

**International Scientific Committee
for Tuna and Tuna-like Species in the North Pacific Ocean:
Peer Review of Function**

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Executive Summary

The International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) requires the function of the ISC Committee and subsidiary bodies be reviewed every 5 years. A Peer Review Team (PRT) of three recognized peers with no Committee affiliation consisting of Drs. Jerry Ault (USA, Chair), Chang Ik Zhang (Republic of Korea) and Hiroyuki Matsuda (Japan) was formed. Terms of Reference provided 10 detailed questions for the PRT to specifically address. Their recommendations focused on improvements to the ISC operational guidelines, managing data information systems, working group and stock assessment reports, clarification of assessment assumptions, outreach, research and science administration, and funding mechanisms for ISC.

The PRT noted that ISC is an especially unique science organization due to its science-driven mission, apparent independence, and the fact that it is not obligated to follow regional fisheries management organization's (RFMO) interests. ISC has built a special role that covers the gaps and helps to plan the necessary future science with a vision to support next-generation stock assessments.

The Species Working Groups' (WGs) primary focus is largely on conduct of stock assessments on a regular and predictable schedule with the best available scientific information (BASI) that demonstrates superior knowledge of the population and spatial dynamics of the concerned species and the stock responses to exploitation and environmental changes. The Statistics WG is focused on facilitation of the collection, exchange and archiving of accurate fishery statistics (catch, effort, bycatch, etc.), biological (population dynamics), and other data in support of stock assessment research, and to coordinate timely exchange and reporting of those data. WGs are guided in their mission by multi-year work plans and the demands by the Committee. It is the opinion of the PRT that ISC has regularly assessed and analyzed fishery and other relevant information concerning the species covered. The PRT also noted that the ISC Species WGs have consistently provided information on the dynamics and ecology of the highly migratory species (HMS) and associated-species populations that allow ISC to accurately assess stock conditions and status. Of particular note is that boundaries for ISC stock assessments encompass the entire range of the stock and are based on the BASI.

The role of stock assessment science for ISC involves provision of scientific advice to resource managers on the status and future trends of exploited marine resources and, on the technical basis for setting annual fishery catch quotas and other management measures that will achieve optimum fishery yield while avoiding overfishing and ecosystem harm. The PRT felt that ISC has performed admirably on concise reporting of its findings and conclusions on the status of the species with well-defined trends in population abundance, developments in fisheries, and conservation needs. However, procedures should continue to be streamlined and a formalized



framework for WG and SA reports is urgently needed. Ideally, the “standard document” would have all the critical information in the same location and be of similar quality. These documents should be distributed to Member scientists at least one month prior to WG meetings.

The failure of ISC to complete assessments on time may have far-reaching near- and long-term consequences. At a time when the ISC is striving to gain scientific credibility and stature among tuna RFMOs, ISC cannot afford to waiver from its mission due to differences in opinion and “advocacy creep.” Overall the PRT felt that ISC has adopted reports and findings by consensus of all Members and non-voting Members when possible. Also, ISC does consistently consider other matters, as appropriate, at the request of its Members. However, ISC must stay above the political fray and maintain a strong science focus. Their scientists should strictly provide the core science to write management plans, but not be involved in their writing.

Data is an expanding and critically-important enterprise for ISC. Ensuring the highest level of accuracy, precision and reliability of data is perhaps the most fundamental and crucial component of the ISC operation to meet their goals. Data that form the basis of stock assessments must absolutely be supported by scientific documentation of substance. Personal or institutional opinions do not constitute BASI. There is no replacement for good data in enhancing assessment model performance. In addition, there is substantial need to develop an objective basis for inclusion of data streams into particular stock assessments.

The ISC noted the importance of adopting the revised and updated Operations Manual that provides substantially more structure so that ISC products remain scientifically credible. This should become recommended guidance for ISC WG scientists developing WG working papers and stock assessment reports. ISC has done an impressive job to date of advancing its role and outreach impact. However, to communicate broadly its leadership in the science of tuna and tuna-like species with its constituency, primary reports and documents must follow the BASI guidelines and should be clearly written and summarized on the website.

The goal of ISC in developing collaborations with regional RFOs and RFMOs is to facilitate and coordinate scientific research and data acquisition concerning the abundance, biology and biometry of tuna and tuna-like species, and as necessary, of associated or dependent species, and the effects of natural processes and human activities on these stocks and species. The PRT felt that ISC interactions with other regional organizations (e.g. IATTC, PICES, etc.) have enabled ISC to fully function to meet its goals and objectives. However, ISC should establish transparent data sharing relationships with other RFMOs (i.e., IATTC, WCPFC) that include an environment that allows independent analysts access to data used in WG stock assessments.

There is great need to improve the interactions between WCPFC and ISC. The particularly caustic atmosphere and high and palpable degree of animosity between ISC and the Science Committee needs to get fixed. ISC must work with WCPFC and IATTC to improve relationships and clearly establish a way to move forward.



The PRT believes that ISC should look at data from the strategic perspective of asking: “*What is needed to implement the most appropriate stock assessment model?*” Such a perspective will help to guide the necessary research science functions of ISC to meet its goals. ISC has, under the limited fiscal flexibility it experiences, formulated proposals for conduct of and, to the extent possible, coordinated international and national programs of research addressing such species.

Data and model developments are greatly needed to help ISC provide the needed scientific advice associated with exploitation and environmental changes in the North Pacific Ocean. A focused ISC research portfolio to achieve an integrated assessment framework should embody a large-scale systems-science approach with an integrated spatial, biological-physical, and socio-economic assessment program along with technical and statistical refinements in fishery-dependent and fishery-independent surveys of fish catches, effort, and their biophysical and climate-environment relationships. Linking these processes in an ecosystem based fishery management (EBFM) framework will also require more focused study of ecosystem dynamics. We suggest that this new ISC ecosystem-based research science framework will accommodate data and models on climate, ocean, space, fish and fisheries.

