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CURRENT AND PLANNED ACTIVITIES OF THE IATTC
STAFF

A. Research 1

1. Stock assessment 1

2. Tagging studies 2

3. Life history of tunas 3

4. Ecosystem studies 4

5. Bycatch studies..... 5

6. Reducing bycatches of bigeye tuna by purse-seine vessels 6

B. Data 6

1. Data collection and database program work plan 6

2. FIRMS..... 8

C. Capacity building 8

1. Tagging 8

2. Bycatches 8

3. Shark fisheries 8

This document describes the current situation regarding certain aspects of the staff’s research, data management, and outreach activities, and outlines future activities and planned improvements.

A. RESEARCH

1. STOCK ASSESSMENT

1.1. Schedule for stock assessments and reviews

Species	Last assessed	2011	2012	2013
Yellowfin	2009 (full); 2010 (update)	Full	Update	Full
Skipjack	2004		Full	
Bigeye	2010	Update	Full	Update
Striped marlin	2010			
Swordfish	2006	Full		
Sailfish	never		Full	
Black marlin ¹	never			
Blue marlin ¹	2001			
Silky shark	never		Full	
Independent review / Fall workshop		Workshop	Yellowfin review	Workshop

¹ These assessments will be carried out in collaboration with other organizations, so dates cannot yet be set.

1.2. Plan of work

1. **Preparatory work for the stock assessments in the schedule.** Some stock assessments are simple updates and require only adding new data to the existing stock assessment model. Other stock assessments are benchmark assessments or assessments of species that have never been assessed, and therefore require substantial work to collate and analyse the data, and to investigate the model assumptions.
2. **Independent review of the yellowfin tuna stock assessment (2012).** Carry out sensitivity analyses to investigate the issues relating to the yellowfin tuna stock assessment.
3. **Fall stock assessment methodology workshop series (2011, 2013).** Conduct analyses and write working documents related to the workshop topic.
4. **Post-stratification of purse-seine length composition data.** Evaluate the possibility of re-stratifying the purse-seine length-composition data so that stock assessments can be conducted using spatial structures other than those restricted to the Commission's measurement areas.
5. **Spatially-structured stock assessment models.** Develop a fine-spatial-scale stock assessment model with spatially-correlated random effects for bigeye tuna.
6. **Integrating tagging data/information into stock assessment models.** Develop methods for integrating the available tagging data into the stock assessment models to improve the stock assessments. The IATTC staff, in collaboration with South Pacific Commission and the US National Marine Fisheries Service, has obtained funding from the Pacific Fisheries Research Programme to investigate this topic.
7. **Forecasting bigeye catch.** Develop a forecasting approach to predict the spatial distribution of bigeye tuna catch based on spatially-explicit weekly report data and environmental covariates. Evaluate the performance of the predictions in reducing bigeye catch.
8. **Shark stock assessment:** Stock assessment modeling research and data collation will be conducted to enable the assessment of one or more shark stocks.

1.3. Potential topics for fall workshops

- a. Including species interactions in stock assessment models
- b. Forecasting fisheries dynamics
- c. Statistical issues in stock assessment

2. TAGGING STUDIES

1. Analyses of archival tag data for yellowfin from off Baja California, Mexico, during 2002-2010, have been completed, and a manuscript on yellowfin movements, behavior, and habitat utilization has been submitted for publication in a peer-reviewed scientific journal.
2. Continuation of the collaborative project among the IATTC, the Instituto Nacional de Pesca of Mexico, and the owners of the sport-fishing vessel *Royal Star* in tagging yellowfin and wahoo at the Revillagigedo Islands in 2011, the final year for this project.
3. Analyses of archival tag data for yellowfin from the Revillagigedo Islands, Mexico, during 2006-2011, and preparation of a manuscript on movements, behavior, and habitat utilization, for publication in a peer-reviewed scientific journal.
4. In collaboration with the Secretariat of the Pacific Community (SPC), conduct a six-week tuna-tagging cruise in the equatorial central Pacific Ocean (ECPO), targeting bigeye tuna, starting in November 2011.
5. Analyses of archival tag data for bigeye released in the ECPO during 2008-2011, and preparation of a manuscript on movements, behavior, and habitat utilization, for publication in a peer-reviewed

scientific journal.

