 S8_TWN_LL
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
 27.5 100 62.9045 66 -1 99 2 0 0 0 0 0 0 0 # SizeSel_1P_1_F1_UC_LTN
 -9 4 -8.22825 -3 -1 99 4 0 0 0 0 0 0 0 # SizeSel_1P_2_F1_UC_LTN
 -1 9 3.5143 4 -1 99 3 0 0 0 0 0 0 0 # SizeSel_1P_3_F1_UC_LTN
 -1 9 5.69924 5 -1 99 4 0 0 0 0 0 0 0 # SizeSel_1P_4_F1_UC_LTN
 -999 -999 -999 -5 -1 99 -2 0 0 0 0 0 0 0 # SizeSel_1P_5_F1_UC_LTN
 -999 -999 -999 -5 -1 99 -2 0 0 0 0 0 0 0 # SizeSel_1P_6_F1_UC_LTN
 45 130 92.3678 100 -1 99 2 0 0 0 0 0 1 2 # SizeSel_2P_1_F2_USA_LL
 0.1 30 24.5657 10 -1 99 3 0 0 0 0 0 1 2 # SizeSel_2P_2_F2_USA_LL
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_3P_1_F3_EPO_M
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_3P_2_F3_EPO_M
 27.5 130 83.3866 90 -1 99 2 0 0 0 0 0 0 0 # SizeSel_4P_1_F4_JPN_PL_LF
 -9 4 -4 -3 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_4P_2_F4_JPN_PL_LF
 -1 9 5.36443 4.6 -1 99 3 0 0 0 0 0 0 0 # SizeSel_4P_3_F4_JPN_PL_LF
 -1 9 3.97328 3 -1 99 4 0 0 0 0 0 0 0 # SizeSel_4P_4_F4_JPN_PL_LF
 -999 -999 -999 -5 -1 99 -2 0 0 0 0 0 0 0 # SizeSel_4P_5_F4_JPN_PL_LF
 -999 -999 -999 -5 -1 99 -2 0 0 0 0 0 0 0 # SizeSel_4P_6_F4_JPN_PL_LF
 27.5 100 54.7341 75 -1 99 2 0 0 0 0 0 0 0 # SizeSel_5P_1_F5_JPN_PL_SF
 -9 4 -0.931761 -3 -1 99 4 0 0 0 0 0 0 0 # SizeSel_5P_2_F5_JPN_PL_SF
 -1 9 3.21189 6 -1 99 3 0 0 0 0 0 0 0 # SizeSel_5P_3_F5_JPN_PL_SF
 -1 9 3.88478 3 -1 99 4 0 0 0 0 0 0 0 # SizeSel_5P_4_F5_JPN_PL_SF
 -999 -999 -999 -5 -1 99 -2 0 0 0 0 0 0 0 # SizeSel_5P_5_F5_JPN_PL_SF
 -999 -999 -999 -5 -1 99 -2 0 0 0 0 0 0 0 # SizeSel_5P_6_F5_JPN_PL_SF
 27.5 130 88.8463 89 -1 99 2 0 0 0 0 0 2 2 # SizeSel_6P_1_F6s1_JPN_OLLF1
 -9 4 -0.424186 -3 -1 99 4 0 0 0 0 0 2 2 # SizeSel_6P_2_F6s1_JPN_OLLF1
 -4 9 5.58817 6 -1 99 3 0 0 0 0 0 2 2 # SizeSel_6P_3_F6s1_JPN_OLLF1
 -4 9 4.49669 3 -1 99 2 0 0 0 0 0 2 2 # SizeSel_6P_4_F6s1_JPN_OLLF1
 -999 -999 -999 -5 -1 99 -2 0 0 0 0 0 2 2 # SizeSel_6P_5_F6s1_JPN_OLLF1
 -999 -999 -999 -5 -1 99 -2 0 0 0 0 0 2 2 # SizeSel_6P_6_F6s1_JPN_OLLF1
 27.5 130 77.6329 89 -1 99 2 0 0 0 0 0 0 0 # SizeSel_7P_1_F6s2_JPN_OLLF1
 -9 4 -8.38732 -3 -1 99 4 0 0 0 0 0 0 0 # SizeSel_7P_2_F6s2_JPN_OLLF1
 -4 9 4.06471 6 -1 99 3 0 0 0 0 0 0 0 # SizeSel_7P_3_F6s2_JPN_OLLF1
 -4 9 4.7943 3 -1 99 2 0 0 0 0 0 0 0 # SizeSel_7P_4_F6s2_JPN_OLLF1
 -999 -999 -999 -5 -1 99 -2 0 0 0 0 0 0 0 # SizeSel_7P_5_F6s2_JPN_OLLF1
 -999 -999 -999 -5 -1 99 -2 0 0 0 0 0 0 0 # SizeSel_7P_6_F6s2_JPN_OLLF1
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_8P_1_F7s1_JPN_CLLF1
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_8P_2_F7s1_JPN_CLLF1
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_9P_1_F7s2_JPN_CLLF1
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_9P_2_F7s2_JPN_CLLF1
 45 130 91.5601 110 -1 99 2 0 0 0 0 0 0 0 # SizeSel_10P_1_F8_JPN_OLLF2
 0.1 30 13.9318 10 -1 99 3 0 0 0 0 0 0 0 # SizeSel_10P_2_F8_JPN_OLLF2
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_11P_1_F9_JPN_CLLF2
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_11P_2_F9_JPN_CLLF2
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_12P_1_F10_JPN_GN
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_12P_2_F10_JPN_GN
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_13P_1_F11_JPN_M
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_13P_2_F11_JPN_M
```

```
 27.5 130 82.5253 89 -1 99 2 0 0 0 0 0 3 2 # SizeSel_14P_1_F12_TWN_LL
 -9 4 -4 -3 -1 99 -4 0 0 0 0 0 3 2 # SizeSel_14P_2_F12_TWN_LL
 -1 9 6.03996 6 -1 99 3 0 0 0 0 0 3 2 # SizeSel_14P_3_F12_TWN_LL
 -4 9 5.34978 3 -1 99 4 0 0 0 0 0 3 2 # SizeSel_14P_4_F12_TWN_LL
 -999 -999 -999 -5 -1 99 -5 0 0 0 0 0 3 2 # SizeSel_14P_5_F12_TWN_LL
 -999 -999 -999 -5 -1 99 -4 0 0 0 0 0 3 2 # SizeSel_14P_6_F12_TWN_LL
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_15P_1_F13_KO_LL
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_15P_2_F13_KO_LL
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_16P_1_F14_TK_GN
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_16P_2_F14_TK_GN
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_17P_1_S1_UC_LTN
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_17P_2_S1_UC_LTN
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_18P_1_S2_USA_LL
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_18P_2_S2_USA_LL
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_19P_1_S3_JPN_PL_LF
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_19P_2_S3_JPN_PL_LF
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_20P_1_S4_JPN_PL_SF_early
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_20P_2_S4_JPN_PL_SF_early
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_21P_1_S5_JPN_PL_SF_late
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_21P_2_S5_JPN_PL_SF_late
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_22P_1_S6_JPN_LLF1
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_22P_2_S6_JPN_LLF1
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_23P_1_S7_JPN_LLF2
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_23P_2_S7_JPN_LLF2
 1 80 1 1 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_24P_1_S8_TWN_LL
 -80 -80 -80 -80 -1 99 -4 0 0 0 0 0 0 0 # SizeSel_24P_2_S8_TWN_LL
#_Cond 0 #_custom_sel-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no enviro fxns
1 #_custom_sel-blk_setup (0/1)
 45 130 96.1257 100 -1 99 2 # SizeSel_2P_1_F2_USA_LL_BLK1repl_2001
 0.1 30 6.44513 10 -1 99 3 # SizeSel_2P_2_F2_USA_LL_BLK1repl_2001
 27.5 130 76.0267 89 -1 99 2 # SizeSel_6P_1_F6s1_JPN_OLLF1_BLK2repl_1993
 -9 4 -8.07952 -3 -1 99 4 # SizeSel_6P_2_F6s1_JPN_OLLF1_BLK2repl_1993
 -4 9 4.22699 6 -1 99 3 # SizeSel_6P_3_F6s1_JPN_OLLF1_BLK2repl_1993
 -4 9 6.5436 3 -1 99 2 # SizeSel_6P_4_F6s1_JPN_OLLF1_BLK2repl_1993
 -999 -999 -999 -5 -1 99 -2 # SizeSel_6P_5_F6s1_JPN_OLLF1_BLK2repl_1993
 -999 -999 -999 -5 -1 99 -2 # SizeSel_6P_6_F6s1_JPN_OLLF1_BLK2repl_1993
 27.5 130 86.4651 89 -1 99 2 # SizeSel_14P_1_F12_TWN_LL_BLK3repl_2003
 -9 4 -4 -3 -1 99 -4 # SizeSel_14P_2_F12_TWN_LL_BLK3repl_2003
 -1 9 5.04604 6 -1 99 3 # SizeSel_14P_3_F12_TWN_LL_BLK3repl_2003
 -4 9 5.43062 3 -1 99 4 # SizeSel_14P_4_F12_TWN_LL_BLK3repl_2003
 -999 -999 -999 -5 -1 99 -5 # SizeSel_14P_5_F12_TWN_LL_BLK3repl_2003
 -999 -999 -999 -5 -1 99 -4 # SizeSel_14P_6_F12_TWN_LL_BLK3repl_2003
#_Cond No selex parm trends
#_Cond -4 # placeholder for selparm_Dev_Phase
1 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm bounds; 3=standard w/ no bound check)
#
# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters
#
1 #_Variance_adjustments_to_input_values
#_fleet: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
  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 #_add_to_survey_CV
  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 #_add_to_discard_stddev
```

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 #_add_to_bodywt_CV
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_mult_by_lencomp_N
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_mult_by_agecomp_N
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 #_mult_by_size-at-age_N
0 #_discard_like: >0 for DF of T-dist(read CV in data file); 0 for normal with CV; -1 for normal with se; -2 for lognormal
0 #_DF_for_meanbodywt_like
#
4 #_maxlambdaphase
1 #_sd_offset
#
26 # number of changes to make to default Lambdas (default value is 1.0)
Like_comp codes: 1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey phase value sizefreq_method
1 17 1 1 1
1 18 1 1 1
1 19 1 1 1
1 20 1 1 1
1 21 1 1 1
1 22 1 1 1
1 23 1 1 1
1 24 1 1 1
4 1 1 0.01 1
4 2 1 0.01 1
4 4 1 0.01 1
4 5 1 0.01 1
4 6 1 0.01 1
4 7 1 0.01 1
4 10 1 0.01 1
4 14 1 0.01 1
5 1 1 0.1 1
5 2 1 0.1 1
5 6 1 0.1 1
5 10 1 0.1 1
9 1 1 1 1
9 4 1 1 1
9 8 1 1 1
11 1 1 0 1
12 1 1 0 1
13 1 1 100 1
#
0 # (0/1) read specs for more stddev reporting
0 1 -1 5 1 5 1 -1 5 # placeholder for selex type, len/age, year, N selex bins, Growth pattern, N growth ages, NatAge_area(-1 for all), NatAge_yr, N Natages
placeholder for vector of selex bins to be reported
placeholder for vector of growth ages to be reported
placeholder for vector of NatAges ages to be reported
999

Swordfish Fishery Economics: Transfer Effect and West Coast Fishery Attrition

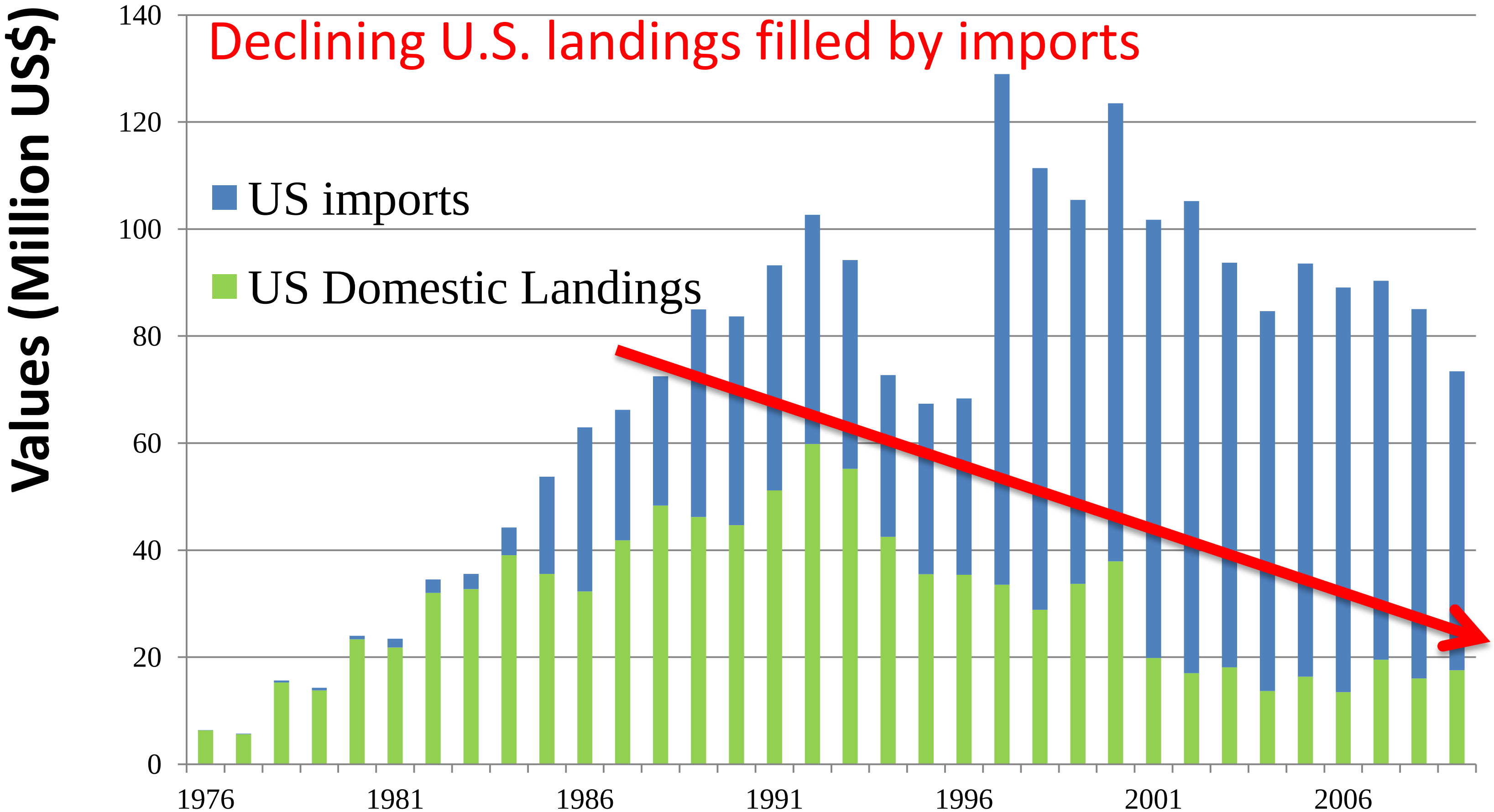
Stephen M. Stohs
Southwest Fishery Science Center

September 2011

Transfer Effect

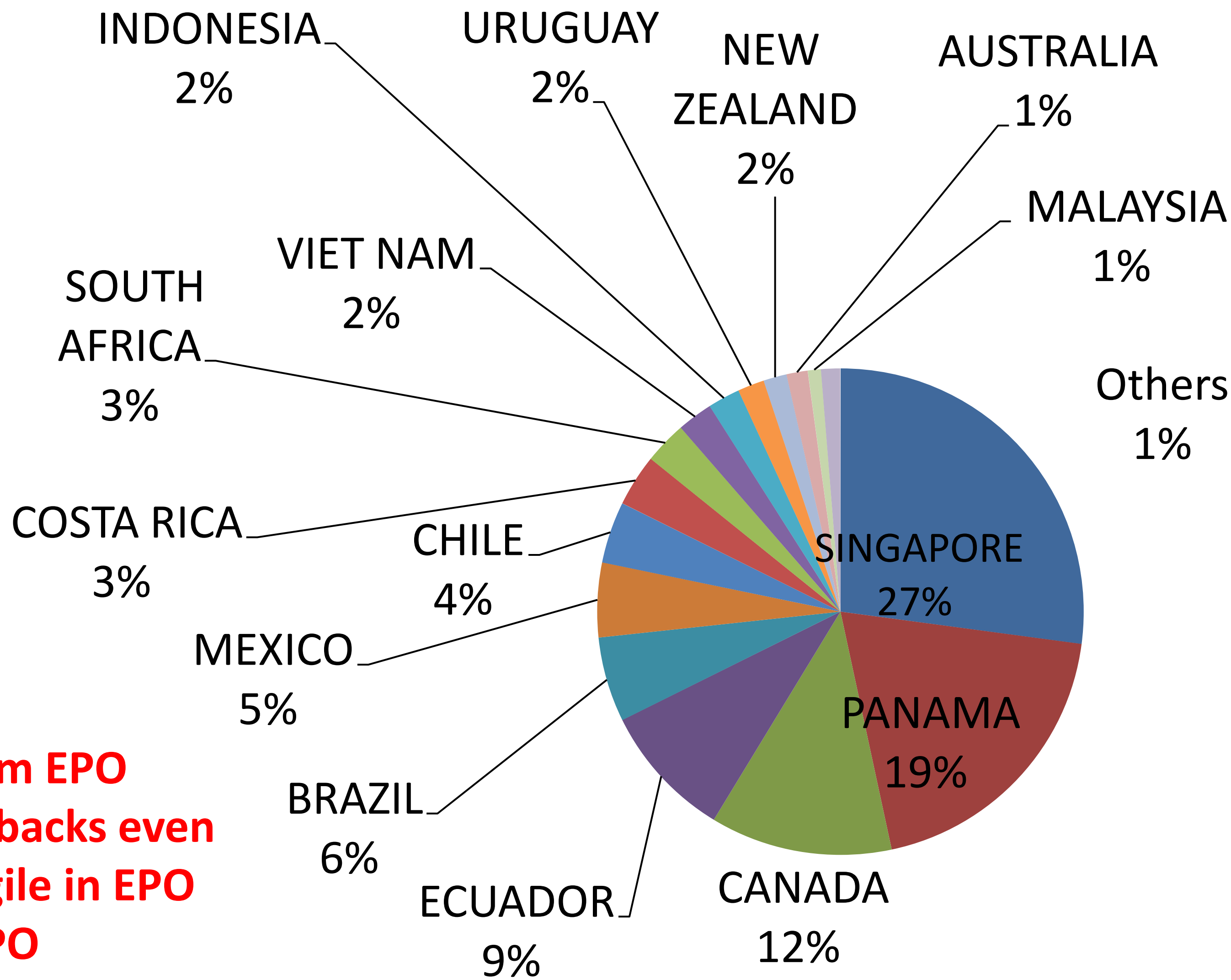
- Imports have substituted for declining U.S. swordfish landings in recent years.
- EPO landings are a large component of U.S. swordfish imports.
- The EPO leatherback population is more fragile than the WPO population.
- Swordfish consumption in the rest of the world has recently increased, while U.S. consumption has decreased.