To achieve the goal of efficient research and administrative functioning, ISC needs its own budget. The PRT found it unusual that ISC is the rare international organization which does not seem to have a funding mechanism such as system of annual Members’ fees. ISC should develop a budget proposal that incorporates the scope of the required research programs and sufficient support for the Secretariat (i.e., ISC Director, WG Chairs, and staff).

Finally, to solidify its position as the world’s leading scientific body for conservation and rational utilization of tuna and tuna-like species, ISC needs to reflect evolution in purpose, procedures and functions, perhaps along the following lines: (i) develop a clear framework of operations for the organization’s future, including protocol standardizations; (ii) incorporate EBFM concepts, approaches and methods; (iii) extend ISC research to the entire Pacific Ocean to cover trans-boundary species straddling two or more RFMOs, and later, for trans-oceanic migratory species; and, (iv) regularly publish ‘*Status Report of Tuna and Tuna-like Species, Their Fisheries and Habitats of the World*’.



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1.0 TERMS OF REFERENCE FOR THE PEER REVIEW

The International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) Rules and Procedures stipulate that every 5 years the function of the ISC and subsidiary bodies would be reviewed by a team of three recognized peers with no Committee affiliation. To meet this requirement, ISC11 developed a Terms of Reference (TOR) for the peer review and the Republic of Korea, Japan and the United States each agreed to sponsor a reviewer.

The Peer Review Team (PRT) was formed in March 2012 and consisted of Dr. Jerry Ault (USA) as chair, Dr. Chang Ik Zhang (Republic of Korea) and Dr. Hiroyuki Matsuda (Japan).

The PRT was charged with evaluating and addressing the following general question:

“Does ISC’s function adequately enable it to advance fishery science of North Pacific tuna and tuna-like species and address the needs of the Northern Committee?”

The PRT was also directed to offer recommendations for improvement of ISC functioning.

The TOR provided 10 more detailed questions for the PRT to specifically address (**Table 1**). These questions were distributed over four principal function areas of the ISC: (1) data information systems; (2) working group assessments; (3) scientific objectivity versus advocacy; and, (4) interactions with subsidiary bodies. These functions and processes are at the heart of the ISC science program of assessment and research.

During the course of this 9-month evaluation PRT members attended at least one Working Group (WG) meeting each and all members attended ISC12 in July 2012 in Sapporo, Japan, where Dr. Ault presented the team’s interim progress report. The Chair also attended WCPFC-NC8 in September 2012 in Nagasaki, Japan (see Appendix I).

The peer-review team noted that ISC is an especially unique science organization due to its science-driven mission and because it is operationally independent from the Regional Fisheries Management Organizations (RFMOs) it serves. ISC has built a special role that covers the gaps and helps to plan the necessary future science with a vision to support next-generation stock assessments.

The peer review of ISC’s function was completed at the end of 2012. This PRT report of findings and recommendations will be considered at ISC13 in July 2013.



Table 1.- Terms of Reference (TOR) elements for the peer review of ISC function.

Species & Statistics Working Groups

- WG.1 *Have ISC Species Working Groups provided information on the dynamics and ecology of the HMS and associated-species populations in order for ISC to accurately assess stock conditions and status?*
- WG.2 *Has the ISC regularly assessed and analyzed fishery and other relevant information concerning the species covered?*
- WG.3 *Are the ISC reports on its findings or conclusions on the status of such species such as trends in population abundance of such species, developments in fisheries, and conservation needs satisfactory?*

Data Information Systems

- DI.1 *Are the respective roles and responsibilities for data management clearly defined and organized? Are there overlaps, gaps or areas of ambiguity?*
- DI.2 *Has the Statistical Working Group collected, exchanged and archived fishery biological and other data needed for stock assessments and for monitoring fishery developments and bycatch?*
- DI.3 *Does the data reporting protocol adequately allow for ISC to advance fishery science for North Pacific tuna and tuna-like species?*

Objectivity versus Advocacy

- OA.1 *Has the ISC adopted reports and findings by consensus of all Members and non-voting members when possible?*
- OA.2 *Has the ISC considered other matters, as appropriate, at the request of one of the Members?*

Subsidiary Bodies

- SB.1 *Do ISC interactions with other organizations (e.g. IATTC, PICES, etc.) enable ISC to function to meet its objectives?*
- SB.2 *Is the ISC functioning to meet the needs of the WCPFC Northern Committee?*



2.0 OVERVIEW OF ISC FUNCTION, STRUCTURE AND PROCESS

2.1 The International Scientific Committee (ISC)

The International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) was established in 1995 through an intergovernmental agreement between Japan and the United States of America (USA). Since its establishment and first meeting in 1996, the ISC has undergone a number of changes to its charter and name 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 tuna and tuna-like species in the North Pacific Ocean during part or all of their life cycles; and, (2) to build and strengthen the regional scientific framework for conservation and rational utilization of these species. The Committee is made up of voting Members from coastal states and fishing entities of the North Pacific region, as well as, coastal states and fishing entities with vessels fishing for highly migratory species (HMS) in the region. Member countries are: Canada, China, Chinese-Taipei, Japan, Korea, Mexico, and the USA. Non-voting Members may be incorporated from relevant intergovernmental fishery and marine science organizations, but must be recognized by all voting Members. Non-voting Members include two RFMOs, the Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC); two Regional Fisheries Organization's (RFOs), the U.N. Food and Agricultural Organization (FAO) and North Pacific Marine Science Organization (PICES), as well as the Secretariat for the Pacific Community (SPC). The Committee is composed of representatives with suitable scientific and fisheries qualifications from Members and Non-voting Members. Each Member and Non-voting Member has the right to appoint one representative (Leader), an alternate, if desired, and to be accompanied by experts or advisors with suitable scientific and fisheries qualifications to participate on the Committee. The Leaders are the main source of contact for ISC communications. Scientific and fisheries experts, who are neither Members nor Non-voting Members of the Committee, may be invited to participate in the deliberations or work of the Committee. Decisions on inviting experts, nominated by Members, are made by consensus of Members of the Committee. The Committee meets at least once annually.