6. Continue to seek funding sources for an IATTC Regional Tuna Tagging Project for bigeye, yellowfin, and skipjack tunas throughout the eastern Pacific Ocean (EPO).

3. LIFE HISTORY OF TUNAS

3.1. Early life history

The early life history (ELH) group will be conducting research on the ecology, physiology, and pre-recruit dynamics of tunas. Research activities will be centered around the following six projects, based at the IATTC's Achotines Laboratory in Panama, but also involving collaboration with other research organizations.

1. Comparative studies of the early life history of Pacific bluefin tuna and yellowfin tuna (2011-2015)

Funded by Japan International Cooperation Agency (JICA) and Japan Science and Technology Agency (JST); collaborators: Kinki University and the Autoridad de los Recursos Acuáticos de Panamá (ARAP)

This project has been approved for funding, and will commence in June 2011. It includes (1) comparative research on the early life history of Pacific bluefin and yellowfin, with experimental work to be conducted in Japan and at the Achotines Laboratory; (2) studies of the reproductive biology of Pacific bluefin (Japan) and yellowfin (Achoines Laboratory); (3) development of recruitment prediction models for Pacific bluefin and yellowfin, and of forecasting tools for management of those stocks; (4) development of technologies for the cage culture of yellowfin juveniles and to provide research guidelines for the improvement of yellowfin mariculture in Central America. Publications summarizing the research results will be developed jointly.

2. Advancement of hatchery technologies for large-scale production of yellowfin tuna (September 2009-December 2011)

Funded by Saltonstall-Kennedy Program (S-K), U.S. National Oceanic and Atmospheric Administration (NOAA); collaborators: Hubbs Sea World Research Institute (HSWRI)

This project commenced in September 2009. **Objectives:** (1) demonstrate working techniques for long-distance air transport of yellowfin eggs and larvae from the Achotines Laboratory to facilitate rearing experiments in San Diego, and to serve as a model for transportation of other marine fish species; (2) conduct experiments at the Achotines Laboratory and in San Diego to refine rearing methods used for yellowfin, with the aim of large-scale production of juveniles for research purposes; (3) dissemination of research results to the public and private sectors and resource agencies through reports and publications to aid in the ultimate development of successful aquaculture of yellowfin.

3. Nutritional studies of early life stages of yellowfin tuna (2011-2012)

Funded by IATTC and Texas A&M University (TAMU); collaborators: TAMU

This project is an ongoing collaborative study of the nutrition of larval and early-juvenile stages of yellowfin. The experimental research is conducted at the Achotines Laboratory, and the analytical studies at TAMU. **Objectives:** (1) describe the general components of nutrition (proximate composition, amino acids, digestive enzymes) of egg, larval, and early-juvenile stages of yellowfin; and (2) utilize the nutritional data to improve understanding of the physiological aspects of the feeding and survival of pre-recruit life stages of yellowfin. One paper was published during 2011, and another is in development.

4. Ocean acidification impacts on tropical tuna (2011-2012)

Funded by the Pelagic Fisheries Research Program (PFRP) of the University of Hawaii; collaborators: Secretariat of the Pacific Community (SPC)

This project will include two years of experimental research at the Achotines Laboratory and modeling studies conducted at the SPC. **Objectives:** (1) quantify the effects of ocean acidification on egg, larval, and early-juvenile stages of yellowfin; and (2) incorporate the effects of egg and larval mortality associated with ocean acidification into models to forecast the integrated impacts of climate change on tuna population dynamics and distribution in the Pacific Ocean. Joint publications of the research results will be developed.