Values of US Swordfish Landings and Imports



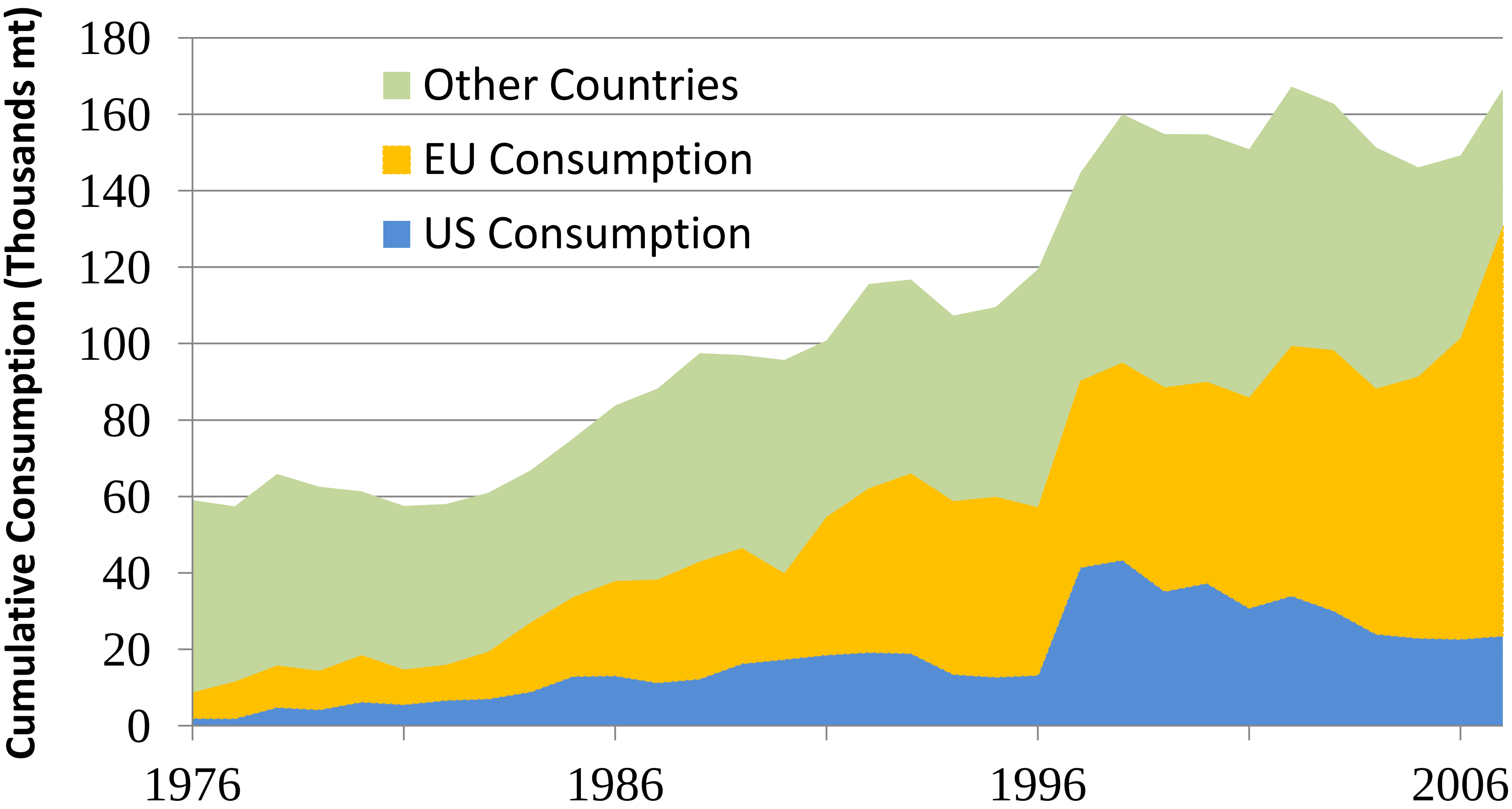
Data source: Personal communication with Fisheries Statistics Division, National Marine Fisheries Service Headquarters

2008 U.S. Swordfish Imports by Weight



- **40% from EPO**
- **Leatherbacks even more fragile in EPO than WCPO**

Swordfish Consumption in the US, EU and Other Countries

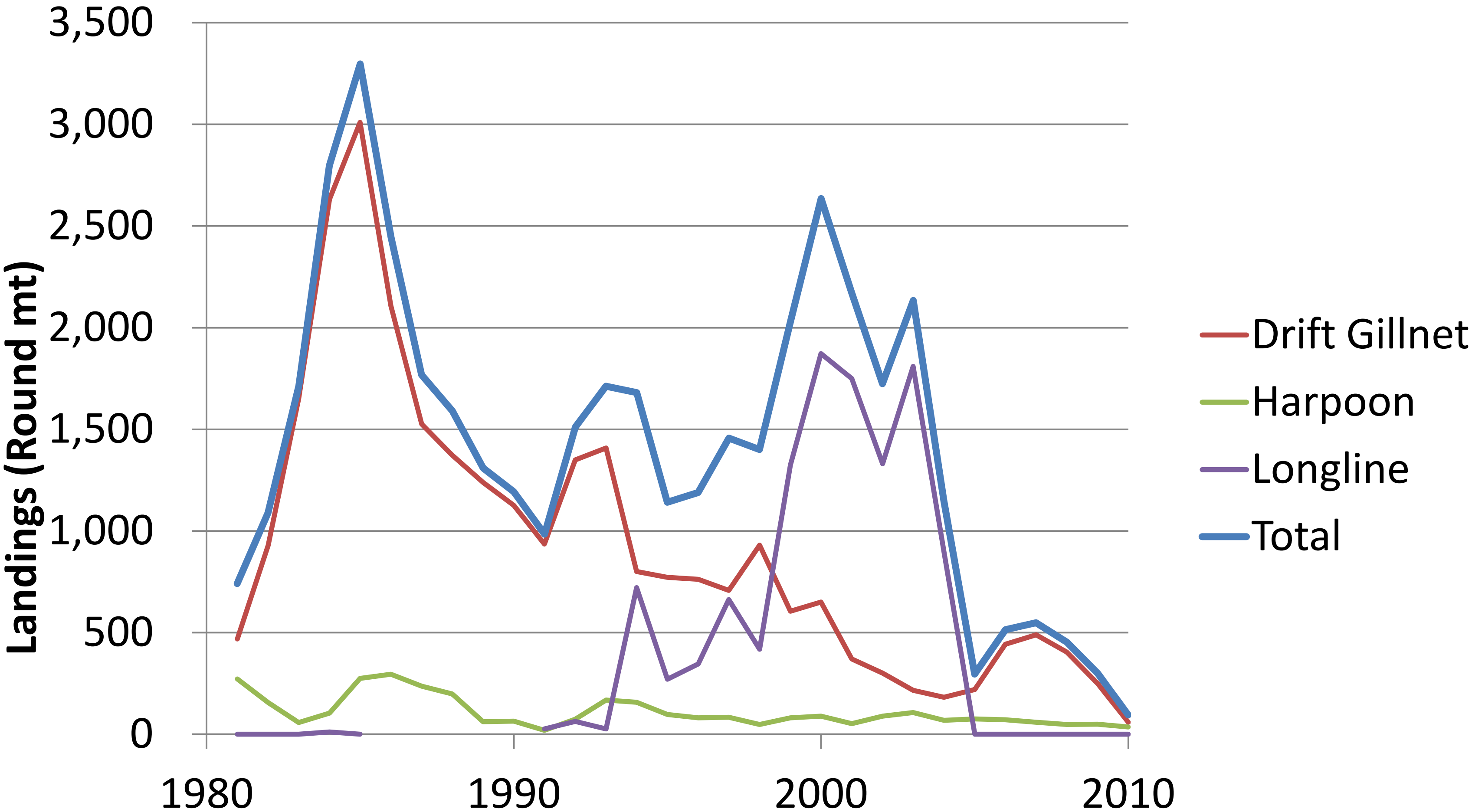


Data Source: FAO Fisheries Department. 2010.

West Coast Fishery Attrition

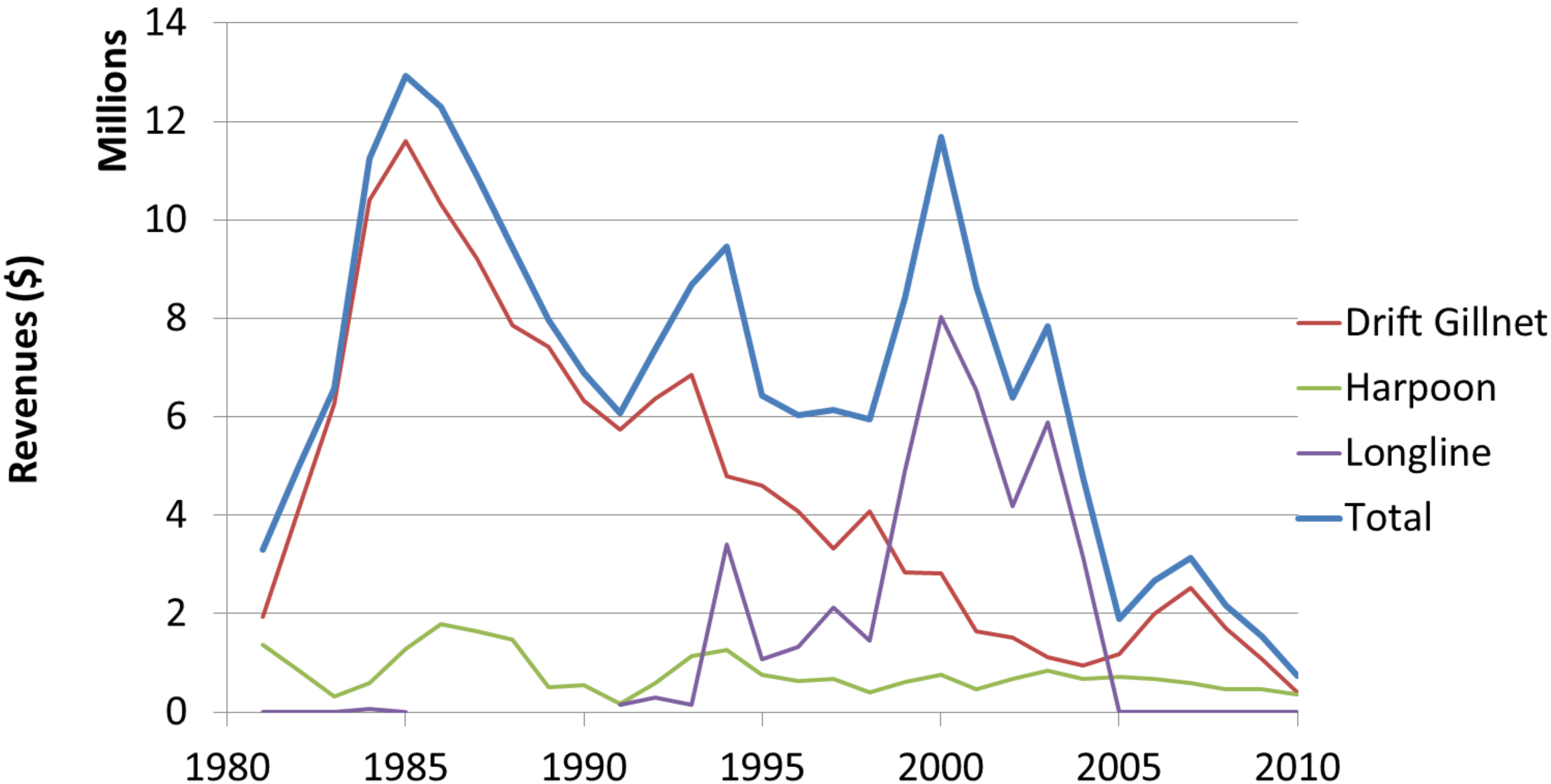
- West Coast swordfish fisheries peaked in the 1990s
- Recent experience is marked by attrition
- Landings, revenues and participation have declined

HMS FMP Swordfish Fishery Landings



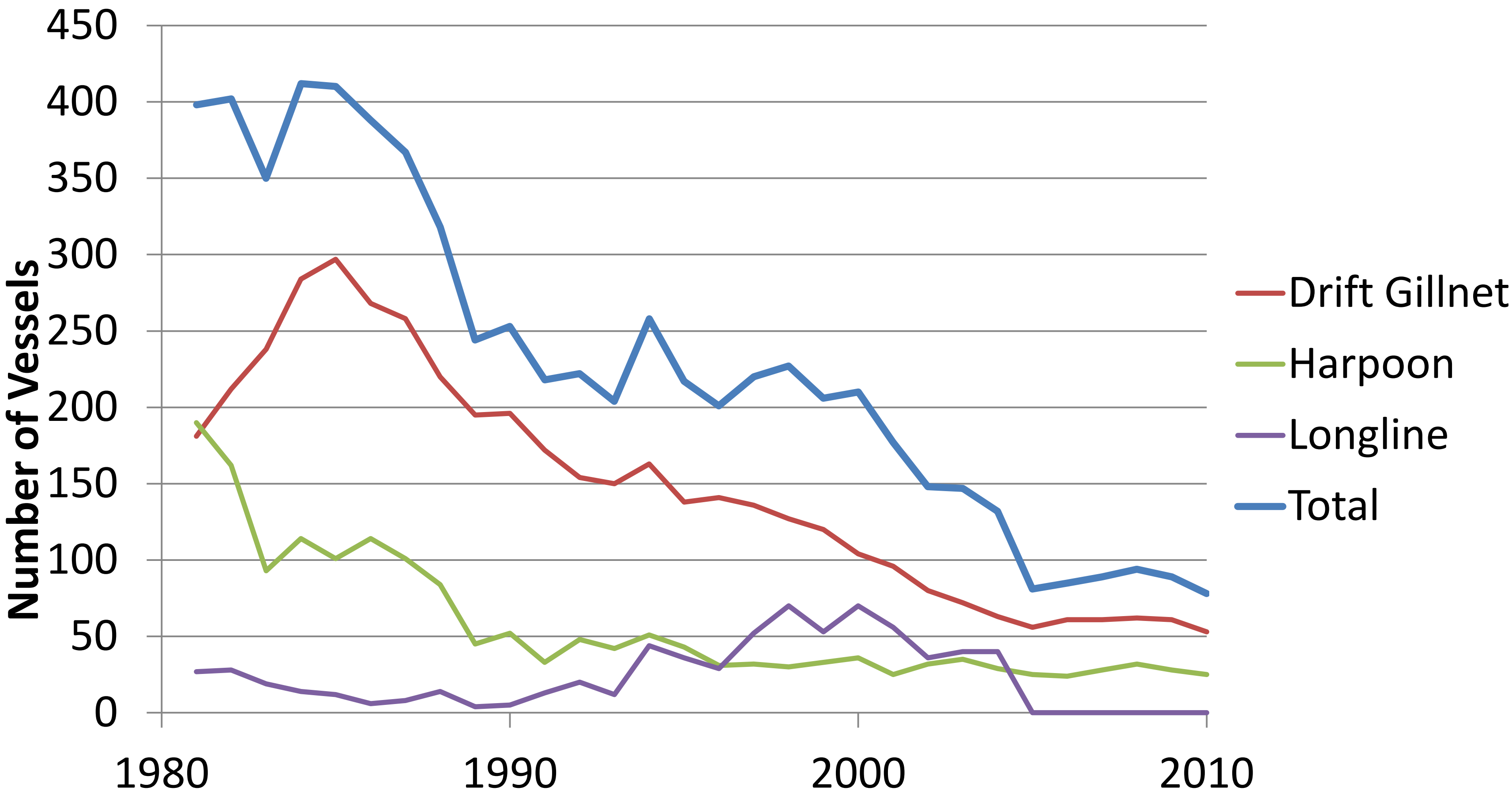
Data Source: PacFIN

HMS FMP Swordfish Fishery Revenues



Data Source: PacFIN

HMS FMP Swordfish Fishery Participation



Data Source: PacFIN

Summary

- Declining U.S. swordfish production appears to have led to increased imports to meet U.S. consumption demand
- A large share of imports comes from regions with fragile leatherback turtle populations
- West Coast swordfish fisheries have experienced recent downtrends in landings, revenues and participation

Agenda Item E.1.b
Supplemental SWFSC ISC PowerPoint (Kohin)
September 2011

Southwest Fisheries Science Center Report on ISC Conservation Advice and the 2011 North Pacific Albacore Stock Assessment

Pacific Fisheries Management Council Meeting

San Mateo, CA

Suzanne Kohin

ISC 11 - July 20-25, San Francisco CA

International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean

ISC Members and Observers in attendance:

Canada, Chinese Taipei, Japan, Korea, Mexico, United States, WCPFC

Key Business:

Review Progress of Working Groups since ISC 10

Update Stock Status and Conservation Advice

Other Matters:

Status of Interactions with RFMOs and other Organizations

Develop Rules and Procedures for the External Peer Review

Review ISC Website and Database Progress

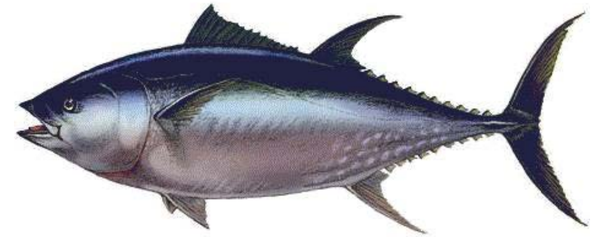
Elect new ISC vice-Chair (Chinese Taipei) and introduce 3 new Working Group Chairs

Update Operations Manual

Next meeting to be held in July 2012 in Japan

http://isc.ac.affrc.go.jp/pdf/ISC11pdf/ISC11_Plenary_FINAL_September.pdf

Bluefin Tuna



- No new assessment; next assessment planned for May 2012
- No new conservation advice:

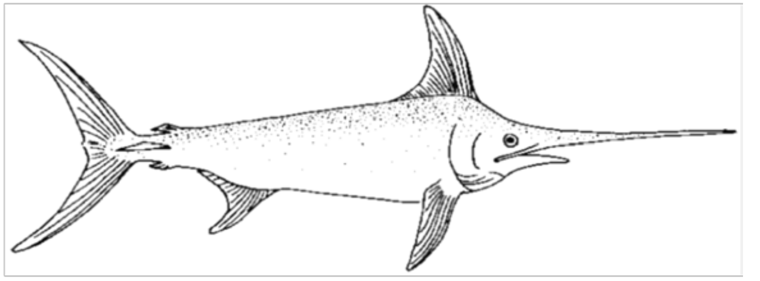
ISC advised that "...**it is important that the level of F is decreased below the 2002-04 levels, particularly on juvenile age classes**."