2.2 ISC Chairperson and Vice Chairperson

The ISC Chairperson is elected by Members of the Committee. The Chairperson serves as the leader of the Committee and is responsible for advancing the objectives of the ISC in a cost-effective and efficient manner. Responsibilities of the Chair include heading meetings of the Committee and supervising the work of the Working Groups (WGs) and subsidiary bodies, organizing meetings of the Committee, and probably most importantly, ensuring that ISC assignments and commitments are completed in a timely, efficient manner, and coordinated among the WGs.



Additional duties with respect to preparations for Plenary meetings include: (1) distribute a draft meeting agenda 90 days in advance and soliciting comments, (2) coordinate arrangements, (3) ensure that reports of subsidiary bodies and results of assignments are available on a timely basis, (4) appoint and distribute a list of proposed invited experts for approval by Members in advance of the meeting, (5) appoint rapporteurs, and (6) perform other matters that are required for smooth preparation and functioning of a meeting. In conducting meetings, the Chairperson strives for consensus of all Members and Non-voting Members in Committee decisions, conclusions and findings. The Chairperson serves for a term of three years and is eligible for re-election for one additional three-year term.

ISC Vice Chairperson

A Vice Chairperson is elected by Members of the Committee. In the absence of the Chairperson, the Vice Chairperson assumes all duties and responsibilities of the Chairperson.

2.3 ISC Procedures and Science Research Functions

Under this enabling mandate, ISC provides strategic scientific advice to the Member governments and RFMOs on the sustainability of the fish stocks and fisheries for tuna and tuna-like species in the North Pacific Ocean. Fishery and population-dynamic data tabulated, assimilated and analyzed by ISC Members in peer-reviewed Species and Statistics WGs forms the basis of scientific research conducted by the ISC. The Committee science functions are:

- (1) to regularly assess and analyze fishery and other relevant information concerning the species covered, including trends in population abundance, developments in fisheries, and conservation needs; and,
- (2) to prepare reports of its findings or conclusions on the status of the species covered, including trends in population abundance, developments in fisheries, and conservation needs.

The Committee also promotes research cooperation and collaboration among Members by developing proposals for conduct of, and to the extent possible, coordinates international and national programs of research addressing the species covered. Furthermore, it uses the best available science and takes into account the work and findings of other relevant technical and scientific organizations in the execution of its functions. English is the working language of the organization.

ISC is an especially unique science organization due to its science-driven mission, apparent independence, and the fact that it is not obligated to follow RFMO interests. ISC has built a special role that covers the gaps and helps to plan the necessary future science with a vision to



support next-generation stock assessments. The ISC Science function generally consists of several elements: (i) working groups on data acquisition and assimilation (database, web products and outreach); (ii) working groups on stock assessments and model development; and, (iii) strategic development of the science to management interface.

3.0 FUNCTION of ISC WORKING GROUPS (WGs)

In 1996, the ISC established three highly migratory species Working Groups (Bigeye Tuna Working Group, Pacific Bluefin Tuna Working Group, and Swordfish Working Group) and a Statistics Working Group. A fourth species Working Group, the Marlin Working Group, was created in 1999. In 2004, the Bigeye Tuna Working Group was dissolved and a Bycatch Working Group was created. These WGs focused on the primary fisheries for highly migratory species in the North Pacific Ocean (see Appendix II for full listing). In 2005, the North Pacific Albacore Workshop was merged into the ISC and renamed the Albacore Working Group. In 2007, the Swordfish Working Group and the Marlin Working Group were merged into a Billfish Working Group. In 2010, the Bycatch Working Group was dissolved and a Shark Working Group was established.

3.1 Species and Statistics WGs

The current listing of four ISC species complex working groups (WGs) and one statistics WG is given in **Table 2** with the committee member composition shown in Appendix III. The ISC organizational chart identifies the points of contact for the respective WGs and assists Delegation Leaders in keeping abreast of WG activities, workshop results, and national points of contact. Working Groups are subsidiary bodies of the Committee and report directly to the Committee. Each WG provides a focused forum for cooperation and collaboration in science research by Member and Non-voting Member scientists, as well as a point of focus for consideration of technical matters assigned by the Committee. Working Groups consist of scientists with appropriate credentials and experience. They are appointed by Members and Non-voting Members of the Committee.

Table 2.- Listing of the current ISC working groups.

Acronym	Name	Chair (Member Country)
ALBWG	Albacore Working Group	John Holmes (Canada)
BILLWG	Billfish Working Group	Jon Brodziak (USA)
PBFWG	Pacific Bluefin Working Group	Yukio Takeuchi (Japan)
SHARKWG	Shark Working Group	Suzanne Kohin (USA)
STATWG	Statistics Working Group	Ren-Fen Wu (Chinese Taipei)



A WG Chairperson with appropriate expertise and knowledge is elected by Members of each Working Group. The WG Chairperson is responsible for leading and facilitating meetings of the Working Group, facilitating the development of multi-year work plans and coordinating work plan assignments. The Chairperson will also help to organize meetings, including advanced preparation of agendas, scheduling of presenters, appointing of rapporteurs, providing assignments for reports, and ensuring that Committee assignments are completed as required. The Chairperson also ensures that participants with differing views get an opportunity to be heard. WG Chairs strive for consensus of all members in reporting of Working Group findings, conclusions and decisions to the Committee. The Chair serves a three-year term and may be reappointed for an additional three-year term, but not for more than two consecutive terms.

The Species Working Groups' primary focus is largely on the conduct of stock assessments on a regular and predictable schedule with the best available scientific information that demonstrates superior knowledge of the population and spatial dynamics of the concerned species and the stock responses to exploitation and environmental changes. Species Working Group findings, therefore, may be progress reports for certain stretches of time before a formal more "current" stock assessment is available. Consistency among stock assessment and associated reports of species WGs is a major requirement.

The Statistics Working Group (STATWG) is focused on facilitation of the collection, exchange and archiving of accurate fishery statistics (catch, effort, bycatch, etc.), biological (population dynamic), and other data in support of stock assessment research, and to coordinate timely exchange and reporting of those data.