5. Studies of methods of collection, transport and culture of Indo-Pacific sailfish and wahoo at the Achotines Laboratory (2010-2011)

Funded by the Secretaría Nacional de Ciencia, Tecnología e Innovación (SENACYT), Panama; collaborators: University of Miami, Graduate Program in Aquaculture

This project is ongoing at the Achotines Laboratory. **Objectives:** (1) investigate the feasibility of collecting, transporting and rearing Indo-Pacific sailfish and wahoo at the Achotines Laboratory for purposes of research on the biology and physiology of these species; and (2) dissemination of the research results to the public and private sectors through reports and publications to aid in the development of research programs on the resource management of these species.

6. Development of a reference collection of microalgae at the Achotines Laboratory (2010-2011)

Funded by SENACYT

This project is ongoing at the Achotines Laboratory. The objective is to develop a reference collection of microalgae at the Laboratory, which will serve as a regional reference center for microalgae culture to aid researchers requiring pure, isolated cultures of marine algae for research and aquaculture purposes.

3.2. Life history of yellowfin tuna

Investigation of the age, growth, maturity, and fecundity of yellowfin in the EPO. Finalize collection of samples, conduct laboratory analyses, perform statistical analyses of the data sets, and complete the preparation of a manuscript.

4. ECOSYSTEM STUDIES

Ecological research at the IATTC is focused on studies of food-web dynamics, the effects of the tuna fisheries on the ecosystem, and modeling of ecosystem processes in the EPO.

4.1. Food-web dynamics

Improving the understanding of food-web dynamics in the pelagic EPO is important, given that accurate depictions of trophic connections and flows are the backbone of ecosystem models of any type.

4.1.1. Stable isotopes in ecology

1. Sample collections and analyses under a three-year project, "CAMEO 2009: A novel tool for validating trophic position estimates in ecosystem-based fisheries models." Principal goals are to validate the application of amino acid compound-specific isotopic analysis (AA-CSIA) across multiple marine phyla and across systems with contrasting biogeochemical cycling regimes, and to develop the use of AA-CSIA trophic position estimates for validating trophic models of exploited ecosystems.
2. Publication of yellowfin tuna-dolphin trophic interactions based on stable isotopes and diet analysis.
3. Analysis and publication of stable isotope data for pelagic squids and their prey, for interpreting the important ecological role of cephalopods in the EPO ecosystem.
4. Continued analysis and co-authorship of Pacific-wide isotope biogeography study of tropical tunas.

4.1.2. Diet studies

1. Analysis and prediction of yellowfin tuna diet composition using a classification tree model. Draft manuscript will be completed and submitted in 2011 for publication: *Decadal-scale diet composition of yellowfin tuna in the tropical eastern Pacific Ocean*.
2. Analysis of diet data for skipjack, bigeye, and associated pelagic predators using classification tree models.
3. Continued collaboration on ecological analyses with researchers at the University of Washington. Co-authorship of a publication on dietary evidence of increased cephalopod production in the EPO over a 50-year period.
4. Publication of a manuscript on the trophic ecology of mesopelagic myctophid fishes in the EPO.
5. Continued collaboration with international research program [CLIOTOP](#). Analysis of tropical pelagic predator diet data world-wide to address global trends and environmental influences.

4.2. Effects of fisheries on the EPO ecosystem

4.2.1. Ecological Risk Assessment

Long-term ecological sustainability is a requirement of ecosystem-based fisheries management. The vulnerability to overfishing of many of the stocks incidentally caught in the EPO tuna fisheries is unknown, and biological and fisheries data are severely limited for most of these stocks.

1. Productivity and susceptibility analysis (PSA) was tested for measuring vulnerability to overfishing in a preliminary analysis of a subset of species in the EPO purse-seine fishery.
2. A complete PSA will be conducted for the major species and stocks caught by the purse-seine fishery in the EPO, and a report will be produced.

4.2.2. Ecosystem modeling

Ecosystem-based fisheries management is facilitated through the development of multi-species ecosystem models that represent ecological interactions among species or guilds and provide inferences on the effects of different fishing scenarios on the ecosystem.