Striped Marlin

- No new assessment; next assessment planned for Dec. 2011
- No new conservation advice:

ISC advised that "...**the fishing mortality rate should not be increased above the current reference years (2001-2003) as specified in the latest assessment."**

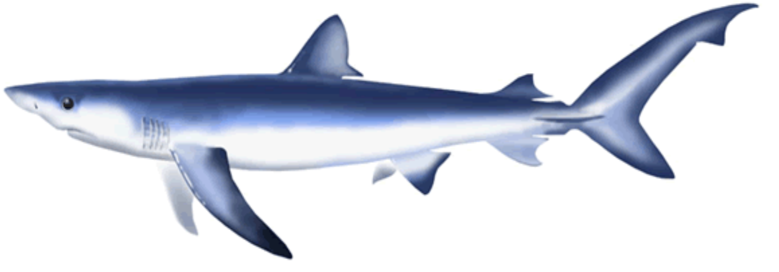
Swordfish



- No new assessment; next assessment planned for 2013
- No new conservation advice:

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

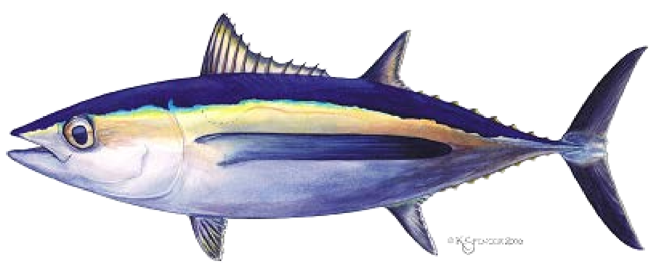
Sharks



- First SHARKWG meeting held in April 2011
  - Prioritization of work on blue and shortfin mako sharks
- An assessment of north Pacific blue shark planned for 2012

Albacore

- Prior to ISC 11, the last albacore assessment was conducted in 2006
- $F_{(2002\text{-}2004)}$ was found to be high with respect to most commonly used BRPs
- New assessment conducted in June 2011 in Shizuoka, Japan
- Assessment will undergo independent CIE review



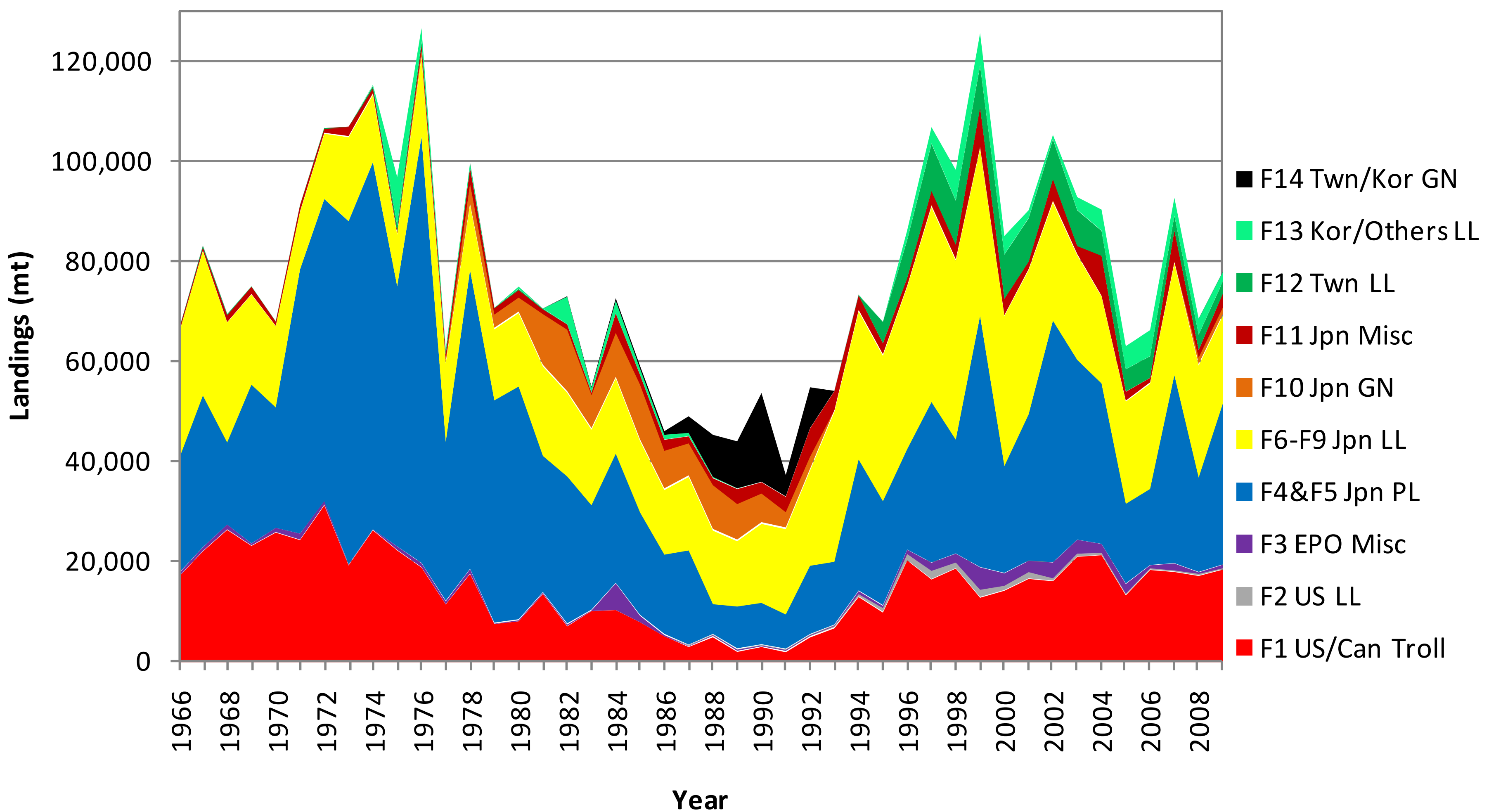
Methodology

- Stock Synthesis v3.11b
- Seasonal, length-based, age-structured, forward-simulation model
- Projections used to estimate if future SSB will fall below SSB-ATHL in the 25-yr (2010-2035) projection period

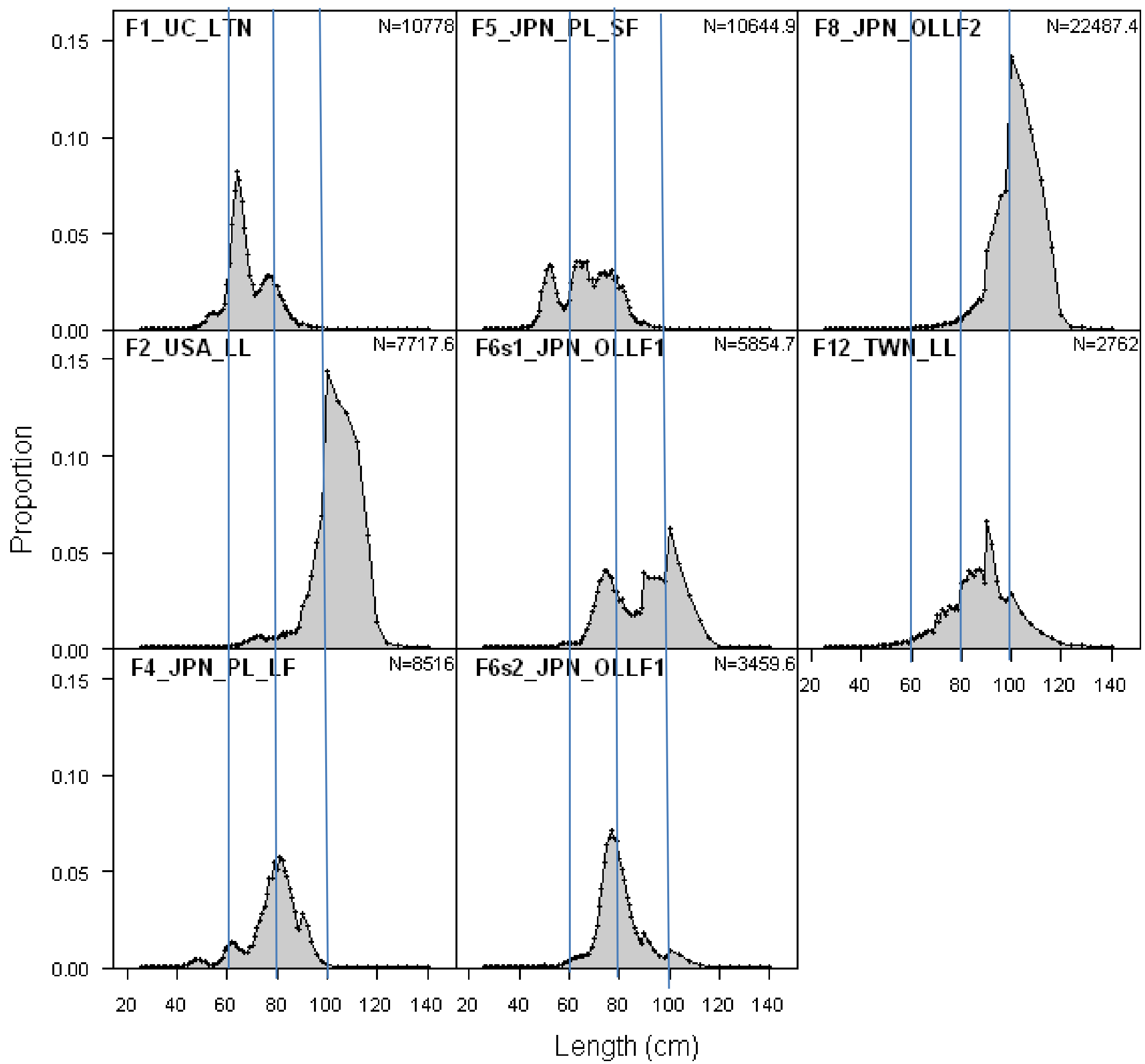
Input Data

- 14 fisheries defined by gear, location, season, and the unit of catch (numbers or weight): 3 EPO, 8 Japan, 1 Taiwan, 2 WPO others
- Quarterly Catch for each fishery (weight or number)
- Quarterly length compositions (8)
- CPUE indices (8)
- Conditional age-length data from otoliths (Wells et al. 2011)

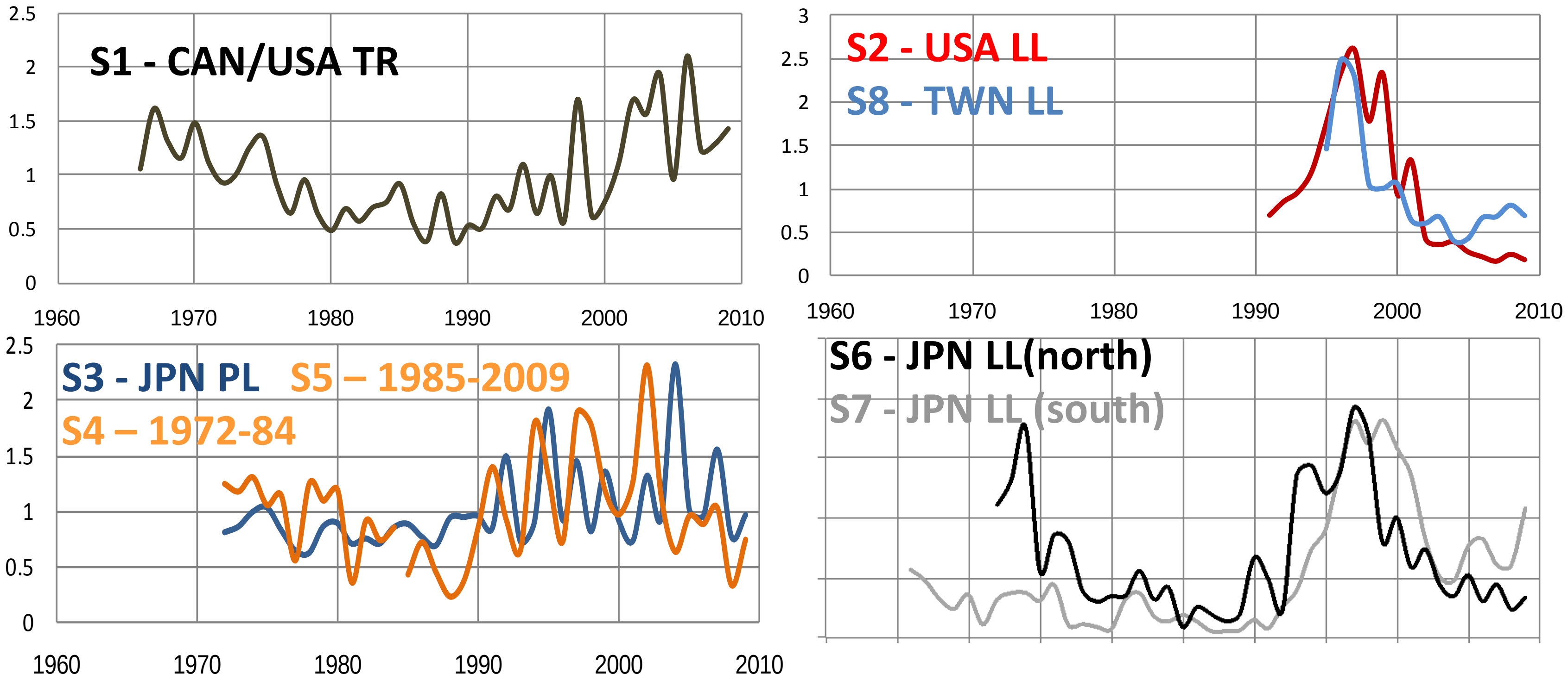
Catch History



Length Compositions



Abundance indices



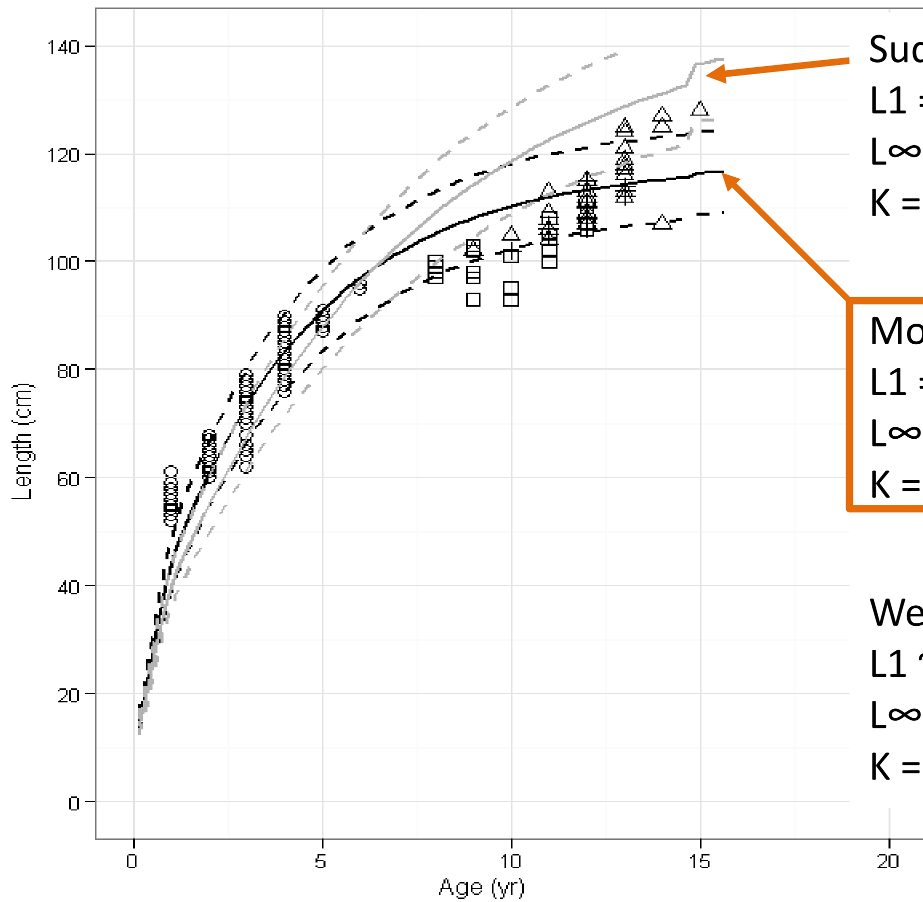
Base Case Model Assumptions

Many sensitivity runs conducted to explore alternative assumptions

- Basic
  - Data from 1966 – 2009
  - Entire North Pacific north of 10° N
  - Single stock, well mixed
  - Sexes combined
  - Movement not explicitly modeled
- Biological
  - Spawning in Q2
  - Recruitment in Q2
  - M= 0.3 yr^{-1} for all ages
  - Maturity (Ueyanagi 1957): 50% age 5, 100% ≥ age 6
  - 15 years is maximum age
  - Quarterly L-W relationships (Watanabe et al. 2006)
- Stock-recruitment
  - Beverton and Holt model
  - Steepness (h) $= 1$
- Data Weighting
  - Downweight length comps and otolith data
  - Tune model to S6 - JP LL CPUE (CV=0.2)

Growth

- Key change; 2006 assessment used fixed growth curve from Suda (1966)
- Growth estimated in model
- Conditional age-at-length data from otoliths included
- Use of the new growth model had a dramatic effect on scaling



Suda curve
L1 =40.2 cm
L∞ = 146.46 cm
$K = 0.149\ yr^{-1}$

Model estimates
L1 = 44.4 cm
L∞ = 118.0 cm
$K = 0.2495\ yr^{-1}$

Wells et al. (2011)
L1 ~ 50 cm
L∞ = 120.0 cm
$K = 0.184\ yr^{-1}$

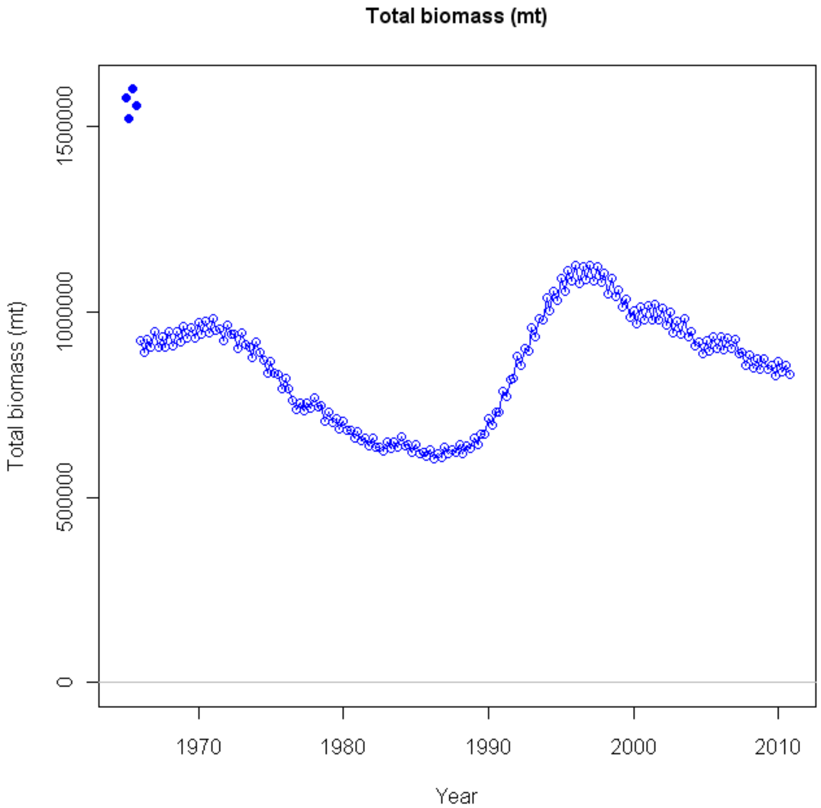
Base Case Model Results

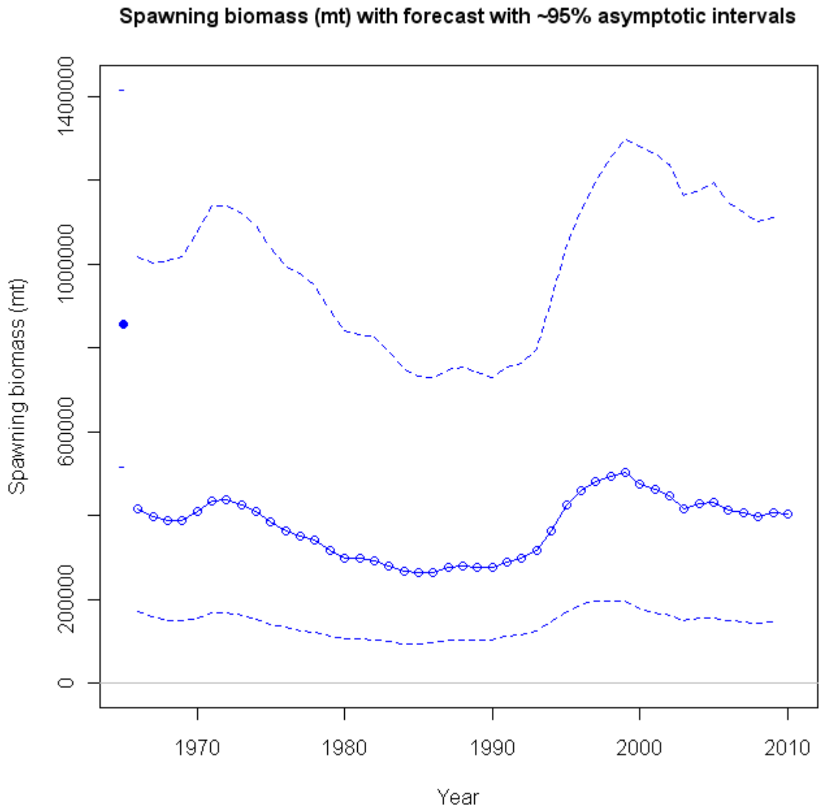
- Model Fit Diagnostics
  - CPUE
  - Length composition data
  - Liklelihoods

- Model Parameter Estimates
  - Growth
  - Estimated selectivity patterns

- Stock Assessment Results
  - Biomass
  - Recruitment
  - F-at-age

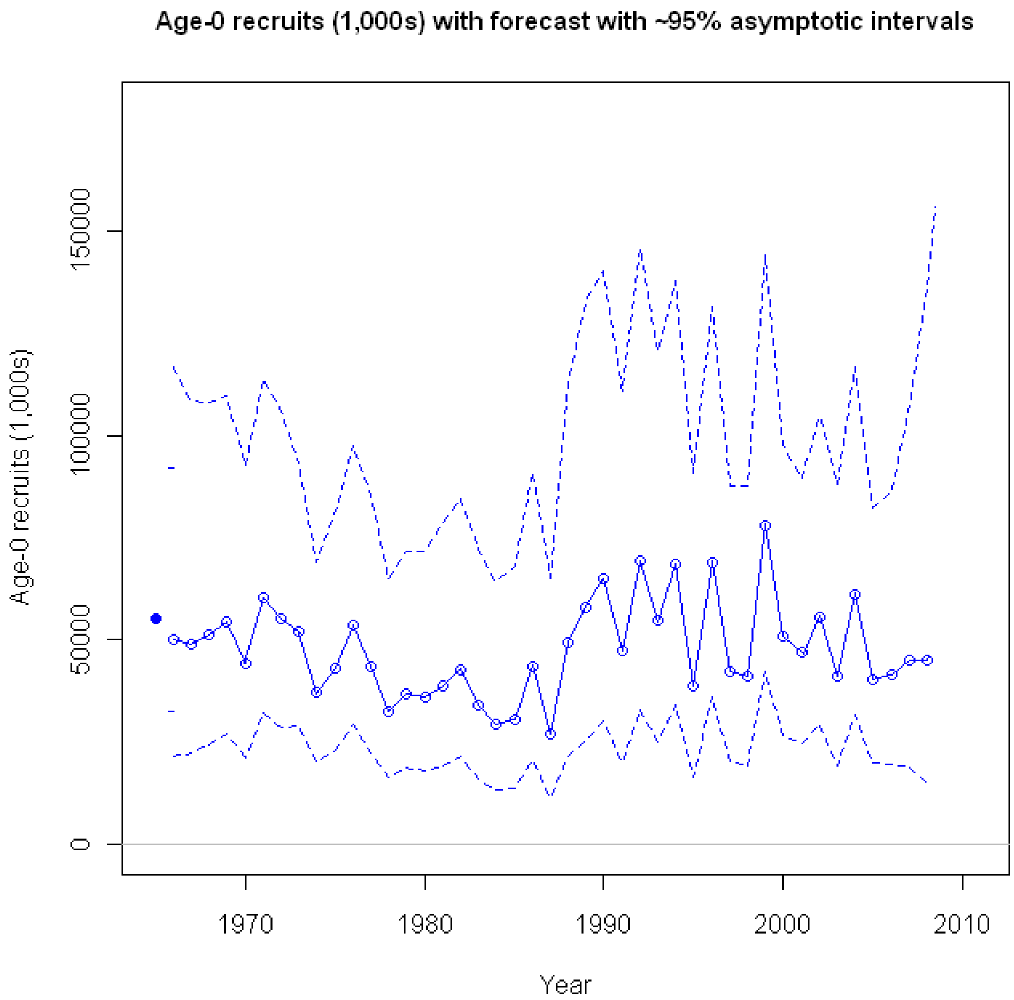
Estimated B and SSB





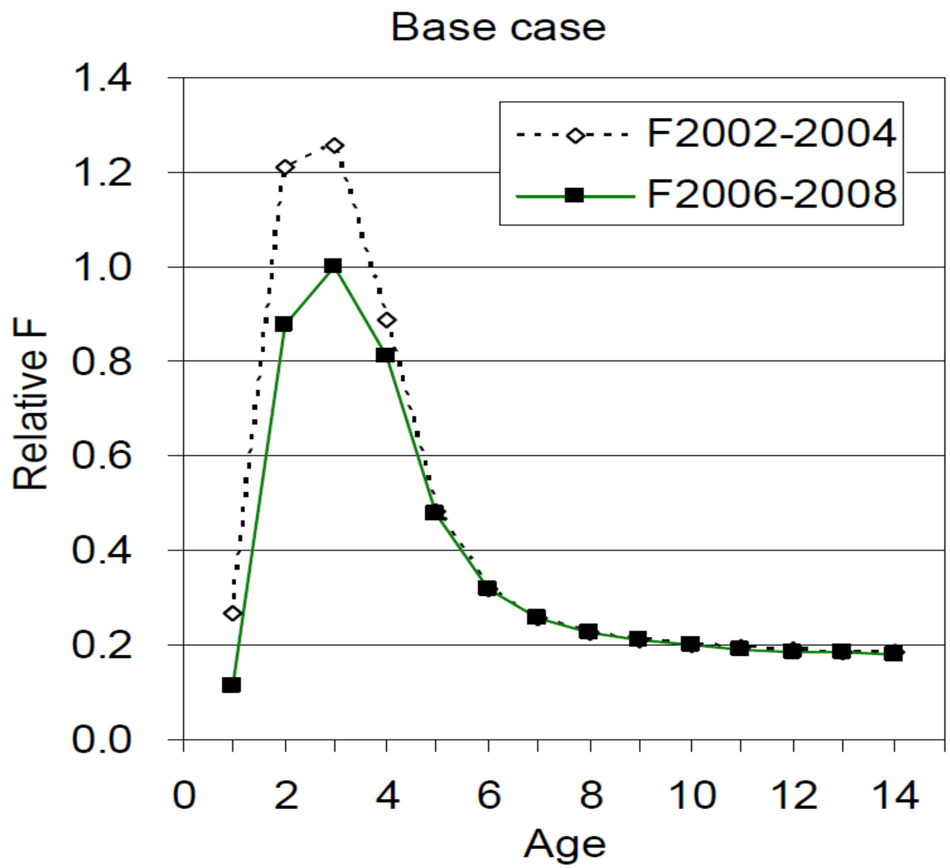
Median SSB ~ 405,000 t

Recruitment – Age 0



Average annual recruitment ~48 million fish

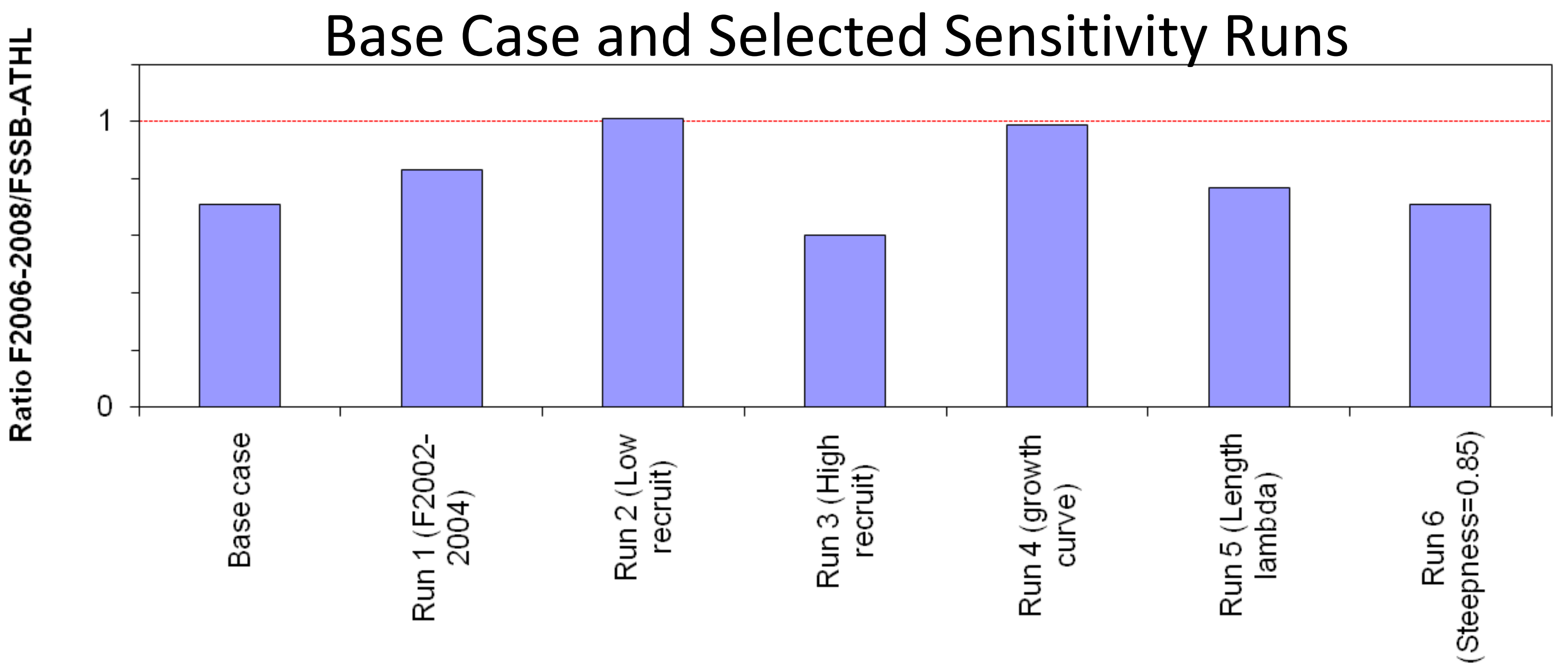
Fishing Mortality



Current F = geometric mean of 2006-2008

$F_{2002\text{-}2004}$ = geometric mean 2002-2004 for comparison with 2006 assessment

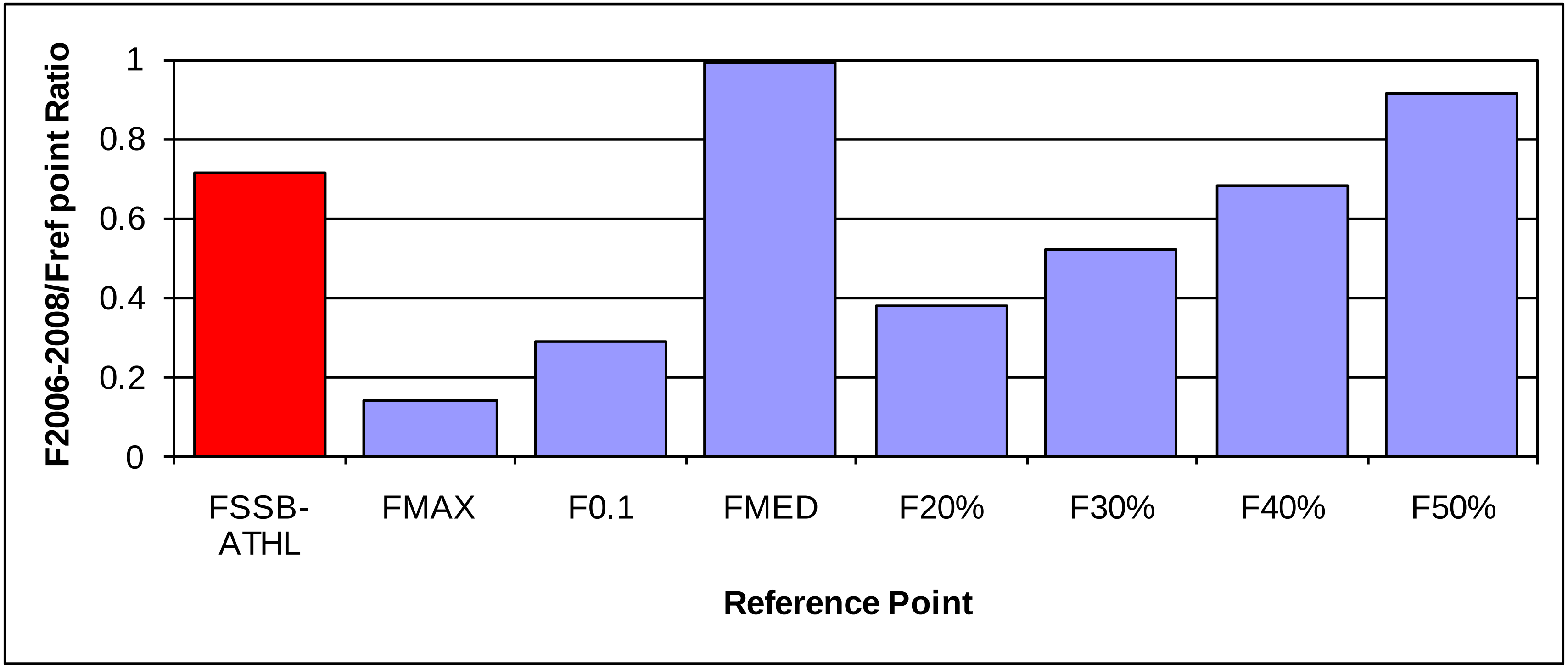
$F_{current}$ vs. $F_{SSB-ATHL}$ Reference Point



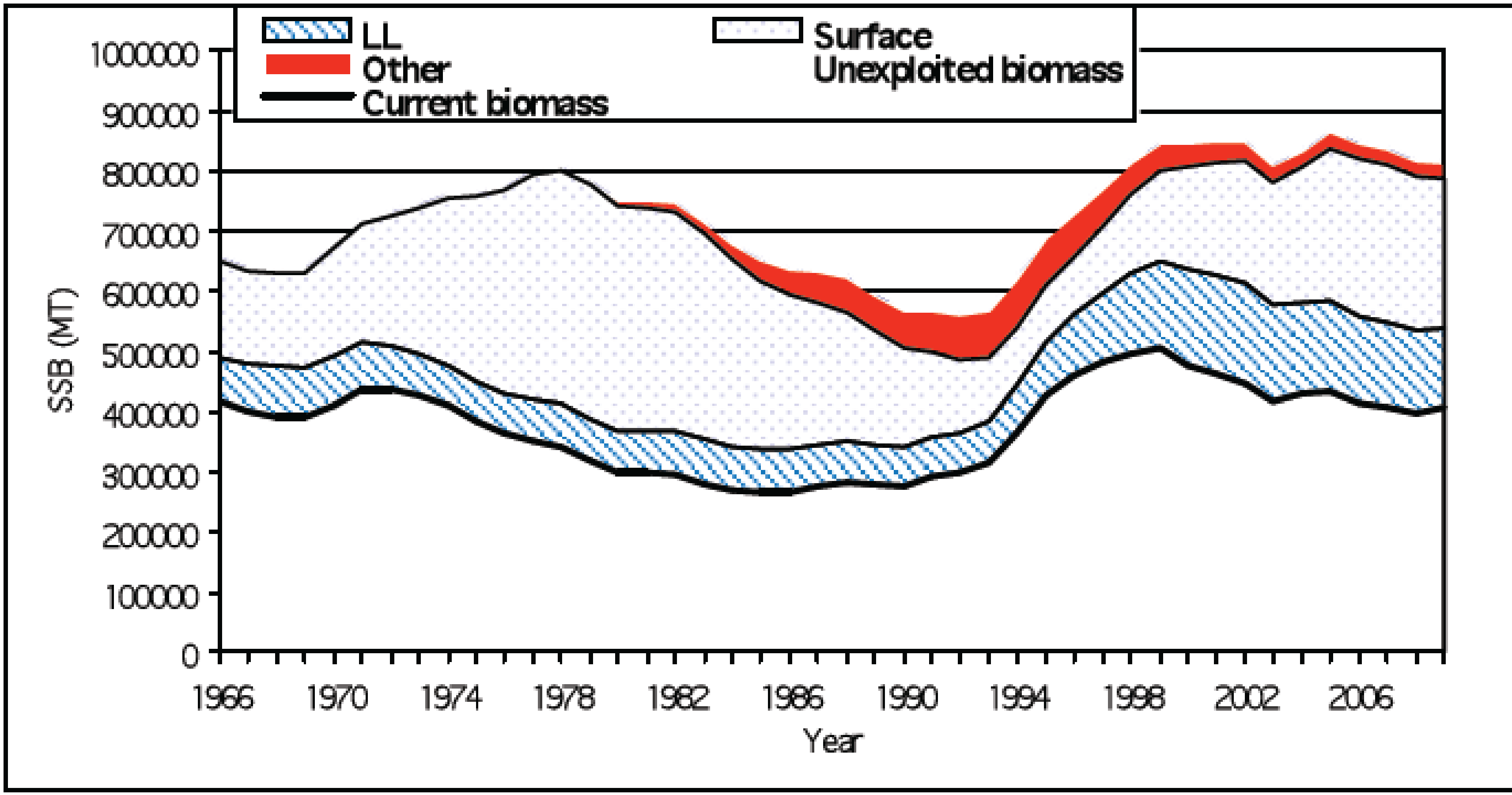
- For the Base Case, current F is 71% of $F_{SSB-ATHL}$
- Most F-ratios are below 1.0, except for low recruitment run

Other Biological Reference Points: Base Case

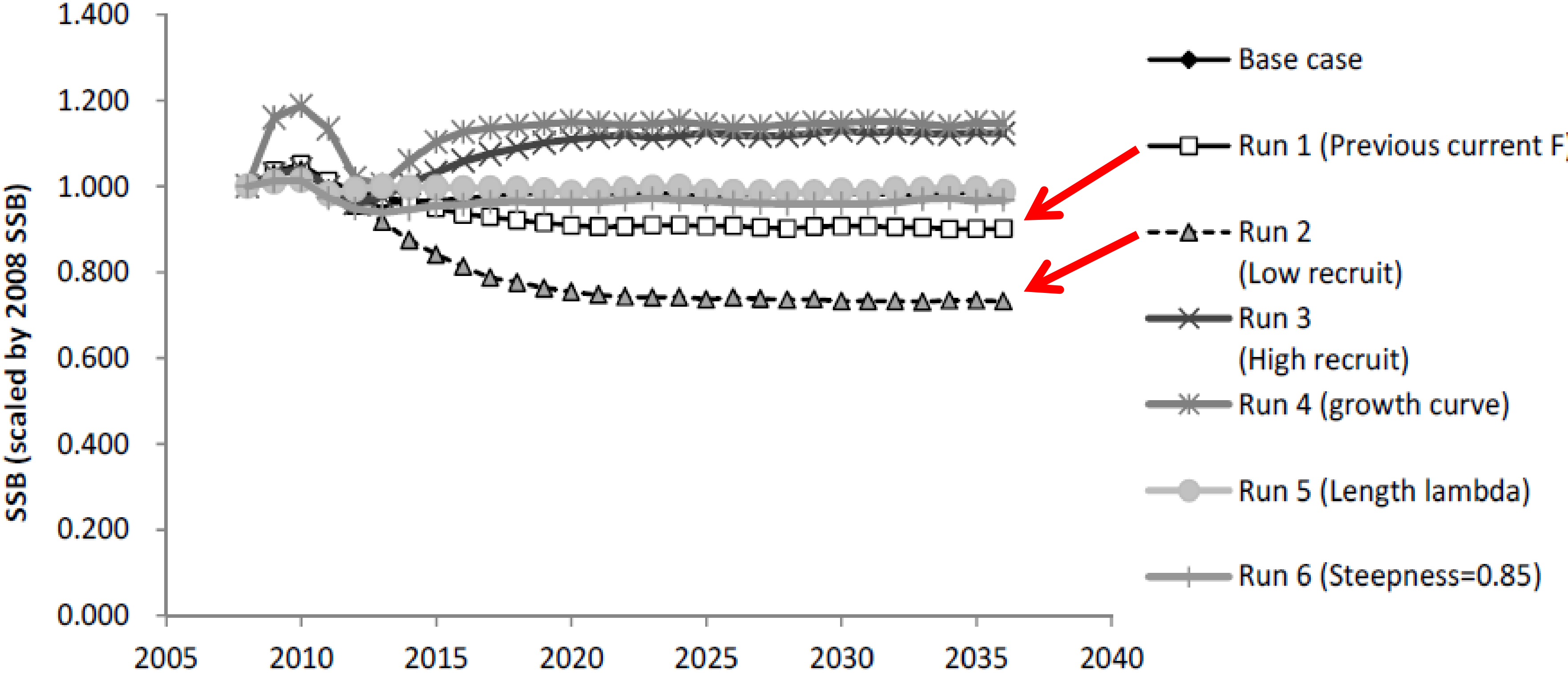
$F_{2006-2008}$ lower than most commonly used reference points



Fishery Impact Analysis



Future Projection Results



General Assessment Considerations

- Like any assessment, there is uncertainty in the estimates of biomass (total and SSB) and fishing mortality

- However, trends in SSB & recruitment were relatively robust to the different plausible assumptions tested by the WG

- Results are highly robust that fishing mortality has declined ($F_{2006\text{-}2008}$ is lower than $F_{2002\text{-}2004}$)

Stock Status Conclusions

- The stock is considered to be healthy at average historical recruitment levels and current F
- Current F is about 71% of $F_{SSB\text{-}ATHL}$ and the stock is expected to fluctuate around the long-term median SSB (~405,000 t) assuming no change in recruitment
- If future recruitment declines, then the risk of SSB falling below the SSB-ATHL threshold increases and current F may not be sustainable

ENFORCEMENT CONSULTANTS REPORT ON NATIONAL MARINE FISHERIES SERVICE REPORT

All three States have vessel marking requirements already in place in regulation or rule. To remain consistent with the proposed regulations from the Western and Central Pacific Fisheries Commission (WCPFC), modification to all three State's existing regulations would be necessary.

The number of vessels participating in this fishery is relatively low, though California has the highest number of participants. The enforcement priority associated with the discrepancy in vessel marking requirements as proposed is also low.

Given that all three States exercise regulatory authority over their vessels anywhere in the Exclusive Economic Zone, State enforcement entities are more concerned with vessels adhering to proper marking requirements within their jurisdictions.

<u>Applicable State law</u>

Washington:

WAC 220-20-051 (4) Every vessel designated to participate in a commercial fishery or to deliver food fish or shellfish must have the official Coast Guard documentation number, complete state registration number, or Alaska department of fish and game registration number permanently displayed in ten-inch tall numbers, or letters and numbers, of proportionate width, clearly visible from each side of the vessel. It is unlawful to participate in a commercial fishery or deliver food fish or shellfish without having such numbers displayed. This subsection does not apply to salmon guide, charter or nontransferable emergency salmon delivery licensees, or to Canadian vessels delivering under a nonlimited entry delivery license.

Oregon:

Oregon Administrative Rule 635-006-0140
Boat License

(1) A boat license is issued in accordance with ORS 508.035 and 508.260 of the commercial fishing laws and is required for the owner or operator of any boat used in taking food fish or shellfish for commercial purposes, except for the taking of clams or crayfish.
(2) A pair of decals bearing the last two numbers of the year for which the license is issued is included with the license for placement on the licensed boat. The license year decals shall be affixed to the licensed boat in a conspicuous place on each side of the boat on the superstructure as near midship as practicable.
(3) In accordance with subsection (3) of ORS 508.260, the assigned identification number of each licensed commercial fishing boat shall be as follows:
    (a) The federal document number (all vessels five registered net tons and over);
    (b) The state vessel registration number (all vessels not having a Federal document number).

(4) Licensed commercial fishing boats which are federally documented shall have the document identification number displayed on each side of the boat adjacent to the current year license decal in not less than 3-inch high block numbers either placed on the boat or on an identification plate attached to the boat.
(5) Licensed commercial fishing boats which are state registered shall have their identification number displayed on each side of the bow as required by the appropriate laws or rules for displaying such number.

California:

CDFG Code7880. (a) Every person owning or operating any vessel used in connection with fishing operations for profit who has been issued a commercial boat registration pursuant to Section 7881 shall display, for the purpose of identification, a Department of Fish and Game registration number on the vessel in a manner designated by the department.

PFMC
09/14/11

HIGHLY MIGRATORY SPECIES ADVISORY SUBPANEL REPORT ON NATIONAL MARINT FISHERIES SERVICE REPORT

North Pacific Albacore Management Framework

The Highly Migratory Species Advisory Subpanel (HMSAS) met and began preliminary consideration of the task given by the Council to start the process to develop a proactive management framework for North Pacific albacore that could be proposed at the international level. In what the HMSAS believes will be the first of several meetings which will be required to fully consider this complicated topic, the following points were agreed upon.

1. The HMSAS would greatly appreciate further guidance on exactly what is meant by a "management framework," recalling that when the HMS Fishery Management Plan (FMP) was first proposed it was proposed as a "framework" FMP and then actually turned out to be a document of several hundred pages.
2. Any such management framework should begin with an understanding that the U.S. albacore fishery differs from other U.S. fisheries such as groundfish, salmon, and coastal pelagics in the sense that those fisheries may be adequately controlled by regulating U.S. fishermen. The albacore fishery consists of fishing effort by several different countries which actually take the majority of the resource and which are not subject to U.S. jurisdiction.
3. Such a management framework also needs to be based on the understanding that the albacore fishery differs from other HMS fisheries such as those for skipjack, yellowfin, bigeye, and other tropical tunas.
4. One of the differences is that the U.S. North Pacific troll and bait boat albacore fishery, unlike the year-round fisheries for tropical tunas, is a seasonal fishery with the season generally running from late May or early June until early or late October.
5. Another difference is that the albacore fishery only targets one species, albacore, unlike the fisheries for tropical tunas such as purse seine and longline with vessels that may target one species but almost without exception catch several different species of tropical tunas.
6. The U.S. albacore fishery also moves over the years from a near shore, Exclusive Economic Zone (EEZ), or far offshore location and varies as to whether the catch is predominantly in the southern or northern part of the west coast.
7. A further difference from other HMS fisheries is that the nation with the vastly predominant effort and catch can change in one year. For example, the Japanese surface bait boat fleet can decide to fish for skipjack tuna instead of albacore tuna.

To ensure that all countries comply with comprehensive reporting:

1. The Albacore Working Group (ALBWG) of the International Scientific Committee (ISC) needs to be tasked with evaluating the adequacy of the current national sampling programs of those countries which fish for North Pacific albacore.

2. The Northern Committee of the Western and Central Pacific Fisheries Commission (WCPFC) needs to enforce the data reporting requirements that have been agreed to by the international participants.
3. The ISC ALBWG needs to continue to perform age-growth work in order to ensure improvement of the statistical model of growth and estimates of age-at-length.