Working Groups are guided in their work mission by multi-year work plans and demands by the Committee. Working papers from the WGs must maintain a high degree of organization and standardization. WG papers must be made available on the ISC website shortly after each WG workshop.

For example, in 2012 work of the Species WGs consisted of collecting fishery and biological data, compiling and analyzing data, testing hypotheses and stock assessment model assumptions, and exploring new models or variations of standard models for use in the upcoming assessments. Species WGs also made progress investigating shark ageing issues, improving best available data practices and scientific reporting procedures. The STAT WG compiled a catalogue and inventory of the ISC database, advancing development of the website and data enterprise system, and optimizing administration.

It is the opinion of the PRT that ISC has regularly assessed and analyzed fishery and other relevant information concerning the species covered. In 2012, six intercessional workshops were held to facilitate collaboration among Member scientists in implementing ISC work plans



and coordinating research on the stocks. The year was marked by completion of a benchmark assessment for striped marlin and working on preparations for new stock assessments for blue shark and Pacific blue marlin in 2013. The shark WG contributed to an extensive data assimilation and selection of candidate stock assessment models. Analysis of CPUE, genetics and tagging data showed two different stories for the stock distributions of striped marlin and swordfish. The two striped marlin assessments (2009 & 2012) covered the NW Pacific Ocean, but not the eastern Pacific Ocean. In 2012 a comprehensive peer-reviewed stock assessment for North Pacific Albacore in 2012 was completed. It should be noted that plans to complete the much anticipated second ISC Pacific bluefin tuna stock assessment scheduled for presentation at ISC12 were waylaid due to polarized interpretations of the value of certain input data, model parameterizations, and assessment model assumptions. These issues were fully resolved in a special PBFWG meeting held in Honolulu in November 2012. The Pacific bluefin tuna stock assessment was reviewed, and stock status and conservation advice adopted during the December 2012 Intercessional Meeting of the ISC.

The PRT also noted that the ISC Species Working Groups have consistently provided information on the dynamics and ecology of the HMS and associated-species populations in order for ISC to accurately assess stock conditions and status. Of particular note is that boundaries for ISC stock assessments encompass the entire range on the stock and are based on the best available scientific information (BASI). In contrast, while there is general consensus that the bigeye tuna and yellowfin tuna stocks are single stocks in the Pacific Ocean, their status is assessed and conservation measures proffered according to management boundaries. In the upcoming years ISC assessments through the working groups will focus on the appropriate stock structure domains for future assessments of other species.

3.2 Stock Status and Conservation Advice

The role of stock assessment science in ISC involves two primary elements. The first element is to provide scientific advice to resource managers on the current status and future trends in abundance and productivity of exploited marine resources. The second element is to provide the technical basis for setting annual fishery catch quotas and other fishery management measures that will achieve optimum yield from the fishery while avoiding overfishing and ecosystem harm.

The PRT felt that ISC has performed admirably on concise reporting of its findings and conclusions on the status of the species. These were accomplished in terms of well-defined trends in population abundance of such species, developments in fisheries, and conservation needs. As part of a 3-year assessment cycle process currently being developed by the ISC, specific concerns have been identified from the assessment process or were identified by the assessment peer review. These should continue to be streamlined.



Recommendations

- A formalized framework is urgently needed for formatting WG papers and SA reports. Ideally, the “standard document” would have all the critical information in the same location and be of similar quality. These documents should be distributed to member scientists at least one month prior to WG and Plenary meetings.
- Statistical analyses and methods differ between working groups and should be standardized across working groups. We noted that what was “optimal” for one group was highly questionable by another. Because of the apparent uneven playing field with respect to training in complicated areas of statistical modeling and assessment, the PRT believes that a program of Third Party training workshops also seems to be warranted.
- All data that form WG stock assessment analyses must be available to peer-member scientists for parallel and complimentary analyses.
- There is great need to improve the evaluation of the accuracy and precision of input parameters and indices than currently followed. Appropriate choice of a stock assessment model should be based in complexity, resolution and quality of BASI. The choice should allow stock status determinations, relative to common biological reference points.
- In addition, harvest policy analysis should be conducted to assist resource managers with their decision making in considering the most appropriate stock projections.
- The process of independent stock assessment reviews will require improved documentation of the assessment process relative to current practice, especially in data review and preparation. More consistency is required in the quality of peer-reviewers for future stock assessment reviews that include more experts with sufficient knowledge of tunas and tuna stock assessment methodologies.
- There is need for development of standard procedures for archiving assessment models and datasets (i.e., base-case models, sensitivity runs, biological data, etc.), including specific formats and where they are archived.
- Transparency of primary dataset(s) is very important. Credibility of stock assessments is impugned when they are based on unverified assumptions.

3.3 Objectivity versus Advocacy

While there were many apparent accomplishments and successes that advanced the scientific integrity of ISC in 2012, concomitantly, there were setbacks that have the potential to seriously



erode the scientific credibility of the organization. The failure of ISC to complete assessments on time has far-reaching near- and long-term implications and ramifications. At a time when the ISC is gaining scientific credibility and stature among tuna RFMOs, ISC cannot afford to waiver from its mission due to differences in opinion and “advocacy creep.”

However, overall the PRT felt that ISC has adopted reports and findings by consensus of all Members and non-voting members when possible. In addition, ISC appears to consistently consider other matters, as appropriate, at the request of its Members.

Recommendations

- In reality, ISC must continue to stay above the political fray and maintain a strong science function focus. ISC scientists should strictly provide science, the core information to write management plans, but not be involved in writing them!
- In the process of consideration of a particular management measure, several issues must be evaluated: How is the measure objectively measured once implemented?; What are the specific metrics identified to sufficiently evaluate success or failure of the particular management measure?; and, What is the probability that a change will be detected, if it were to occur?
- There is need to avoid breakdown of the scientific process and associated scientific credibility when the process is “strongly” influenced by politics. In general, the PRT believes that:
 - (i) If the secondary data or any documents have been agreed upon in the scientist’s WG, data transparency and deliberations with clear and easy messages are strongly encouraged.
 - (ii) If there is a serious controversy between scientists, we should clarify what differences (in assumptions) promulgated such controversy. In this case, clear documentation (via the minutes or as a ‘*Summary of Controversy*’) is very important, as are the assumptions used by BOTH sides.
 - (iii) Scientists should clarify how and when assumptions that are used will be verified.