1. Continue the development of a second-generation model of the pelagic ecosystem in the tropical EPO based on Ecopath with Ecosim (EwE). The first IATTC model had 38 components and represented 1993-1997, while the second model will represent 2003-2005 based on new diet and stable isotope data.
2. Analyses of potential metrics of ecological impact of the tuna fisheries in the EPO. An analysis based on metrics of diversity, trophic level, and replacement time of fisheries catches was concluded. A second analysis using the EPO ecosystem model will be conducted to address the ecological state of the ecosystem as opposed to metrics based on removals alone.

5. BYCATCH STUDIES

In addition to continuing activities under the Agreement on the International Dolphin Conservation Program (AIDCP), the following are planned:

1. Bycatches on FADs:

- a. Continue support of research planning activities by industry, NGOs and government organizations (*e.g.* International Seafood Sustainability Foundation (ISSF));
- b. If industry does not provide information on FAD location and drift (with a prudent delay to avoid uncertainties about confidentiality), test different systems to identify individual FADs, and implement a FAD marking and tracking program.
- c. Support sorting grid experiments with scientific designs and analyses;

- d. Carry out experiments on alternative FAD designs to mitigate entanglements and reduce marine debris generation, and,
- e. Subject to availability of funding, carry out experiments with live-capture of tunas and other species to increase selectivity, using pumps or “wet” brailers to transfer the catch from the purse seine to the vessel (Captain R. Stephenson’s concepts).

2. Sea turtles:

- a. Continue support of Regional Sea Turtle Program, and publish the results of the first stages;
- b. Continue support of OFCF sea turtle program, and publish results of entanglement mitigation experiment, a hook catalog for the EPO, and comparative gear studies.

3. Sharks and rays:

- a. Continue the examination of spatial options for bycatch mitigation;
- b. Analyze data on bycatches of sharks and manta rays in the purse-seine fishery;
- c. Produce catch and effort estimates for artisanal fleets;
- d. Pending funding, cooperate in the planning of mitigation experiments.

4. Seabirds:

- a. Monitor trends for species affected by fisheries in the EPO.

5. Bycatches and diversified harvesting

Carry out modeling studies comparing different fisheries/gear selectivity levels, and their impacts on ecosystem properties with academic partners (University of Washington), pending funding.

6. Workshops for fishers

As part of the research to mitigate bycatches, and of the communication with the fishing fleet to discuss options for gear and operational studies, continue with the workshops that are organized around bycatch issues in the different fisheries.

- a. Workshops on the tuna-dolphin issue (AIDCP);
- b. Workshops on bycatches on FADs;
- c. Workshops on sea turtle bycatches in artisanal longline fisheries.

6. REDUCING BYCATCHES OF BIGEYE TUNA BY PURSE-SEINE VESSELS

The IATTC is working collaboratively with the International Seafood Sustainability Foundation (ISSF), to undertake a research cruise in the equatorial EPO in 2011 aboard a chartered purse-seine vessel to conduct field experiments on tunas and sharks within aggregations associated with drifting fish-aggregating devices (FADs). The cruise will focus on solutions to avoid catching undesirable sizes of bigeye tuna around FADs, but will also study the survival of sharks released after capture. Various complementary scientific tools will be used to elucidate behavioral differences between skipjack and bigeye tunas, with the aim of revealing opportunities for maximizing catches of skipjack and minimizing catches and mortality of bigeye and other species associated with drifting FADs.