4. The ISC ALBWG should continue to examine catch per unit of effort data in order to improve the stock assessment model and to investigate proposed reference points suggested by the ISC ALBWG with an eye on aiming for the long term economic yield.

U.S. Canada Albacore Treaty

The HMSAS requests that the Council make the following comments to the U.S. delegation at the upcoming renegotiation of the U.S. / Canada Albacore Treaty.

To ensure that the objectives of the Treaty are achieved, the following adjustments are needed:

1. Changes to make access to the resource fair and equitable for U.S. albacore fishermen. These could be area restrictions, shorter periods of Canadian access to the U.S. EEZ, reduced number of Canadian vessels, and requirements for Canadians to contribute toward albacore research and science.
2. The HMSAS notes that if international catch and effort controls are placed on U.S. fishermen at some point, the elimination of Canadian catch history in U.S. waters needs to be a primary option. Changes in the Treaty are needed to modify the present treaty that would give the U.S. credit for all catches in the U.S. EEZ for potential future quota. Presently the catch would go to the U.S. only if the treaty was in place.

The Antigua Convention Enabling Legislation

The HMSAS requests that the Council send a letter to the Secretaries of Commerce and State explaining to them how important it is for U.S. fisheries representatives to be able to participate in the Inter-American Tropical Tuna Commission’s (IATTC) Antigua Convention with the U.S. being a full member of that organization. The Antigua Convention, which updates the IATTC Convention, was negotiated over 10 years ago. It entered into force two years ago. While the United States Senate has given its advice and consent to the new convention, the U.S. cannot deposit its instrument of acceptance until the House and Senate pass implementing legislation. For several years now Congress has failed to pass such legislation. The letter would urge the Secretaries of Commerce and State to redouble their efforts to obtain such legislation and to encourage the Congress not to complicate the implementing legislation by associating it with other legislation which does not relate to the Antigua Convention. It is becoming increasingly embarrassing for the U.S., a founding member of the IATTC and a leader in the negotiation of the Antigua Convention, to not attain the status of a member of the new Commission. The inability of the U.S. to be a full member is also adversely affecting one of the primary fisheries of the U.S. in the Eastern Pacific, the albacore troll and pole and line fishery. Prompt action is needed on submitting a clean bill to the Congress.

PFMC
09/14/11

Agenda Item E.1.c
Supplemental HMSMT Report
September 2011

HIGHLY MIGRATORY SPECIES MANAGEMENT TEAM REPORT ON DEVELOPING A MANAGMENT FRAMEWORK FOR NORTH PACIFIC ALBACORE

The HMSMT and HMSAS heard a presentation at their September 2011 joint meeting summarizing results of the 2011 North Pacific albacore assessment conducted by the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC). The ISC concluded that the stock is not currently subject to overfishing, and is not in an overfished state, based on commonly used reference points.

At the June 2011 Council meeting, the Council tasked the HMSMT and HMSAS to develop a proactive management framework for North Pacific albacore that could be proposed at the international level through U.S. delegations. Although the assessment results are relatively optimistic, the HMSMT believes development of a proactive management framework is still warranted. This management framework would include the identification of precautionary biological reference points and associated management responses in the form of recommendations to U.S. delegations to the IATTC, Northern Committee (NC), and WCPFC and management measures that do not disadvantage the west coast albacore fishery.

The HMSMT advocates moving forward with plans to develop a proactive management framework. As a potential starting point, the HMSMT discussed Agenda Item E.1.a Attachment 4, a Northern Committee plan to develop a precautionary management framework for North Pacific albacore. Key elements in the NC's adopted plan include the following:

(1) Use of a new data submission template to report on fisheries and country-level catch and effort for North Pacific albacore to verify compliance with the existing WCPFC albacore conservation measure (CMM 2005-03);

(2) Development of appropriate reference points for North Pacific albacore and contingent actions in case limit reference points are breeched; and

(3) Recommend any necessary changes to CMM 2005-03 contingent upon the next albacore stock assessment results in 2014.

The HMSMT discussed the potential applicability of this approach as a starting point for developing a similar framework which meets U.S. fishery objectives and develops a process that gives the Council ample opportunity to provide input to U.S. delegations to the IATTC, Northern Committee, and WCPFC meetings. The HMSMT could prepare a draft report and work plan on the feasibility of this approach and present it to the Council at a future meeting.

HMSMT request for Council Guidance

1. Consider whether to task the HMSMT with exploring the possibility of following a similar approach to the Northern Committee plan for developing a management framework.

2. Consider requesting the HMSMT to report their findings on this approach at the November 2011 Council meeting.

3. If the Council decides to request the HMSMT to explore this approach, provide further guidance specifying how to proceed and a desired timeframe.

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON THE NATIONAL MARINE FISHERIES SERVICE REPORT

The Scientific and Statistical Committee (SSC) considered the stock assessment report for albacore tuna conducted by the Albacore Working Group of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC). Dr. Steve Teo of the Southwest Fisheries Science Center presented the assessment results and answered questions. The SSC did not formally review the assessment itself, which will undergo an external review by the Center for Independent Experts (CIE) in October 2011. Results of this review will inform the next albacore assessment, as the ISC has accepted and approved the current assessment for current management.

The documentation provided to the SSC was a great improvement over the last assessment (2006), although the report lacked details on analysis of area-specific catch information and likelihood profiles for key parameters. The SSC did not identify major problems with the assessment, but would have requested additional analyses in a full review.

The SSC noted the following issues which should be addressed in future assessments:

- Management advice for this stock is currently based on a spawning biomass limit reference point, but no target reference points based on maximum sustainable yield (MSY) biomass have been set. This enables the assessment to provide management advice based on catch per unit of effort (CPUE) in spite of high uncertainty in recruitment and biomass. A thorough evaluation of uncertainty in the absolute magnitude of biomass will be required if total allowable catch (TAC) management is a goal.

- Steepness (h) is currently set at a default value of 1, which is optimistic. Further exploration of the effects of steepness on biomass estimates and future stock status should be explored, especially because the data do not appear to be informative for estimating h.

- The age-length relationship has a large effect on model outputs. This relationship is assumed to be constant for all areas in the model; however, there is evidence for region-specific growth. Further evaluation of area specific age-length relationships and an update of the maturity function are needed.

- External peer review and a standard format for the assessment document will assure that management advice is based on best available science and methodology.

Model fits to CPUE are not informative if the data are highly uncertain and essentially flat over time. The effects of weighting data sets should be explored further.

PFMC
09/14/11

SWORDFISH MANAGEMENT WORKSHOP REPORT

The National Marine Fisheries Service (NMFS) will be reporting on the results of a 2-day informational workshop they hosted in San Diego, California, on May 10-11, 2011, titled *U.S. West Coast Swordfish Workshop: Working Towards Sustainability*. Attendees included West Coast fishermen, processors, distributors, conservation organizations, fishery managers, natural resource economists, and legislative aides. The genesis for the workshop came from a NMFS analysis that forecasted a continued decline in West Coast-based swordfish fishing effort and landings through 2020, while continued deliveries of swordfish to the West Coast are expected.

NMFS decided to use an informational workshop format as a means of examining with stakeholders the current state of knowledge on biological, ecological, and socio-economic factors of Pacific swordfish fisheries to achieve a common understanding, and to hear perspectives on the potential future for the U.S. West Coast swordfish fisheries. NMFS will report on key topics discussed and the results of small-group discussions that generated participant feedback regarding: (1) the current state of swordfish fisheries; (2) possible gear and operational changes; and (3) strategies for providing U.S. consumers with a local and sustainable supply of swordfish.