4.0 DATA INFORMATION SYSTEMS

Data is an expanding and critically important enterprise for ISC. Ensuring the highest level of accuracy, precision and reliability of data is perhaps the most fundamental and crucial component of the ISC operation if it is to produce successful and impactful stock assessment analyses that meet ISC goals.



4.1 Data Reporting Protocols and Exchange Requirements

The ISC's minimum fishery data reporting and exchange requirements for its members are similar to those of other highly migratory species RFMOs and are designed for advancing the ISC objectives of fishery monitoring and resource assessment (**Figure 1**). The Committee, however, recognizes that Members have the capability and the appreciation for collecting and maintaining a much broader suite and finer detail of data than required.

Members are encouraged to continue and expand their efforts in this regard and to regularly review the adequacy of their data collection requirements. Members are also encouraged to archive their holdings in electronic files for easy access. This latter point is important because ISC stock assessments and other analyses frequently require input of detailed data or results from analyses of detailed data that must undergo efficient scrutiny by ISC working groups. Furthermore, the ISC may decide in the future to require Members to submit the detailed fishery data for the ISC database.

The minimum data Members are required to report to and exchange with ISC fall into three categories:

- Category I: Total annual catch (round weight by species), discards, and total annual fishing effort by gear, species and country (active vessels by fishery);
- Category II: Catch-effort (summary of logbook data) at 5-degree x 5-degree resolution;
- Category III: Biological data, (size composition, length or weight frequencies, sex information) at 5-degree x 5-degree resolution.

Data provided for use and held by the ISC remains the property of the ISC. Release of these data to the general public is governed by the policies of the contributor. Category II and Category III data contain proprietary information and therefore, shall be made available to contributors and members of ISC working groups for use in the work of the Working Groups only. They are not to be retained or shared with non-members of the Working Groups.

Japan is responsible for managing the central data depository and has designated a Data Administrator for implementing the ISC data access and availability guidelines. Each year, data correspondents submit Category I, Category II, and Category III data to the ISC on or before July 1st. Data are to be submitted electronically to the Data Administrator.

4.2 Database Administrator

The ISC Database Administrator (DA) is a full-time position identified within the ISC organization and residing in the Office of the Chair (OoC), and is responsible for managing all data and information needs for the smooth functioning of the ISC technical Working Groups (WGs) and the OoC. The position is currently part-time and supervised by the National



Research Institute of Far Seas Fisheries, Shimizu, Japan. Before 2007, the DA was responsible for maintaining, exchanging and making available summarized information to researchers from fishery data (ISC Categories I through III) are collected and submitted by ISC members. Stock assessment work of the ISC typically requires more detailed and possibly confidential data than the summarized data designated as public domain data. The ISC, therefore, revised the responsibilities of the DA to focus on the objectives of managing a database for archiving documents and information used or produced by ISC, supporting a WG portal system and maintaining selective fishery statistics for monitoring the fisheries and for use in ISC general purpose reports. The responsibilities of the DA include:

1. Receive and manage end-products produced by the ISC WGs,
2. Receive and manage catch data for all HMS of interest to ISC from the North Pacific Ocean.
3. Provide support for preparing summary tables and figures of fishery data for use on the ISC website and for use by the WGs.

The DA collects and maintains catch statistics on all HMS of concern to the ISC and catch statistics on key non-HMS species that interact with the fisheries. The DA manages the portals created for the WGs. The DA produces summarized fishery statistics in tables and figures for the ISC website.

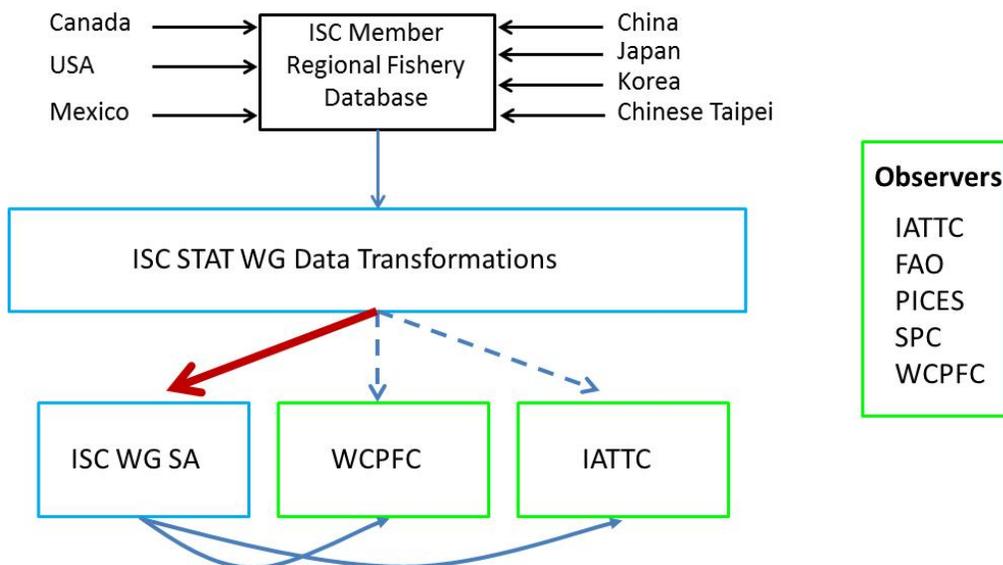


Figure 1.- Schematic of the systems flow of scientific data identified by the ISC STAT WG. Primary data outlets are the ISC stock assessment working groups, and data inventories are shared with the WCPFC and IATTC.