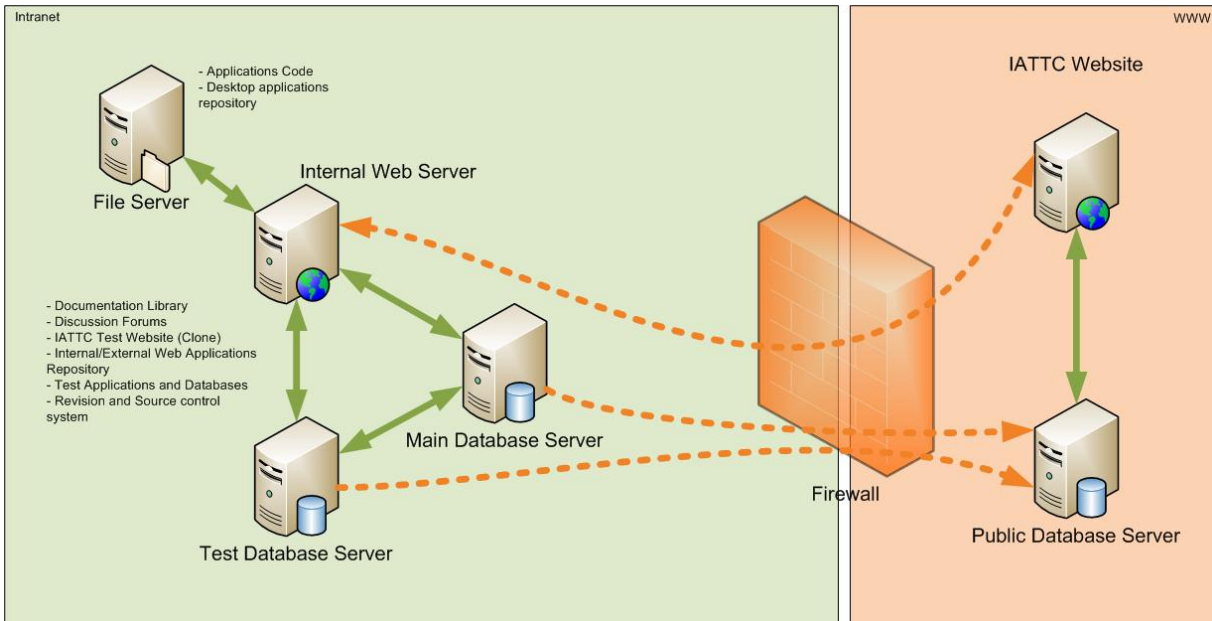
B. DATA

1. Data collection and database program work plan

At the meeting of the IATTC Scientific Advisory Committee (SAC) in August 2010, a summary of the organization of the work in the data group and of activities and objectives planned for future years was presented. This report contains an update of the progress of previously proposed activities, as well as new projects that are planned for the near future.

1.1 Activities since the previous report

1. A teamwork environment has been established. The IT staff and developers are working together to use common databases, servers and other resources in a collaborative manner. The IT staff has completed the migration of servers to a virtualized environment, which will be the basis on which to build the new workgroup environment. The following diagram represents the system being built, as described in section 1.2.1, 'Planned improvements', of [Document SAC-01-18](#).



2. The main Length Frequency and Species Composition program, of vital importance for analyses, is fully automated and documented. For many years, these analyses required many manual operations, and thus a great deal of time and effort for the staff. The automation of the program not only lightens the workload, but affords greater clarity and transparency throughout the process. Certain other dependent tasks have been identified, and are in the process of being automated (best scientific estimate (BSE), estimates by flag, bluefin and black skipjack estimates, and longline estimates). This work is about 90% complete.
3. The Catch and Effort program has been analyzed, and will be fully automated and documented. This program is also a very important component of the overall data processing. It provides a measure of fishing effort and combines data from observer and fishing vessel logbooks into a single source. About 10% of this work has been completed.
4. Development of a spatial database is in progress. This database will provide greater precision, speed, consistency and ease of handling of all types of spatially-referenced data. It will contain precise definitions of the areas of interest in the EPO (EEZ, fishing areas, sampling areas, etc.). This project is about 50% complete.
5. The Stock Assessment database, which contains a copy of all surface fishery data needed for stock assessments, has been created and documented. These data have been organized to optimize analysis efficiency. All of the processes required to extract, process, and summarize the data from the original sources have been automated and are contained in the database. This project is about 90% complete.
6. Development of a documentation library is in progress. This library will provide transparency and ease of use for all databases and data sets. The documentation library is about 20% complete.
7. Development of a new IATTC website is in progress. The antiquated software used to maintain the present web site is being replaced with the latest development tools. These tools will lead to easier maintenance and additions to the web site, as well as greatly improved functionality. The intention is to make the IATTC website easier to use, both for IATTC staff and website visitors. This project is

about 10% complete.