Council Action:

Consider the Report and Implications for Amending the Fisheries Management Plan for West Coast Fisheries for Highly Migratory Species (HMS FMP)

Reference Materials:

None at time of briefing book distribution.

Agenda Order:

a. Agenda Item Overview — Kit Dahl
b. Workshop Report — Mark Helvey
c. Reports and Comments of Advisory Bodies and Management Entities
d. Public Comment
e. **Council Action**: Consider the Report and Implications for Amending the Fisheries Management Plan (FMP)

PFMC
08/23/11

Science, Service, Stewardship

The *U.S. West Coast Swordfish Workshop: Working towards Sustainability*

May 10-11
San Diego, CA

NOAA FISHERIES SERVICE

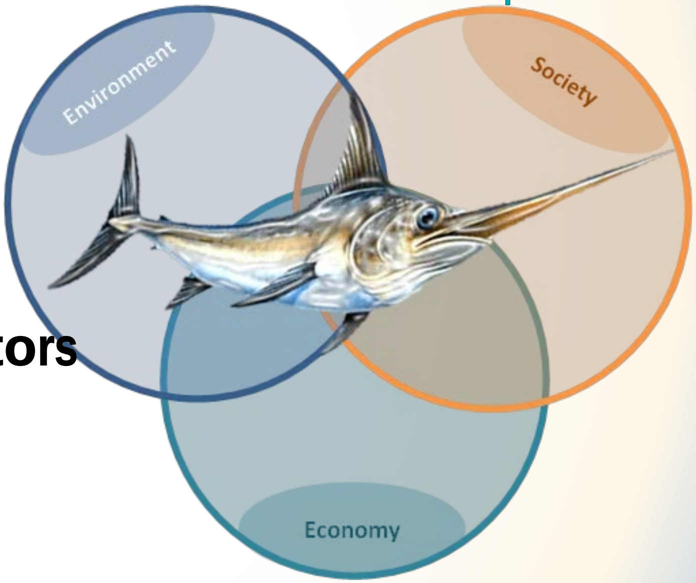
Workshop Overview

- **Hosted by NMFS**
  - **Southwest Regional Office & Southwest Fisheries Science Center**
- **Approximately 80 participants**
  - **Swordfish fishermen (West Coast and Hawaii-based) – DGN, harpoon, longline**
  - **Seafood buyers, processors, distributors**
  - **Scientists – biologists, economists, anthropologist, toxicologist**
  - **Fishery managers – Federal, California, Oregon, PFMC, WPFMC**
  - **NGOs – The Nature Conservancy, Natural Resources Defense Council, Sea Turtle Restoration Project, Center for Ocean Solutions, Monterey Bay Aquarium, Long Beach Aquarium of the Pacific, SeaWeb**
  - **Chef/ restaurateurs**
  - **Legislative aides**
- **Facilitated by CONCUR Inc.**

Workshop Overview

- **Goals:**
  - Information sharing about the sustainability of Pacific swordfish fisheries
  - Common understanding of the issues facing, and potential future of, U.S. west coast swordfish fisheries
- **Format:**
  - Presentations
    - Overview, Management, History
    - Ecological, Economic & Social Factors
  - Discussion Panels –
    - Stakeholder Perspectives on the Fishery
    - Innovative Approaches to Consumer Trends & Preferences
  - Small Group Discussions

Sustainable Development



Global Swordfish Supply & Demand

- Total landings ≈ 95,000 mt in 2008
- United States is largest SWO consuming country
- As economic entity, EU exceeds U.S. consumption or all other countries combined

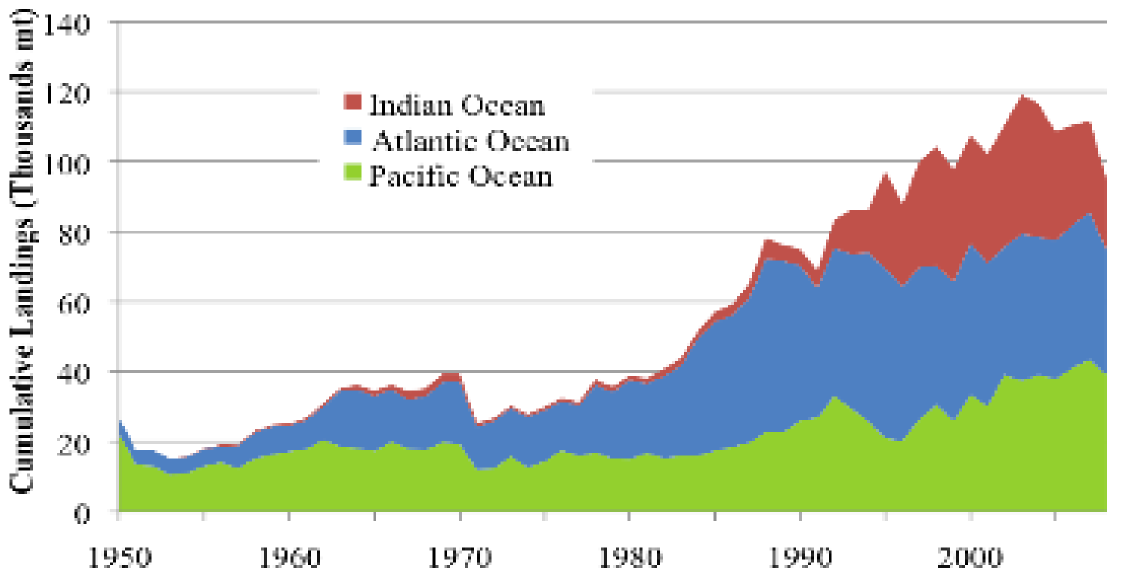


Fig. 1 Swordfish Landings by Major Fishing Area (1950-2008)

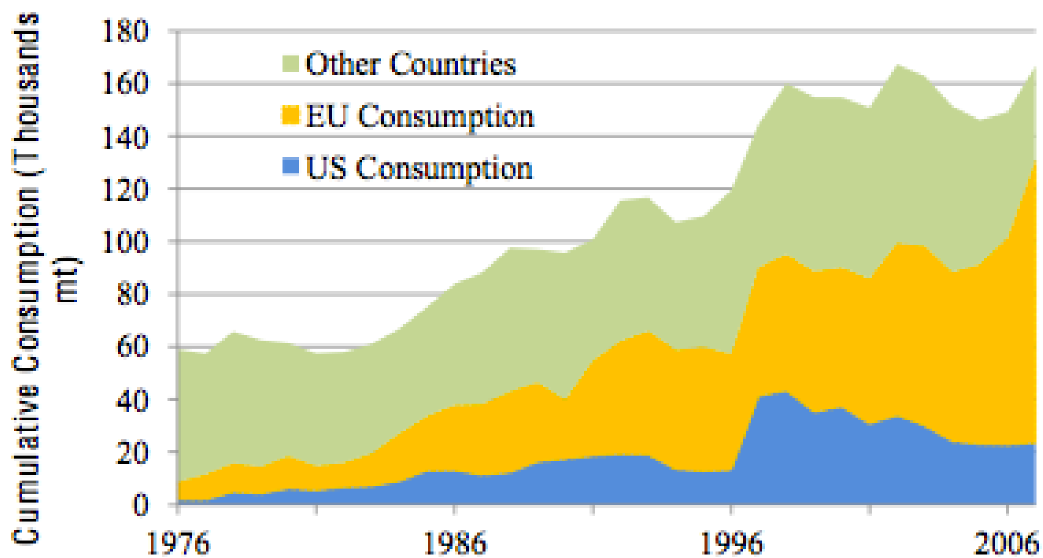
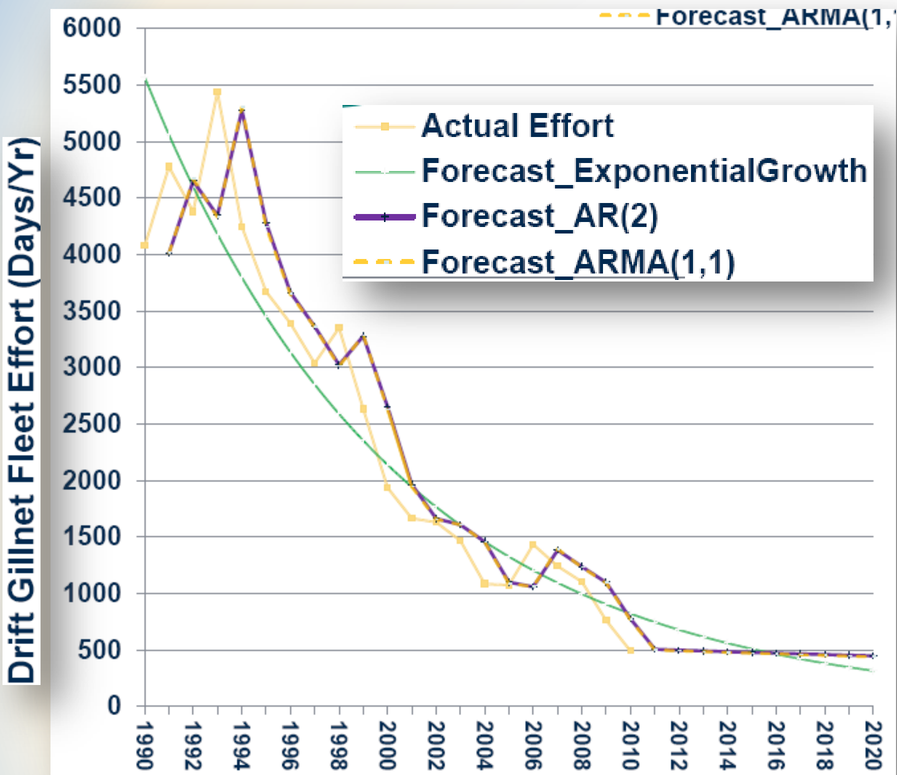
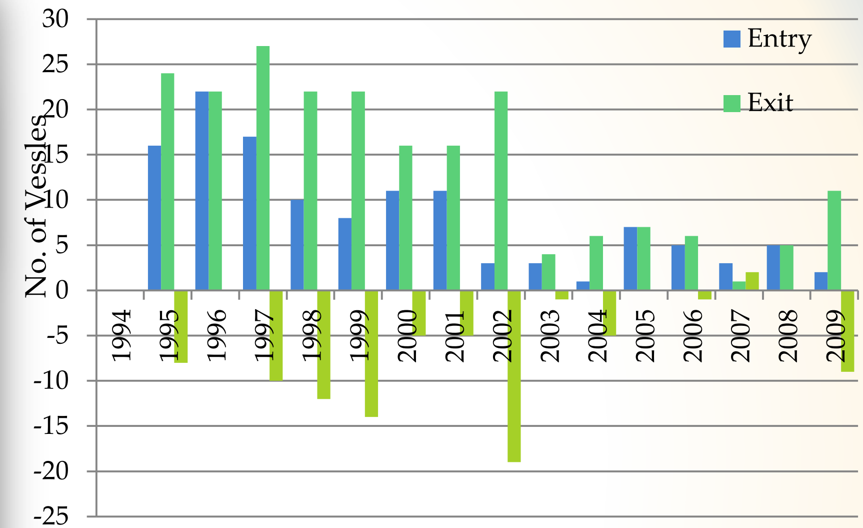


Fig. 2 Swordfish Consumption in the US, EU and Other Countries

DGN Effort Declining

Source: NMFS



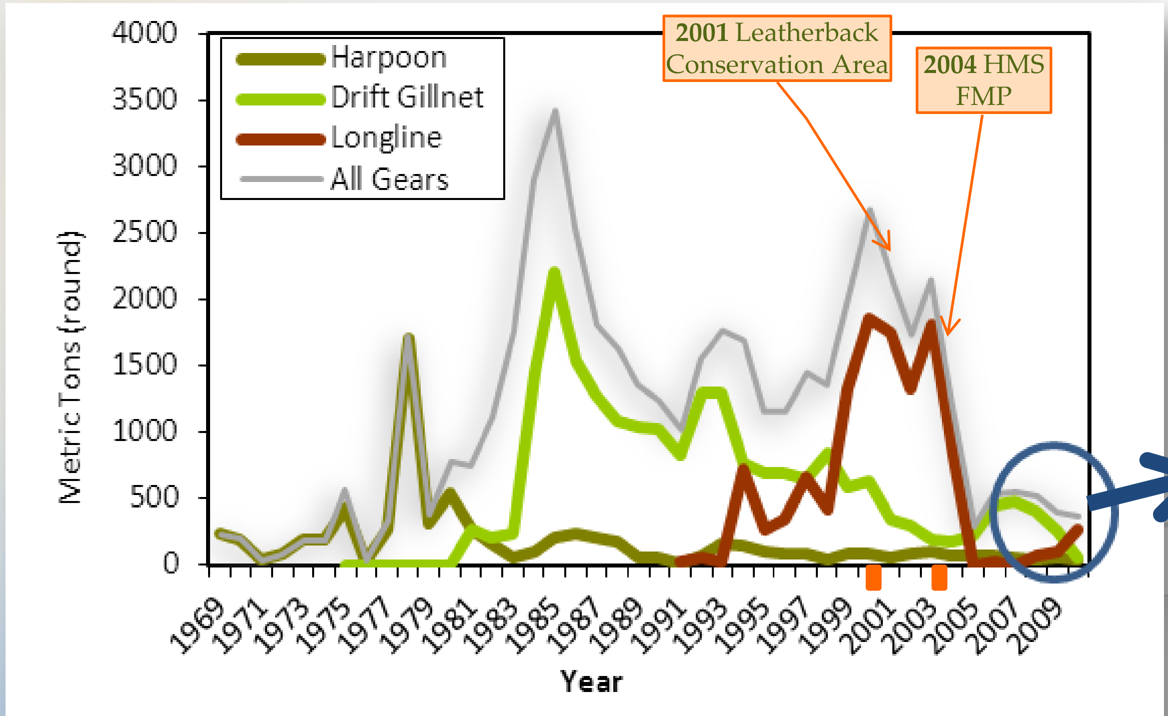


- DGN fleet effort has declined at annual rate of 9.57 % over last two decades
- DGN fleet effort forecasted at 500 fishing days by 2015 and 300-450 days by 2020
- Net change in the DGN fleet has mostly been negative for most of the years

Landings in California

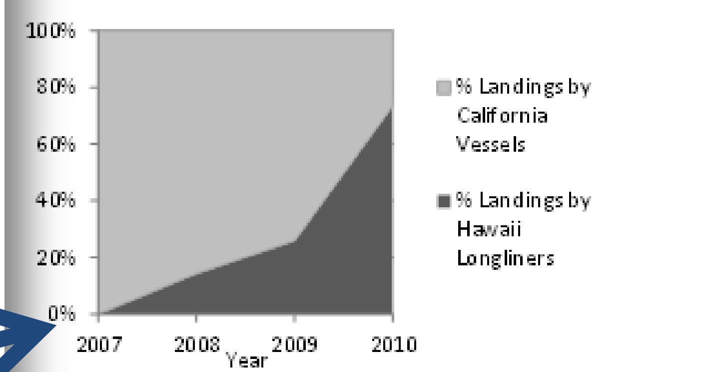
From Marija Vojkovich's talk

- **West Coast landings have progressively declined**
- **Hawaii longline landings into California recently surpassed DGN landings**



California Swordfish Landings by Gear Type 1969-2009

CDFG

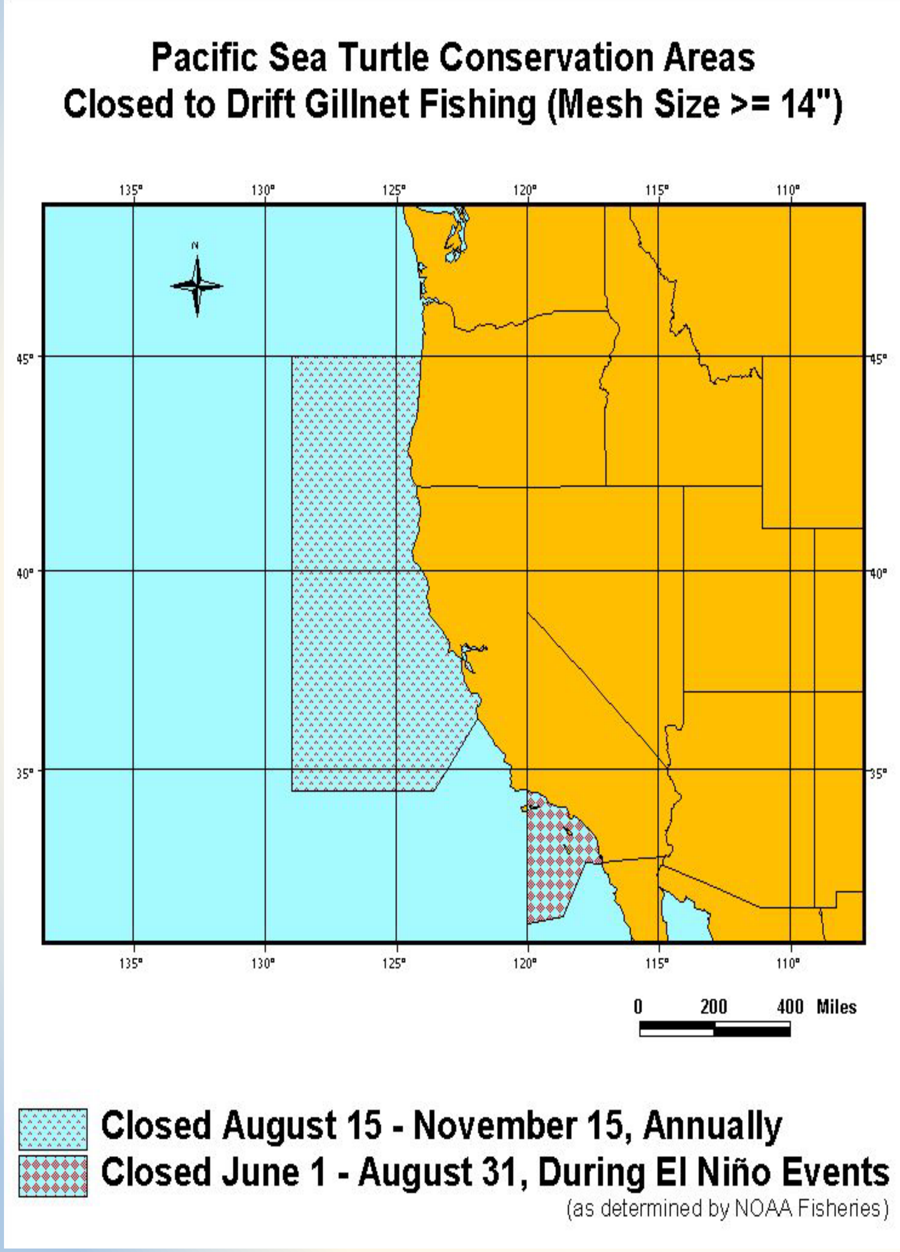


California Swordfish Landings by Vessel Origin 2007-10

NMFS

Time/Area Closures

From Tina Fahy's talk



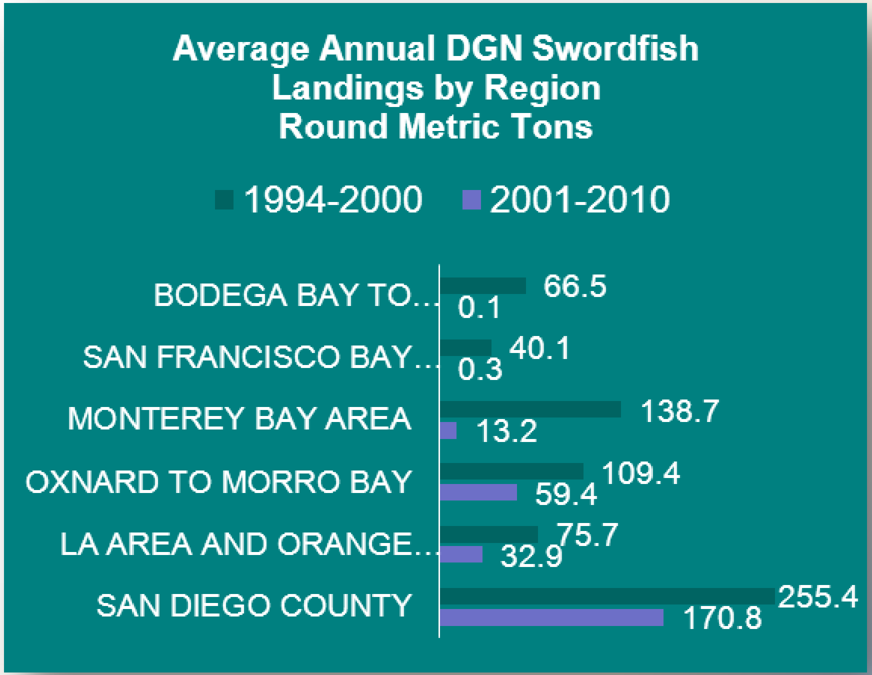
- Federal regulations established in closures 2001and 2003
- Used to protect leatherback & loggerhead sea turtles
- Closed 214,000 miles^2 to DGN fishing during the peak of swordfish season

Economic Impacts from Leatherback Closure

From Steve Stoh's talk

- **Significant declines in effort, revenue, and landings**
  - **Northern & Central California particularly**
- **Fleet size shrinking**
- **Fewer ports participating**
- **Buying "local" is difficult**
- **High reliance on imports**
- **Creates "transfer" effect**

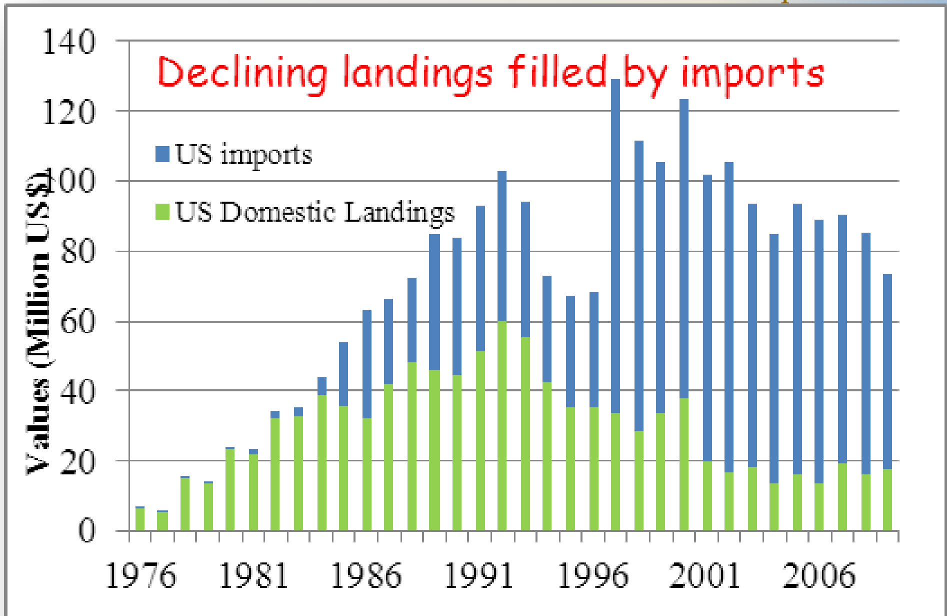
Averages	Vessel #	Total Revenue
1994-2000	120	$4,570,193
2001-2007	55	$2,125,498



High Reliance on Imports

From Dale Squires' talk

- **U.S. demand > U.S. supply**
- **40% of imports from Eastern Pacific Ocean (EPO)**
  - o EPO leatherback sea turtle stock considered more vulnerable than WCPO stock
  - o Fishing practices of foreign fleets less conservative
  - o Foreign competition in EPO fishing grounds and markets
- **Market transfer effects**
  - o Due to the global scale and interconnections of fish production/marketing systems, bycatch does not disappear, the impacts are simply transferred to other places ➔ net sea turtle mortality



US Swordfish Landings Values and Imports

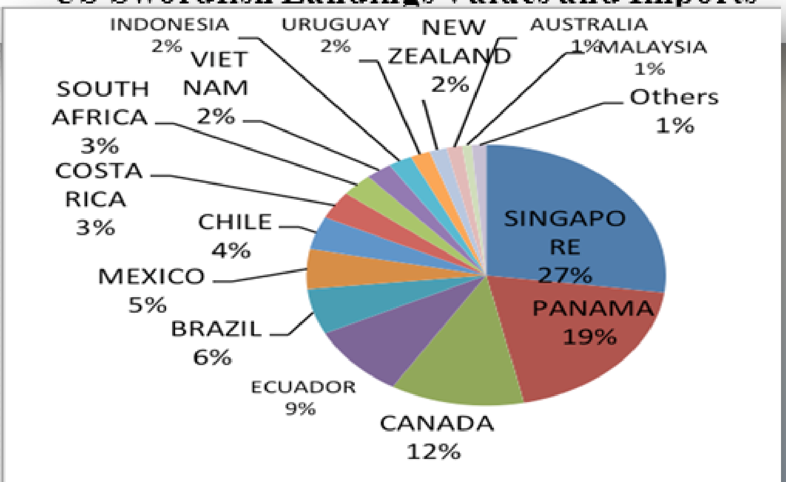
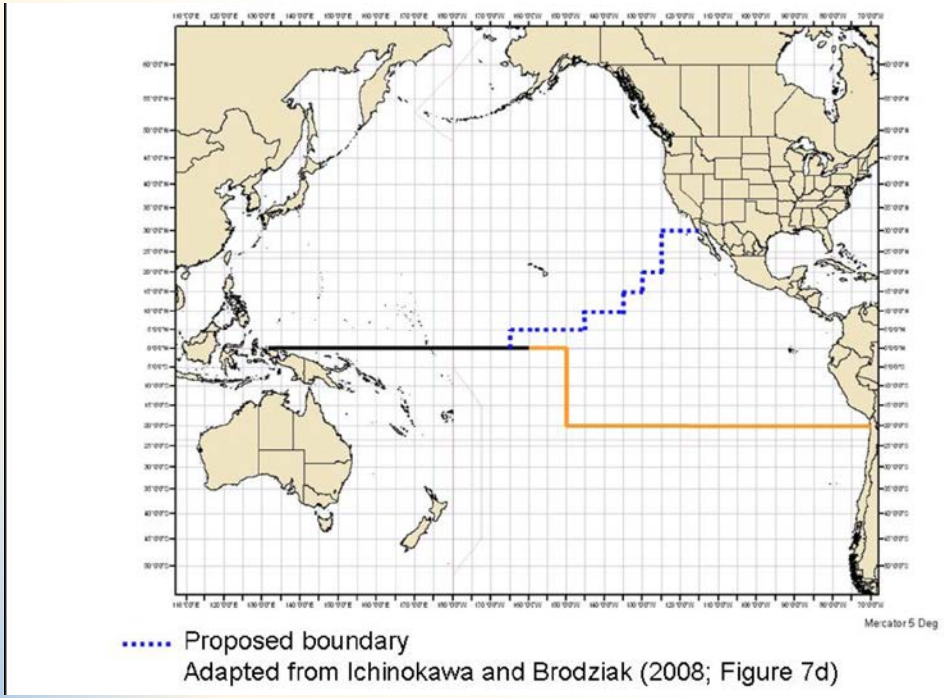


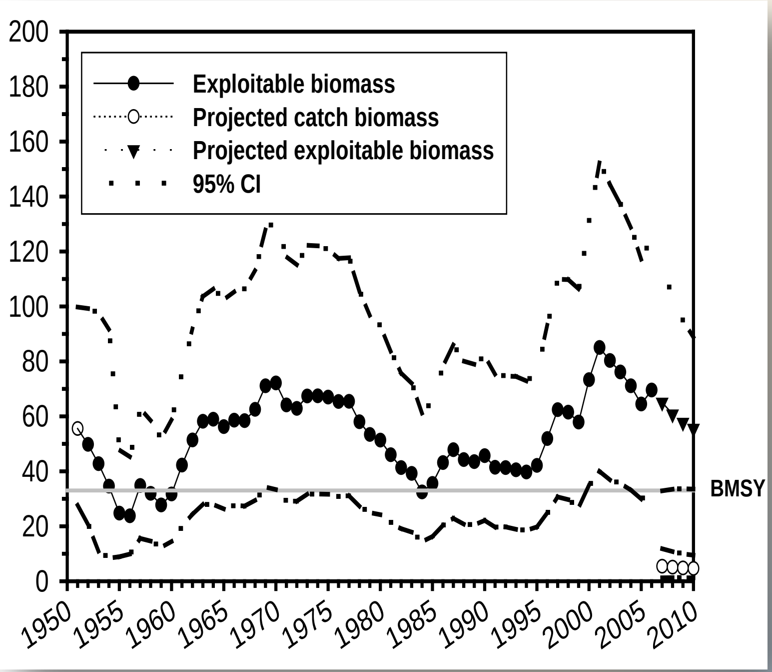
Fig . 22 Swordfish Imports in US in 2008 (Product Weight)

Healthy Stock

From Jon Brodziak's talk

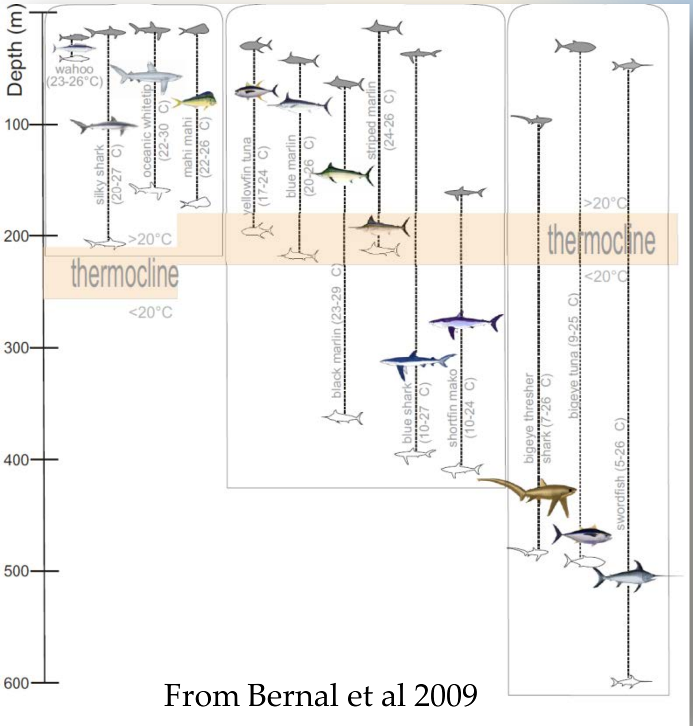
- The WCPO and EPO stocks of swordfish are healthy and above the level required to sustain recent catches.
- Swordfish biomass is well above biomass at MSY (B_{MSY})
- Harvest rates are below their limits in both the eastern and western North Pacific





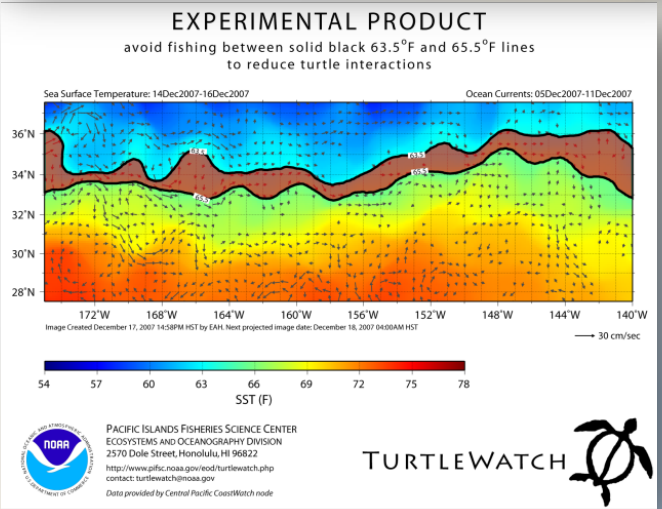
Minimizing Bycatch

- **Bycatch**
  - U.S. West Coast mako and thresher harvests are considered sustainable based on current HGs and recent trends in catch effort and size data
  - North Pacific blue shark population is above MSY based on data thru 2002 (Suzy Kohin)



From Bernal et al 2009

- **Current Research & Emerging Innovations**
  - Day-time deep-setting for increased gear selectivity (Chugey Sepulveda)
  - Tools and techniques to minimize interactions with sea turtles (Jessica Redfern)
  - 2008 workshop on Swordfish and Leatherback Use of Temperate Habitat (SLUTH) (Heidi Dewar)



Stakeholder Perspectives

Environment:

Sustainable

- **All agreed swordfish is healthy (no overfishing, not overfished)**
  - **Stock is underutilized**
- **Sea turtles are protected in the United States**
  - **Stocks are global and are subject to adverse impacts beyond U.S. waters**
- **Other bycatch is monitored**
  - **Shark stocks interactions in DGN fishery are not of significant concern**
- **Research and gear innovation needed**
  - **Necessary for achieving economic and societal sustainability**

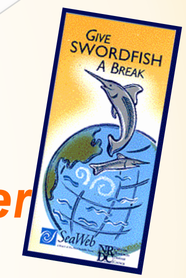
Economic & Social Aspects:

Disadvantages to Domestic Production

- **All agreed the fishery is NOT economically sustainable**
- **Uneven playing field with foreign fleets and imports**
- **Cost to fish increasing**
- **Compounding regulatory burdens**
- **Importing swordfish to meet U.S. demand lowers net national benefits**
- **Safety-at-Sea issues**

Economics & Social:
Market Pressures

- **Consumer trends & perceptions – powerful market force**
  - Growing demand for sustainable & local seafood



- **Consumers confused with seafood mis-information, conflicting messages, and/or too technical information**
  - ***"When Americans get confused about seafood, they order chicken."***

- **Restaurants – pivotal role in informing consumers**
  - 67% of all seafood in the U.S. is consumed in restaurants, even though "fish are easy to cook"

- **Seafood lacks a positive message that can unify industry**

Stakeholder Recommendations

Better Market Strategies

- Ensure ongoing domestic supply to meet demand for local & sustainable seafood
- Create new labeling & traceability tools

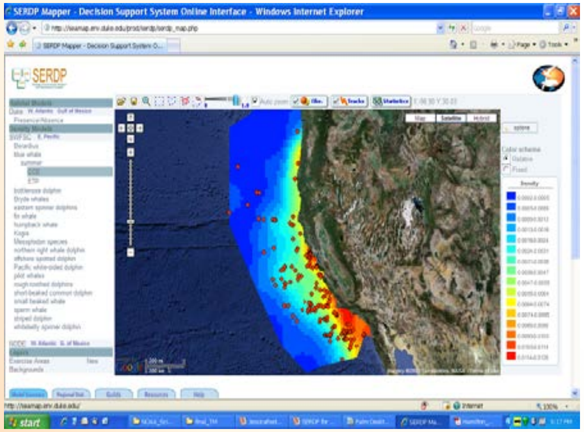
Photos: V. Tennini

- Increase outreach & education on sustainable seafood
- Create new partnerships: industry, NGOs, restaurateurs, managers
- Promote Pacific-wide conservation practices
- Replace negative campaigns with positive ones

FISHWATCH.NOAA.GOV
FishWatch
U.S. Seafood Facts

Research & Management

- **Consider gear & operational modifications**
- **Consider EFPs as tools for innovation**
- **Use SLUTH report for research ideas**
    - **Expand research on temporal-spatial overlap between sea turtles and swordfish**
    - **Re-examine science of closed area**



- **Make permit transfers easier**
- **Look at funding options for gear switching**
- **Create self-tax (conservation tax)**
- **Create partnerships**

Summary & Conclusions

- **Ideal Scenario**
  - U.S. West Coast Swordfish fishery is revitalized and contributes to rebuilding of fishing communities
  - Sea turtles in U.S. & global waters are protected and recovering
- **Holistic, Pacific-wide approach is needed**
  - Transfer affects are real
  - Marine mammal/sea turtle conservation approached as Pacific-wide effort
  - Demonstrate/export our conservation practices to foreign fleets
- **Create opportunities for local success**
  - Experiment with gear and operational changes to increase fishing selectivity
- **Look to partnerships**

Science, Service, Stewardship

Steering Committee: Tina Fahy, Craig Heberer, Heidi Hermsmeyer, Jennifer Ise, Drs. Dale Squires and Yonat Swimmer

Executive Committee: Dr. Kevin Chu, Mark Helvey, Kristen Koch, Gary Sakagawa, and Heidi Taylor

http://www.swr.noaa.gov/sfws

NOAA FISHERIES SERVICE

Summary & Conclusions

HIGHLY MIGRATORY SPECIES ADVISORY SUBPANEL REPORT ON SWORDFISH MANAGEMENT WORKSHOP REPORT

The Highly Migratory Species Advisory Subpanel (HMSAS) received an excellent presentation from Mark Helvey and his staff on the *US West Coast Swordfish Workshop: Working Towards Sustainability* held in San Diego, California, May 10-11, 2011, with many participants. The workshop helped define the condition of the west coast swordfish fishery, the fleet, and the result of regulations implemented to protect leatherback sea turtles.