4.3 Webmaster and Website

In the past year (since ISC11), a number of important and progressive improvements have been implemented on the ISC website: (1) meeting schedules, and WG documents and papers are updated regularly to the website; (2) the structure of the pages “Fisheries Statistics,” “Organization Chart,” and “Recommendation” has been updated and improved based on the ISC11 Plenary Report and discussion with Members; (3) test pages for species Working Group pages have been developed with substantial assistance from the WG Chairs and members. These pages were publicly available on the website soon after the ISC12 Plenary meeting; and, (4) side-calendar functioning has been greatly improved. In addition, the architecture of the website has been optimized, allowing for enhanced user access to ISC information and documents.

The ISC website is located at: <http://isc.ac.affrc.go.jp>

The PRT felt that rather than asking whether the database structure is suitable to database specialists and IT wonks; the more appropriate questions are: (1) “*Can the assessment scientists extract the right kind of data for model-building and stock assessment?*”; and, (2) “*Will managers have what they need to sustain these valuable fishery resources in an uncertain environment?*”.

Recommendations

- Data that form the basis of stock assessments must absolutely be supported by scientific documentation of substance. Personal or institutional opinions do NOT constitute BASI.
- There needs to be some consideration as to whether ISC will pursue a distributed versus portal system for data holdings. It is clear that there must be sufficient training for ISC members on use of the portal system to ensure seamless access and utility.
- Statistical standardizations of indicator data streams that reflect relative abundance (e.g., catch-per-unit-effort over time) are of paramount importance to the stock assessment process. To achieve strength and parity in this area, fishery data must be standardized and provided in timely manner through a smooth connection, with greater harmony and consistency amongst data sets. This includes common species-species stock codes to ensure integral inter-relationships between internal and external data sets.
- There will inevitably be some lags in receipt of data by ISC. The lack of current up-to-date data is expected to increase uncertainty about current stock status and future stock projections. The focus of ISC is accurate and precise data with which to conduct stock assessments. At minimum, catch and effort data need to be complete, accurate and precise. Thus, there is great need for getting ISC members to be fully responsible for



providing the data that is capable of being uploaded and accessible so that the web portal can provide more of a real-time situation for the whole of the ISC member countries. This should include a push for Category III data as standard contributions from ALL countries.

- Because of the inherent time-lag in acquisition of data, proposed conservation management measures (CMM) should not be based on MSY, but perhaps a more conservative management benchmark to sufficiently factor in the assessment and management uncertainty.
- There is no replacement for good data in enhancing the performance of assessment models. A strong need exists to develop an objective basis via robust statistical criteria for prioritization and inclusion of data streams into particular stock assessments.

5.0 REVISION OF ISC OPERATIONS MANUAL

The ISC Chair clearly noted the importance of adopting the updated Operations Manual so that ISC products remain scientifically credible. As a result, 2011-12 was spent on revising and finalizing a new and sophisticated version of the ISC Operations Manual. The new version of the document provides substantially more structure. The most significant change was the clear focus on use of the best available scientific information (BASI) in the pursuits of the ISC. With confirmation from the Members that the proposed BASI guidelines are consistent with ISC objectives, then they should become recommended guidance for ISC WG scientists developing WG working papers and stock assessment reports.

ISC has done an impressive job to date of advancing its role and outreach impact. However, to communicate broadly its leadership in the science of tuna and tuna-like species with its constituency, primary reports and documents must follow the BASI guidelines, should be clearly summarized on the website and written in clear English.

The proposed changes addressed many of the concerns identified during the external review of the North Pacific albacore stock assessment and preliminary results of the ISC Function Review.

Concerns were expressed about added workloads for the WGs due to these new documentation procedures for stock assessments, especially without a Secretariat that can assist in this task.

The ISC Chair noted that it is common practice for tuna RFMOs to produce stand alone stock assessment reports and indicated that ISC must adopt such practices to ensure scientific credibility and promote transparency. By starting with the objective of a stand alone document, the amount of extra work involved should not be substantial.



6.0 SUBSIDIARY BODIES – Interactions with Regional Organizations

The goal of ISC in developing these type of relationships and collaborations with regional RFOs and RFMOs is to facilitate, carry out and coordinate scientific research and data acquisition concerning the abundance, biology and biometry of tuna and tuna-like species in the north Pacific Ocean ecosystem, and as necessary, of associated or dependent species, and the effects of natural factors and human activities on the populations of these stocks and species. The PRT felt that ISC interactions with other regional organizations (e.g. IATTC, PICES, etc.) have enabled ISC to fully function to meet its goals and objectives.

6.1 Provision of Scientific Advice

The ISC functions to meet the needs of the WCPFC-Northern Committee. The WCPFC-ISC MoU outlines the following: the Northern Committee may request from the ISC scientific information and advice regarding the status of fish stocks (generally those stocks occurring mostly north of the 20° parallel of north latitude) for response prior to each meeting of the Northern Committee. This formal request is transmitted expeditiously to the ISC. The Commission will, if requested, provide data necessary for the scientific analysis to be conducted by the ISC. The ISC provides requested scientific information and advice in accordance with this MOU one month before the annual meetings of the Northern Committee. ISC also provides the requested scientific information and advice to the Commission and the Scientific Committee. While the ISC regularly provides the requested information and advice, it would be strengthened if the RFMOs (IATTC and WCPFC) had established biological reference points to gauge stock status. Presently, neither RFMO has established biological reference points.

6.2 Framework for Mutual Cooperation

An appropriate framework for mutual cooperation includes regular reciprocal consultations and contacts on matters of common interest regarding scientific research on highly migratory tuna and tuna-like resources to include exchange of relevant reports, information, project plans, documents, and publications regarding matters of mutual interest. In addition, routine exchanges of fishery data (Category I, II, and III) from the northeastern Pacific Ocean is required to minimize duplicative data collection efforts and enhance fishery monitoring and stock assessment through the use of robust common data sources. This process would include development of compatible data codes and standards to facilitate data exchange. Additionally, cooperation in strategic research and assessment of stocks that occur in the north eastern Pacific during part or all of their life cycle, as appropriate. The Director of the RFO or RFMO and their designated staff will be invited to participate as observers at the ISC plenary and to participate as full members at the ISC Working Groups. The costs of participation are presently borne by each respective Organization.