1.2 Planned work

1. Length Frequency data management database and application. The present design of the Length Frequency database will be examined and, where appropriate, improved. Data entry and editing tools will be developed.
2. Vessel register database and application redesign.
3. Review and improvement of the IATTC reporting workflow. This project will incorporate the automation tasks already completed or in progress in order to automate recurring reporting tasks, such as creation of maps, tables, and figures regularly presented in IATTC quarterly and annual reports and other publications.
4. Development of a data request management application. The IATTC receives regular requests for data summaries from interested parties. This project will unify and standardize staff efforts to assign data requests, produce results, document procedures, and catalog and store all aspects of the job for future reference.

2. FIRMS

The IATTC is making information on the status and trends of fisheries and resources available through its participation in the Fishery Resources Monitoring System (FIRMS). Partnership in FIRMS provides immediate access to the information technology tools and experience developed under FIRMS.

FIRMS, established in 2004, is a subsystem of FIGIS (Fisheries Global Information System), which was established under the FAO [Code of Conduct for Responsible Fisheries](#) in recognition of the need to provide the global community with well-documented and consistently-presented information on fisheries. FIRMS was developed by the regional fisheries management organizations (RFMOs) and international organizations to meet needs identified in the Code of Conduct. Its mission is to provide access to a wide range of high-quality information on the global monitoring and management of fisheries and marine resources. This mission is accomplished by defining standards for information and data on fisheries resources, as well as standards for reporting and consistent presentation to the global community. The [partners in FIRMS](#) include the tuna RFMOs (CCSBT, IATTC, ICCAT, and IOTC) and FAO. It also serves as a model for national resource monitoring systems (NatFIRMS).

C. CAPACITY BUILDING

1. Tagging

Provided funds are available, a three-day training course on tagging methodology for large pelagics, with emphasis on tropical tunas, will be held at the Achotines Laboratory in 2012 for up to 10 participants from Latin American member countries. Participants will learn about the objectives of tagging studies, types of tags, tagging methodologies, data analyses, and potential applications of tagging data in stock assessments, and carry out tuna tagging in waters close to the laboratory.

2. Bycatches

- a. Training courses on bycatch estimation and mitigation;
- b. Design of research strategies to address bycatch issues;
- c. Management and economic incentives to address bycatch issues.

3. Shark fisheries

The Commission staff will provide appropriate assistance to developing IATTC members in:

3.1. Sampling

- a. Continue the development of, and promote the adoption of, standardized data collection forms (catch, effort, biological data) for sharks and rays, in cooperation with other regional and

subregional organizations, member nations, and if possible with Western Pacific organizations collecting data .

- b. Develop and disseminate sampling designs for landings of sharks and rays, and for observer programs where available, and support the creation and maintenance of databases.
- c. In-port collection of shark catch, size distribution, and effort data, as well as the development of standardized methods to identify shark species. This assistance should be extended to the proper identification of shark species based upon body parts (*e.g.* fins or trunks), or on incomplete specimens.

3.2. Data reporting

Improving their capabilities to report data on catches and effort by gear type, landings and shark trade, in accordance with IATTC reporting procedures, including available historical data. This assistance shall likely include the development of observer programs covering different fisheries. We plan to have one training course per year, dedicated to the development of standardized national observer programs.

3.3. Biological parameters

Conducting research on stock structure and biological parameters such as age, growth, natural mortality, diet, and reproduction. This assistance will likely include training in biological sample collection and analysis methods which will be part of the general training course on data collection.

3.4. Fisheries data studies

Conducting research on the spatial-temporal characteristics of the catch, including identification of shark nursery grounds and of specific areas and seasons that contribute to the majority of catches. This assistance shall likely include a general training course on quantitative methods in fisheries data analysis, which will also cover methods for estimating fisheries quantities, such as fishing mortality, and inputs for stock assessment (*e.g.*, total catch, standardized trends of CPUE).

3.5. Workshops on stock assessment of sharks

Participation in shark stock assessment workshops, which would include among its research topics stock assessment and management of sharks.