Each harbor along the coast has indicated a reduction in revenue and is struggling to maintain a fishing heritage. The decline from swordfish landings has limited ports from having diverse fisheries that can support their infrastructure. The west coast swordfish fishermen have undertaken many unrecognized improvements in gear and practices to reduce bycatch that have made their fishery one of the cleanest in the world, and yet changes in regulations continue to curtail or eliminate delivery of swordfish to our ports and consumers. There are only a few drift gill net swordfish fishing operations remaining, and it is highly likely that the fishery will disappear without some steps to improve the current economic/regulatory framework. The United States is the world's largest market for swordfish. The workshop provided information that most of the imported catch is by foreign fisheries without the same standards that are applicable to American fishermen. The workshop helped environmental nongovernmental organizations consider supporting saving turtles by replacing unregulated fishing with a regulated swordfish fleet.

After discussion and review, the HMSAS proposes that the Council give guidance to the HMS Management Team with input from the HMSAS to develop strategies that are needed to revive the swordfish fleet on the West Coast.

PFMC
09/14/11

Agenda Item E.2.c
Supplemental HMSMT Report
September 2011

HIGHLY MIGRATORY SPECIES MANAGEMENT TEAM REPORT ON SWORDFISH MANAGEMENT WORKSHOP REPORT

The Highly Migratory Species Management Team (HMSMT) and HMS Advisory Subpanel heard a presentation at their September 2011 joint meeting on the results of a workshop held May 2011 in San Diego in which several HMSMT members participated. The HMSMT notes the level of participation and the body of information presented at the workshop by a diverse segment of key constituents and stakeholders was very impressive and encouraging.

Based on the workshop report, the HMSMT offers the following comments for Council consideration. Should the Council decide to instruct the HMSMT to prepare a suite of alternatives to revitalize the west coast swordfish fishery, the HMSMT would like to request the Council's attention in defining the parameters for this assignment given the considerable body of work the HMSMT has previously prepared in support of existing or planned west coast swordfish fisheries. This body of work includes, but is not limited to, a management framework for shallow-set longline fishing on the high seas (2005), developing alternatives for limited and tightly controlled drift gillnet (DGN) fishing in the Pacific Leatherback Conservation Area (2006), the exempted fishing permit for longline fishing within the U.S. Exclusive Economic Zone (2007), and the proposed HMS FMP amendment for establishment of a high seas shallow-set longline (SSLL) fishery (2009). With respect to the proposed SSLL fishery, the Council voted to not move forward, citing concerns, among others, that the existence of latent DGN fishery permits could lead to an increase in effective fishing effort by vessels using SSLL gear, potentially increasing impacts to finfish and protected species such as sea turtles.

The HMSMT notes that a number of outside developments regarding swordfish fishing methods and leatherback sea turtle conservation in the Pacific Ocean have occurred since these previous actions were considered and the HMS FMP was implemented in 2004. These developments include, but are not limited to, reopening the Hawaii SSLL fishery on the high seas with set limitations, turtle take caps, and required gear modifications to mitigate impacts to non-target species (e.g., bait type and circle hook requirements); detailed analysis of leatherback habitat use on the U.S. West Coast as background for a proposal to establish a leatherback sea turtle critical habitat; and new results on leatherback sea turtle migrations from satellite tagging studies. In addition, the proposed modification of the Hawaii SSLL swordfish fishery was the subject of recent litigation in regards to the Western Pacific Fishery Management Council's desire to increase the sea turtle take caps and eliminate the set certification system for their SSLL swordfish fishery. This litigation resulted in a settlement that eliminated the set certificate program, but prevented sea turtle caps from being increased.

Two specific recommended actions from the workshop call for revisiting the science behind the Pacific Leatherback Conservation Area closure decision and to incorporate a more holistic Pacific-wide approach to managing the impacts of swordfish fisheries on protected species. If the Council directs the HMSMT to incorporate these actions into the development of alternatives, significant support from a wide array of stakeholders, the States, and National Marine Fisheries Service Regions, Science Centers, and Headquarters staff will be needed to successfully complete the HMSMT assignment.

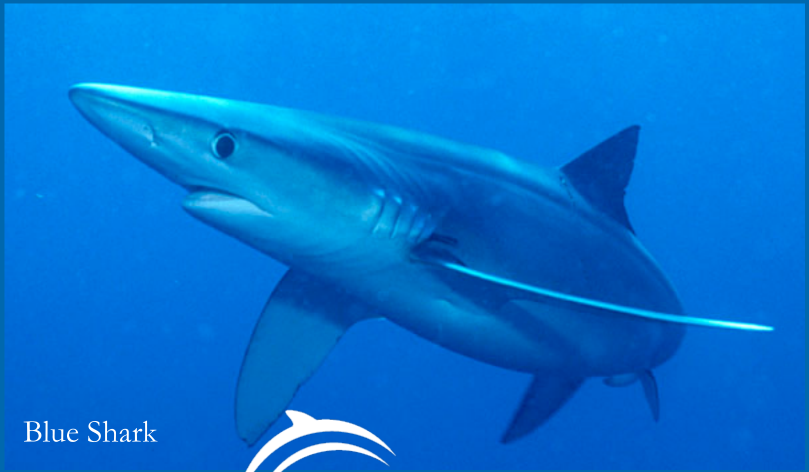
PFMC
09/14/11

Sustainable West Coast Swordfish Fishery?

Leatherback sea turtle


Bigeye and yellowfin tuna

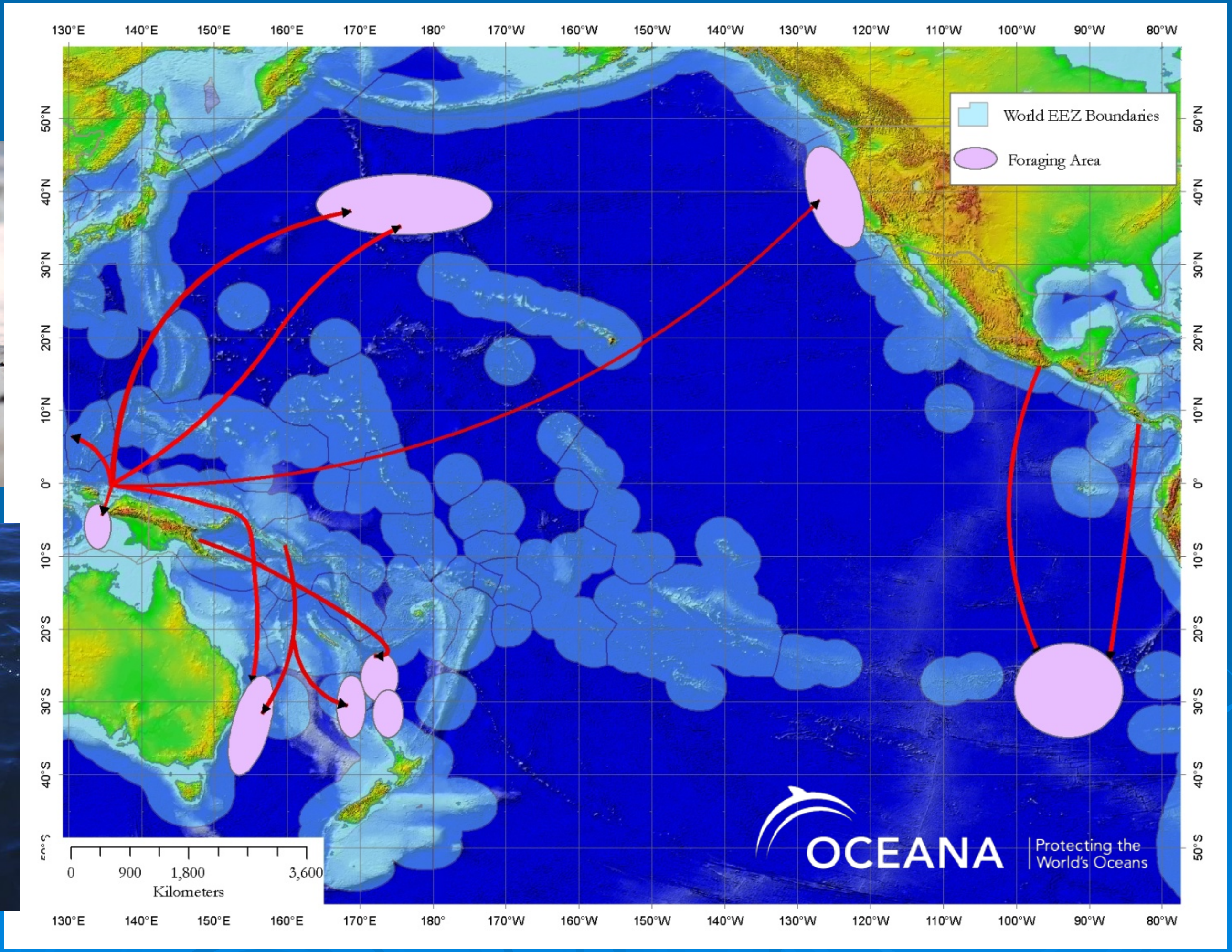

Bottlenose Dolphin


Blue Shark

Ben Enticknap, September 14, 2011. PFMC HMS E.2

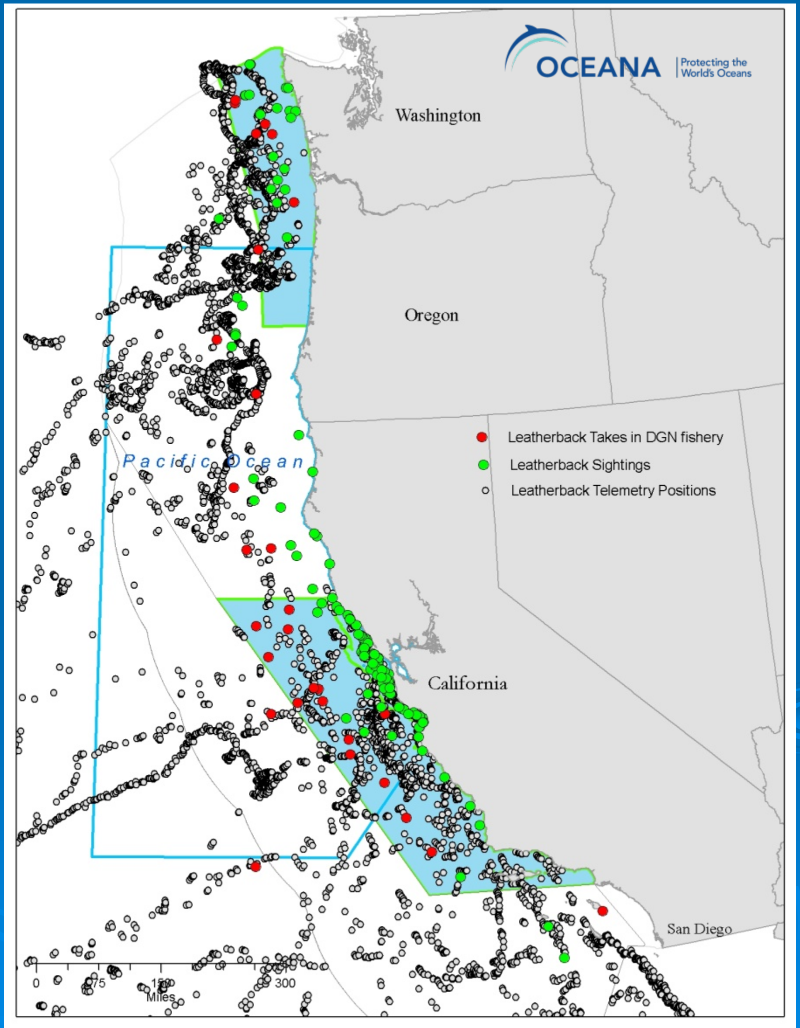
OCEANA | Protecting the World's Oceans

Leatherback Sea Turtles
Nesting Beaches to Foraging Hotspots



Source: Adapted from S. Benson et al. April 4, 2008 report on SLUTH workshop to PFMC; Shillinger et al. 2008.

Proposed Critical Habitat Designation
70,600 square miles (182,854 square km)



"We conclude that leatherbacks are on the verge of extinction in the Pacific."

- Spotilla, J.R., et al. 2000. Pacific Leatherbacks Face Extinction. Nature.

Leatherback in Monterey Bay, California. Photo: J. Sorensen

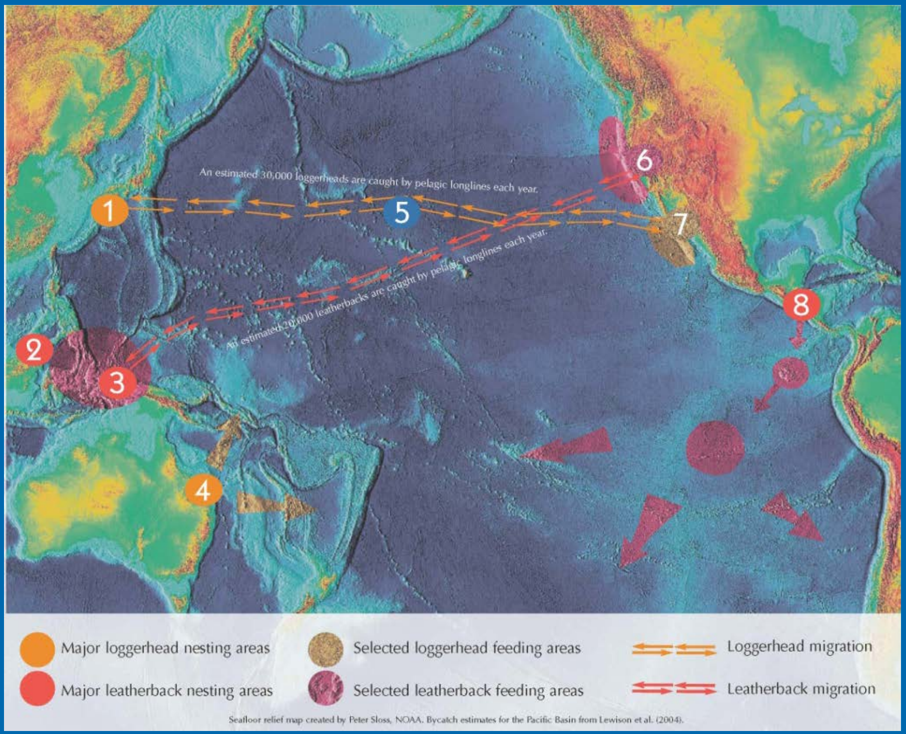
3 - 9

Estimated number of leatherback takes in proposed high seas longline fishery per year. 2009 HMS DEIS at 107.

Mortality: 1 – 3

ESA-listed Loggerhead Sea Turtles

Loggerhead Sea Turtle, Oceana



4 – 27

Estimated Number of Loggerhead Takes in proposed fishery, 2009 HMS DEIS at 107

California AJR 62

Resolved, That the Legislature of the State of California requests that the National Marine Fisheries Service defer consideration of any efforts to introduce shallow-set longline fishing off the California coast, both inside and outside the EEZ, until Pacific leatherback sea turtle critical habitat is established, the federal status of the North Pacific loggerhead sea turtle is clarified, and **critical habitat is designated for the North Pacific loggerhead sea turtle, if it is designated as "endangered"**

- July 2008

Marine Mammals


Bottlenose Dolphin

5 – 10 marine mammals per year

"The species most likely to be taken are Risso's dolphins and bottelnose dolphins" DEIS at V


Humpback whale

Bottlenose dolphin, Bryde's whale, California sea lion, common dolphin, false killer whale, humpback whale, short-finned pilot whale, pygmy sperm whale, Risso's dolphin and striped dolphins have been observed taken in Hawaii and West Coast SSLL fisheries. DSEIS at 72

Increasing Bycatch of Fish

Blue Shark

5,900 – 30,900 sharks per year (blue, mako, oceanic whitetip and other sharks), DSEIS at 99


Bigeye and yellowfin tuna

1,600 – 5,500 tuna per year (bigeye, albacore, yellowfin, skipjack and others), DSEIS at 99

+ hundreds of Striped Marlin, Blue Marlin and others each year.

got mercury?

"Do not eat sharks, swordfish, king mackerel or tile fish because they contain high levels of mercury."

EPA and FDA advice for:

Women who might become pregnant

Women who are pregnant

Nursing mothers

Young Children

Source: U.S Food and Drug Administration

A 'Sustainable' West Coast Swordfish Fishery: True Costs

- Bycatch of thousands of fish each year
- Take of dolphins, whales, endangered sea turtles
- Human health: Mercury poisoning

- Why not invest in the harpoon fishery?
  - No bycatch
  - Higher market value
  - Mercury

Building a model for the conservation of an internationally migratory species

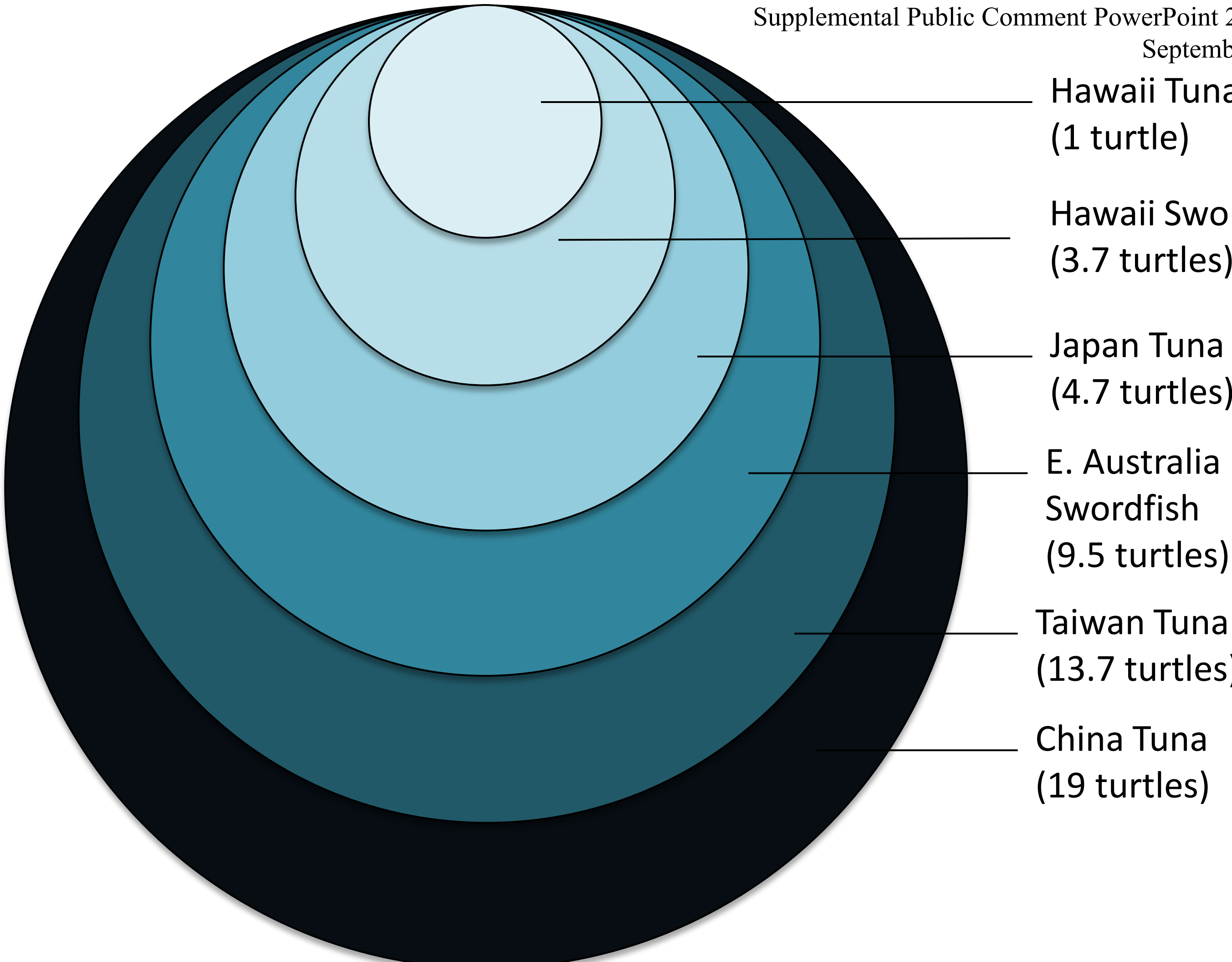
"Ultimately, successful conservation efforts for leatherback sea turtles must include both protection for nesting beaches and mitigation of at-sea threats in foraging areas and along migratory routes."