Recommendations

- ISC should establish transparent data sharing relationships with other RFMOs (IATTC, WCPFC), perhaps via a distributed data system. There is a need to create an environment that allows independent (review) analysts access to data used in WG stock assessments.
- There is a great need to improve the basis of interactions between WCPFC and ISC. The particularly caustic atmosphere and high and palpable degree of animosity between ISC and the WCPFC-Science Committee needs to get fixed. ISC must work with WCPFC and IATTC and good working relationships are paramount to ensure progress. ISC must work with WCPFC to improve this relationship and clearly establish a way to move forward. Principals of these organizations should meet and discuss solutions. They should also establish a framework for regular meetings to discuss issues and identify potential problems.
- There is a strong need to verify the accuracy of the data obtained from the WCPFC data manager because catches for some countries are much higher than historical figures for those countries.
- There is need to develop and implement an exchange of data inventories with the IATTC, as is done with the WCPFC, to ensure that species working groups have complete catch histories.
- Past IATTC assessments have used a stock boundary inconsistent with that used by ISC. Further communication and coordination will be needed leading up to the next striped marlin assessment 3 years hence.
- For ISC to develop effective advice on stock status, RFMOs must adopt target and limit biological reference points.
- If a stock is managed, consideration should be given to whether the proposed approach can reach sustainable levels for the particular stock. In that regard, RFMOs should consider an emphasis on enforcement.

7.0 THE FUTURE OF ISC

The PRT believes that ISC should look at data from the strategic perspective of asking: *“What is needed to implement the most appropriate stock assessment model?”* Such a perspective will help to guide the necessary research science functions of ISC to meet its goals.



7.1 Research Science

The PRT felt that ISC has, given its limited fiscal flexibility, formulated proposals for conduct of and, to the extent possible, coordinated international and national programs of research addressing such species. Causes of large-scale shifts in climate and oceanic conditions vary, ranging from natural to anthropogenic in origin. The role these shifts play in influencing population resilience is an area ripe for research. A combination of groups including ISC and PICES will need to consider these factors when assessing stocks and ultimately embrace a more holistic approach within an ecosystem-based management framework.

ISC Member countries conduct research on tunas, billfishes, sharks, and bycatch (with an emphasis on sea turtles and marine mammals). Areas of investigation include fishery monitoring; socio-economics of fisheries, markets, and fishing communities; life history studies and oceanography; bycatch mitigation (turtles, sharks, marine mammals); fishery-independent surveys, and stock assessment methodology. Forty-nine manuscripts were published last year related to ISC objectives. An integrated research program would probably include a multi-element research approach, such as:

- Population dynamics (e.g., age-and-growth studies).
- Population structure investigations (e.g., tagging, genetics, etc.).
- Migratory patterns, foraging ecology, and local stock structures.
- Economics including fishery cost-earnings and pricing analysis, and spillover effects.
- Oceanographic and climate effects on fisheries productivity and recruitment variability.
- Coupled oceanographic-climate and size-structured bioenergetics-based ecosystem models.
- Strategic data and model developments in the context of a wider integrated plan.

Recommendations

- Data and model developments are greatly needed to help ISC provide the needed scientific advice associated with exploitation and environmental changes in the North Pacific Ocean. A focused ISC research portfolio to achieve an integrated assessment framework should embody a large-scale systems-science approach and involve several key elements:
 - (1) An integrated spatial, biological-physical, and socio-economic assessment program;
 - (2) Abundance, migration and spawning relative to environmental cues using an international billfish & tuna tagging program with state-of-the-art technologies in a balanced design; and,
 - (3) Technical and statistical refinements in fishery-dependent and fishery-independent surveys of fish catches, effort, and their biophysical and climate-environment relationships.



- Linking these processes in an ecosystem-based fishery management (EBFM) framework will also require more focused study of ecosystem dynamics. We suggest that this new ISC ecosystem-based research science framework will accommodate data and models on climate, ocean, space, fish and fisheries.

7.2 Funding Mechanisms for ISC?

Managing ISC activities is a challenge that is an inherent consequence of the ISC framework adopted by the Members. That is, ISC relies on in-kind contributions from its Members rather than monetary contribution to support a “secretariat” to oversee day-to-day operations of the organization. Given this framework, the Office of the Chairman takes on the role of a secretariat, but not a full-service one at that, owing to uncertain support from the Chairman’s funding source. Likewise, the working groups depend on in-kind contributions from Members who elect to participate in specific working groups. This support is uneven among the Members and Members with insufficient support cannot participate actively; this can delay progress of a working group in completing assignments. To date, the support for administration of ISC activities has been provided solely by the US for day-to-day operations of the office of the Chairman, and by Japan for operating the ISC website and database. Member countries with scientists serving as chairpersons of the working groups have contributed to supporting administrative services of the working groups.

To achieve the goal of efficient research and administrative functioning, ISC needs its own budget. The PRT found it unusual that ISC is the rare international organization that does not seem to have a funding mechanism such as a system of annual Members’ fees.

Recommendations

- It would be beneficial if ISC could develop a necessary budget proposal that incorporates the scope of the required research programs and sufficient support for the Secretariat (i.e., ISC Director, WG Chairs, and staff). This budget should be prepared and discussed at length at ISC13. In particular, it should address what does it cost to run the ISC organization and include a strategy to seek a continued funding source.
- We believe that annual Members fees used for standard operations of the organization are essential. In addition, trust funds are required to fund special research, such as integrated ecosystem-based fishery assessment and management. Scant evidence of this seems to exist for ISC.
- To achieve this integrated science-based research operation, ISC should perhaps establish a Secretariat for improved functioning. The Secretariat could be comprised of: (1) Executive



Director; (2) Administrative Assistant; and, (3) two statistical staff persons. All individuals should be highly-qualified and would likely be employed through open competition from ISC Members. The ISC Chair's role should be separated from that of the Executive Director. The Secretariat location should be a permanent place, perhaps selected from Member nations.