Benson et al. 2007 Abundance, distribution, and habitat of leatherback turtles off California, 1990-2003. Fish Bull. 105:337-347

Estimate of Longline Fisheries B/C Ratio

(sea turtle interactions per 190,000 kg of target fish)

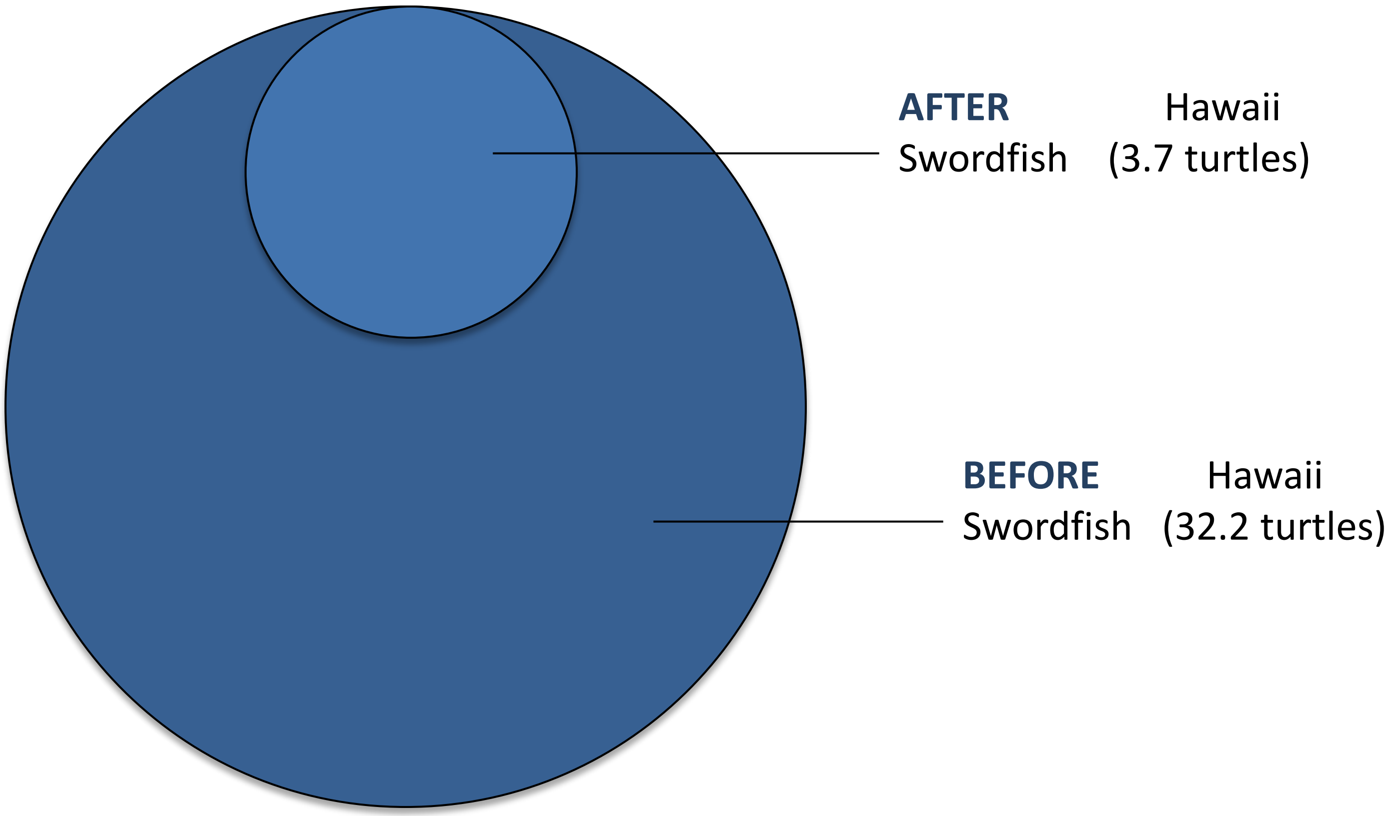
Agenda Item E.2.d
Supplemental Public Comment PowerPoint 2 (TNC)
September 2011



Source: Bartram, P, J Kaneko and K Nakamura. 2010. Sea Turtle Bycatch to Catch ratios for differentiating longline –caught seafood products. *Marine Policy.* 34: 145-149.

Effect of 2004 Sea Turtle Interaction Reduction Measures

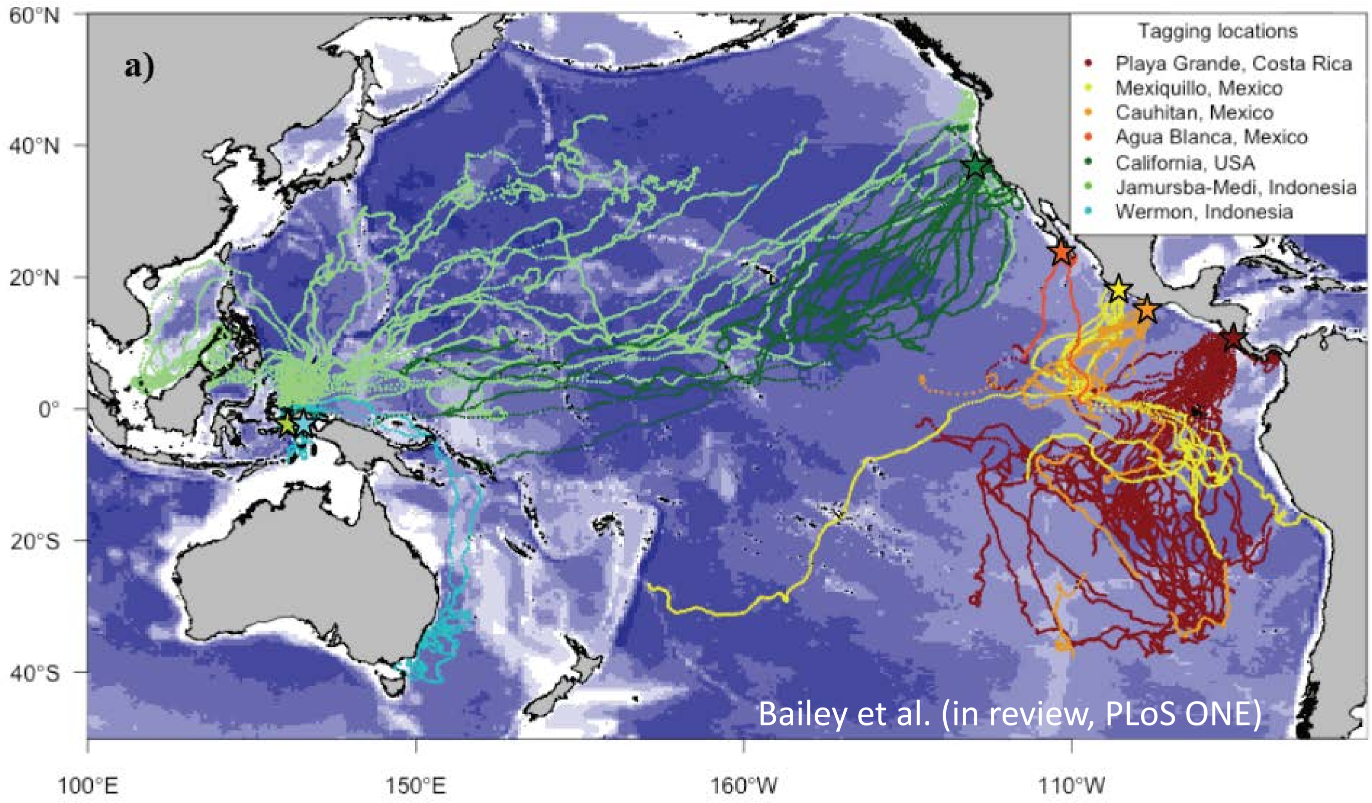
(Hawaii swordfish longline fishery sea turtle interactions per 190,000 kg of target fish)



Source: Bartram, P, J Kaneko and K Nakamura. 2010. Sea Turtle Bycatch to Catch ratios for differentiating longline –caught seafood products. *Marine Policy.* 34: 145-149.

Distinct populations

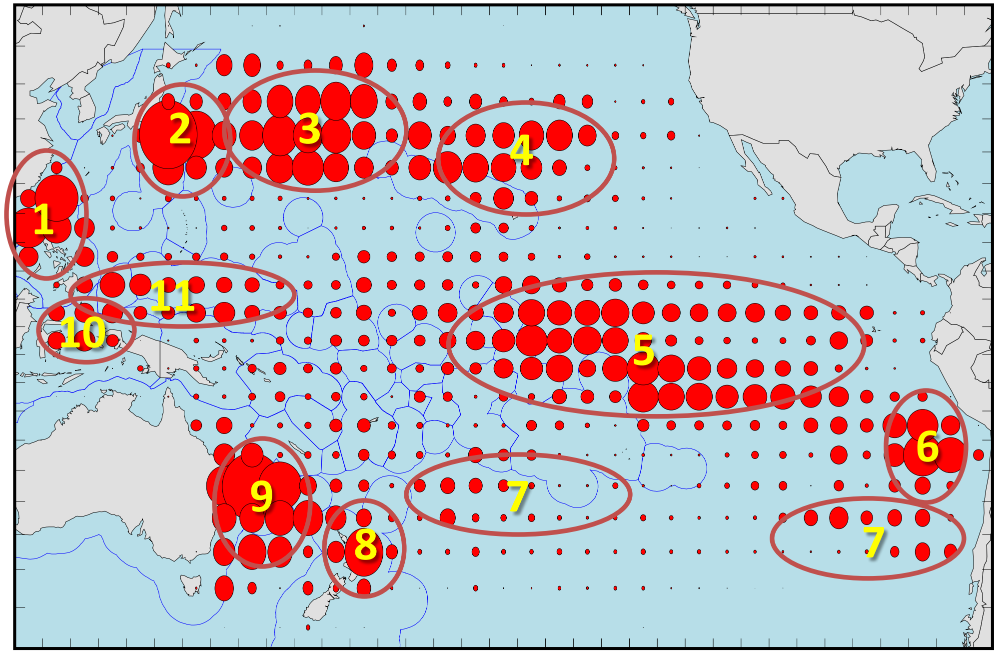
Tracks: S. Eckert, S. Morreale, G. Shillinger, S. Benson, P. Dutton, L. Sarti-Martinez



WP and EP leatherback turtles exploit diverse coastal and pelagic habitats

International Swordfish Fleets

Swordfish longline catch (1995 – 2005)*

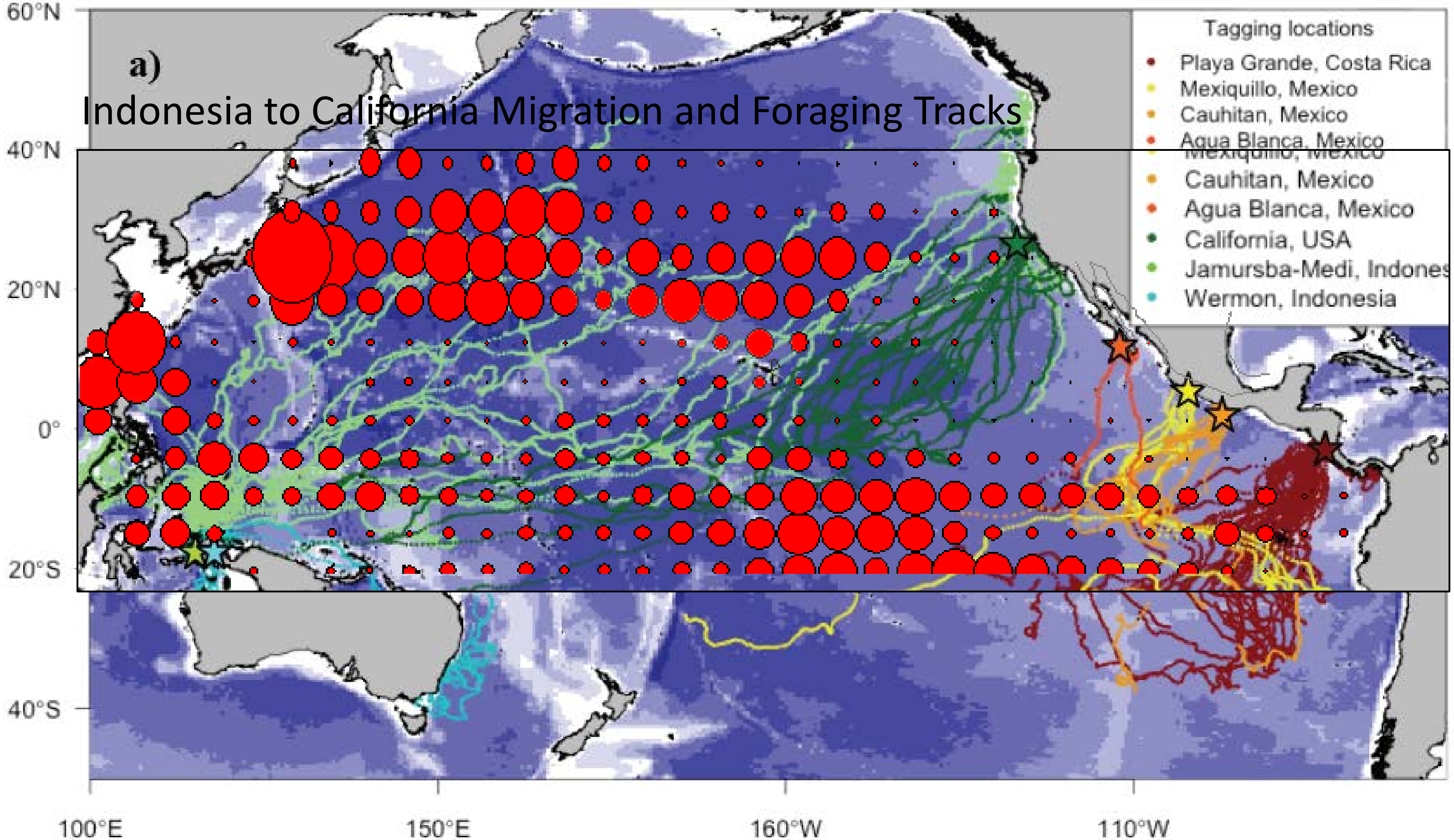


Major swordfish LL fleets

1) Taiwan domestic
2) Japan domestic
3) Japan/Taiwan
4) Hawaii
5) International mixed
6) Japanese distan
7) Spanish
8) New Zealand
9) Australia domestic
10) Indonesian domestic
11) Taiwan

*does not include US West Coast data

Running the Gauntlet



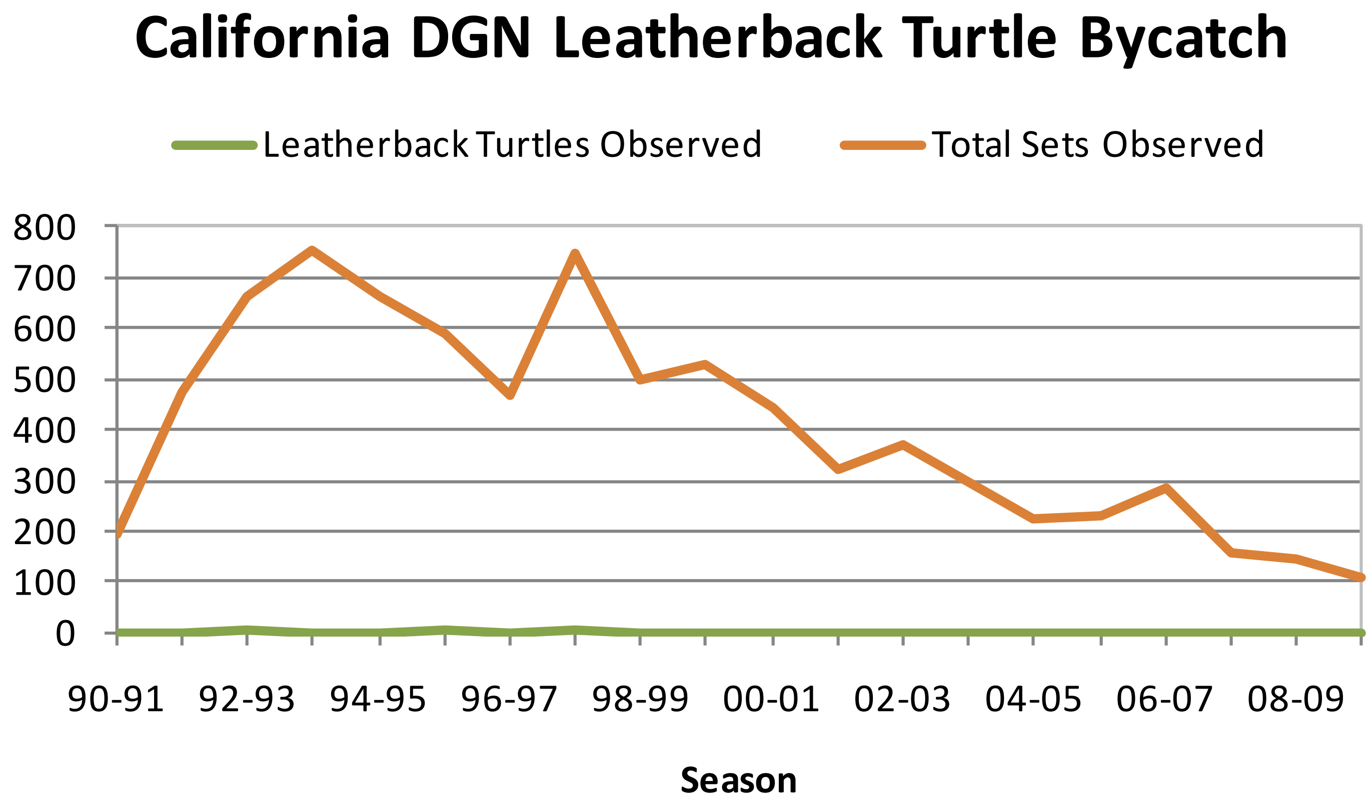
Problems in Eastern Pacific are Severe

- 37,000 unlicensed coastal fishermen in Peru
- Total gillnets set > 100,000 km annually
- Total long lines set average 80M hooks/year
- Equivalent to one third annual effort of global industrial swordfish fleet

Sea Turtle By Catch in Peru

- Researchers observed only 3 ports and estimated 5900 turtles captured annually
  - 3200 loggerheads
  - 2400 greens
  - 240 olive ridleys
  - 70 leatherbacks
- Represents 1% of long line and net effort Peru
- Scientists extrapolate number of turtles captured per year is likely in 10,000s.

Ecological Footprint (CA DGN fishery)



- California DGN Leatherback Turtle bycatch
  - Between 0-5 turtles captured per any season
  - Between 0-0.9% turtles caught per set/per season
  - Only 1 leatherback caught since 2000 – released alive

Where does this disparity leave us?

- We have become a nation and state of importers – import 75% of swordfish we consume

- Swordfish imports are coming from unregulated and unobserved fisheries with higher turtle bycatch rates

- Swordfish fleet in CA has dwindled from 129 to 32 vessels while Indo-Pacific turtle by catch rates continue to increase

Is this what we want?

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Alliance of Communities for Sustainable Fisheries
256 Figueroa Street #1, Monterey, CA 93940
(831) 373-5238
www.alliancefisheries.com

"Connecting Fishermen with their Communities"

August 25, 2011

Mr. Dan Wolford
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Dear Chair Wolford and Council Members,

Please accept these comments regarding the swordfish fishery from the Alliance of Communities for Sustainable Fisheries, a 501(c-3) organization representing fishing families from Port San Luis to Pillar Point Harbors in central California.

Each of the Harbor communities within the Alliance region is struggling to maintain its fishing heritage. Paramount to the success of that struggle is the ability to have diverse and valuable seafood products utilizing our infrastructure. West coast swordfish fishermen have undertaken many improvements to their gear and fishing practices that have made this one of the cleanest fisheries in the world and yet changes in regulations governing the swordfish fishery continue to curtail or eliminate the delivery of this seafood to our ports. There are only a few Drift Gill Net swordfishing operations left and it is highly likely that this fishery (and the wonderful product they deliver to our docks) will disappear in the near future without significant steps to improve the economic/regulatory framework they must operate under currently.

Swordfish is a prized seafood product, both by our residents as well as visitors to our communities, which also rely heavily on tourism. To enable the resumption of swordfish landings to our central coast ports, the Alliance requests that the Council create a process wherein recommendations are developed as to how to reinvigorate this fishing, including potential changes to regulations.

Thank you for considering these comments.

Sincerely,

Kathy Fosmark
Co-Chair

Frank Emerson
Co-Chair

Supporting Associations & Organizations

Pacific Coast Federation of Fishermen's Association
Ventura County Commercial Fishermen's Association
Port San Luis Commercial Fishermen's Association
Morro Bay Commercial Fishermen's Association