8.0 MAJOR CONCLUSIONS AND RECOMMENDATIONS

The peer review team recommendations focus on improvements to the ISC operational guidelines, managing data information systems, working group and stock assessment report format, clarification of assessment assumptions, outreach, research science, science administration and funding mechanisms of ISC. ISC12 Plenary discussed a change in the scope of ISC functions as suggested in the peer review team's progress report and agreed that priorities would have to be set. Plenary also agreed that the peer review report outlined an expansive vision for ISC. To realize this transformation ISC will have to proceed incrementally. The Plenary noted that a suggested prioritization of improvements to ISC functions would be useful in the peer review report. Plenary agreed that a draft budget would also be useful for ISC13 when it discusses the recommendation and full peer review report in July 2013. To solidify its position as the world's leading scientific body for conservation and rational utilization of tuna and tuna-like species, ISC needs to revise its Operations Manual (OM) to reflect evolution in purpose, procedures and functions along the following lines:

- (i) develop a clear framework of operations for the organization's future, including protocol standardizations;
- (ii) incorporate ecosystem-based fishery management (EBFM) concepts, approaches and methods;
- (iii) extend ISC research to the entire Pacific Ocean to cover trans-boundary species straddling two or more RFMOs, and later, for trans-oceanic migratory species; and,
- (iv) regularly publish '*Status Report of Tuna and Tuna-like Species, Their Fisheries and Habitats of the World*'.

Additionally, the PRT provides the following recommendations:

- There is need to institute specialized training workshops to develop a suite of standardized analytical skills and approaches amongst Members.



- While ecosystem-based fishery management is popular concept, the PRT suspects it will result in more vehement and chaotic controversy. Adaptive population management has been well established, based on Bayesian statistics and Feedback control in population dynamics. ISC should objectively clarify how different conclusions are derived from the range of different scientists and rigorously check their assumptions (e.g., prior distribution). EBFM is particularly immature as compared to population management.
- There is need to develop a regular stock assessment peer review process that is both efficient and cost effective. Independent peer reviews of research, including stock assessments, bolster an organization's credibility.
- ISC should be looking at allowing observers with scientific credentials at the Plenary; however, Members must first establish firm ground rules that are unanimously agreed upon, and recognize that a change in outside participation will definitely increase the costs of operation. To this end, it would not be advisable to use their money to offset these additional costs for two reasons: (1) because confidential information will be presented, discussed and analyzed; and (2) infusion of outside persons with advocacy intentions inevitably will diminish or ruin the credibility of the ISC science process. The Plenary is not an advocacy session, so external observers should at most be limited to a few comments. In particular, observers should not be allowed to present documents that will be entered into either the WG sessions or the Plenary.



Appendix I.- List of: (A) ISC meetings attended by the peer-review team; and (B) ISC participants interviewed by the PRT.

(A) ISC Meetings Attended by Peer-Review Team

<u>Location</u>	<u>Work Group</u>	<u>Dates</u>	<u>Team Members</u>
Shanghai, China	Billfish WG	Mar 30-Apr 7	J. Ault
Shimizu, Japan	Shark & Bluefin WGs	May 24-Jun 3	J. Ault, C. Zhang, H. Matsuda
Sapporo, Japan	Statistics WG	Jul 11-12	J. Ault
Sapporo, Japan	ISC Plenary	Jul 17-22	J. Ault, C. Zhang, H. Matsuda
Nagasaki, Japan	Northern Committee	Sep 1-6	J. Ault

(B) ISC participants interviewed during ISC peer-review process.

Gerard DiNardo, USA
Chi-Lu Sun, Chinese Taipei
Susie Kohin, USA
Ren-Fen Wu, Chinese Taipei
Hideki Nakano, Japan
Sarah Shoffler, USA
Samuel Pooley, USA
Kevin Piner, USA
Steve Teo, USA
Takei Yamaguchi, Japan
John Holmes, Canada
Michele Dreyfus, Mexico
Jon Brodziak, USA
Xiaojie Dai, China
Michael Hinton, USA-IATTC
Darryl Tagami, USA
Chien-Chung Hsu, Chinese Taipei
Jackie King, Canada
Koji-. Uosaki, Japan
Kazuhiro Oshima, Japan
Yumi Okochi, Japan
Izumi Yamasaki, Japan
Francisco Werner, USA
Joon-Taek Yoo, Republic of Korea



Appendix II.- Names and FAO codes of highly migratory species of ISC interest in the North Pacific Ocean.

FAO Code	Common English Name	Scientific Name
TUNAS		
ALB	Albacore	<i>Thunnus alalunga</i>
BET	Bigeye tuna	<i>Thunnus obesus</i>
PBF	Pacific bluefin tuna	<i>Thunnus orientalis</i>
SKJ	Skipjack tuna	<i>Katsuwonus pelamis</i>
YFT	Yellowfin tuna	<i>Thunnus albacares</i>
BILLFISHES		
BIL	Other billfish	Family <i>Istiophoridae</i>
BLM	Black marlin	<i>Makaira indica</i>
BLZ	Blue marlin	<i>Makaira nigricans</i>
MLS	Striped marlin	<i>Kajikia audax</i>
SFA	Sailfish	<i>Istiophorus platypterus</i>
SSP	Shortbill spearfish	<i>Tetrapturus angustirostris</i>
SWO	Swordfish	<i>Xiphias gladius</i>
SHARKS		
ALV	Common thresher shark	<i>Alopias vulpinus</i>
BSH	Blue shark	<i>Prionace glauca</i>
BTH	Bigeye thresher shark	<i>Alopias superciliosus</i>
FAL	Silky shark	<i>Carcharhinus falciformis</i>
LMA	Longfin mako	<i>Isurus paucus</i>
LMD	Salmon shark	<i>Lamna ditropis</i>
OCS	Oceanic white tip	<i>Carcharhinus longimanus</i>
PSK	Crocodile shark	<i>Pseudocarcharias kamoharai</i>
PTH	Pelagic thresher shark	<i>Alopias pelagicus</i>
SMA	Shortfin mako shark	<i>Isurus oxyrinchus</i>
SPN	Hammerhead spp.	<i>Sphyrna</i> spp.



Appendix III.- ISC organizational chart as of July 2012.

ISC Organizational Chart (July 2012)

